

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 Continue with control measures	
<0.01		
≥ 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. Investigating including enclosure & equipment where present and clean immediate area 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	
restricted area for asbestos has	Principal Contractor or a person appointed by the Principal contractor shall prepare a non-conformance report and assess reason of the non-conformance.	
not undertaken induction into the AMP.	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	Principal Contractor or a person appointed by the Principal Contractor shall immediately contact landfill.	
(e.g. to landfill which is not licenced to receive asbestos)	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

Date of Identification	Location	Item Description, Including Condition of ACM (Friable/Bonded)	Approximate Size and Weight	Laboratory Testing	Fate of ACM
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.
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.
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.
	Historical investigation Historical investigation Historical investigation	Historical investigation Fill material within the site 0-0.1m beneath original site surface Historical investigation Fill material within the site 0.1m beneath original site surface Historical Fill material within the site 0.4m beneath original site surface Historical Fill material within the site 0.4-0.5m beneath	Including Condition of ACM (Friable/Bonded) Historical investigation Fill material within the site 0-0.1m beneath original site surface Historical investigation Fill material within the site 0.1m beneath original site surface Historical Fill material within the site 0.1m beneath original site surface Historical Fill material within the investigation site 0.4-0.5m beneath Material Type	Including Condition of ACM (Friable/Bonded) Historical investigation Historical investigation Fill material within the site 0.1m beneath original site surface Historical investigation Fill material within the site 0.1m beneath original site surface Historical investigation Fill material within the site 0.1m beneath original site surface Chrysotile, Unknown Material Type Unknown Material Type Unknown Material Type	Including Condition of ACM (Friable/Bonded) Historical investigation Fill material within the site 0-0.1m beneath original site surface Historical investigation Fill material within the site 0.1m beneath original site surface Historical investigation Fill material within the site 0.1m beneath original site surface Historical Fill material within the site 0.1m beneath original site surface Chrysotile, Unknown Material Type Unknown Yes, indicating presence of asbestos in soil sample Chrysotile, Unknown Unknown Yes, indicating presence of asbestos in soil sample

List is to be updated during construction

We are engineers, scientists and innovators



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Appendix J Acid Sulfate Soil Management Plan



engineers | scientists | innovators



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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Signature	DRAFT	lange Jostad		
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Distribution	RobertsCoGeosyntec Electronic File	RobertsCo Geosyntec Electronic File		

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



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Appendices

Appendix A Figures

Appendix B Liming Rate Table



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

Details	
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.	
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.	
er: 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.	
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 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 mBGI
 - 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 1998 (Methods 21A and or 21Af). The pH of each load and the time of extra recorded and forwarded to the landfill. If the pH is less than 5.5 then the massuitable 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 m³ 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 μ g/L for pH <6.5, not greater than 100 μ g/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 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.

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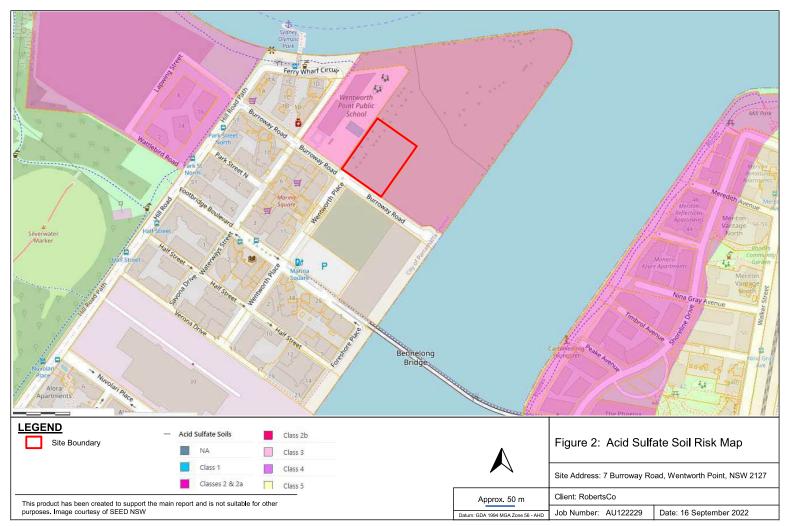


Appendix A Figures

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Appendix B Liming Rate Table

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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				S	oil Analysis	s - Oxidisab	le Sulfur (S	%) or equi	valent TPA/T	AA				
(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

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.

Medium treatment: (>0.1 to 1 t lime). M

Н High treatment:(>1 to 5 t lime). Very High treatment: (>5 tonne lime).

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

Lime rates are for pure fine CaCO₃ 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/m³).

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.

Identify aspects

Identify potential impacts and categorise

Assess risk level for the identified impacts

Identify mitigation criteria or specific mitigation measures

Determine timing and responsibility for mitigation criteria and measures

>	Н	low severe are potential adverse impacts on:		What is the	likelihood (ris	k) of this level	of severity?
Severity	Human Health	Environment	Construction schedule and/or project costs		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.

AU122229 Appendix L Environmental Risk Register

Erosion and Sedimentation Risks							
Aspect	Impact	Risk of Impact	Mitigation Criteria or Management Measure	Risk After Mitigation / Management	Responsibility		
Pre-construction	I	1		1			
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		

AU122229 Appendix L Environmental Risk Register

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		I		1		
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	ı				-	
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/Const	ruction						
Pre-construction and construction activities resulting in noise complaints	Disturbance of onsite receptors/personnel, local residents, potential noise complaints. Nonconformance 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 / cons	truction	I				
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	1	1			-
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	"	l			
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	"			П	
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

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)