Aqualand Projects Pty Ltd

Remedial Works Plan EWDA-01

Central Barangaroo

Purpose:

To detail the management of contamination throughout the Early Works Development Application 01 at Central Barangaroo, Barangaroo NSW

Prepared for:

Aqualand Project Pty Ltd

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EXECUTIVE SUMMARY

This report details the Remediation Works Plan (RWP) for the Early Works Development Application 01 (EWDA-01) of the Central Barangaroo development located at Hickson Road, Milsons Point, NSW. This RWP was commissioned by Aqualand Projects Pty Ltd (Aqualand). The EWDA-01 proposes to expedite an initial stage of early works activities for the Central Barangaroo precinct, along a short section of Hickson Road. These proposed works are required at an early stage, in order to facilitate the coordinated design and delivery of the precinct and its neighbouring activities.

Specifically, the EWDA-01 includes:

- Demolition of a length of an existing shoring wall capping beam along Hickson Road;
- Construction of a new secant pile retention wall and associated rock anchors;
- Excavation of land related to the secant pile retention wall and associated rock anchors;
- Localised remediation related to the secant pile retention wall and associated rock anchors;
- Associated Archaeological Investigations in the area of excavation and works; and
- Sydney Metro / Hickson Road interfaces – perimeter retention wall interface works and rock anchors, and Hickson Road public domain interface works.

The objective of this RWP is to provide a technical specification that provides specific detail of the work that must be completed to facilitate delivery of the remediation works prescribed by the JBS Environmental Pty Ltd (JBS) Remediation Action Plan (RAP) (JBS 2013, herein referred to as the JBS RAP), throughout EWDA-01, and to provide information regarding the proposed staging, sequencing and planning of remediation works.

An independent Site Auditor, Rowena Salmon of Ramboll Australia Pty Ltd (Ramboll, formerly ENVIRON), has been appointed by Aqualand to review this RWP.

Central Barangaroo (and the greater Barangaroo Development Area) has been investigated for environmental contamination extensively, with subsurface contamination requiring remediation and management during the proposed development.

Previous environmental investigations conducted on the Central Barangaroo Site have identified soil as being contaminated with total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAHs), metals and asbestos-impacted fill material. No significant contamination has been identified on the Central Barangaroo Site, with the exception of tar impacted material and associated groundwater impact on the boundary of the Declaration Area, and an area of asbestos impacted fill material. The Declaration Area has been remediated by others, with remediation extending into Block 5, that forms part of the work area of this RWP.

This RWP has been prepared specifically for the EWDA-01 area of Central Barangaroo in accordance with the existing JBS RAP (applicable to the entirety of Central Barangaroo), as required for the staging of development works, with construction in EWDA-01 beginning prior to other areas of the broader Central Barangaroo site.

It is considered that the site would be suitable for residential, commercial (retail) and open space land-use, following proposed remedial works undertaken as detailed in this RWP and future RWP's. While a Long-Term Environmental Management Plan (LTEMP) was contemplated in the RAP, the RWP and proposed design intends on delivering the site without any long-term monitoring or management requirements. As such, the requirement for a LTEMP at this stage is unlikely

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1. INTRODUCTION

EDP Consultants Pty Limited (EDP) was engaged by Aqualand Projects Pty Ltd (Aqualand), to prepare a Remedial Works Plan (RWP) for the remediation of Central Barangaroo required to facilitate the Early Works Development Application 01 (EWDA-01), located at Hickson Road, Millers Point NSW. The EWDA-01 is part of a larger Central Barangaroo area comprising Lots 5, 6 and 7 of Deported Plan (DP) 876514 (Central Barangaroo Site). This RWP has been prepared in accordance with the existing JBS Environmental Pty Ltd (JBS) Remediation Action Plan (RAP) (JBS 2013, herein referred to as the JBS RAP) for the entirety of Central Barangaroo, however this RWP has been prepared specifically for the scope of the EWDA-01 at Central Barangaroo, as required for the staging of development works.

This RWP is applicable to the EWDA-01 footprint only and is a standalone document from the reports prepared for the wider Central Barangaroo site.

Refer to **Figure 1** for the site location provided in **Appendix A**.

1.1 Background

Previous environmental investigations conducted on the Central Barangaroo Site have identified soil as being contaminated with total petroleum hydrocarbon (TPH), polycyclic aromatic hydrocarbons (PAH), metals and asbestos-impacted fill material. No significant contamination has been identified on the Central Barangaroo Site, with the exception of tar impacted material and associated groundwater impact on the boundary of the Declaration Area and an area of asbestos impacted fill material. The Declaration Area has been remediated by others, with remediation extending into Block 5, that forms part of the work area of this RWP.

In May 2013, JBS prepared the JBS RAP for Central Barangaroo. The JBS RAP was subsequently subject to NSW EPA Site Auditor Review and considered appropriate to render the site suitable for the proposed use in the Site Audit Statement (SAS) (GN 439B-5) and Site Audit Report (herein referred as SAR) prepared by ENVIRON Australia Pty Ltd (AS121473, ENVIRON 2013) with the provision of additional remediation detail, including this RWP.

The contaminants of concern identified through previous investigations are summarised in Table 4.1 of ENVIRON 2013.

ENVIRON 2013 note that the most common contaminants are PAHs, which were detectable in around 85% of fill samples in Central Barangaroo, with the samples containing elevated PAHs as well as showing elevated total recoverable hydrocarbons (TRH). The most common heavy metal contaminant was lead, with around 8% of samples exceeding the screening criteria used by the Auditor.

Asbestos fibres were only identified in one fill sample [BH401 at a depth of 9.0-9.4 m below ground level (mbgl)] in Block 5. The SAR noted that the investigation methodology employed by all previous assessments limited the ability to assess the composition of fill material, resulting in a potential for asbestos to be present in the fill material at a higher frequency than suggested by the site investigations, as has been found to be the case on other parts of the Barangaroo project area.

The JBS RAP was prepared on the basis of proposed public open space, and the potential for a future mixed commercial and residential buildings with two basement carparks extending 10 mbgl. These assumptions have been refined in the current proposed plans for Central Barangaroo, with a 5-level basement excavation extending approximately 15.55 mbgl.

This RWP outlines how the remediation strategy for the proposed development will be implemented for the scope of EWDA-01, being in summary the construction of a short section of retaining structure (Secant Pile) on the eastern site boundary.

1.2 Project Approval Context

1.2.1 Modification 9 (MOD 9) to MP06_0162

Aqualand and Infrastructure New South Wales recently prepared Modification 9 to the approved Barangaroo Concept Plan MP06_0162 (MOD 9). The application seeks amendments to the approved Barangaroo Concept Plan as it relates to Central Barangaroo. Specifically, this includes modifications to the Central Barangaroo development blocks 5, 6 and 7 with regards to building envelopes, GFA and height, as well as the street and pedestrian movement network. MOD 9 was lodged on 8 April 2022. The proposed early works are permissible under the provisions of the approved Barangaroo Concept Plan and not reliant on MOD 9.

1.2.2 Proposed Development the Subject of this SSDA

The proposed SSDA will seek approval for early works associated with the future mixed-use development within Central Barangaroo (refer MP06_0162). Specifically, the works are associated with the construction of a secant pile retention wall along the Hickson Road (eastern) boundary, and include:

- Partial demolition of an existing shoring wall capping beam along Hickson Road;
- Construction of a new secant pile retention wall;
- Excavation of land related to the secant pile retention wall;
- Localised remediation related to the secant pile retention wall;
- Associated Archaeological Investigations in the area of excavation and works; and
- Sydney Metro / Hickson Road interfaces – perimeter retention wall interface works, and Hickson Road public domain interface works.

2. SITE INFORMATION

2.1 Site Identification

Site identification details are summarised in **Table 1** and the location and layout of the site is shown on **Figure 1** and **Figure 2**, respectively, provided in **Appendix A.**

Table 1: Site Identification

Site Identification	
Site Address:	Hickson Road, Millers Point NSW
Legal Identification:	Part Lots 5 and 6 in DP 876514
Local Government Area:	City of Sydney
Site Area:	EWDA-01 includes the eastern portion of Blocks 5, 6 and 7, Central Barangaroo, adjacent to Hickson Road, Millers Point NSW. The EWDA-01 work area has a total combined area of approximately 225 m^2.
Current Zoning:	B4 Mixed Use and RE1 Public Recreation
Site Elevation:	Approximately 2-4 m Australian Height Datum (AHD)

2.2 Site Description

At the time of writing, the site contained a relatively flat concrete hardstand surface. The site was being utilised for the temporary storage of plant, equipment and materials associated with other stages of development within the greater Barangaroo area.

2.3 Surrounding Land Use

The site is within the eastern portion of Central Barangaroo. It is bounded by the Block 5, 6 and 7 future basements to the west and the road reserve of Hickson Road to the north-east. Sydney Harbour is situated immediately beyond the Block 7 Foreshore footprint in the north and west, and mixed residential and commercial buildings occupy the eastern side of Hickson Road. Works to the north of the site were being undertaken for the construction of the Barangaroo Metro Station. Works to the south were associated with the Lendlease development in Block 4.

3. ENVIRONMENTAL SETTING

3.1 Topography

A review of the NSW Government National Map online database (http://www.nationalmap.gov.au/) accessed in January 2022, indicated that the site was generally flat and was located at an elevation of approximately 2-3 m AHD.

3.2 Geology and Soils

According to the 1:100 000 Geological Survey of NSW (Sydney) Sheet 9130 (Ed 1) 1983 and numerous site investigations, the Central Barangaroo Site is underlain by man-made fill materials that have been placed over marine sands over Hawkesbury Sandstone. The stratigraphic summary provided in the SAR is presented in **Table 2.**

Table 2: Summary of Stratigraphy of Central Barangaroo (Environ SAR 2013)

Thickness (m)	Material	Location	Description
0.5	Pavement	Over all of site	Hard surfacing, bituminous concrete except for 20 m concrete strip along the shoreline
			Gravel, occasionally concrete slab
6 – 18	Fill	Shallowest on eastern side near Hickson Road, increasing in thickness towards Darling Harbour	Variously described as sand or clay but mainly sandy, gravelly, silty or clayey in places. Possibly broken sandstone. Contains some brick, concrete, tile, but appears minor
0–2	Alluvial soil	Overlying bedrock or residual soil, absent in places on eastern side	Alluvial sediments consisting predominantly of dark silty clay
0 – 20	Residual soil	Overlying bedrock, absent in places on eastern side	Sandy clay residual, highly weathered rock
	Bedrock	Whole of site	Sandstone, some shale. Weathering and fracturing decreasing with depth

Based on information available in previous reports, the depth of fill and alluvial soil was determined based on the identified depth of bedrock. The rock contours range from less than -2 mAHD in the eastern area to -23 mAHD in the western areas of the future basement.

The fill profile did not show any distinct and predictable layers. Boreholes in close proximity to each other show significant differences in soil description.

Tar was observed in natural soils in Blocks 5 and 6 (BH70, BH400, BH401, BH402 and BH403) and in shallow fill material in BH70 (2.5-4 mbgl) and BH74 (1-2.5 mbgl). The majority of these areas were included in the Block 5 remediation of the Declaration Area.

3.3 Hydrogeology

Groundwater at Central Barangaroo is shallow, generally reflective of sea level at a depth of approximately 2 mbgl. Previous investigations and experience in the greater Barangaroo area show the groundwater to be tidally influenced. The SAR notes that tidal studies at the southern end of Barangaroo indicate a high degree of connectivity between groundwater and the adjoining waters of Darling Harbour, decreasing towards Hickson Road.

Due to the presence of fill materials, hydraulic conductivity is expected to vary locally, however is expected to be high due to the prevalence of sand in the field logs.

Due to the tidal influence, groundwater is expected to be saline. The overall groundwater flow direction is expected to be to the west towards Darling Harbour, however will vary due to preferential flow pathways within the fill body and tidal influence interacting with inflow from the east.

4. PROJECT SUMMARY

4.1 Central Barangaroo

Central Barangaroo at the time of this RWP is intended to be developed by Aqualand for mixed commercial (retail), residential and public open space uses. The proposed works require bulk excavation of a basement to -13.05 mAHD (approximately 15.55 mbgl) to allow construction of five basement levels, and level change in the surrounding land for the construction of roads, footpaths and public recreation areas. The basement development will require deeper piling and retention excavation and footings. The total basement excavation footprint is approximately 11,772 m^2, with an expected volume requiring off-site disposal of 187,000 m^3.

The proposed uses for the basement and ground floor levels include:

- Basement 5: Carpark; plant rooms; water treatment.
- Basement 4: Retail space; plant rooms.
- Basement 3: Void over retail space; plant rooms.
- Basement 2: Retail space, plant rooms; loading dock.
- Basement 1: Void over retail and loading dock; operations centre and event operations room.
- Ground Floor: Retail space; carpark access; residential lobby.

The remediation components associated with the wider Central Barangaroo are applicable to DA-02 and are not relevant for the scope of this RWP.

4.2 Early Works Development Application 01

EWDA-01 specifically involves:

- Demolition of a length of an existing shoring wall capping beam along Hickson Road;
- Construction of a new secant pile retention wall and associated rock anchors;
- Excavation of land related to the secant pile retention wall and associated rock anchors;
- Localised remediation related to the secant pile retention wall and associated rock anchors;
- Associated Archaeological Investigations in the area of excavation and works; and
- Sydney Metro / Hickson Road interfaces – perimeter retention wall interface works and rock anchors, and Hickson Road public domain interface works.

In relation to ground disturbance, EWDA-01 will be installing the secant pile wall along a 150 m length. The Guide-wall trench is proposed to be 1.5 m wide by 1.1 m deep. Secant piles will be placed at 1.4 m centres with average diameter of 0.95 m, extending to a depth of approximately 12 m. The total excavated materials

anticipated to be managed under this RWP is ~2,100 m^3. However, the total excavated PASS to be managed under the site's ASSMP is anticipated to be less than 1,000 tonnes.

5. REMEDIAL PLAN

5.1 Remedial Objectives

The objective of this RWP is to provide a technical specification that provides specific details of the work that must be completed to facilitate delivery of the remediation works prescribed by the JBS RAP, specifically for scope of the EWDA-01, and provide information regarding the proposed staging, sequencing and planning of remediation works.

The objectives of the JBS RAP included:

- Make the site suitable, from a contamination perspective, for the proposed Stage 1 Public Domain and long-term residential land use (this includes areas outside the EWDA-01 boundary);
- Ensure that the Central Barangaroo Site does not pose an unacceptable risk to the surrounding environment, including to neighbouring communities; and
- Ensure no unacceptable risk is posed to the natural environment, including groundwater and the water of Darling Harbour.

5.2 Approach

This RWP was developed in accordance with:

- Relevant regulatory guidelines and industry standards including but not limited to:
- The NSW EPA Guidelines for the NSW Site Auditor Scheme (3rd edition) 2017;
- Relevant documents under Section 105 of the *Contaminated Land Management Act 1997* (as amended); and
- The preferred remediation strategies relevant to the EWDA-01 recommended by the JBS RAP.

This RWP was prepared in liaison with Aqualand and the Site Auditor.

5.3 Site Acceptance Criteria

Following review of the JBS RAP, SAR, Human Health and Ecological Risk Assessment (HHERA) and other risk documentation, . only soil SAC have been included in this EWDA-01 RWP given the nature of the works involves installation of secant pile wall. The SAC to be applied during the remediation of the site are based on a combination of typical health investigation levels (HILs) and site-derived risk-based criteria. Both health-based SAC (HB-SAC) and Ecological SAC (E-SAC) have been adopted.

The SAC apply to residual site soils remaining to the east of the perimeter retention walls (saturated and unsaturated).

5.3.1 Human Health Criteria – Soil

EDP have adopted Environmental Risk Sciences Pty Ltd's (EnRiskS)'s *Table 4 – Recalculated Criteria for Imported Fill*, presented in the advice to the Auditor in Appendix F of the SAR.

Table 3: Health Based Site Acceptance Criteria (HB-SAC)

Key Chemicals	Recreational	Resident		Commercial		Gardener	Intrusive Worker
	SSTL Soil (mg/kg)	SSTL Soil (mg/kg)	SSTL GW (mg/L)	SSTL Soil (mg/kg)	SSTL GW (mg/L)	SSTL Soil (mg/kg)	SSTL Soil (mg/kg)
2, 4-dimethylphenol	440	NA	NC	NA	NA	2000	9 300
2-methylnaphthalene	300	NA	51000	NA	NA	1200	6 200
Acenaphthene	910	NA	160000	NA	NA	3800	18 800
Acenaphthylene	910	NA	155000	NA	NA	3800	18 800
Ammonia	450	400000	4050	250000	2300	1200	1 200
Anthracene	4500	NA	500000	NA	NA	18900	94 000
Arsenic	190	NA	NC	NA	NA	1500	4 700
Benzene	120	45	29	19	17	32	2 000
Benzo[a]pyrene TEQs	16	NA	70	NA	NA	6	1 570
Chromium	320	NA	NC	NA	NA	2600	4 500
Copper	10200	NA	NC	NA	NA	240000	290 000
Cresols	2200	NA	NC	NA	NA	10000	46 700
Cyanide	100	NA	NC	NA	NA	2500	3 000
Dibenzofuran	76	NA	12000	NA	NA	320	1 500
Ethylbenzene	520	1100	180	430	100	600	5 500
Fluoranthene	600	NA	30000	NA	NA	2500	12 500
Fluorene	600	NA	85000	NA	NA	2500	15 000
Lead	600 (HIL-C)	NA	NC	NA	NA	600 (HIL-C)	600 (HIL-C)
Naphthalene	250	1600	7	910	4	320	320
Phenanthrene	450	NA	50000	NA	NA	1900	9 400
Phenol	5200	NA	NC	NA	NA	24000	112 000
Pyrene	2300	NA	35000	NA	NA	9500	47 000
Styrene	6500	28000	2100	16000	1200	21000	151 000
Toluene	1400	10400	4400	5200	2500	3500	22 900
Total Trimethylbenzenes	1000	3000	470	1700	270	2000	14 000
TRH C_{10}-C_{14} Aliphatic	1450	9000	1500	5100	850	3000	2 500
TRH C_{10}-C_{14} Aromatic	620	13100	280	7500	160	2100	3 150
TRH C_{15}+ Aliphatic	31500	NA	NC	NA	NA	140000	670 000
TRH C_{15}+ Aromatic	470	NA	NC	NA	NA	2200	10 000
TRH C_6-C_9 Aliphatic	9800	12300	24000	7000	13800	7500	4 200
Xylenes	930	850	160	390	95	660	7 100

SSTL= Site specific trigger level
Grey = not applicable to this RWP

5.3.2 *Ecological Criteria – Soil*

The ecological criteria proposed has been obtained from those developed for other area of the greater Barangaroo site, as the receptors are the same.

Table 4: Ecological Site Acceptance Criteria (E-SAC)

Key Chemical	Ecological Criteria		
	EILs for Root Zone Soils (i.e. protective of phytotoxicity) (mg/kg)	EILs for Saturated Soils protective of surface waters (mg/kg)	EILs for Unsaturated Soils protective of surface waters (mg/kg)
Arsenic	20	4.6	18
Cadmium	3	0.1	0.2
Chromium (VI)	-	18	70
Chromium (total)	190	-	-
Cobalt	-	1.7	6.7
Copper	60	6.8	27
Lead	1 100	46	190
Mercury	1	0.2	0.9
Nickel	30	210	850
Vanadium	-	300	1 200
Zinc	200	20	79
Cyanide (free)	0.9	0.4	1.6
Ammonia	20	<LOR	<LOR
Benzene	0.2	0.1	0.3
Toluene	0.3	<LOR	0.1
Ethylbenzene	0.8	<LOR	0.1
Xylenes	-	<LOR	0.1
Styrene	-	<LOR	0.4
Acenaphthene	29 (sum)	0.4	1.5
Acenaphthylene		0.7	2.7
Anthracene		<LOR	<LOR
Fluorene		1.2	4.7
Naphthalene		1.6	6.4
Phenanthrene		0.1	0.5
2-methylnaphthalene	-	<LOR	<LOR
Benz[a]anthracene	18 (sum)	-	-
Benzo[a]pyrene		0.2	0.7
Benzo[b]fluoranthene		-	-
Benzo[ghi]perylene		-	-
Benzo[k]fluoranthene		-	-
Chrysene		-	-
Dibenz[ah]anthracene		-	-
Fluoranthene		1.2	4.7
Indeno[123cd]pyrene		-	-
Pyrene		<LOR	0.1
Dibensofuran	-	<LOR	<LOR
Phenol	3.8	-	-
Cresols	3.8	<LOR	<LOR
2,4-dimethylpehnol	3.8	<LOR	<LOR

Key Chemical	Ecological Criteria		
	EILs for Root Zone Soils (i.e. protective of phytotoxicity) (mg/kg)	EILs for Saturated Soils protective of surface waters (mg/kg)	EILs for Unsaturated Soils protective of surface waters (mg/kg)
TPH C_6-C_9	210	<LOR	<LOR
TPH C_{10}-C_{14}	150	<LOR	<LOR
TPH C_{15}-C_{36}	300	-	-

LOR – Limit of reporting

5.3.3 *Off-site Disposal Criteria*

Materials that are required to be disposed off-site during the excavation works are to be classified for off-site disposal in accordance with *NSW EPA Waste Classification Guidelines*)(NSW EPA 2014) and managed in accordance with NSW EPA legislation. The relevant Waste Classification Guidelines include *Part 1: Classifying Waste 2014 and Addendum 2016; Part 2: Immobilisation of Waste and Part 4: Acid Sulfate Soils.*

5.3.4 *Imported Materials*

In addition to the SAC described in **Section 5.3** above, all imported materials (if required) must meet appropriate regulatory classifications to allow the lawful placement of the materials on Central Barangaroo. This is expected to include the following:

- Virgin Excavated Natural Material (definition from POEO Act 1997).
- Excavated Natural Materials Order 2014 (NSW EPA).
- Recovered Aggregate Order 2014 (NSW EPA).

5.4 Summarised Scope of Remedial Works Plan

The scope of this RWP is to:

- Detail of the remediation work procedures and methodology that must be followed to execute the remedial works in accordance with the requirements of the JBS RAP;
- Provide preliminary details of the timing and sequencing of work required for compliance with the JBS RAP;
- Outline environmental and health and safety requirements including risk identification and suggested mitigation measures;
- Detail monitoring requirements during remediation works to demonstrate that the works are protective of the environment, the surrounding community and on-site workers;
- Detail materials handling requirements as per the Materials Compliance Management System (MCMS), including stockpiling requirements and hold points as required for the classification of material for re-use or offsite disposal (including stabilisation if required); and
- Detail validation and reporting requirements (VSAQP) required to demonstrate the success of the remediation program.

5.5 Remediation Area and Extent

The remediation area is considered the entire EWDA-01 retaining structure as currently defined by the proposed secant pile wall in **Appendix A - Figure 3**. It is noted that the design may be subject to change, which may vary the exact position of the retaining structures, though unlikely to result in a required change to this RWP. As the EWDA-01 will impact on contaminated materials, the JBS RAP and this RWP have been prepared to ensure the site was developed in a manner that ensures the ongoing suitability of the site. The

extent of remediation is the fill materials proposed for removal during the EWDA-01 retention wall and anchoring activities.

5.6 Remedial Options

Several remedial options were considered by JBS and discussed in Table 6.3 of the JBS RAP. The preferred remedial options are outlined below.

5.6.1 Preferred Remedial Option

With consideration to NSW EPA's hierarchy for remediation, and to the site-specific contaminants and environmental setting, the following remediation/management approach has been adopted in the RWP. Where the proposed EWDA-01 works vary from the assumptions considered in the JBS RAP, these are noted in italics below the section:

Shallow (<10m) and Deep (>10m) Tar Impacted Material

Remediation of any shallow and deep tar impacted material (via excavation and off-site disposal) will be undertaken to the extent practicable and necessary for the EWDA-01 proposed works. The identified extent of shallow tar impacted materials occurs within the extent of the proposed basement excavation at the south of the Central Barangaroo Site, with the known tar impacted materials removed during remediation of the Declaration Area. It is not expected that tar impacted material will be disturbed during the EWDA-01 excavations.

Note: No tar has been identified in the EWDA-01 footprint. This remediation option will be adopted in the remediation contingency strategy outlined in **Section 8.2**.

Asbestos

A single location (BH401) observed asbestos impacts to fill. This area will not be disturbed during EWDA-01.

Note: BH401 is outside the boundary of the EWDA-01 footprint and located within Block 5. Asbestos is a known contaminant of concern in the greater Barangaroo area and will be managed as outlined in **Section 8.2.2**.

5.7 Remediation Approach

The remediation approach to be adopted for the EWDA-01 is to excavate and remove all materials required for the installation of the retention structure. All materials removed will be classified and disposed off-site in accordance with NSW EPA 2014.

Imported and beneficially reused materials (if applicable) will be validated against the SAC prior to acceptance/placement on the site (see **Section 5.3.4**).

. While a LTEMP was contemplated in the RAP, the RWP and proposed design intends on delivering the site without any long-term monitoring or management requirements. As such, the requirement for a LTEMP at this stage is unlikely

5.8 Regulatory and Planning Requirements

The RAP developed by JBS was prepared in accordance with the Director General requirements (DGRs) relating to the Project Application SSD_5374. Other applicable legislation has been discussed below.

5.8.1 *Environmental Planning and Assessment Act 1979*

The Barangaroo Site is listed as a State Significant Site within Schedule 3 of the *State Environmental Planning Policy (Major Projects) 2005*. As such, development approval for the project falls under the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Since the works have been assessed under Part 3A of the EP&A Act, the remediation works are ancillary to other development, and the consent authority is the Director General of the NSW Department of Planning and Infrastructure.

5.8.2 *Protection of the Environment Operations Act 1997 (POEO)*

No waste materials, other than VENM or ENM (or other resource recovery exempt materials) are to be imported onto the Central Barangaroo Site. As such, it is not expected that any licensing requirements in relation to waste/resource recovery are required. Materials requiring removal from site will be undertaken in accordance with the requirements of the *Protection of Environment Operations Act 1997* (POEO Act), including ensuring:

- Reuse of materials wherever practicable;
- Generation of waste is minimised;
- Waste is classified in accordance with relevant guidelines;
- Waste is transported by an appropriately licensed transporter;
- Movement of the waste materials is recorded appropriately;
- Waste is disposed to appropriately licensed facilities;
- Records of waste disposal are maintained by the Remediation Contractor and copies are provided to the Site Auditor; and
- Other materials are removed to facilities lawfully able to accept such materials.

Any waters released during EWDA-01 shall not result in pollution of waters and be undertaken in accordance with the EPL (Environment Protection Licence) held by Barangaroo Development Authority (BDA – EPL #13336 or EWDA-01 specific EPL as required). Water is expected to require treatment prior to discharge.

5.8.3 *Protection of the Environment Operations (Waste) Regulation 2014*

The regulations make requirements relating to non-licensed waste activities and waste transporting. The proposed works on the Central Barangaroo Site will not require to be licensed. Section 112 of the Regulation requires that wastes are stored in an environmentally safe manner and Section 70 of the Regulation stipulates that vehicles used to transport waste must be covered when loaded.

