Appendix J Photographic Log

Geosyntec consultants

Photograph Log

Client Name:	Site Location:	Project Number:
RobertsCo	7-9 Burroway Road, Wentworth Point, NSW	21067

Photo Number: 1	Date: 30 November 2021	
Description: UST Location 1 test pitting.		

Photo Number: 2	Date: 24 November 2021	
Description: Former mechanics pit test pitting.		

Geosyntec consultants

Photograph Log

Client Name:	Site Location:	Project Number:
RobertsCo	7-9 Burroway Road, Wentworth Point, NSW	21067

Photo Number: 3	Date: 1 December 2021
Description: Former wash bay test pitting.	

Photo Number: 4	Date: 30 November 2021
Description: Marker layer placement in the northern portion of the site, noting geofabric overlap of approx. 500mm.	

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Photograph Log

Client Name:	Site Location:	Project Number:
RobertsCo	7-9 Burroway Road, Wentworth Point, NSW	21067

Photo Number: 5	Date: 30 November 2021	
Description: Capping placement in the northern portion of the site.		

Photo Number: 6	Date: 1 December 2021	
Description: Marker layer placement in the central portion of the site.		

Geosyntec consultants

Photograph Log

Client Name:	Site Location:	Project Number:
RobertsCo	7-9 Burroway Road, Wentworth Point, NSW	21067

Photo Number: 7	Date: 1 December 2021	
Description: Capping placement in the central portion of the site.		

Photo Number: 8	Date: 1 December 2021	
Description: Capping placement in the central portion of the site.		

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Photograph Log

Client Name:	Site Location:	Project Number:
RobertsCo	7-9 Burroway Road, Wentworth Point, NSW	21067

Photo Number: 9	Date: 3 December 2021	
Description: Capping placement in the eastern portion of the site.		

Photo Number: 10	Date: 3 December 2021	
Description: View across the site to the north showing near-completed capping using material from the western portion of the site (Ridges Road).		

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Photograph Log

Client Name:	Site Location:	Project Number:
RobertsCo	7-9 Burroway Road, Wentworth Point, NSW	21067

Photo Number: 11	Date: 8 December 2021	
Description: View across the site to the southeast showing completed capping using material from the western portion of the site, noting final level difference between Ridges Road and the rest of the site.		

Photo Number: 12	Date: 8 December 2021	
Description: View across the site to the southwest showing completed capping using material from the western portion of the site, noting final level difference between Ridges Road and the rest of the site. Capping of the former mechanics pit area being conducted (centre).		

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Photograph Log

Client Name:	Site Location:	Project Number:
RobertsCo	7-9 Burroway Road, Wentworth Point, NSW	21067

Photo Number: 13	Date: 8 December 2021	
Description: View across the site to the east showing completed capping using material from the western portion of the site, with capping of the former mechanics pit area being conducted (centre).		

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Appendix G Construction Soil and Water Management Sub-Plan

roberts co

Construction Soil and Water Management Plan

WENTWORTH POINT HIGH SCHOOL

Date: 22/05/2023

Document Details

Title	Construction Soil and Water Management Plan
Client	Schools Infrastructure NSW
Document Reference Number	RCo-CSWMP-PLN-001
Principal Contractor	Roberts Co
Roberts Co Project No.	20016
Principal Contractor ABN	68 627 689 418
Project Address	3 Burroway Road, Wentworth Point, NSW, 2127

Document Authorisation

Adam Greentree	Ben Drayton	Gerhard Nelson
PROJECT MANAGER	**SITE MANAGER**	**PROJECT HSE MANAGER**
22/05/23	22/05/23	22/05/23
		
Date	**Date**	**Date**

TABLE OF CONTENTS

1 DOCUMENT CONTROL

All changes made to the Construction Soil and Water Management Plan are recorded in the amendment table below. The version number and date of revision for the current document revision are shown in the footer of the document.

1.1 Revision History

Revision	Date	Description of changes	Prepared by	Approved by
01	8/02/23	Update Template	AG	AG
02	22/05/23	Updated to reflect transition onsite from Civil phase to Structure phase	AG	AG

2 DEFINITIONS AND ABBREVIATIONS

Term/Abbreviation	Definition
AS/NZS	Australian Standard/New Zealand Standard
Client (Principal)	The party to whom Roberts Co is contracted for a Project
Client's Representative	The person appointed by the Client to perform the duties of the "Superintendent" as defined in the contract
Consultant	The party engaged to perform the design, preparation of detailed 'For Construction' documentation and necessary certification to meet contractual requirements.
D&C	Design and Construct
HSE	Health, Safety and Environment
EPBC Act	Environmental Protection and Biodiversity Conservation Act (Commonwealth) - legislation to protect and manage matters of national environmental significance
EPA	Environment Protection Authority
ESD	Ecologically Sustainable Development
H&S	Health and Safety
HSC	Health and Safety Committee
HSEQ	Health, Safety, Quality and Environment
IMS	Integrated Management System
ITP	Inspection and Test Plan – defines the steps to be taken to check and verify an activity or product
NGER	National Greenhouse and Energy Reporting
OEH	Office of Environment and Heritage
PAP	Principal's Authorised Person
PM	Project Manager
PMP	Project Management Plan
PP	Process Procedure – A work instruction, which details the technical/engineering/safety/quality/environmental methodology for a particular activity
RAP	Remediation Action Plan
RCo	Roberts Co
SDS	Safety data sheet
SWMS	Safe Work Method Statement – a planning process to determine detailed methodology, identification of hazards, risks and control measures, used to break down and analyses individual PRA work elements. Specific risk assessment based on day-to-day tasks, facilitated by supervision and involving consultation with workforce before task is undertaken. Signed off by all people undertaking the task.

Term/Abbreviation	Definition
Subcontractor	Any company, body or person who is contracted to Roberts Co for the purpose of supplying plant and/or services
System Element	The administrative activities that need to be implemented and controlled to ensure that the product or service meets environmental requirements
The Project	Wentworth Point High School

Table 01 – Terms of reference, definitions, and abbreviations.

3 PURPOSE AND APPLICATION

This Construction Soil and Water Management Plan ("**CSWMP**") for the Wentworth Point High School ("**The Project**") outlines the Roberts Co system for managing and minimising the impacts of its activities, meeting its legislative and contractual obligations and providing a means of continually improving performance.

This CSWMP provides a 'road map' for the implementation of the Construction Soil and Water Management Plan, including plans, procedures and forms. It provides directions to the documents required to address Construction Soil and Water Management for the Project. This CSWMP is for use by all Project personnel and subcontractors during the Project:

- Procurement
- Construction

3.1 Construction Soil and Water Management Plan

The CSWMP has been developed in accordance with the requirements of ISO 14001 and the Roberts Co Integrated Management System. It incorporates the requirements of the contract / project scope / tender documents including:

- Legislative and contractual requirements
- Approval conditions
- Processes and procedures that Roberts Co will adopt to identify, manage and control the risks associated with soil and water management on the project.
- Provision of adequate resources and allocation of responsibilities for ensuring the effective implementation of this CSWMP
- Methods for maintaining records and requirements for reporting
- Process for monitoring and reviewing the management performance of the Project to drive continual improvement

This CSWMP has been revised to incorporate all relevant contractual information and obligations.

Project-based Roberts Co personnel are required to sign the CSWMP acknowledgment form in Appendix 02.

3.2 Supplementary Plans

Supplementary Plans may be required by the contract or deemed necessary by the Project Manager. Supplementary plans that are required will be included as annexures to this plan.

Other management plans may include, but not limited to the following:

- TTW Sediment and Erosion Control Plan and Details
- Acid Sulphate Soil Management Plan
- Remediation Action Plan

3.3 Interfacing with Other Plans

This CSWMP should be read in conjunction with the other suite of Project specific management plans:

- Project Management Plan
- Construction Management Plan
- Work Health and Safety Management Plan

3.4 Project Scope

The Wentworth Point High School (previously known as the Sydney Olympic Park new high school) is a new high school for 1530 students.

The project was originally to be developed in 2 stages - Stage 1 a Stream 5 school for 850 students, and Stage 2 upgrade to a Stream 9 school for 1530 students.

Development of the school will be in 2 phases:

- Phase 1 to construct all teaching spaces,
- Phase 2 to complete the multipurpose hall, sports courts, and landscaping (once TfNSW/Landcom's peninsula masterplan is amended and the road relocation approved).

With waterfront views, maritime access and green parkland surrounds, Sydney Olympic Park High School will be a landmark educational facility for SINSW. This future high school has the responsibility to contribute to this growing suburb and be the heart of Wentworth Point's culturally diverse community.

3.5 Receiving Environment

The project site is based in Wentworth Point area. The south-eastern corner of the project is located 100m from the Parramatta River. Burroway Road to the south of the project falls towards Parramatta to the east. Along this Burroway Road street frontage is a number of Stormwater inlets.

4 LEGAL AND OTHER REQUIREMENTS

All personnel associated with the project will comply with all relevant requirements including:

- Laws – Acts, regulations, policies, etc;
- Environment Protection Licence (if applicable) and permits;
- Development consents, and;
- Relevant industry standards / codes.

Compliance conditions shall be incorporated into this CSWMP. Specific details and controls are included in the associated sub-plans.

A copy of relevant Permits, Licences and any development approvals relevant to RCo activities will be kept on site.

5 RESPONSIBILITIES AND AUTHORITIES

Authorities and responsibilities for all positions are defined in this plan below and communicated in job descriptions and other project documentation. Key responsibilities are indicated in the project organisational chart. Key responsibilities and authorities include;

5.1 Construction Manager

- Ensure that independent audits of the system are conducted
- Review audit outcomes and take action as necessary
- Resolve major issues which cannot be resolved by the Project Manager
- Ensure that internal audits of the system are conducted
- Review audit corrective actions and take action as necessary to ensure timely close out of issues

5.2 HSEQ Manager

- Provide support to the project team
- Facilitate internal and external audits

5.3 Project Manager

- Ensure that project responsibilities and authorities are defined and communicated
- Provide adequate resources to meet objectives
- Approve the CSWMP and various sub-plans and ensure effective implementation and maintained
- Allocate appropriate resources and provide support for the implementation of the CSWMP
- Report to senior management on performance, including assurance, incident and/or environmental breaches
- Take action to resolve non-conformances and incidents
- Ensure suppliers and subcontractors comply with requirements;
- Report environmental incidents to the client / local authorities, as required.

5.4 Site Manager

- Supervise all site construction activities and personnel by ensuring that they meet requirements of the plan
- Organise and manage site plant, labour and tCSWMPorary materials
- Ensure that site controls are properly maintained and provide support to the Project HSE Manager/Advisor
- Take action to resolve non-conformances and incidents

5.5 Project HSE Advisor / Manager

- Ensure that the CSWMP is effectively established, implemented and maintained on the project
- Ensure compliance with all relevant statutes, regulations, rules, procedures, standards and policies
- Report to the Project Manager on the performance of the system and improvement opportunities
- Provide support to the project team to enable them to meet their commitments
- Ensure that environmental controls, materials and equipment are maintained

5.6 Contractors

- Comply with all legal and contractual requirements
- Comply with site environmental requirements
- Comply with management / supervisory directions
- Participate in induction and training as directed
- Report all incidents in a timely manner

5.7 All Personnel

- Comply with the relevant Acts, Regulations and Standards
- Comply with the Company's environmental policy and procedures
- Promptly report to management on any non-conformances, environmental incidents and/or breaches of the system
- Report all incidents
- Act in an responsible manner

6 OPERATIONAL CONTROL

6.1 Risk Assessment and Control

Project wide obligations, aspects and impacts, and risks associated with the project shall be identified and assessed prior to the commencement of the project by the Project Manager in consultation with the project team and recorded in either or all of the following risk assessments or documents, as required:

- Project Risk Assessment (PRA) – (refer to WHS Plan-Appendix 04)
- SWMS, Inspection and Test Plans / check sheets (as appropriate)
- Work instructions or procedures (e.g., refuelling and servicing)

6.2 Hold Points

The activities outlined in the table below are not to proceed without objective review and approval by the nominated authority. Proceeding past a specified Hold Point without authorisation is deemed as a system non-conformance.

These activities below are considered hold points.

ITEM	PROCESS HELD	ACCEPTANCE CRITERIA	APPROVAL AUTHORITY
Dewatering	Dewatering / pumping water off the site	Controls in place as per TTW sediment and erosion plan	Site Manager
Sediment and erosion control measures	Construction activities involving ground disturbance	Sediment and Erosion Control Plan has been developed, reviewed, approved and implemented	Project Manager

Table 05 – Control hold points.

6.3 Controls to Be Implemented

1) Measures to Ensure Sediment is Not Tracked onto the Roadway
    a. At both Gate 1 and Gate 2 a 'cattle grid' will be set up to remove sediment from site vehicles tires prior to leaving the confines of the site area,
    b. This 'cattle grid' area is to have a water available to allow for the washing of any sediment/ mud from tires prior to leaving site,
    c. Where required a street sweeper will be used to clear any debris from the public roads at the site entry,
2) Erosions and Sediment Controls;
    a. To be established as per TTW's Sediment and Erosion Control Plan and Details included in **Appendix 1**. Generally this includes the following;
        i. Cattle grid,
        ii. Siltration fencing,
        iii. Berms and falls in bulk excavation levels to contain water in site boundary area,
        iv. Sandbag/ 'coconut log' sediment traps,
        v. Backfill to retaining wall to Burroway Road site boundary area to be completed with a free draining material. To allow for overland flow water to drain into this area,
    b. Measures in accordance with Managing Urban Stormwater: Soils & Construction (4th edition, Landcom 2004) commonly referred to as the 'Blue Book'
3) Contamination of Water
    a. All sediment laden water in overland flow will be directed away from the leachate management system to prevent cross-contamination of clean water with leachate laden water,
4) Management of Off-site Water Flow
    a. All water that gathers in excavations onsite to be managed internally within the site boundary.
    b. All water will be pumped to the north west corner of the site where there are minimal construction activities taking place. This water will be allowed to dissipate into the ground water,
    c. If any water is to be pumped offsite the Permit to Discharge Water is to be completed as included in Appendix 3.
    d. The planned strategy is for all water to be retained inside the site boundary. If this strategy needs to change the runoff water from the site must be captured and held for sufficient time in an appropriately sized basin until sediment and suspended clay or other colloids have settled. This may require flocculation if necessary in the holding pond to achieve this.

6.4 Potential Contaminated Waste

CIVIL AND EXCAVATION PHASE

We have engaged an Environmental Consultant (Geosyntec) to provide a Remediation Action Plan (RAP) and to supervise works during the excavation phase. Due to the past use of the land as light industrial land use there is an expectation that some contaminated fill will be excavated. Roberts Co and Geosyntec undertook sampling and testing prior to the main works commencing to identify the existing conditions onsite. This sampling included the following;

- Excavation of test pits to identify potential fill types and contaminants,
- An assessment on the presence of Asbestos Containing Material,
- Confirmation of groundwater conditions,

The results of this sampling and the strategy to remediate and contaminated waste is detailed in the Remediation Plan included in Appendix 8.

In summary, the measures required to manage contaminated waste/ fill within the site boundary include the following;

- Removal of any Underground Storage Tanks and backfill with clean material,
- All fill excavated from below the existing ground level is to be stockpiled onsite while samples are taken by the Environmental Consultant. 1 sample is to be taken for every 100m3. These samples will be analysed to determine the soil classification and presence of contaminants,
- Once the soil has been classified it will be removed from site and taken to a facility with the applicable license for the classification type,
- Tipping dockets and a register is to be maintained to track contaminated fill removed from site,
- A marking layer will be installed over the existing fill and a minimum 600mm 'capping layer' of clean fill will be placed over the entirety of the site,

STRUCTURE AND FITOUT PHASE

Some hazardous substances will be used onsite during construction of Wentworth Point High School (fuel, oil, caulking, membranes etc). The following controls will be in place to control the use of these substances and ensure no environmental impact;

- A hazardous substance risk assessment shall be conducted for hazardous substances prior to use
- Adequate training in the use of chemicals, emergency response and spill containment equipment shall be provided prior to commencing work
- Safety Data Sheets (SDS) shall be available for any hazardous chemical or dangerous good stored and handled at the project / workplace
- A hazardous substance and SDS register is established and maintained
- Any hazardous chemical that is used, handled or stored at the project / workplace is correctly labelled (with exception to conditions specified in the WHS Regulation - Schedule 9)
- Storage of chemicals must be in accordance with the relevant SDS; non-compatible chemicals must not be stored together
- No bulk storage of hazardous substances or refuelling within the zone of influence of any environmentally sensitive areas and/or waterways
- Flammable liquids and gases must only be stored in approved ventilated containers

- Containers of hazardous chemicals including oil and fuel, stored in a bunded area which is sufficient to contain 110% of the largest container and 25% of the second largest container
- Emergency response and spill containment equipment must be available where chemicals and dangerous goods are stored and used,

7 MONITORING AND MEASUREMENT

Key characteristics of the project operations and activities which have a significant impact on the environment will be regularly monitored and measured.

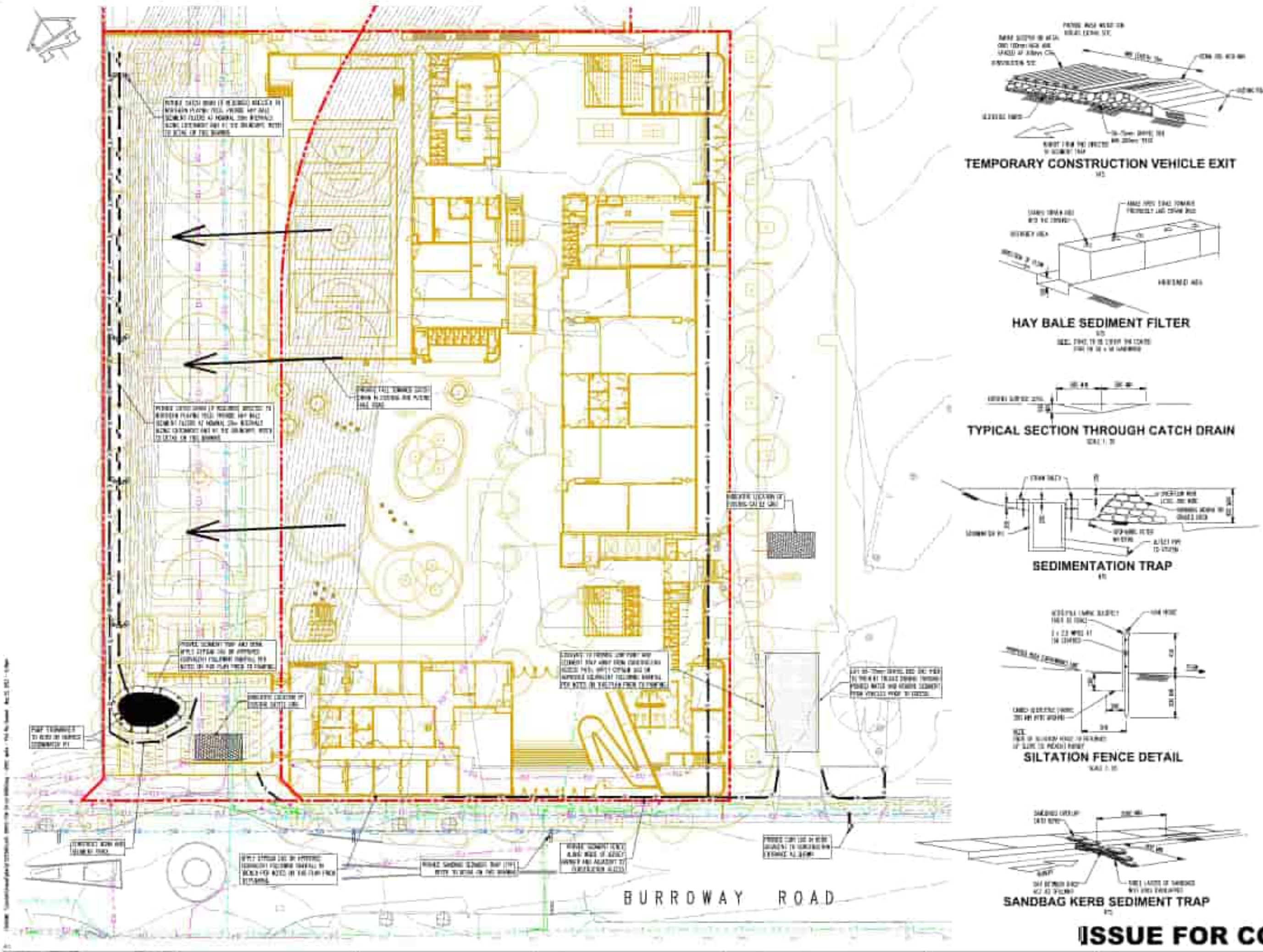
Monitoring / Reporting Aspect	Details
Inspection and Monitoring	The WHS Manager will perform weekly soil and sediment control inspections and monitoring during the site establishment, construction and site demobilisation phases. Project Procedures will be prepared as necessary to specify how monitoring is to be undertaken, including responsibility and frequency. Monitoring results and any corrective actions identified will be recorded in Roberts Co designated electronic database. National Greenhouse and Energy Reporting related information will be collected and uploaded into Roberts Co designated electronic database. Inspection checklists and any corrective actions identified will be recorded in Roberts Co designated electronic database.
Reporting	The following information will be retained for inclusion in the Reports as follows: – HSE Inspections (Project) – HSE Incidents / complaints (Project)

Table 06 – Control hold points.

APPENDICES

Appendix 01 – TTW – Sediment and Erosion Control Plan and Details

Begins on next page



EROSION AND SEDIMENT CONTROL NOTES

Sequence Of Works

WATER QUALITY TESTING REQUIREMENTS

EROSION AN SEDIMENT CONTROL PUMP OUT NOTES

EROSION AND SEDIMENT CONTROL LEGEND

ISSUE FOR CONSTRUCTION

ARCHITECT	ENGINEER	PROJECT	DRAWING NAME	SCALE	DRAWN BY	AUTHORISED BY
WOODS BAGOT	TTW Structural Civil Traffic Façade	SYDNEY OLYMPIC PARK HIGH SCHOOL (SOPHS)	SEDIMENT AND EROSION CONTROL PLAN AND DETAILS	AS NOTED	LA	
				DRAWING No. SOPHS-TTW-CV-L0-00003		REVISION 01

Appendix 02 – CSWMP Plan Sign Off

I have read and understand the requirements of the role, processes, responsibilities and accountabilities as outlined within this Construction Soil and Water Management Plan.

NAME	POSITION	DATE REVIEWED	SIGNATURE
Gerhard Nelson	HSE Manager	23/05/2023	

Appendix 03 – Roberts Co Permit to Discharge Water

Begins on Next Page

PERMIT TO DISCHARGE WATER

Project:			
Permit No.:			
Permit Issue Date:		**Permit Expiry Date:**	

This Permit to Discharge Stormwater is to be completed to ensure any worker and/or subcontractor who are required to discharge water (ground or storm water) from the project / workplace are required to record and/or treat the water prior. The Permit must be completed by the Works Supervisor and issued to the nominated Roberts Co representative for approval to proceed.

PART 01: Permit Application (To be completed by the supervisor responsible for the works)

Applicant Name:			
Company / Employer:			
Position / Role:		**Contact Number:**	
Proposed Start Date:		**Proposed Start Time:**	
Proposed Completion Date:		**Proposed End Time:**	
Specific Location of Water:			
Description / Scope of work:			
Proposed Method of Discharge:			

PART 02: Water Quality Results (To be completed by the supervisor responsible for the works)

Test Type	Time Tested	Criteria	Test Record	Acceptable?		Actions
pH		pH 6.5-8.5		☐ Yes	☐ No	
NTU				☐ Yes	☐ No	
Oil/Grease		No visible signs		☐ Yes	☐ No	
Total Suspended Solids		<50mg/L		☐ Yes	☐ No	
Conductivity				☐ Yes	☐ No	

PART 03: Summary of Water Treatment (To be completed by the supervisor responsible for the works)

Approximate total volume of water to be discharged:				
Gypsum	☐ Yes	☐ No	Quantity:	
pH increaser	☐ Yes	☐ No	Quantity:	
pH decreaser	☐ Yes	☐ No	Quantity:	
Other:	☐ Yes	☐ No	Quantity:	
Comments:				

PART 04: Permit Holder (Works Supervisor)			
Works Supervisor – I accept this permit and agree to be bound by the conditions above and the associated procedures and accept the responsibility as the person directly in charge of the work.			
Name:			
Signature:		**Date:**	
PART 05: Permit Authorisation / Approval (Roberts Co)			
Permit Authority – I authorise this Permit to Discharge subject to the conditions and precautions as indicated on this permit.			
Name:			
Signature:		**Date:**	
PART 06: Permit Completion (Discharge works are completed)			
Name:			
Signature:		**Date:**	

Appendix 04 – Operational Control Procedures – Construction Soil and Water Management Risk Action Plans

Water Quality, Site Drainage and Erosion and Sediment Control	
Objective	– To comply with contractual and legislative requirements and ensure that water discharged off-site from construction and erosion and sediment control (ESC) activities does not cause environmental nuisance / harm
Targets	– No sediment impacts to the surrounding environment and waterways as a result of the works – Prevent water quality impacts off site as a result of erosion and sedimentation.
Legal, Contractual and Other Requirements	– See Appendix 3 for list of applicable legislative requirements
Site specific planning / approval conditions / licence conditions	– Planning consent conditions requirements
Controls (means and resources)	– Erosion and sediment control plans (ESCPs) will be developed and implemented prior to the commencement of topsoil stripping and earthworks – The development of ESCPs will be guided by the Blue Book and other guidelines where required – Particular attention will be paid to the design criteria for sediment fences, straw bales, catch drains, diversion drains, sandbags and similar controls – Permanent drainage to be installed as early in the program as possible – All water to be discharged in accordance with legislation and only after RCo approval – Discharge quality must comply with: – TSS: ≤ 50mg/lt (~Turbidy 30NTU). If this cannot be achieved though natural settling, then the trapped sediment laden water is to be flocculated with gypsum applied at a rate of approx. 40kg/100m3 – pH: Between 6.5 and 8.5 – Provide shaker grids or rumble strip at site egress points. Note where aggregate is used, minimum size is 150mm

Water Quality, Site Drainage and Erosion and Sediment Control	
	– Top-soil / mulch stockpiles to be not greater than 2.0m in height. All stockpiles will be located clear of watercourses and drainage works – Wastewater management facilities shall only be provided through connection to existing sewer or proprietary storage and pump out systems are permitted – Wastewater storage and pump out systems shall be procured, installed and operated, including the provision of automatic cut off valves for inflows and high level alarms – All disturbed surfaces will be revegetated within 1 month of final land forming and in compliance with the landscaping plans – ESC devices are to be maintained when their capacity has been reduced by 25% – Under no circumstances will tCSWMPorary stockpiles be placed within 5m of the site boundary or in position where it could impact adjacent property – Toolbox talks will be conducted for CSWMPloyees and subcontractors on the requirements of the ESC Plan – The ESC Plan is to be maintained and up to date for the current site conditions – Use sandbag check dams to protect stormwater drains as required – All ESC works will be removed immediately prior to final completion and all surfaces will be returned to pre-existing condition
Responsibilities	– All staff to ensure adequate ESC devices are installed and maintained – The PER will undertake "at least weekly" inspections of on-site ESC devices, plus prior to expected rainfall and after rainfall – The Site Manager is responsible for the repair / management of any damage or additional ESC devices, as required
Timeframe	– Duration of site works
Monitoring and Reporting	– Visually monitored daily by site supervision – Weekly inspections to be documented on form HSE Inspection – Maintenance activities for ESCPs shall be documented – items that cannot be immediately repaired are to be documented on the project CAR Register – All water quality data including quantity, quality and dates of water release will be maintained the project records

Appendix 05 – Acid Sulfate Management Plan

Begins on Next Page

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Acid Sulfate Soil Management Plan – Wentworth Point new High School

7 Burroway Road, Wentworth Point, NSW 2127

RobertsCo
21 October 2022

AU122229 CEMP App J

Geosyntec consultants

Quality Management

Document Distribution

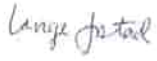
Issue/Revision	Issue 1	Revision 1	Revision 2
Remarks	DRAFT	Final	
Date	16 September 2022	21 October 2022	
Prepared by	Olivia Zurek	Olivia Zurek	
Reviewed by	Lange Jorstad	Lange Jorstad	
Signature	DRAFT		
File reference	Appendix J - Revision 1 Acid Sulphate Soil Management Plan	Appendix J - Revision 1 Acid Sulphate Soil Management Plan 12Oct2022	
Distribution	• RobertsCo • Geosyntec Electronic File	• RobertsCo • Geosyntec Electronic File	

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Table of Contents

Attachments

Terminology

AASS	Actual acid sulfate soil
ASS	Acid sulfate soil
ASSMAC	Acid Sulfate Soil Management Advisory Council
CEMP	Construction environmental management plan
EPA	Environment Protection Authority
mAHD	metres Australian Height Datum
mBGL	Metres below ground level
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)
PASS	Potential acid sulfate soil
POEO	Act Protection of the Environment Operations Act 1997 (NSW)
PPE	Personal protective equipment
SPOCAS	Suspension peroxide oxidation combined acidity and sulfate
SPOS	Peroxide-oxidisable sulfur
SWL	Standing water level
SWMS	Safe work method statement
TAA	Total actual acidity
TPA	Titratable peroxide acidity
TSA	Titratable sulfidic acidity
VENM	Virgin excavated natural material
WHS	Work health and safety

the ASSMAC (1998) action criteria. It was concluded that 'PASS are likely to exist below the water table (i.e. 1.5 m BGL and below), in the darker coloured material observed'.

1.4 Objectives

This ASSMP forms part of the Construction Environmental Management Plan.

The objectives of this ASSMP is to provide guidance on the environmental management of ASS during the remediation, excavation and construction works to be followed by the Principal Contractor and their sub-contractors, and provide appropriate mechanisms to reduce the potential on-site and off-site environmental impacts and mitigate the risks associated with the disturbance of PASS.

The following issues are addressed in the ASSMP:

- strategies for the management of PASS during development
- implementation of a soil and groundwater monitoring program; and
- contingency procedures to be implemented in the event of the failure of management strategies

This document has been prepared to give guidance on management of ASS, in accordance with the NSW Acid Sulfate Soils Management Advisory Committee's ASSMAC (1998) Acid Sulfate Soil (ASS) Assessment Guidelines.

1.5 Review and Approval

This ASSMP is to be reviewed and endorsed by the Site Auditor. Once endorsed by the Site Auditor, the ASSMP is to be submitted to Council and the NSW EPA before the certification of the works.

2 Site Information

2.1 Site Identification

A summary of Site identification details is provided below.

Table 2.1: Site Identification

Title	Details
Street Address:	7 Burroway Road, Wentworth Point, NSW (formerly 3 Burroway Road)
Property Description:	Lot 1 in Deposited Plan 1276305 (formerly Lot 202 DP1216628,Lot 204 D P 1216628 and Lot 204 DP1216628)
Current Site Ownership:	Roads and Maritime Services (RMS)
Property Size:	0.7 hecatre
Local Government Area:	City of Parramatta Council
Zoning – Existing:	B1 Neighbourhood Centre and R4 High Density Residential (Auburn LEP (2010))

2.2 Local Environmental Plan

A review of the Auburn Local Environmental Plan 2010 (ASS Map – Sheet ASS_009), which at the time of writing had not been consolidated to a new City of Parramatta Council Local Environmental Plan, indicates that the Site is located in an ASS risk Class 2 area.

2.3 Acid Sulfate Soil Risk Map

A review of the Prospect/Parramatta River 1:25,000 Acid Sulfate Soils Risk Map indicates that the Site is classified as 'Disturbed Terrain' that includes filled areas that occur during the reclamation of low-lying swamps for urban development. Other activities that result in the classification of a disturbed terrain include dredging, heavy ground disturbance through urban development and/or construction of dams or levees.

2.4 Site Conditions

The site condition reports are summarised below in Table 2.2.

Table 2.2: General Site Conditions

Title	Details
Topography:	The Site is relatively level at an elevation of less than 10 metres Australian Height Datum (mAHD) and has been subjected to historical filling associated with land reclamation which has altered the original topography.
Superficial Geology:	Based on the Sydney Geological Series Sheet 9130, the Site is underlain by man-made fill comprising dredged sand and mud, demolition rubble and/or industrial and household waste (up to 2.4 mBGL). The fill is underlain by Quaternary Age alluvial deposits (1–4.8 mBGL). Ferruginous and humic cementation may occur in places and shell layers are common. Highly weathered, grey sandstone was encountered at one borehole location at 4.4–4.8 mBGL.
Depth to Groundwater:	Depth to groundwater ranges between 0.6 mBGL to 3.7 mBGL, and standing water levels (SWL) ranged between 0.5 mAHD and 2.7 mAHD.
Flow Direction:	Groundwater flows northwest and northeast towards the Parramatta River and Homebush Bay respectively.