5.8.4 *Waste Avoidance and Resource Recovery Act 2001*

Section 3 of the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) includes the following objectives:

- To encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development;
- To ensure that resource management options are considered against a hierarchy of the following order:
    - Avoidance of unnecessary resource consumption;
    - Resource recovery (including reuse, reprocessing, recycling and energy recovery); and
    - Disposal.
- To provide for the continual reduction in waste generation;
- To minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste;
- To ensure that industry shares with the community the responsibility for reducing and dealing with waste;

- To ensure the efficient funding of waste and resource management planning, programs and service delivery;
- To achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis; and
- To assist in the achievement of the objectives of the POEO Act.

Material re-use will occur in preference to disposal in accordance with the requirements of s.3(b) of the WARR Act. The avoidance of unnecessary resource consumption and the reduction in waste generation has been achieved through a risk-based approach in setting remediation / site acceptability standards for the site. The consideration of future site uses in setting these criteria, with actual measured contaminant distribution across the site has reduced the extent of the required remediation works.

5.8.5 *Waste Classification Guidelines (NSW EPA 2014)*

All wastes generated and proposed to be disposed off-site shall be assessed, classified and managed in accordance with the NSW EPA 2014.

5.8.6 *Asbestos*

All works undertaken at the site must be conducted in accordance with the site-specific Asbestos Management Plan (AMP). The AMP dictates the controls to be implements should asbestos be encountered.

In addition to the AMP, in the event that asbestos impacted fill materials are encountered, all related works and the disposal of asbestos waste shall be undertaken in accordance with the requirements of the:

- *NSW Work Health & Safety Act 2011;*
- *NSW Work Health & Safety Regulation 2017*;
- *NSW Code of Practice: How to Manage and Control Asbestos in the Workplace 2019;*
- *NSW Code of Practice: How to Safely Remove Asbestos 2019*;
- *Waste Classification Guidelines: Part 1: Classifying Waste* (NSW EPA 2014);
- JBS (2013), Remedial Action Plan – Central Barangaroo 42021 – 51725 (Rev H);
- *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM 2013); and
- Driscoll, T. (2013), The use of Asbestos-contaminated Soils on Barangaroo.

An asbestos management plan *Asbestos in Soil Management Plan EWDA-01, Central Barangaroo, Hickson Road, Millers Point NSW* (EDP AMP, 2022) has been developed for EWDA-01 and has been included as **Appendix C**.

5.9 Remediation Scope of Works

The scope of remediation works comprises the following stages:

- Finalisation and approval of this RWP;
- Develop a Remedial Works Contingency Plan (RWCP – **Section 8**);
- Provide additional environment and safety information **(Sections 6 & 10)** to aid the development of site wide Construction Environmental Management Plan (CEMP), AMP and Work, Health and Safety Plan (WHS Plan);
- Develop the Validation, Sampling, Analysis and Quality Plan (VSAQP – **Section 9**) into this RWP;
- Conduct the remediation works to the extent described in **Section 5.10** of this RWP;
- Conduct ongoing validation of remedial works as outlined in the VSAQP;
- Prepare a validation report at the completion of remediation, outlining the performance of the remediation works against the criteria in the RWP; and
- Based on outcomes of the remedial works, determine the requirements for a long-term environmental management plan. This will be determined at the completion of remediation and validation works.

5.10 Remediation Methodology

The methodologies to be undertaken during the EWDA-01 for the various components of the remediation works are presented in detail in the Sections below.

5.10.1 Remediation Schedule

The proposed construction schedule to be determined by Aqualand.

5.10.2 Site Establishment and Enabling Works

Prior to commencement of remedial works the following would be undertaken:

- Finalisation of site-wide CEMP (separate document);
- Finalisation of WHS Plan;
- Survey and ground marking of the EWDA-01 boundaries;
- Delineation of the EWDA-01 boundaries from other site areas by means of jersey kerb, chain-wire fence or other delineating feature and hoarding at boundary;
- Setup of all appropriate safety and environmental controls;
- Setup of site sheds and amenities buildings; and
- Commence contractor briefing and inductions.

Termination and re-location of in-ground services

The location of all site services shall be identified and relocated as necessary if expected to be impacted by the proposed works. The requirement for site services to be connected to new site sheds shall be assessed and connected as required. It is expected that stormwater diversion works will be required to re-direct services.

Removal of Concrete

The EDWA-01 area is currently covered with concrete hardstand that will require cutting and breaking up before any groundworks can occur. Concrete will be temporarily stored in stockpile to facilitate expedient load-out. Concrete and road base will be removed together offsite to a facility licensed for the purpose of resource recovery.

Concrete will be progressively removed as required throughout the remediation and construction program. Initial concrete removal will be to facilitate the demolishing of the existing guide wall for the Barangaroo Metro, then further excavation of surface concrete to allow installation of the new guide wall. Other concreted areas will remain as hardstand stockpiling areas (as required in **Section 7.3.2**).

All waste will be managed in accordance with the MCMS.

5.10.3 Piling and Rock Anchors

The number, size and depth of the required piles will be determined following completion of geotechnical assessments and on finalisation of the construction design. Secant piles are proposed at 1.4 m centres with an approximate diameter of 0.95 m. Rock anchoring is required as a temporary support to the retention wall prior to basement slab construction. Anchoring will be undertaken as excavation adjacent the decant wall progresses and the majority of anchors are outside the scope of the EWDA-01. Rock anchoring spoil is expected to be similar in nature to piling spoil, being saturated. Piling and rock anchor spoil will be managed in accordance with MCMS in **Sections 7.3.2, 7.2.1** and the VSAQP in **Section 9.2.2.**

5.10.4 Management of Excavated Materials

Treatment

The EWDA-01 site area soils are not expected to contain coal tar materials requiring treatment or stabilisation. Should tar materials be identified, the processes described in **Section 8.2.1** must be followed. Stabilisation for other contaminants is not of expected to be required, though may be considered for the PAH elevated hotspots. Some processing/treatment of fill soils to remove large materials (i.e. brick, concrete, sandstone etc.) may potentially be carried out. This will be at the discretion of the Remediation Contractor.

Validation Waste Classification

All waste materials leaving the site must be appropriately classified. The waste classification protocols are described in the MCMS in **Section 7** and the VSAQP in **Section 8**.

Offsite Disposal

Following appropriate classification, it is expected that all waste soils generated during the EWDA-01 will require off-site disposal. Details of the classification of materials for off-site disposal will be provided by the Remediation Consultant to the disposal contractor/facility. No soil materials shall be disposed off-site until classification data is provided by the Remediation Consultant. Approvals to accept the appropriate classification of waste at a landfill will be reviewed by the Remediation Consultant prior to any material being disposed from the site. The disposal certificates will be presented in the validation report for the EWDA-01. The procedure for waste classification is prescribed in the MCMS.

Offsite Reuse

Should the findings of *in situ*, *ex situ* and additional visual assessments required by the MCMS demonstrate that the materials have a potential for reuse offsite, a report must be prepared by the Remediation Consultant outlining the resource recovery mechanisms through which it can be reused, or a specific resource recovery order/exemption will need to be obtained from the NSW EPA. This is determined to be separate from the potential reuse opportunities allowed by the receiving landfills Environmental Protection Licence. The procedure for the determination of offsite reuse is prescribed in the MCMS.

Onsite Reuse

There is a potential for some materials to be retained for reuse on site. The mechanism for reuse is described in the MCMS, and involves consideration of chemical and visual data together with the proposed reuse position (i.e. engineering fill or landscape). Validation controls around the reuse of soils is provided in the MCMS.

5.10.5 Site De-Establishment

Reinstatement of Services

Following completion of surface works, services may require reinstatement from their temporary positions. New services will be connected to the future construction.

5.10.6 Site Remediation and Validation Reporting

Following the completion of the remediation works, a site remediation and validation report (SRVP) will be compiled detailing the remediation methodology undertaken and outcomes of the works including the results for all validation assessment, classification or other sampling events conducted throughout the remediation. The validation report will include any recommendations on the requirements for future monitoring or management. Further requirements for this report are detailed in **Section 11**. Validation for the EWDA-01 will be incorporated into a greater validation report for Central Barangaroo.

Validation of the remedial works will be undertaken to demonstrate that the works were undertaken in accordance with the requirements of this RWP. Details of the validation program are provided in **Section 8.** Validation works are expected to include interim validation reports at key milestones of the construction, to ensure that work progresses towards the remediation goals. An independent Site Audit, completed by a Site Auditor accredited by the NSW EPA, will be conducted to review:

- The interim validation report(s) that will be prepared for EWDA-01; and
- Materials tracking and compliance reports.

It is expected that an interim advice will be received from the appointed Site Auditor, as the final Site Audit Statement cannot be prepared until the wider Central Barangaroo works are completed.

6. ENVIRONMENTAL MANAGEMENT CONSIDERATIONS

Disturbance of sub-surface environments for the purpose of remediation brings with it the potential of risk to the surrounding environment, associated with migration of contamination off-site or within a site, as well as to site personnel. To ensure the protection of the environment, measures need to be implemented during the remediation of a contaminated site. Further to typical environmental controls required for construction sites, EDP advised the following considerations for the EWDA-01 to be included in the development of the CEMP.

6.1 Ambient Air Monitoring

During the remediation works the ambient air surrounding the works area should be constantly monitored using a calibrated PID for the presence of volatile organic compounds and a LEL meter will be used to measure the potential for an explosive atmosphere to be present. Details of ambient air monitoring should be included in the site-wide CEMP and WHS Plan.

Due to the potential risk of the presence of asbestos, air monitoring must also include monitoring for airborne asbestos fibres. Details of asbestos monitoring requirements are contained in the site-specific AMP included in Appendix C.

6.2 Validation Against CEMP

The CEMP should include the validation process whereby compliance with the CEMP will be measured. The findings of the CEMP compliance validation will be included in the overall remediation validation reports prepared for Site. The hold point and validation requirement are provided in **Table 6**.

Table 5: Hold Point 1: Commencement of EWDA-01 Construction Activities

HOLD POINT 1	
Process held:	Commencement of EWDA-01 construction activities
Acceptance criteria:	Site-specific CEMP has been prepared. All site environmental controls are implemented at the site in accordance with the approved CEMP.
Release of hold point:	Remediation Contractor and Remediation Consultant issue a release of this hold point following review of site environmental controls.

7. MATERIALS COMPLIANCE MANAGEMENT SYSTEM

The purpose of the materials compliance management system (MCMS) is to ensure all materials imported during the site works meet the SAC, and that all materials removed during the EWDA-01 are appropriately classified and removed to appropriately licensed facilities. Further, this MCMS provides a well-documented system for tracking on-site material movements to ensure materials are placed or disposed appropriately.

Temporary onsite storage is required where in situ data is insufficient for pre-classification to allow a direct load-out of the waste, in order for further ex-situ waste classification sampling to be conducted.

Material classification and verification will be undertaken prior to materials being removed from or imported into the site. All classification and verification processes will be conducted and recorded by the Remediation Consultant. This MCMS is divided into the following Sections:

- Roles and Responsibilities.
- Material Classification Procedure.
- Material Tracking.
- Material Quality.

7.1 Responsibilities

Table 6 below outlines the roles and responsibilities for the implementation of this MCMS.

Table 6: Roles and Responsibilities for MCMS

Role	Responsibilities
Remediation Contractor	▪ Implementation of on-site procedures and protocols outlined in this MCMS document. ▪ Ensure all subcontractors and consultants involved in the works are made aware of the processes and procedures within this MCMS. ▪ The movement of material after verification from the remediation consultant is received. ▪ Obtain and retain documentation for waste disposal, imported materials, material movements and stockpile management.
Remediation Consultant	▪ Classification and verification of materials to be used in regard to the SAC. ▪ Maintain waste tracking and quality documents imported and exported materials, for inclusion in the final site validation report.
Site Auditor	▪ Review and approve the MCMS. ▪ Review and approve any ongoing amendments made to the MCMS.

7.2 Material Classification Procedure

Material classifications for site materials is proposed to either be *in situ* or *ex situ*. This is due to the availability and reliability of historical data together with supplementary data collected during early works. The procedure for both classification options has been provided in this MCMS. Where the *in-situ* data is insufficient to allow for pre-classification, materials will be classified using the Stockpile Classification methodology described in **Section 7.2.2.**

Note: The current dataset does not allow for an in-situ classification to be prepared. Should an in-situ classification be required, a Sampling, Analysis and Quality Plan (SAQP) must be developed by the Remediation Consultant. This SAQP should be reviewed by the Site Auditor and potentially NSW EPA to ensure it will provide sufficient information to characterise the site, and include appropriate investigation techniques for all contaminants of concern. For the purpose of this MCMS, all references to in situ protocols are assuming the SAQP has been implemented and a classification obtained.

For all materials handled as part of the remedial works, material quality must be confirmed. Material quality must be confirmed through a combination of reviewing existing analytical data, material observation, and additional soil sampling and analysis (if required).

The following **Table 7** outlines the naming of various material types.

Table 7: Unique Material Identification IDs

Material Source	Unique Identifier
Retention Wall	Retention wall stockpile number
Bulk Excavation	Excavation lot number – future works

Due to the high moisture nature of piling material, temporary stockpiling is required in accordance with **Section 7.3.2.** These materials are proposed for *ex situ* classification.

7.2.1 *EWDA-01 In Situ Classification*

Pre-classification utilising *in situ* data is proposed where suitable data sets are available. At the time of this RWP it is proposed that additional *in situ* classification investigation works will be required prior to the following procedure being implemented. It is expected that the *in situ* classification will require a minimum sampling density of 1:250 m^3 to allow the calculation of 95%UCL average as described in NEPM 2013 Schedule B2 and *VIC EPA IWRG 702 2009*. For in-situ assessment, as the total volume of soil to be generated is expected to be in excess of 200m^3, the sampling frequency is provided in the VSAQP in **Section 9** is to be adopted.

In situ pre-classification allows for a shorter process time from excavation to offsite disposal. The pre-classification will be a chemical pre-classification in accordance with the NSW EPA 2014, with wastes assigned one of the classifications described in **Table 9.**

Further to the chemical pre-classification, in situ materials require ex situ visual assessment to provide further verification that they are free from asbestos, hazardous wastes (including coal tar), acid sulfate soils or other unexpected finds. In situ materials will be drawn into short-term temporary stockpiles for inspection. Each stockpile created from the EWDA-01 excavations will be assigned a unique stockpile ID. This ID will track the quality and movement of the stockpile while on site, and through to final disposal or placement.

The inspection process will commence at the beginning of excavation through to stockpile creation. All observations will be recorded by the Remediation Consultant on the Stockpile ITP and the stockpile will not be removed from site or reused on site until a 'Stockpile Release' form has been approved.

The visual assessment will observe the nature of the excavated materials, noting the texture, colour odour and any evidence of contamination. The inspection will note the quantity (approximate percentage) and type of foreign materials present and the presence of asbestos, tar-impacted materials or any unexpected finds.

Materials determined suitable to be reused on site will be tracked in accordance with **Section 7.3.4.**

Materials identified for offsite disposal will be tracked in accordance with **Section 7.3.3**.

Records will be maintained by the Remediation Contractor of all forms and Hold Point releases.

Table 8: Hold Point 4: Stockpile Release

HOLD POINT 4	
Process held:	Removal of excavation stockpile from site.
Acceptance criteria:	Remediation Consultant verifies the visual observations as recorded in the Stockpile ITP, confirming the final waste classification. Sth Stockpile ITP must identify the pile numbers that are contained in the classified stockpile.
Release of hold point:	Completion and signoff of 'Stockpile Release' by Remediation Consultant.

7.2.2 *EWDA-01 Ex Situ Stockpile Classification*

Materials that do not have an *in situ* pre-classification are to be stockpiled on site to allow sampling, analysis and subsequent classification by the Remediation Consultant. To supplement the existing *in situ* data, an *ex situ* validation frequency must be adopted to ensure a total analysis frequency of 1:250 m^3. In the event that *in situ*

assessment is not undertaken, *ex-situ* stockpile material should be sampled at a higher frequency to enable appropriate classification. The sampling frequency is provided in the VSAQP in **Section 9**.

Once sampling and analysis has been completed (in accordance with the VSAQP, **Section 9**), all materials will be assigned an appropriate waste classification, as detailed below.

Table 9: Waste Classification and Disposal

Waste Classification	Description
General Solid Waste	Materials classified as General Solid Waste (GSW) in accordance with the NSW EPA 2014 will be transported to and disposed of at a lawfully licensed facility to accept this waste. Materials classified as GSW must either have all results less than the contaminant threshold (CT) for GSW criteria (<CT1) of Table 1 of the waste classification guidelines, or less than the specific contaminant concentration (SCC) and associated leachable criteria (TCLP) for GSW (<SCC1 and <TCLP1) in accordance with Table 2. Some GSW materials may be considered suitable for the licensed facility to recycle them. This is only is the materials meet the chemical criteria of CT1, plus the additional analytical criteria and acceptance limits of the environmental protection license held by the facility.
Restricted Solid Waste	Materials classified as Restricted Solid Waste (RSW) in accordance with the NSW EPA 2014 will be transported to and disposed of at a lawfully licensed facility to accept this waste.
Hazardous Waste	Materials classified as Hazardous Waste (HW) in accordance with the NSW EPA 2014 will be transported to and disposed of at a lawfully licensed facility to accept this waste. HW materials must be disposed to a facility with treatment capacity to stabilise the waste, after which a lower classification can be assigned prior to landfill disposal. HW materials cannot be directly placed in landfill cells.
Tar Containing Waste	Coal tar or coal tar pitch waste (being the tarry residue from the heating, processing or burning of coal or coke) comprising of more than 1% by weight of coal tar or coal tar pitch waste has been pre-classified by the EPA as Hazardous Waste in accordance with the NSW EPA 2014. This material will be transported to and disposed of at a lawfully licensed facility to accept this waste, with proven expertise and capacity to stabilise tar contaminants prior to disposal.
Special Waste (Asbestos Waste)	Materials confirmed to contain asbestos (bonded or friable) will be classified as special waste (asbestos waste). In accordance with the NSW EPA 2014, this material must also have a chemical classification, as outlined above. The chemical classification will determine the offsite disposal location of the material. All materials will be transported to and disposed of at a lawfully licensed facility to accept asbestos waste.
Virgin Excavated Natural Material (VENM)	VENM is defined by the POEO Act as natural material (such as clay, gravel, sand, soil or rock fines) that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities and that does not contain any sulfidic ores or soils or any other waste. It is expected that some sandstone rock materials beneath the eastern portions of the site may meet this definition.
Excavated Natural Material (ENM)	ENM includes naturally occurring rock and soil that has been excavated from the ground, contain at least 98% (by weight) natural materials and do not meet the definition of VENM. Fill materials meeting this description, may be suitable for classification as ENM. ENM materials must be assessed in compliance with and as compliant to the NSW EPA Excavated Natural Material Order 2014 (NSW ENM Order).
Site-Specific Resource Recovery Exemption	Materials that do not meet an existing resource recovery order (RRO) though might be considered to have a beneficial land application, may be considered for a site-specific resource recover order and exemption. This requires consideration of the physical and chemical status of the waste, and an application made to NSW EPA outlining the proposed reuse opportunity, risk assessment and demonstrated beneficial reuse characteristics.

Following the provision of the final classification, a Stockpile Release is required prior to remove from or reuse on site, as per the Hold Point described in **Table 8.**

7.2.3 *Quality of Imported Material*

Prior to the importation of any materials onto site, they must first be confirmed as fit for purpose. Materials imported on site are split into two categories: Engineering/General Fill and Landscaping. Materials proposed for importation must be compared against set criteria before they can be considered fit for purpose.

Only material which meets the definition of VENM, ENM and recovered aggregates or as defined under relevant regulations and approved for import by NSW EPA and the Site Auditor, will be imported to site. No onsite material (or material from the greater Barangaroo Site) is proposed to be reused during the EWDA-01, though during excavation, materials may be identified for later beneficial reuse.

For VENM and ENM, the source site(s) and material type(s) shall each be inspected by the Remediation Consultant and confirm that the site history indicates the site is uncontaminated and that the soil proposed to be excavated is natural, visually clean, odour free and no chemical evidence of contamination is recorded. Recovered aggregates supported by approved NSW EPA Orders and Exemptions should also be inspected to confirm the material is as per the material description and has appropriate supporting reports or documentation.

Any requirements, such as specific sampling/analytical requirements in accordance with the NSW ENM Order, must be reviewed by the Remediation Consultant, to ensure compliance with the relevant regulations. If the data is insufficient in accordance with the relevant DQIs (refer to **Section 9.6.3**), the materials will not be accepted onto site until additional data has been collected in accordance with the requirements of this RWP, and relevant regulatory requirements have been achieved to the satisfaction of the Remediation Consultant.

Regular inspections of imported materials accepted for importation onto site shall be undertaken by the Remediation Consultant. This is required to ensure that imported materials meet the description of the material classification documentation. In the event that imported materials are observed by the Remediation Consultant to be inconsistent with that described in the documentation and/or that observed by the Remediation Consultant at the source site, the importation of soils from the specific source site(s) shall be suspended until such time as confirmatory sampling/analyses is to confirm the suitability of the materials for acceptance onto site.

Should the imported materials be rejected or suspended from use, the supplier will be contacted, and alternative sources will be sought. The process of rejection or suspension will be documented in the validation report for any material brought onto site.

No materials will be imported to site until the release of the Hold Point described in **Table 10.**

Engineering/General Fill

For VENM, a minimum of three samples must be collected and analysed to characterise each source site. For recycled (non-VENM) materials, an ongoing validation frequency of 1:250 m^3 will be adopted. This is required to validate the material as suitable for the proposed use. Materials must be analysed for chemical and physical properties in accordance with any relevant resource recovery order, the SAC, source specific contaminants of concern and specification compliance unique for the engineering application (i.e. drainage, structural, bearing or other).

Analysis must be undertaken at suitable NATA accredited laboratory, with results to be reviewed and reported by the Remediation Consultant. Additional sampling densities may apply for any materials covered by the NSW EPA resource recover order.

Landscaping Material

As with the Engineering/General Fill requirements outlined above, a minimum of three samples must be collected and analysed to characterise each source to ensure compliance with the SAC. Following initial approval, a frequency of 1:250 m^3 will be adopted for any material containing waste derived products (soils or mulches). Additional analysis will also be required to ensure that the materials are suitable for the proposed landscaping use in accordance with a landscape soil specification, to be prepared by EDP.

Analysis must be undertaken at suitable NATA accredited laboratory, with results to be reviewed and reported by the Remediation Consultant. Additional sampling densities may apply for any materials covered by the NSW EPA resource recover order.

7.3 Material Tracking

All materials removed from or imported to site as part of the remedial works must be tracked in order to verify that all materials are fit for purpose, appropriately classified and handled correctly. The material tracking system will detail origin, destination and quality of all materials handled as part of the required remediation. The system will include tracking of: haulage vehicle registration numbers, estimated volumes, tip dockets, landfill recorded volumes and confirmed disposal classification of all materials. All materials handled will be tracked on the job specific Waste Tracking Register developed as part of this RWP, and Material Tracking Forms detailed in **Section 7.3.6**.

Quality assurance will be tracked via robust documentation processes contained in this MCMS.

7.3.1 Importing Materials

Prior to materials being accepted onto site, the following compliance procedure will be implemented:

- The source site(s) and material type(s) shall each be inspected by the Remediation Consultant and confirm that the site history indicates the site is uncontaminated and that the soil proposed to be excavated is natural, visually clean, odour free and is undisturbed. These materials must be tracked utilising 'Importation & Placement Form' detailed in **Section 7.3.6**. Materials that can't have their origin confirmed by a reputable report should not be accepted onto site;
- The documentation relating to the materials shall be reviewed by the Remediation Consultant and assessed against the requirements outlined in **Section 5.3.4** of this RWP;
- Records of the vertical and lateral placement must be made for all materials that are imported to site as part of the remediation works. Details of the imported material and material placement shall be recorded in the 'Importation & Placement Form', detailed in **Section 7.3.6**. ; and
- Placement information will include GPS co-ordinates (including X, Y and Z).

Table 10: Hold Point 5: Approval of Proposed Imported Material

HOLD POINT 5	
Process held:	Importation of Material
Acceptance criteria:	The material source and previous assessments have been deemed acceptable by the Remediation Consultant. Analysis confirms materials meet the SAC and any applicable regulatory requirements. Source has been inspected by the Remediation Consultant.
Release of hold point:	Completion and signoff of 'Importation & Placement Form' up to item 11.

7.3.2 Stockpiling of Materials

The temporary stockpiling of excavated materials will be required prior to the loading and offsite disposal of site-derived materials. All stockpiled materials must be tracked as part of the materials tracking system to ensure materials are disposed of at an appropriate destination. Bulk excavation materials are proposed for

stockpiling within the excavation zone. Early works and diaphragm wall materials will be stockpiled on existing hardstand.

A designated stockpiling area must be established at the site for the wet drilling/excavation spoil. This area should be within an area of existing hardstand surface that is clear of rubbish, rubble, structures and vegetation. Appropriate drainage systems as well as sediment and erosion control measures should be installed within this area, and maintained throughout the project. These measures should include diversion drains and bunds, as well as silt fencing and hay bales where necessary.

A buffer zone must be established around each stockpile to enable easy access and prevent cross contamination between stockpiles. The whole stockpile area should have a buffer zone to prevent impact on surrounding facilities.

Stockpiles must be tracked using unique stockpile numbering. For each stockpile, all details should be recorded in a 'Stockpile ITP' detailed in **Section 7.3.6.** The site source (i.e. bulk excavation grid, diaphragm wall panel number, pile number etc.) will be recorded on this form.

Hold Point 2: Signoff of stockpile bay construction by Remediation Contractor.

7.3.3 Offsite Disposal of Materials

All site-derived materials that require offsite disposal will be classified, managed and disposed of in accordance with the NSW EPA 2014. Where materials have a resource recovery potential, these will be assessed in accordance with **Section 7.3.4**.

An appropriate waste classification is required to ensure that all materials are disposed of at facilities lawfully able to accept the materials. An outline of potential waste classifications and the appropriate disposal facility are outlined in **Section 7.2.1**.

Stockpiled materials generated during EWDA-01 will be classified following the procedure outlined in **Section 7.3.2.**

Following classification, all materials proposed for offsite disposal must be tracked using 'Offsite Disposal Form' described in **Section 7.3.6.**

Hold Point 3: Signoff of waste classification certificate and offsite disposal form by Remediation Consultant.

7.3.4 Reuse of Materials

Reuse of site-derived materials is not expected to be possible for EWDA-01. The procedure below outlines the steps required should reuse of materials become possible onsite, or if an offsite resource recovery potential is identified.

Initial processing of materials will be in accordance with standard bulk excavation methods. Materials will be approved for lot release in accordance with **Section 7.2**. Materials will be stockpiled for visual assessment in accordance with **Section 7.2.1**.