2.5 Previous ASS Investigations

The Site, as a portion of Wentworth Point Peninsula Park Project, has been subject to a number of historical ASS investigations. A list of most relevant reports is provided below:

- WSP 2009a, Acid Sulfate Soil Management Plan Harbour Radio Pty Limited (2GB) Burroway Road, Homebush Bay, NSW.
- WSP 2009b, Environmental Site Assessment Harbour Radio Pty Limited (2GB), Burroway Road, Homebush Bay, NSW.
- GHD, 2012, Additional Contamination Assessment – Stage 1 Area, incorporates results from the 2010 detailed site investigation.
- Parsons Brinckerhoff (PB) 2014, Proposed management of acid sulfate soils prepared for the Wentworth Point Development.
- WSP 2014, Soil Contamination Assessment Burroway and Hill Road, Wentworth Point Development, HomebushBay, NSW 2127.
- Parsons Brinckerhoff (PB) 2015, Detailed Remediation Action Plan – Infrastructure Delivery, Wentworth Point Development.

3 Extent of Management

3.1 Proposed Redevelopment

The proposed works will include the removal and remediation of surrounding soil of several USTs approximately 3m bgl. It will also include excavation, pile soil and inground service trenching.

Site layout for the site is provided as Appendix A, which indicate the areas requiring excavation.

The proposed remediation works for the infrastructure delivery include the bulk excavation of specific cut-to-fill areas to depths that may extend up to 3.0 mBGL (WSP, 2015). Based on the proposed excavation depth, indicative volumes of soil to be disturbed, and the Site located in an area of high occurrence of ASS materials at or near the ground surface, any materials that are excavated and suspected of containing PASS and/or ASS should be assessed and managed according to management measures and mitigation strategies discussed in the following sections.

3.2 Assessment Criteria

The following assessment criteria for field and laboratory testing have been developed with reference to the ASSMAC guidelines (1998).

ASS are usually found in estuarine environments up to 10 mAHD and generally consist of clays and sands containing pyritic material. The field indicators of ASS include:

- iron staining on any drain surfaces
- unusually clear or milky green water discharging from the site
- jarosite horizons or mottling due to iron in the subsurface
- corrosion of concrete or steel structures
- presence of any sulfurous odours.

Analytical results are assessed against the following criteria taken from ASSMAC (1998). Action criteria are based on texture and clay content of the soil being analysed and the total volume of soil to be disturbed. For the purpose of this plan the adopted action criteria is conservatively applied for coarse texture soils, based on the natural soils encountered including clay, sand and sandy clay. As the potential amount of ASS requiring excavation is unknown both the criteria for 1 to 1,000 tonnes disturbed and for >1,000 tonnes disturbed have been considered; for coarse soils the criteria are the same for both categories. Table 3.2 outlines the assessment criteria.

Table 3.1: Adopted Action Criteria

Analyte	Units	Action Criteria (Coarse Soils)	
		1 to 1,000 tonnes disturbed	>1,000 tonnes disturbed
S_{POS}	%	0.03	0.03
TTA + TPA	mol H$^+$/T	18	18
TSA	mol H$^+$/T	18	18

S_{POS} – Peroxide-oxidisable sulfur
TAA – Total actual acidity
TPA – Titratable peroxide acidity
TSA – Titratable sulfidic acidity

4 ASS Management Strategy

The following sections outline management measures and mitigation strategies to be undertaken to manage areas where potential or actual ASS materials are present at the Site.

General construction environmental management for the proposed works is presented in the CEMP. This ASSMP provides specific information for the management of ASS at the site and is a sub-plan to the CEMP.

4.1 ASS General Management Strategies

There are a range of control and management measures available when dealing with the possible disturbance of ASS. Such measures can be implemented individually or jointly as part of a combined approach.

PB (2014) summarises the following general strategies as outlined in ASSMAC (1998):

- Avoidance – where ASS areas are avoided altogether (total avoidance) or development activities are adjusted so that the more severe areas are left undisturbed (partial avoidance).
- Oxidation prevention – ASS are innocuous if they are not allowed to oxidise. Oxidation can be prevented by avoidance, water table control, in situ capping, or removal and burial below the water table.
- Acid neutralisation – acid present or produced by oxidation in the soil can be controlled by the addition of alkaline agents such as agricultural lime for example.
- Leachate treatment – where the sulfidic content of the soil is very low (quantity), deliberate oxidation with leachate collection and treatment might be appropriate. This method is generally only applicable to sands, given the lengthy drying times for clay, and would require pilot trials prior to implementation.
- Disposal to landfill – the ASS may be removed and disposed of at an appropriate landfill facility. Untreated ASS would require treatment as a contaminated soil for the purpose of transport and disposal.

It is considered that avoidance of PASS/ASS is not viable as the proposed excavation is anticipated to extend to a depth greater than 1.5mbgl.

Therefore, the most feasible management strategies are summarised as follows:

- For PASS generated from the landward section of the launching channel, the material can be treated by addition of an alkaline agent such as agricultural lime. The treated PASS can then be reused in other parts of the site or the wider Wentworth Point redevelopment (where possible). The treated PASS can only be placed beneath the proposed capping layer to be constructed as part of the overall Wentworth Point development. No treated PASS can be placed below the water table.
- Dewatering associated with the works to be undertaken within the cofferdam and the excavation required as part of the launching channel construction may result in the exposure of PASS.

5 Testing and Management Procedures for Acid Sulfate Soils

As part of the development works will involve the excavation of PASS/ASS, the management strategy to be adopted for the site during the excavation and construction works in order to mitigate the impacts of PASS/ASS on the surrounding environment will include the following steps:

- Appoint a suitably qualified person to manage the acid sulfate soil issues during the earthworks
- Minimise the amount of PASS/ASS required to be excavated
- Excavate and stockpile spoil in separate layers based on geological units and moisture content (i.e., saturated or dry) and reinstate spoil in the same order to ensure that PASS remain saturated.
- Reinstate PASS/ASS under the water table with 16 hours of excavation works (where possible)
- Undertake monitoring and laboratory testing of excavated soils (mainly based on visual assessment, field testing and laboratory testing) to assess the potential presence of acid generating potential during excavation activities and establish liming rates
- Excavated PASS/ASS can be managed through either offsite disposal or on-site treatment
- Manage and monitor dewatering activities to minimise the ingress of groundwater into the excavation and to maintain the groundwater table in the area.

In the case of the exposed sediments within the cofferdam, the material will undergo in-situ cement-lime mixing to increase the geotechnical specification of the sediments. This should reduce the potential for acid generation. Further testing is required to be undertaken to assess whether additional liming is required prior to onsite reuse or offsite disposal.

5.1 Training and Responsibilities

The Principal Contractor should appoint a suitably qualified person who will be responsible for managing ASS at the site during the proposed remediation, excavation and construction works. It is expected that daily attendance to the site will be required to facilitate soil sampling required under this ASSMP.

The appointed person should be familiar with:

- This ASSMP
- Council and other relevant statutory requirements
- Recognition of PASS and ASS
- ASS testing and treatment procedures
- Onsite management of ASS activities
- The NSW ASSMAC Guideline

The classification of ASS/PASS during excavation should be carried out by personnel trained in the identification of ASS and be based on visual classification and the field peroxide test. If required, a suitably qualified environmental consultant should be engaged to assist or train the Principal Contractor in the identification of acid sulfate soils and sampling and analysis.

5.2 Screening of Soils During Excavation

The following procedures are recommended for the Principal Contractor for the sampling and stockpiling of excavated materials. This should be carried out by personnel trained in identifying and testing ASS in the field. Depending on site constraints, other equivalent procedures may be adopted by the Principal Contractor:

- Site excavations will be observed and logged by personnel trained in identifying and testing PASS/ASS in the field
- Excavated soils from depth greater than 1.5m below ground level or excavated sediments from Homebush Bay are considered as PASS/ASS and will be required to be field tested as per Section 5.4
- Based on the field classification tests, soils/sediments suspected as being PASS/ASS will be stockpiled separately to materials assessed as not PASS/ASS. Temporary stockpiling of such materials should be carried out as per Section 5.6.
- Soils/sediments assessed as having a low risk of ASS will be stockpiled in accordance with the Construction Environmental Management Plan (CEMP) with the objective to reduce water ponding, and to control surface erosion and sediment transport outside the stockpiled areas. These soils can be reused within the wider redevelopment area beneath the proposed capping layer. Any surplus soil or sediments generated from Homebush Bay will require to be classified under Parts 1 and 4 of the NSW EPA (2014) Waste Classification Guidelines for offsite disposal.

5.3 Visual Classification

A preliminary visual check by personnel trained in the identification of PASS will be based on material type, colour and consistency:

- PASS are generally grey in colour. Soils may start turning a brown colour when acid is being generated.
- Soils may have a sulfurous (rotten egg) odour. Caution is urged as the low lying terrain may mean that peat could be present, which can have a similar type of odour.
- There may be some bubbling occurring in soils when exposed to air and acidification is occurring. This only happens if acidification takes place relatively quickly.

5.4 Field Test Classification

Section 6.5 in the WSP/PB (2017) has specified the soil sampling frequency for PASS/ASS:

Field pH measurements will be need to be undertaken at a frequency of 1 sample per 25m3 of excavated soils from below 1.5m below ground level. Field pH readings of 4 or less than 5.5 will indicate that the soils are acid and may be the result of limited oxidation of sulfides. Field screening should be carried out by personnel trained in the identification of PASS/ASS and based on the protocols presented in the NSW Acid Sulfate Soil Manual (second edition, March 1998).

5.5 Laboratory Testing for Assessing Liming Rate

Based on the results of the visual classification and field testing, samples will be collected by personnel trained in the identification of ASS and submitted for laboratory analysis using the chromium reducible sulfur suite (Scr) method to confirm the results of the field test and determine the required liming rate.

Sample will be submitted for Sc analysis at a minimum rate of 10% of the total number of field screened samples, or at a minimum 1 sample per treatment batch.

5.6 Temporary Stockpiling

Where stockpiling exceeds two days, excavated soils will be bunded and covered with plastic to help slow the oxidation process. Where extended periods of stockpiling occur (i.e. greater than two weeks) soils will be removed to a treatment pad and lime applied. Normal stormwater and sediment controls should be in place. Extended periods of stockpiling will require leachate collection and monitoring. Where monitoring of the leachate indicates low pH, the addition of lime will be required prior to discharge to stormwater. It should be noted that discharge to stormwater requires approval from Council, and will be subject to other criteria such as the presence of contaminants, pH and suspended solids.

5.7 Bulk Earthworks

Given the heterogeneity and chemical composition of fill soils, highly variable nature of the Quaternary alluvium beneath the Site, and the nature of the proposed site works, avoidance of ASS materials is not considered viable. Staged excavation works should be implemented in the areas PASS/ASS have been identified. Care should be taken during the bulk earthworks to minimise disturbance of groundwater and prevent oxidation of soils below groundwater table.

- Where potential or actual ASS is required to be excavated, the following considerations should be taken into account (ASSMAC, 1998):
- Where the sulfidic layer is <0.5 m deep, these areas should ideally be left undrained with minimal disturbance (i.e. generally these areas are best left waterlogged).
- Where the sulfidic layer is between 0.5 and 2.0 m deep, drainage and excavation should only be attempted in accordance with a properly designed management plan:
  - if the sulfidic layer is 0.5 to 1 mBGL, excavation should be limited to areas less than 0.3 mBGL
  - if the sulfidic layer is 1 to 1.5 mBGL, excavation should be limited to areas less than 0.5 mBGL
  - if the sulfidic layer is more than 1.5 mBGL, excavation should be limited to areas no greater than 1 mBGL.
- Where areas are 'scalded' or degraded and devoid of vegetation, no further drainage or excavation should be undertaken. Remediation strategies should be developed.

Prior to excavation works, the following controls and management measures should be implemented to manage the PASS/ASS at the Site.

Table 5.1: Management of ASS materials prior to excavation works

Title	Details
Wash Bays	Wash bays should be installed at the site to minimise off-site tracking of contaminated materials by machinery. Wash bays should be used prior to trucks/machinery leaving the Site or when moving from an excavation area to a clean area of the Site. Leachate controls should be employed around wash bays to minimise the spread of contamination. These should include collection of runoff.
Staged Excavation Planning	Staged excavation works should be implemented in the areas PASS/ASS have been identified by laboratory analysis of soil samples or are suspected, to minimise the risks posed to the environment and to minimise oxidation of in situ materials. To achieve this, the excavation area should be excavated systematically as a series of smaller 'cells' rather than one large area.

Title	Details
	Where ASS materials are left in situ as the uppermost layer and exposed (i.e. not saturated), areas should be either capped with clean virgin excavated natural material (VENM) or concrete as soon as possible prior to moving to the next area. Ideally, the optimum 'cell' size should be calculated based on the area that can be completed (including capping works) in a single day. Prior to commencement, a works schedule should be prepared indicating when each area will be excavated and capped. Areas should be marked out prior to the excavation works taking place.

5.8 Management Options for ASS/PASS

Where PASS is excavated, excavated PASS materials may be managed by one (or a combination) of the following methods:

- neutralisation of PASS materials where reuse on-site above the water table is required (Option A)
- reburial of excavated PASS materials below the water table (Option B) and
- disposal of excess treated/untreated PASS material to a licensed off-site facility where it cannot be reused on-site (Option C).

Management options for ASS/PASS have been outlined and evaluated in the following table.

Table 5.2 Management options for ASS/PASS

Option	Details	Evaluation of Applicability
Option A: Treatment of PASS and on-site reuse	PASS is excavated and neutralised with lime. The treated material will be re-used on site above the water table with adequate capping.	This option is suitable for PASS materials excavated above/below water table to be used for raising the levels for the development.
Option B: Reburial of excavated PASS materials below the water table	Excavated PASS materials may be re-used on-site by burying the materials in an area of the site located below the water table.	This option is suitable for saturated PASS materials (below water table) and not suitable for fill materials.
Option C: Disposal of excess treated/untreated PASS material to licences off-site facility	A waste classification is assigned for the off-site disposal of PASS to a licensed offsite facility.	Potential option for situations of limited spatial area for treatment or volume of excavation larger than treatment / reburial capacity.

5.9 Preferred Option for Management of ASS/PASS

As outlined in the table above, the most viable and therefore the preferred option for managing ASS/PASS during the proposed site works is Option A (Treatment of PASS and on-site reuse) in coupled with Option B (Reburial of excavated PASS materials below the water table). The management procedure for both options is outlined below.

5.9.1 Treatment of PASS and on-site reuse (Option A)

During bulk earthworks, where PASS materials are to be reused on-site in areas not saturated or more than 16 hours after excavation, these materials must be treated prior to reuse.

The procedures outlined in the following table should be implemented for this option:

Table 5.3: Management procedures for Option A – Treatment and on-site reuse

Procedure	Details
Step 1: Lime Selection and Liming Rate Adoption	The most common material used to neutralise acidic sediments is agricultural lime (aglime as CaCO3). Aglime (pH 8.2) is the safest and cheapest neutralising agent (Manual, 1998). Based on the results from the assessment undertaken along Burroway Road (WSP, 2014), the liming rate would be between 0.04 tonnes of lime per tonne of disturbed soil and 0.12 tonnes of lime per tonnes of soil. These rates are based on the average and maximum Peroxide-oxidisable sulfur (SPOS) from the assessment. Appendix B provides the neutralising calculations worksheet from ASSMAC (1998) which can be used to determine the appropriate dosing rates based on laboratory data from any ASS identified during the works. When estimating lime requirements in accordance with ASSMAC (1998) guidelines, a safety factor of at least 1.5 to 2 times the weight/volume should be applied to allow for inefficient mixing of the lime and its low reactivity. In addition, the purity and effective neutralising values also needs to be included in the estimation of lime requirement, as specified in ASSMAC (1998).
Step 2: Set up Treatment Area/s	Treatment must be undertaken on a developed hardstand area or suitable engineered pad or limed pad. The hardstand area would require appropriate drainage controls to ensure that any runoff is collected. The limed pad should be at least 100mm thick and this thickness should be maintained for the duration of treatment works. The purpose of this guard layer is to minimise the risk of acidic water leaching from the base of the treatment area into the groundwater. Dependent upon the rate of spoil generation, several bunded treatment areas may be necessary for stockpiling and treatment. An earthworks strategy should be prepared to ensure that sufficient space is available on site to accommodate treatment of the PASS.
Step 3: Spoil Management	Stockpiles containing PASS materials should be placed to minimise environmental impact from any leachate. ASSMAC (1998) indicates that the design of stockpile(s) should include the following controls: • all stockpiles to be bunded to retain any water run-off from the treated materials • establish leachate collection and treatment systems including an impervious pad on which to place the stockpile • if an impervious pad has not been established under the stockpile, as a precautionary measure, an apron of fine lime should be applied below the stockpile when stockpiling materials for any length of time • minimise the surface area exposed to oxidation – consider using some form of artificial capping if storage is for longer than a few weeks • minimise the amount of water infiltration – consider using some form of artificial capping • establish diversion banks upslope to prevent run-on water • establish sediment control structures to ensure sulfidic material is not eroded – consider using some form of capping. To manage spoil effectively and meet the above requirements, excavated materials should be stored in a designated area at each site and reused or disposed of off-site as soon as possible following excavation with appropriate management procedures.
Step 4: Excavation & Handling	PASS disturbed during development works should be immediately transferred to the designated treatment area and spread out in 150 mm to 300 mm thick layers. If possible the layers should be allowed to dry in order to aid the mixing process. The layers should then be interspersed with the appropriate amount of lime to aid in the effective mixing of lime and soil. Lime should be applied to the excavated material within the treatment area as soon as possible. If circumstances prevent the spreading and treatment of the material, the surface area of the stockpile should be minimised by forming a relatively high coned shape and avoiding 'spreading-out' of the stockpile. This will limit the surface area exposed to oxidation. Water infiltration should be minimised by covering the stockpile during wet weather. This will limit the formation and transport of acid leachate due to rainfall. The stockpile should be bunded to prevent erosion of the PASS and any movement of potentially acid leachate. Upstream surface runoff water should also be diverted around the stockpile.
Step 5a: Lime Treatment	An excavator or other suitable equipment (as deemed appropriate by the excavation contractor) should be used to thoroughly mix the lime through the soil. Alternatively use of a pug mill may be considered dependent upon the volume of soil to be treated in a timely fashion Monitoring should be undertaken by qualified personnel to ensure the mixing is undertaken to a suitable extent as neutralisation success relies on effective mixing of the neutralising agents and soil.
Step 5b: Lime Buffer	Establishing a 'lime buffer' at the face of any recent excavation which exposes ASS by sandbagging the face and incorporating lime under and in the sandbags so that the acid leachate flows through the sandbags; backfilling the face with clean fill mixed with lime/sand mix; and excavating a trench behind the face and incorporating a lime/sand mix or barrier so that the acid leachate/water must pass through. Insoluble coatings and preferred pathways may limit the effectiveness of lime buffers.

Procedure	Details
Step 5c: Capping	To minimise the generation of acids, open excavations where the uppermost exposed layer contains PASS materials should be capped as soon as possible or left saturated. If capping is necessary, one (or a combination) of the following capping options should be used: • cap with clean, imported VENM (tested to ensure it meets the appropriate criteria for imported VENM materials) • cap with re-used soil from on-site (tested to ensure it is within the adopted site assessment criteria and does not contain ASS) • cap with concrete. Capping should occur within 16 hours to minimise the environmental risks associated with acid generation. Where concrete or other building materials are to be placed directly in contact with PASS or AASS, appropriate materials should be chosen that are resistant to the long-term effects of sulfate and sulfuric acid which may be produced by the soils.
Step 6: pH Testing and Monitoring	The pH of the soil should be checked using the test method(s) outlined in the ASS Manual 1998 (Methods 21A and or 21Af) to confirm that PASS have been neutralised by lime addition. If required, additional lime should be added to the soil and additional mixing undertaken. Following treatment with lime the pH of the soil should be in the 5.5 to 8.5 range.
Step 7: Re-use on Site	Following treatment and validation, treated PASS materials could be re-used on site above groundwater table for raising the ground level. Treated PASS should not be spread over sensitive areas (e.g. mangroves) or directly adjacent to waterways. The area where the treated PASS is going to be placed should be cleared. The area should be dusted with lime. The neutralised PASS should then be spread across the placement area in layers. Care should be taken not to disturb the underlying soil. On completion, the surface of the neutralised PASS should be dusted with additional lime prior to capping. A suitable capping layer should be placed over the neutralised PASS. The finished surface should be turfed or paved to minimise the potential for erosion.

5.9.2 Reburial of excavated PASS materials below the water table (option B)

The procedures outlined in the following table should be implemented for this option:

Table 5.4: Management procedures for Option B – Reburial below the water table

Procedure	Details
Step 1: Excavation & Reburial	This mitigation strategy may involve reburial of the excavated PASS materials as quickly as possible prior to acid generation by over-excavation (in a staged approach) to provide capacity for disposal of the PASS materials at the bottom of a constructed void preferable below a permanent water table. Cut and fill budget should be prepared to ensure that there is adequate capacity to maintain the PASS materials in anaerobic conditions in the void. This must be done within 16 hours of excavation works to avoid acid generation. If the material is to remain exposed at the surface, it should be capped (refer Table 4.3). If the material is required to be stored for longer than 16 hours, then it must either be: • placed in a temporary holding area where it remains saturated (either below the water table in another area of the site or in an artificial saturated area filled with water). As a safety measure, some lime should usually be added and the water needs to be monitored and treated if the pH drops below 6.5. • treated as per Option A.
Step 2: Treatment (subject to duration of PASS materials exposed to oxygen)	As per Table 4.3.

5.10 Alternative Management Option for ASS/PASS

Option C – Disposal of excess treated/untreated PASS material to a licensed off-site facility is considered as an optional management strategy for situations of limited spatial area for treatment or volume of excavation larger than treatment/reburial capacity encountered.

5.10.1 Disposal at a Licensed Landfill (Option C)

If excavated PASS materials cannot be re-used on site, they should be disposed of at a suitably licensed waste facility. Excavated soils containing ASS should be disposed of in accordance with the NSW EPA (2014) waste classification guidelines, as follows:

- For VENM containing PASS (pH of 5.5 or more):
  - the materials must be kept wet at all times during excavation and subsequent handling, transport and storage
  - the receiving landfill must be licensed by the NSW EPA to dispose of PASS below the water table
  - the materials must be received at the receiving landfill within 16 hours of being dug up.
- For Actual ASS (AASS, pH of 5.5 or less) or PASS that has dried out, undergone any oxidation of its sulfidic minerals or is not VENM:
  - the materials must be treated (neutralised) on-site through liming, mixing and testing to ensure that the mixing of lime materials is successful. Monitoring of pH should be carried out regularly during and after the neutralisation procedure to establish the effectiveness of the treatment
  - following neutralisation, testing should be undertaken to classify the treated material in accordance with the NSW EPA (2014) Waste Classification Guidelines - Part 1: Classifying Waste (2014) and Waste Classification Guidelines Part 4: Acid Sulfate Soils (2014), and the excess treated materials should be disposed to an NSW EPA licensed landfill facility.

The receiving landfill must be licensed by the EPA to accept the class of waste as per the classification. The landfill should be informed prior to receiving the waste that the material contained ASS and was treated in accordance with the neutralising techniques outlined in ASSMAC (1998).

Information should be recorded/filed for each batch of material tested and disposed of off-site. This should include the origin of material, the volume, a description of the materials, laboratory results and disposal certificates.

The costs associated with the off-site disposal can be significant and should be assessed at an early stage of the project to avoid significant future unexpected additional costs.

The procedures outlined in the following table should be implemented for this option:

Table 5.5: Management procedures for Option C – Disposal at a Licenced Landfill

Procedure	Details
Step 1: Contact Landfill	Prior to commencement of excavation works, the landfill should be contacted and the necessary approvals should be obtained for disposal.
Step 2: Excavation & Handling	Natural soil classed as PASS should be excavated/disturbed in stages. PASS must be kept wet at all times during excavation and subsequent handling, transport and storage until they can be disposed of safely.
Step 3: pH Testing	The pH of the soil should be checked using the test method(s) outlined in the ASS Manual 1998 (Methods 21A and or 21Af). The pH of each load and the time of extraction should be recorded and forwarded to the landfill. If the pH is less than 5.5 then the material is not suitable for disposal and Option A should be implemented.
Step 4: Transport for VENM containing PASS (pH of 5.5 or more) **OR**	Provided that the pH of the excavated PASS is not less than 5.5, PASS material can be loaded onto trucks and transported immediately to the landfill. Prior to burial the landfill will check the pH of each load. Any loads that do not meet the acceptance pH criteria will be turned away.
Step 4: Treatment for AASS/PASS (pH of 5.5 or less)	As per Table 4.3.

Procedure	Details
Step 5: Waste Classification and Disposal	Following neutralisation, testing should be undertaken to classify the treated material in accordance with the NSW EPA (2014) Waste Classification Guidelines and the excess treated materials should be disposed to a NSW EPA licensed landfill facility.

6 Groundwater Management

Some dewatering may be required given the proposed remediation works for the infrastructure delivery include the bulk excavation of specific cut-to-fill areas to depths that may extend up to 3.0 mBGL (WSP, 2015).

The procedure for managing groundwater seepage and dewatering during development works is outlined in the following table:

Table 6.1: Management procedure for dewatering

Procedure	Details
Step 1: Minimise the depth of dewatering	Where possible the depth of dewatering should be minimised to reduce the generation of ASS and/or acidic conditions. Excavation and dewatering works should be staged over short durations to reduce the time and volume of PASS exposed to oxidation.
Step 2: Approvals for Groundwater Disposal	Reference should be made to the local council, NSW Office of Water/WaterNSW, Sydney Water and other relevant authority's approval requirements for further information in relation to disposal of water to either the sewer or stormwater systems.
Step 3: pH Testing and Neutralisation	Water pumped from the excavation should be placed in a portable tank, or appropriate holding facility, where samples can be obtained for testing. The water should be in the pH range of 6.5 to 8.5 (NSW Government, 2009). If the pH is outside of this range, treatment will be necessary prior to disposal. Based on the disposal option chosen for the development, additional screening for contaminants may be required by the relevant authorities prior to disposal.
Step 3: On-going groundwater monitoring	In the event that extended pumping of water is necessary during the construction period, the level and quality of the groundwater should be monitored on a regular basis over the entire construction period. The pH should be measured and recorded on a regular basis. Immediate advice is to be sought from an experienced consultant if the pH at any location is not within 10% of the initial pH at the commencement of pumping. If required, corrective action should be taken as soon as possible. Laboratory analysis will be required on water samples as part of the corrective action to assess the quantity of neutralising agents required if treatment is necessary. The groundwater monitoring program refer to Section 7.

7 Monitoring Program

The overall objective of monitoring is to measure the effectiveness of the proposed strategies in achieving the desired outcomes. Monitoring will assist in identifying and addressing any non-conformances and providing information for implementing corrective actions within an appropriate timeframe. Table 6.1 outlines the monitoring program during the works.

Table 7.1: Monitoring Program

Procedure	Details
General	Monitoring of ASS control/management procedures including excavation methods, spoil management measures, and dewatering and groundwater management should be undertaken. ASS pollution incident response investigations, including management and/or remediation measures, should be prepared as required.
Soil Monitoring Program	The following will constitute the soil monitoring program during the works: • Field pH measurements of all materials excavated should be taken and logged to provide broad coverage of the excavated material types encountered. One sample should be collected per 25 m^3 of excavated soil materials for on-site pH testing. • Field pH readings of 4 or less will indicate that ASS are present with oxidising sulfides, readings of greater than 4 but less than 5.5 indicate that the soils are acidic and may be the result of limited oxidation of sulfides. • Where soils are required to be limed, materials should be tested to ensure that the neutralisation process has been successful. Field testing should be undertaken at a rate of one per 50 m3, if changes in liming rates or material are observed additional samples should be collected. Laboratory testing (SPOCAS or chromium suite) should be undertaken at a rate of 25% of field samples to confirm the results. • For waste disposal: - material is pre-classified as PASS material as per the NSW EPA (2014) waste classification guidelines providing it is delivered to the receiving waste facility within 16 hours of excavation - if soil is not delivered to the waste facility within 16 hours it will require liming and testing to ensure that the material has been successfully neutralised and to classify the material as per the NSW EPA (2014) waste classification guidelines. Information should be recorded and filed for each batch of soil tested. Information should include the origin of the material, the volume, a description of the materials, laboratory results and disposal certificates (where appropriate).
Water Monitoring Program	The following will constitute the water monitoring program during the works: • Any pumped water from the excavations and runoff collected will be stored in retention basins or fully contained tanks on-site. • Water samples should be representative of the stored water and may require sampling from different depths, particularly if the water has been stored long enough to allow it to settle. • Water stored in basins/tanks should be tested for metals (aluminium, arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel and zinc) and cations and anions to characterise the water quality. In addition, the water should be tested for physical parameters on-site including dissolved oxygen, electrical conductivity, pH, reduction/oxidation potential, temperature and turbidity. • If runoff is stored separately to any pumped water, the requirement for site runoff can be met via the following water quality criteria being tested for and met prior to off-site discharge of collected runoff: - total suspended solids not greater than 1,500 mg/L - pH between 6.5 and 9.0 - iron not greater than 500 µg/L - aluminium not greater than 5 µg/L for pH <6.5, not greater than 100 µg/L for pH >6.5 - no visible oil or grease film. ASSMAC (1998) provides water quality performance criteria to be met for the discharge of water into the environment are summarised, as summarised below.

Procedure	Details		
	Water Quality Indicator	**Fresh water**	**Marine Water**
	pH	6.5-9.0	<0.2 pH unit change
	Iron (total)	500 µg/L	Not applicable
	Total dissolved solids	<1500mg/L	>1500mg/L
	Aluminium	5 µg/L for pH <6.5	Not applicable

8 Contingency Plan

8.1 Incident and Emergency Response

There is a potential for incidents and emergency response requirements relating to ASS issues, particularly pollution/contamination of surrounding areas and waterways from acid contamination. The contractor is to have appropriate incident reporting mechanisms (including near miss reporting) and these are incorporated into the Site work health and safety (WHS) plans and CEMP. Some issues that may arise unexpectedly include:

- interception of existing unknown AASS and/or PASS identified through field inspections/measurements or observed adverse reactions with flora and/or fauna (including site workers and public)
- inclement weather or incorrect management practices causing erosion and transportation of AASS and/or PASS materials off-site from stockpiles and active construction excavations.

The emergency response procedures will include:

- immediate containment of acid runoff from stockpiles or areas of excavation by bunding
- communication between the project manager, site managers, supervisors and contractors detailing the pollution incident requiring response/action
- site inspection to assess extent of severity of the emergency/incident
- based on the assessed severity of the incident by Roads and Maritime, the project manager will determine the need to notify regulators potentially including the NSW EPA; notifications should detail the type and extent of potential impacts and remediation requirements
- monitoring and/or management of incidents which may include soil or groundwater sampling and analysis, spill clean-up, investigation materials, correction of erosion control measures and remediation of affected area (if required)
- incident reporting detailing all investigation and remediation actions taken and remediation results carried out
- environmental incidents will be reported immediately to the site supervisor who will contact the project manager. All incidences will be investigated and the appropriate course of action will be taken to address the issues. Serious environmental incidents will be reported to the NSW EPA.

8.2 Non-Conformance Preventative and Corrective Action

In the event of a non-conformance, the source and nature of the event will be investigated, the effectiveness of the existing controls reviewed and modified where practical, and necessary strategies will be implemented to minimise further impacts.

Prior to undertaking any remediation or excavation, a safe work method statement (SWMS) will be prepared that defines safe procedures to protect the health and safety of personnel. The SWMS will include the following:

- all workers will wear personal protective equipment (PPE) that may include breathing apparatus, protective overalls, gloves, safety boots and hard hat
- decontamination facilities made available to ensure workers are free of any contamination prior to leaving the workplace
- ASS areas are separated from the remaining activities by appropriate fencing and signage. Access to the site is restricted only to personnel directly involved in the works.

9 References

ASSMAC 1998, Acid Sulfate Soil Manual.

Browns Smart Consulting 2014, Road Bulk Earthworks Plan

Department of Science, Information Technology, Innovation and the Arts (DSITIA), Queensland Government 2014,

Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines.

National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).

NSW EPA 2017, Guidelines for the NSW Site Auditor Scheme (3rd edition).

NSW EPA 2014, Waste Classification Guidelines, Part 1: Classifying waste.

NSW EPA 2014, Waste Classification Guidelines, Part 4: Acid Sulfate Soils.

NSW EPA 1995, Sampling Design Guidelines.

NSW EPA 1997, Guidelines for Consultants Reporting on Contaminated Sites.

Parsons Brinckerhoff (PB) (2015) Proposed Management of Acid Sulfate Soils prepared for the Wentworth Point development, Ref: 2207004B-CLM-LTR-002 RevB.

Parsons Brinckerhoff (PB) 2015, Detailed Remediation Action Plan – Infrastructure Delivery, Wentworth Point Development, Ref: 2207004B-RES-REP-001 Rev C.
Stone, Y., Ahern, C. R., and Blunden, B. 1998, Acid Sulfate Soils Manual 1998. Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia

Thiess Pty Ltd (2014) Environmental Management Plan Homebush Bay Sediments, 6 November 2014. Final

WSP 2009a, Acid Sulfate Soil Management Plan Harbour Radio Pty Limited (2GB) Burroway Road, Homebush Bay, NSW.

WSP 2009b, Environmental Site Assessment Harbour Radio Pty Limited (2GB), Burroway Road, Homebush Bay, NSW.

WSP 2014a, Soil Contamination Assessment Burroway and Hill Road, Wentworth Point Development, Homebush Bay, NSW 2127.

WSP 2014b, Proposed management of acid sulfate soils.

WSP 2015, Detailed Remediation Action Plan – Infrastructure Delivery, Wentworth Point Development.