On-site Reuse

The on-site reuse of excavated materials requires a similar assessment as would assign a waste classification, though with consideration of the SAC. Following the completion of chemical assessment in accordance with **Sections 7.2.1** (*in situ*) **or Section 7.2.2** (*ex situ*), the results will be compared by the Remediation Consultant against the SAC provided in **Section 5.3.** If compliant, and an on-site opportunity exists (expected to be general fill), the Remediation Consultant must track the removal and placement and reuse of the material using the 'Importation & Placement Form'.

Table 11: Hold Point 6: On-site Reuse of Site Materials

HOLD POINT 6	
Process held:	On-site Reuse of Site Material
Acceptance criteria:	The material source area and historical data have been deemed acceptable by the Remediation Consultant in consideration of the SAC. Analysis confirms materials meet the SAC and any applicable regulatory requirements.
Release of hold point:	Completion and signoff of 'Importation & Placement Form'.

Off-site Reuse

Following the classification procedures in **Section 7.2,** materials may have been determined suitable for off-site reuse under either an existing RRO, a site-specific RRO, or as VENM. These materials are not required to be disposed at a licensed waste facility, though require tracking both in accordance with this MCMS and the applicable RRO.

Off-site reuse will be tracked using the 'Offsite Disposal Form' described in **Section 7.3.6**.

In addition, the Remediation Consultant must prepare a classification letter, outlining the compliance with the VENM definition, of appropriate RRO, including details of all sampling and analysis frequencies and results to justify the classification.

Table 12: Hold Point 7: Off-site Reuse of Site Materials

HOLD POINT 7	
Process held:	Off-site Reuse of Site Material
Acceptance criteria:	The material source area and historical data have been deemed acceptable by the Remediation Consultant in consideration of either existing RRO or a specific RRO/RRE has been obtained from NSW EPA. Analysis confirms materials meet the relevant RRO and any applicable regulatory requirements.
Release of hold point:	Completion and signoff of 'Stockpile ITP', 'Offsite Disposal Form' and Accompanied classification letter.

7.3.5 Transportation of Materials

The following procedures will be adhered to for the transportation of all materials leaving site:

- Trucks transporting site-won materials will be covered and decontaminated in the wheel wash facility prior exiting the excavation area and leaving site;
- Trucks carrying contaminated materials will not be permitted to drive over areas of site which have previously been excavated, validated or reinstated;
- Trucks transporting contaminated materials will be covered prior to exiting site, and will remain covered until authorised to unload at the intended destination;
- Should saturated materials require transportation, trucks transporting these materials must be fitted with seals to ensure that the movement of these materials is undertaken appropriately. The integrity of the seals will be inspected and tested prior to commencement of each day's haulage works;
- Trucks will exit site through predetermined exit points and will follow a predetermined transport route to the destination; and
- Empty trucks will return directly to the excavation area along predetermined haul roads.

This procedure will be documented in the CEMP, and compliance monitoring within the validation processes of the CEMP.

7.3.6 *Materials Tracking Forms*

Standard forms have been prepared as part of the material tracking system to ensure materials are handled in compliance with this RWP. The forms and their function shall include, but not be limited to:

- **Stockpile ITP**: This Inspection and Test Protocol (ITP) will provide a record of all material stockpiled at site. The form must detail the date, material type, estimated stockpile quantity, origin, inspection and sampling details and waste classification report details. This form will be used where stockpiles are generated from on-site activities. Site materials intended for reuse must also use this form. Details of the records will be retained by the Remediation Consultant and Remediation Contractor.
- **Offsite Disposal Form:** Provide a record of all material removed from site, and provide detail on the material type, quantity, origin, disposal destination and waste classification. The form must detail approval by a Remediation Consultant that the material meets the disposal requirements. This form is to be used following visual assessment and completed Stockpile ITP.
- **Importation & Placement Form:** Provide records of all material imported into or reused on site, and provide detail on the date, source, material type, estimated quantity, origin, intended use, classification and vertical and lateral placement.

7.3.7 *Unexpected Finds*

Should unexpected contents be observed within the materials proposed for offsite disposal, additional sampling is required in order to ensure appropriate classification. For materials containing unexpected finds, additional analysis is required at a rate of 1:25 m^3 or as determined by the Remediation Consultant. Unexpected finds must be managed in accordance with **Section 8.3**, and assessed under quality control procedures in accordance with **Section 8**. The required analysis will depend on the nature of the find, and is to be determined by the Remediation Consultant.

7.4 Non-Conformances

Although this MCMS has been developed to ensure compliance with site criteria and regulatory guidelines, non-conformances may occur due to the incorrect classification, disposal or placement of materials. Should review of tracking information identify that a breach of the MCMS has occurred, actions described in the RWCP (**Section 8**) will be implemented.

7.5 Records

All records relating to material movement, classification, disposal, importation and placement must be retained and updated daily into the MCMS waste tracking register.

8. REMEDIATION WORKS CONTINGENCY PLAN (RWCP)

8.1 Overview

The purpose of the Remediation Works Contingency Plan (RWCP) is to outline procedures for the identification and management of unexpected issues or events that may occur during the remediation works.

This section outlines both expected and unexpected finds. Expected finds include encountering those substances identified through historical account for the site, and experience in the greater Barangaroo area. Unexpected finds include events that have not been previously encountered in other areas of the greater Barangaroo area or through environmental investigations.

Expected finds can be managed with minimum disruptions by appropriate planning. As unforeseen sub-surface conditions impose a degree of uncertainty for the remediation works, potential risks and/or unexpected issues or events have been identified as follows:

- Unexpected finds, including extensive liquid chemical contamination;
- Variation of contaminant characteristics or identification of unanticipated contaminants and materials;
- Generation of unacceptable levels of dust;
- Release of unacceptable levels of volatile gases during the excavation works;
- Generation of unacceptable odours from the excavation works;
- Generation of unacceptable noise and/or vibration levels during site works; and
- Spills and leaks of hazardous materials.

If any of the above or other events occur, the contingency procedure to be adopted is as follows:

- Remediation Consultant would undertake a preliminary assessment and determine if works could continue or would need to cease in order to determine changes to methodologies;
- Remediation Consultant would notify Aqualand and provide details of any changes to work methods required;
- If required, Remediation Consultant would conduct a detailed assessment (including sampling and analysis if required) and determine remedial/management actions;
- Remediation Consultant would direct Contractors to undertake any works required to secure the area, changes to methods or to continue.

8.2 Expected Finds/Events

The following sections outline those situations that have a likelihood of occurring during the remediation works.

8.2.1 Identification of Tar Impacted Materials

Though no tar has previously been identified in the EWDA-01 area, given the former history of the site and the occurrence of coal tar to the south of Central Barangaroo, it is treated as an expected find. Tar found at the base of the proposed basement excavation will require over excavation.

Any suspected tar impacted materials (i.e. based on odours and discolouration) must be segregated from other excavated materials and placed in a designated area with appropriate odour controls until such time as an appropriate assessment and methodology is confirmed for their appropriate management. Tar impacted materials are considered Hazardous Waste in accordance with the NSW EPA 2014, and will require disposal at a licensed waste facility with demonstrated ability to immobilise the waste prior to landfill disposal. This must be in accordance with an immobilisation approval from NSW EPA. Details of the stabilisation trial required to demonstrate appropriate immobilisation and gain the NSW EPA approval is outlines in **Section 8.4**.

Should tar be encountered at the base of the proposed excavation during the works associated with the secant pile wall, materials will be over excavated / over drilled in 0.2 m increments, until no visible tar materials remain. Despite the proposed works for EWDA-01 existing within the former tar remediation zone, occurrence of tar at the base of the remediation zone and at the sandstone interface is possible. The piling works for the secant wall are considered to be the opportunity to remove any residual tar impact at the base of the pile, where it sockets into natural rock.

It should be noted that lateral remediation of tar impact is not proposed in this RWP. Residual tar may remain in contact with the external secant wall face at completion of installation as it is assumed any tar on the internal wall face will be excavated as part of the DA02 scope. The revised human health risk assessment, Construction Quality Assurance Plan (CQAP) documentation and any visual observations of the exposed secant wall during DA02 will be the primary lines of evidence to confirm no risk to internal basement users even if tar is in contact with the external face of installed walls.

As coal tar is pre-classified as Hazardous Waste, it is not proposed that verification analysis be performed prior to removal to the licensed treatment facility. Following the stabilisation of the coal tar by the appropriate facility, confirmation analysis will be required prior to landfill disposal. Although the materials are in control of the licensed facility, the Remediation Contractor is responsible to ensure verification analysis and sign off occurs prior to disposal.

8.2.2 *Identification of Asbestos Materials*

In the event that asbestos-containing materials or materials that potentially contain asbestos are encountered, the materials will be characterised in accordance with the procedure for hotspot validation in **Section 9.2** to identify the nature and extent of the impact.

As asbestos contaminated soils are pre-classified as Special Waste, no further chemical assessment is required should an appropriate pre-classification be in place (see **Section 7.2.1**). Should the remediation be operating an ex situ verification strategy, additional chemical analysis will be required (see **Section 7.2.2**).

All works will be controlled under the guidance of the site-specific AMP, which will detail the controls required to be protective of human health throughout the remediation project.

Should asbestos be encountered within the piling spoil, the spoil will be appropriately classified and disposed offsite. As such, the asbestos contamination within the extent of this RWP and DA01 will be effectively removed to the width of DA01 wall and guide trench. The nature and location of the impact will be document on a site register to be addressed during the DA02 schedule.

Note: Should asbestos be encountered in significant quantity and/or distribution that poses a difficulty in managing as an unexpected find, it is expected that this process will require updating to allow more dynamic management processes.

8.2.3 *Materials Containment Breach*

In the event that any materials storage containment controls are breached and stockpiled materials (including spoil leachate) have escaped or have the potential to escape, then the breach is to be corrected as soon as practicable. The management controls shall be rectified and investigations undertaken to review the adequacy of the controls and any improvements implemented. The CEMP must include a documented process for identifying, responding to, reporting and recording such incidents.

8.2.4 *Placement of Inappropriate Materials*

In the event that any part of the site incorrectly receives material unsuitable for placement within it, then the following action shall be undertaken:

- Placement of material within the site shall be halted; The location of the incorrectly placed material shall be located using the GPS co-ordinates recorded at the time of placement (see MCMS – **Section 7.2**);
- The area of the incorrectly placed material shall be dug out and stockpiled separately. The nominal dimensions of the area to be recovered shall be a 5 m x 5 m x 1 m section, however this should be refined as appropriate based on the quantity of the material to be recovered and available GPS data;
- The resulting excavation shall be validated as a hotspot in accordance with the VSAQP (**Section 9.2**) to demonstrate the remaining soils within the zone are compliant with the SAC. If validation results are unacceptable the excavation should be extended until results of validation sampling are compliant with the SAC;
- The recovered material shall be stockpiled separately on site, so a Stockpile ITP and Stockpile Release can be obtained.
- The stockpile can then be removed offsite, tracked using the Offsite Disposal Form, and recorded on the waste tracking register.

- A review of management controls, communication plans and investigations shall be undertaken to assess the adequacy of the MCMS in view of the system failure; and
- Filling works shall recommence once any recommendations for improvements and additional verification of the material provider/source site have been implemented.

The CEMP shall include a documented process for identifying and responding to such incidents. Details of each incident and of corrective actions are required to be documented in the Validation Report.

8.2.5 *Emissions Complaints*

Due to the nature of the activities and type of contaminants identified at Central Barangaroo, there is a potential for complaints to be received from members of the public relating to environmental emissions including:

- Odour emissions arising from handling of malodorous soil/groundwater;
- Noise and vibration arising from excavation and other works;
- Dust emissions arising from excavation, material handling and placement; and
- Silty water discharging to Darling Harbour.

Monitoring of all environmental emissions shall be undertaken during the works as detailed in the CEMP and appropriate actions taken to further control emissions following receipt of a complaint. Such additional controls may include the following actions, as appropriate, which are required to be detailed in the CEMP:

- Notification to the Client at the earliest opportunity;
- Notification to the Remediation Contractor at the earliest opportunity;
- Application of odour-masking chemicals on odorous materials to minimise odour emission;
- Disturbance of soils during meteorologically favourable periods only;
- Covering highly impacted soils which are generating excessive odours; and/or
- Ceasing discharge of water to Darling Harbour until remediation contractor remediate water with approved level.

8.2.6 *Emissions Complaints*

Due to the nature of the activities and type of contaminants identified at Central Barangaroo, there is a potential for complaints to be received from members of the public relating to environmental emissions including:

8.2.7 *Acid Sulfate Soils*

In the event that acid sulfate soils are encountered during the works, they are to be managed in accordance with the '*Acid Sulfate Soil Management Plan SSDA: Central Barangaroo Early Works – Hickson Road Interface*'. A copy of this management plan is included in Appendix D.

8.3 Unexpected Finds/Events

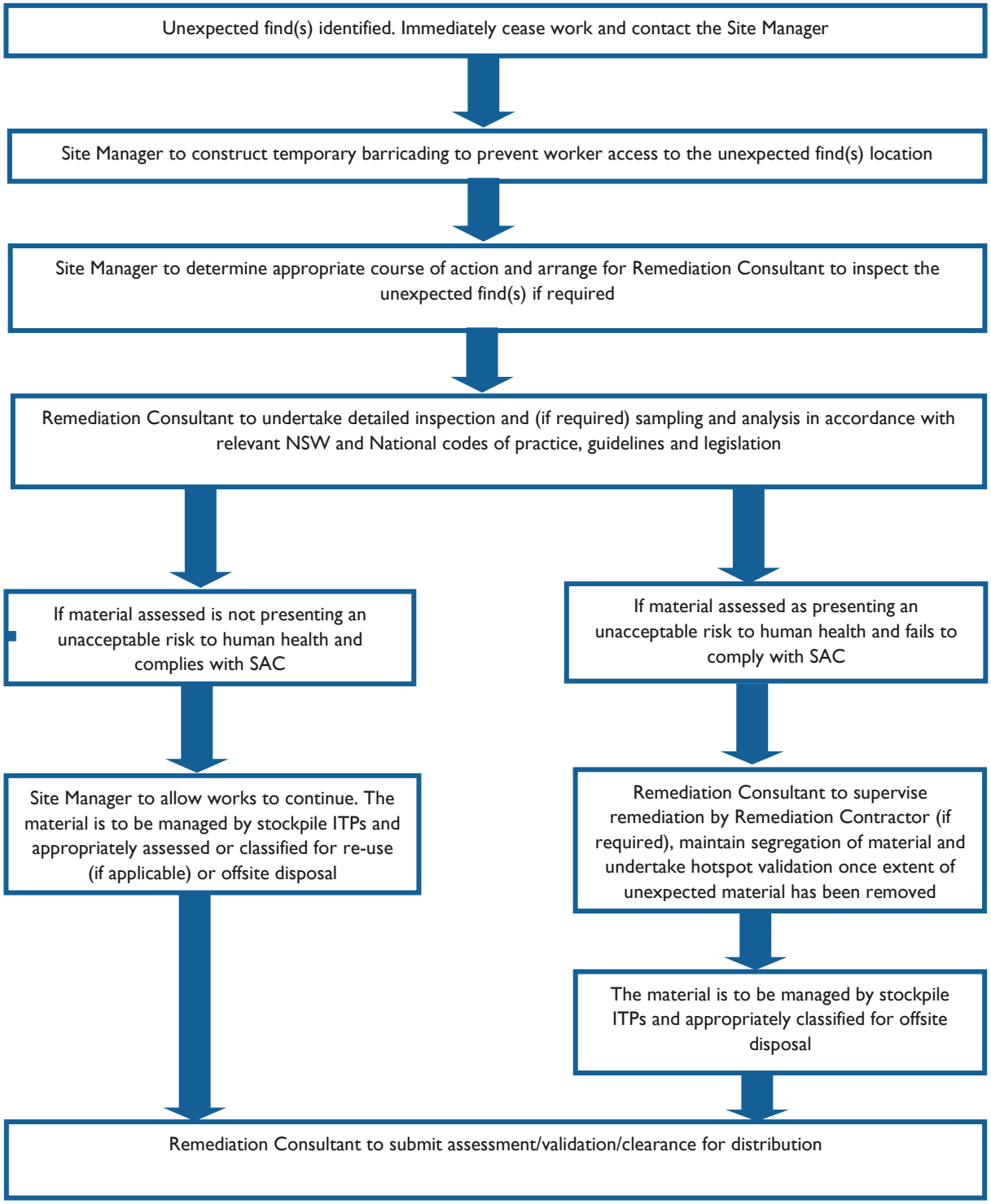
As a precautionary measure to ensure the protection of the workforce and the surrounding community, should any other unexpected potentially hazardous substance/event be identified, the procedure summarised in **Table 13** are to be followed.

The sampling strategy for each unexpected find shall be designed by a suitably qualified environmental consultant. The strategy will, however, be aimed at determining the nature of the substance – if it is hazardous and, if so, is it at concentrations which pose an unacceptable risk to human health or the environment?

Whether the substance if hazardous or not shall be determined by collection and chemical analysis of representative samples of the substance by the Remediation Consultant. The sampling frequency of the identified substance/materials shall meet the minimum requirements outlined in the NEPM 2013.

Validation following removal of an unexpected find must follow all quality protocols outlined in the VSAQP and specifically in accordance with **Section 1.1.1**, and at a minimum include visual and chemical validation of the surrounding materials. All walls and excavation base will require assessment.

Table 13: Unexpected Finds Procedure



8.4 Stabilisation Trial

Coal tar materials are known to be present in the southern portion of Central Barangaroo, though no tar has been identified in the EWDA-01 footprint. Stabilisation trials and *ex situ* stabilisation has been successfully achieved for early works in the Barangaroo area. Prior to the adoption of previously confirmed methodology, EDP propose that coal tar materials are disposed of at a waste contractor with existing approvals to treat coal tar as a priority. However, if a suitable receiver can't be identified, the stabilisation methodology below would apply and be completed in consultation with the NSW EPA.

The stabilisation methodology below can apply to gross tar contamination, or significantly elevated hydrocarbons impacted soils.

8.4.1 Suggested Methodology

- Collect bulk soil samples contaminated with coal tar / or high concentrations of hydrocarbons;
- Air-dry and homogenise;
- Laboratory analysis (total concentrations) of PAHs and TRH/TPH;
- Laboratory analysis (leachate concentrations) of PAHs and TRH. The leachate tests shall include:
    - Toxicity Characteristic Leaching Procedure (TCLP);
    - Australian Standard Leaching Procedure (ASLP); and
    - Multiple Extraction Procedure (MEP).
- Assess multiple treatment rates using the following expected treatment rates (established in earlier works at Barangaroo) as a midpoint:
    - 5% RemBind-FO and/or other stabilising agents;
    - 10% Portland Cement including alternative percentages; and
    - Other additives that may increase chemical stabilisation of contaminants.
- Analysis of treated samples for PAH and TRH/TPH (in TCLP, ASLP and MEP) and unconfined compressive strength (UCS); and
- Report results in comparison to the NSW EPA 2014.

It was noted in previous studies that bulk coal tar required physical stabilisation with the addition of 40-50% fly ash to achieve the UCS.

9. VALIDATION SAMPLING, ANALYSIS AND QUALITY PLAN

9.1 The objective of this VSAQP is to describe the sampling, analytical and quality programs to be undertaken during validation sampling works of soil during and following basement excavation. This VSAQP applies to all bulk excavated material, basement floors and walls, impacted 'hotspots' and imported materials to Central Barangaroo. Data Quality Objectives

In determining the type, quantity and quality of data needed to support decisions relating to the remediation of Central Barangaroo, the seven-step Data Quality Objective (DQO) approach has been undertaken in accordance with Section 4.1 of the NSW EPA Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017. The DQO's are presented in detail in the following sections.

9.1.1 Step 1: State the Problem

Central Barangaroo is to the north of the former gas works operations that have resulted in significant contamination of regions of the Barangaroo precinct. Central Barangaroo has been reclaimed over the years with materials from unknown and uncontrolled sources. The fill thickness is expected between 0-16 mbgl.

Central Barangaroo is proposed for redevelopment for mixed residential (with basement carpark) and commercial (retail) land use, together with some public open space areas.

Previous investigations conducted on the site since 2007 have identified that a low level of contamination exists in the fill materials, with the typical contaminants of concern including TPH, PAHs, heavy metals and asbestos. This is expected to be due to the filling and historical commercial and industrial land uses in the Barangaroo area. Groundwater in the wider Central Barangaroo area is known to be impacted by these contaminants.

9.1.2 Step 2 Identify the Decisions

The decisions to be made based on the results of the validation program are as follows:

- Have the remediation works been undertaken in accordance with this RWP?
- Has the methodology proposed achieved the objectives outlined within this RWP?
- What, if any, additional data is required to determine and support the above decisions?

9.1.3 Step 3 Identify Inputs to the Decisions

The inputs required to make the above decisions are as follows:

- Appropriate guidelines endorsed by NSW EPA;
- Risk-based SAC;
- Concentrations of contaminants of concern in generated waste materials;
- Waste tracking documents and landfill dockets;
- Certification of imported materials;
- Concentrations of contaminants of concern in close proximity to basement walls and floor;
- Observations of basement floor for the presence of tar-containing materials;
- Observations of the presence of odorous or discoloured soils;
- Concentrations of contaminants of concern in groundwater;
- Assessment of whether the concentrations of the contaminants of concern are greater than or equal to or less than the adopted criteria; and
- Determination of whether the remediation works have been successfully completed.

9.1.4 *Step 4 Define the boundaries*

The boundaries of the remediation works have been identified as follows:

- Spatial boundaries – This remediation work is limited to the EWDA-01 footprint as presented in **Appendix A**. The vertical extent is limited to the maximum excavation depth of 12 mbgl, and depth of proposed piles;
- Temporal boundaries – the temporal boundary is limited to the data collected during the remediation works, supported by the historical data available from 2007; and
- Constraints within the study boundaries – The following issues present limitations upon the validation strategies:
    - Visual observation of basement wall prevented due to method of wall construction.
    - Limited access to surrounding areas of Central Barangaroo for groundwater monitoring.

9.1.5 *Step 5 Develop a Decision Rule*

The decision rules for the remediation works are as follows:

1. If remediation works cannot be successfully conducted within the methodology presented in this RWP, an alternate remedial option may be undertaken; and
2. If validation monitoring indicates high variability in waste materials, validation frequencies may be required to increase.
3. If validation sampling of imported materials fails the SAC or other regulatory requirements, materials will be rejected.
4. If validation monitoring of groundwater indicates significant change in measurable contaminants, additional groundwater assessment, control or change in remediation approach may be required.

9.1.6 *Step 6 Specify Limits on Decision Errors*

The acceptable limits on decision errors to be applied in the remediation and characterisation works and the manner of addressing possible decision errors have been developed based on the Data Quality Indicators (DQIs) of precision, accuracy, representativeness, comparability and completeness.

The potential for significant decision errors are to be minimised by:

- Completing a robust Quality Assurance/Quality Control (QA/QC) assessment of the validation data and application of the probability that 95% of data will satisfy the DQIs, therefore a limit on the decision error will be 5% that a conclusive statement may be incorrect;
- Pursuing an appropriate remediation methodology that will achieve the objectives for the works;
- Assessing appropriate sampling and analytical density for the purposes of characterisation; and
- Ensuring that the criteria set for the remediation works are appropriate.

9.1.7 *Step 7 Develop the Plan for Remediation and Validation of the Site*

The design of the remediation plan is based on satisfying the remediation objective to ensure the site is suitable for the proposed landuse with all remaining soils, and any imported materials meeting the SAC. The works that are required to confirm that the remediation works outlined in this RWP have been completed successfully and to identify the requirements, if any, for further monitoring and/or a Long-term EMP are outlined in **Section 9.2**.

9.2 Sampling Plan

The sampling frequency and analytical plan is summarised in **Table** in **Section 9.4**

9.2.1 Retention Walls

Validation samples are to be collected from the perimeter of the retention walls (pre or post basement construction) to observe the presence of tar impacted material in possible contact with the retention walls. Once the location of and thickness of walls are confirmed, boreholes are to be constructed every 20 m along the eastern edge of the secant pile wall alignment, within 1-3 m of the walls external edge. Samples to be collected at a rate of 1 per vertical metre (or where visual/olfactory observations require) until natural material encountered.

This validation frequency can only be reduced if considering applicable historical data. Further validation of the basement wall will require the completion of construction validation protocols (CVP) to ensure the construction methodology meets the design requirements and RAP assumptions.

9.2.2 Materials for Offsite Disposal

All materials excavated from site require appropriate classification in accordance with the NSW EPA 2014. Excavated material is to be stockpiled on site to allow sampling, analysis and subsequent classification by Remediation Consultant. To supplement the existing in situ data, to achieve a minimum validation sampling density of 1:250 m^3 has been adopted.

In the event that *in situ* assessment is not undertaken, *ex-situ* stockpile material must be sampled for the contaminants of concern, at a higher frequency to enable appropriate classification. The sampling frequency should adopt the protocol outlined in the NEPM 2013 Schedule B2 and *VIC EPA IWRG 702 2009*. A summary is provided as follows:For soil volumes less than 200 m^3

- Minimum of 3 samples; and
- One sample per 25 m^3 of material.

For soil volumes greater than 200 m^3

- Minimum of 10 samples for volumes up to 2,500 m^3 with application of 95% UCL average; and
- One sample per 250 m^3 of material above 2,500 m^3 95% UCL average.

Note that the application of 95% UCLs and the reduced sample frequency for larger volumes of material are at the discretion of the validation consultant and are dependent on material homogeneity.

Should tar impacted material be encountered, immobilisation approvals will be required from the NSW EPA prior to disposal as discussed in **Sections 8.2.1 and 8.4**. This may require additional validation analysis.

9.2.3 Imported Materials

All Imported Materials will only be accepted on the site if they:

- Meet the definition of Virgin Excavated Natural Material (VENM) as defined in relevant legislation, noting that all reported concentrations of organic constituents should be below the laboratory limits of reporting and the reported concentrations of inorganic constituents consistent with published background levels in NEPM 2013;
- Meet the requirements of the *NSW EPA ENM Order 2014*; or
- Meet the requirements of the *NSW EPA Recovered Aggregate Order 2014*; and
- Meet the SAC.

The sampling plan will be specific for each waste type, in accordance with the MCMS and any appropriate guidelines or resource recovery orders.

9.2.4 Basement Construction Validation

Adequate supervision and monitoring of the construction of the basement design elements relevant to DA-01 are required to ensure compliance and document that the secant wall is constructed in accordance with

appropriate specifications. The design elements applicable to DA-01 includes the construction of a secant pile wall into bedrock and capping beam which must be verified through the requirements of a A CQAP (or procedures). must be prepared as part of the detailed design of the southern basement construction with regards to the groundwater control wall elements. Data, inspection test plans and verification tests as required in the CQAP will be collated with "as built" drawings to validate the construction of the secant wall and capping beam in accordance with the detailed design. This documentation will be presented in a validation report prepared for DA-01.

9.3 Sampling Methodology

9.3.1 Soils

Samples shall be collected by the Remediation Consultant using a hand trowel, or in excavations deeper than approximately 1 m sonic drilling (for wall validation locations) and directly from the piling rig auger flight or the piling spoil stockpile. All samples will be collected using clean nitrile gloves, and drill heads will be cleaned if evidence of gross contamination or coal tar is observed in arisings, to ensure the minimisation of cross-contamination.

Where samples are obtained from stockpiles, they will be collected from approximately 0.3 m beneath the surface of the stockpile. No composite samples are proposed. The hand trowel will be thoroughly decontaminated using a solution of a phosphate-free detergent and deionised water between each sampling location. Where samples are required within large stockpiles or embankments, samples shall be collected by test pits constructed using an excavator. Samples shall be collected from the centre of the excavator bucket ensuring that no part of the sample has contacted the sides of the excavator bucket.

During the collection of soil samples, features such as material uniformity, seepage, discolouration, staining, foreign materials, presence/absence of visible asbestos-containing materials, odours and other indications of contamination will be noted on the field documentation.

Collected soil samples will be immediately transferred to laboratory-supplied glass jars and sealed using Teflon-lined screw caps and filled so that there is minimum headspace. Sample labels will record: job number; sample identification number; sampler's initials; and date and time of sampling. Sample containers will be transferred to on ice for sample preservation prior to and during transport to the testing laboratory. A chain of custody (CoC) form will be completed and forwarded with the samples to the testing laboratory.

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9.4

9.4 Analytical Plan

The sampling frequency and analysis schedule to be carried out during validation assessment is detailed below:

Table 14: Soil Sampling Frequency and Analytical Program

Item	Sampling Frequency			Analytes	SAC Reference
	Excavation Base	Excavation Walls	Stockpiled Materials		
Validation – all bulk excavated materials requiring classification/ removal from site (*in-situ or ex-situ)*			1/250 m^3 (minimum) for each material type (if ex situ classification method employed)	Asbestos, Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn), TRH, BTEX, PAHs, visual inspection for tar impacted material	Section 5.3.3 Section 9.2.2

Item	Sampling Frequency			Analytes	SAC Reference
	Excavation Base	Excavation Walls	Stockpiled Materials		
Imported soils – general fill (if required) either VENM or exempt material eg. ENM, recovered fines, recovered aggregates	-	-	Minimum 3 samples per source site for approval. 1:250 m^3 thereafter for non-VENM sources.	Asbestos, Metals, TRH, BTEX, PAHs, OCPs, PCBs. Additional analysis required in accordance with relevant resource recovery order	Section 5.3.4 Section 9.2.3
Imported soils – landscaping soils (as required) eg. mulch, blended materials	-	-	Minimum 3 samples per source site for approval. 1:250 m^3 thereafter for non-VENM sources.	Asbestos, Metals, TRH, BTEX, PAHs, OCPs, PCBS Additional analysis required in accordance with relevant resource recovery order and soil scientist specification	Section 5.3.4 Section 9.2.2
In situ Validation – retention walls		1/1 m depth at boreholes 1/20 m along wall		Asbestos, Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn), TRH, BTEX, PAHs, visual inspection for tar impacted material	Section 5.3.1 Section 9.2.1

9.5 Laboratory Methodology

Soil and water validation samples shall be analysed by a primary laboratory which shall be NATA accredited for the required analyses. The secondary (check) laboratory responsible for analysing a certain proportion and type of QA/QC samples shall also be NATA accredited for the required analyses. Both laboratories will also be required to meet the environmental consultant's internal quality assurance requirements.

The analytical schedule, laboratory methods, LORs and reference methods to be applied for this assessment must be appropriate to meet the project DQOs and DQIs with approved methods from ALS Environmental listed in **Tables 15** . Equivalent or approved methods at other laboratories are also suitable.

Table 15: Soil Analytical Methods

Analyte	Method	LOR	Method Descriptions
Asbestos identification in soils	EA200	0.1 g/kg	AS4964-2004 Method for the qualitative identification of asbestos in bulk samples. Analysis by Polarised Light Microscopy including dispersion staining.
PAH/Phenols (SIM)	EP075(SIM)	0.5 mg/kg (per PAH)	(USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5-point calibration curve. This method is compliant with NEPM 2013 Schedule B (3) (Method 502 and 507).
Pesticides (OCPs) by GCMS	EP068	0.05-0.2 mg/kg	Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5-point calibration curve. This technique is compliant with NEPM 2013

Analyte	Method	LOR	Method Descriptions
			Schedule B (3) (Method 504,505)
pH (1:5)	EA002	0.1 pH units	In house: Referenced to APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Polychlorinated Biphenyls (PCB)	EP066	0.1 mg/kg	Referenced to USEPA SW 846 - 8270D Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5-point calibration curve. This method is compliant with NEPM 2013 Schedule B (3) (Method 504)
Total Mercury by FIMS	EG035T	0.1 mg/kg	Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM 2013 Schedule B (3)
Total Metals by ICP-AES	EG005T	1-5 mg/kg	Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM 2013 Schedule B (3)
TRH - semivolatile fraction		50-100 mg/kg	Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40.
TRH Volatiles/BTEX	EP080	TRH: C_6-C_9: 10 mg/kg BTEX: 0.2-0.5 mg/kg	(USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
VOCs	EP074	MAHs, sulfonated, fumigants, halogenated aromatics, trihalomethanes, PAHs: 0.5 mg/kg Oxygenated compounds: 5 mg/kg Halogenated aliphatics: 0.5-5 mg/kg	Referenced to USEPA SW 846 - 8260B Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5-point calibration curve. This method is compliant with NEPM 2013 Schedule B (3) (Method 501).

9.6 Quality Assurance and Quality Control Plan

The field and laboratory quality assurance and quality control plan to be adopted for the remediation works has been designed to achieve pre-determined DQIs that will demonstrate the precision, accuracy, representativeness, completeness and comparability of the data set and that the data set is of acceptable quality to meet the objectives of the works.

The specific QA/QC plan for the field and laboratory components of the investigation have been developed based on NSW EPA *Contaminated Land Guidelines: Consultants reporting on contaminated land 2020* (NSW EPA 2020) and are detailed below.

9.6.1 Field QA/QC

The field QA procedures to be adopted and the field QC samples to be collected during the remediation works and the corresponding acceptable control limits are presented in **Table 16.**

Table 16: Field QA/QC

Data Type	Comments and Acceptable Control Limits
Field Personnel	Use appropriately trained field personnel employing procedures listed in this RWP.
Field Data Collection	All data collection to be undertaken in accordance with this RWP. Site conditions and sample locations properly described. Information to be recorded in field notes. Field notes are appropriately completed and included in the report on the works.
Sample Handling (storage and transport)	Soil and water samples will be collected into the appropriately preserved sample containers supplied by the analytical laboratory and each sample will be characterised by a unique number. The sample containers will be stored on ice in a chilled, insulated container until received by the analysing laboratory. Sample numbers, dates, preservation and analytical requirements will be recorded on Chain-of-Custody (COC) documentation, which will also be delivered to the analytical laboratory. All samples are required to be documented as received by the laboratory chilled and intact.
Calibration of Field Equipment	PID will be calibrated using iso-butylene gas (100 ppm) at the start of each day of sampling and at a number of times during each day. A record of the calibrations undertaken will be kept and included in the report. Water quality meters will be calibrated prior to each monitoring event. A record of the calibrations undertaken will be kept and included in the report.
Field Intra/Inter-Laboratory Duplicates	Intra and inter-laboratory duplicates will be collected and analysed at a rate of 1 in every 10 primary samples. Duplicate samples will be labelled so as to conceal their relationship to the primary sample from the laboratory. It is expected that RPD's would be less than 30%, and if not, liaison with the laboratory will be undertaken and samples will be reanalysed, if required.
Rinsate Blanks	Rinsate blank samples (from an item of sampling equipment) will be collected and analysed at a rate of one per piece of re-useable equipment per day of sampling. Concentrations of analytes to be less than LORs.
Trip Blanks	Laboratory prepared trip blanks will be utilised during the sampling program (soil and groundwater). Trip blanks will be laboratory prepared where possible and filled with deionised water prior to sampling and remain in the sample storage container (esky) until the samples are removed by the receiving laboratory. Concentrations of analytes to be less than LORs.
Trip Spikes	Laboratory prepared trip spikes will be utilised during the sampling program (soil and groundwater). Trip spikes will be laboratory prepared prior to sampling events and remain in the sample storage container (esky) until the samples are removed by the receiving laboratory. Concentrations of analytes to be within 70-130% of the expected range.

9.6.2 Laboratory QA/QC

The laboratory QA procedures to be adopted and the internal laboratory QC samples to be analysed and the corresponding acceptable control limits are presented in **Table 17.**

Table 17: Laboratory QA/QC

Data Type	Comments and Acceptable Control Limits
Sample Analysis	All sample analyses to be conducted using NATA certified laboratories which will implement a quality control plan in accordance with NEPM 2013.
Holding Times	Maximum acceptable sample holding times: • Volatile organic analysis: Soil: 14 days; Water (and rinsate samples): 14 days; • Inorganic analysis: Soil: 3 months; Water (and rinsate samples): 3 months • Dioxins: Water:1 year; Soil: 1 year • Cyanide: Soil: 14 days; Water: 14 days • Ammonia: Water: 28 days
Laboratory Detection Limits	All laboratory LORs to be less than the SAC.
Laboratory Blanks	Laboratory blanks to be analysed at a rate of 1 in 20, with a minimum of one analysed per batch. Concentration of analytes to be less than the laboratory detection limits.
Laboratory Duplicates	Laboratory duplicates to be analysed at a rate of 1 in 20, with a minimum of one analysed per batch. RPDs to be less than 30%.
Laboratory Control Samples (LCS)	LCSs to be analysed at a rate of 1 in 20, with a minimum of one analysed per analytical batch. Control limits: Control limits: 70 to 130 % Acceptable Recovery and if not, liaison with the laboratory will be undertaken and samples will be reanalysed, if required.
Matrix Spikes	Matrix spikes and matrix spike duplicates prepared by dividing a field sample into two aliquots, then spiking each with identical concentrations of the analytes at a rate of 1 in 20. Matrix spike control limits: 70–130 % Acceptable recovery and if not, liaison with the laboratory will be undertaken and samples will be reanalysed, if required. Matrix spike duplicates: RPDs <30% and if not, liaison with the laboratory will be undertaken and samples will be reanalysed, if required.

9.6.3 Data Quality Indicators

Acceptance limits on field and laboratory data collected for the remediation and validation works have been established above. A summary of the DQIs and the corresponding measures to be applied for the investigation are presented in **Table 18.**

Table 18: Summary of DQIs

DQI	Field	Laboratory	Acceptability Limits
Precision	Sampling methodologies appropriate and complied with. Collection of intra/inter-laboratory duplicate and inter-laboratory duplicate samples	Analysis of: • Field intra/inter-laboratory duplicate samples (1 in 10 samples) • Laboratory duplicate samples	RPD of <30% (raised for results close to LOR)

DQI	Field	Laboratory	Acceptability Limits
Accuracy	Sampling methodologies appropriate and complied with. Collection of rinsate blanks	Analysis of: • Rinsate blanks (1/day/equipment) • Method blanks • Matrix spikes • Matrix spike duplicates • Laboratory control samples • Laboratory prepared spikes • Reagent blanks • Reference materials	 • <LORs • <LORs • 70 to 130% • RPD of <30% • 70 to 130% • 70 to 130% • <LORs • Varies
Representativeness	Appropriate media sampled according to SAQP All media identified in SAQP sampled.	All samples analysed according to RWP.	All samples analysed according to RWP.
Comparability	Same sampling methodologies used on each day of sampling Experienced sampler Climatic conditions Same types of samples collected	Same analytical methods used (including clean-up) Sample laboratory detection limits (justify/quantify if different) Same laboratories (NATA accredited) Same units	As per NEPM 2013 < nominated criteria
Completeness	All critical locations and media sampled All samples collected Sampling methodologies appropriate and complied with Experienced sampler Documentation correct	All critical samples analysed and all analytes analysed according to VSAQP Appropriate methods Appropriate laboratory detection limits Sample documentation complete Sample holding times complied with	As per NEPM 2013 As per NEPM 2013

In the event that a DQI is not met by laboratory analyses, the field observations relating to the nature of the samples will be reviewed and if no obvious source for the non-conformance is identified, such as an error in sampling, preservation of sample/s or heterogeneity of sample/s, liaison with the laboratories will be undertaken in an effort to identify the issue that has given rise to the non-conformance and additional analyses will be undertaken on the original sample/s, on duplicate samples or on other samples, if required.

If no explanation for the non-conformance is identified, the concentrations for the affected samples will be marked as estimates.

10. WORK HEALTH AND SAFETY

A site-specific WHS Plan must be prepared by the Remediation Contractor prior to the commencement of remediation works, and reviewed/approved by the Remediation Consultant. The information contained in this section was prepared in the RAP and shall be incorporated into the WHS Plan.

The WHS Plan shall contain procedures and requirements that are to be implemented as a minimum during the works, in addition to the RWCP. The objectives of the WHS Plan are to:

- Apply standard procedures that minimises risks resulting from the works;
- Ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- Have procedures to protect other site workers and the general public. These objectives will be achieved by:
    - Assignment of responsibilities;
    - An evaluation of hazards;
    - Establishment of personal protection standards, mandatory safety practices and procedures;
    - Monitoring of potential hazards and implementation of corrective measures; and
    - Provision for contingencies that may arise while operations are being conducted at the site.

In addition to the normal construction-related matters, the WHS Plan shall address the following site-specific specific hazards associated with the works relating to the management of contaminated soil and groundwater:

- Under/aboveground services, specifically former gasworks infrastructure (if any);
- Use of plant and machinery within confined spaces (i.e. excavations);
- Contact with contaminated soil (incl. dust), groundwater and vapours, including requirements for specific Personal Protective Equipment (PPE);
- Handling of potentially asbestos containing materials;
- Operation of water treatment plant; and
- Heat/Cold stress.

In addition to general assessment of the potential for exposure to chemical contaminants, the WHS Plan shall also include specific consideration of all site-specific contaminants listed in the SAC (**Section 5.3**), which are listed as contaminants of concern within the greater Barangaroo Project Site but external to Central Barangaroo. As a precautionary measure, the Plan should include the requirement for the plan to be revised in the event of an unexpected find of contaminated material during remediation construction.

The Plan must detail the PPE and decontamination requirements to be followed to control the risks posed by potential exposure to chemical contaminants at the site, including consideration of the AMP controls.

11. REPORTING

11.1 Validation Report

At the completion of the works detailed within this RWP, the results of the works will be presented in a site remediation and validation report (SRVR) for the EWDA-01 that will be prepared in general accordance with the NSW EPA 2020 and with other relevant guidelines endorsed by NSW EPA and must be of sufficient reliability to allow the Site Auditor to compete the Site Audit Statement.

The SRVP report will be prepared for the EWDA-01 and later combined in an overall Central Barangaroo Validation Report. The program for validation reports will be developed in consultation with the Auditor.

The validation report shall include:

- Details of the remediation works conducted;
- Information demonstrating that the objectives of the RWP had been achieved, in particular that the results and assessment of the data against both the pre-defined data quality objectives and the remediation criteria;
- Any variations to the strategy undertaken during the implementation of the remedial works;
- Details on volumes of materials removed;
- A photographic record of the works;
- Details on waste classification, tracking and off-site disposal;
- Results of environmental monitoring undertaken during the course of the remedial works;
- Details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents;
- Verification of regulatory compliance;
- Detail of imported materials;
- Documentation of visual inspections;
- Details on the reinstatement works undertaken;
- Validation of compliance with CEMP;
- Results of groundwater monitoring;
- Recommendations regarding the need for a LTEMP;
- Comment of the site's compliance with the RAP/SAR and the RAP objectives;
- Reporting on waste management; and
- Recommendations on the requirements for future groundwater monitoring, or additional soil validation sampling.

The CQAPs will be reviewed as part of the site validation and included as an attachment to the final validation report.

11.2 Routine Status Reports

11.2.1 Materials Tracking and Compliance

Routine reports are expected to be required to monitor the progress of remediation and compliance with the MCMS. An audit of the MCMS and waste tracking register will be required early in the project works, to ensure all required information is being recorded appropriately and adequate records retained. The materials tracking and compliance reports will include:

- Summary of remediation works performed in the reporting period;

- Quantity and classification of materials disposed offsite;
- Quantity and quality of materials imported to site;
- Reporting of the above in compliance of the MCMS;
- Description of non-conformances and corrective action; and
- Provision of waste tracking records and forms.

11.3 Long Term Environmental Management Plan

Further to the reference in in **Section 5.7**, while a LTEMP was contemplated in the RAP, the RWP and proposed design intends on delivering the site without any long-term monitoring or management requirements. As such, the requirement for a LTEMP at this stage is unlikely.

If it is deemed in future a a LTEMP is needed, the LTEMP will be prepared to detail the on-going management and monitoring requirements for Central Barangaroo. However, the precise nature and extent of the management requirements will not be known until remediation/management works are conducted and the validation data obtained.

The LTEMP would be nominally prepared following the completion of the final validation report for the Central Barangaroo Site, though as the staging of the development of the LTEMP is not known, this may involve an interim LTEMP, amended over time to include the remaining portions for Central Barangaroo.

A LTEMP should contain the following elements:

- A statement of the objectives of the LTEMP;
- Description of the responsibilities of the various nominated partied for implementing elements of the provisions contained in the LTEMP, including the person who has ultimate responsibility for the implantation of the LTEMP;
- Description of the frequency of monitoring and reporting requirements, including whom reports are required to be provided to;
- Description of the material requiring management, including the type of contamination and location on the site (including a plan prepared by a registered surveyor);
- Detailed "as built" drawings and any construction validation reports available;
- Description of the environmental controls to manage the residual contamination issue(s);
- Description of criteria required to be met for all monitoring procedures;
- Description of corrective actions required to be implemented if monitoring criterion are not met;
- Description of the reporting requirements;
- Timeframe for implementing various elements of the provisions contained in the LTEMP;
- Health and safety requirements for particular activities;
- A program of review and audits;
- The provisions in the LTEMP are feasible (i.e. are able to be implemented) and able to be legally enforceable (i.e. a mechanism exists, such as development consent conditions, to give the plan a basis in law); and
- The relevant consent authority is satisfied that the inclusion of a development consent condition relating to the implementation of the LTEMP is acceptable.

11.4 Summary of Hold Points

Table 19 below summarises the hold points required throughout the remediation works.

Table 19: Summary of Remediation Hold Points for EWDA-01

Hold Point #	RWP Section	RWP Table #	Process Held	Responsible
1	6.2	Table 5	Commencement of in-ground construction works	Remediation Contractor & Remediation Consultant
2	7.2		Excavation of site material	Remediation Consultant
3	7.2.1	Table 8	Removal of materials from site	Remediation Consultant
4	7.3.1	Table 10	Importation of material	Remediation Consultant
5	7.3.4	Table 11	On-site Reuse of Site Materials	Remediation Consultant
6	7.3.4	Table 13	Off-site Reuse of Site Materials	Remediation Consultant

12. CONCLUSION

It is considered that the works proposed in the EWDA-01 are minor in nature and have little impact on the overall suitability of the site for future changes to landuse. The information gathered through the implementation of this RWP for EWDA-01 will ensure sufficient information if obtained to allow future statements of site suability to be made.

13. REFERENCES

CRC Care 2013 *Petroleum Hydrocarbon Vapour Intrusion Assessment: Australian Guidance, CRC Care Technical report no. 23, CRC for Contamination Assessment and Remediation of the Environment, Adelaide Australia.*

Driscoll, T. 2013 *The Use of Asbestos-Contaminated Soils on Barangaroo.*

NEPM 2013, *National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended in April 2013), National Environmental Protection Committee, Canberra.*

NSW Work Health and Safety Act 2011;

NSW Work Health and Safety Regulation 2017;

NSW EPA 1995 *Contaminated Sites: Sampling Design Guidelines.*

NSW EPA 2020 *Contaminated Land Guidelines: Consultants reporting on contaminated land.*

NSW DEC 2006 *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition).*

NSW EPA 2014a *Protection of the Environment Operations (Waste) Regulation.*

NSW EPA 2014b *Waste Classification Guidelines Part 1: Classifying Waste.*

NSW EPA 2014c *Excavated Natural Materials Exemption.*

NSW EPA 2014d *Excavated Natural Materials Order.*

VIC EPA 2009 *Industrial Waste Resource Guidelines, Soil Sampling publication IWRG702.*

WA DoH 2021 *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.*

Appendix A: Figures

S-03937 BARANGAROO ASSMP FIGURES MAY 2022 V1.vwx | Wednesday, 11 May 2022 11:22:42 AM | drawn by laurie white at www.reumad.com.au

VER	DATE	AMENDMENTS	DRW	CKD
V1	11/05/2022	initial draft	LDW	

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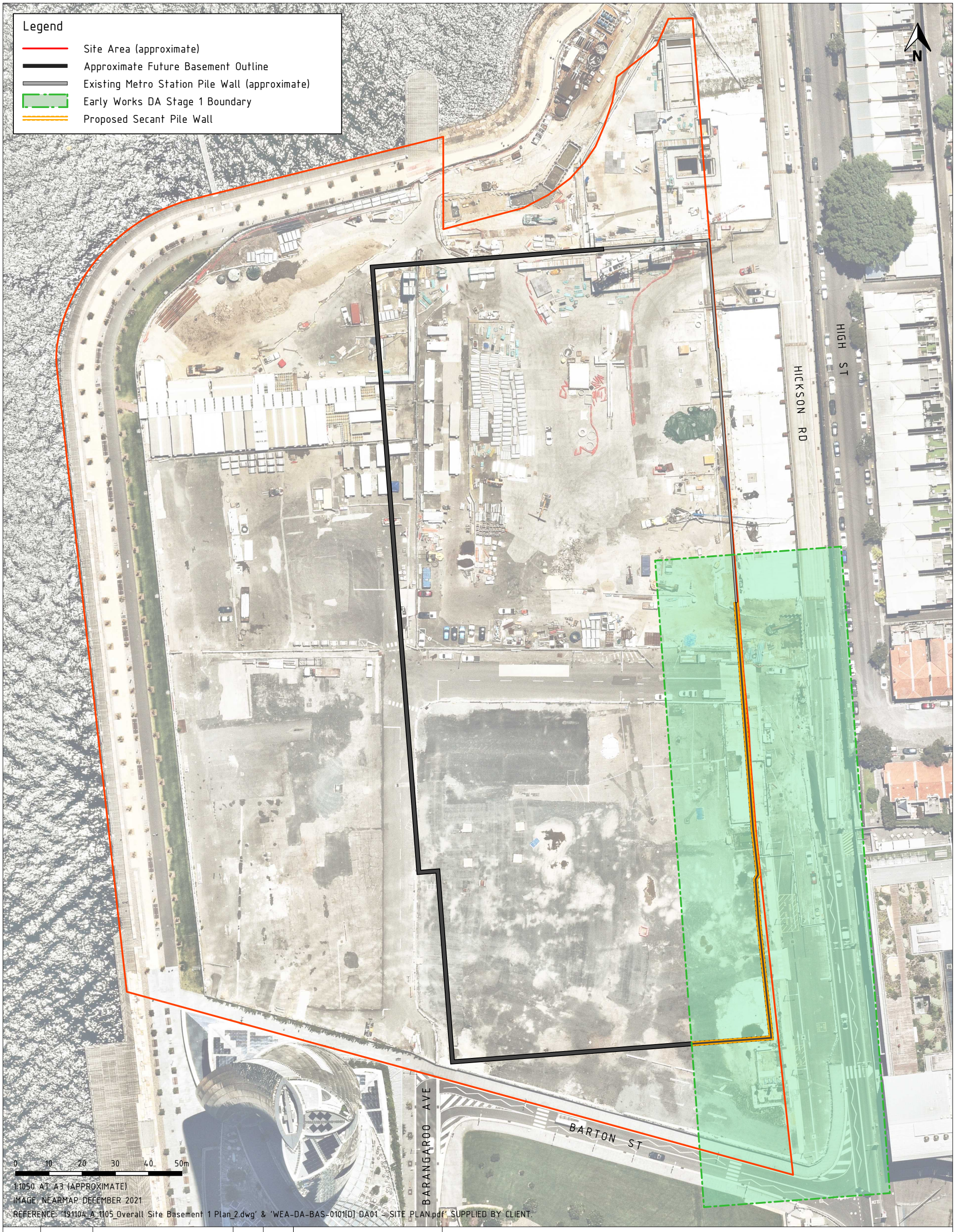
COMMERCIAL IN CONFIDENCE

FIGURE 1
SITE AREA

Project Ref:	S-03937		
Project:	Aqualand Barangaroo, EWDA-01 – Acid Sulfate Soil Management Plan		
Location:	Central Barangaroo, Hickson Road, Barangaroo NSW		
Client:	Aqualand Projects Pty Ltd		
Easting: 333637	Northing: 6251819	Datum mAHD; UTM MGA 56H	PRINT: A3 (L)



S-03937 BARANGAROO ASSMP FIGURES MAY 2022 V1.vwx | Wednesday, 11 May 2022 11:22:42 AM | drawn by laurie white at www.reumad.com.au