10 Limitations

This report has been prepared by Geosyntec Consultants Pty Ltd ("Geosyntec") for use by the Client who commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the Client and other parties. The findings of this report are based on the scope of work outlined in Section 1. The report has been prepared specifically for the Client for the purposes of the commission, and use by any explicitly nominated third party in the agreement between Geosyntec and the Client. No warranties, express or implied, are offered to any third parties and no liability will be accepted for use or interpretation of this report by any third party (other than where specifically nominated in an agreement with the Client).

This report relates to only this project and all results, conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose. This report should not be reproduced without prior approval by the Client, or amended in any way without prior written approval by Geosyntec.

Geosyntec's assessment was limited strictly to identifying environmental conditions associated with the subject property area as identified in the scope of work and does not include evaluation of any other issues.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigation.

This report does not comment on any regulatory obligations based on the findings. This report relates only to the objectives stated and does not relate to any other work conducted for the Client.

The absence of any identified hazardous or toxic materials on the site should not be interpreted as a guarantee that such materials do not exist on the site.

All conclusions regarding the site are the professional opinions of the Geosyntec personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Geosyntec has not independently verified and assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Geosyntec, or developments resulting from situations outside the scope of this project.

Geosyntec is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The Client acknowledges that this report is for its exclusive use.

Attachment A Figures

LEGEND

Site Boundary

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Nearmaps

Approx. 50 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 1: Site Layout Plan

Site Address: 7 Burroway Road, Wentworth Point, NSW 2127

Client: RobertsCo

Job Number: AU122229

Date: 16 September 2022

Geosyntec

LEGEND

Site Boundary

Acid Sulfate Soils

- NA
- Class 1
- Classes 2 & 2c
- Class 2b
- Class 3
- Class 4
- Class 5

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of SEED NSW

Approx. 50 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 2: Acid Sulfate Soil Risk Map

Site Address: 7 Burroway Road, Wentworth Point, NSW 2127

Client: RobertsCo

Job Number: AU122229

Date: 16 September 2022

Geosyntec

Attachment B Liming Rate Table

TABLE 4.5 Treatment categories and lime required to treat a weight of disturbed acid sulfate soils – based on soil analysis

The tonnes (t) of pure fine lime required to fully treat the total weight/volume of ASS can be read from the table at the intersection of the weight of disturbed soil (row) with the soil sulfur analysis (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 (or calculate values exactly using factors from Table 4.6).

Disturbed soil	**Soil Analysis - Oxidisable Sulfur (S %)** or equivalent TPA/TAA													
(tonnes)	***0.03***	***0.06***	***0.1***	***0.2***	***0.4***	***0.6***	***0.8***	***1***	***1.5***	***2***	***2.5***	***3***	***4***	***5***
1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.2	0.2
5	0.05	0.05	0.05	0.05	0.1	0.1	0.2	0.2	0.4	0.5	0.6	0.7	0.9	1.2
10	0.05	0.05	0.05	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.4	1.9	2.3
15	0.05	0.05	0.1	0.1	0.3	0.4	0.6	0.7	1.1	1.4	1.8	2.1	2.8	3.5
20	0.05	0.1	0.1	0.2	0.4	0.6	0.7	0.9	1.4	1.9	2.3	2.8	3.7	4.7
25	0.05	0.1	0.1	0.2	0.5	0.7	0.9	1.2	1.8	2.3	2.9	3.5	4.7	5.9
35	0.05	0.1	0.2	0.3	0.7	1.0	1.3	1.6	2.5	3.3	4.1	4.9	6.6	8.2
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	11.7
75	0.1	0.2	0.4	0.7	1.4	2.1	2.8	3.5	5.3	7.0	8.8	10.5	14.0	17.6
100	0.1	0.3	0.5	0.9	1.9	2.8	3.7	4.7	7.0	9.4	11.7	14.0	18.7	23.4
200	0.3	0.6	0.9	1.9	3.7	5.6	7.5	9.4	14.0	18.7	23.4	28.1	37.5	46.8
500	0.7	1.4	2.3	4.7	9.4	14.0	18.7	23.4	35.1	46.8	58.5	70.2	93.6	117.1
750	1.1	2.1	3.5	7.0	14.0	21.1	28.1	35.1	52.7	70.2	87.8	105.3	140.5	175.6
1,000	1.4	2.8	4.7	9.4	18.7	28.1	37.5	46.8	70.2	93.6	117.1	140.5	187.3	234.1
2,000	2.8	5.6	9.4	18.7	37.5	56.2	74.9	93.6	140.5	187.3	234.1	280.9	374.6	468.2
5,000	7.0	14.0	23.4	46.8	93.6	140.5	187.3	234.1	351.2	468.2	585.3	702.3	936.4	1170.5
10,000	14.0	28.1	46.8	93.6	187.3	280.9	374.6	468.2	702.3	936.4	1170.5	1404.6	1872.8	2341.0

L	**Low treatment**: (<0.1 t lime). Apply 0.05 t (1 bag) or 0.1 t (2 bags) of lime to prevent some soil acidity from the ASS disturbance.
M	**Medium treatment:** (>0.1 to 1 t lime).
H	**High treatment**:(>1 to 5 t lime).
VH	**Very High treatment:** (>5 tonne lime).

A detailed management plan is required if disturbing > 1,000 tonnes of ASS (oxidisable S ≥0.03 %S or equivalent TPA or TAA.)

Lime rates are for pure fine $CaCO_3$ using a safety factor of 1.5. A factor that accounts for Effective Neutralising Value is needed for commercial grade lime (see Management Guidelines).

An approximate volume (cubic m) can be obtained by dividing weight (tonne) by bulk density (t/m^3).

Appendix 06 – Emergency Preparedness and Response

The types of Soil and Water emergencies that could occur on this site are tabulated below.

Note: This plan is designed to supplement both the Roberts Co Project Emergency Response Plan and the Client's site emergency response plan/s, where available.

Emergency	Preparation	Response	Responsibility
Flooding	Monitor meteorological conditions – develop contingency strategy for rainfall > 100mm in 24hours or potential for > 1in 5 ARI All chemicals, fuels and other hazardous substances to be in secured containers and stored within a sealable shipping container Remove plant and equipment from low lying areas Secure plant that cannot be removed Review site drainage flow paths: Redirect site drainage to prevent flooding of residential/business premises. Ensure site drainage does not concentrate surface flow. Review and address the potential for excess water entering the site. Review and maintain erosion and sedimentation controls.	Recover materials washed from site including sediment and other waste. Check effectiveness of erosion and sedimentation devices and other flood controls, maintain where required and safe to do so.	Site Manger / Foreman / Supervisor Project HSE Advisor / Manager
Temporary erosion and sediment controls are damaged during rainfall.	Plan controls to be suitable for expected conditions.	A review of the site to be undertaken by HSEQ Advisor / Manager and Site Manger / Foreman / Supervisor. Controls to be repaired or replaced within 24 hours of detection, immediately if inclement weather current.	Project HSE Advisor / Manager

Emergency	Preparation	Response	Responsibility
	Ensure sufficient materials, labour and plant are available for additional controls.		Site Manger / Foreman / Supervisor
Damage to sediment basin	Check basins for suitability to project requirements; size, treatment type, etc. Basin outlet to be designed to remain functional in 1 in 20 ARI event. Ensure basin construction is in accordance with QA requirements including relevant ITPs.	Water in damaged basin to be pumped to another secure basin or discharged if it meets the site criteria. Damage to be repaired as soon as practical. Repairs to be monitored when basin brought back online.	Project HSE Advisor / Manager Site Manger / Foreman / Supervisor

Appendix 07 – Evidence of Consultation with Parramatta Council

Begins on Next Page

Copy of correspondence where initial TTW Plan was issued to Parramatta City Council

Gavin Finlayson

From: Gavin Finlayson
Sent: Friday, 21 October 2022 2:18 PM
To: BMills@cityofparramatta.nsw.gov.au; council@cityofparramatta.nsw.gov.au
Cc: Marco.Amorelli@au.ey.com; David McDonnell; sherwin.rasquinha1@det.nsw.edu.au; Sandra.Lim@au.ey.com; Adam Greentree
Subject: RE: Construction Soil and Water Management Sub-Plan – Wentworth Point New High School, 7 Burroway Road, Wentworth Point.

Bruce,

I understand that you have spoken to Marco about this project and, further to my previous correspondence, we would appreciate if you could provide any comments on the Construction Soil and Water Management Sub-Plan and Pre-Construction Dilapidation Report by the 26th October 2022.

Regards,

Gavin Finlayson
Contracts Manager

roberts co

Roberts Co
Level 9
60 Castlereagh St
Sydney NSW 2000
M +61 437 267 600

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From: Gavin Finlayson
Sent: Friday, 21 October 2022 1:59 PM
To: BMills@cityofparramatta.nsw.gov.au; mpark@cityofparramatta.nsw.gov.au; council@cityofparramatta.nsw.gov.au
Cc: Marco.Amorelli@au.ey.com; David McDonnell <david.mcdonnell@au.roberts.co>; sherwin.rasquinha1@det.nsw.edu.au; Sandra.Lim@au.ey.com; Adam Greentree <adam.greentree@au.roberts.co>
Subject: Construction Soil and Water Management Sub-Plan – Wentworth Point New High School, 7 Burroway Road, Wentworth Point.

To Whom It May Concern,

RE:APPLICATION NO. SSD-11802230

As a requirement of the applicable conditions of consent, a Construction Soil and Water Management Sub-Plan was required to be prepared as a subplan of the Construction Environment Management Plan for this project.

In accordance with Condition B18 (a), please find Construction Soil and Water Management Sub-Plan prepared by TTW attached for the new Wentworth Point High School, 7 Burroway Road, Wentworth Point.

Please contact me should you require any further information.

Gavin Finlayson
Contracts Manager

roberts co

Copy of correspondence where Rev 01 Construction Soil and Water Management Plan was issued to Parramatta City Council

Adam Greentree

From: Adam Greentree
Sent: Tuesday, 7 March 2023 3:41 PM
To: bmills@cityofparramatta.nsw.gov.au; council@cityofparramatta.nsw.gov.au
Cc: Marco Amorelli; Gavin Finlayson; Nicky Choi
Subject: Wentworth Point High School - Review of Soil and Water Management Plan
Attachments: CSWMP Sub-Plan Consultation To Council.pdf; Construction Soil and Water Management Plan.pdf

Good Afternoon Bruce,

Previously we issued a copy of the Construction Soil and Water Management Plan for review for the Wentworth Point High School Project (see attached). This was in accordance with condition B18 of our conditions of consent. We have now made some amendments to this plan. Please find attached a copy of the revised management plan.

Please let me know if you have any questions or comments.

Regards,

Adam Greentree
Project Manager

Roberts Co
Level 9
60 Castlereagh Street
Sydney NSW 2000
M 0447 237 186

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Appendix 08 – Remediation Action Plan

Refer to document entitled 'Remediation Action Plan Addendum' revision 2 dated 1 March 2022 by Geosyntec.

Appendix H Construction Flood and Emergency Sub-Plan

Construction Flood Emergency Management Plan

Wentworth Point New High School

Prepared for Roberts Co / 20 October 2022

211266

TTW (NSW) PTY LTD (ACN 649 974 112)
(ABN 74 649 974 112) I Consulting Engineers
Level 6, 73 Miller Street, North Sydney NSW 2060

Your Partner in Engineering

Contents

1.0 Preamble

As per the 2022/2023 budget papers, this project is now referred to as "Wentworth Point new high school". Future documentation relating to this project, including this document, will be labelled accordingly.

Due to the SSD-11802230 application being submitted as "Sydney Olympic Park new high school", the project name will remain the same on the Planning Portal and future documentation may reference this.

Please also note 'Wentworth Point new high school' is the placeholder name for the school. The school naming will occur closer to opening, following a community consultation process.

2.0 Introduction

Taylor Thomson Whitting (TTW) has been engaged by Roberts Co to prepare a Flood Emergency Management Plan (FEMP) to be implemented during the construction of the proposed Wentworth Point new High School at 7 Burroway Road, Wentworth Point.

TTW and Schools Infrastructure NSW (SINSW) representative Roberts Co have consulted the relevant NSW State Emergency Services (SES) officers in developing an operational plan between 28 July and 04 August 2022. The consultation is also relevant to developing a plan for the construction phase. Minutes of the consultation are appended to this report.

The purpose of this FEMP is to summarise the flood risks within the site during construction, identify preparation measures that should be undertaken, and provide an action plan with steps to be completed during a flood event.

2.1 Reference Documents

The FEMP has been prepared with reference to the following:

- NSW Government Floodplain Development Manual (2005);
- NSW Government Floodplain Risk Management Guidelines;
- NSW State Emergency Service (SES) guidelines, and;
- FloodSafe guidelines and the relative FloodSafe Tool Kits.

2.2 SSDA Conditions of Consent

Item	Condition	Section Reference
B19	The Construction Flood Emergency Management Sub-Plan must address, but not be limited to, the following: (a) Be prepared by a suitably qualified and experienced person(s)	Appendix A
	(b) Address the provisions of *Floodplain Risk Management Guidelines* (EHG)	1.0 – 9.0
	(c) Include details of: i. The flood emergency responses for both construction phases of the development; ii. Predicted flood levels; iii. Flood warning time and flood notification; iv. Assembly points and evacuation routes; v. Evacuation and refuge protocols; and vi. Awareness training for employees and contractors, and users/visitors	i. 3.0, 5.0 ii. 2.1 iii. 3.0 iv. 5.0 v. 5.0, 6.0, 7.0 vi. 6.0
B22	Prior to the commencement of construction, the Applicant must prepare and implement for the duration of construction; (a) Flood warning and notification procedures for construction workers on site	3.0, 4.0
	(b) Evacuation and refuge protocols	5.0

3.0 Flood Behaviour

The flood analysis within this report has been based on a flood study assessment conducted by Sinclair Knight Merz (SKM) on behalf of Parramatta City Council. The following section provides a summary of the findings of the assessment and TTW's analysis.

3.1 Peak Flood Levels

Design flood levels obtained from the study conducted by SKM for the 5% AEP, 1% AEP and Probable Maximum Flood (PMF) events corresponding to the development area are specified in Table 1.

Table 1 - Design Flood Levels - Extract from Lower Parramatta River Study and Plan (2005)

Flood Event	20% AEP	5% AEP	2% AEP	1% AEP	PMF
Design Flood Level (mAHD)	1.27	1.34	1.39	1.42	2.42

Based on this, the peak flood levels for the site are 1.42m AHD for the 1% Annual Exceedance Probability (AEP) storm event and 2.42m AHD for the Possible Maximum Flood (PMF) event. A minimum Finished Floor Level of 4m AHD has been adopted for the site which exceeds both the flood planning level (1% AEP level + 0.5m freeboard) and the PMF from mainstream riverine flooding from the adjacent Parramatta River.

As the Wentworth Point road network is generally located above the 1% AEP flood level, there is no concern with flood risk in this event. The flood evacuation procedures in the following sections of this report should be followed where flood warnings advise of imminent flooding above the 1% AEP flood level and up to the PMF.

The duration of PMF inundation is likely to be longer than a day as flood levels subside slowly. Therefore, shelter-in-place emergency responses are unsuitable as the primary flood emergency strategy. In the event of a forecasted flood emergency, the contractor shall close the site and advise all workers to stay home.

We note that there is currently no formal response flood warning system in place for the lower Parramatta River. However, the Upper Parramatta river section has a formal flood warning system in place with the closest one being in Silverwater Rd bridge. As per our consultation with SES, the head contractor is to monitor flood warnings from SES, the Bureau of Meteorology (BoM), Parramatta Council, and media outlets (televisions, radio stations) instead as a source of flood warning for the site which is generally received up to 7 days in advance prior to a flood commencing. Consequently, there would be sufficient time prior to a flood event to:

- Prepare for a flood
- Respond when a flood is likely
- Respond during a flood
- Recover after a flood
- Close the site
- Notify workers to stay home

The road network to the south of site is of low hazard as shown in Figure 1 where it is subject to shallow flooding where able-bodied people would be able to wade safely. Trucks could also be used to assist evacuation.

Currently, earthworks are scheduled for a short duration of one month to be undertaken during summer. The risk is therefore low as these conditions are unlikely for flooding.

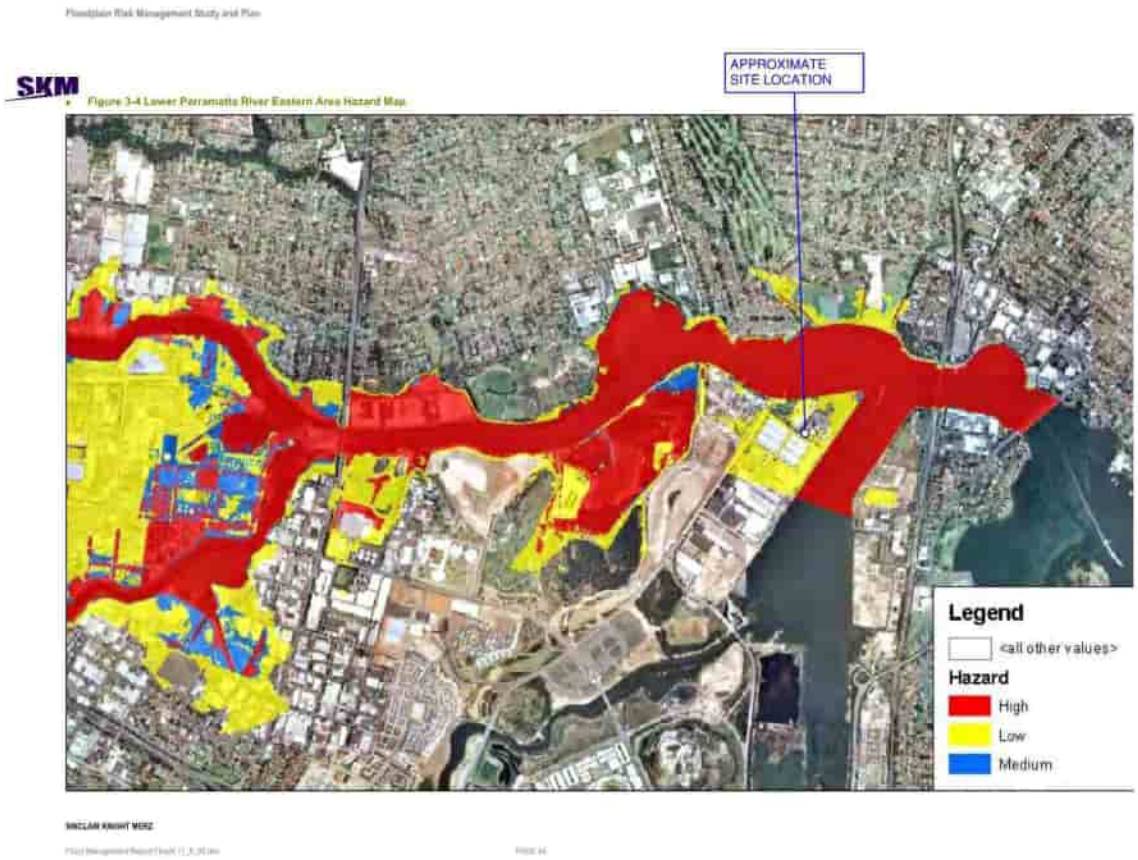

Figure 1 - Flood Hazard Classification (Extract from Lower Parramatta River Study and Plan (2005))

4.0 Flood Warnings and Notifications

4.1 Flood Watches and Warnings

Severe weather and thunderstorm warnings are issued by the Bureau of Meteorology (BoM). These warning are continually updated with descriptions of the likely conditions, including predicted extreme rainfall depths.

Flood warnings are issued by the BoM when flooding is occurring or is expected to occur in an area. Warmings may include specific predictions of flood depths dependent on real-time rainfall and river level data. These warnings are distributed BoM councils, police and the relevant local State Emergency Services (SES), as well as being available on the BoM website.

A **Standard Emergency Warning Signal** (SEWS) will be used by SES to precede all *Top Priority* Flood Warnings and all Evacuation Warnings. Once activated Evacuation Orders are broadcast over the radio stations.

A ***Flood watch*** is issued by the BoM up to four days prior to a flood event. A watch is generally updated daily and may be issued before, during or after rainfall has occurred.

Flood warnings are issued by the BoM when flooding is occurring or expected to occur in a particular area. Warnings may include specific predictions of flood depths dependent on real-time rainfall and river level data. These warnings are distributed to Council, Police and the relevant local SES, as well as being available on the BoM website, through telephone weather warnings and radio broadcasts.

SES Evacuation Warning is a warning message from SES advising the community to prepare for likely evacuation. The warning advises people what to do and what to prepare to take with them.

A ***Flood Evacuation Order*** is a notification to the community, authorised by the SES, when the intent of an Incident Controller is to instruct a community to immediately evacuate in response to an imminent threat. It also advises where people should go and may advise which evacuation route to take.

Visual Observation **-** Site management must visually monitor the flood levels on Burroway Road during severe rainfall events and initiate flood response procedures in the event of flood levels appearing to approach inundation.

4.2 Coordination of Flood Evacuation Warnings and Orders

The overall coordination of the road evacuation routes will be conducted by the SES. The head contractor is to communicate warning messages and orders from the SES to personnel and workers on site.

4.3 Public Address System

The site will have an alert system for workers on site in the event of an emergency. The site will have an Evacuation Procedure with one or multiple assembly points as part of the Emergency Management Plan. As the quadrangle is to be at RL 4.0m AHD, this is a suitable assembly point location. The location of the assembly point is subject to change throughout the course of construction.

Figure 2 - Quadrangle assembly point

Across the proposed site, the ground floor level has been set at RL 4.00m AHD and majority of external areas are located above the PMF flood level. As such, the assembly point can be anywhere within the site after earthworks have been completed. Before this point, the assembly point shall be set at the high point of the site.

5.0 Flood Response

5.1 Contractor Responsibilities

Once the site is in operation the roles and responsibilities in Table 2 below will need to be delegated to specific personnel. In the event of a severe flood, it is the responsibility of the head contractor to ensure these tasks are undertaken.

Table 2 - Contractor Flood Responsibilities

Role	Location	Responsibilities
Head Contractor **Site Manager / Foreman**	On site	- Inform site personnel of flood risk - Coordinate flood evacuation drills - Decide if evacuation is required prior to warnings from SES - Liaise with SES
Head Contractor **First Aid Officer**	On site	- Coordinate assistance for less able workers and personnel during evacuation - Prepare a Flood Emergency Kit that includes a portable radio, torch, spare batteries, first aid materials, emergency contact numbers, candles, waterproof matches, waterproof bags and required medications.
Head Contractor **Site Personnel**	On site	- Coordinate evacuation of workers and assist in evacuation

5.2 Key Contact Details

In the event of a severe flood, key telephone numbers have been listed in Table 3.0 below.

Table 3 - Key Contact Numbers

IMPORTANT TELEPHONE NUMBERS	
Contractor **Foreman** **Site Office** **First Aid Officer**	**Refer to CEMP for details**
OUTSIDE SITE CONTACTS ***** Ambulance / Fire – Call Office numbers shown above to contact***	
State Emergency Services **Busways** **Burwood Bus Depot** **Concord Hospital** **Police – Ryde**	**132 500** **1300 692 929** **131 500** **9767 5000** **9808 7401**

6.0 Assembly Point and Evacuation Routes

6.1 Emergency Assembly Point

An Emergency Assembly Point will be nominated that is within and central to the site. Before earthworks have been completed on site, the assembly point will be the high point of the site. Once earthworks have been completed, the site will be higher than the PMF level and the assembly point can therefore be nominated anywhere within the site.

As it is intended that the flood evacuation warning will be provided prior to flooding occurring, egress from the site can occur on Burroway Road to the south of the site.

6.2 Evacuation Routes

The following information is provided for information only. For "Flood Response Actions" – refer to Section 7 of this FEMP for details.

As per consultation with SES, if necessary, evacuation to higher ground is the most appropriate route in such proximity to the river. As shown in Figure 1 above and Figure 3 below, all workers or personnel on site are to assemble at the quadrangle and evacuate to higher ground at Bennelong Parkway or across Bennelong Bridge.

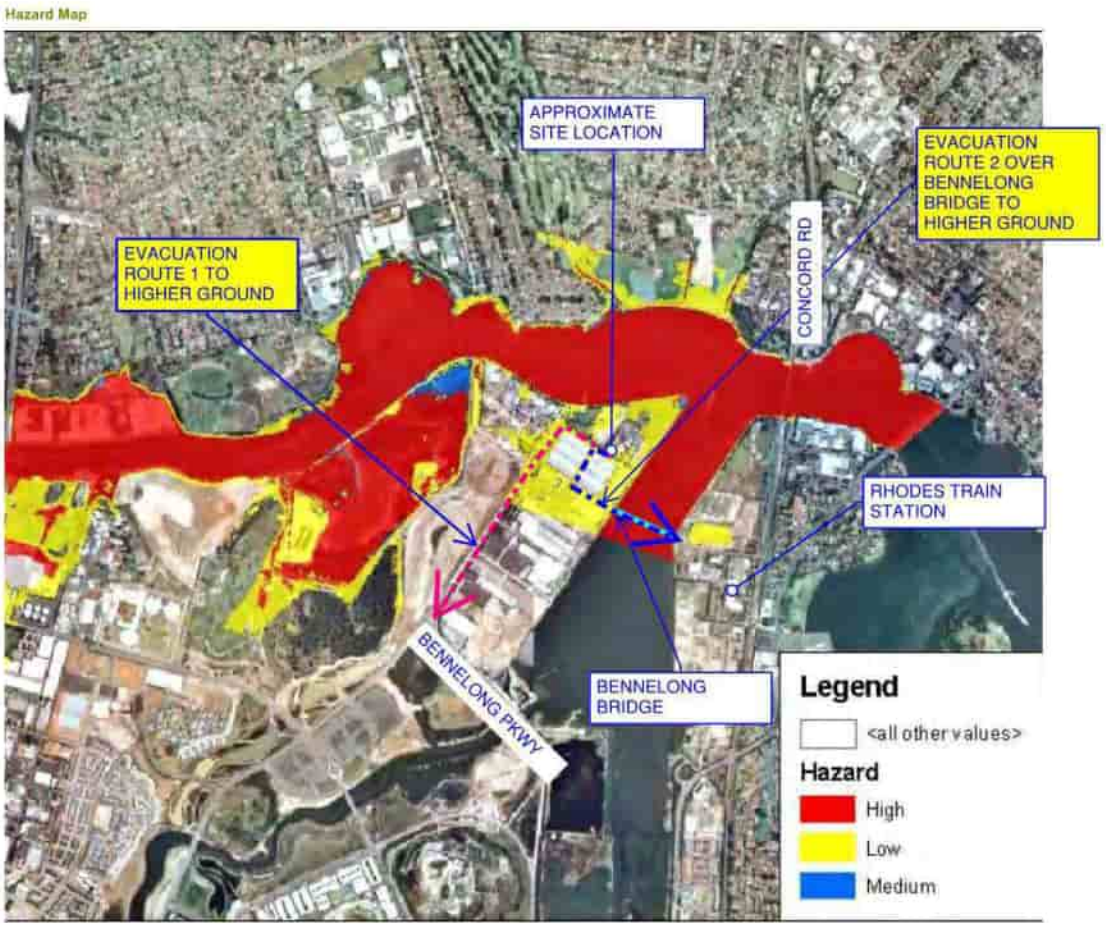

Figure 3 - Evacuation Routes (Extract from Lower Parramatta River Study and Plan (2005))

7.0 Preparation for Flood Response

7.1 Education

7.1.1 Site Personnel

As part of the preparation for a flood event, those with responsibilities within this Plan should review and be familiar with their roles. Inductions should be held to educate personnel on their role during a flood event.

7.1.2 Workers

To increase awareness on site, it is recommended that all inducted workers are made aware of the potential flood risk and actions that will be undertaken during a flood event. Evacuation drills should be undertaken regularly to ensure that all workers are aware of the procedures for evacuation.

7.2 Evacuation Drills

It is recommended that evacuation drills be held at a minimum of twice yearly to ensure all personnel and workers are aware of and familiar with their flood response actions, the sound of the alert and the location of the assembly point.

7.3 Flood Emergency Kit

A Flood Emergency Kit should be prepared prior to a flood event taking place and regularly checked to ensure that supplies within the kit are sufficient and in working condition. This check could occur after the evacuation drill takes place to provide a regular schedule. The Kit should include:

- Radio with spare batteries;
- Torch with spare batteries;
- First aid kit and other medicines;
- Candles and waterproof matches;
- Waterproof bags;
- A copy of the Site Emergency Management Plan; and
- Emergency contact numbers.

This Emergency Kit should be stored in a waterproof container and is the responsibility of the First Aid Officer.

8.0 Flood Response Actions

8.1.1 When A Flood Watch Is Issued

The following actions should be undertaken:

1. Ensure the emergency kit is ready to use.
2. Listen to the local radio station for updates on forecasted flood heights and timings.
3. Call SES for an update and possible evacuation advice.
4. Notify all workers of the flood watch and assist availability of workers to assist with emergency actions if required.
5. Ensure workers are familiar with the safe flood evacuation route.

8.1.2 When A Flood Warning Is Issued

The following actions should be undertaken:

1. Undertake the actions nominated under the "flood watch".

2. During Site Hours:

    - For life-threatening emergencies phone 000 immediately.
    - Coordinate the safe return of workers in consultation with SES and transport operators to their homes.
    - Call Busway (Bus Operator is to be confirmed) and coordinate the required transport resources for evacuation of non-able-bodied personnel/workers.
    - Send SMS to emergency contacts
    - Direct All workers to the Assembly point within the site before the property is flooded.
    - Evacuate workers and personnel

NOTE: Avoid driving or walking through floodwaters. These are the main causes of death during flooding. Although the site may not be flooded, safe travel arrangements for workers to go home is likely to be disrupted by flooding and/or road closures.

3. Outside of Site Hours:

    - Close the site and notify workers of the temporary closure of the site.

9.0 Limitations and Revision of the Flood Emergency Response Plan

This FEMP only addresses the evacuation strategies during extreme flooding events for workers on site during construction and is considered a guide only. It does not cover individual safe travel for workers when their safe travel arrangements may be disrupted by flooding and/or road closures.

It is the head contractor's responsibility to ensure this FEMP is current and updated as necessary to be in line with relevant standards, directorate, legislation, and the Regional's State Emergency Management Plan to ensure the health, safety and welfare of all personnel, workers and others.

10.0 Recommendations

1) Head contractor to liaise with The Transport Services Functional Area for Buses resources allocation and arrangement for non-able-bodied personnel prior to commencing construction on site.

2) Prepare Emergency Management Plan that addresses the recommendations of this FEMP for the ongoing requirements of the site, particularly Section 4.0.

3) Include and update the important telephone numbers in Section 4 of this Report and include in the Emergency Management Plan for the operation of the site.

4) Flood-educate personnel and workers through Education and Evacuation Drills as detailed in the Section 6 of this FEMP.

5) Head contractor to review and update this FEMP as necessary once a year and in accordance with the consent requirements for review of plans, programs and strategies.

6) All personnel and workers to be familiar with Flood Response Actions as detailed in the Section 7 of this FEMP.

Prepared by
TTW (NSW) PTY LTD

WILLIAM BEVER
Graduate Civil Engineer

Reviewed & Authorised By
TTW (NSW) PTY LTD

NEMESIO BIASON JR.
Associate Director

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Appendix A

Consultation Record

Nemesio Biason Jr

From: Nemesio Biason Jr
Sent: Thursday, 4 August 2022 9:41 AM
To: Elspeth O'Shannessy
Cc: David McDonnell; Georgia Sedgmen; Sandra Lim
Subject: RE: Sydney Olympic Park high School

Hi Elle,
As per our latest correspondences, below is the updated minutes of our meeting/consultation.

- *SES Flood data portal flood mapping is based on the Parramatta Council's adopted flood study being the SKM's "Lower Parramatta River Floodplain Risk Management Flood" study 2005*
- *BOM do not provide flash flood warning system but provide potential for flash flooding for a very large scale area as part of their detailed severe thunderstorm warning.*
- *The site is considered Lower risk than other sites that SES has reviewed– The school is elevated high at 4.0mRL and dry, well above the PMF flood level of 2.42mRL.*
- *No current flood warning area that covers Lower Parramatta River catchment. The closest one is at Silverwater Rd Bridge. Department of Education (DoE) is to monitor any flood warnings from SES, BOM, Parramatta Council, Media outlets (television, radio stations) instead as a source of flood warning for the site.*
- *There are risks associated with sheltering in place which is why it is the preferred strategy for schools to close prior to commencing the school day or prior to inundation of the roads. For example secondary emergencies (e.g. fire or medical), complexities with resupply and given the age of the student potential for them or carers to enter the dangerous floodwater.*
- *Primary priority is the closure of school in any road closure within the Precinct and ahead of any major flooding.*
- *Second Priority is school closure upon receiving any flood warning and evacuate out prior to PMF flood*
- *Make sure there is enough time to evacuate, Look at depth and velocity*
- *Evaluate the peak critical PMF storm event which could be hours to a day.*
- *Only need to evacuate if it is a PMF, and students being high school students can self-evacuate or guided by guardians to higher grounds.*
- *In the worst case scenario, or couldn't evacuate – The site is safe as an "On-site refuge" being at 4.0RL being 1.58m above the PMF flood level.*
- *It was suggested to Check Glenwood School's flood emergency response plan.*

Regards
Nemesio

Appendix B

CV

Nemesio Biason

Associate Director

BE CPEng, NER

nemesio.biasonjr@ttw.com.au

Experience

2019 – Current
Associate Director, TTW

2013 – 2019
Associate, TTW

2004 – 2013
Senior Civil Engineer, TTW

2003 – 2004
Design Engineer,
BMD Consulting Pty Ltd

2002 – 2003
Civil Design Engineer,
Cardno Willing Pty Ltd

2001 – 2002
QA/Design Engineer,
Cootamundra Shire Council

Associate Director, Nemesio Biason joined TTW in 2004 as a highly technical civil engineer. He has detailed knowledge of construction projects which spans across commercial, retail, residential, industrial, educational, healthcare and public buildings. Including experience with legal expert witness, water sensitive urban design, stormwater design, flood study, earthworks, pavement and masterplanning.
He brings a practical and adaptive approach to his work, understanding that every project is unique and requires a responsive and collaborative solution. He has a strong network of clients and works cohesively with architect, client and contractors.