VER	DATE	AMENDMENTS	DRW	CKD
V1	11/05/2022	initial draft	LDW	

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COMMERCIAL IN CONFIDENCE

FIGURE 2
EARLY WORKS DA STAGE 1 BOUNDARY

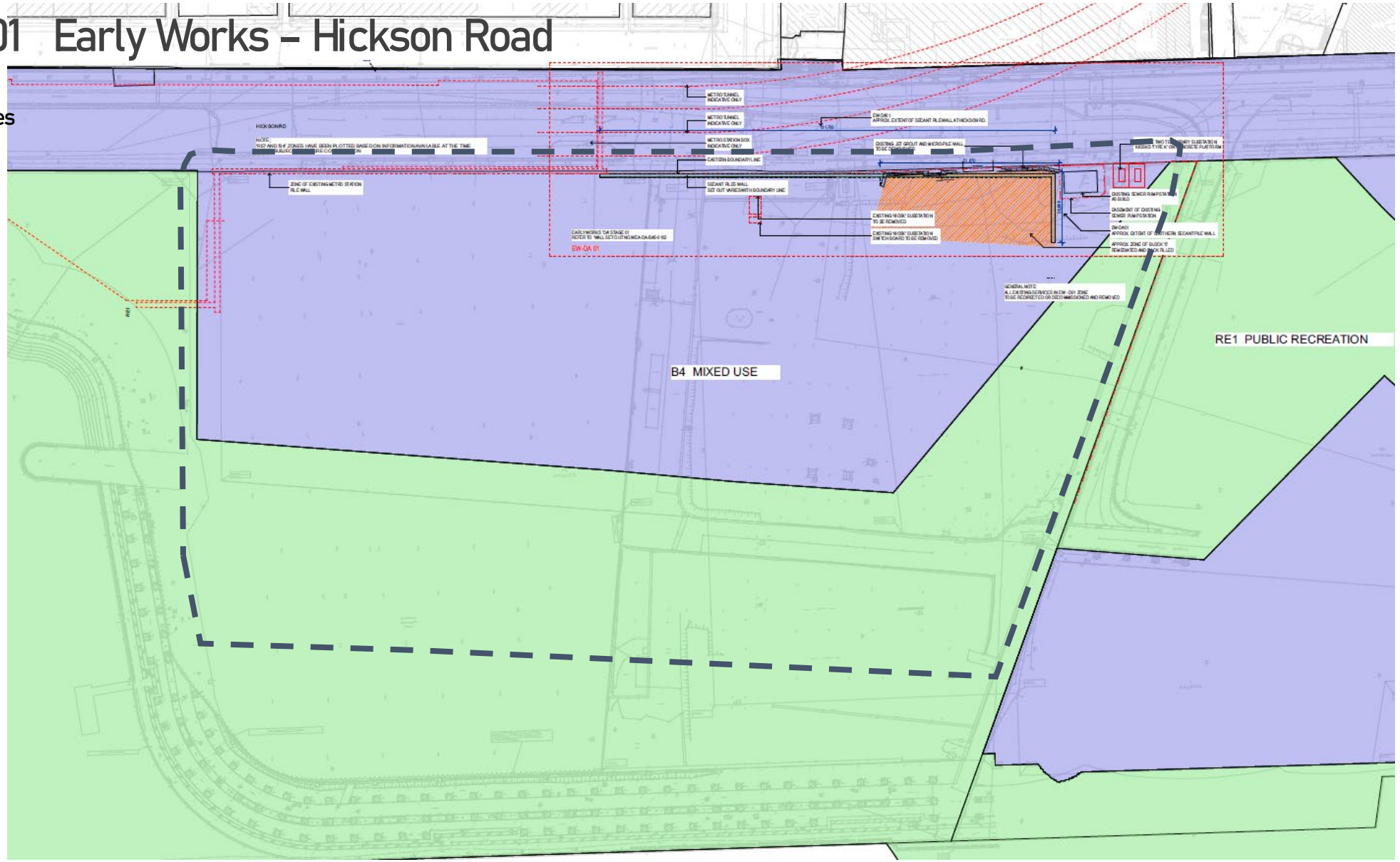
Project Ref:	S-03937		
Project:	Aqualand Barangaroo, EWDA-01 - Acid Sulfate Soil Management Plan		
Location:	Central Barangaroo, Hickson Road, Barangaroo NSW		
Client:	Aqualand Projects Pty Ltd		
Easting: 333637	Northing: 6251819	Datum mAHD; UTM MGA 56H	PRINT: A3 (L)

Appendix B: Proposed Early Works Development Application 01

CENTRAL BARANGAROO SSDA

DA-01 Early Works – Hickson Road

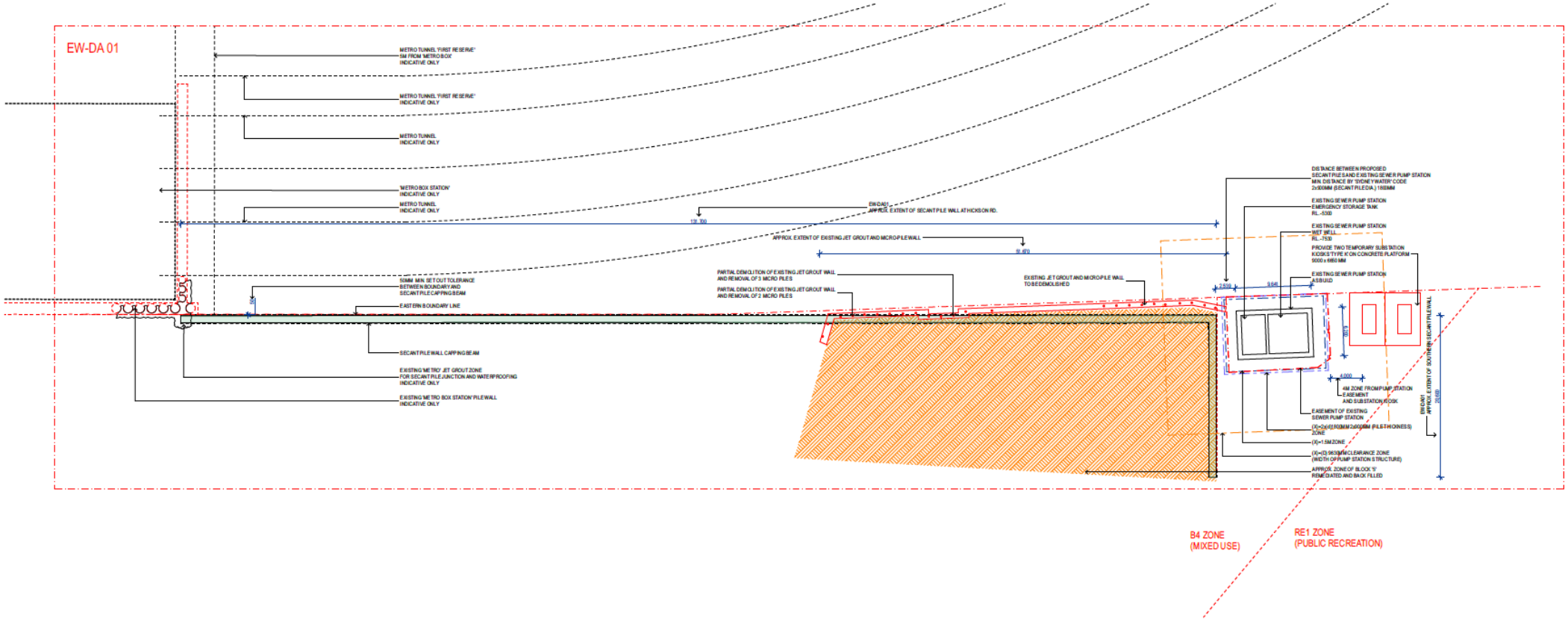
Early works DA-01 proposes



CENTRAL BARANGAROO SSDA

DA-01 Early Works – Hickson Road

Early works DA-01 proposes



Appendix C: Asbestos Management Plan (EDP AMP, 2022)

Aqualand Projects Pty Ltd

Asbestos in Soil Management Plan EWDA-01

Central Barangaroo, Hickson Road, Millers Point NSW

Purpose:

To define the protocols for managing asbestos in soil risks during the Early Works Development Application 01 (EDWA_01) at Central Barangaroo, Hickson Road, Millers Point NSW

Prepared for:

Aqualand Projects Pty Ltd

Document Date:

21 October 2022

Reference:

S-03937.AMP EWDA-01_202209_Final

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DOCUMENT CONTROL

Project Details:	
Report Name:	Asbestos in Soil Management Plan – EWDA-01, Central Barangaroo, Hickson Millers Point, NSW
Client Name:	Aqualand Projects Pty Ltd
Reference:	S-03937.AMP.001_EWDA-01 Central Barangaroo
Prepared by:	Ryan Jacka
Reviewed by:	Kim Femia (LAA001143)

Revision No.:	Revision Date:	Reason for Issue:	Authorised:	
			Name and Position:	Signature:
V1	13/05/2022	First issue to client	Ryan Jacka Principal Consultant CEnvP #874	
Final	13/05/2022	Final as requested	Ryan Jacka Principal Consultant CEnvP #874	
Final	30/09/2022	Final as requested	Ryan Jacka Principal Consultant CEnvP #874	
Final	21/10/2022	New Section 10.1.3	Ryan Jacka Principal Consultant CEnvP #874	

CONTENTS

1. INTRODUCTION

EDP Consultants Pty Ltd (EDP) was engaged by Aqualand Projects Pty Ltd (Aqualand) to prepare an Asbestos in Soil Management Plan (AMP) for the management of potential asbestos impacted fill materials that may be encountered during the Early Works Development Application 01 (EWDA-01) excavation works at Central Barangaroo, Hickson Road, Millers Point, NSW (the site).

2. OBJECTIVE AND SCOPE

The objective of this AMP is to comply with legislative requirements on how to manage asbestos-impacted fill materials during earthworks associated with the EWDA-01, as to limit the potential risk of exposure to airborne asbestos fibres to workers, occupants and surrounding receptors of the site.

To achieve the above objective and to address legal obligations for managing asbestos in the workplace, EDP has prepared this AMP consistent with the requirements as outlined in the NSW *Work Health and Safety Regulation 2017* and Code of Practice: *How to Manage and Control Asbestos in the Workplace 2019*. The AMP specifies work practices and procedures to:

- Ensure the implementation of control strategies for the management of potential asbestos-impacted fill materials during the EWDA-01 works, with provision of safe work procedures and control measures;
- Identify asbestos-containing materials (ACM) at the site;
- Undertake emergency response for accidents or incidents relating to asbestos during the earthworks;
- Satisfy the expected Development Consent requirements for the EWDA-01; and

Information contained within this AMP has been provided to meet the above requirements, as well as facilitate the overall management of potential asbestos-impacted fill materials at the site.

2.1 Expected Development Consent Requirements

Development consent for the EWDA-01 works is yet to be granted. In preparation for the conditions expected to be contained in the consent, EDP has reviewed the consent requirements for other areas of Barangaroo. **Table 1** outlines the consent conditions from the Block 4 remediation works, located south of the Central Barangaroo area.

Table 1: Expected Consent Requirements

Requirement	Where Addressed
Condition B22 – Asbestos Management Sub-Plan (this AMP)	
a) be consistent with Safe Work Australia's Codes of Practice: *How to Safely Remove Asbestos and How to Manage* and *How to Manage and Control Asbestos in the Workplace;*	Throughout AMP.
b) identify any known or potential areas of concern on site for asbestos containing materials;	Based on Stage 1A findings, ACM is likely to be present in the site fill. The eastern portion of Central Barangaroo is known to have shallower fill depths, and therefore EWDA-01 is not expected to encounter significant fill and asbestos impacts.
c) outline the procedures for identification, handling, disposal and/or re-use of asbestos containing materials;	As a precaution, all fill materials are being treated as asbestos-containing, based on Stage 1A findings. Details on identification of ACM is provided in **Section 11**, handling and disposal of ACM detailed in **Section 10.**
d) ensure that all asbestos would be handled and disposed of by a suitably licensed asbestos removalist in accordance with the relevant guidelines and legislation;	**Section 10.1.1**

Requirement	Where Addressed
e) ensure an induction process is in place for site workers and visitors regarding the identification of asbestos and the formal procedures to be followed in the event that asbestos is identified on site;	**Section 7**
f) ensure that the development would comply with the requirements of Condition D27 of this consent;	
g) include a suitable airborne asbestos fibre monitoring program for all asbestos removal works areas; and	**Section 10.6.2**
h) outline the procedures for soil validation and inspection following the completion of asbestos removal works and issuing of asbestos clearance certificates.	**Section 10.6.3**
Condition D27 – Asbestos Waste Management	
(3) *The Applicant must undertake all works in accordance with the requirements of the Asbestos Management Sub-Plan approved under Condition B22.*	
(2) All excavation works involving the removal and disposal of asbestos must only be undertaken by contractors who hold a current Safe Work NSW Asbestos or "Demolition Licence" and a current SafeWork NSW "Class 2 (Restricted) Asbestos Licence (or equivalent) and removal must be carried out in accordance with Safe Work Australia's NOHSC: Code of Practice for the Safe Removal of Asbestos 2005.	All excavation works will be conducted or supervised by a licensed asbestos removal contractor (LARC), as detailed in **Section 10.1.1.**
(3) An asbestos clearance certificate (or certificates) prepared by a suitably licenced asbestos removalist shall be provided to the Department and the Principal Certifying Authority upon completion of all asbestos removal works. The Applicant shall ensure that the asbestos removal works comply with the relevant requirements of the *Work, Health and Safety Regulation 2017*.	Asbestos clearance certificates will be prepared by the nominated hygienist/licensed asbestos assessor (LAA) at the completion of all stages of asbestos remedial works. Detailed in **Section 10.6.3.**
(4) The Applicant must ensure that any asbestos contained in excavated material that is proposed for re-use on site meets the requirements of the EPA and the fill validation requirements outlined in the report prepared by Associate Professor Tim Driscoll entitled *The Use of Asbestos-Contaminated Soils on Barangaroo, Final Report, Report to the Environment Protection Authority 2013*.	All spoil generated during the EWDA-01 works will be excavated and disposed offsite, therefore on-site re-use of the potential asbestos-impacted fill material is not required.

3. SITE DETAILS

Table 2 summarises the details of the work area associated with the requirements of this AMP. The site location and EWDA-01 Area is also illustrated in **Appendix A.**

Table 2: Site Details

Site Details:	
Site Address:	EWDA-01 Area, Central Barangaroo, Hickson Road, Millers Point, NSW
Legal Identification:	Part Lots 5 and 6 in DP 876514
Local Government Area:	City of Sydney
Site Area:	EWDA-01 includes the eastern portion of Blocks 5, 6 and 7, Central Barangaroo, adjacent to Hickson Road, Millers Point NSW.

Site Details:	
	The EWDA-01 work area has a total combined area of approximately 225 m^2. The approximate extent of EWDA-01 is 1.25 hectares (10,250 m^2).
Current Zoning:	B4 Mixed Use and RE1 Public Recreation
Site Elevation:	Approximately 2-4m AHD

4. LEGISLATIVE REQUIRMENTS

The following legislation and Codes of Practice have been utilised (but not limited to) in preparation of this AMP:

- NSW *Work Health and Safety Act 2011*;
- NSW *Work Health and Safety Regulation 2017;*
- *Protection of the Environment Operations Act, 1997;*
- *Protection of the Environment Operations (Waste) Regulation 2014;*
- Code of Practice: *How to Manage and Control Asbestos in the Workplace 2019*;
- Code of Practice: *How to Safely Remove Asbestos 2019*;
- *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition* [NOHSC:3003(2005)];
- Australian Standard (AS) 4964-2004 *Method for the qualitative identification of asbestos in bulk samples* (AS4964-2004);
- *NSW EPA Waste Classification Guidelines: Part 1 – Classifying Waste 2014;*
- AS 2985-2009 Workplace atmospheres – *Method for sampling and gravimetric determination of respirable dust*;
- AS 3640-2009 Workplace atmospheres – *Method for sampling and gravimetric determination of inhalable dust*;
- AS 1319-1994 *Safety signs for the Occupational Environment*;
- AS/NZS 1716 2012 *Respiratory Protective Devices*; and
- AS/NZS 1715 2009 *Selection, use and maintenance of respiratory equipment*.

5. PRINCIPLES OF MANAGEMENT

Implementation of this AMP is the responsibility of the Principal Contractor, Aqualand. All site personnel including Aqualand employees and contractors must be provided, clearly understand, and comply with the AMP. For all sub-contractors undertaking site works, all site works must comply with relevant legislation and guidance. Nothing contained within this AMP may be considered to alter or modify guidelines as set down in the *NSW Code of Practice: How to Manage and Control Asbestos in the Workplace 2019*, or the requirements laid down under all relevant NSW legislation (including the *NSW WHS Act 2011* and *NSW WHS Regulation 2017* or relevant legislation current at the time of works).

The AMP is to be a dynamic document that is revised where necessary to reflect any changes to the site that may result in a change to asbestos exposure risk factors and associated asbestos controls. As soon as reasonably practicable, after such a change is identified, the AMP shall be revised by the Principal Contractor's Hygienist. Whenever the AMP is amended, all site personnel including sub-contractors shall be inducted to the revisions of the AMP and any associated revisions relating to their responsibilities. The AMP shall be maintained by Aqualand with input from their sub-contractors.

6. ROLES AND RESPONSIBILITIES

Table 3 outlines the roles and responsibilities required as part of this AMP.

Table 3: Roles and Responsibilities

Role	Description of Responsibilities:
Asbestos Management Plan Controller (AMPC)	The AMPC is to be a representative of, or nominated by Aqualand. Duties of the AMPC include: • Informing employees, contractors and subcontractors of the location of ACM at the site through the implementation of awareness training, as part of the induction process, etc.; • Providing or delegating supervision as required to ensure that the procedures documented in this AMP are implemented; • Ensuring asbestos related health and safety procedures, including permits to work are completed and safe work method statements (SWMS) are developed and updated on a regular basis; • Establishing a platform for consultation for all relevant site personnel to ensure responsibilities are understood and feedback can be provided; • Notifying workers or occupants of air monitoring results during asbestos remedial works; and • Ensure asbestos related records are maintained with this AMP. Documentation must be archived for an indefinite period and be accessible to any NSW Regulator if requested.
Person Conducting a Business or Undertaking (PCBU)	The PCBU is Infrastructure New South Wales (INSW) as the owner of Central Barangaroo. A general duty is imposed on any PCBU at a workplace to eliminate, as far as is reasonably practicable, a person's exposure to airborne asbestos, or if not reasonably practicable, to minimise so far as is reasonably practicable. A PCBU must ensure that the exposure standard for asbestos is not exceeded at the workplace. A PCBU has a responsibility in relation to asbestos to: • Provide and maintain, so far as practicable, safe and healthy work environments and practices generally, and have written policies on the control of asbestos; • Ensure, so far as is reasonably practicable, that all asbestos or ACM at the workplace is identified by a competent person; • Comply with legislative provisions; and • Liaise where appropriate on a continuous basis so that the existence and condition of asbestos in the working environment is known.
Principal Contractor	The Principal Contractor is Aqualand Projects Pty Ltd. Without negating the PCBU duties, the Principal Contractor assumes management or control of the EWDA-01 area for the duration of the project. Aqualand must: • Ensure, so far as is reasonably practicable, that all asbestos or ACM at the workplace is identified by a competent person; • Arrange for sampling, analysis and verification; • Engage a Class-A and Class-B LARC (dependant on type of material being removed) for asbestos remedial works; • Engage suitably qualified and experienced hygienists to conduct asbestos hygiene services including air monitoring and clearances (as required); • Provide adequate instruction and training for employees and supervision of health and safety measures; • Consult with employees, their representatives and organisations and the NSW Regulator on the control of exposure to airborne asbestos; • Anticipate the need for the control of asbestos risks to be initiated in any particular case; • Provide appropriate protective clothing and equipment, hygiene procedures and personal decontamination facilities; • Prepare, complete, and submit documents for obtaining necessary approvals; and • Ensure a copy of the AMP is made readily accessible for all relevant personnel.

Role	Description of Responsibilities:
Principal Contractor Hygienist	The Principal Contractor Hygienist will be engaged by Aqualand and will be required to undertake a number of high level hygienist tasks on behalf of Aqualand, including: • Development, review and update of this AMP; • Providing advice on all matters related to occupational hygiene across all work packages and delivery stages; • Liaising directly with Aqualand, but also a number of stakeholders (for example, Project Management team, Sub-Contractor Hygienist, Site Safety Committee, INSW, SafeWork NSW); • Review and provide feedback on health and hygiene matters proposed by the Sub-Contractor Hygienist; and • Undertake regular due diligence reviews to ensure that the works are being undertaken in accordance with the relevant plans, procedures and legislation.
Sub-Contractor Hygienist	Each sub-contractor undertaking works at the site will be required to supply their own Sub-Contractor Hygienist. The Sub-Contractor Hygienist will be responsible for: • Undertaking air monitoring during excavation works; • Providing on-site visual inspection, identification of asbestos impacted material and validation sampling of non-asbestos impacted materials; and • Supervising works to ensure compliance with this AMP and NSW regulatory requirements for asbestos management and disposal.
All Hygienists	Hygienists referred to in this AMP should hold an asbestos assessor's licence to provide asbestos hygiene services for the works, including air monitoring clearance inspections. Additionally, all hygienists must be suitably qualified and experienced Competent Person with knowledge and experience in conducting asbestos in soil risk assessments, including sampling and validation.
Licensed Asbestos Removal Contractors	The licensed asbestos removal contractor (LARC) will be engaged by Aqualand to conduct asbestos remedial works (as required). The LARC must perform all works in accordance with licensing requirements and standard industry practice for asbestos removal. The LARC must: • Hold either a Class A (friable) or Class B (non-friable) Asbestos Removal Licence (as required). • Develop a SWMS for the removal work. • Develop an Asbestos Removal Control Plan (ARCP). • Submit an Asbestos Permit to Work Permit (APW) issued and approved by the AMPC. • Submit a 5-day asbestos removal notification to Safe Work NSW prior to remediation works. • Ensure all workers have been inducted into the site. • Ensure the appropriate licences and training/competencies of the workers undertaking the removal works are up to date. • Ensure asbestos work area is established. • Set up decontamination area. • Decontaminate machinery and equipment as required.
Sub-contractors	Aqualand will engage other sub-contractors during the EWDA-01 works, including (but not limited to) plant and machinery operators and waste haulage contractors. These contractors must ensure their responsibilities are met in accordance with this AMP, including: • Completion of induction and training requirements in accordance with this AMP, including asbestos awareness training program for those entering the asbestos work area. • Working under supervision of LARC (as required). • Ensuring plant and machinery entering asbestos work areas have cabins with closed loop air conditioning system fitted with HEPA filter. • Ensuring minimum asbestos PPE is available and worn when entering and exiting asbestos work area.
Employers	Employers have a responsibility, in relation to asbestos for: • Ensure staff have attended an asbestos awareness training program. • Consulting on health and safety matters generally and on measures that may need to be taken on asbestos in occupied areas, on machinery and equipment. • Keeping themselves informed of advice given by competent persons in relation to inspections and meeting health and safety commitments.

Role	Description of Responsibilities:
	• Co-operating on any reasonable request for the variation to work hours and hours of work. • Advising members of their obligations and responsibilities under occupational health legislation.
Workers	Any person entering or conducting work associated with the EWDA-01, extending to off-site processes including, but not limited to, transportation and unloading of materials have a responsibility in relation to asbestos that includes: • Taking reasonable care for his or her own health and safety. • Taking reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons. • Complying with instructions given for their own safety and health and that of others generally. • Complying with all work procedures and instructions related to asbestos. • Co-operating with supervisors and managers in their fulfilment of legislative obligations. • Reporting immediately to their supervisor any perceived safety or health risk. • Wearing and maintain in good order all protective clothing and apparatus provided by the manager or supervisor for personal protection and maintain same in good order. • Ensuring all equipment is in good working order.
Visitors	Visitors have a responsibility in relation to asbestos that includes: • Entering EWDA-01 area is permitted by Aqualand. • Taking reasonable care for his or her own health and safety. • Taking reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons. • Complying with instructions given for their own safety and health and that of others generally; • Complying with all work procedures and instructions related to asbestos. • Co-operating with site staff in their fulfilment of legislative obligations. • Complying, so far as the person is reasonably able, with any reasonable instruction that is given by the person conducting the business or undertaking to allow the person conducting the business or undertaking to comply with all legislative requirements and this AMP. • Reporting immediately (as applicable) to Aqualand, any perceived safety or health risk.
SafeWork NSW / Regulator	NSW Work Health and Safety Regulator. Focuses on harm prevention and improving the safety culture in NSW workplaces. They provide the following: • Offers advice on improving work health and safety. • Provide licenses and registrations for potentially dangerous work. • Investigate workplace incidents. • Enforce WHS laws in NSW.

7. INDUCTIONS, TRAINING & HEALTH MONITORING

All workers who may impact on potential asbestos in soil while working at the site should be made aware of the potential presence of asbestos through inductions to this AMP, toolbox talks and awareness training package.

7.1 Toolbox Talks

While conducting any works at the site with the potential for soil disturbance, all relevant site personnel should undertake a toolbox talk session to ensure that employees and contractors are adequately trained to recognise environmental and work, health and safety issues on a regular basis. The toolbox talk should incorporate details and instructions on how to manage asbestos-impacted soils that may be encountered whilst undertaking works at the site, in accordance with this AMP.

7.2 Inductions

The AMPC will provide an induction into this AMP for new employees and contractors whose involvement has the potential for asbestos to be encountered at the site. As part of the induction, the AMPC must examine the works

to be performed, determine whether the works will impact on asbestos-impacted soils and advise what can and cannot be done. The induction should include information such as (but not limited to):

- The known asbestos-impacted areas;
- Type of asbestos that may be/have been encountered within the soil;
- The necessary permits to be completed (i.e. permit to work/SWMS), with the control measures to be adopted and appropriate personal/respiratory protective equipment (PPE/RPE) and decontamination procedures to be conducted; and
- Unexpected finds and expected finds protocol, including reporting ACM finds to the AMPC as soon as possible so that the appropriate corrective action can be initiated.

This AMP must be made available onsite to all contractors for reference, particularly for the direction on how to manage asbestos-impacted soils during earthworks or if encountered at the site, refer to **Section 10**.

Record of contractors or other personnel who have attended the induction must be maintained in **Appendix B** of this AMP.

7.3 Asbestos Awareness Training

As per the Code of Practice: *How to Manage and Control Asbestos in the Workplace 2019,* the training program should include the following topics:

- Health risks of asbestos;
- Types, uses and likely presence of asbestos at the site;
- Roles and responsibilities of the AMPC and workers under the AMP;
- Where to find the AMP and how to understand the information contained;
- Safe work procedures to be followed with examples to prevent exposure;
- The correct use of PPE/RPE;
- How to implement of control measures and safe work procedures;
- When a Class-A or Class-B LARC are required for asbestos remedial works; and
- Air monitoring requirements and exposure standard for airborne asbestos.

The objective of the training is to create changes in behaviour and asbestos management through improved awareness of workers at the site. The purpose of the training is also to provide understanding to workers of the health implications with of exposure to asbestos, the appropriate control measures and their responsibilities legislative obligations.

It should be considered that all workers at the site undergo an asbestos awareness training session to advise of the presence of potential asbestos in soil whilst conducting works associated with the EWDA-01.

7.4 Health Monitoring

As per Clause 435 of the *WHS Regulation 2017*, the PCBU has a duty to provide health monitoring to a worker carrying out ongoing asbestos-related work and is at risk of exposure to asbestos when carrying out the work.

Based on the available information relating to asbestos contamination reported within the other stages of the project, the risk of exposure to asbestos during the earthworks is considered to be low based on the asbestos contamination considered to be bonded in nature with limited ability to become airborne.

It is understood that the results of the air monitoring conducted during the previous stages of the project were all less than the reporting limit of <0.01 fibres/ml, indicating a low risk of exposure during soil disturbance. As such, health monitoring is not deemed to be a mandatory requirement for workers conducting general earthworks at the site. Confirmation of potential asbestos exposure levels will be monitored throughout the works with background and exposure asbestos-fibre air monitoring conducted for the duration of the works. Airborne asbestos-fibre concentrations must be maintained less than 0.01 fibres/ml, otherwise health monitoring requirements will be triggered.

As per legislative requirements, health monitoring is still required for personnel routinely engaged in asbestos removal and asbestos associated works outside this particular project. This is expected to include the asbestos supervisor and hygienists as a minimum.

7.5 Respirator Fit Testing

Any respirators used during works undertaken at the site must be face fitted to the individual with evidence of the quantitative face fit provided with the contractor's safety documentation. All operatives required to wear respirators must be cleanly shaven to ensure a suitable seal.