Accommodation

Iglu Redfern
233 Johnston Street, Annandale
Block G, Wentworth Point
7-9 Kent Road, Mascot
ILU, Croydon
7 Cremorne Point Road, Cremorne
Trades Hall, Sydney
Zenith Apartments, Kings Cross
7-9 Kent Road, Mascot

Commercial

Balikpapan, Indonesia – Stormwater Design
100 Pacific Highway, North Sydney – Civil Design
16-40 Mount Street, North Sydney – Civil and Public Domain Design for the 5 Green Star Project
Dubai Airport Roof Drainage
7-9 Kent Road, Mascot

Retail

Fairy meadow Shopping Centre Development – Civil Design
Hobart Parliament Square
Charlestown Square North Piazza

Sports + Leisure

Australian Rugby Development Centre, Moore Park – Civil Design
Strathfield Golf Course – Civil Design
Wollongong Leisure Commercial Development – Civil Design
Aerial Rope Park, St Mary's
Moorebank Sports Club extension and Car Park

Art + Culture

Orange Regional Museum – Civil Design (Winner of NSW AIA – NSW Premier's Prize and Sulman Medal)
Anzac Memorial Education and Interpretation Centre – Civil Design ($40m)
Rooty Hill Performing Arts Centre
NSW Art Gallery Storage Facility, Lilyfield – Civil Design
Burelli St, Wollongong (Salvation Army Site) – Civil Design

Education

Macquarie Library, Macquarie University
LEES1 Project, University of Sydney – Civil Design
Wallace Wurth Redevelopment, UNSW – Civil Design
Macquarie University – South Precincts
Danebank Anglican Girls School
North Sydney TAFE, Westbourne Street Entrance
Hurlstone Hawkesbury High School
UNSW Electrical Engineering Building Capital Renewal & modernization Project
St Marks, Stanhope Gardens
Wenona School, North Sydney
Glenfield Agriculture High School
Building Education Revolution (BER) Schools – Leonay, Wyoming, James Erskine, Blaxland, Pymble, Llandlo, Cambridge Park, Ellison, Luddenham and Werrington County Public Schools
Glenfield High School
Danebank School Redevelopment

Healthcare + Research + Aged Care

Sir Moses Montefiore Jewish Home, Randwick
Graythwaite Rehabilitation Centre, Ryde Hospital
Blue Haven Community Centre
Condobolin Retirement Village
Prince of Wales – Neuroscience Research Precinct Stage 2A
BUPA Sutherland
Northshore Private Hospital

TTW

Your Partner in Engineering

Nemesio Biason

What is it about the industry that motivates you?

It motivates me to see the engineering and construction industry thriving in its ability to meet client and community expectations despite working in highly-constrained time and financial parameters, and yet still delivering high-end and innovative projects.

Government + Public

Wynyard Walk, Sydney (Winner of NSW CIA Excellence in Infrastructure Projects)

80 Alfred Street, Milsons Point – Public Domain Works Design

5-11 Meriton Street, Gladesville – Public Domain Works Design

15 Strathford, Cammeray – Public Domain Works Design

Block 8, Central Park – Public Domain Works Design

207-211 Darlinghurst Road, Darlinghurst – Public Domain Works Design

20 Alfred Street, Milson's Point

Willoughby Council Kerb and Gutter and Drainage Design, Castle Cove

Civil

Accessways + Car Parks

Westpoint Shopping Centre, Blacktown – Alpha Street New Carpark Entry/Exit Design

Macquarie University – Gumnut Childcare Car Park – Design and Project Management

Flood Mitigation

Superlot 5, Little Bay – Stormwater, Civil, and Flood Assessment

Merrylands City Central Project – Civil Design and Flood Advice

Bass Hill Plaza – Flood Damage Investigation (Peer Review)

Wynyard Walk, Sydney – Stormwater Expert Witness

434-444 Elizabeth Street, Surry Hills

Roads + Stormwater

Echuca RSL Club – Stormwater Analysis

Stage 1, St. Mary's Leagues Club - Civil and Stormwater Design

18a Bradleys Head Road, Mosman – Stormwater Design

Phoenix Theatre Gallery, Chippendale – Stormwater and Public Domain Works Design

Rooty Hill RSL, Rooty Hill – Civil Design and Flood Study

Civil Continued

Flood Mitigation (Cont'd)

176-184 George Street, Concord – Flood Management

10-20 McEvoy Street, Waterloo – Flood Study

Macquarie Park Cemetery – Stormwater, Prioritisation Analysis 37 ha Catchment

Emirates 6-star Resort Development, Wolgan Valley – Flood Study (18,525ha catchment)

Dunmore Stable, Dunmore – Flood Study (11,500ha catchment)

47& 57 Princes Hwy Albion Park Rail – Flood Study (10,700ha catchment)

Baker Street, Banksmeadow Industrial Development - Flood Study

1 – 3 Dunning Avenue, Roseberry – Flood Study

Railway Parade, Burwood – Stormwater Analysis (11ha catchment)

10-20 McEvoy Street, Waterloo – Flood Expert Witness

New South Head Rd, Double Bay – Flood Study (240ha catchment)

ACT Prison – Catchment and Overland Flowpath Analysis

Jakarta International School – Flood Study (27ha catchment)

Richard Johnson Anglican School – Sites Detention Basin Analysis

Claremont, Nyngan – Flood Analysis

Subdivision + Infrastructure

Berkeley Industrial Subdivision

Burroway Road – Road and Drainage Design

Macquarie University – Campus Wide Infrastructure (Road works, Stormwater, Sewer and Water), Masterplanning for 2031 and Flood Studies

Macquarie University – Balaclava Road Extension and Roundabout Design

697 Anzac Parade, Maroubra – Stormwater Diversion

Blacktown Showground Project – Stormwater Design

Berkeley Road Industrial Subdivision Stage 2, Berkeley – Flood Study (46ha catchment) and Civil Design

Appendix I Asbestos Management Plan

Geosyntec consultants

engineers | scientists | innovators

Asbestos Management Plan – Wentworth Park new High School

7 Burroway Road, Wentworth Point, NSW 2127

RobertsCo
21 October 2022

AU122229 CEMP App I

Quality Management

Document Distribution

Issue/Revision	Issue 1	Revision 1	Revision 2
Remarks	DRAFT	FINAL	
Date	23 September 2022	21 October 2022	
Prepared by	Cissilia Young	Hayden Davies Licensed Asbestos Assessor LAA001437	
Reviewed by	Lange Jorstad	Lange Jorstad	
Signature	DRAFT		
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This report was prepared in accordance with the scope of services set out in the contract between Geosyntec Consultants Pty Ltd (ABN 23 154 745 525) and the client.

Geosyntec Consultants Pty Ltd
ABN 23 154 745 525
www.geosyntec.com.au

Table of Contents

Appendices

1 Introduction

1.1 Background

Geosyntec Consultants Pty Ltd (Geosyntec) was engaged by RobertsCo Pty Ltd (the Client), to prepare a Construction Environmental Management Plan (CEMP) for the Wentworth Point new High School redevelopment project, located at 7 Burroway Road, Wentworth Point, NSW (the project site). The site location is presented in Figure 1 and the site layout is presented in Figure 2, Appendix A.

As per the 2022/2023 budget papers, this is now referred to as "Wentworth Point new high school". Future documentation relating to this project, including this document, will be labelled accordingly.

Due to the SSD-11802230 application being submitted as "Sydney Olympic Park new high school", the project name will remain the same on the Planning Portal and future documentation may reference this.

Please also note 'Wentworth point new high school' is the placeholder name for the school. The school naming will occur closer to opening, following a community consultation process.

Based on review of current spatial data, the site is legally identified as Lot 1 in DP 121276305, and occupies an area of approximately 1 ha. The site is currently vacant land which has been partially capped with up to 2m of certified Virgin Excavated Natural Material (VENM). The proposed redevelopment is understood to include school buildings and open space areas within the development footprint, and is consistent with the definition of 'HIL C' as presented in Schedule B1 of National Environment Protection (Assessment of Site Contamination) Measure (1999) as amended in 2013 (NEPM 2013), which includes public open space land use and secondary schools.

Mr Andrew Lau from JBS&G, an NSW EPA accredited Contaminated Land Auditor, has been appointed by Schools Infrastructure NSW to conduct an audit of the proposed school development with respect to land contamination. This is to ensure that the investigations and any remedial works are undertaken in accordance with the requirements of the NSW Contaminated Land Management Act (1997) so that the land is fit for purpose, and meet requirements of **SSD-11802230**.

The site is impacted with contaminants associated with previous light industrial land use, filling, hazardous building materials, and suspected petroleum storage and infrastructure.

A Remediation Action Plan (RAP) was prepared by Parsons Brinckerhoff (PB) in 2015 for a portion of land identified as Area 1 (part of a wider area known as Stage 1), which included the site.

In 2019, Stage 1 remediation works were undertaken on the wider peninsula site which involved the placement of a cap on part of the area occupied by the proposed school site. The capping works were undertaken by Landcom with Zoic Environmental being the environmental consultant and Mr Andrew Lau appointed as the NSW EPA accredited Site Auditor for these works. Details of the capping works were presented in the following document:

- Zoic Environmental (March 2020) Interim Validation Report Early Works Package Headland Park Wentworth Point Development, 7, 9 and 11 Burroway Road, Wentworth Point, NSW 2127 (Ref: 18170 EW VAL).

The report confirms the placement of capping material in the same configuration that is presently located in this area with the completed works being endorsed by the Site Auditor.

In March 2022 Geosyntec (formerly Zoic) prepared a RAP addendum, to advise on required additions / amendments to the approved PB (2015) RAP, to enable the site to be remediated to

meet the suitable of the revised end use of the site as a school. The RAP addendum required: validation criteria udpates, remediation requirements for identified underground storage tanks and other infrastructure, validation works sampling and analysis plan, requirements for reinstatement of the marker and capping layer following excavations, management measure for the previously placed cap in the western portion of the site, and discussion of ground gas protection systems.

The RAP addendum was endorsed by the Site Auditor, and **condition C32(c) of the SSD** states the recommendations of the Remedial Action Plan Addendum (1 March 2022 prepared by Geosyntec) must be complied with.

The preferred remedial strategy as presented in the PB (2015) RAP, and addendum Geosyntec (2022) RAP, included development of a CEMP for implementation through the remediation and redevelopment works for the infrastructure phase of the project. This CEMP has been prepared in general accordance with the requirements as described in the PB (2015) RAP, the addendum Geosyntec (2022) RAP, and the draft SSD conditions, and has been adapted to meet the requirements of the site.

1.2 Objectives

This AMP form part of the Construction Environmental Management Plan for the SOPHS redevelopment works at the site.

The objective of this AMP is to provide guidance and strategies for the handling, management and treatment of asbestos including the removal, transport and disposal of asbestos-impacted soils from the site if required, in order to protect the health of onsite workers, visitors and potential offsite receptors and prevent potential spread of asbestos contamination offsite.

Specific aims of this AMP are to:

- Outline safe working conditions for workers;
- Outline procedures to manage works where asbestos may be encountered during development activities, including excavation of potential asbestos-impacted soils;
- Outline measures for the safe onsite storage and (where required) disposal of asbestos containing material (ACM) and asbestos-impacted soils in accordance with relevant legal and statutory requirements; and
- Outline ongoing management requirements to ensure that risk posed by potential asbestos contamination is appropriately managed.

1.3 Regulatory Framework

All asbestos-related works including asbestos remediation works will be undertaken in accordance with, but not limited to, all relevant sections of the following guidelines and regulations:

- Work Health and Safety Act 2011.
- Work Health and Safety Regulations 2017.
- Protection of the Environment Operations Act 1997 and associated Regulations.
- WorkCover NSW (now SafeWork NSW) (2014) 'Managing Asbestos in or on Soil', March 2014.
- NSW EPA (2014) 'Waste Classification Guidelines, Part 1: Classifying Waste'.
- National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended in 2013 (NEPM, 2013).

- WA DoH (2009) 'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia'.

The above guidelines and regulations have been considered in the preparation of this AMP.

All parties involved in site works must ensure that they currently, and for the duration of the project, hold all appropriate licences, approvals and permits for working with asbestos, including excavation, transport and disposal of asbestos waste. These may include, but are not limited to:

- Notification to SafeWork NSW (required 10 days before licensed asbestos removal work is commenced). Notification for friable asbestos removal work, if required, should be accompanied by an Application for Permit for friable asbestos removal works.
- Permit from SafeWork NSW for any removal work involving friable asbestos (if relevant or required)

1.4 Certification and Approval

This AMP is to be reviewed and endorsed by the Site Auditor. Once endorsed by the Site Auditor, the AMP is to be submitted to relevant statutory authorities.

1.5 Project Description

The proposed redevelopment is understood to include school buildings and open space areas within the development footprint.

The Wentworth Point new high school (previously known as the Sydney Olympic Park new high school) is a new high school for 1530 students.

The project was originally to be developed in 2 stages – Stage 1 a Stream 5 school for 850 students, and Stage 2 upgrade to a Stream 9 school for 1530 students.

Development of the school will be in 2 phases:

- Phase 1 to construct all teaching spaces,
- Phase 2 to complete the multipurpose hall, sports courts, and landscaping (once TfNSW/Landcom's peninsula masterplan is amended and the road relocation approved).

With Waterfront views, maritime access and green parkland surrounds, Sydney Olympic Park High School will be a landmark educational facility for SI NSW. This future high school has the responsibility to contribute to this growing suburb and be the heart of Wentworth Point's culturally diverse community.

The adjoining land to the east (being developed under separate approval) includes the redevelopment of Burroway Road along the eastern boundary of the school, which will provide car parking, drop off zones, and delivery for the school.

2 Site Identification and Description

2.1 Site Identification

The site location is shown in Figure 1, with the site layout plan in Figure 2, Appendix A. Information in the following section was sourced from the Zoic Environmental Pty Ltd (Zoic) (2019) SAQP – Headland Park (File reference: 18170 SAQP Peninsula Park Landcom 19Feb19 Final) for 7, 9 and 11 Burroway Road, Wentworth Point, NSW 2127, which encompassed the site. The site identification and land use details include:

Table 2.1: Site Identification

Title	Details
Street Address:	7 Burroway Road, Wentworth Point, NSW 2127
Property Description:	Lot 1 DP 1276305 (formerly parts of Lots 202, 203 and 204, DP 1216628)
Current Site Ownership:	NSW Department of Education
Geographical Coordinates:	Lat: -33.824002° Long: 151.080528°
Property Size:	Approximately 0.7 hectares
Local Government Area:	City of Parramatta Council (formerly Auburn City Council)
Zoning – Existing:	B1 Neighbourhood Centre and R4 High Density Residential

2.2 Surrounding Land Use

Land uses immediately adjoining the Site are described as follows:

Table 2.3: Immediate Site Surrounds

Title	Details
North:	Vacant land comprising part of the proposed Wentworth Point Peninsula Park redevelopment area followed by Parramatta River.
East:	Vacant land comprising part of the Wentworth Point Marina and Rowing Club redevelopment area followed by Homebush Bay.
South:	Burroway Road followed by a construction site.
West:	Wentworth Point Public School followed by Marina Square Shopping Mall.

2.3 Site Conditions

The site condition is based on published information and a review of past reports and is presented in Table 3.1.

Table 2.2: General Site Conditions

Title	Details
Topography and Drainage:	The site is approximately less than 10m Australian Height Datum (AHD). In general, the site is relatively level and has been subjected to historical filling associated with land reclamation which has altered topography. Surface water is expected to infiltrate into unsealed areas or consist of overland flow and ultimately drain to the Parramatta River or Homebush Bay which are located to the north and east of the site respectively.
Site Surface & Vegetation:	The site surface consists of concrete slabs in the centre and eastern portions, and previously placed VENM material in the western portion. Vegetation at the site comprises some trees and shrubs growing between the concrete slabs and some grasses growing on the VENM material.
Condition of Buildings & Roads:	There are currently no buildings or roads onsite.
Relevant Local Sensitive Environments:	Local sensitive receiving environments include Parramatta River and Homebush Bay, located away from the northern and eastern boundaries respectively.

3 Asbestos Register

The PB (2015) RAP provided a summary of contamination issues at the site. The RAP identified asbestos (bonded and friable) as a contaminant of potential concern (COPC) within the fill material across the wider Stage 1 area, which encompasses the site.

An asbestos register including previous detections within the site from the PB (2015) RAP is provided in Appendix B.

4 Implementation of This AMP

This AMP is applicable for the development activities within the site, where potential ACM could be present.

4.1 Roles and Responsibilities

4.1.1 Roles

Description of the key roles of involved parties is provided below.

Principal Contractor (RobertsCo)

Under the provisions of the Work Health and Safety Regulation 2017 prepared under the Work Health and Safety Act 2011, the Principal Contractor must be appointed as the "person conducting a business or undertaking" (PCBU).

The Principal Contractor has the responsibilities set out in the Work Health and Safety Act and Regulations and the Safe Work Australia Codes of Practice.

The Principal Contractor will also be responsible for co-ordinating health and safety activities related to asbestos for the project.

Competent Person or Licensed Asbestos Assessor

A Competent Person or an Asbestos Assessor shall be engaged to assess any suspected asbestos containing materials encountered during the remediation, validation and development works and provide advice on appropriate procedures for its handling, treatment or management.

A Competent Person is defined in SafeWork Australia (2011a) as "a person who has acquired, through training, qualification or experience, the knowledge and skills to carry out the task" – in this case the task is asbestos identification.

An Asbestos Licensed Assessor is a person who holds an asbestos assessor licenced by SafeWork NSW.

Given friable asbestos may be potentially present at the site, airborne asbestos monitoring and dust monitoring during any asbestos works should be completed by an Asbestos Assessor. Laboratory analysis for air monitoring is discussed in Section 5.3.5.

Licensed Asbestos Removalist

A SafeWork NSW licensed asbestos removalist will be required to undertake asbestos removal as follows:

- Class A (friable) licensed asbestos removal contractor shall be engaged if friable asbestos is identified.
- Class B (non-friable) licensed asbestos removal contractor if more than 10 m^2 of non-friable asbestos is identified for removal or if there is doubt about the total quantity.

For smaller quantities of non-friable asbestos, a suitably trained and experience contractor is required to conduct the removal work.

The asbestos removal contractor will remove ACM or asbestos impacted soils from the site and remediate or dispose of them to a suitably licensed waste facility or transfer the material to an onsite containment area (if available). The licensed asbestos removal contractor will be the primary person responsible for works on site involving ACM or asbestos impacted soils.

Given friable asbestos may be potentially present at the site, asbestos removal works should be completed by a Class A (friable) licensed asbestos removal contractor.

4.1.2 Responsibilities

Description of the key roles and responsibilities of involved parties in relation to this AMP is provided below in Table 4.1.

Table 4.1. Key roles and responsibilities of involved parties in relation to this AMP

Role	Responsibility
Principal Contractor RobertsCo	• Approval of the AMP. • Provision of safe working environments relating to asbestos. • Ensure that all persons involved with the project have undertaken the appropriate workplace health and safety training and have been inducted into the CEMP. • Ensure that all persons involved with asbestos in asbestos restricted areas have been inducted into this AMP. • Ensure that all persons working on the project have been provided with the appropriate workplace health and safety training relating to asbestos, asbestos awareness and identification of asbestos containing materials (ACM). • Ensure that all persons working in the project area are appropriately trained for the specific works they undertake. • Keep all training and induction records relevant to this AMP for persons involved in this project. • Ensure that a site-specific safety plan for works in areas where potential asbestos contamination may be encountered is prepared for the site. • Ensure that any subcontractors provide adequate SWMS for activities where asbestos may be encountered. • Monitor the compliance with this AMP and relevant regulations, codes and guidelines. • Control access into areas where asbestos is known to exist. • Be responsible for the project work at all times until all works are completed. • Maintain and update the Asbestos Register for this project. • Auditing compliance with the AMP. • Manage accident and emergency procedures related to asbestos. • Inform the Asbestos Assessor of new asbestos finds. • Engage a suitably experienced and licensed asbestos removalist and ensure they maintains appropriate licences and permits. • Maintain material tracking records relating to the excavation, stockpiling and disposal of asbestos containing materials. • Keep air monitoring records. • Compliance with all other applicable statutory responsibilities related to management of asbestos in the workplace.
Subcontractor(s) and their Supervisor(s) To be Engaged	• Understand the requirements of the CEMP and this AMP. • Prepare SWMS, as required by the Principal Contractor, for specific activities undertaken within the project where asbestos may be encountered. • Take reasonable care for their own safety and the safety of others. • Attend site inductions, asbestos awareness training and identification of ACM training, and, follow all site rules and work instructions related to asbestos. • Take immediate action to rectify asbestos hazards that should arise during the course of the work. • Immediately report unexpected finds (including asbestos) to site supervisor. • Comply with the CEMP, this AMP, SSP, SWMS and other relevant OHS legislation and industry standards. • Establish and maintain a positive safety climate on the project. • Compliance all other applicable statutory responsibilities related to management of asbestos in the workplace.
Licenced Asbestos Removalist To be Engaged	• Notify SafeWork NSW in writing at least five days before removal work commences in accordance with Safe Work Australia (2011b).

Role	Responsibility
	• Obtain Permit from SafeWork NSW for any friable asbestos removal works. • Undertake asbestos removal work in accordance with Safe Work Australia (2011a & 2011b). • Compliance with all other applicable statutory responsibilities related to management of asbestos in the workplace.
Suitably Qualified Environmental Consultant / Asbestos Assessor Geosyntec	• Provision of safe working environment. • Issue this AMP and coordinate works to review/update the AMP, as necessary. • Provide onsite supervision of all potential asbestos works. • Provide air monitoring services, when required by the SafeWork Australia Codes and/or the Principal Contractor and arrange for display of daily results for information of workers. • Engage suitably qualified and competent staff and/or contractors to manage works in areas impacted with asbestos. • Provide advice on handling, management and treatment of potential asbestos impacted material. • Be available, if required, for consultation with regards to conditions and requirements of this AMP. • Provide validation of excavation, waste classification and other advice in relation to asbestos. • Other activities that may be required by the Principal Contractor from time to time.

4.2 Training and Induction

The Principal Contractor shall ensure that:

- Workers undertaking work onsite must be trained and be given appropriate occupational health and safety training in relation to asbestos, asbestos awareness training and training in the identification of asbestos containing materials (ACM) which may be encountered during their work
- Workers undertaking work within the site must be inducted into the CEMP
- Workers undertaking work in areas where asbestos may be encountered must be inducted into this AMP
- Other visitors entering the site understand the site safety provisions, including those covered in the CEMP and this AMP, as required
- Persons undertaking site induction acknowledge that they have understood the requirements of the site safety and environmental obligations related to asbestos
- Records of the site induction relating to asbestos must be kept

4.3 Audit and Revision of this AMP

The implementation of this AMP should be audited at regular intervals throughout the duration of construction works to confirm that the requirements of the AMP are understood and being implemented and to assess its ongoing suitability.

The audit shall include a site walkover and an assessment of induction, tracking and monitoring records prepared under this AMP. Should the review identify inconsistencies, these shall be documented in a review report and recommendations made for correcting these inconsistencies. The audit shall be documented in a brief audit report which will include recommendations for revisions to the AMP.

In the event that site conditions are substantially different than previously observed and/or the audit process recommends revision of this AMP, this AMP should be updated.

4.4 Non-Conformance to this AMP

In the event of a non-conformance to this AMP, the source and nature of the event will be investigated, the effectiveness of the existing controls reviewed and modified where practical, and necessary strategies will be implemented to minimise further impacts.

If necessary, the AMP will be updated as required to rectify non-conformance with the AMP.

5 Management Plan for Asbestos Impacted Soil

5.1 Asbestos Types, Risk and Potential Exposure Pathways

At the time of preparation of this AMP, friable and non-friable ACM had been identified within the fill material within the wider Stage 1 area which encompasses the site, as detailed in the PB (2015) RAP.

Non-friable ACM is defined by SafeWork Australia (2011b) as "… material containing asbestos that is not friable asbestos, including material containing asbestos fibres, reinforced with a bonding compound." This includes bonded asbestos fragments found in soil.

Friable asbestos is defined by SafeWork Australia (2011b) as "… material that is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry, and contain asbestos." This includes soil impacted with asbestos fibres or fibre bundles, or asbestos fragments which can easily produce asbestos fibre or fibre bundles.

Mechanical disturbance of non-friable asbestos may result in the production of friable asbestos.

Asbestos poses a human health risk through the inhalation of its fibres (WA DoH 2009). If deposited in the lungs, the fibres can initiate diseases which may produce major health effects, such as asbestosis, lunch cancer and/or mesothelioma.

Potential exposure pathways for asbestos relevant to this AMP are considered to be:

- Inhalation of asbestos fibres by workers/visitors during excavation of asbestos containing soil
- Inhalation of asbestos fibres by workers/visitors from stockpiled material containing asbestos
- Inhalation of asbestos fibres by workers or others onsite or offsite during transport of asbestos containing material

5.2 Health and Safety Management

5.2.1 Safe Work Method Statements (SWMS)

The Principal Contractor or subcontractors undertaking works must prepare site specific job hazard assessment and relevant safe work method statements for the work undertaken. The SWMS must include activities where asbestos may be encountered and strategy to minimise exposure to asbestos in accordance to this AMP, including requirements of personal protective equipment (PPE).

Safe Work Method Statements must:

- Describe how work is to be carried out;
- Identify the safety risks;
- Describe the control measures that must be applied to the work;
- Describe the equipment used in the work;
- Describe any standards or codes applicable to the work; and
- Training and qualifications required of persons undertaking the work.

SWMS prepared by the contractors must be reviewed and approved by the Principal Contractor.

5.2.2 Site Access Control, Barriers and Signage

The overall construction area will be secured by fencing, which limits access to public. The Principal Contractor shall also maintain site access control in areas where ACM has been identified or may potentially be present ('restricted asbestos area'). Site access to restricted asbestos areas will be determined by the Site Supervisor. Only authorised and appropriately inducted and trained persons are to be permitted in restricted asbestos areas.

Appropriate warning signs and/or barriers are to be placed around restricted asbestos areas maintaining at least 3m buffer from the impacted area, in accordance with the following regulations and guidelines:

- Standards Australia (1994) 'AS 1319-1994: Safety Signs for the Occupational Environment'; and
- Safe Work Australia (2011b) 'Code of Practice: How to Safely Remove Asbestos', December 2011.

Given asbestos was generally identified to be present within the fill material across the wider Stage 1 area encompassing the site, it is anticipated that areas that are being excavated are generally considered as 'restricted asbestos area'. Access to restricted asbestos areas will be controlled and permitted by the Principal Contractor only after persons entering the site have been advised of the potential contamination hazards. This shall at least include notification of the potential presence of asbestos containing materials and asbestos impacted soils.

Any authorised person accessing the restricted asbestos area should do so in accordance with health and safety requirements as indicated in this AMP. The implementation of the health, safety and environmental requirements should be administered by the Principal Contractor. Site access will not be allowed until workers have been inducted, have signed in, and if entering the restricted asbestos areas must use the required PPE (Section 5.2.3). Upon exiting the site, personnel must remove and dispose of/clean the PPE in the provided decontamination area.

Restricted asbestos area boundaries shall be determined by the Principal Contractor in consultation with the Asbestos Assessor and will vary according to the location and size of the required daily activities. Any restricted asbestos area boundaries will be designed to allow other site works not involving significant intrusive works to continue without being required to adhere to this AMP.

It may be found that restricted asbestos area boundaries require to be assigned to the site boundaries, in which case all site workers must adhere to the requirements of this AMP.

Workers entering restricted asbestos areas must be inducted to this AMP.

5.2.3 Personal Protective Equipment (PPE) Requirement

Requirements of PPE will be determined by the Principal Contractor, depending on the type of work for each activity, and must be covered in the site specific SWMS.

In areas where asbestos containing materials or asbestos impacted soils are not exposed, no additional PPE is required above the standard construction site PPE outlined by the Principal Contractor for the site.

Should suspected ACM be identified outside the restricted asbestos areas, then the Asbestos Assessor should be contacted. If the presence of asbestos is confirmed the additional items of PPE are required in addition to the standard construction site PPE outlined by the Principal Contractor for the site, and applies for any ground workers within the restricted asbestos areas.

The minimum level of additional PPE required for onsite personnel working in a restricted asbestos area is listed below:

- **Body Protection.** Fluorescent or white disposable coveralls (Tyvek suits) are to be worn during excavation activities. For workers undertaking work in the restricted area for asbestos, disposable Tyvek suits must be worn. Disposable gloves should also be worn for workers contacting soils. Disposable Tyvek coveralls and gloves must be removed when leaving the restricted asbestos area and are to be considered as potentially contaminated with asbestos and will therefore need to be disposed as asbestos contaminated waste.
- **Respiratory Protection.** Respiratory protection is required to prevent inhalation of airborne dusts. A minimum of a P2 rated disposable mask or respirator fitted with a P2 rated cartridge will be used in the restricted asbestos area.
- **Foot Protection.** Steel toed boots are to be worn by personnel working on-site.

Eating, drinking, chewing gum or tobacco, smoking or other practices that involves hand to mouth transfer increases the probability of ingestion of foreign matter into the body. Hands must be thoroughly washed before eating, drinking or smoking. Smoking, drinking or eating is not permitted onsite.

Plant operators must close cabin doors and windows when operating within restricted asbestos areas for asbestos.

5.3 Asbestos Management During Construction Works

5.3.1 General intrusive works in areas where asbestos has not been identified

Management of general intrusive works during the construction in areas where asbestos has not been identified is as follows:

- Intrusive work onsite in areas where asbestos has not been identified shall only be carried out by suitably qualified and experienced contractors, who have received asbestos awareness training and have been trained in the recognition of asbestos;
- Intrusive works can be undertaken in a manner similar to that normally undertaken on similar construction projects, although the ground conditions should be carefully observed by the operator and/or others noting the presence of any evidence of ACM;
- If no visual evidence of ACM is observed works can continue as normal.
- If visual evidence of ACM is observed and/or ACM is encountered (i.e. new asbestos finds), works should cease and the Supervisor informed and should be managed as described in Section 5.3.3 below.

5.3.2 Intrusive Works in Areas where Asbestos Contaminated Fill Materials are not Exposed

Management of general intrusive works during the construction in areas where asbestos contaminated fill materials are not exposed (see Section 3) is as follows:

- In areas where asbestos contaminated fill materials are not yet exposed shall only be carried out by suitably qualified and experienced contractors, who have received asbestos awareness training and have been trained in the recognition of asbestos;
- A spotter who has received asbestos awareness training and have been trained in the recognition of asbestos should be present to observe the soils being disturbed in the intrusive excavation;
- Intrusive works can be undertaken in a manner similar to that normally undertaken on similar construction projects, although the ground conditions shall be carefully observed by the operator and the spotter noting the presence of any evidence of ACM;

- If visual evidence of ACM is observed and/or ACM is exposed, works should cease and the Supervisor informed and should be managed as described in Section 5.3.3 below.
- Where excavations occur in the area capped with virgin excavated natural material (VENM) located in the west of the site, the above points apply. If excavations proceed beyond the marker layer present beneath the VENM cap into underlying site fill soils, the work area is classified as a restricted asbestos area and the below sections apply. The marker layer and VENM cap must be reinstated following completion of such works, with photographic records of reinstatement kept.

5.3.3 Intrusive Works in Areas Classified as Restricted Asbestos Areas

Areas where asbestos has been identified in previous contamination investigations are described in Section 3 are for the purpose of this AMP defined as restricted asbestos areas.

Management of intrusive work in areas classified as restricted asbestos areas will be as follows:

- Intrusive work onsite within restricted asbestos area shall only be carried out by suitably qualified and experienced contractors, who have received asbestos awareness training and have been trained in the recognition of asbestos, which may be encountered during their work.
- Access to the restricted asbestos area must be controlled as per Section 5.2.2.
- Excavation work within the restricted asbestos area must be observed by an Asbestos Assessor.
- Stockpile management of asbestos impacted material shall be undertaken in accordance with Section 5.3.6.
- Transport and disposal of asbestos impacted material shall be undertaken in accordance with Section 5.3.7.
- An asbestos decontamination area must be present within the restricted asbestos area. Decontamination of asbestos shall be undertaken in accordance with Section 5.3.8.

Specific management controls during intrusive work within the restricted area for asbestos are as follows:

Prior to work commencing

- SafeWork NSW should be notified for all asbestos removal work comprising: any friable asbestos removal; and non-friable asbestos removal >10m2 or if there is doubt about the total area. Notifications must be submitted at least 5 days prior to any asbestos being disposed of offsite.
- A SafeWork NSW Permit is required for all friable asbestos removal works. The SafeWork NSW Permit shall be sought by the licenced asbestos removal contractor. Friable asbestos removal permits must be submitted at least 7 days prior to any friable asbestos being disposed of offsite.
- An observation of the surface soil in the area of the excavation should be undertaken. If a small number of ACM fragments are observed, they shall be picked up by a licenced asbestos removalist (if practicable) and placed into a labelled asbestos waste bag and stored in a designated waste storage area for offsite disposal by a licenced asbestos removalist. If significant number of ACM fragments is observed, they shall be dealt with during the excavation as described by the following section. Records of the ACM finds should be maintained in the Asbestos Register for the site by the Principal Contractor (attached in Appendix B).

During excavation

- Personnel undertaking work within the restricted asbestos area must wear minimum PPE as listed in Section 5.2.3. Air monitoring must be undertaken within or adjoining the restricted asbestos area in accordance with Section 5.3.5.
- The excavation shall be kept damp by water spraying during excavation works to reduce the potential of dust generation in accordance with Section 5.3.9.
- Any open excavation shall be covered with HDPE sheeting or similar and secured at the end of each working day.
- Management of potential asbestos impacted soil shall be decided by an Asbestos Assessor in accordance with guidance provided in the PB (2015) RAP, National Environment Protection Measure (NEPM) (as amended 2013), SafeWork NSW (2014) and other appropriate guidelines.

Post excavation

Given that 'cap and contain' has been selected as the preferred remediation strategy for the wider Wentworth Point redevelopment area, remediation of asbestos restricted areas is not required.

5.3.4 New Asbestos Finds and Determination of New Restricted Areas

The strategy for new asbestos finds encountered during the construction is as follows:

- If suspected ACM is encountered in areas outside an existing asbestos restricted area, work must cease within 10m radius of the area. The suspected ACM must be left onsite and appropriately isolated (e.g. by covering) until the area is inspected by the Asbestos Assessor. The Asbestos Assessor will confirm the presence or absence of asbestos. The handling, treatment and/or management of ACM and potentially ACM impacted soil will be decided by a Licensed Asbestos Assessor. If the presence of asbestos is confirmed, the area of at least within 10m radius of the find must be included in the asbestos restricted area and managed as per Section 5.3.3 of this AMP for the remaining duration of the works. Such areas can only be considered as 'cleared' once the material has been capped in accordance with the PB (2015) RAP.
- Records of the ACM finds should be maintained in the Asbestos Register for the site by the Principal Contractor (attached in Appendix B).

5.3.5 Air Monitoring

Asbestos air monitoring is to be carried out by an Asbestos Assessor during any works within a restricted asbestos area which results in disturbance of the ground surface. The purpose of the air monitoring is to verify that the control measures in place to minimise the generation of asbestos fibres into the air are working satisfactorily and that there is no exposure of asbestos fibres to adjacent areas. The air monitoring devices will be placed at the boundaries of the restricted area for asbestos determined as appropriate by the Asbestos Assessor or a Competent Person. The Asbestos Assessor may also consider it to be appropriate to include monitoring on individuals or monitoring on machinery – this would only be carried out following consultation with the Principal Contractor.

Sample collection and analysis will be conducted in accordance with the National Occupational Health and Safety Commission (NOHSC) 'Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition, 3003 – 2005'.

The analysis will be performed by a NATA registered laboratory and reported on endorsed certificates. The results of air monitoring shall be available on a 24-hour turnaround time basis. Daily air monitoring reports shall be kept by the Principal Contractor or site supervisor who should

be able to be produced upon request or display the results in prominent locations to keep workers informed of the results.

Air monitoring test results should be below 0.01 fibres/mL throughout the duration of any ground disturbance works in the restricted asbestos area, to demonstrate the adequacy of the control measures implemented. The following table shows the actions that will come into force should fibre levels exceed this action level of 0.01 fibres/mL.

Table 5.1: Action Levels

Action Level (fibres/mL)	Control / Action
<0.01	Continue with control measures
≥ 0.01 and ≤ 0.02	Review control measures, investigate cause and implement controls to minimise further release
≥ 0.02	Stop removal work, and where applicable notify SafeWork NSW. Investigate cause including enclosure & equipment where present and clean immediate area. Do not recommence work until air test results return readings of < 0.01 fibres/ml

5.3.6 Management of Asbestos-Impacted Stockpiles

Stockpiles of potentially asbestos impacted material must be kept damp when in use and/or covered if remaining for more than 24 hours. Covers will need to extend beyond the perimeter of the stockpiles and be secured to prevent being blown away by wind.

Appropriate management of asbestos impacted stockpiles will be critical in instances where friable asbestos has been identified. The Asbestos Assessor should be consulted on the requirements for management and monitoring of friable asbestos stockpiles.

5.3.7 Transport and Disposal of Asbestos Impacted Soils

Each truck transporting potentially asbestos impacted material for transportation onsite or offsite shall be double lined with 1000 gauge polythene sheeting. Each truck shall be filled to within the maximum weight limit and the load will then be adequately covered during transportation to landfill.

Waste requiring offsite disposal must be disposed of in accordance with appropriate guidelines, including (but not limited to) the NSW EPA (2014) 'Waste Classification Guidelines Part 1: Classifying Waste'.

Any waste classified as Special Waste (Asbestos) must also be logged under the Waste Locate system to satisfy tracking requirements for asbestos waste.

Disposal of asbestos impacted waste must be to appropriately licensed landfills.

All vehicles entering and exiting the site will be required to comply with the NHVL (national heavy vehicle legislation)

5.3.8 Decontamination of Equipment and PPE

Machinery used for the handling (e.g. excavation) and treatment of asbestos impacted soil may become contaminated with asbestos and will need to be decontaminated by washing down prior to leaving the site. All wash down liquids will need to be collected and managed appropriately.

Decontamination will involve hosing / removal of soil from the tracks and bucket as far as reasonably practicable by the Site Supervisor. Tools used shall be hosed down / wiped clean with a damp cloth.

Upon completion of works, boots and clothing will be wiped down with a damp cloth and disposable PPE and Respiratory Protective Equipment (RPE) disposed of as asbestos waste. Non-disposable RPE should be wet-wiped and placed in a sealed container for future use.

5.3.9 Dust Management

The following dust management measures shall be undertaken, as appropriate:

- Keeping excavation areas, stockpiles and haulage pathways damp.
- Keeping haulage vehicles covered and providing designated site access for haulage vehicles.
- Appropriate decontamination of haulage vehicles.
- Maintaining access roads to ensure no significant dust at the site boundary.
- Providing dust suppressors to equipment, where appropriate.
- Monitoring of dust levels at the site boundary.

If significant dust is visible at the site boundary, then additional dust control measures shall be employed, which may include:

- Reducing the area of soil exposed (by covering or minimising size of excavations etc.)
- Temporarily suspending activities until wind speed reduce
- Additional use of water spray

6 Contingency Plans and Control Measures

A list of contingency items and control measures with respect to asbestos and this AMP is provided below in Table 6.1:

Table 6.1: Contingency Plans and Control Measures

Contingency Item	Control Measures
Person undertaking work in the restricted area for asbestos has not undertaken induction into the AMP.	Principal Contractor or a person appointed by the Principal contractor shall prepare a non-conformance report and assess reason of the non-conformance. Person undertaking work shall be inducted into this AMP.
Significant asbestos find is encountered in the work area	Report to Principal Contractor, who should contact the Asbestos Assessor to provide advice on handling, treatment and management of the material.
ACM is found on a stockpile or material that has been excavated	Location of the original material should be revealed from material tracking data. Principal Contractor should be informed. Asbestos Assessor should provide advice on management of the material in the original location as well as the location where it has been placed.
ACM is found on haulage pathway	Principal Contractor or a person appointed by the Principal Contractor shall prepare a non-conformance report and assess reason of the non-conformance. Review of procedure of transport of asbestos contaminated material shall be undertaken by the Principal Contractor. Rectification of the procedure shall be undertaken, if considered appropriate. ACM shall be collected and disposed of appropriately in accordance with Safe Work Australia (2011b).
Significant dust generation	Stop work, undertake more dust suppression. Do not commence work again until dust suppression is adequately undertaken.
Asbestos impacted stockpile disposed of inappropriately (e.g. to landfill which is not licenced to receive asbestos)	Principal Contractor or a person appointed by the Principal Contractor shall immediately contact landfill. Principal Contractor or a person appointed by the Principal Contractor shall prepare a non-conformance report and assess reason of the non-conformance. Rectification of the procedure shall be undertaken, if considered appropriate. The Asbestos Assessor shall be engaged to assess appropriate management strategy. Incident may need reporting to NSW EPA.

Relevant emergency contacts are as follows:

Table 6.2: Emergency Contacts

Emergency Contact	Details
Project Manager	RobertsCo
Superintendent	To be Appointed
Principal Contractor	RobertsCo
Environmental Consultant	Geosyntec
SafeWork NSW	131 050
NSW EPA	131 555

7 Communication and Consultation

7.1 Internal Communication

Communication and consultation regarding asbestos management will occur between workers involved with asbestos management (including Project Manager, Principal Contractor's Environmental Manager / Coordinator, Site Foreman, Environmental Consultant, Occupational Hygienist) and other workers onsite through tool-box talks, inductions and general communication onsite where necessary. This may include communication of asbestos management procedures as outline in Section 5 (e.g. standard safety protocols during excavation), new asbestos finds, new restricted areas and upcoming removal works.

7.2 External Communication

7.2.1 Regulatory Authorities

Communication with a range of Regulatory Authorities shall be undertaken throughout the Project. This communication shall be through the Project Manager. Any communication from a regulator must be notified to the Principal Contractor's Environmental Manager / Coordinator, and records of all communications retained and appropriately filed.

7.2.2 Consultation with Neighbours

RobertsCo has indicated that the ultimate client, School Infrastructure NSW, will inform neighbours of the works.

7.2.3 Media

All contact with the media shall be through the Client. Under no circumstances is the Project staff to engage with the media.

8 References

NSW EPA (2015) Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997. NSW DECC, Sydney.

NEPM (2013) National Environment Protection (Assessment of Site Contamination) Measure, Schedule A and Schedules B(1)-B(9). National Environment Protection Council, Adelaide.

NOHSC (2005) 'Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition, 3003 - 2005', National Occupational Health and Safety Commission.

NSW EPA (2014) NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste

Parsons Brinckerhoff (PB, 9 January 2015) Detailed Remediation Action Plan – Infrastructure Delivery, Wentworth Point Development, Ref: 2207004B-RES-REP-001 Rev C.

Protection of the Environment Operations Act 1997

SafeWork Australia (2011a) 'Code of Practice: How to Manage and Control Asbestos in the Workplace'.

SafeWork Australia (2011b) 'Code of Practice: How to Safely Remove Asbestos', December 2011.

Standards Australia (1994) 'AS 1319-1994: Safety Signs for the Occupational Environment'.

WA DoH (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

Waste Avoidance and Resource Recovery Act 2001

Waste Management Act 2000

WorkCover NSW (now SafeWork NSW) (2014) 'Managing Asbestos in or on Soil'.

9 Limitations

This report has been prepared by Geosyntec Consultants Pty Ltd ("Geosyntec") for use by the Client who commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the Client and other parties. The findings of this report are based on the scope of work outlined in Section 1. The report has been prepared specifically for the Client for the purposes of the commission, and use by any explicitly nominated third party in the agreement between Geosyntec and the Client. No warranties, express or implied, are offered to any third parties and no liability will be accepted for use or interpretation of this report by any third party (other than where specifically nominated in an agreement with the Client).

This report relates to only this project and all results, conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose. This report should not be reproduced without prior approval by the Client, or amended in any way without prior written approval by Geosyntec.

Geosyntec's assessment was limited strictly to identifying environmental conditions associated with the subject property area as identified in the scope of work and does not include evaluation of any other issues.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigation.

This report does not comment on any regulatory obligations based on the findings. This report relates only to the objectives stated and does not relate to any other work conducted for the Client.

The absence of any identified hazardous or toxic materials on the site should not be interpreted as a guarantee that such materials do not exist on the site.

All conclusions regarding the site are the professional opinions of the Geosyntec personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Geosyntec has not independently verified and assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Geosyntec, or developments resulting from situations outside the scope of this project.

Geosyntec is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The Client acknowledges that this report is for its exclusive use.

Appendix A Figures

Appendix B Asbestos Register

Asbestos Register

Wentworth Point Redevelopment – Marina and Overwater Rowing Club

ID	Date of Identification	Location	Item Description, Including Condition of ACM (Friable/Bonded)	Approximate Size and Weight	Laboratory Testing	Fate of ACM
1B09b - Soil	Historical investigation	Fill material within the site 0-0.1m beneath original site surface	Chrysotile, Unknown Material Type	Unknown	Yes, indicating presence of asbestos in soil sample	To be capped during construction OR disposed of under NSW waste Classification Guidelines should offsite disposal be required.
1B03 - Soil	Historical investigation	Fill material within the site 0.1m beneath original site surface	Chrysotile, Unknown Material Type	Unknown	Yes, indicating presence of asbestos in soil sample	To be capped during construction OR disposed of under NSW waste Classification Guidelines should offsite disposal be required.
1BW01 - Soil	Historical investigation	Fill material within the site 0.4-0 5m beneath original site surface	Chrysotile, Unknown Material Type	Unknown	Yes, indicating presence of asbestos in soil sample	To be capped during construction OR disposed of under NSW waste Classification Guidelines should offsite disposal be required.
List is to be updated during construction						

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Appendix J Acid Sulfate Soil Management Plan

Geosyntec consultants

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Acid Sulfate Soil Management Plan – Wentworth Point new High School

7 Burroway Road, Wentworth Point, NSW 2127

RobertsCo
21 October 2022

AU122229 CEMP App J

Quality Management

Document Distribution

Issue/Revision	Issue 1	Revision 1	Revision 2
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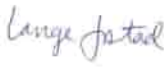
Prepared by	Olivia Zurek	Olivia Zurek	
Reviewed by	Lange Jorstad	Lange Jorstad	
Signature	DRAFT		
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Table of Contents

Appendices

Geosyntec consultants

Terminology

AASS	Actual acid sulfate soil
ASS	Acid sulfate soil
ASSMAC	Acid Sulfate Soil Management Advisory Council
CEMP	Construction environmental management plan
EPA	Environment Protection Authority
mAHD	metres Australian Height Datum
mBGL	Metres below ground level
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)
PASS	Potential acid sulfate soil
POEO	Act Protection of the Environment Operations Act 1997 (NSW)
PPE	Personal protective equipment
SPOCAS	Suspension peroxide oxidation combined acidity and sulfate
SPOS	Peroxide-oxidisable sulfur
SWL	Standing water level
SWMS	Safe work method statement
TAA	Total actual acidity
TPA	Titratable peroxide acidity
TSA	Titratable sulfidic acidity
VENM	Virgin excavated natural material
WHS	Work health and safety

1 Introduction

1.1 The project

Geosyntec Consultants Pty Ltd (Geosyntec) was engaged by RobertsCo Pty Ltd (the Client), to prepare a Construction Environmental Management Plan (CEMP) for the Wentworth Point new High School for Stage 2 of the redevelopment project, located at 7 Burroway Road, Wentworth Point, NSW (the project site). This Acid Sulfate Soil Management Plan (ASSMP) forms one of the Sub-Plans of the CEMP.

Based on review of current spatial data, the site is legally identified as Lot 1 in DP 121276305, and occupies an area of approximately 1 ha. The site is currently vacant land which has been partially capped with up to 2m of certified Virgin Excavated Natural Material (VENM). The proposed redevelopment is understood to include school buildings and open space areas within the development footprint, and is consistent with the definition of 'HIL C' as presented in Schedule B1 of National Environment Protection (Assessment of Site Contamination) Measure (1999) as amended in 2013 (NEPM 2013), which includes public open space land use and secondary schools. Stage 1 works have already occurred which included the removal of concrete slab.

This ASSMP is required to meet condition B17(d) of the SSD Conditions of Consent.

Previous investigations indicate that Potential Acid Sulphate Soils (PASS) are present within fill and the underlying estuarine sediments at depths ranging from 0.1–4.0 m below ground level (mBGL, WSP, 2015). More recent investigations indicate that PASS are likely to exist below the water table (i.e. 1.5 mBGL and below), in the darker coloured material observed (WSP, 2014a). These PASS materials are required to be managed during the earthworks.

Therefore, this ASSMP was prepared based on previous investigation results to present the management measures in general accordance with the Acid Sulfate Soil Manual (ASSMAC, 1998). Reference has also been made to the Queensland Acid Sulfate Soil Technical Manual v 4.0 (DSITIA, 2002).

This Sub-Plan should be read in conjunction with the Construction Environmental Management Plan (CEMP).

1.2 Aim

The aim of this Sub-Plan for the duration of the Stage 1 Works Package is to minimise the potential risks associated with the potential acid sulfate soil (PASS) previously identified at the Site.

1.3 Site Background

PB (2014) provides a summary of the previous acid sulfate soils testing results obtained from the site:

Results of suspension peroxide oxidation combined acidity and sulphate (SPOCAS) testing conducted during previous contamination investigations at the site concluded that potential acid sulphate soil (PASS) materials are present within fill and the underlying estuarine sediments at depths ranging from 0.1–4.0 mBGL. Further to this, assessment works completed by Parsons Brinckerhoff in June 2014, indicated that PASS were present in five locations (BH1, BH16, BH17, BH23 and BH26) analysed with SPOCAS, with significant drops in pH following the addition of peroxide and measured titratable peroxide acidity (TPA) and titratable sulfidic acidity (TSA) above

the ASSMAC (1998) action criteria. It was concluded that 'PASS are likely to exist below the water table (i.e. 1.5 m BGL and below), in the darker coloured material observed'.

1.4 Objectives

This ASSMP forms part of the Construction Environmental Management Plan.

The objectives of this ASSMP is to provide guidance on the environmental management of ASS during the remediation, excavation and construction works to be followed by the Principal Contractor and their sub-contractors, and provide appropriate mechanisms to reduce the potential on-site and off-site environmental impacts and mitigate the risks associated with the disturbance of PASS.

The following issues are addressed in the ASSMP:

- strategies for the management of PASS during development
- implementation of a soil and groundwater monitoring program; and
- contingency procedures to be implemented in the event of the failure of management strategies

This document has been prepared to give guidance on management of ASS, in accordance with the NSW Acid Sulfate Soils Management Advisory Committee's ASSMAC (1998) Acid Sulfate Soil (ASS) Assessment Guidelines.

1.5 Review and Approval

This ASSMP is to be reviewed and endorsed by the Site Auditor. Once endorsed by the Site Auditor, the ASSMP is to be submitted to Council and the NSW EPA before the certification of the works.

2 Site Information

2.1 Site Identification

A summary of Site identification details is provided below.

Table 2.1: Site Identification

Title	Details
Street Address:	7 Burroway Road, Wentworth Point, NSW (formerly 3 Burroway Road)
Property Description:	Lot 1 in Deposited Plan 1276305 (formerly Lot 202 DP1216628,Lot 204 D P 1216628 and Lot 204 DP1216628)
Current Site Ownership:	Roads and Maritime Services (RMS)
Property Size:	0.7 hecatre
Local Government Area:	City of Parramatta Council
Zoning – Existing:	B1 Neighbourhood Centre and R4 High Density Residential (Auburn LEP (2010))

2.2 Local Environmental Plan

A review of the Auburn Local Environmental Plan 2010 (ASS Map – Sheet ASS_009), which at the time of writing had not been consolidated to a new City of Parramatta Council Local Environmental Plan, indicates that the Site is located in an ASS risk Class 2 area.

2.3 Acid Sulfate Soil Risk Map

A review of the Prospect/Parramatta River 1:25,000 Acid Sulfate Soils Risk Map indicates that the Site is classified as 'Disturbed Terrain' that includes filled areas that occur during the reclamation of low-lying swamps for urban development. Other activities that result in the classification of a disturbed terrain include dredging, heavy ground disturbance through urban development and/or construction of dams or levees.

2.4 Site Conditions

The site condition reports are summarised below in Table 2.2.

Table 2.2: General Site Conditions

Title	Details
Topography:	The Site is relatively level at an elevation of less than 10 metres Australian Height Datum (mAHD) and has been subjected to historical filling associated with land reclamation which has altered the original topography.
Superficial Geology:	Based on the Sydney Geological Series Sheet 9130, the Site is underlain by man-made fill comprising dredged sand and mud, demolition rubble and/or industrial and household waste (up to 2.4 mBGL). The fill is underlain by Quaternary Age alluvial deposits (1–4.8 mBGL). Ferruginous and humic cementation may occur in places and shell layers are common. Highly weathered, grey sandstone was encountered at one borehole location at 4.4–4.8 mBGL.
Depth to Groundwater:	Depth to groundwater ranges between 0.6 mBGL to 3.7 mBGL, and standing water levels (SWL) ranged between 0.5 mAHD and 2.7 mAHD.
Flow Direction:	Groundwater flows northwest and northeast towards the Parramatta River and Homebush Bay respectively.

2.5 Previous ASS Investigations

The Site, as a portion of Wentworth Point Peninsula Park Project, has been subject to a number of historical ASS investigations. A list of most relevant reports is provided below:

- WSP 2009a, Acid Sulfate Soil Management Plan Harbour Radio Pty Limited (2GB) Burroway Road, Homebush Bay, NSW.
- WSP 2009b, Environmental Site Assessment Harbour Radio Pty Limited (2GB), Burroway Road, Homebush Bay, NSW.
- GHD, 2012, Additional Contamination Assessment – Stage 1 Area, incorporates results from the 2010 detailed site investigation.
- Parsons Brinckerhoff (PB) 2014, Proposed management of acid sulfate soils prepared for the Wentworth Point Development.
- WSP 2014, Soil Contamination Assessment Burroway and Hill Road, Wentworth Point Development, HomebushBay, NSW 2127.
- Parsons Brinckerhoff (PB) 2015, Detailed Remediation Action Plan – Infrastructure Delivery, Wentworth Point Development.

3 Extent of Management

3.1 Proposed Redevelopment

The proposed works will include the removal and remediation of surrounding soil of several USTs approximately 3m bgl. It will also include excavation, pile soil and inground service trenching.

Site layout for the site is provided as Appendix A, which indicate the areas requiring excavation.

The proposed remediation works for the infrastructure delivery include the bulk excavation of specific cut-to-fill areas to depths that may extend up to 3.0 mBGL (WSP, 2015). Based on the proposed excavation depth, indicative volumes of soil to be disturbed, and the Site located in an area of high occurrence of ASS materials at or near the ground surface, any materials that are excavated and suspected of containing PASS and/or ASS should be assessed and managed according to management measures and mitigation strategies discussed in the following sections.

3.2 Assessment Criteria

The following assessment criteria for field and laboratory testing have been developed with reference to the ASSMAC guidelines (1998).

ASS are usually found in estuarine environments up to 10 mAHD and generally consist of clays and sands containing pyritic material. The field indicators of ASS include:

- iron staining on any drain surfaces
- unusually clear or milky green water discharging from the site
- jarosite horizons or mottling due to iron in the subsurface
- corrosion of concrete or steel structures
- presence of any sulfurous odours.

Analytical results are assessed against the following criteria taken from ASSMAC (1998). Action criteria are based on texture and clay content of the soil being analysed and the total volume of soil to be disturbed. For the purpose of this plan the adopted action criteria is conservatively applied for coarse texture soils, based on the natural soils encountered including clay, sand and sandy clay. As the potential amount of ASS requiring excavation is unknown both the criteria for 1 to 1,000 tonnes disturbed and for >1,000 tonnes disturbed have been considered; for coarse soils the criteria are the same for both categories. Table 3.2 outlines the assessment criteria.

Table 3.1: Adopted Action Criteria

Analyte	Units	Action Criteria (Coarse Soils)	
		1 to 1,000 tonnes disturbed	>1,000 tonnes disturbed
S_{POS}	%	0.03	0.03
TTA + TPA	mol H^+/T	18	18
TSA	mol H^+/T	18	18

S_{POS} – Peroxide-oxidisable sulfur
TAA – Total actual acidity
TPA – Titratable peroxide acidity
TSA – Titratable sulfidic acidity

4 ASS Management Strategy

The following sections outline management measures and mitigation strategies to be undertaken to manage areas where potential or actual ASS materials are present at the Site.

General construction environmental management for the proposed works is presented in the CEMP. This ASSMP provides specific information for the management of ASS at the site and is a sub-plan to the CEMP.

4.1 ASS General Management Strategies

There are a range of control and management measures available when dealing with the possible disturbance of ASS. Such measures can be implemented individually or jointly as part of a combined approach.

PB (2014) summarises the following general strategies as outlined in ASSMAC (1998):

- Avoidance – where ASS areas are avoided altogether (total avoidance) or development activities are adjusted so that the more severe areas are left undisturbed (partial avoidance).
- Oxidation prevention – ASS are innocuous if they are not allowed to oxidise. Oxidation can be prevented by avoidance, water table control, in situ capping, or removal and burial below the water table.
- Acid neutralisation – acid present or produced by oxidation in the soil can be controlled by the addition of alkaline agents such as agricultural lime for example.
- Leachate treatment – where the sulfidic content of the soil is very low (quantity), deliberate oxidation with leachate collection and treatment might be appropriate. This method is generally only applicable to sands, given the lengthy drying times for clay, and would require pilot trials prior to implementation.
- Disposal to landfill – the ASS may be removed and disposed of at an appropriate landfill facility. Untreated ASS would require treatment as a contaminated soil for the purpose of transport and disposal.

It is considered that avoidance of PASS/ASS is not viable as the proposed excavation is anticipated to extend to a depth greater than 1.5mbgl.

Therefore, the most feasible management strategies are summarised as follows:

- For PASS generated from the landward section of the launching channel, the material can be treated by addition of an alkaline agent such as agricultural lime. The treated PASS can then be reused in other parts of the site or the wider Wentworth Point redevelopment (where possible). The treated PASS can only be placed beneath the proposed capping layer to be constructed as part of the overall Wentworth Point development. No treated PASS can be placed below the water table.
- Dewatering associated with the works to be undertaken within the cofferdam and the excavation required as part of the launching channel construction may result in the exposure of PASS.

5 Testing and Management Procedures for Acid Sulfate Soils

As part of the development works will involve the excavation of PASS/ASS, the management strategy to be adopted for the site during the excavation and construction works in order to mitigate the impacts of PASS/ASS on the surrounding environment will include the following steps:

- Appoint a suitably qualified person to manage the acid sulfate soil issues during the earthworks
- Minimise the amount of PASS/ASS required to be excavated
- Excavate and stockpile spoil in separate layers based on geological units and moisture content (i.e., saturated or dry) and reinstate spoil in the same order to ensure that PASS remain saturated.
- Reinstate PASS/ASS under the water table with 16 hours of excavation works (where possible)
- Undertake monitoring and laboratory testing of excavated soils (mainly based on visual assessment, field testing and laboratory testing) to assess the potential presence of acid generating potential during excavation activities and establish liming rates
- Excavated PASS/ASS can be managed through either offsite disposal or on-site treatment
- Manage and monitor dewatering activities to minimise the ingress of groundwater into the excavation and to maintain the groundwater table in the area.

In the case of the exposed sediments within the cofferdam, the material will undergo in-situ cement-lime mixing to increase the geotechnical specification of the sediments. This should reduce the potential for acid generation. Further testing is required to be undertaken to assess whether additional liming is required prior to onsite reuse or offsite disposal.

5.1 Training and Responsibilities

The Principal Contractor should appoint a suitably qualified person who will be responsible for managing ASS at the site during the proposed remediation, excavation and construction works. It is expected that daily attendance to the site will be required to facilitate soil sampling required under this ASSMP.

The appointed person should be familiar with:

- This ASSMP
- Council and other relevant statutory requirements
- Recognition of PASS and ASS
- ASS testing and treatment procedures
- Onsite management of ASS activities
- The NSW ASSMAC Guideline

The classification of ASS/PASS during excavation should be carried out by personnel trained in the identification of ASS and be based on visual classification and the field peroxide test. If required, a suitably qualified environmental consultant should be engaged to assist or train the Principal Contractor in the identification of acid sulfate soils and sampling and analysis.

5.2 Screening of Soils During Excavation

The following procedures are recommended for the Principal Contractor for the sampling and stockpiling of excavated materials. This should be carried out by personnel trained in identifying and testing ASS in the field. Depending on site constraints, other equivalent procedures may be adopted by the Principal Contractor:

- Site excavations will be observed and logged by personnel trained in identifying and testing PASS/ASS in the field
- Excavated soils from depth greater than 1.5m below ground level or excavated sediments from Homebush Bay are considered as PASS/ASS and will be required to be field tested as per Section 5.4
- Based on the field classification tests, soils/sediments suspected as being PASS/ASS will be stockpiled separately to materials assessed as not PASS/ASS. Temporary stockpiling of such materials should be carried out as per Section 5.6.
- Soils/sediments assessed as having a low risk of ASS will be stockpiled in accordance with the Construction Environmental Management Plan (CEMP) with the objective to reduce water ponding, and to control surface erosion and sediment transport outside the stockpiled areas. These soils can be reused within the wider redevelopment area beneath the proposed capping layer. Any surplus soil or sediments generated from Homebush Bay will require to be classified under Parts 1 and 4 of the NSW EPA (2014) Waste Classification Guidelines for offsite disposal.

5.3 Visual Classification

A preliminary visual check by personnel trained in the identification of PASS will be based on material type, colour and consistency:

- PASS are generally grey in colour. Soils may start turning a brown colour when acid is being generated.
- Soils may have a sulfurous (rotten egg) odour. Caution is urged as the low lying terrain may mean that peat could be present, which can have a similar type of odour.
- There may be some bubbling occurring in soils when exposed to air and acidification is occurring. This only happens if acidification takes place relatively quickly.

5.4 Field Test Classification

Section 6.5 in the WSP/PB (2017) has specified the soil sampling frequency for PASS/ASS:

Field pH measurements will be need to be undertaken at a frequency of 1 sample per 25m3 of excavated soils from below 1.5m below ground level. Field pH readings of 4 or less than 5.5 will indicate that the soils are acid and may be the result of limited oxidation of sulfides. Field screening should be carried out by personnel trained in the identification of PASS/ASS and based on the protocols presented in the NSW Acid Sulfate Soil Manual (second edition, March 1998).

5.5 Laboratory Testing for Assessing Liming Rate

Based on the results of the visual classification and field testing, samples will be collected by personnel trained in the identification of ASS and submitted for laboratory analysis using the chromium reducible sulfur suite (Scr) method to confirm the results of the field test and determine the required liming rate.

Sample will be submitted for Sc analysis at a minimum rate of 10% of the total number of field screened samples, or at a minimum 1 sample per treatment batch.

5.6 Temporary Stockpiling

Where stockpiling exceeds two days, excavated soils will be bunded and covered with plastic to help slow the oxidation process. Where extended periods of stockpiling occur (i.e. greater than two weeks) soils will be removed to a treatment pad and lime applied. Normal stormwater and sediment controls should be in place. Extended periods of stockpiling will require leachate collection and monitoring. Where monitoring of the leachate indicates low pH, the addition of lime will be required prior to discharge to stormwater. It should be noted that discharge to stormwater requires approval from Council, and will be subject to other criteria such as the presence of contaminants, pH and suspended solids.

5.7 Bulk Earthworks

Given the heterogeneity and chemical composition of fill soils, highly variable nature of the Quaternary alluvium beneath the Site, and the nature of the proposed site works, avoidance of ASS materials is not considered viable. Staged excavation works should be implemented in the areas PASS/ASS have been identified. Care should be taken during the bulk earthworks to minimise disturbance of groundwater and prevent oxidation of soils below groundwater table.

- Where potential or actual ASS is required to be excavated, the following considerations should be taken into account (ASSMAC, 1998):
- Where the sulfidic layer is <0.5 m deep, these areas should ideally be left undrained with minimal disturbance (i.e. generally these areas are best left waterlogged).
- Where the sulfidic layer is between 0.5 and 2.0 m deep, drainage and excavation should only be attempted in accordance with a properly designed management plan:
  - if the sulfidic layer is 0.5 to 1 mBGL, excavation should be limited to areas less than 0.3 mBGL
  - if the sulfidic layer is 1 to 1.5 mBGL, excavation should be limited to areas less than 0.5 mBGL
  - if the sulfidic layer is more than 1.5 mBGL, excavation should be limited to areas no greater than 1 mBGL.
- Where areas are 'scalded' or degraded and devoid of vegetation, no further drainage or excavation should be undertaken. Remediation strategies should be developed.

Prior to excavation works, the following controls and management measures should be implemented to manage the PASS/ASS at the Site.

Table 5.1: Management of ASS materials prior to excavation works

Title	Details
Wash Bays	Wash bays should be installed at the site to minimise off-site tracking of contaminated materials by machinery. Wash bays should be used prior to trucks/machinery leaving the Site or when moving from an excavation area to a clean area of the Site. Leachate controls should be employed around wash bays to minimise the spread of contamination. These should include collection of runoff.
Staged Excavation Planning	Staged excavation works should be implemented in the areas PASS/ASS have been identified by laboratory analysis of soil samples or are suspected, to minimise the risks posed to the environment and to minimise oxidation of in situ materials. To achieve this, the excavation area should be excavated systematically as a series of smaller 'cells' rather than one large area.