7.6 Permit to Work

For any asbestos remedial work, an asbestos permit to work (APW) will need to be issued to, and signed by, the LARC. The APW may only be issued by the AMPC. Before being issued with an APW, the LARC are required to read and understand the AMP.

The APW should detail the nature of the work to be performed and document the removalist/contractor agreement to:

- Abide with the requirements for working with ACM as detailed in the NSW Codes of Practice;
- Isolate/restrict access to the work area;
- Provide and erect appropriate warning signs;
- The use of safe work procedures;
- Appropriate use of PPE/RPE;
- Appropriate decontamination and clearance inspections of the work area; and
- Remove and dispose of any ACM (including PPE/RPE) in accordance with WHS legislation.

The APW formally transfers the responsibility for compliance with this AMP and the NSW *Work Health and Safety Regulation 2017* to the signatories.

An example APW is provided in **Appendix C.**

8. COMMUNICATION AND CONSULTATION

Consultation through an agreed and documented mechanism where workers consult on a regular basis to express their views on health and safety matters at the site should be established.

The procedure should provide a framework for:

- Workers to communicate health and safety matters associated with asbestos at the site;
- Resolving workplace health and safety risks;
- Ensuring management personnel are aware of hazards and health and safety issues experienced by employees, contractors and visitors to site;
- Decision-making about health and safety by gathering a wider source of health and safety ideas and knowledge;
- Supporting commitment to health and safety;
- Reducing the number and severity of health and safety risks and hazards; and
- Strengthening the health and safety culture at the site.

9. RECORD KEEPING

Relevant documentation regarding the implementation of this AMP should be maintained by Aqualand. The documentation may include (but not be limited to):

- Site plans, identifying the location of asbestos-impacted soil at the site;
- Revisions of the AMP for the site;

- Asbestos related incident reports;
- Employee and contractor inductions and training records;
- Health monitoring records or statement of subcontractors regarding compliance with health monitoring requirements; and
- Relevant environmental reports.

It will be the responsibility of Aqualand to review and update the records as required and to implement corrective actions where necessary.

Relevant records should be maintained with this AMP.

10. ASBESTOS REMEDIATION SPECIFICATION

10.1 Asbestos Remediation Works Procedure

Asbestos remedial works associated with the EWDA-01 are defined as the excavation, stockpiling, validation/clearance and loading/disposal of potential asbestos impacted soil which may be encountered at the site. Details of the requirements of these works are detailed in the following sections.

10.1.1 General Requirements

Any works proposed to disturb the soils at the site will require management in accordance with this AMP. If earthworks are to be completed in an area of confirmed asbestos contamination the works must be supervised by a contactor holding a Class A (friable) or Class B (non-friable) asbestos removal licence issued by SafeWork NSW under all applicable controls and procedures in accordance with this AMP. In addition, air monitoring and clearance inspections are required for all earthworks by a nominated hygienist/LAA, independent from the LARC.

10.1.2 Stages of Remedial Works

The remediation works associated with EWDA-01 will be conducted in the following stages:

1. Surface concrete removal.
2. Guide Wall construction works, involving:
   - Excavation and stockpiling;
   - Concrete installation within excavation;
   - Waste classification, validation/clearance; and
   - Transport loading and offsite disposal.
3. Secant Pile Wall excavation, including:
   - Excavation and stockpiling;
   - Concrete installation within excavation;
   - Waste classification, validation/clearance; and
   - Transport loading and offsite disposal.

Based on previous asbestos contamination identified within the Barangaroo project site, the asbestos impacts that may be uncovered are deemed to be non-friable (bonded) in nature. In the event that asbestos contamination is encountered in the form of non-friable asbestos, management of excavation works should be completed under non-friable asbestos conditions as per Section 10.1.6. Excavation and offsite disposal is deemed an acceptable remedial approach.

In the event that friable ACM is uncovered during the earthworks, works must cease in the area and the **Unexpected Finds Protocol** should be implemented, as detailed in **Section 12.**

10.1.3 Triggers for Implementation and Cessation of Asbestos Controls

Responsible Party: Aqualand, Workers

Key ground disturbance activities for EWDA-01 involve excavation of soil to install the guide wall, and drilling of soils to install the secant piles. If any form of non-friable asbestos is identified in excavated or drilled spoil, the immediate work area must be considered asbestos impacted and appropriate non-friable asbestos controls in accordance with the requirements of this Section (Section 10) must be followed.

For the guide wall excavation and secant pile will drilling, triggers to cease implementation of asbestos controls are as follows:

- Guide wall (or other trenches) - a minimum 5 m of further excavation in either direction which has not identified any further instances of asbestos. Verification of the absence of asbestos in the trench sidewalls and base to enable cessation of asbestos controls must be undertaken by a hygienist.
- Secant pile wall – drill spoil from a two directly adjacent piles in either direction must not identify any further instances of asbestos (e.g. if pile 03 identifies asbestos, piles 01, 02, 04 and 05 at a minimum must be drilled under asbestos controls). Verification of the absence of asbestos in pile spoil to enable cessation of asbestos controls must be undertaken by a hygienist.

If evidence of friable asbestos is identified, the UXP provided in Section 12 will be activated, however the protocol for cessation of asbestos controls outlined above are considered to apply.

10.1.4 Safe Work Method Statement

Responsible Party: Aqualand, Licensed Asbestos Removal Contractor, Hygienist and Sub-Contractors

Prior to the commencement of earthworks at the site, all employees or nominated sub-contractors are required to have completed a detailed SWMS for the works. The SWMS should include task-specific health and safety protocols for the works, including the management of asbestos contamination.

10.1.5 Regulator Notification

Responsible Party: Licensed Asbestos Removal Contractor

The appointed LARC must submit a five-day notification and Asbestos Removal Control Plan prior to the commencement of asbestos in soil removal works to SafeWork NSW.

10.1.6 Neighbour Notification

Responsible Party: Aqualand and Licensed Asbestos Removal Contractor

The LARC will draft the required notification for adjacent properties and will submit this to Aqualand for review and approval. The LARC is to notify neighbouring properties of the removal of asbestos. This will be undertaken at least 1-day in advance of the works to ensure adjacent properties are aware of the upcoming works.

10.1.7 Control Measures for Asbestos Remedial Works

Responsible Party: Aqualand, Licensed Asbestos Removal Contractor, Hygienists and Sub-Contractors

The following procedure must be followed during the asbestos remedial works, which are deemed to include the excavation, stockpiling, transport and disposal of confirmed asbestos-impacted soil at the site.

- Prior to the commencement of the works, all relevant site personnel must be appropriately trained and inducted into the requirements of this AMP and undertake a toolbox talk as detailed in **Section 7.1** to ensure that workers are adequately trained to recognise environmental and health-related issues associated with potential asbestos in soil contamination at the site.
- LARC to delineate the asbestos work area(s). The asbestos work area(s) is where the asbestos-impacted concrete and soils will be excavated and stockpiled and will also include vehicle transit routes and decontamination area(s).

- The asbestos work area must be established by the LARC with suitable exclusion zones with signs and barricades to clearly delineate and isolate the area. Signs must be placed in positions that clearly indicate the location of the asbestos work area(s). The work area(s) must remain in place until the works are completed within an area, with all air monitoring results satisfactory and clearance certificate issued by hygienist.
- LARC must set-up dry decontamination area at the entrance/exit to the asbestos work area(s), as detailed in **Section 10.4.1.**
- LARC to establish a suitable stockpiling area within the asbestos work area. The stockpile footprint is to be lined with high-density polyethylene (HDPE) sheeting and should be located away from drainage lines and waterways.
- The hygienist shall undertake control asbestos fibre air monitoring for the duration of the earthworks in accordance with the NOHSC *Membrane Filter Method for Estimating Airborne Asbestos Fibres, 2nd Edition 2005* [NOHSC:3003(2005)]. Monitoring must be NATA accredited, including sampling and analytical methods, as detailed in **Section 10.6.2.**
- Minimum PPE must be worn at all times by workers within the asbestos work area including P2 half face respirator, Type 5/6 coveralls, disposable booties and gloves. Further details on PPE requirements are provided in **Section 10.3.**
- Truck drivers and plant/machinery operators will operate and be supervised in the asbestos work area by the LARC. Operators may be exempt from asbestos PPE requirements if it can be shown that their cab can be sealed during works and closed loop air conditioning can be engaged with HEPA filter attached. As a minimum a P2 half face respirator must be worn when entering the asbestos work area and traveling to and from the excavator cab.
- Transport routes must be planned prior to commencing transport across the site to minimise driving over fill materials with minimal obstacles.
- All drains that may be affected by the asbestos remedial works (including contaminated water from decontamination area(s) should be capable of capturing particles down to 5µm to prevent asbestos residue entering the drainage system. Filter material shall be inspected and replaced regularly. Soiled filter media is to be disposed offsite as Special Waste (asbestos waste).
- Care should be taken to ensure dust generation is kept to a minimum, with dust suppression techniques to be employed throughout each stage of works. Dust suppression should be in the form of a fine mist water spray. This can be achieved with a mains-supplied hose fitted with a pistol grip or water cart. Excessive use of water causing pooling and run-off should be avoided, further dust suppression techniques are provided in **Section 10.2.3**.
- During the excavation process, all earthworks must be undertaken systematically with observations of all soil being extracted, stored, moved, and disposed offsite recorded.
- Surface concrete should be carefully separated from soil and visually inspected and cleared by hygienist prior to offsite disposal.
- Stockpiles generated during the works must be carefully placed within the stockpiling area and covered and secured with weighted HDPE sheeting or geofabric as detailed in **Section 10.2.4.**
- Hygienist must conduct soil sampling of stockpiles for waste classification purposes to facilitate offsite disposal of the material to a licensed landfill facility in accordance with *the NSW EPA Waste Classification Guidelines: Part 1 – Classifying Waste, 2014.*
- All plant and machinery must be decontaminated and visually cleared by hygienist prior to leaving the site, as per **Section 10.4.3.**
- Decontamination of all workers, PPE and tools used during the asbestos earthworks is required when exiting the asbestos work area. All waste generated during the works must be disposed offsite as Special Waste (asbestos). Further details of decontamination and waste procedures in outlined in **Section 10.4.**
- The hygienist must provide clearance inspections at various stages of the earthworks as detailed in **Section 10.6.3.**

10.2 Site Set-Up

10.2.1 Fencing and Signage

Responsible Party: Aqualand and Licensed Asbestos Removal Contractor

The asbestos work area shall be established for the duration of the earthworks and must be made secure and signed appropriately (e.g. 'Authorised Persons Only' or 'Specialised Work Zone'). The asbestos work area shall include the establishment of a physical barrier and an exclusion zone surrounding the site.

For the purposes of this AMP the asbestos work area should be designated as the zone where soil disturbance is being undertaken, including the decontamination area. The asbestos work area should be established prior to earthworks commencing. This boundary shall be maintained throughout the duration of the works.

10.2.2 Erosion and Sediment Control

Responsible Party: Aqualand and Licensed Asbestos Removal Contractor

Erosion and sediment controls must be in place prior to commencement of work, especially in areas of highly erodible soil. Suitable containment and (where applicable) filtration is to be used at the asbestos work area boundaries to prevent run-off to adjoining property or to the adjacent water body particularly at vehicle wash points.

10.2.3 Dust Suppression

Responsible Party: Aqualand and Licensed Asbestos Removal Contractor

Dust suppression techniques must be adopted to minimise the generation and dispersal of dusts during excavation works. Note that care must be taken to prevent and control water run-off.

These techniques may include:

- Fine water spraying;
- Use of gravel or fabric barriers to the surface of trafficked areas;
- Minimising the degree of traffic;
- Covering stockpiles with HDPE sheeting or geofabric at the conclusion of each shift; and
- Ceasing works if environmental conditions result in visible dust being generated from the site.

10.2.4 Stockpile Management

Responsible Party: Licensed Asbestos Removal Contractor

The following is required for stockpiles generated during the works:

- Stockpiles shall be established on HDPE sheeting or geofabric on the ground surface;
- Dust suppression shall be in place as discussed above;
- Stockpiles shall not exceed 2 m in height and shall be of the lowest height practicable;
- Stockpiles shall have asbestos signage displayed where present;
- Stockpiles are to be wetted down with water;
- Stockpiles to be stored for more than one day, or where adverse weather conditions are expected (e.g. high winds) shall be covered with weighted HDPE or geofabric; and
- Stockpiles shall be suitably barricaded or otherwise fenced off to prevent access.

10.3 Personal and Respiratory Protective Equipment

Responsible Party: All Workers Entering and Exiting the Asbestos Work Area

All contractors undertaking asbestos remedial work at the site shall be responsible for providing their workers with appropriate PPE/RPE to minimise the risk of exposure to asbestos. The level of PPE/RPE required for asbestos

remedial work detailed in this AMP has been based on the asbestos contamination previously identified within Stage 1A (non-friable ACM). Minimum asbestos PPE should include the following:

- Half face respirator with P2 particulate filter;
- Disposable nitrile or latex gloves;
- Type 5/6 disposable coveralls; and
- Disposable boot covers or footwear that can be easily decontaminated (i.e. gumboots).

Plant and machinery operators may be exempt from asbestos PPE requirements if it can be shown that the cab can be sealed during works and closed loop air conditioning can be engaged with HEPA filter attached. As a minimum a half face respirator with P2 particulate filter must be worn when entering the asbestos work area and traveling to and from the excavator cab.

See the below sections and **Appendix D** for further information/specifications on asbestos PPE.

10.3.1 Respirators

The selection of suitable RPE depends on the nature of the asbestos work, the probable maximum concentrations of asbestos fibres encountered and any personal characteristics of the wearer that may affect the facial fit of the respirator (facial hair and glasses etc.). Workers must be clean shaven to maintain a sufficient seal and respirators must be fit-tested for the individual on annual basis. If the wearer cannot be clean shaven, a powered air purifying respirator (PAPR) with hood may be worn.

Based on the asbestos contamination previously identified within Stage 1A of the project (i.e. non-friable ACM), half face P2 respirator is deemed to provide suitable protection for the asbestos remedial works. If friable ACM is uncovered during the works, a risk assessment must be conducted by the hygienist to determine the most appropriate form of RPE to be worn, alternatively a P3 full face respirator must be worn.

10.3.2 Coveralls and Boot Covers

Disposable coveralls should be utilised to minimise the risk of asbestos fibres contaminating clothing or under garments during asbestos remedial works. Coveralls rated Type 5/6 or Category 3 (EN ISO 13982–1) are of a suitable standard and should be fitted with elastic hoods, cuffs and anklets to reduce the risk of penetration of asbestos fibres.

If laced boots with eyelets are worn by workers, it is advisable that protective boot covers are worn in tandem with coveralls. Boot covers help ensure asbestos fibres do not contaminate footwear which cannot be easily decontaminated.

Coveralls and boot covers should be used for single use only. Once coveralls and boot covers have been used, they should be treated as asbestos contaminated waste.

10.3.3 Gloves

Disposable latex or nitrile gloves should be worn when handling asbestos or working around asbestos. Gloves should be single use only and disposed of as asbestos waste one used.

10.4 Decontamination

Decontamination of the work area, workers, PPE/RPE and tools used in asbestos remedial work is an important requirement in the process of minimising exposure to airborne asbestos fibres. Decontamination not only reduces the exposure risk to workers exiting an asbestos work area but also to persons outside the asbestos removal work area.

To determine the appropriate decontamination procedure, the risks of the remedial works should be assessed. Either wet decontamination, dry decontamination methods (or a combination of both) should be utilised each time persons or equipment enter/exit an asbestos work area and at the completion of the asbestos work.

The selection of decontamination methods and procedures including how to set up an effective decontamination area/s is outlined in the *Code of Practice: How to Safely Remove Asbestos 2019*. The following decontamination procedure has been developed as part of this AMP which is based on the nature of potential asbestos contamination at the site (non-friable ACM).

10.4.1 Decontamination Area Set-Up

Responsible Party: Licensed Asbestos Removal Contractor

The LARC must provide a dry decontamination area(s) set up at the entrance/exit to the asbestos work area for site workers to personally decontaminate when entering and exiting the asbestos work area.

This decontamination area shall include:

- A dirty decontamination area that includes:
  - Equipment for hosing down (by use of a fine mist) contaminated clothing and footwear;
  - Storage for contaminated clothing and footwear;
  - Asbestos waste bags and duct tape; and
  - Geofabric lining to capture water.
- A clean decontamination area that includes:
  - Storage for individual RPE in containers.
  - Spray bottle of water or wet wipes; and
  - Asbestos waste bags and duct tape.
- A clean change area that includes:
  - Storage for clean clothing and PPE.

10.4.2 Decontamination of Personnel and Hand Tools

Responsible Party: All Workers Entering and Exiting the Asbestos Work Area

The procedure for entry to the asbestos work area for all workers is to be as follows:

- Enter via the clean changing area, where personnel will change into the required PPE. Any clothes removed here shall be stored.
- Move to the clean decontamination area and put on respirators. Check for good fit and seal before progressing.
- Proceed to asbestos work area.

The procedure for leaving the asbestos work area for all workers is to be as follows:

- Proceed into the dirty decontamination area. Decontaminate all tools and equipment used during the works using wet wipes and/or fresh water before they are removed from the asbestos work area.
- Spray down PPE and RPE using fine mist water spray. Do not remove respirators at this stage. Booties, coveralls and gloves can be removed and placed in labelled asbestos waste bags.
- Proceed to clean decontamination area: Wash hands, fingernails, face, head and respirator using wet wipes or spray bottle of water. Respirator can be removed at this point. Store respirator in a suitable container within the clean decontamination area.
- Move to the clean change area and change into clean clothing.

Disposable PPE and all waste generated during decontamination procedure must be placed in double asbestos waste bags, tied in a goose-neck position with duct tape and disposed offsite as Special Waste (asbestos). Note that asbestos waste bags must be filled to 50% capacity only.

10.4.3 Decontamination of Plant and Equipment

Responsible Party: Licensed Asbestos Removal Contractor

A plant decontamination area must be designated and maintained at the site during asbestos remedial works which is to remain until completion of the works. Additional decontamination procedures include:

- Placing geofabric on the surface of the designated plant and equipment wash bay prior to commencing decontamination.
- Installing silt fencing or bunding if necessary, to prevent water and/or contaminated soil from leaving the site.
- Using a water truck or hose pipe, and hand tools for the purpose of decontaminating plant such as excavators, paying particular attention to the excavator track and bucket.
- Installing wheel wash bay at the exit of the asbestos work area for all plant and machinery to exit through.

10.5 Exempt Tools and Equipment

Tools and equipment that generate dust must not be used on asbestos impacted soils during the project. These include:

- High-speed abrasive power and pneumatic tools, for example angle grinders, sanders, saws and highspeed drills.
- Brooms and brushes.
- High-pressure water spray, jets, power or similar tools and instruments.
- Compressed air.

10.6 Asbestos Hygiene

10.6.1 Visual Inspection of Site-Set-Up

Responsible Party: Hygienist

A visual inspection will be undertaken by the LAA to assess the completion of the establishment of the asbestos work area and decontamination facilities prior to commencement of the asbestos remedial works. Access to the asbestos work area will only be permitted following satisfactory completion of the visual inspection.

10.6.2 Asbestos-Fibre Air Monitoring

Responsible Party: Hygienist

NATA accredited asbestos fibre air monitoring must be undertaken during the asbestos removal works by an LAA. Air monitoring must be undertaken in accordance with NOHSC: 3003(2005) and ISO/IEC 17025 *General requirements for the competence of testing and calibration laboratories 2017*.

Air monitoring results must be daily. Works shall cease if the air monitoring results are found to be above the reporting limit of 0.01 fibres per millilitre of air (f/ml). Emergency procedures shall be followed when air monitoring control levels are exceeded as outlined in **Section 13.2.**

10.6.3 Visual Clearances Inspections and Certificates

Responsible Party: Hygienist

Following the completion of daily works, a site walkover must be undertaken by the nominated hygienist to confirm that no visible asbestos materials are present outside the asbestos work area(s). Clearance certificates should be provided and issued for the site following clearances inspections and at appropriate milestones throughout the removal works, including:

- Following concrete removal to facilitate offsite disposal as construction and demolition waste.
- Once excavation has occurred to the required design depths and new concrete has been satisfactorily installed.
- Plant and machinery prior to exiting the asbestos work area.

Any stockpiles generated during excavation works shall be wetted down and covered with weighted HDPE sheeting or geofabric as detailed above.

At the conclusion of works in a specific area, the hygienist must also undertake a walkover of the area to confirm that visible asbestos materials in the area have been sufficiently removed and the area has been sufficiently stabilised.

As air monitoring certificates are issued for the site, an accompanying daily update summarising the asbestos-related activities undertaken at the site should be provided to Aqualand.

10.7 Transport and Waste Disposal

Responsible Party: Licensed Asbestos Removal Contractor and Waste Haulage Contractors

For the offsite disposal of asbestos-impacts soils generated at the site, the material will be pre-classified as Special Waste (asbestos waste) with soil chemical characterisation required in accordance with the *NSW EPA Waste Classification Guidelines: Part 1 – Classifying Waste 2014* prior to disposal offsite to an appropriately licensed landfill facility. Hygienist must conduct soil chemical characterisation for waste classification to facilitate appropriate offsite disposal to a NSW landfill facility.

Asbestos materials need to be double bagged in asbestos waste bags and tied in a goose-neck position prior to disposal. Soils should be directly placed into awaiting trucks lined and covered with tarpaulin. Asbestos waste must be tracked for quantities greater than 10 m^2 or volumes greater than 100 kg using NSW EPA's Waste Locate https://wastelocate.epa.nsw.gov.au/.

11. SAMPLE COLLECTION OF SUSPECTED ASBESTOS

If suspected ACM requires identification during the works, the nominated hygienist shall sample the suspected material in accordance with AS4964-2004.

Sample/s collected must be delivered to and analysed by a NATA accredited laboratory for the presence of asbestos using polarised light microscopy and dispersion staining techniques. Once the NATA accredited laboratory report has been received, Aqualand is to engage the Principal Contractor Hygienist to conduct a risk assessment of the material if found to contain asbestos and determine whether the existing control measures are adequate or whether additional control measures need to be adopted.

If ACM is identified, details should be recorded and actioned within the ACM Find Checklist provided in **Appendix E.**

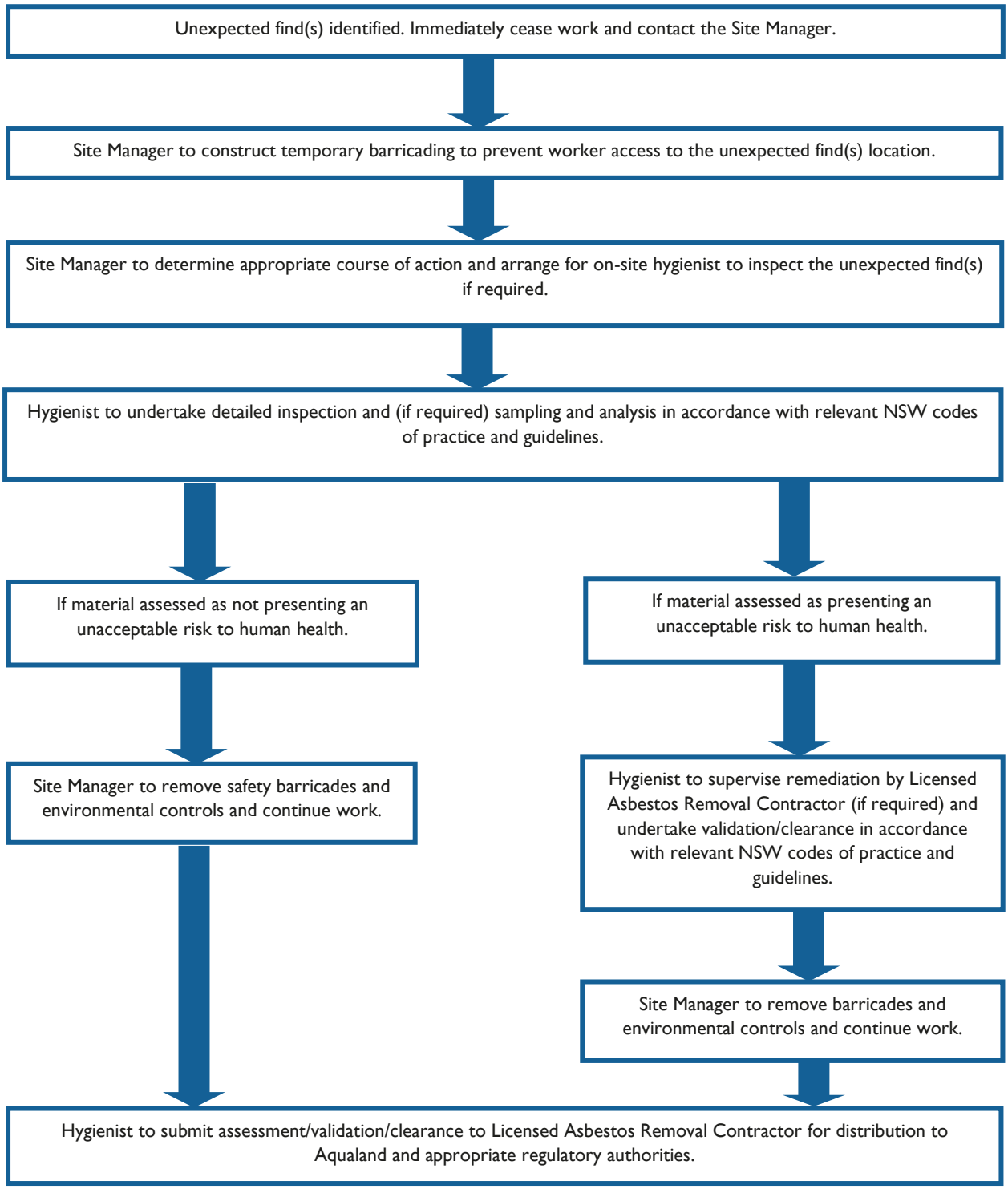
12. UNEXPECTED FINDS PROTOCOL

If one or more of the following situations is identified, Aqualand must be notified, works shall cease within the area, the excavation covered with soil and the area made secure until such time as an assessment of the area can be undertaken by the hygienist and an appropriate course of action determined:

- Friable ACM is uncovered; and/or
- Other potential contaminants are identified including stained or malodourous soil.

The flow-chart overleaf details the unexpected finds protocol to be adopted.

FLOW CHART – UNEXPECTED FINDS PROTOCOL



13. INCIDENTS AND EMERGENCY PROCEDURES

The following sections outline the emergency procedures to follow should there be an uncontrolled release of asbestos fibres at the site, or if air monitoring detects an exceedance of respirable airborne fibres above the action levels.

13.1 Asbestos Disturbance

In the event that an activity causes the accidental disturbance of ACM resulting in the potential uncontrolled release of airborne fibres, the following outlines the steps which should be followed.