Title	Details
	Where ASS materials are left in situ as the uppermost layer and exposed (i.e. not saturated), areas should be either capped with clean virgin excavated natural material (VENM) or concrete as soon as possible prior to moving to the next area. Ideally, the optimum 'cell' size should be calculated based on the area that can be completed (including capping works) in a single day. Prior to commencement, a works schedule should be prepared indicating when each area will be excavated and capped. Areas should be marked out prior to the excavation works taking place.

5.8 Management Options for ASS/PASS

Where PASS is excavated, excavated PASS materials may be managed by one (or a combination) of the following methods:

- neutralisation of PASS materials where reuse on-site above the water table is required (Option A)
- reburial of excavated PASS materials below the water table (Option B) and
- disposal of excess treated/untreated PASS material to a licensed off-site facility where it cannot be reused on-site (Option C).

Management options for ASS/PASS have been outlined and evaluated in the following table.

Table 5.2 Management options for ASS/PASS

Option	Details	Evaluation of Applicability
Option A: Treatment of PASS and on-site reuse	PASS is excavated and neutralised with lime. The treated material will be re-used on site above the water table with adequate capping.	This option is suitable for PASS materials excavated above/below water table to be used for raising the levels for the development.
Option B: Reburial of excavated PASS materials below the water table	Excavated PASS materials may be re-used on-site by burying the materials in an area of the site located below the water table.	This option is suitable for saturated PASS materials (below water table) and not suitable for fill materials.
Option C: Disposal of excess treated/untreated PASS material to licences off-site facility	A waste classification is assigned for the off-site disposal of PASS to a licensed offsite facility.	Potential option for situations of limited spatial area for treatment or volume of excavation larger than treatment / reburial capacity.

5.9 Preferred Option for Management of ASS/PASS

As outlined in the table above, the most viable and therefore the preferred option for managing ASS/PASS during the proposed site works is Option A (Treatment of PASS and on-site reuse) in coupled with Option B (Reburial of excavated PASS materials below the water table). The management procedure for both options is outlined below.

5.9.1 Treatment of PASS and on-site reuse (Option A)

During bulk earthworks, where PASS materials are to be reused on-site in areas not saturated or more than 16 hours after excavation, these materials must be treated prior to reuse.

The procedures outlined in the following table should be implemented for this option:

Table 5.3: Management procedures for Option A – Treatment and on-site reuse

Procedure	Details
Step 1: Lime Selection and Liming Rate Adoption	The most common material used to neutralise acidic sediments is agricultural lime (aglime as CaCO3). Aglime (pH 8.2) is the safest and cheapest neutralising agent (Manual, 1998). Based on the results from the assessment undertaken along Burroway Road (WSP, 2014), the liming rate would be between 0.04 tonnes of lime per tonne of disturbed soil and 0.12 tonnes of lime per tonnes of soil. These rates are based on the average and maximum Peroxide-oxidisable sulfur (SPOS) from the assessment. Appendix B provides the neutralising calculations worksheet from ASSMAC (1998) which can be used to determine the appropriate dosing rates based on laboratory data from any ASS identified during the works. When estimating lime requirements in accordance with ASSMAC (1998) guidelines, a safety factor of at least 1.5 to 2 times the weight/volume should be applied to allow for inefficient mixing of the lime and its low reactivity. In addition, the purity and effective neutralising values also needs to be included in the estimation of lime requirement, as specified in ASSMAC (1998).
Step 2: Set up Treatment Area/s	Treatment must be undertaken on a developed hardstand area or suitable engineered pad or limed pad. The hardstand area would require appropriate drainage controls to ensure that any runoff is collected. The limed pad should be at least 100mm thick and this thickness should be maintained for the duration of treatment works. The purpose of this guard layer is to minimise the risk of acidic water leaching from the base of the treatment area into the groundwater. Dependent upon the rate of spoil generation, several bunded treatment areas may be necessary for stockpiling and treatment. An earthworks strategy should be prepared to ensure that sufficient space is available on site to accommodate treatment of the PASS.
Step 3: Spoil Management	Stockpiles containing PASS materials should be placed to minimise environmental impact from any leachate. ASSMAC (1998) indicates that the design of stockpile(s) should include the following controls: • all stockpiles to be bunded to retain any water run-off from the treated materials • establish leachate collection and treatment systems including an impervious pad on which to place the stockpile • if an impervious pad has not been established under the stockpile, as a precautionary measure, an apron of fine lime should be applied below the stockpile when stockpiling materials for any length of time • minimise the surface area exposed to oxidation – consider using some form of artificial capping if storage is for longer than a few weeks • minimise the amount of water infiltration – consider using some form of artificial capping • establish diversion banks upslope to prevent run-on water • establish sediment control structures to ensure sulfidic material is not eroded – consider using some form of capping. To manage spoil effectively and meet the above requirements, excavated materials should be stored in a designated area at each site and reused or disposed of off-site as soon as possible following excavation with appropriate management procedures.
Step 4: Excavation & Handling	PASS disturbed during development works should be immediately transferred to the designated treatment area and spread out in 150 mm to 300 mm thick layers. If possible the layers should be allowed to dry in order to aid the mixing process. The layers should then be interspersed with the appropriate amount of lime to aid in the effective mixing of lime and soil. Lime should be applied to the excavated material within the treatment area as soon as possible. If circumstances prevent the spreading and treatment of the material, the surface area of the stockpile should be minimised by forming a relatively high coned shape and avoiding 'spreading-out' of the stockpile. This will limit the surface area exposed to oxidation. Water infiltration should be minimised by covering the stockpile during wet weather. This will limit the formation and transport of acid leachate due to rainfall. The stockpile should be bunded to prevent erosion of the PASS and any movement of potentially acid leachate. Upstream surface runoff water should also be diverted around the stockpile.
Step 5a: Lime Treatment	An excavator or other suitable equipment (as deemed appropriate by the excavation contractor) should be used to thoroughly mix the lime through the soil. Alternatively use of a pug mill may be considered dependent upon the volume of soil to be treated in a timely fashion. Monitoring should be undertaken by qualified personnel to ensure the mixing is undertaken to a suitable extent as neutralisation success relies on effective mixing of the neutralising agents and soil.
Step 5b: Lime Buffer	Establishing a 'lime buffer' at the face of any recent excavation which exposes ASS by sandbagging the face and incorporating lime under and in the sandbags so that the acid leachate flows through the sandbags; backfilling the face with clean fill mixed with lime/sand mix; and excavating a trench behind the face and incorporating a lime/sand mix or barrier so that the acid leachate/water must pass through. Insoluble coatings and preferred pathways may limit the effectiveness of lime buffers.

Procedure	Details
Step 5c: Capping	To minimise the generation of acids, open excavations where the uppermost exposed layer contains PASS materials should be capped as soon as possible or left saturated. If capping is necessary, one (or a combination) of the following capping options should be used: • cap with clean, imported VENM (tested to ensure it meets the appropriate criteria for imported VENM materials) • cap with re-used soil from on-site (tested to ensure it is within the adopted site assessment criteria and does not contain ASS) • cap with concrete. Capping should occur within 16 hours to minimise the environmental risks associated with acid generation. Where concrete or other building materials are to be placed directly in contact with PASS or AASS, appropriate materials should be chosen that are resistant to the long-term effects of sulfate and sulfuric acid which may be produced by the soils.
Step 6: pH Testing and Monitoring	The pH of the soil should be checked using the test method(s) outlined in the ASS Manual 1998 (Methods 21A and or 21Af) to confirm that PASS have been neutralised by lime addition. If required, additional lime should be added to the soil and additional mixing undertaken. Following treatment with lime the pH of the soil should be in the 5.5 to 8.5 range.
Step 7: Re-use on Site	Following treatment and validation, treated PASS materials could be re-used on site above groundwater table for raising the ground level. Treated PASS should not be spread over sensitive areas (e.g. mangroves) or directly adjacent to waterways. The area where the treated PASS is going to be placed should be cleared. The area should be dusted with lime. The neutralised PASS should then be spread across the placement area in layers. Care should be taken not to disturb the underlying soil. On completion, the surface of the neutralised PASS should be dusted with additional lime prior to capping. A suitable capping layer should be placed over the neutralised PASS. The finished surface should be turfed or paved to minimise the potential for erosion.

5.9.2 Reburial of excavated PASS materials below the water table (option B)

The procedures outlined in the following table should be implemented for this option:

Table 5.4: Management procedures for Option B – Reburial below the water table

Procedure	Details
Step 1: Excavation & Reburial	This mitigation strategy may involve reburial of the excavated PASS materials as quickly as possible prior to acid generation by over-excavation (in a staged approach) to provide capacity for disposal of the PASS materials at the bottom of a constructed void preferable below a permanent water table. Cut and fill budget should be prepared to ensure that there is adequate capacity to maintain the PASS materials in anaerobic conditions in the void. This must be done within 16 hours of excavation works to avoid acid generation. If the material is to remain exposed at the surface, it should be capped (refer Table 4.3). If the material is required to be stored for longer than 16 hours, then it must either be: • placed in a temporary holding area where it remains saturated (either below the water table in another area of the site or in an artificial saturated area filled with water). As a safety measure, some lime should usually be added and the water needs to be monitored and treated if the pH drops below 6.5. • treated as per Option A.
Step 2: Treatment (subject to duration of PASS materials exposed to oxygen)	As per Table 4.3.

5.10 Alternative Management Option for ASS/PASS

Option C – Disposal of excess treated/untreated PASS material to a licensed off-site facility is considered as an optional management strategy for situations of limited spatial area for treatment or volume of excavation larger than treatment/reburial capacity encountered.

5.10.1 Disposal at a Licensed Landfill (Option C)

If excavated PASS materials cannot be re-used on site, they should be disposed of at a suitably licensed waste facility. Excavated soils containing ASS should be disposed of in accordance with the NSW EPA (2014) waste classification guidelines, as follows:

- For VENM containing PASS (pH of 5.5 or more):
  - the materials must be kept wet at all times during excavation and subsequent handling, transport and storage
  - the receiving landfill must be licensed by the NSW EPA to dispose of PASS below the water table
  - the materials must be received at the receiving landfill within 16 hours of being dug up.
- For Actual ASS (AASS, pH of 5.5 or less) or PASS that has dried out, undergone any oxidation of its sulfidic minerals or is not VENM:
  - the materials must be treated (neutralised) on-site through liming, mixing and testing to ensure that the mixing of lime materials is successful. Monitoring of pH should be carried out regularly during and after the neutralisation procedure to establish the effectiveness of the treatment
  - following neutralisation, testing should be undertaken to classify the treated material in accordance with the NSW EPA (2014) Waste Classification Guidelines - Part 1: Classifying Waste (2014) and Waste Classification Guidelines Part 4: Acid Sulfate Soils (2014), and the excess treated materials should be disposed to an NSW EPA licensed landfill facility.

The receiving landfill must be licensed by the EPA to accept the class of waste as per the classification. The landfill should be informed prior to receiving the waste that the material contained ASS and was treated in accordance with the neutralising techniques outlined in ASSMAC (1998).

Information should be recorded/filed for each batch of material tested and disposed of off-site. This should include the origin of material, the volume, a description of the materials, laboratory results and disposal certificates.

The costs associated with the off-site disposal can be significant and should be assessed at an early stage of the project to avoid significant future unexpected additional costs.

The procedures outlined in the following table should be implemented for this option:

Table 5.5: Management procedures for Option C – Disposal at a Licenced Landfill

Procedure	Details
Step 1: Contact Landfill	Prior to commencement of excavation works, the landfill should be contacted and the necessary approvals should be obtained for disposal.
Step 2: Excavation & Handling	Natural soil classed as PASS should be excavated/disturbed in stages. PASS must be kept wet at all times during excavation and subsequent handling, transport and storage until they can be disposed of safely.
Step 3: pH Testing	The pH of the soil should be checked using the test method(s) outlined in the ASS Manual 1998 (Methods 21A and or 21Af). The pH of each load and the time of extraction should be recorded and forwarded to the landfill. If the pH is less than 5.5 then the material is not suitable for disposal and Option A should be implemented.
Step 4: Transport for VENM containing PASS (pH of 5.5 or more) **OR**	Provided that the pH of the excavated PASS is not less than 5.5, PASS material can be loaded onto trucks and transported immediately to the landfill. Prior to burial the landfill will check the pH of each load. Any loads that do not meet the acceptance pH criteria will be turned away.
Step 4: Treatment for AASS/PASS (pH of 5.5 or less)	As per Table 4.3.

Procedure	Details
Step 5: Waste Classification and Disposal	Following neutralisation, testing should be undertaken to classify the treated material in accordance with the NSW EPA (2014) Waste Classification Guidelines and the excess treated materials should be disposed to a NSW EPA licensed landfill facility.

6 Groundwater Management

Some dewatering may be required given the proposed remediation works for the infrastructure delivery include the bulk excavation of specific cut-to-fill areas to depths that may extend up to 3.0 mBGL (WSP, 2015).

The procedure for managing groundwater seepage and dewatering during development works is outlined in the following table:

Table 6.1: Management procedure for dewatering

Procedure	Details
Step 1: Minimise the depth of dewatering	Where possible the depth of dewatering should be minimised to reduce the generation of ASS and/or acidic conditions. Excavation and dewatering works should be staged over short durations to reduce the time and volume of PASS exposed to oxidation.
Step 2: Approvals for Groundwater Disposal	Reference should be made to the local council, NSW Office of Water/WaterNSW, Sydney Water and other relevant authority's approval requirements for further information in relation to disposal of water to either the sewer or stormwater systems.
Step 3: pH Testing and Neutralisation	Water pumped from the excavation should be placed in a portable tank, or appropriate holding facility, where samples can be obtained for testing. The water should be in the pH range of 6.5 to 8.5 (NSW Government, 2009). If the pH is outside of this range, treatment will be necessary prior to disposal. Based on the disposal option chosen for the development, additional screening for contaminants may be required by the relevant authorities prior to disposal.
Step 3: On-going groundwater monitoring	In the event that extended pumping of water is necessary during the construction period, the level and quality of the groundwater should be monitored on a regular basis over the entire construction period. The pH should be measured and recorded on a regular basis. Immediate advice is to be sought from an experienced consultant if the pH at any location is not within 10% of the initial pH at the commencement of pumping. If required, corrective action should be taken as soon as possible. Laboratory analysis will be required on water samples as part of the corrective action to assess the quantity of neutralising agents required if treatment is necessary. The groundwater monitoring program refer to Section 7.

7 Monitoring Program

The overall objective of monitoring is to measure the effectiveness of the proposed strategies in achieving the desired outcomes. Monitoring will assist in identifying and addressing any non-conformances and providing information for implementing corrective actions within an appropriate timeframe. Table 6.1 outlines the monitoring program during the works.

Table 7.1: Monitoring Program

Procedure	Details
General	Monitoring of ASS control/management procedures including excavation methods, spoil management measures, and dewatering and groundwater management should be undertaken. ASS pollution incident response investigations, including management and/or remediation measures, should be prepared as required.
Soil Monitoring Program	The following will constitute the soil monitoring program during the works: • Field pH measurements of all materials excavated should be taken and logged to provide broad coverage of the excavated material types encountered. One sample should be collected per 25 m^3 of excavated soil materials for on-site pH testing. • Field pH readings of 4 or less will indicate that ASS are present with oxidising sulfides, readings of greater than 4 but less than 5.5 indicate that the soils are acidic and may be the result of limited oxidation of sulfides. • Where soils are required to be limed, materials should be tested to ensure that the neutralisation process has been successful. Field testing should be undertaken at a rate of one per 50 m3, if changes in liming rates or material are observed additional samples should be collected. Laboratory testing (SPOCAS or chromium suite) should be undertaken at a rate of 25% of field samples to confirm the results. • For waste disposal: - material is pre-classified as PASS material as per the NSW EPA (2014) waste classification guidelines providing it is delivered to the receiving waste facility within 16 hours of excavation - if soil is not delivered to the waste facility within 16 hours it will require liming and testing to ensure that the material has been successfully neutralised and to classify the material as per the NSW EPA (2014) waste classification guidelines. Information should be recorded and filed for each batch of soil tested. Information should include the origin of the material, the volume, a description of the materials, laboratory results and disposal certificates (where appropriate).
Water Monitoring Program	The following will constitute the water monitoring program during the works: • Any pumped water from the excavations and runoff collected will be stored in retention basins or fully contained tanks on-site. • Water samples should be representative of the stored water and may require sampling from different depths, particularly if the water has been stored long enough to allow it to settle. • Water stored in basins/tanks should be tested for metals (aluminium, arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel and zinc) and cations and anions to characterise the water quality. In addition, the water should be tested for physical parameters on-site including dissolved oxygen, electrical conductivity, pH, reduction/oxidation potential, temperature and turbidity. • If runoff is stored separately to any pumped water, the requirement for site runoff can be met via the following water quality criteria being tested for and met prior to off-site discharge of collected runoff: - total suspended solids not greater than 1,500 mg/L - pH between 6.5 and 9.0 - iron not greater than 500 µg/L - aluminium not greater than 5 µg/L for pH <6.5, not greater than 100 µg/L for pH >6.5 - no visible oil or grease film. ASSMAC (1998) provides water quality performance criteria to be met for the discharge of water into the environment are summarised, as summarised below.

Procedure	Details		
	Water Quality Indicator	**Fresh water**	**Marine Water**
	pH	6.5-9.0	<0.2 pH unit change
	Iron (total)	500 µg/L	Not applicable
	Total dissolved solids	<1500mg/L	>1500mg/L
	Aluminium	5 µg/L for pH <6.5	Not applicable

8 Contingency Plan

8.1 Incident and Emergency Response

There is a potential for incidents and emergency response requirements relating to ASS issues, particularly pollution/contamination of surrounding areas and waterways from acid contamination. The contractor is to have appropriate incident reporting mechanisms (including near miss reporting) and these are incorporated into the Site work health and safety (WHS) plans and CEMP. Some issues that may arise unexpectedly include:

- interception of existing unknown AASS and/or PASS identified through field inspections/measurements or observed adverse reactions with flora and/or fauna (including site workers and public)
- inclement weather or incorrect management practices causing erosion and transportation of AASS and/or PASS materials off-site from stockpiles and active construction excavations.

The emergency response procedures will include:

- immediate containment of acid runoff from stockpiles or areas of excavation by bunding
- communication between the project manager, site managers, supervisors and contractors detailing the pollution incident requiring response/action
- site inspection to assess extent of severity of the emergency/incident
- based on the assessed severity of the incident by Roads and Maritime, the project manager will determine the need to notify regulators potentially including the NSW EPA; notifications should detail the type and extent of potential impacts and remediation requirements
- monitoring and/or management of incidents which may include soil or groundwater sampling and analysis, spill clean-up, investigation materials, correction of erosion control measures and remediation of affected area (if required)
- incident reporting detailing all investigation and remediation actions taken and remediation results carried out
- environmental incidents will be reported immediately to the site supervisor who will contact the project manager. All incidences will be investigated and the appropriate course of action will be taken to address the issues. Serious environmental incidents will be reported to the NSW EPA.

8.2 Non-Conformance Preventative and Corrective Action

In the event of a non-conformance, the source and nature of the event will be investigated, the effectiveness of the existing controls reviewed and modified where practical, and necessary strategies will be implemented to minimise further impacts.

Prior to undertaking any remediation or excavation, a safe work method statement (SWMS) will be prepared that defines safe procedures to protect the health and safety of personnel. The SWMS will include the following:

- all workers will wear personal protective equipment (PPE) that may include breathing apparatus, protective overalls, gloves, safety boots and hard hat
- decontamination facilities made available to ensure workers are free of any contamination prior to leaving the workplace
- ASS areas are separated from the remaining activities by appropriate fencing and signage. Access to the site is restricted only to personnel directly involved in the works.

9 References

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WSP 2009b, Environmental Site Assessment Harbour Radio Pty Limited (2GB), Burroway Road, Homebush Bay, NSW.

WSP 2014a, Soil Contamination Assessment Burroway and Hill Road, Wentworth Point Development, Homebush Bay, NSW 2127.

WSP 2014b, Proposed management of acid sulfate soils.

WSP 2015, Detailed Remediation Action Plan – Infrastructure Delivery, Wentworth Point Development.

10 Limitations

This report has been prepared by Geosyntec Consultants Pty Ltd ("Geosyntec") for use by the Client who commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the Client and other parties. The findings of this report are based on the scope of work outlined in Section 1. The report has been prepared specifically for the Client for the purposes of the commission, and use by any explicitly nominated third party in the agreement between Geosyntec and the Client. No warranties, express or implied, are offered to any third parties and no liability will be accepted for use or interpretation of this report by any third party (other than where specifically nominated in an agreement with the Client).

This report relates to only this project and all results, conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose. This report should not be reproduced without prior approval by the Client, or amended in any way without prior written approval by Geosyntec.

Geosyntec's assessment was limited strictly to identifying environmental conditions associated with the subject property area as identified in the scope of work and does not include evaluation of any other issues.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigation.

This report does not comment on any regulatory obligations based on the findings. This report relates only to the objectives stated and does not relate to any other work conducted for the Client.

The absence of any identified hazardous or toxic materials on the site should not be interpreted as a guarantee that such materials do not exist on the site.

All conclusions regarding the site are the professional opinions of the Geosyntec personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Geosyntec has not independently verified and assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Geosyntec, or developments resulting from situations outside the scope of this project.

Geosyntec is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The Client acknowledges that this report is for its exclusive use.

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Appendix A Figures

LEGEND

Site Boundary

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Nearmaps

Approx. 50 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 1: Site Layout Plan

Site Address: 7 Burroway Road, Wentworth Point, NSW 2127

Client: RobertsCo

Job Number: AU122229

Date: 16 September 2022

Geosyntec consultants

LEGEND

Site Boundary

Acid Sulfate Soils

- NA
- Class 1
- Classes 2 & 2a
- Class 2b
- Class 3
- Class 4
- Class 5

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of SEED NSW

Approx. 50 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 2: Acid Sulfate Soil Risk Map

Site Address: 7 Burroway Road, Wentworth Point, NSW 2127

Client: RobertsCo

Job Number: AU122229

Date: 16 September 2022

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Appendix B Liming Rate Table

TABLE 4.5 Treatment categories and lime required to treat a weight of disturbed acid sulfate soils – based on soil analysis

The tonnes (t) of pure fine lime required to fully treat the total weight/volume of ASS can be read from the table at the intersection of the weight of disturbed soil (row) with the soil sulfur analysis (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 (or calculate values exactly using factors from Table 4.6).

Disturbed soil	**Soil Analysis - Oxidisable Sulfur (S %)** or equivalent TPA/TAA													
(tonnes)	***0.03***	***0.06***	***0.1***	***0.2***	***0.4***	***0.6***	***0.8***	***1***	***1.5***	***2***	***2.5***	***3***	***4***	***5***
1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.2	0.2
5	0.05	0.05	0.05	0.05	0.1	0.1	0.2	0.2	0.4	0.5	0.6	0.7	0.9	1.2
10	0.05	0.05	0.05	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.4	1.9	2.3
15	0.05	0.05	0.1	0.1	0.3	0.4	0.6	0.7	1.1	1.4	1.8	2.1	2.8	3.5
20	0.05	0.1	0.1	0.2	0.4	0.6	0.7	0.9	1.4	1.9	2.3	2.8	3.7	4.7
25	0.05	0.1	0.1	0.2	0.5	0.7	0.9	1.2	1.8	2.3	2.9	3.5	4.7	5.9
35	0.05	0.1	0.2	0.3	0.7	1.0	1.3	1.6	2.5	3.3	4.1	4.9	6.6	8.2
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	11.7
75	0.1	0.2	0.4	0.7	1.4	2.1	2.8	3.5	5.3	7.0	8.8	10.5	14.0	17.6
100	0.1	0.3	0.5	0.9	1.9	2.8	3.7	4.7	7.0	9.4	11.7	14.0	18.7	23.4
200	0.3	0.6	0.9	1.9	3.7	5.6	7.5	9.4	14.0	18.7	23.4	28.1	37.5	46.8
500	0.7	1.4	2.3	4.7	9.4	14.0	18.7	23.4	35.1	46.8	58.5	70.2	93.6	117.1
750	1.1	2.1	3.5	7.0	14.0	21.1	28.1	35.1	52.7	70.2	87.8	105.3	140.5	175.6
1,000	1.4	2.8	4.7	9.4	18.7	28.1	37.5	46.8	70.2	93.6	117.1	140.5	187.3	234.1
2,000	2.8	5.6	9.4	18.7	37.5	56.2	74.9	93.6	140.5	187.3	234.1	280.9	374.6	468.2
5,000	7.0	14.0	23.4	46.8	93.6	140.5	187.3	234.1	351.2	468.2	585.3	702.3	936.4	1170.5
10,000	14.0	28.1	46.8	93.6	187.3	280.9	374.6	468.2	702.3	936.4	1170.5	1404.6	1872.8	2341.0

L	**Low treatment**: (<0.1 t lime). Apply 0.05 t (1 bag) or 0.1 t (2 bags) of lime to prevent some soil acidity from the ASS disturbance.
M	**Medium treatment:** (>0.1 to 1 t lime).
H	**High treatment**:(>1 to 5 t lime).
VH	**Very High treatment:** (>5 tonne lime).

A detailed management plan is required if disturbing > 1,000 tonnes of ASS (oxidisable S ≥0.03 %S or equivalent TPA or TAA.)
Lime rates are for pure fine $CaCO_3$ using a safety factor of 1.5. A factor that accounts for Effective Neutralising Value is needed for commercial grade lime (see Management Guidelines).
An approximate volume (cubic m) can be obtained by dividing weight (tonne) by bulk density (t/m^3).

Appendix K Environmental Risk Register

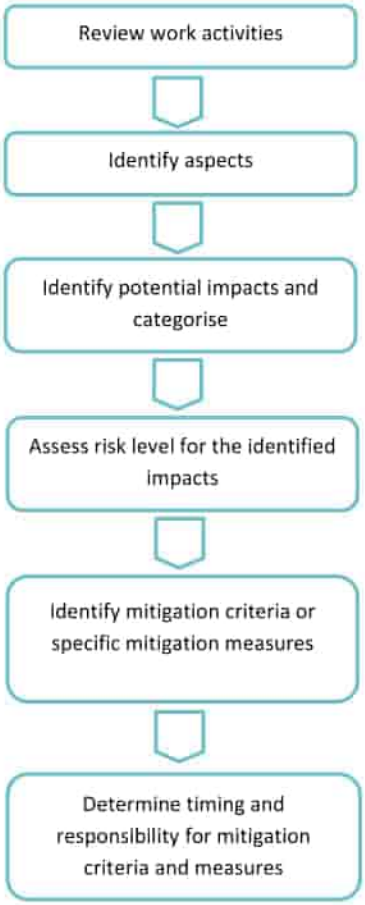
Environmental Aspects and Impacts: SOPHS Early Works

The process used to develop possible mitigation measures after an environmental risk has been identified, is illustrated in the Figure to the right.

The mitigation measures developed to control the identified environmental impacts are presented in the following tables. Also shown are the associated levels of risk of impact and responsible party for the implementation of the respective mitigation measure. In accordance with the roles and responsibilities described in Section 3.

As defined in ISO 14001, an environmental aspect is "an element of an organisation's activities, products or services that can interact with the environment" (SAI Global, 2004). Environmental aspects within this project are specific actions or items that could cause an impact.

The risk assessment matrix on the following page is used to determine the level of risk for identified potential impacts from the proposed works.



Severity	How severe are potential adverse impacts on:			What is the likelihood (risk) of this level of severity?			
	Human Health	Environment	Construction schedule and/or project costs	Very Likely	Likely	Unlikely	Very Unlikely
Catastrophic	Death, life-threatening injuries, permanent disability / ill health	Catastrophic environmental incident, serious risk and/or damage to onsite or offsite receptors, regulatory involvement, significant onsite and offsite remediation, financial penalties enforced, legal action	Severe delays, significant cost increases, possible project termination	16	15	13	10
Major	Major illness or injury requiring surgery / hospitalisation	Major environmental incident, onsite and offsite contaminant migration, regulatory notification and remediation needed	Lengthy project delays / major cost increases	14	12	9	6
Moderate	Injury or illness requiring treatment and resulting in lost time	Moderate environmental incident, contained onsite, requires some remedial action	Moderate project delays and cost increases	11	8	5	3
Minor	Minor injury or exposure not requiring medical attention	Minor environmental incident, localised	Minor project delays / some additional costs	7	4	2	1

Should additional environmental impacts relating to changed or additional work activities be identified during the project, the risks are to be assessed according to this procedure. Following this risk assessment system, mitigation measures must be selected as required, with responsibility allocated and the details documented in the relevant table, as part of the ongoing review of the CEMP.

Erosion and Sedimentation Risks					
Aspect	**Impact**	**Risk of Impact**	**Mitigation Criteria or Management Measure**	**Risk After Mitigation / Management**	**Responsibility**
Pre-construction					
Erosion and sediment control design	Inappropriate design, resulting in offsite transport of sediment to roads, and/or stormwater drains	12	An approved erosion and sediment control plan (ESCP) is to be implemented with controls in place.	4	Project Engineers / Site Manager
Construction					
Site preparation	Sediment mobilisation and surface runoff from site establishment and clearing.	12	Prior to commencement of site work, install all erosion and sediment control measures based on an erosion and sediment control plan and ensure controls are operational in accordance with approved ESCP.	4	Site Manager
Vehicle traffic leaving site	Sediment tracked offsite by vehicle wheels.	8	Appropriate measures are to be implemented during the construction period to ensure vehicles leaving the premises are sufficiently free from dirt, aggregate or other materials such that material are not transported onto public roads. These may include shake-down areas at access points and truck wash-down facilities.	4	Site Manager
Transport of materials to and from site	Loss of load resulting in pollution of roads	5	Truck loads shall be covered. Should any material be transported onto the road or any spills occur it is to be cleaned up prior to cessation of the same day's work and/or commencement of any rain event.	2	Site Manager
Stormwater run-off	Run-off resulting in soil erosion.	12	Do not stockpile materials on drainage lines. Ensure stockpile slopes and batters are not excessive. Control stormwater runoff during construction in accordance with the ESCP.	5	Site Manager

Erosion and Sedimentation Risks Cont.					
Aspect	**Impact**	**Risk of Impact**	**Mitigation Criteria or Management Measure**	**Risk After Mitigation / Management**	**Responsibility**
Exposed surfaces and stockpiling of fill and construction materials	Offsite transport of sediment to roads and stormwater drains. Loss of fill material.	12	Maintain a project ESCP: Daily operational check of control measures by Project Engineer or nominated person. Additional inspections to be carried out by the Site Manager / Project Engineer after each storm event to assess adequacy of the erosion control measures, repair/replace any dysfunctional erosion control devices, and clean up any sediment that has left the site or is deposited on public land or drainage channels.	5	Site Manager / Project Engineer

Water quality					
Aspect	**Impact**	**Risk of Impact**	**Mitigation Criteria or Management Measure**	**Risk After Mitigation / Management**	**Responsibility**
Pre-construction					
Design of erosion and sedimentation control	Inappropriate design, resulting in localised ponding or flooding, excessive runoff, erosion and pollution of local area.	12	Controls to be installed in accordance with the ESCP. Any discharge to the street stormwater system is to be approved by the Council in writing prior to discharge.	4	Contractor / Site Manager
Construction					
Discharge of waters from site	Discharge of sediment laden waters into watercourses.	14	Any discharge to the street stormwater system is to be approved by the Council in writing prior to discharge. Implement ESCP.	2	Site Manager
Plant and equipment refueling, chemical use and storage	Accidental spills and leaks into nearby watercourses during refueling of equipment or storage of fuels and chemical.	8	Refuel plant and equipment in a location away from drains and watercourses. Ensure sufficient spill response kits are accessible on site at all times. Chemicals to be stored on site must comply with the management measures in the CEMP. Ensure site induction covers dangerous/hazardous goods and appropriate spill response procedure.	2	Site Manager
General use of construction site	Waste, litter etc. entering waterways via stormwater drains.	4	Ensure contractors leave the construction work sites free of debris and other rubbish (daily) and at the completion of the works. Provide sufficient number of and type of suitable receptacles on site for general waste, recyclable materials and other waste types (as required).	2	Project Manager / Site Manager

Noise and Vibration Management					
Aspect	**Impact**	**Risk of Impact**	**Mitigation Criteria or Management Measure**	**Risk After Mitigation / Management**	**Responsibility**
Pre-construction/Construction					
Pre-construction and construction activities resulting in noise complaints	Disturbance of onsite receptors/personnel, local residents, potential noise complaints. Non-conformance with Consent Conditions.	8	Comply with defined work hours: 7.00am to 6.00pm Monday to Friday, 8.00am to 3:30pm Saturdays, no work on Sundays or public holidays. All subcontractors to be managed to ensure they work only within defined hours.	4	Site Manager

Traffic Management					
Aspect	**Impact**	**Risk of Impact**	**Mitigation Criteria or Management Measure**	**Risk After Mitigation / Management**	**Responsibility**
Pre-construction / construction					
Parking due to construction related vehicles	Loss of parking availability in local streets.	8	All site personnel are to be advised of parking allocations. Ensure work vehicles and plant/equipment do not obstruct vehicular or pedestrian traffic on roadways, footpaths or access to land uses unless absolutely necessary.	4	Site Manager
Construction traffic movements to and from site (deliveries and site staff)	Increased traffic volume on roads during construction.	8	Haul routes to be identified and communicated to staff, personnel and subcontractors. Co-ordinate deliveries to avoid peak periods where feasible. Implement traffic management plans, including use of designated routes. Implement traffic control plan, including traffic controller where necessary.	4	Site Manager
Pedestrian movements surrounding construction site / site occupant movements	Pedestrian/occupant confusion, interference with vehicles, potential incident due to conflict between pedestrian/occupant and construction access points.	15	Identify traffic controls required. Restrict site access to personnel and authorised people only in accordance with WorkCover 2000 Regulations. Provide appropriate restriction signage.	9	Project Manager

Heritage Management					
Aspect	**Impact**	**Risk of Impact**	**Mitigation Criteria or Management Measure**	**Risk After Mitigation / Management**	**Responsibility**
Construction					
Discovery of unexpected find of heritage item/artifact	Impact on that heritage item in the event that correct steps are not taken.	8	Follow heritage protocol for unexpected heritage finds.	5	Site Manager

Air Quality					
Aspect	**Impact**	**Risk of Impact**	**Mitigation Criteria or Management Measure**	**Risk After Mitigation / Management**	**Responsibility**
Construction					
Operation of plant and equipment	Air pollution from emissions	1	Ensure equipment and machinery is maintained and not left idling when not in use.	1	Site Manager
Vehicle movement, earthworks, handling and transport of spoil and fill	Dust generated from earthworks, including materials handling and wheel dust	4	Cover all loads of excavated material and other erodible materials that are transported to and from the work site. Avoid or restrict dust generating activities during windy conditions.	2	Site Manager
Management of stockpiles, exposed areas and general site	Wind erosion of exposed surfaces and stockpiles	4	Keep areas adjacent to the work sites free of construction soil or dust. Monitor all work sites, general work areas, stockpiles and skip bins for dust generation and water down or cover affected areas especially stockpiles of waste material. Minimise soil and vegetation disturbance, in order to minimise dust generation.	2	Site Manager
Excavation works	Release of dust from excavation	4	Implement dust suppression measures appropriate for the specific works; no dust is to leave the site. Wetting down / water carts can be used to minimise dust release.	2	Site Manager

Waste Management					
Aspect	**Impact**	**Risk of Impact**	**Mitigation Criteria or Management Measure**	**Risk After Mitigation / Management**	**Responsibility**
Construction					
Earthworks and construction	Generation of waste including potentially recyclable or reusable materials	12	Waste Management is to be based on the waste hierarchy, and is to maximise recycling and reuse of waste material and construction wastes, and to minimise waste to landfill. Waste management is to include the following steps. All material leaving site is to be disposed of at a suitable location lawfully able to accept the waste it is receiving. All material leaving the site is to be disposed of in accordance with the provisions of the Protection of the Environment Operations Act 1997 and the NSW EPA (2014) Waste Classification Guidelines, Part 1: Classifying Waste. The waste disposal facility must be appropriately licensed to receive the class of waste being delivered as described in the respective waste classification. Monitor waste volumes and record their method and location of disposal and whether or not that location was a place that could lawfully be used as a waste facility for that waste.	9	Project Manager

Waste Management					
Aspect	**Impact**	**Risk of Impact**	**Mitigation Criteria or Management Measure**	**Risk After Mitigation / Management**	**Responsibility**
Construction					
Earthworks and construction	Generation of waste leading to disposal - construction waste	7	Provide a sufficient number of and type of suitable receptacles onsite for general waste, recyclable materials and other waste types (as required). Maximise segregation of wastes. Recycle and divert from landfill surplus soil, rock, and other excavated material where possible. Separately collect and stream quantities of waste concrete, bricks, blocks, timber, metals, plasterboard, paper, and packaging, glass, and plastics and offer them for recycling where practical. Ensure that no waste from the site is conveyed to or deposited at any place that cannot lawfully be used as a waste facility for that waste.	2	Project Manager

Appendix L Contingency and Emergency Response Plan

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Appendix L: Contingency and Emergency Response Plan

1 Incident and Emergency procedures

1.1 Inductions

All site personnel must undergo a Roberts Co site induction prior to accessing the Site. The following emergency details will be discussed as part of the induction process:

- the name(s) of any first aiders on site
- the location of first aid kits and fire extinguishers
- emergency procedure details for the site, including contact details for emergency services and the nearest hospital
- site addresses details and map with route to nearest hospital highlighted
- location of the site assembly area
- location of environmentally sensitive areas and access requirements.

2 Incident/Emergency Response

All unplanned events, irrespective how minor, shall be reported at the first opportunity to the site supervisor and project manager. In the event that an environmental incident occurs which results in noncompliance with environmental requirements the incident will be classified as an emergency.

Any pollution or other environmental incident which occurs should be immediately managed and contained as much as can be safely done. The severity of the incident should be assessed and notification made to the appropriate parties:

- The Site Manager and the Environmental Site Representative should be notified of all environmental incidents.
- The RMS Project Manager must be notified as soon as possible of all significant pollution event or environmental emergency.
- Appropriate regulatory authorities, such as the NSW EPA, WorkCover, Council etc., should be notified as required.

Emergency contacts are listed in Table 1 below.

Table 1: Emergency Contacts

Emergency Contacts/Person/Agency	
Site Manager – Ben Drayton	0439 719 570
Environmental Site Representative – Ben Drayton	0439 719 570
Mainland Civil Environmental manager – James McMillan	0404 202 312

Emergency Services	
Emergency	000
Police – non-emergency (Ryde)	02 9808 7401
Ambulance – non-emergency (Auburn)	02 9320 7777
NSW Fire and Rescue – non-emergency (Rhodes)	02 9743 4241
NSW Health, Myhealth Medical (Wentworth Point)	02 9023 3200
Other	
City of Parramatta	1300 617 058
WorkCover	13 10 50
Sydney Water	13 20 90
Ausgrid	13 13 88

Discharge of water containing contamination, suspended matter, any oils or similar materials or any foaming or nonbiodegradable detergents into the waterways on and adjacent to the work area is to be avoided using all proper controls. Any release of water may be a breach of NSW EPA regulations and may be subject to action by the NSW EPA.

Any occurrence which may result in the contamination of the land, surface or groundwater or air must be immediately reported to the EPA, site supervisor and RMS immediately. Any occurrence which does or may result in exposure of site workers or the public to contamination must be immediately reported to the site supervisor and RMS immediately and to emergency services if necessary.

3 Spill Management

In the event of a chemical spill, including potentially contaminated groundwater, the following procedures will be implemented:

- Work will be immediately ceased, and the spill will be contained and cleaned up using the spill kit.
- For large leaks, which cannot be contained using the spill kit, or leaks that leave the site, emergency services will be contacted for assistance (000).
- All leaks and spills to be reported as environmental incidents.

Appendix M Remedial Action Plan Addendum (Geosyntec, March 1, 2022)

Geosyntec consultants

engineers | scientists | innovators

Remediation Action Plan Addendum

7-9 Burroway Road, Wentworth Point, NSW 2127

RobertsCo
1 March 2022

21067 RAP Addendum

Geosyntec consultants

Quality Management

Document Distribution

Issue/Revision	Issue 1	Revision 1	Revision 2
Remarks	DRAFT	DRAFT	FINAL
Date	13 January 2022	18 February 2022	1 March 2022
Prepared by	Edward Munnings	Edward Munnings	Edward Munnings
Signature	DRAFT	DRAFT	
Reviewed by	Peter Moore	Peter Moore	Peter Moore
Signature	DRAFT	DRAFT	
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This report was prepared in accordance with the scope of services set out in the contract between Geosyntec Consultants Pty Ltd (ABN 23 154 745 525) and the client.

Geosyntec Consultants Pty Ltd
ABN 23 154 745 525
www.geosyntec.com.au

Executive Summary

Geosyntec Consultants Pty Ltd (Geosyntec) was engaged by RobertsCo Pty Ltd (the Client), as the Environmental Consultant for the Sydney Olympic Park High School (SOPHS) redevelopment project, located on 7-9 Burroway Road, Wentworth Point, NSW (the project site). The main role of the Environmental Consultant is to facilitate the delivery of investigation, remediation and validation activities to render the site suitable for the proposed end use. A Remediation Action Plan (RAP) Addendum is required to document recent Data Gap Investigation (DGI) works and present any required amendments to the existing Parsons Brinckerhoff (PB) 2015 RAP based on the findings of the DGI, prior to commencement of the main remediation and development works. The site location is presented in Figure 1 and the site layout is presented in Figure 2, Appendix A.

The site is legally identified as part of Lots 202, 203 and 204, DP 1216628, and occupies an area of approximately 0.95 ha. The proposed redevelopment is understood to include school buildings and open space areas within the development footprint, and is consistent with the definition of 'HIL C' as presented in Schedule B1 of National Environment Protection (Assessment of Site Contamination) Measure (1999) as amended in 2013 (NEPM 2013), which includes public open space land use and secondary schools.

Mr Andrew Lau from JBS&G, an NSW EPA accredited Contaminated Land Auditor (the Auditor), has been appointed by Schools Infrastructure NSW to conduct an audit of the proposed school development with respect to land contamination. This is to ensure that the investigations and any remedial works are undertaken in accordance with the requirements of the NSW Contaminated Land Management Act (1997) so that the land is fit for purpose.

The site is impacted with contaminants associated with previous light industrial land use, filling, hazardous building materials, and suspected petroleum storage and infrastructure.

A Remediation Action Plan (RAP) was prepared by Parsons Brinckerhoff (PB) in 2015 for a portion of land identified as Area 1 (part of a wider area known as Stage 1), which included the site:

- Parsons Brinckerhoff (January 2015) Detailed Remediation Action Plan – Infrastructure Delivery Wentworth Point Development (Ref: 2207004B-RES-REP-001 RevC), referred to herein as the PB (2015) RAP.

The PB (2015) RAP specifically related to infrastructure delivery, including the construction of Ridge Road, which is located in the western portion of the site. The Auditor previously endorsed the PB (2015) RAP, with the endorsement relating to the intent of the RAP at that time i.e., Infrastructure Delivery, as the high school land use had not been determined at that time.

In 2019, Stage 1 remediation works were undertaken on the wider peninsula site which involved the placement of a cap on part of the area occupied by the proposed school site. The capping works were undertaken by Landcom with Zoic Environmental being the environmental consultant and Mr Andrew Lau appointed as the NSW EPA accredited Site Auditor for these works. Details of the capping works were presented in the following document:

- Zoic Environmental (March 2020) Interim Validation Report Early Works Package Headland Park Wentworth Point Development, 7, 9 and 11 Burroway Road, Wentworth Point, NSW 2127 (Ref: 18170 EW VAL).

The report confirms the placement of capping material in the same configuration that is presently located in this area with the completed works being endorsed by the Site Auditor pertaining to infrastructure delivery (Ridge Road), in accordance with the PB (2015) RAP. These works are referred to as the 'Zoic 2019-2020' remediation works'.

When the high school development was confirmed for the site, Geosyntec recommended that the PB (2015) RAP be used as the basis for any remediation works that are proposed to be undertaken

on the site in the future, given that the risk overall profile for the area had not changed and that under NEPM 2013 the site still falls into same land use category (HIL C as presented in Schedule B1). It is understood that rather than preparing an entirely new RAP for remediation of the site, it was requested that a RAP Addendum be prepared to document the site-specific remediation and validation requirements to be followed in conjunction with the PB (2015) RAP capping strategy during the main remediation works, to make the site suitable for the proposed High School use. It is understood that this approach has been endorsed by the Auditor.

Prior to the commencement of the early works, Geosyntec prepared a Sampling Analysis and Quality Plan (SAQP) (Geosyntec (19 November 2021) Sampling Analysis and Quality Plan – Sydney Olympic Park High School). The SAQP details the DGI works and validation works required to be undertaken in accordance with the Auditor endorsed RAP to ensure that the site is suitable to the proposed land use. The Geosyntec (2021) SAQP was endorsed by the Auditor.

This RAP Addendum Report documents the DGI works completed alongside the early works component of the proposed development, in accordance with the Auditor endorsed Geosyntec (2021) SAQP, and presents required amendments / additions to the PB (2015) RAP based on the DGI findings. The DGI included the following scope of work:

- Excavation of test pits in locations of former underground storage tanks (USTs) and other infrastructure, including two UST locations, former Mechanics Pit which was uncovered during excavation works and a former Wash Bay.
- Confirmation of groundwater conditions with sampling from existing wells at the site.
- Confirmation of landfill gas conditions with monitoring from existing wells at the site.
- Assessment of tidal influences on ground gas at the site through collection of continuous water level and ground gas data.

Key findings of the DGI are presented below:

- UST Location 1, UST Location 2 and the Former Mechanic Pit Location have been identified as areas requiring remediation due to the presence of remnant infrastructure, observations of hydrocarbon odour and sheen during test pitting, and several exceedances of adopted site suitability criteria for total recoverable hydrocarbons. Remediation requirements are outlined in Section 11.
- The Former Wash Bay Location was not identified as an area requiring remediation, with no observations of contamination made during investigation activities, and no exceedances of adopted HSL C criteria for secondary school grounds.
- Groundwater at the site does not require remediation, with chemical results considered to be representative of regional conditions given that much of the wider peninsula comprises former landfilled areas.
- The gas screening value (GSV) using data from the DGI was calculated to be 1.34 L/hr (Max. Methane (15.1%v/v) x Max. BH Flow (8.9 L/hr), which gives a characteristic situation (CS) of CS3 (moderate risk). This is within the historical range for the site (CS2 to CS4) and therefore the current design assumptions for the gas mitigation system detailed in the Draft Design and Verification Plan (DVP) for CS4 can be retained.
- Ground gas concentrations appeared to be primarily affected by diurnal effects, with no clear correlation between tidal cycles and standing water level or landfill gas. It is therefore concluded that tidal activity does not affect ground gas behaviour at the site.

Amendments / Additions to the PB (2015) RAP

Based on the findings of the DGI and the layout of the proposed development, Geosyntec presented RAP Amendments in Section 11 of this report, including the following:

- Validation Criteria Updates;
- Remediation Requirements of USTs and Other Infrastructure;
- A Validation Works Sampling and Analysis Plan;
- Requirements for the Reinstatement of Marker and Capping Layer Following Excavations;
- Management Measures for the Previously Placed Cap in the Western Portion of the Site; and
- Discussion of Ground Gas Protection System (GGPS)

Following remediation and validation activities, a long term environmental management plan (EMP) will be prepared for the site which will document ongoing management requirements for the entire site including the GGPS.

On the basis of the DGI results, the site can be made suitable for the proposed high school development, providing that the requirements of the 2015 PB (2015) RAP and this RAP Addendum are implemented.

Geosyntec consultants

Table of Contents

Appendices

1 Introduction

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1.1 Background

The site is impacted with contaminants associated with previous light industrial land use, filling, hazardous building materials, and petroleum storage and infrastructure.

A Remediation Action Plan (RAP) was prepared by Parsons Brinckerhoff (PB) in 2015 for a portion of land identified as Area 1 (part of a wider area known as Stage 1), which included the site:

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infrastructure delivery (Ridge Road), in accordance with the PB (2015) RAP. These works are referred to as the 'Zoic 2019-2020' remediation works'.

When the high school development was confirmed for the site, Geosyntec recommended that the PB (2015) RAP be used as the basis for any remediation works that are proposed to be undertaken on the site in the future, given that the risk overall profile for the area had not changed and that under NEPM 2013 the site still falls into same land use category (HIL C as presented in Schedule B1). It is understood that rather than preparing an entirely new RAP for remediation of the site, it was requested that a RAP Addendum be prepared to document the site-specific remediation and validation requirements to be followed in conjunction with the PB (2015) RAP capping strategy during the main remediation works, to make the site suitable for the proposed High School use. It is understood that this approach has been endorsed by the Auditor.

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This RAP Addendum Report documents the DGI works completed alongside the early works component of the proposed development, in accordance with the Auditor endorsed Geosyntec (2021) SAQP, and presents required amendments / additions to the PB (2015) RAP based on the DGI findings.

1.2 Proposed Development

The proposed redevelopment is understood to include school buildings and open space areas within the development footprint. The proposed building layout is presented in Figure 3, Appendix A.

The early works component of the proposed development, completed during November and December 2021, involved removal of the previous concrete slab to facilitate the DGI works and undertaking the investigative works, followed by placement of a high visibility marker layer and capping layer consisting of material previously placed on the west of the site (known as Ridge Road) as part of the Zoic 2019-2020 remediation works.

1.3 Objective

The objective of the DGI works were to close out previously identified data gaps relating to the contamination status of the site and inform any amendments to the PB (2015) RAP, to allow the site to be remediated and made suitable for the proposed intended use as a high school.

1.4 Scope of Work

To achieve the objective, the following has been completed in accordance with the (2021) SAQP:

- Excavation of test pits in locations of former underground storage tanks (USTs) and other infrastructure, including two UST locations and former Wash Bay. During these excavations, an unidentified Mechanics Pit was uncovered which was then also included in the DGI.
- An assessment of the presence of Asbestos Containing Material across the project site.
- Confirmation of groundwater conditions with sampling from existing wells at the site.
- Confirmation of landfill gas conditions with monitoring from existing wells at the site.

- Assessment of tidal influences on ground gas at the site through collection of continuous water level and ground gas data.

1.5 Regulatory Framework

Field activities and reporting were carried out in general accordance with the following guidelines and regulations:

- NEPC (1999) National Environment Protection (Assessment of Site Contamination) Measure, Schedule A and Schedules B(1)-B(9). National Environment Protection Council, Adelaide, as amended in April 2013 [referred to herein as NEPM (2013)].
- NSW Department of Urban Affairs and Planning (1998) Managing Land Contamination: Planning Guidelines: SEPP 55 Remediation of Land, August 1998.
- NSW EPA (2020) Consultants Reporting on Contaminated Land - Contaminated Land Guidelines.
- Contaminated Land Management Act 1997.
- Environmental Planning and Assessment Act (EPA Act) 1979 / State Environmental Planning Policy No. 55 (2020): Remediation of Land (SEPP 55).
- NSW EPA (1995) Contaminated Sites: Sampling Design Guidelines. NSW EPA, Sydney.
- NSW EPA (2014) Waste Classification Guidelines: Part A – Classifying Waste.
- Safe Work Australia (2019a) How to Manage and Control Asbestos in the Workplace.
- Safe Work Australia (2019b) How to Safely Remove Asbestos Code of Practice.
- WA DoH (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.
- Work Health and Safety Act (2011) and Regulations (2017).

2 Site Identification and Conditions

2.1 Site Identification

The site location is shown in Figure 1, with the site layout plan in Figure 2, Appendix A. Information in the following section was sourced from the Zoic Environmental Pty Ltd (Zoic) (2019) SAQP – Headland Park (File reference: 18170 SAQP Peninsula Park Landcom 19Feb19 Final) for 7, 9 and 11 Burroway Road, Wentworth Point, NSW 2127, which encompassed the site. The site identification and land use details include:

Table 2.1: Site Identification

Title	Details
Street Address:	Part of 7-9 Burroway Road, Wentworth Point, NSW 2127
Property Description:	Part of Lots 202, 203 and 204, DP 1216628
Current Site Ownership:	NSW Department of Education
Geographical Coordinates:	Lat: -33.823734° Long: 151.080786°
Property Size:	Approximately 0.95 hectares
Local Government Area:	City of Parramatta Council (formerly Auburn City Council)
Zoning – Existing:	B1 Neighbourhood Centre, R4 High Density Residential and RE1 Public Recreation (Auburn Local Environmental Plan (ALEP) 2010 and Draft Parramatta Local Environmental Plan 2020)

2.2 Surrounding Land Use

Land uses immediately adjoining the Site are described as follows:

Table 2.3: Immediate Site Surrounds

Title	Details
North:	Vacant land comprising part of the proposed Wentworth Point Peninsula Park redevelopment area followed by Parramatta River.
East:	Vacant land comprising part of the Wentworth Point Marina and Rowing Club redevelopment area followed by Homebush Bay.
South:	Burroway Road followed by a construction site.
West:	Wentworth Point Public School followed by Marina Square Shopping Mall.

In addition to the above, it is noted that several former landfill areas are located around the Wentworth Point area in which the site is located. These were generally active between the 1950s and 1980s

3 Environmental Setting of the Site

3.1 Site Condition

The site condition is based on published information and a review of past reports and is presented in Table 3.1.

Table 3.1: General Site Conditions

Title	Details
Topography and Drainage:	The site is less than 10m Australian Height Datum (AHD). In general, the site is relatively level and has been subjected to historical filling associated with land reclamation which has altered topography. Surface water is expected to infiltrate into unsealed areas or consist of overland flow and ultimately drain to the Parramatta River or Homebush Bay which are located to the north and east of the site respectively.
Site Surface & Vegetation:	The site surface consists of concrete slabs in the centre and eastern portions, and previously placed VENM material in the western portion. Vegetation at the site comprises some trees and shrubs growing between the concrete slabs and some grasses growing on the VENM material.
Condition of Buildings & Roads:	There are currently no buildings or roads onsite.
Relevant Local Sensitive Environments:	Local sensitive receiving environments include Parramatta River and Homebush Bay, located away from the northern and eastern boundaries respectively.
Condition of the site since issue of 2020 Interim Audit Advice	By the completion of the Zoic 2019-2020 Remediation and Validation works, the western portion of the site has been capped with a minimum thickness of 500mm VENM in accordance with the PB (2015) RAP. No changes occurred at the site, including the validated western portion and existing hardstand in the remainder of the site, between the completion of the Zoic 2019-2020 works and the commencement of early works in October 2021, other than the placement and removal of some construction offices on existing hardstand areas and the appearance of some weeds across the site surface (See Figure 6, Appendix A). The composition of the capping material imported as VENM has not changed since its placement in 2019.

3.2 Geology, Hydrogeology and Hydrology

The geology, hydrogeology and hydrology is summarised in Table 3.2. This information has been extracted from PB (2015) RAP.

Title	Details
Geology Map Conditions:	Section 2.4.2 in the PB (2015) RAP states that the Sydney 1:100,000 scale Geological Series Sheet 9130 indicates that the site is underlain by fluvial soils of the Birrong Soil Landscape Group.
Soil Map Conditions:	Table 2.2 in the PB (2015) RAP provides a summary of the ground conditions at the site: • The site is underlain by a layer of fill at depths ranging between 0-2.4m below ground level (bgl). The composition of the fill is variable across the site comprising clay, gravelly sand, sand, clayey sand, sandy clay, gravels, and anthropogenic materials including crushed sandstone, shale, brick, concrete and terracotta.

Title	Details
	Varying amounts of slag, seashells, charcoal, and blue metal gravels were also observed. • Beneath the fill layer lies a layer of natural soils comprising grey, dark grey, and black clays, sand and sandy clay. The natural materials were reported as soft and wet and were representative of either dredged materials from adjacent Parramatta River, salt march or mangrove bed materials. The depths of this layer range between 1-4.8m deep. • The natural soils are underlain by a highly weathered, grey sandstone, which was encountered at 4.4-4.8mbgl.
Acid Sulfate Soils:	Section 2.4.2 in the PB (2015) RAP states that the Prospect/Parramatta River 1:25,000 Acid Sulfate Soils Risk Map indicates that the site is classified as 'Disturbed Terrain' that includes filled areas that occur during the reclamation of low lying swamps for urban development. Other activities that result in the classification of a disturbed terrain include dredging, heavy ground disturbance through urban development and/or construction of dams or levees.
Depth to Groundwater:	Standing water levels at the site as informed by the PB (2015) RAP which indicates groundwater is encountered between 0.6-3.7m bgl with an average of 1.7m bgl.
Direction and Rate of Groundwater Flow:	Table 2.4 in the PB (2015) RAP states that the direction of groundwater flow onsite was inferred to the northwest and northeast towards Parramatta River and Homebush Bay, respectively.
Summary of Monitoring Wells & Use of Water Abstraction:	Section 2.4.2.1 in the PB (2015) RAP provides a summary of the registered bore search results completed by GHD in 2009. The search of NSW Department of Primary Industries Office of Water All Groundwater Map identified six (6) licenced bores within 1km of the site boundaries. Four of the bores are located to the north of Parramatta River and are therefore not considered relevant to the site. Two wells were south of Parramatta River and are detailed below: • Registered bore GW067978 – located east of Homebush Bay and registered for irrigation purposes. The bore was installed in 1992, to a total depth of 180 m. Groundwater was encountered in the sandstone bedrock aquifer in multiple water bearing zones including: 65-65.1m (indicative of freshwater conditions); 71.4-71.5m (indicative of saline conditions); 78.4-83m in the sandstone bedrock (indicative of highly saline conditions); and 91.2-102m (indicative of highly saline conditions). • Registered bore GW107955 – located at 1 Bennelong Road and registered for monitoring purposes. The bore was installed to a total depth of 5m. No further details regarding the depth to groundwater or the geology encountered was available for this bore.
Nearest Water Body:	The closest receiving water body from the site is the adjoining Parramatta River and Homebush Bay to the north and east of the site, respectively.

4 Data Quality Objectives

The data quality objective (DQO) process is a systematic planning tool based on the scientific method for establishing criteria for data quality and for developing data collection designs. The DQO defines the experimental process required to test a hypothesis.

The DQO process has been developed to ensure that efforts relating to data collection are cost effective, by eliminating unnecessary, duplicative or overly precise data whilst at the same time, ensuring the data collected is of sufficient quality and quantity to support defensible decision making.

It is recognised that the most efficient way to accomplish these goals is to establish criteria for defensible decision making before data collection begins and develop a data collection design based on these criteria. By using the DQO process to plan the investigation effort, the relevant parties can improve the effectiveness, efficiency and defensibility of a decision in a resource and cost effective manner.

4.1 Guidance Documents

DQOs have been developed to detail the type of data that is needed to meet the overall objectives of this project (refer to Section 1.2), including the Data Gap Investigation and Validation Strategy. The DQOs have been developed in general accordance with guidelines made or approved by NSW EPA.

4.2 Process for DQO Development

The DQO process consists of seven steps, which are designed to clarify the study objectives, define the appropriate type of data and specify tolerable levels of potential decision errors. The seven-step DQO process adopted for the works is as follows:

- Step 1 – Defining the Problem. The first step in the DQO process is to 'define the problem' that has initiated the investigation;
- Step 2 – Identify the Decision. The second step in the process is to define the decision statement that the study will attempt to resolve;
- Step 3 – Identify Inputs to the Decision. In this step, the different types of information needed to resolve the decision statement are identified;
- Step 4 – Define the Study Boundaries;
- Step 5 – Develop a Decision Rule;
- Step 6 – Specify Limits on Decision Errors; and
- Step 7 – Optimise the Design for obtaining the Data.

4.3 Step 1 – Defining the Problem

4.3.1 Concise Description of the Problem

The site has been planned to be redeveloped into Sydney Olympic Park High School, including school buildings and a play area. Previous investigations have identified contaminated soil, potential petroleum (diesel) storage infrastructure and a wash down area, asbestos, and potential acid sulfate soils that require management.

Data Gap Investigation

The problem is previously identified data gaps require additional investigation in order to:

- Confirm hazardous ground gas ratings to inform the design of the gas mitigation system.
- Assess potential for tidal influences on ground gas at the site.
- Locate suspected underground storage tanks (USTs) and identify any associated contamination and whether any remedial works are required.
- Confirm groundwater conditions at the site and assess risk towards Parramatta River and Homebush Bay.

Validation Strategy

The problem is how the site will be remediated to address the identified potential health and environmental risks in relation to the identified contamination and if the remediation can be integrated into the proposed redevelopment works and construction methodologies to avoid large scale disturbance or generation of significant quantities of waste requiring offsite disposal.

The matters considered within the validation strategy are:

- What work is required (i.e., survey data) to validate the remediation strategy?
- How many soil samples should be collected to suitably validate any reuse of the cut-to-fill materials onsite?
- What sampling design (i.e. locations, layout, frequency) should be used to achieve the DQOs?

It is noted that Section 7.5.3 in the PB (2015) RAP states that 'cut-to-fill material' and/or spoil material for reuse (below the cap) will require to be validated in order to evaluate its suitability for reuse onsite. Section 6.4.7 in the PB (2015) RAP states that any fill material generated during piling works for the construction of retaining walls, service excavation or stormwater drains should be validated for reuse onsite, and if suitable, reused beneath the capping layer.

However, Section 4.1 in the PB (2015) RAP states that, 'based on the proposed remediation strategy that will provide a cap over the identified contaminated fill, exposure to the identified COPCs in the material below the cap is considered to be mitigated by the presence of the cap. Hence, separate remediation criteria for material below the cap was not presented'.

On this basis, any cut-to-fill material to be placed under the cap is not proposed to be validated as part of the validation works, with the exception of the following (if required as part of the development):

- Construction of earth retaining walls associated with the proposed new roads and pavements where the walls can be constructed using 'a profile of validated, clean onsite cut-to-fill material (compacted in controlled layers), and imported material to provide stability'. Any cut-to-fill materials to be used for the construction of earth retaining walls will be validated as per the requirements outlined in the PB (2015) RAP.
- Any other situations where reuse of cut-to-fill materials or spoil above the cap is proposed.

The above deviation from the PB (2015) RAP has been approved by the Site Auditor (email dated 29 October 2018) as part of the previous remediation works across the wider Stage 1 Area.

Section 6.6.2 in the PB (2015) RAP states that field pH measurements of excavated material will need to be undertaken to determine whether treatment / neutralisation is required prior to reuse or disposal. This will be conducted by the appointed Principal Contractor.

4.4 Step 2 – Identify the Decision

Based on the decision-making process for assessing urban redevelopment sites detailed in Appendix A of NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme (3rd edition) and modified to relate to the specific redevelopment requirements for the proposed Data Gap Investigation, remediation and validation works, the following decisions are required to be made:

Data Gap Investigation

- Are hazardous ground gas ratings within the historical range between CS2 and CS4? Do landfill gas concentrations pose a risk to human health?
- Does tidal activity influence ground gas behaviour at the site?
- Are USTs or other infrastructure present? Do chemical concentrations in soil adjacent to these pose a risk to future site users/environment?
- Do chemical concentrations in site groundwater pose a risk to environmental receptors?

Validation Strategy

- Will chemical concentrations in excavated spoil and/or site soils intended to be reused as fill onsite pose a risk to future site users/environment following removal of infrastructure and impacted soils in the UST, wash bay and mechanical pit areas?
- Is the spoil/soil material (including material from removal of the USTs, Mechanics Pit and Wash bay) to be disposed offsite classified in accordance with waste classification guidelines?
- Does the imported material used for the capping layer comply with VENM/ENM criteria?
- Has the site been adequately capped?

4.5 Step 3 – Identification of Inputs into the Decision

4.5.1 List of Informational Inputs Needed to Resolve the Decision Statement

The information inputs required include:

Data Gap Investigation

- Relevant historical data from previous reports
- Conceptual site model presented in Section 4
- Observations made during the proposed field works
- Results from manual and continuous ground gas monitoring of existing wells at the site.
- Results from a level logger deployed at the site.
- The locations of USTs and the former infrastructure (i.e. the former wash bay) were determined by correlating known locations from a previous GHD investigation with historical aerial photographs which will be investigated using test pits / trenching. Visual inspection of trenching excavations in potential UST and wash bay locations, and results from soils collected from trenches if USTs are identified. Note that USTs are not permitted to be removed as part of the approved early works.
- Adopted site criteria being NEPM 2013 Health Investigation/Screening Levels for Secondary Schools Land Use (HIL/HSL-C (outdoor areas)/HSL-A/B (building footprints) for soils, Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) (2018) Default Guideline Values for Marine Waters with 95% protection level and PFAS National

Environmental Management Plan (2020) (NEMP 2020) Human Health (non-potable and recreational uses) and Ecological (slightly to moderately disturbed ecosystem) criteria.

Validation Strategy

- Results from the validation and waste classification works, including chemical results from samples collected from the UST, Mechanics Pit and Wash bay areas.
- Visual inspection of site areas, soils and ground works during remediation on a regular basis (including photographic records) (including the UST, Mechanics Pit and Wash bay areas).
- Adopted site criteria being NEPM 2013 Health Investigation/Screening Levels for Secondary Schools Land Use (HIL/HSL-C).
- Information obtained from VENM / ENM source sites (e.g., VENM certificates, ENM classification documentation), and results from the VENM / ENM sampling works.
- Pre-and post-survey data to confirm capping thickness.

4.5.2 List of Environmental Variables or Characteristics that will be Measured

Data Gap Investigation

The Data Gap Investigation will require the following parameters to be measured:

- Landfill gas concentrations (i.e. methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulfide) will be determined using an appropriately calibrated landfill gas analyser, and Biosystems Gas Flux (or similar) for one location, to be selected based on initial hand-held landfill gas monitoring results. Atmospheric pressure, flow rate and pressure differential will also be recorded.
- Groundwater level will be recorded continuously for a set period of time covering several tidal cycles using a level logger for in well location, to be selected based on initial results, representativeness of ground gas conditions at the site and proximity to Parramatta River.
- Soil samples from trenching excavations near any identified USTs or other infrastructure will be analysed for total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX) and polycyclic aromatic hydrocarbons (PAH). Selected soil samples may be analysed for PFAS as a screening measure.
- Groundwater samples from selected existing wells will be analysed for 8 heavy metals, ammonia, phenols and per-and-poly fluoroalkyl substances (PFAS).