Table 4: Emergency Response Procedure

Step:	Responsible Person:	Action:
1	Occupant / Worker / Contractor	• Stop work and immediately notify the AMPC.
2	AMPC	• Remove personnel from the area who are potentially at risk of exposure.
3	AMPC	• Restrict access to the area, dampen and contain. • Erect signage and barricades to restrict access to the area.
4	AMPC / Hygienist	• Contact hygienist to provide advice on additional controls.
5	AMPC	• If asbestos confirmed, hygienist to conduct air monitoring within the area. • All air monitoring results must be below the lowest reporting limit for the method of <0.01 fibres/ml. • Engage LARC (as required) to undertake asbestos remedial work.
6	LARC / Hygienist	• LARC (as required) to perform asbestos remedial works. • Hygienist to perform control asbestos air monitoring during removal works
7	Hygienist	• Hygienist to perform clearance asbestos air monitoring within removal works area (if required), to ensure the area is suitable for reoccupation. • Provide clearance certificate based on successful clearance inspection and/or clearance air monitoring. All air monitoring results must be below the lowest detectable limit for the method of <0.01 fibres/ml.

13.2 Elevated Asbestos Fibre Air Monitoring Results

If during asbestos remedial work, air monitoring results exceed the method reporting limit of 0.01 fibres/ml of air, the existing controls will need to be reviewed and improved before works may continue.

The following table provides the procedure to be followed depending on the air monitoring result.

Table 5: Emergency Response Procedure

Action Level	Responsible Person:	Control / Action:
>0.02 fibres/mL	Hygienist	• Notify LARC and AMPC of results as soon as practicable.
	LARC	• Stop work immediately. • Notify the regulator by phone or in writing with air monitoring result and that removal works have ceased.
	AMPC / LARC	• Erect signage and barricades around asbestos work area to restrict access.
	AMPC / Hygienist / LARC	• Conduct an investigation into the cause for the exceedance. This is to be performed by thorough visual inspection of the work area and equipment in consultation with workers. • Once suspected cause is identified existing controls to be reviewed and new and/or improved controls to be implemented.
	Occupational Hygienist	• Conduct additional air monitoring around the asbestos work area once new controls have been implemented. • Works must not recommence until air monitoring results are <0.01 fibres/ml.
≥0.01 fibres/mL BUT ≤0.02 fibres/mL	Hygienist	• Notify LARC and AMPC of results as soon as practicable.
	AMPC / Hygienist / LARC	• Investigate potential cause for the exceedance. • Existing controls to be reviewed and new and/or improved controls to be implemented where applicable.
<0.01 fibres/mL	LARC	• Continue with existing control measures.

14. PROJECT LIMITATIONS

This Asbestos Management Plan (AMP) has been prepared by EDP Consultants Pty Ltd (EDP) solely for the client listed in **Section 1 (Client)**. This report may only be used and relied upon by the Client and must not be copied to, used by, or relied upon by any person other than the Client or altered, amended or abbreviated, issued in part or issued incomplete without the prior written consent of EDP. This report relates only to the site as detailed within **Section 3** and as described in this report and must not be used in relation to any other work area or site.

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The services undertaken by EDP in connection with preparing the report were limited to those expressly detailed in **Section 2**. The opinions, conclusions and any recommendations in the report are based on the conditions encountered, inspection findings and reviewed information and documentation only.

Please note that subsequent to the date of this report, works or site conditions may have resulted in changes to the status of any identified materials. All changes should be documented and provided to EDP as a supplement to this report.

The data and advice provided herein relate only to the project and structures described in the report. EDP accepts no responsibility for any other use of the data or advice.

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This report must be read in conjunction with all of the attached appendices and should be kept in its entirety without separation of individual pages or sections. EDP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

EDP is not a professional quantity surveyor (QS) organisation. Any areas, volumes, tonnages or any other quantities noted in this report are estimates only. The services of a professional QS organisation should be engaged if quantities are to be relied upon.

Appendix A: Site Plan

Appendix B: AMP Induction Record

AMP Induction Record

Name:	Company:	Signed:	Date:

Appendix C: Example Asbestos Permit to Work

ASBESTOS PERMIT TO WORK PERMIT (EXAMPLE)

WORK REQUEST FORM REFERENCE:	
VALID UNTIL (Insert Date)	
Description of asbestos materials:	
Will an asbestos consultant be required?	YES ❑ NO ❑
Will a licensed removal contractor be required?	YES ❑ NO ❑
Company Name:	
Supervisor:	
Contact Number:	
SPECIFIC PERMIT REQUIREMENTS (TICK AS REQUIRED):	
Scope of works/technical specification for ACM removal?	YES ❑ NO ❑
Contractor Safe Work Method Statement (SWMS) issued for review and approval prior to commencement of work?	YES ❑ NO ❑
Other Items (list details):	
CONTRACTOR ACCEPTANCE STATEMENT:	
I have read and understood the permit requirements and will undertake the work in accordance with all necessary procedures and specifications.	
Signed:	
Print Name and Position:	
Date:	

The contractor must retain a copy of the work permit and work request form on site for the duration of works.

WORK PERMIT COMPLETION

(To be completed by the Management Plan Controller & Contractor)

Date Work Completed:	
Clearance certificate & air monitoring results (if applicable) received (list reference numbers):	
I am satisfied that the works have been completed in accordance with the work permit and the area has been cleaned to the required standard. Inspections and air monitoring (if applicable) confirm that the area can be safely re-occupied.	
Management Plan Controller Signature:	
Date:	
Contractor Signature:	
Date:	

Original to be retained by the **Management Plan Controller.**

Copy to be retained by **instigator of the work request.**

Appendix D: Asbestos Personal Protective Equipment

ASBESTOS MATERIALS PERSONAL PROTECTIVE EQUIPMENT

During asbestos remedial works, PPE must be worn by the LARC, the hygienist and all other personnel that may have come into contact or handled the soils onsite or uncovered asbestos materials.

The following PPE should be used as required:

PPE	Picture
Half faced disposable P2 respirator may be used for non-friable asbestos remedial works. Respirators must comply with AS/NZS 1715-2009 Selection, use and maintenance of respiratory equipment.	
Half faced respirator with a P2 particulate filter cartridge to be used for non-friable (bonded) asbestos remedial works or entry into asbestos work area at the completion of the works. Respirators must comply with AS/NZS 1715-2009 Selection, use and maintenance of respiratory equipment.	
Full faced respirator with a P3 particulate filter cartridge to be used for friable asbestos remedial works within the asbestos work area during the remedial works. Respirators must comply with AS/NZS 1715-2009 Selection, use and maintenance of respiratory equipment.	
Disposable coveralls rated Type 5/6 or equivalent e.g. Tyvek To be used for intrusive works.	
Appropriate glasses or goggles. To be used for intrusive works.	
Appropriate gloves i.e. cut resistant gloves for working with soil and disposable nitrile gloves to be worn over the cut resistant gloves, where required. Occupational protective gloves shall comply with EN 420-1994(AS/NZS2161.2-1998) Occupational Protective Gloves, Part 2 General Requirements.	
Disposable booties or safety gum boots/non-laced safety boots. To be used for intrusive works.	

It is important to note that the disposable coveralls and gloves are single use only and must be disposed of as asbestos waste after each use. Non-disposable respirators must be decontaminated prior to leaving the asbestos work area. Cartridges must be inspected and replaced as required dependent upon the type and duration of usage. Good personal hygiene practices must be carried out following any contact with asbestos materials, with particular attention paid to washing hands, fingernails and head prior to removing respirator.

Appendix E: ACM Find Checklist

ACM Find and Recommended Action Timeframes						
Location Description and Item:	Action Required:	Action Timeframe:	Remedial Works Undertaken:	Completed by (Company):	Date of Works:	Remediation Sign off (AMPC):

Level 4, 38 Oxley Street
St Leonards, NSW 2065, Australia

email: enquiries@edp-au.com
www.edp-au.com
Office: +61 (0)2 8484 5810

ABN: 13 624 867 509

Appendix D: Acid Sulfate Soil Management Plan (EDP ASSMP, 2022)

Aqualand B Development Holding Pty Ltd

Acid Sulfate Soils Management Plan

Central Barangaroo Early Works – Hickson Road Interface

Purpose:

To provide an acid sulfate soils management plan for the treatment and disposal of potential acid sulfate soils at the site throughout the Early Works Development Application 01 at Central Barangaroo, Millers Point NSW.

Prepared for:

Aqualand B Development Holding Pty Ltd (Aqualand)

Document Date:

September 2022

Reference:

S-03937.ASSMP.001 V2

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DOCUMENT CONTROL

Project Details:	
Report Name:	Acid Sulfate Soil Management Plan – Central Barangaroo
Client Name:	Aqualand B Development holding Pty Ltd
Reference:	S-03937.ASSMP.001 V1
Prepared by:	Mark Challoner
Reviewed By:	Hamish Donovan

Revision No.:	Revision Date:	Reason for Issue:	Authorised:	
			Name and Position:	Signature:
V1	29/04/2022	First issue to client	Ryan Jacka Principal Consultant CEnvP #874	
V1 Final	13/05/2022	Final as requested	Ryan Jacka Principal Consultant CEnvP #874	
V2	29/09/2022	Updated Following Auditor Comments	Ryan Jacka Principal Consultant CEnvP #874	

STATEMENT OF LIMITATIONS

This document has been prepared in response to specific instructions from the client to whom the report has been addressed. The work has been undertaken with the usual care and thoroughness of the consulting profession. The work is based on generally accepted standards, practices of the time the work was undertaken. No other warranty, expressed or implied, is made as to the professional advice included in this report.

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Reliance on Information Provided by Others

EDP notes that where information has been provided by other parties in order for the works to be undertaken, EDP cannot guarantee the accuracy or completeness of this information the client therefore waives any claim against the company and agrees to indemnify EDP for any loss, claim or liability arising from inaccuracies or omissions in information provided to EDP by third parties.

Recommendations for Further Study

The industry recognised methods used in undertaking the works may dictate a staged approach to specific investigations. The findings therefore of this report may represent preliminary findings in accordance with these industry recognised methodologies. In accordance with these methodologies, recommendations contained in this report may include a need for further investigation or analytical analysis. The decision to accept these recommendations and incur additional costs in doing so will be at the sole discretion of the client and EDP recognises that that the client will consider their specific needs and the business risks involved. EDP does not accept any liability for losses incurred as a result of the client not accepting the recommendations made within this report.

CONTENTS

GLOSSARY OF TERMS

Abbreviation:	Definition:
ASS	Acid Sulfate Soils (including Actual Acid Sulfate Soils and Potential Acid Sulfate Soils)
AASS	Actual Acid Sulfate Soil
ASSMAC	Acid Sulfate Soil Management Advisory Committee
ASSMP	Acid Sulfate Soil Management Plan
EPA	Environment Protection Authority
NATA	National Association of Testing Authorities
PASS	Potential Acid Sulfate Soils
pHf	Field pH with the addition of deionised water onsite
pHfox	Oxidised pH with the addition of peroxide onsite
SPOCAS	Suspension Peroxide Oxidation Combined Acidity and Sulfate

1. INTRODUCTION

EDP Consultants Pty Limited (EDP) was engaged by Aqualand Pty Ltd (Aqualand), to prepare an Acid Sulfate Soils Management Plan (ASSMP) for the Early Works Development Application 01 (EWDA-01) for Central Barangaroo, located at Hickson Road, Millers Point NSW. The EWDA-01 is part of a larger Central Barangaroo area comprising Lots 5, 6 and 7 of Deported Plan (DP) 876514 (Central Barangaroo Site).

The objective of this ASSMP was to detail management strategies to mitigate the risks posed by the potential acid sulfate soils (ASS) at the site.

Refer to **Figure 1** for the site location provided in **Appendix A**.

2. BACKGROUND

2.1 Project Appreciation

Acid sulfate soil risk maps provided on in City of Sydney Council Local Environmental Planning (LEP) 2012, identified areas of the site with a Class 1 acid sulfate soil risk and limited additional acid sulfate soil data is available. It is expected that potential or actual acid sulfate soils will be disturbed as part of earthworks associated with EWDA-01. In anticipation of ASS disturbance and to satisfy consent requirements under EWDA-01, an acid sulfate soil management plan is to be prepared. This ASSMP outlines the management measures required to be implemented for the scope of EWDA-01, being in summary the construction of a short section of retaining structure (Secant Pile) on the eastern site boundary.

This ASSMP is a supporting document to the EDP Consultants, *EW01 Remedial Works Plan, Central Barangaroo, 2022* report (herein referred to as RWP). The RWP was developed to provide additional remediation detail to the existing JBS Environmental Pty Ltd (JBS) Remediation Action Plan (RAP) (JBS 2013, herein referred to as the JBS RAP), which was subsequently subject to NSW EPA Site Auditor Review and considered appropriate to render the site suitable for the proposed use in the Site Audit Statement (SAS) (GN 439B-5) and Site Audit Report (herein referred as SAR) prepared by ENVIRON Australia Pty Ltd (AS121473, ENVIRON 2013).

3. OBJECTIVES

This ASSMP was developed to assist in the effective management of the environmental risks associated with ASS during the proposed civil works to be undertaken at the site. The objectives of the ASSMP are to:

- Ensure field staff are aware and can identify ASS during the proposed works;
- Ensure appropriate control measures are adopted to protect the environment;
- Provide a framework to manage waste soils which are potentially acid sulfate generating during the proposed works;
- Provide options for long-term management of ASS materials remaining in-situ; and
- A Contingency Strategy.

4. TECHNICAL FRAMEWORK

This ASSMP has been developed in general accordance with the following documents:

- NSW *Work Health and Safety Act 2011*;
- NSW *Work Health and Safety Regulation 2017*;
- NSW EPA *Waste Classification Guidelines 2014: Part 1 – Classifying Waste; and Part 4 – Acid Sulfate Soils 2014* (NSW EPA 2014);
- NSW EPA *Protection of the Environment Operations (POEO) Act 1997*;
- NSW EPA *POEO (Waste) Regulation 2014*;
- ASSMAC *Acid Sulfate Soils Assessment Manual 1998* (ASSMAC Manual 1998);
- Department of Agriculture and Water Resources *National Strategy for the Management of Coastal Acid Sulfate Soils 2000*

The ASS assessment criteria as based on the ASSMAC Manual 1998 which incorporates the following guidelines:

- *ASSMAC Acid Sulfate Soil Assessment Guidelines 1998*;
- *ASSMAC Acid Sulfate Soil Planning Guidelines 1998;*
- *ASSMAC Acid Sulfate Soil Management Guidelines 1998;*
- *ASSMAC Acid Sulfate Soil Laboratory Method Guidelines 1998; and*
- Department of Agriculture and Water Resources *National Acid Sulfate Soils Guidance; National acid sulfate soils sampling and identification methods manual 2018.*

The ASS Manual 1998 provides advice on best practice in planning, assessment and management of activities in areas containing ASS. These guidelines update and expand on the NSW EPA Environmental Guidelines: Assessing and Managing Acid Sulfate Soils 1995.

5. SITE INFORMATION

5.1 Site Identification

Site identification details are summarised in **Table 1** and the location of the site is shown on **Figure 1** and site layout on **Figure 2**, provided in **Appendix A.**

Table 1: Site Identification

Site Identification	
Site Address:	Hickson Road Millers Point NSW
Legal Identification:	Part Lots 5 and 6 in DP 876514
Local Government Area:	City of Sydney
Investigation Area:	EWDA-01 includes the eastern portion of Blocks 5, 6 and 7, Central Barangaroo, adjacent to Hickson Road, Millers Point NSW. The EWDA-01 work area has a total combined area of approximately 225 m^2.
Current Zoning:	B4 Mixed Use and RE1 Public Recreation
Site Elevation	Approximately 2-4 m Australian Height Datum (AHD)
Former Land Use	The site has been used as a commercial port facility and public road.
Current Land Use:	The site currently comprises a relatively flat concrete hardstand surface. The site is being utilised for the temporary storage of plant, equipment and materials associated with other stages of development within the greater Barangaroo area.

Site Identification	
Surrounding Land Use	The site is within the eastern portion of Central Barangaroo. It is bounded by the Block 5, 6 and 7 future basements to the west and the road reserve of Hickson Road to the north-east. Sydney Harbour is situated immediately beyond the Block 7 Foreshore footprint in the north and west, and mixed residential and commercial buildings occupy the eastern side of Hickson Road. Works to the north of the site were being undertaken for the construction of the Barangaroo Metro Station. Works to the south were associated with the Lendlease development in Block 4.
Topography	A review of the NSW Government National Map online database (http://www.nationalmap.gov.au/) accessed in January 2022, indicated that the site was generally flat and was located at an elevation of approximately 2-3 m AHD.
Acid Sulfate Soils:	A review of the 1:100 000 Geological Survey of NSW (Sydney) Sheet 9130 (Ed 1) 1983 shows the Barangaroo precinct to be defined as man-made fill and has is classified as disturbed terrain . This disturbed terrain may include filled / reclaimed areas of low-lying swamps for urban development. Other disturbed terrain includes areas which have been mined or dredged or have undergone heavy ground disturbance trough general urban development. Soil investigations are required to assess these areas for acid sulfate potential. Review of Sydney Local Environmental Plan 2012 Acid Sulfate Soils Risk Map - Sheet 014 indicated that the site had not been assessed; however, the southern portion of the Barangaroo development was classified as Class 1. No acid sulfate soils testing has been undertaken on the underlying fill and natural materials. Based on intrusive investigations conducted on similar materials, at similar depths in neighbouring portions of the site, PASS is very likely to exist within the fill and natural superficial deposits materials underlying the site.
Sensitive Receptors	Sensitive receptors identified within a 500 m radius of the site include: • underlying soil and groundwater ecosystems • surface water body (Darling Harbour) receives stormwater and rainfall • runoff from the site and surrounds • site users including on-site and off-site employees, construction tradesmen and visitors; and including occupiers of commercial buildings and/or residential properties down-gradient and adjacent to the site

5.2 Geology and Soils

According to the 1:100 000 Geological Survey of NSW (Sydney) Sheet 9130 (Ed 1) 1983 and numerous site investigations, the Central Barangaroo Site is underlain by man-made fill materials that have been placed over marine sands over Hawkesbury Sandstone. The stratigraphic summary provided in the SAR is presented in **Table 2.**

Table 2: Summary of Stratigraphy of Central Barangaroo (Environ SAR 2013)

Thickness (m)	Material	Location	Description
0.5	Pavement	Over all of site	Hard surfacing, bituminous concrete except for 20 m concrete strip along the shoreline
			Gravel, occasionally concrete slab
6 – 18	Fill	Shallowest on eastern side near Hickson Road, increasing in	Variously described as sand or clay but mainly sandy, gravelly, silty or clayey in places.

Thickness (m)	Material	Location	Description
		thickness towards Darling Harbour	Possibly broken sandstone. Contains some brick, concrete, tile, but appears minor
0–2	Alluvial soil	Overlying bedrock or residual soil, absent in places on eastern side	Alluvial sediments consisting predominantly of dark silty clay
0 – 20	Residual soil	Overlying bedrock, absent in places on eastern side	Sandy clay residual, highly weathered rock
	Bedrock	Whole of site	Sandstone, some shale. Weathering and fracturing decreasing with depth

Based on information available in previous reports, the depth of fill and alluvial soil was determined based on the identified depth of bedrock. This information has been presented in **Appendix A: Figure 3**. The rock contours range from less than -2 mAHD in the eastern area to -23 mAHD in the western areas of the future basement.

The fill profile did not show any distinct and predictable layers. Boreholes in close proximity to each other show significant differences in soil description.

5.3 Hydrogeology

Groundwater at Central Barangaroo is shallow, generally reflective of sea level at a depth of approximately 2 mbgl. Previous investigations and experience in the greater Barangaroo area show the groundwater to be tidally influenced. The SAR notes that tidal studies at the southern end of Barangaroo indicate a high degree of connectivity between groundwater and the adjoining waters of Darling Harbour, decreasing towards Hickson Road.

Due to the presence of fill materials, hydraulic conductivity is expected to vary locally, however is expected to be high due to the prevalence of sand in the field logs.

Due to the tidal influence, groundwater is expected to be saline. The overall groundwater flow direction is expected to be to the west towards Darling Harbour, however, will vary due to preferential flow pathways within the fill body and tidal influence interacting with inflow from the east.

6. PROJECT SUMMARY

6.1 Central Barangaroo

Central Barangaroo at the time of this ASSMP is intended to be developed by Aqualand for mixed commercial (retail), residential and public open space uses. The proposed works require bulk excavation of a basement to -13.05 mAHD (approximately 15.55 mbgl) to allow construction of five basement levels, and level change in the surrounding land for the construction of roads, footpaths and public recreation areas. The basement development will require deeper piling and retention excavation and footings. The total basement excavation footprint is approximately 11,772 m^2, with an expected volume requiring off-site disposal of 187,000 m^3.

The proposed uses for the basement and ground floor levels include:

- Basement 5: Carpark; plant rooms; water treatment.
- Basement 4: Retail space; plant rooms.
- Basement 3: Void over retail space; plant rooms.
- Basement 2: Retail space, plant rooms; loading dock.
- Basement 1: Void over retail and loading dock; operations centre and event operations room.
- Ground Floor: Retail space; carpark access; residential lobby.

6.2 Early Works Development Application 01

EWDA-01 specifically involves:

- Demolition of a length of an existing shoring wall capping beam along Hickson Road;
- Construction of a new secant pile retention wall and associated rock anchors;
- Excavation of land related to the secant pile retention wall and associated rock anchors;
- Localised remediation related to the secant pile retention wall and associated rock anchors;
- Associated Archaeological Investigations in the area of excavation and works; and
- Sydney Metro / Hickson Road interfaces – perimeter retention wall interface works and rock anchors, and Hickson Road public domain interface works.

In relation to ground disturbance, EWDA-01 will be installing the secant pile wall along a 150 m length. The Guide-wall trench is proposed to be 1.5 m wide by 1.1 m deep. Secant piles will be placed at 1.4 m centres with average diameter of 0.95 m, extending to a depth of approximately 12 m. The total excavated materials anticipated to be managed under this ASSMP is ~2,100 m3. However, the total volume of potential or actual acid sulfate soils are anticipated to be less than 1,000 tonnes.

6.3 Assessment Criteria

Assessment of ASS conditions and the impacts of the proposed development were based on information provided in the Department of Agriculture and Water Resources *National Acid Sulfate Soils Guidance; National acid sulfate soils sampling and identification methods manual 2018* (DAWR, 2018). The DAWR includes information on assessment of the likelihood that the site lies within an ASS area, the need for an ASS management plan, and the development of mitigation methods for the proposed development.

The guidelines provide action criteria which determine the need to prepare an ASSMP, based on the percentage of oxidizable sulfur or Total Potential Acidity (TPA), for broad categories of soil. The action criteria adopted for this ASSMP are provided in the **Table 3**.

Table 3: Action Criteria

Type of Material		Action Criteria 1–1000 tonnes ASS disturbed		Action Criteria if more than 1000 tonnes disturbed	
Texture range. McDonald et al. (1990)	**Approx. clay content (%<0.02mm)**	**Sulfur trail** *% S oxidisable (oven-dry basis) e.g. S_{TOS} or S_{POS}*	**Acid trail** *mol H^+/T (oven-dry basis) e.g. TPA or TSA*	**Sulfur trail** % S oxidisable (oven-dry basis) e.g. STOS or SPOS	**Acid trail** *mol H+/T (oven-dry basis) e.g. TPA or TSA*
Coarse Texture	<5	0.03	18	0.03	18
Sands to loamy sands	5 - 40	**0.06**	**36**	0.03	18
Medium Texture	>40	0.1	62	0.03	18

The action criteria for coarse textured soils (sands to loamy sands) and <1000 tonnes disturbed should be adopted for future works.

7. ACID SULFATE SOIL DELINEATION AND MANAGEMENT STRATEGY OVERVIEW

7.1 Acid Sulfate Soil Occurrence

It is considered that the following soils have an elevated risk of containing PASS and should be assumed to be PASS unless further investigation confirms otherwise:

- Fill - as sand or clay but mainly sandy, gravelly, silty or clayey in places. Possibly broken sandstone. Contains some brick, concrete, tile, but appears minor; and
- Alluvial sediments consisting predominantly of dark silty clay.

PASS is suspected within the fill and natural soils from varying depths overlying bedrock to as deep as 20 m across the site.

7.2 Management Strategy Overview

ASS management will be required to prevent adverse impacts occurring to the environment and infrastructure from ASS during the proposed excavation works at the site. As acidity is transported by water, excavation should be conducted during dry periods as far as possible as this will minimise the risk associated with water acidification during the works.

Based on the nature of the works, and the identification of PASS within the soils planned for disturbance, the recommended ASS management strategy for the proposed works should be undertaken over three stages:

- Stage 1: Onsite treatment and assessment prior to off-site disposal; and
- Stage 2: Disposal of treated ASS offsite.

At time of preparation of this ASSMP, it is understood that excavated soils as part of EWDA-01 will be disposed offsite. However, if there is opportunity for re-use, soils which have been demonstrated to be effectively treated for ASS and are chemically compliant with the acceptance criteria outlined the in Remedial Works Plan, can be considered for re-use.

8. RESPONSIBILITIES

A copy of this ASSMP should be kept onsite at all times and anyone who will conduct work within the site or will be undertaking future works must be inducted into this ASSMP.

Table 4 provides a summary of responsibilities of interested parties onsite which relates to the project.

Table 4: Summary of Responsibilities

Position/Organisation	Report to	Summary of Responsibilities
Aqualand	Regulatory Authorities (as required)	Engage Civil Contractor. Engage a suitably qualified environmental consultant (eg. EDP) Provide funding for approvals. Communicate requirements to all contractors. Review documentation provided by contractors. Review the ASSMP and any other reports developed by consultants. Ensure the ASSMP is implemented correctly. Ensure the ASSMP is available to anyone conducting excavation works onsite.
Civil Contractor	Aqualand	Must have experience in managing, treating and disposing ASS. Complete SafeWork NSW permits and notification as required. Notify landfill for acceptance of the waste and adhere to landfill requirements. Undertake ASS treatment, soil and wastewater removal in accordance with their contract and ASSMP requirements for the site. Follow instructions by environmental consultant during the works. Regularly inspect and monitor all activities for adherence to appropriate environmental standards. Undertake works in a safe and environmentally responsible manner and in accordance with legislative requirements.

Position/Organisation	Report to	Summary of Responsibilities
		Management of unexpected constraints and conditions that may arise during the works.
Environmental Consultant (e.g. EDP)	Aqualand	Must be experienced in contamination assessments including the identification and management of ASS. Provide work, health and safety and environmental consultancy to Aqualand. Ensure works are undertaken in accordance with this ASSMP and current legislative requirements. Provide validation testing for ASS and waste classification assessments prior to off-site disposal as required. Track all materials moving on and off-site. Undertake surface water monitoring as required.

9. STAGE 1: ASSESSMENT AND ONSITE TREATMENT PRIOR TO OFF-SITE DISPOSAL

The strategy outlines the initial assessment, onsite neutralisation, management, monitoring and validation of ASS within soils planned for off-site disposal. This strategy should be undertaken as required using the methodology outlined below.