Validation Strategy

The PB (2015) RAP has presented the following characteristics, which will be measured:

- **Cut-to-fill material and other excavated materials generated from the site for onsite reuse**: Representative soil samples will be analysed for: heavy metals (arsenic, cadmium, chromium, copper, iron, lead, nickel, zinc), total recoverable hydrocarbons (TRHs), benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAHs) and asbestos (ACM and 500ml). ASLP will be conducted for metals and PAHs where necessary. We note that the PB (2015) RAP has proposed the SPOCAS test for ASS analysis, however, Geosyntec considers the chromium reducible sulfur suite (CRS) test is a more reliable indicator for ASS presence.
- **Material requiring offsite disposal:** Representative soil samples will be analysed for: heavy metals, total petroleum hydrocarbons (TPHs), BTEX, PAHs, CRS test and asbestos (presence

/ absence only). The specific contaminant concentrations (SCCs) and toxicity characteristics leaching procedure (TCLP) data will determine waste classification.

- **Capping material**: The following information will be reviewed prior to material importation as we understand that there is a net deficit of soil available on the site to complete capping:
  - Relevant VENM certificate or ENM assessment provided by the source site/s
  - Published site history information such as historical aerial photography and NSW EPA records
  - Visual inspection at the source site/s to confirm the material meets the definition of VENM or ENM
  - Regular visual inspection of the material at arrival
  - Representative soil samples will be collected and confirmed as VENM/ENM by testing for: heavy metals, TPH, BTEX, PAHs, electrical conductivity (EC) and pH, in accordance with the requirements under the Excavated Natural Material Resource Recovery Order 2014.
  - The above findings will be presented to the Site Auditor. Material will not be imported onsite for use without prior approval by the Site Auditor.
- **Survey data** will be collected prior to, and post installation of the capping layer to confirm capping layer thickness.
- Regular site inspections during remediation works. **Photographic records** (e.g., during installation of marker layer) will be collected and included in the Validation Report.

4.5.3 Identification of Site Criteria for Each Medium of Concern

Data Gap Investigation

The criteria that will be adopted for the data gap investigation works are outlined below:

- NSW EPA (2020) Hazardous Ground Gas Guidelines will be adopted with respect to assessment of landfill gas. This will include consideration of gas concentration, flow rate, gas screening values, characteristic gas situation and prevailing atmospheric pressure.
- It is considered that use of SafeWork NSW (2018) Workplace Exposure Standards for Airborne Contaminants is appropriate for use in the Gas Monitoring Well Network beneath the site. It should be noted that the recorded concentrations are taken within the ground and the criteria are designed to be applied to the atmosphere thus adding a further layer of conservatism. Where site users and construction workers are present in these areas, it is considered unlikely that they would be exposed to concentrations in the ground or that their exposure time will be greater than 8hrs per day and consequently the adopted criteria would also be protective of their health.
  - SafeWork NSW (2018) TWA screening criteria for hydrogen sulfide: 10 ppm
  - SafeWork NSW (2018) TWA screening criteria for carbon monoxide: 30 ppm
  - Additionally, AS2865 – 1995 Safe Working in a Confined Space guidelines will used for oxygen (>19.5%v/v).
- Soil samples collected from UST / diesel infrastructure trenches will be compared to NEPM (2013) Health Investigation Levels (HIL) and Health Screening Levels (HSL) for C – Secondary Schools for sandy soil (0 to <1m depths) given the proposed land use and NEPM (2013) Management Limits for Total Petroleum Hydrocarbons for residential, parkland and public open space use for coarse soil.
- Groundwater samples will be compared to Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) (2018) Default Guideline Values for Marine Waters with 95%

protection level and PFAS National Environmental Management Plan (2020) (NEMP 2020) Human Health (non-potable and recreational uses) and Ecological (slightly to moderately disturbed ecosystem) criteria.

- Any contact with potential acid sulfate soils will be assessed in accordance with NSW Acid Sulfate Soils Management Advisory Committee (1998) Acid Sulfate Soil Assessment Guidelines (AASSMAC 1998) where required.
- Aesthetic considerations will also be taken into account during investigation activities, particularly the presence of hydrocarbon sheens and/or odours in groundwater.

Validation Strategy

The criteria that will be adopted for the validation works are outlined below:

- For spoil/soil intended for onsite reuse, the material will be compared to:
  - NEPM (2013) Health Investigation Levels (HIL) C.
  - Health Screening Levels (HSL) A/B as required by NEPM (2013) for assessment of secondary schools, for sand soil.
  - NEPM (2013) Management Limits for Total Petroleum Hydrocarbons for residential, parkland and public open space use for coarse soil.
- Where soils are to be placed below the cap, an assessment of risk towards potential receptors will also be made in addition to comparison against the above criteria, given that the cap will act as a barrier to underlying fill soils.
- Any soils proposed to be used for tree planting, landscaping or garden bed areas will be assessed against NEPM (2013) Ecological Investigation and Screening Levels (EILs and ESLs). Ecological criteria will only be applicable to soils present within the top 2m of these locations.
- Material to be disposed offsite will be compared to NSW EPA (2014) Waste Classification Guidelines – Part 1, Classifying Waste and Part 4 Acid Sulfate Soils (where required) to determine the materials' waste classification and inform disposal options.
- Capping material will be assessed as described in Table 7.1 of the SAQP. Validation samples will be collected in general accordance with the NSW EPA (2014) The Excavated Natural Material Order. If ENM materials are used, the results will be compared to the criteria presented in the NSW EPA (2014) The Excavated Natural Material Order.
- Capping thickness will be determined from pre-and post-capping survey data to ensure compliance with the approved capping design requirements as described in Section 6 and the PB (2015) RAP. Any changes to the final capping design are required to be reviewed and endorsed by the appointed Site Auditor prior to implementation.

Ecological criteria are not considered relevant as the site is expected to be capped with concrete hardstand or clean topsoil. Given the presence of the marker layer, it is anticipated that only trees with shallow roots will be planted onsite. If large trees are required to be planted in any area of the site, modifications to the depth of the capping layer will need to be considered.

4.5.4 Identification of Analytical Methods that are required for Chemicals of Potential Concern so that Assessment can be made Relative to the Site Criteria

The table below outlines the analytical methods of the NATA accredited primary laboratory Eurofins.

Table 5.1 Summary of Soil Analytical Methods

Analyte	Soil	LOR (mg/kg)
Asbestos	AS4964-2004 (Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia May 2009)	0.001%w/w
Mercury	US EPA 7470/1	0.1 mg/kg
Other Metals	US EPA 6010, 6020	0.1-5 mg/kg
Acid Sulfate Soils	ASSL Methods Guidelines Version 2.1	Various
TRH	P&T GC/MS GC/FID (USEPA 8260/8000) NEPM 2013 Schedule B3	20-100 mg/kg
SVOC	GC/MS (USEPA 8270) NEPM 2013 Schedule B3	0.5-5 mg/kg
VOC	P&T GC/MS USEPA 8260 NEPM 2013 Schedule B3	0.5-1 mg/kg

Table 5.2: Groundwater Analytical Methods

Analyte	Analytical Method	LOR (µg/L)
TPH	P&T GC/MS GC/FID (USEPA 8260/8000)	10-100
PAH	Capillary GC/MS in SIM (USEPA SW 846 - 8270B)	1-2
Mercury	Cold Vapour AAS (USEPA 7471A)	0.05
Metals	ICP-OES (USEPA 200.7)	0.1-1.0
VOCs	P&T GC-MS (USEPA 8260B)	1-2
PFAS	LC-MS/MS (USEPA Method 537.1-169) NEMP (2020) 2.0	0.01-0.02

4.6 Step 4 – Defining the Study Boundaries

4.6.1 Detailed Description of the Spatial and Temporal Boundaries of the Problem

The lateral boundary of the remediation area is presented in Figure 2, Appendix A.

The vertical study boundary is nominated to extend to the required depth for the cut-to-fill program for the redevelopment, or by the maximum depth of UST trenching excavations (maximum target depth 4m below existing ground level (bgl) or at interception of groundwater which is anticipated to be at approximately 3m bgl or shallower, beyond which deeper excavation may not be possible due to test pit collapse).

4.7 Step 5 –Developing Decision Rules

The decision rules adopted to answer the decisions outlined in Section 5.4 are summarised in the following table:

Table 5.3 Summary of Decision Rules

No.	Decision to be Made	Decision Rule
Data Gap Investigation		
1	Are hazardous ground gas ratings within the historical range between CS2 and CS4? Do landfill gas concentrations pose a risk to human health?	If concentrations of landfill gas generate ratings are between CS2 and CS4 inclusive, then YES, ratings are within the historical range and the current design assumptions for the gas mitigation system will likely be retained. If ratings fall outside this range, then the answer is NO. If the rating is greater than CS4, then the current design assumptions must be reconsidered. Landfill gas will be assessed in accordance with NSW EPA (2020) Guidelines for the Assessment and Management of Sites Affected by Hazardous Ground Gases, including consideration of landfill gas concentrations, flow rates, gas screening values and characteristic gas situations. If results are less than the adopted site criteria then the decision is no, and landfill gas does not pose a risk.
2	Does tidal activity influence ground gas behaviour at the site?	If ground gas parameters are correlated with tidal movements, then the answer is YES, otherwise, the answer is NO.
3	Are USTs or other infrastructure present? Do chemical concentrations in soil adjacent to USTs or other infrastructure pose a risk to future site users/environment?	Observations during trenching will determine presence/absence of USTs and other infrastructure. If the soil analytical results are less than the adopted site criteria then the decision is no, and soil contaminant concentrations do not pose a risk. If results are above the adopted criteria, then the answer is YES.
4	Do chemical concentrations in site groundwater pose a risk to environmental receptors?	If the groundwater analytical results are less than the adopted site criteria then the decision is no, and groundwater contaminant concentrations do not pose a risk. If results are above the adopted criteria, then the answer is YES.
Validation Strategy		
1	Will chemical concentrations in spoil/site soil intended to be reused as fill pose a risk to future site users/environment following removal of infrastructure and impacted soils in the UST, wash bay and mechanical pit areas?	For the spoil/site soil, to determine suitability for secondary school use, the following criteria will be adopted with respect to the decision-making process: • If the soil results are less than the adopted site criteria (HIL/HSL C / HSL A/B and TPH Management Limits for residential, parkland and public open space/secondary schools) then the decision is no and the remediation strategy is acceptable. • If soils are above the criteria, a qualitative risk review will be undertaken to assess whether these soils represent an unacceptable risk to human health or the environment if placed under the cap.
2	Does the imported material used for the capping layer comply with VENM/ENM criteria?	Where relevant documentation provided by the source site, site history review, visual observations from inspections and chemical analysis indicate compliance with VENM/ENM criteria then the decision is yes. Otherwise the decision is no. Where the decision is yes, the material is appropriate to be used on site. Where the decision is no, the material must not be used onsite. In addition to the above, no materials can be imported onsite for use with prior approval by the Site Auditor.
3	Has the site been adequately capped?	If the survey data indicates that there is a capping layer of minimum of 500mm then the answer is yes. Otherwise the answer is no.

4.8 Step 6 – Specify the Limits on Decision Errors

4.8.1 Decision-maker's Tolerable Decision Error Rates Based on Consideration of the Consequences of Making an Incorrect Decision

The pre-determined data quality indicators (DQI's) established for the project, for both the Data Gap Investigation and Validation Strategy, are discussed below in relation to precision, accuracy, representativeness, comparability and completeness (PARCC parameters) as required by Step 6 of the DQO process.

Table 6.4 DQO and DQI

DQO	Frequency	Data Quality Indicator
Precision		
Intra-laboratory field duplicates	1/20 samples soil; 1/20 samples groundwater.	30% RPD[1]
Inter-laboratory field duplicates	1/20 samples soil; 1/20 samples groundwater.	
Laboratory duplicates	1/20 samples	30% RPD[1]
Laboratory method blanks	1/20 samples	< LOR
Accuracy		
Matrix spikes	1/20 samples	70 to 130%R for metals and inorganics
Laboratory control spike	1/20 samples	60-140%R for organics
Surrogate spike	1/20 samples	10-140%R for sVOC and speciated phenols
Representativeness		
Sampling handling storage and transport appropriate for media and analytes	All samples	Yes
Rinsate Blanks	1 per equipment per day (if applicable)	<LOR
Trip Blank	1 per sample batch soil; 1 per sample batch groundwater.	<LOR
Trip Spike	1 per sample batch soil; 1 per sample batch groundwater.	60-140%R for organics
Samples extracted and analysed within holding times.	All samples	Hold Times: 14 days - organics 6 months – inorganics
Leak testing of ground gas wells	N/A	Leak testing of existing wells was conducted as part of previous investigations and is therefore not proposed for this data gap investigation.
Response zones of ground gas wells unflooded	All wells	All wells to be gauged as part of gas monitoring works to ensure response zone remains unflooded to allow for

DQO	Frequency	Data Quality Indicator
		drawing of surrounding gases from the soil formation
Comparability		
Standard operating procedures used for sample collection and handling (including decontamination)	All samples	Yes
Standard analytical methods used for all analyses	All samples	Yes
Consistent field conditions, sampling staff and laboratory analysis	All samples	Yes
Limits of reporting appropriate and consistent	All samples	Yes
Completeness		
Soil description and COCs completed and appropriate	All samples	Yes
Appropriate documentation for testing	All samples	Yes
Data set to be 95% complete after validation	All samples	Yes

1 - If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgment will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

4.9 Step 7 – Optimise the Design

4.9.1 The Optimum Manner in which to Collect the Data Required to meet the Objectives for the Assessment and which will meet the Project DQOs

With consideration to NSW EPA (1995) Sampling Design Guidelines; the review of existing environmental data; and, the evaluation of operational decision rules, a resource-effective sampling and analysis plan is presented in Section 7 of the report, for both the Data Gap Investigation and Validation Strategy.

5 Sampling and Analysis Plan

This section provides details of the proposed sampling and analysis plan from the Geosyntec (2021) SAQP, outlining methodologies to be adopted to ensure that the proposed Data Gap Investigation works meet the requirements of guidelines made or approved by NSW EPA. A sampling and analysis plan for remaining validation works is presented in Section 11 as part of the RAP Amendments.

Table 6.1: Sampling and Analysis Plan

Sampling Item	Data Gap Investigation - Sampling and Analysis Plan
Sampling Pattern / Density Rationale:	The locations of USTs have been determined by correlating known locations from a previous GHD investigation with historical aerial photographs which will be investigated using test pits. Targeted soil samples are proposed to be collected from trenching excavations if USTs or other infrastructure are found. Four test pits will be dug around the perimeter of each UST if possible and the wash bay site to the depth of groundwater which is shallow (2-3m below ground level) . Samples will be collected at a rate of 2 samples per test pit, or one sample per identified soil horizon including fill and natural soils. Samples will also be targeted towards identified potential contamination. These locations will be surveyed using a GPS coordinates to allow subsequent location following completion of the early works. Ground gas monitoring is proposed to be conducted from each of the previously installed Greencap (2021) wells (GG1 to GG9). From the perspective of the eventual gas design and technical specification, the proposed buildings have been divided into three parts, namely the sports hall which is covered by wells GG1 and GG2, the eastern school building which is covered by wells GG3 to GG7 inclusive and the southwestern school building which is covered by wells GG8 and GG9. The number of existing wells is considered sufficient to characterise the ground gas regime for each of these footprints when the historical ground gas results from GHD, those from Greencap and those proposed within the SAQP are considered as a whole. Section 3.4.2 of the NSW (2020) Hazardous Ground Gas Guidelines states that the number and density of boreholes required on a particular site will be a matter of professional judgement and that it should take into account the sensitivity of the land use (secondary school), the nature of the source (regional filling), heterogeneity of the ground conditions (at least 2 wells per building to account for heterogeneity) and robustness of the CSM (based on the previous investigation and to be confirmed by the Data Gap Investigation). Groundwater monitoring is proposed to be conducted from four of the previously installed Greencap (2021) wells with enough water column to facilitate low flow sampling methods (Hydrasleeves) (GG2, GG5, GG6 and GG8). Where groundwater is encountered in locations with identified USTs, and contamination is apparent (sheen, odour), grab samples of groundwater will also be taken directly from test pits for screening purposes.
Soil Sampling Devices / Techniques	Samples will be collected by appropriately trained and experienced Geosyntec Environmental Scientists in accordance with standard operating procedures based on NEPM (2013), AS4482.1-2005, AS4482.2-1999 and other relevant guidelines made or approved by NSW EPA as appropriate.
Sampling Depths	Soil samples from UST test pits will be taken from depths observed to be potentially contaminated (e.g. if odour or staining are observed), or in the absence of indicators of contamination they will be taken from depths which align with the sides and base of the UST.
Selection of Samples for Analysis:	Soil that is observed having visual or olfactory indicators of contamination and/or have PID screening values above background levels will be selected. In lieu of soil displaying the above characteristics, a representative sample will be obtained as outlined in the sampling density rationale above.

Sampling Item	Data Gap Investigation - Sampling and Analysis Plan
Sample Splitting Techniques	Soil samples will be split into two parts with minimal disturbance or mixing to reduce loss of volatiles. One part will form the primary sample and the second part will be placed into a zip lock bag for PID screening. Where a duplicate or triplicate sample is required, a similar procedure will be adopted but the sample will be split into three or four parts respectively.
Sample Container Selection:	Soil and groundwater sample containers will be supplied by the laboratory and generally comprise glass jars / bottles with integrated Teflon seals to prevent loss of volatiles. Approved containers will be used for collection of groundwater PFAS samples.
Decontamination Procedures:	Where possible disposable / dedicated sampling equipment will be used.
Sample Handling and Preservation Procedures:	Soil samples will be logged using the USCS and details of any discolouration, staining, odours or other indicators of contamination noted. Samples will be placed into laboratory supplied containers using a clean pair of nitrile gloves. Acid sulfate soil samples will be placed in snap lock bags and the air removed.
PFAS-specific Sampling and Analysis considerations	Sampling and analysis will be conducted in accordance with NEMP (2018), with specific consideration given to the following elements: • No Teflon coated products will be used during sampling. • Eurofins is NATA accredited for the analysis of PFAS using an in house method based on USEPA 537 and ASTM D7359-D8.
Field Calibration and Screening Protocols	Calibrated field instruments will be supplied by an environmental equipment supplier. Measurement of background concentrations in ambient air will be conducted prior to each reading to account for sensor drift. The result will be record on a field data sheet along with date, location details (batch details) and depth. For PID sampling, a small hole will be punched into the zip lock bag sample. The tip of the PID will be inserted into the bag and the maximum concentration noted on the borehole record sheet. The Biosystems Gas Flux (or similar) will be pre-calibrated upon receipt from the supplier and will be checked to ensure it is functioning properly with a fully charged battery or reliable power source prior to deployment.
Groundwater Monitoring Well Sampling	Groundwater sampling of four existing Greencap (2021) wells will be conducted by an appropriately trained and experienced Geosyntec Environmental Scientist in accordance with a standard operating procedure based on EPA Victoria (2000) Water Sampling Guidelines. Standing water levels will be determined using an interface probe, which can also detect the thickness of any NAPL if present. Hydrasleeves suitable for PFAS sample collection will be installed in the wells to be within the water column for at least 48 hours. Field parameters including DO, temperature, pH, EC and ORP will be measured during sample collection after 48 hours of hydrasleeves being installed. Where hydrasleeve sampling is not possible, low flow sampling methods (i.e. peristaltic pump) will be used. Well Purge Data Record Sheets will be completed for each well, which detail the sampling date, project number, operator, well ID, weather, gauge data (including depth to water and depth to bottom and depth to product if present), water quality data and general comments. Relevant onsite and offsite wells will be gauged and surveyed to estimate the hydraulic gradient in the area.
Landfill Gas Monitoring	Monitoring will be conducted in accordance with NSW (2020) Hazardous Ground Gas Guidelines.

Sampling Item	Data Gap Investigation - Sampling and Analysis Plan
	Landfill gas detectors (e.g. GA5000 or similar) will be used to collect measurements of methane, carbon dioxide, carbon monoxide, hydrogen sulfide and oxygen in landfill gas wells. An initial gas monitoring event will be completed from each of the Greencap wells. A Biosystems Gas Flux (or similar) or similar will then be deployed in the location with the highest result based on historical results and the confirmatory first round of handheld ground gas monitoring for the continuous measurement of gas concentrations and borehole pressure. An additional handheld gas monitoring event will be completed during continuous monitoring at the site (from all wells), during falling atmospheric pressure for reference purposes. When the historical data and the data to be collected during the Data Gap Investigation are considered as a whole, the monitoring period is considered to be sufficient for characterisation of ground gas conditions at the site. Additionally, as per section 3.4.6 of the NSW EPA Hazardous Ground Gas guidelines, continuous monitoring equipment (CME) can reduce the number of monitoring events through the overall time period required. CME will allow the investigation obtain data from a variety of meteorological conditions, including capture of likely worst case meteorological scenarios as defined in the NSW (2020) Hazardous Ground Gas Guidelines.

6 Evaluation of QA/QC

6.1.1 Field QA/QC Sampling

The methodology for obtaining QA/QC samples was conducted as follows:

Duplicate Samples

In accordance with NEPM (2013), at least 5% of soil samples and groundwater samples were duplicates collected in the field for analysis at the primary laboratory. They were collected from the same sampling point and divided into two separate and unrelated sample containers for analysis at the same laboratory (intra-laboratory precision).

- Soil duplicate: DUP1 (soil) = TS2-1_0.4-0.6
- Groundwater duplicate: DUP1 (water) = GG01

Triplicate Split Samples

At least 5% of soil samples and groundwater samples were duplicates collected in the field for analysis at the secondary laboratory. They were collected from the same sampling point and divided into two separate and unrelated sample containers for analysis at the secondary laboratory (inter-laboratory precision).

- Soil triplicate = TRIP1 (soil) = TS2-1_0.4-0.6
- Groundwater triplicate = TRIP1 (water) = GG01

Trip Spike and Trip Blank

Trip spike samples are held during field sampling to assess loss of volatile from samples during transit, while trip blanks are collected to assess whether contamination may have been introduced to samples during shipping and field handling activities.

Trip spike and trip blank were not tested as part of the soil sampling event.

Given that soil sampling was conducted for screening purposes to assist with determining remediation requirements, the absence of trip spike and blank are not considered affect the outcome of the assessment, and the data is considered fit for purpose. Additionally, given that samples were collected based on standard procedures including zero headspace and tight seal of the sample jar lid, and that concentrations of volatile compounds were generally noted to be close to the laboratory detection limits, the loss of volatile compounds is considered unlikely.

One trip blank was tested during groundwater sampling activities:

- Groundwater trip blank = tripblank

No trip spike was tested as part of the groundwater sampling event. Given that all volatile results were reported below their respective laboratory limits of detection, it is considered that loss of volatile is unlikely to have occurred during laboratory transit.

6.1.2 QA/QC Results

Field QA/QC

Soil samples were taken with clean disposable nitrile gloves directly from the auger flights with care taken to collect soil that had not come in contact with the auger stem. Samples were then placed in laboratory-supplied sample containers with Teflon sealed lid, with zero headspace and tight seal.

Groundwater samples were collected using clean dedicated tubing at each well to prevent any potential cross contamination and were placed into laboratory supplied containers. Field filtering for metal analysis was not conducted in the field and was requested to be undertaken by the laboratory.

Groundwater trip blank results were below laboratory detection limits indicating low likelihood of cross contamination of samples.

The QA/QC results for soil and groundwater duplicate (intra-laboratory) and triplicate (inter-laboratory) samples are summarised below with results presented in Appendix F.

Based on the information referenced above, it was concluded that the data is of an acceptable quality to achieve the objectives of this study, with the following comments:

a. Relative Percent Differences (RPDs) calculated for inter-laboratory samples for TRH >C16-34 are indicative of heterogeneous composition within the fill material.
b. Relative Percent Differences (RPDs) calculated for inter-laboratory and intra-laboratory samples for arsenic, copper and nickel are likely a result of concentrations being close to the laboratory detection limit.

Laboratory QA/QC

Samples were received and analysed by the primary and secondary laboratories with attempt to cool samples evident and within sample holding times. Soil samples were received by the laboratory on the same day as sampling, and as such there was insufficient time for temperatures lower than 10-14°C to be reached inside the eskies.

Laboratory limits of reporting (LOR) for PAHs were raised form <0.1mg/kg to <1mg/kg for soil samples TS2-1_1.0-1.2, TS2-2_1.0-1.2 and TS2-4_1.2-1.4 due to interferences from analytes other than those being tested. Raised LOR were below adopted criteria, and were relatively low in comparison to detections of some PAHs in the samples, and therefore, this is not considered to affect the outcome of the assessment.

Some matrix spikes were not able to be completed due to high concentrations of analytes in some samples causing interference. Those which were able to be completed without interference, however, reported percentage recoveries within the acceptable range.

Detailed QA/QC results are presented on the laboratory testing certificates presented in Appendix C and summarised in Table G-1 in Appendix G.

7 Site Assessment Criteria

The proposed redevelopment is understood to include school buildings and open space areas within the development footprint.

Therefore, the criteria adopted for the site comprised criteria for secondary school and open space land use as outlined below.

7.1 Assessment Criteria for Soil

Soil analytical results were assessed against the guidelines listed below, with the adopted soil criteria summarised in Table 7.1:

- NEPM (2013) Health Investigation Levels (HIL) C.
- Health Screening Levels (HSL) C and A/B as required by NEPM (2013) for assessment of secondary schools, for sandy soil. HSL C applies to secondary school grounds, and HSL A/B applies to secondary school buildings.
- NEPM (2013) Management Limits for Total Petroleum Hydrocarbons for residential, parkland and public open space use for coarse soil.

Ecological criteria are not considered relevant as the site is expected to be capped with additional material followed by concrete hardstand or clean topsoil to facilitate construction of the school.

Table 7.1: Adopted Soil Site Suitability Criteria (mg/kg)

NEPM (2013) Soil Site Suitability Criteria	HIL C – Public Open Space / Recreational (mg/kg)	Soil HSL A/B Low – High Density Residential (Secondary School Buildings) for Sand Soil, 0 to <1m (mg/kg)	Soil HSL C Low – Recreational (Secondary School Grounds) for Sand Soil, 0 to <1m (mg/kg)	Hydrocarbon Management Limits for Residential, Parkland and Public Open Space, Coarse Soil Type
TRH				
F1	-	45	NL	700
F2	-	110	NL	1,000
F3 (>C16-C34)	-	-	-	2,500
F4 (>C34-C40)	-	-	-	10,000
BTEX				
Benzene	-	0.5	NL	-
Toluene	-	160	NL	-
Ethylbenzene	-	55	NL	-
Xylenes (Total)	-	40	NL	-
PAHs				
Naphthalene	-	3	NL	-
Benzo(a)pyrene	3	-	-	-
Total PAHs	300	-	-	-
Heavy Metals				
Arsenic	300	-	-	-
Cadmium	90	-	-	-

NEPM (2013) Soil Site Suitability Criteria	HIL C – Public Open Space / Recreational (mg/kg)	Soil HSL A/B Low – High Density Residential (Secondary School Buildings) for Sand Soil, 0 to <1m (mg/kg)	Soil HSL C Low – Recreational (Secondary School Grounds) for Sand Soil, 0 to <1m (mg/kg)	Hydrocarbon Management Limits for Residential, Parkland and Public Open Space, Coarse Soil Type
Chromium (VI)	300	-	-	-
Copper	17000	-	-	-
Lead	600	-	-	-
Mercury	80	-	-	-
Nickel	1200	-	-	-
Zinc	30000	-	-	-
OCPs				
DDT+DDE+DDD	400	-	-	-
DDT	-	-	-	-
Aldrin and dieldrin	10	-	-	-
Chlordane	70	-	-	-
Endosulfan	340	-	-	-
Endrin	20	-	-	-
Heptachlor	10	-	-	-
HCB	10	-	-	-
PCBs				
PCBs	1	-	-	-
Asbestos				
Asbestos	Presence			

7.2 Waste Classification

Given that excavation and disposal of soils from identified UST and other infrastructure locations may be required as part of the main remediation works, soil results were also compared against NSW Environment Protection Authority (EPA) Waste Classification Criteria found in the NSW EPA (2014) Waste Classification Guidelines Part 1: Classifying Waste. Chemical assessment was required as the material included a mixture of soil and anthropogenic inclusions. Waste Classification CT1, SCC1 and TCLP1 criteria for General Solid Waste are displayed in Table 7.2. The relevant Waste Classification are listed below:

- NSW EPA Waste Classification CT1 Criteria for General Solid Waste
- NSW EPA Waste Classification TCLP1 and SCC1 Criteria for General Solid Waste

Table 6.2. Waste Classification Criteria for General Solid Waste.

NSW EPA (2014) General Solid Waste	CT1 (mg/kg)	CT2 (mg/kg)
TPH		
TPH C_6 – C_9 Fraction	650	2,600
TPH C_{10} – C_{36} Fraction	10,000	40,000

NSW EPA (2014) General Solid Waste	CT1 (mg/kg)	CT2 (mg/kg)
BTEX		
Benzene	10	40
Toluene	288	1,152
Ethylbenzene	600	2,400
Xylenes (Total)	1,000	40
PAHs		
Benzo (a) Pyrene	0.8	3.2
Total PAHs	200	800
Heavy Metals		
Arsenic	100	400
Cadmium	20	80
Chromium (VI)	100	400 (as CrVI)
Lead	100	400
Mercury	4	16
Nickel	40	160
PCBs		
Total PCBs	50	50
Pesticides		
Total Pesticides	250	1000

7.3 Assessment Criteria for Groundwater

Groundwater analytical results were assessed against the guidelines listed below, with adopted groundwater criteria summarised in Table 7.3:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) (2018) Default Guideline Values for Marine Waters with 95% protection level, noted to be generally consistent with NEPM (2013) Groundwater Investigation Levels (GILs) for Marine Waters taken from Table 1C.
- NEPM (2013) Groundwater HSLs: HSL A/B Residential use (required for secondary school buildings) for sandy soil taken from Table 1A(4).
- PFAS National Environmental Management Plan (2020) (NEMP 2020) Human Health (non-potable and recreational uses) and Ecological (slightly to moderately disturbed ecosystem) criteria.
- Consideration of aesthetic impacts to groundwater on site during sampling activities with respect to maintaining visual amenity.

Table 6.3. Adopted Groundwater Site Suitability Criteria

NEPM (2013) Groundwater Site Suitability Criteria	ANZG 95% toxicant criteria for Marine Waters / NEPM (2013) GILs for Marine Waters (µg/L)	Groundwater HSL A&B for 2m to <4m Depth and Sand Soil Type (µg/L)
Benzene	700 (ANZG) / 500 (NEPM)	800
Toluene	180	NL

NEPM (2013) Groundwater Site Suitability Criteria	ANZG 95% toxicant criteria for Marine Waters / NEPM (2013) GILs for Marine Waters (µg/L)	Groundwater HSL A&B for 2m to <4m Depth and Sand Soil Type (µg/L)
Ethylbenzene	80	NL
Xylenes (o)	75 (ANZG-unknown protection level) / 350 (NEPM)	NL
Xylenes (m+p)	200 (NEPM – as p-xylene only)	NL
Xylenes (Total)	-	NL
Naphthalene	70 (ANZG) / 50 (NEPM)	NL
F1	-	1000
F2	-	1000
Arsenic	13 / 24*	-
Cadmium	55 (ANZG) / 7 (NEPM)	-
Chromium	27 / 4.4**	-
Copper	1.3	-
Lead	4.4	-
Mercury	0.4 (ANZG) / 0.1 (NEPM)	-
Nickel	70 (ANZG) / 7 (ANZG)	-
Zinc	15	-
Benzo(a)pyrene	0.2	-
Naphthalene	16	-
Anthracene	0.4	-
Fluoranthene	1.4	-
Phenanthrene	2	-

*ANZG 0.013mg/L = AsV ; 0.024mg/L = AsIII
** ANZG/NEPM 27 µg/L = CrIII unknown protection level ; 4.4 µg/L = CrVI

Table 8.2 PFAS NEMP 2020 Criteria Values

Parameter	Health-based Guidance Values (Non-Potable and Recreational Use) (µg/L)	Aquatic Ecosystem: Freshwater/Marine Guideline Values 95% Species Protection* (µg/L)
PFOS	-	0.13
PFOA	10	220
PFOS + PFHxS	2	-

*Note 3 of Table 5 in NEMP (2020) states 'The WQG advise that the 99% level of protection be used for ...slightly to moderately disturbed systems. This approach is generally adopted for chemicals that bioaccumulate and biomagnify in wildlife.'

Given that NEMP (2020) criteria have been applied as a screening measure only, the 95% Species Protection Guideline Values have been adopted.

7.4 Assessment of Ground Gas

NSW EPA (2020) Hazardous Ground Gas Guidelines will be adopted with respect to assessment of landfill gas. This will include consideration of gas concentration, flow rate, gas screening values, characteristic gas situation and prevailing atmospheric pressure.

It is considered that use of SafeWork NSW (2018) Workplace Exposure Standards for Airborne Contaminants is appropriate for use in the Gas Monitoring Well Network beneath the site. It should be noted that the recorded concentrations are taken within the ground and the criteria are designed to be applied to the atmosphere thus adding a further layer of conservatism. Where site users and construction workers are present in these areas, it is considered unlikely that they would be exposed to concentrations in the ground or that their exposure time will be greater than 8hrs per day and consequently the adopted criteria would also be protective of their health.

- SafeWork NSW (2018) TWA screening criteria for hydrogen sulfide: 10 ppm
- SafeWork NSW (2018) TWA screening criteria for carbon monoxide: 30 ppm
- Additionally, AS2865 – 1995 Safe Working in a Confined Space guidelines will used for oxygen (>19.5%v/v).