9.1 Treatment Area Setup

Responsible Party: Civil Contractor

An appropriate assessment/treatment area must be constructed for the treatment of excavated soils. The soils are to remain within this area until the treated soils are considered appropriate to be removed off-site. The assessment/treatment area should be constructed in accordance with the *ASSMAC Management Guidelines 1998* and the *Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines 2014*.

Allowances should be made during construction planning to resume sufficient land to allow for these items. **Figure 1** below shows a cross section of a typical treatment pad. Note that a treatment pad established on hardstand can achieve the outcomes of that described below without excavated drains. Final designs must be developed in reference to this ASSMP and approved by the supervising environmental consultant.

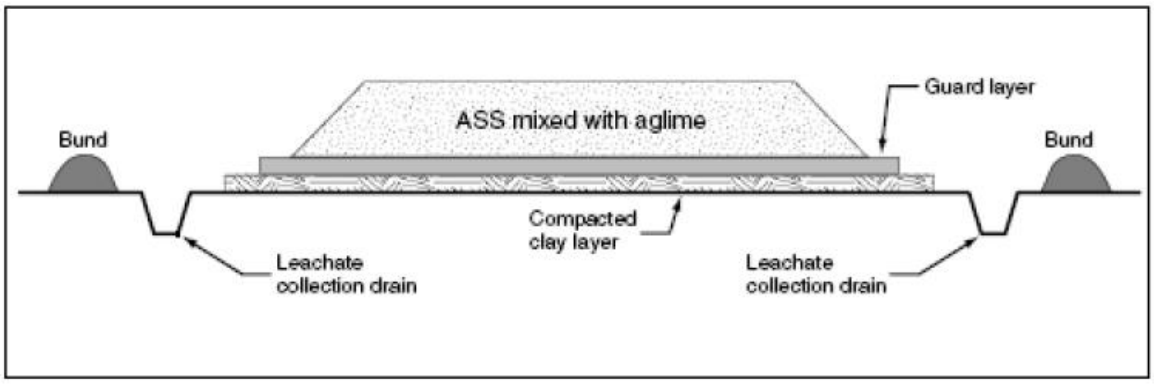

Figure 1: Schematic cross-section of a treatment pad, including clay layer, guard layer, leachate collection system and containment with bunding

The assessment/treatment area should be prepared as follows:

- Prepare a treatment pad of appropriate area for the volume of soil to be treated/stored. The pad should be prepared on relatively level or gently sloping ground to minimise the risk of any potential instability issues.

- It is recommended that the ASS assessment/treatment area must be constructed on hardstand or a similar impervious layer such as high-density polyethylene (HDPE) sheeting, and shall be within a portion of the site that does not lie in a natural drainage line.
- Apply a guard layer of fine agricultural lime (ag-lime) over the impervious layer, to neutralise downward seepage. This guard layer should be applied at a rate of 5 kg of ag-lime/m^2 per vertical meter of fill. The guard layer should be re-applied following removal of treated soils prior to addition of untreated ASS.
- Liming pads should be bunded with onsite soils not classified as PASS and a perimeter drain excavated to collect and contain leachate. The bunds should be preferably constructed of low permeability soil (i.e. clay) or, where suitable soil is not available, hay bales covered with impermeable plastic, with bunds at least 0.3 m high around the entire stockpile/treatment area. The drain and inner bund slopes should have a layer of ag-lime applied to neutralise any possible leachate migrating from the stockpiled material.

It should be noted that alternate methods for establishing an appropriate assessment/treatment area may be considered due to practicality constraints onsite. This would be subject to achieving the required treatment standard to the satisfaction of a suitably qualified environmental consultant.

9.2 Assessment and Treatment Process

Responsible Party: Civil Contractor and Environmental Consultant

9.2.1 Assessment

It is recommended that in-situ assessment of the soils is undertaken to determine the soil condition with regards to acid sulfate soils, with samples to be selected based on visual or olfactory evidence in accordance with DAWR, 2018 which includes:

- Waterlogged soils — unripe muds (soft, sticky and can be squeezed between fingers, blue grey or dark greenish grey mud with a high water content
- Silty sands or sands (mid to dark grey) or bottom sediments (dark grey to black for example monosulfidic black oozes)
- Peat or peaty soils
- Coffee rock horizons; and / or
- A sulfurous smell for example hydrogen sulfide or 'rotten egg' odour.

.. In-situ assessment prior to excavation will potentially reduce the volume of soil requiring eventual treatment and management.

The testing frequency will be based on EDP's *Sampling and Analysis Quality Plan – Central Barangaroo, September 2022* (SAQP, 2022) during the in-situ assessment with the collected samples to be analysed at a National Association of Testing Authorities (NATA) accredited laboratory. Results of the chromium reducible analysis will be compared against Table 5.4 provided in DAWR 2018 and will be used to inform the lime dosing rates for the treatment phase.

If previous in-situ assessment has not been undertaken, or has indicated the presence of ASS, an assessment of the stockpile in the treatment area to determine the ASS condition should be undertaken.

9.2.2 Treatment

The treatment process should involve the following:

- Removal of non-ASS overburden (i.e possible non-ASS fill) from the soils containing ASS to the satisfaction of a suitably qualified environmental consultant;
- Transport ASS material requiring treatment to the assessment/treatment area;
- Manage ASS during stockpiling and treatment to minimise dust and leachate generation (eg. by covering, or lightly conditioning with water). If wet weather prevails, stop works and cover the stockpiled material with a HDPE sheeting to reduce the formation of leachate;
- Limit the surface area of the ASS exposed to oxygen by forming relatively high-coned stockpiles;

- Material must be treated as soon as practical. Several treatment areas may be required for stockpiling and treatment, depending on the quantity of ASS material excavated;
- Spread the ASS onto the guard layer in a layer of 0.2 to 0.3 m thickness. When spreading the first soil layer, care should be taken not to churn the lime guard layer;
- Let the ASS dry to facilitate lime mixing (if too wet, then adequate mixing of lime cannot be undertaken);
- Apply ag-lime (refer to **Section 9.3)** to the stockpiled soil, at the indicative liming rate in **Section 9.4** and harrow/ mix thoroughly prior to spreading the next layer;
- Continue the spreading/liming/mixing cycle. This can be done one layer at a time, or with multiple ASS layers placed on top of each other;
- Assess the success of the treatment using validation testing in accordance with **Section 9.5**;
- Samples will need to be collected from all layers, which is likely to require use of plant for sampling;
- If validation sampling indicates that additional neutralisation is required, add additional lime and mix;
- When validation testing indicates that lime neutralisation is complete in accordance with **Section 9.5.1**, then the stockpiled soil may be assessed for waste classification purposes;
- Undertake waste classification assessment and dispose off-site in accordance with **Section 10;**
- Management of leachate and wastewater in accordance with **Section 11**.

It is possible that excavation of both acidic and ASS will be required for the proposed development. The excavated soils should be stockpiled such that the acidic soils are segregated from the ASS and that these soils are also segregated from non-ASS.

Additionally, stockpiles of ASS should be kept moist to minimise oxidation, prior to lime treatment. They should be covered to prevent rainfall leaching through the stockpile and possibly creating acidic runoff and be located as far away as possible from any sensitive receptors (e.g. waterways, drainage channels etc.)

9.3 Neutralising Materials for Soils

Responsible Party: Civil Contractor and Aqualand

An appropriate neutralising agent must be selected for the works. Ag-lime is the preferred neutralisation material for the management of ASS. Ag-lime comprises calcium carbonate ($CaCO_3$), typically made from limestone that has been finely ground and sieved to a fine powder. Ag-lime with a purity of 95% or better should be used (i.e. ENV $\geq$95, where ENV is the effective neutralising value, a term used to rate the neutralising power of different forms of materials relative to pure, fine $CaCO_3$ which is designated ENV = 100). The ag-lime should be fine and dry, as texture and moisture can also decrease the ENV.

9.4 Lime Application Rate

Responsible Party: Civil Contractor and Environmental Consultant

The amount of lime required for treatment of ASS material must be estimated based on the laboratory analytical results.

Based on the results of the Chromium Reducible Sulfur suite, a liming rate was calculated (kg of $CaCO_3$/tonne of soil), detailing the volume of lime required to neutralise the acidity present within the soils, based on total and potential acidity as well as the acid neutralising capacity of the soils.

It should be noted that the acid production will vary both horizontally and vertically through the ASS profile

.due to the variability of natural systems. The liming rate to be calculated from the analytical results should therefore be considered as a 'starting point', and pH monitoring should be conducted during treatment to assess the progress of the neutralisation, and need for additional mixing and/or addition of ag-lime.

Material will only be considered to have been successfully treated when all soil has been validated in accordance with **Section 9.5.1.** If an alternate neutralising product is used, a specific dosing rate will need to be calculated.

A useful online liming rate calculator provided by the Western Australian Government, Department of Environment Regulation can be used for updating liming rates if more analytical data becomes available during the works.

Liming Rate Calculator: https://www.der.wa.gov.au/your-environment/acid-sulfate-soils/67-lime-rate calculations-for-neutralising-acid-sulfate-soils

For material remaining in-situ, an application of lime should be applied by dusting the top surface of the soil following excavation. The intent is to form a narrow crust of neutralised soil to prevent significant acid generation. However excessive amounts of lime should not be applied to prevent altering the chemistry of the receiving waterbody. It should be noted that in-situ material does not require validation, however ongoing monitoring may be required for soil and water parameters at the site.

9.5 Validation Testing

Responsible Party: Civil Contractor and Environmental Consultant

A suitably qualified environmental consultant must conduct all validation inspections and validation sampling required during the treatment works. The validation assessment should be conducted progressively throughout the bulk excavation works, following the neutralisation and blending of each stockpile of material. The validation assessment shall be undertaken as follows:

- A visual and olfactory assessment to determine that indicators of ASS such as monosulfidic black oozes (MBO), unripe muds, peat or peat soils, coffee rock or sulfurous/hydrogen sulfide odours:
- During and following neutralisation, the stockpiled soils will require pH screening to confirm that the appropriate quantities of lime have been added and the soils have been suitably mixed/blended:
- The pH testing should be undertaken on the treated material at the following frequency:
  - 1:25 m^3 of treated soil or a minimum of four samples per treatment batch.
  - pH to be measured using 1:5 soil:water (pH_f) and field oxidised 1:4:1 soil:water:peroxide (pH_{fox}).
- NATA accredited laboratory testing. The preferred laboratory testing method is the Chromium Reducible Sulfur suite, and should be undertaken at a frequency of at least 1:250 m^3 from within the treated material with a minimum of 2 samples, to validate the lime neutralisation:
  - Validation sampling locations to be selected on:
    - Systematic sampling (gridded) pattern;
    - Visual inspection for indications of ASS during site inspection; and
    - Accessibility of the proposed sampling location.
  - Validation samples shall be collected using the following methodology:
    - Soil samples will be recovered from a minimum of 0.3 m beneath the soil surface of the stockpile utilising hand equipment;
    - Nitrile gloves will be used during sampling, with a change of gloves between each sampling location;
    - Soil samples will be collected in sampling containers provided by the analysing laboratory, ensuring sufficient sample is collected for the required analysis;
    - All containers will be clearly labelled with unique sample identification; and
    - All samples will be stored on ice prior to dispatch and during transportation to the nominated laboratory under chain of custody procedures.
- Compare the validation results with the acceptance criteria given in **Section 9.5.1**. If all results meet the acceptance criteria, the ASS will be considered to have been successfully treated and may be disposed off-site to an appropriately licensed waste facility following the procedures outlined in **Section 10**.
- Analytical results are to be compiled into a ASS stockpile validation report and incorporated into this ASSMP.

9.5.1 Acceptance Criteria for Treated Acid Sulfate Soils

The acceptance criteria are based on the results of field pH screening and Chromium Reducible Sulfur testing. Appropriate neutralisation will have been considered where:

- Field pH (pH_f) = 6.0-8.5;
- Oxidised pH (pH_{fox}) = >5; and

- Chromium Reducible Sulfur analytical results of the treated material demonstrates the net acidity is compliant with adopted validation criteria / action criteria provide in **Table 3**, and that no additional liming is required.

Further treatment of the soil will be required if any of the above conditions are not met. Once successfully treated, further assessment will be required to facilitate off-site disposal as detailed in **Section10.**

10. STAGE 2: OFFSITE DISPOSAL OF TREATED ACID SULFATE SOILS

Responsible Party: Civil Contractor and Environmental Consultant

Following successful treatment of ASS, the environmental consultant must undertake chemical assessment of the soils, or alternatively review the available chemical data for the soils for comparison against NSW EPA 2014 criteria in order to facilitate off-site disposal, if required. All testing must be undertaken in accordance with the Remedial Works Plan.

Stockpiled materials will need appropriate storage onsite to await for the waste classification to be undertaken. As a minimum, each stockpile will need to be maintained and secured within the assessment/treatment area and covered with weighted HDPE sheeting to prevent leachate generation whilst awaiting waste classification assessment results.

Prior arrangements should be made with the waste facility to ensure that it is licensed to accept the waste. The waste facility should be informed that the PASS has been treated in accordance with the neutralising techniques outlined in this ASSMP produced in accordance with ASSMAC Manual 1998 and that the waste has also been classified in accordance with NSW EPA 2014.

11. WATER MANAGEMENT

11.1 Leachate and Wastewater Management

Responsible Party: Civil Contractor

Given the presence a shallow groundwater table and the likelihood of the acidic and ASS being saturated during excavation, it is expected that dewatering will be required and that leachate will be generated from stockpiled soils. Given the suspected presence of acidic and ASS, it is possible that the leachate / groundwater may have an adverse impact on the environment, if untreated. Any leachate / groundwater generated must be collected for subsequent monitoring and treatment as required. The following is recommended:

- Eliminate need for dewatering, where possible.
- Minimise the time and volume of dewatering (i.e. staged dewatering and excavation over relatively short durations), if undertaken.

The pH of leachate water or water extracted during dewatering operations should be monitored and adjusted prior to discharge. Adjustment of pH should be undertaken if discharge water falls outside the discharge quality limits specified for discharge to the sewerage or stormwater system (subject to regulatory approval) or the land via evaporation/infiltration. The pH levels should also be compared to background levels of nearby waters.

The amount of neutraliser required to be added to the discharged leachate/groundwater can be calculated from the equation below:

$$\text{Alkali Material Required (kg)} = [(M_{Alkali} \times 10^{-pH\ initial}) / 2 \times 10^{3}] \times V$$

Where: pH initial = initial pH of leachate

V = volume of leachate (litres)

$M_{Alkal\ i}$ = molecular weight of alkali material (g/mole)

The alkali should be added to the discharged leachate/groundwater water as slurry. Mixing of the slurry is best achieved using an agitator. Leachate water collected from bunded areas and stockpiles (in catch ponds), and extracted groundwater should be neutralised as necessary before release. Calcined magnesia (magnesium hydroxide, burnt magnesite, or magnesia) is the recommended neutralising agent as it produces a two-step reaction, which proceeds rapidly at acidic pH and slows down as higher pH is approached, and hence reduces the potential for over neutralisation to occur. Furthermore, whilst ag-lime is well suited to the treatment of soils, it does not dissolve well in water, hence it is not very effective at adjusting the pH of water. Hydrated lime ($Ca(OH)_2$) is more soluble than ag-lime making it more suited to treating water, but it has a high pH value (pH ~12). Therefore, if hydrated lime is to be used to treat water, then it should be added incrementally with care and thoroughly mixed to prevent overshooting the desired pH. As a guide, the approximate quantities of hydrated lime provided in **Table 4**, would be required to neutralise acidic water.

Table 5: Recommended Approximate Liming Rates for Water

Water pH	Water Extraction Rate		
	2 m^3/hr	5 m^3/hr	10 m^3/hr
2	0.74	1.85	3.7
3	0.074	0.185	0.37
4	0.0074	0.0185	0.037
5	0.00074	0.00185	0.0037
6	0.000074	0.000185	0.00037

Notes: Liming rates are for hydrated lime (kg of $Ca(OH)_2$)

11.1.1 Water Discharge Criteria

Notwithstanding any additional regulatory requirements placed on water disposal by City of Sydney Council or NSW EPA or through licensed discharge criteria, it is recommended that Council's Policy for the Discharge of Liquid Trade Waste and Septic Waste to the Council's Sewerage System and the ANZECC 2000 criteria are met before discharging any water, leachate or groundwater to the environment, as detailed in **Table 5**.

Table 6: Water Discharge Criteria

Indicator	Sewer	Stormwater	Land Application
pH	7.0 – 9.0	6.0 – 8.0	6.0 – 8.0 (or within background levels)
Total suspended solids (TSS)	300 mg/kg (600 mg/L)[2]	25 mg/L	NA
Visible oil & grease	NA	None visible	None visible
Total dissolved solids (mg/L)	1,000	10,000	1,000

Notes:
1. Field measurement of turbidity may be substituted for TSS subject to regulatory approval. Correlation of Turbidity to TSS is dependent on site specific factors and it is recommended that if turbidity is to be monitored then the relationship should be establish at the commencement of the monitoring programme. Notwithstanding, an initial approximate correlation of turbidity to TSS would be 0.5 NTU approximates 1 mg/L TSS.
2. It is understood that concentration up to 600 mg/L may be accepted by GCC for some sites.

12. REPORTING

ASSMAC Manual 1998 does not require formal reporting of ASS management however, it is important to keep records of the management and validation process to show compliance with the guidelines.

A record of management, treatment, monitoring, validation and disposal of ASS should be maintained by the Civil Contractor and provided to Aqualand and should include the following details:

- Date(s) of works involving ASS;

- Location/area and depth of excavated ASS;
- Waste facility location and copy of licence;
- Where relevant for neutralisation of ASS, an ASS stockpile validation report should be prepared which includes:
  - Neutralisation process undertaken;
  - Liming rate utilised;
  - Results of field and analytical testing and comparison to acceptance criteria;
  - Neutralised ASS disposal (landfill) location; and
- Tonnages of material treated/disposed and waste dockets.

13. CONSULTATION AND COMMUNICATION

All project personnel, subcontractors and consultants will receive training in both Aqualand and their personal environmental obligations during the inductions and toolbox talks.

All project personnel will undergo a general project induction prior to commencing work with Aqualand. This will include an ASS component to reinforce the importance of management and the measures that will be implemented to address ASS issues at the site.

Site inductions and toolbox talks will highlight the specific environmental requirements and activities being undertaken at the site. These will be based on the measures outlined in the specific Safe Work Method Statements. Examples of topics that should be covered during project induction and toolbox talks include:

- Location and planned disturbance of ASS at the site;
- Management procedures in place for handling and treating ASS impacted soils;
- Site set up and location of ASS treatment areas; and
- Unexpected discovery of ASS.

14. ENVIRONMENTAL INCIDENT & COMPLAINTS MANAGEMENT

Details of all complaints received or incidents must be recorded on the Complaint/Incident Record Form provided in the site Environmental Management Plan, with the information to be recorded to include, as a minimum:

- Date and time that the complaint was received, or the incident occurred;
- The name, address and contact details of the person making the complaint, or reporting the incident;
- The name of the person who received the complaint, or received notification of the incident;
- A brief description of the issue; and
- A summary of the actions implemented to address the complaint/incident, including the dates that these actions were implemented and the signature of the persons responsible for resolving or rectifying the issue.

15. SITE SUPERVISION

Site supervision during excavation/earthworks by appropriately qualified environmental consultant is required to ensure that the excavated materials are appropriately handled and that materials different to those encountered during the investigation onsite are assessed, if encountered. It is envisaged that written instruction would be issued to the site personnel at the completion of each inspection that would identify the materials encountered during excavation and the appropriate treatment or handling procedures required.

As part of the site supervision the environmental consultant shall be responsible for monitoring excavations, field and laboratory assessments, truck loading and recording the truck movements and load characteristics. Load information shall be verified by comparison with tip dockets. The environmental consultant shall also maintain a daily record containing the following information:

- Details of unusual materials or odours encountered during excavations;
- pH meter calibration details;
- Location and results of pH monitoring;
- Details of accidents or incidents on the site;
- Details of any environmental issues and any related corrective and preventive action taken;
- Details of any visitors relation to environmental or health issues;
- Details of contractors engaged for the removal of waste;
- Record of soil volumes excavated, truck movements including destination/source, volumes of material exported/imported to the site;
- Daily site diagrams showing the location of stockpiles, excavations and sediment controls; and
- Records of soil sampling locations.

16. DOCUMENTATION AND RECORD KEEPING

All relevant documentation will be maintained by Aqualand. The documentation to be maintained may include (but not be limited to):

- Staff and contractor inductions provided as **Appendix E** of this ASSMP;
- NSW EPA Waste Transport Certificates;
- Transportation dockets for excavated soil removed from the site, with a summary of these to be included on the materials tracking forms provided as **Appendix F** of this ASSMP;
- Soil classification documentation that relates to any soil that requires further investigation and sampling during the course of the excavation works;
- Ongoing management requirements for material to remain in-situ;
- Stockpile validation and classification records; and
- Complaints/incidents register.

Appendix A: Figures

Appendix B: Acid Sulfate Soil Definitions and Potential Impacts

ACID SULFATE SOILS DEFINITIONS

ASS are naturally occurring sediments containing iron sulfides, primarily pyrite, commonly deposited in alluvial and estuarine environments. The occurrence of ASS is associated with areas or regions that have previously been or are currently estuarine environments. Due to changes in sea level or geomorphologic changes to the coastal systems, these sediments are often overlain by terrestrial sediments.

When ASS are exposed to air (e.g. due to excavation or dewatering), the oxygen reacts with iron sulfides in the sediment, producing sulfuric acid. This acid can be produced in large quantities and is highly mobile in water. The process can also release iron and other metals present in the soils.

The sulfuric acid (and metals) can drain into waterways causing severe short and long-term socioeconomic and environmental impacts, including damage to man-made structures and natural ecosystems.

ASS can either be classified as AASS that have already reacted with oxygen to produce acid, or PASS. AASS and PASS are often found in the same profile, with AASS generally overlying PASS horizons.

PASS are soils containing iron sulfide that have not been exposed to oxygen (e.g. soils below the water table). The field pH of these soils in the undisturbed state is 4 or more and is commonly neutral or slightly alkaline. However, they pose a considerable environmental risk when disturbed, as they will become more acidic when exposed to air and oxidised.

POTENTIAL IMPACTS OF ACID SULFATE SOILS DISTURBANCE

The generation of AASS can result in the release of sulfuric acid and iron into the soil and surrounding waters. This in turn can release aluminium, nutrients and heavy metals (particularly arsenic) stored within the soil matrix. Once mobilised in this way, the acid, metals and nutrients can seep into waterways, killing fish, other aquatic organisms and vegetation.

Additionally, low levels of impact include reduced hatching, decline in growth rates, skin and health impacts for aquatic life. The potential impact on water leaching activities also include change in pH of soil and water, changes to water quality and changes to the hydraulic regime. Soil texture or sediment particle size distribution also affects the potential impacts of exposing ASS. Coarse-textured sulfidic sands are particularly vulnerable to rapid oxidation due to their relatively higher permeability and negligible buffering capacity. Water also moves through coarse material quickly, which may create large volumes of contaminated leachate.

AASS exposure can result in medium to long-term changes in soil chemistry. Changes in soil chemistry may affect the water quality of the tidally influenced area, resulting in reduced biodiversity and potentially death of flora and vegetation.

As the works will involve the disturbance of PASS adjacent to Brisbane Waters, the implementation of the controls detailed in this plan are required to minimise the potential acid generating impacts of the soils associated with the planned works at the site. Particular care should be taken with allowing air to penetrate sandy sediments as they have little buffering capacity. These materials can oxidise and leach very rapidly.

ACID SULFATE SOILS MAPPING

The Department of Land and Water Conservation has prepared Acid Sulfate Soil Risk Maps for the coastal areas in NSW that predicts the distribution of acid sulfate soils based on an understanding of the factors that led to their formation reinforced by extensive soil surveying. The Acid Sulfate Soil Risk Maps have also been converted into Acid Sulfate Soil Planning Maps for use with Local Environmental Plans.

The Acid Sulfate Soil Planning Maps establish five classes of land based on the probability of acid sulfate soils occurrence and the type of works that might disturb them. The five classes in the Acid Sulfate Soils Planning Maps are shown in the table below.

Acid Sulfate Soil Risk Classes

Class of land pertaining to ASS	Nature of works requiring ASS Assessment
1	▪ Any works
2	▪ Works below natural ground surface ▪ Works by which the water table is likely to be lowered
3	▪ Works beyond 1 m below natural ground surface ▪ Works by which the water table is likely to be lowered beyond 1 meter below natural ground surface
4	▪ Works beyond 2 meters below natural ground surface ▪ Works by which the water table is likely to be lowered beyond 2 meters below natural ground surface
5	▪ Works within 500 meters of adjacent Class 1, 2, 3 or 4 land which are likely to lower the water table below 1 m AHD on adjacent Class 1, 2, 3 or 4 land

Review of the City of Sydney's Acid Sulfate Soils Risk Map indicated that the site exists within unclassified land.

Appendix C: Contingency Procedures

CONTINGENCY PROCEDURES

In the event of a non-conformance, the source and nature of the event should be investigated, the effectiveness of the existing controls reviewed and modified where practical, and necessary strategies implemented to minimise further impacts. Contingency strategies for stockpiles and water quality exceeding performance criteria are outlined in the table below.

Contingency strategies for stockpile treatment and water quality exceeding performance criteria

Item	Event	Contingency Measures
Stockpile Treatment	ENV is not provided with the neutralising material.	Representative sampling of the neutralising agent should be conducted and analysed for calcium carbonate equivalence by a NATA accredited laboratory to determine the ENV of the material.
	Stockpile validation acceptance criteria are exceeded.	If pH_f and pH_{fox} and laboratoryresults of treated soil validation samples are outside the acceptable thresholds, further lime treatment of soils should be undertaken.
	Soils encountered during excavation works are not representative of the soils previously identified.	The soils should be treated as containing sulfidic components and assumed to be ASS unless sampling and analysis confirms otherwise.
Water Quality	Leachate or water generated from / in contact with ASS, exceed water quality performance criteria.	Cease discharging and assess control measures. Adjust lime treatment rates or other additives (such as flocculants) if required.
	EC, floatable matter and colours in the receiving water exceed performance criteria.	Cease discharging and assess control measures. A suitable treatment method such as aeration and/or filtration should be employed.

Appendix D: Unexpected Finds Protocol

IDENTIFICATION AND MANAGEMENT OF UNEXPECTED CHEMICAL CONTAMINATION AND/OR ACID SULFATE SOILS

ACID SULFATE SOILS

Should unexpected ASS be uncovered during the excavation works (i.e. the identification of soil displaying characteristics of the identified ASS geological units), the following steps should be followed:

- Cease works in the vicinity of the uncovered ASS;
- The workers identifying the unexpected ASS shall inform Aqualand of the suspected ASS;
- Appropriately stockpile the soil within an area designated for ASS;
- If necessary, use physical barriers to shelter and prevent runoff to environmentally sensitive features (i.e. Parramatta River, vegetated areas etc.);
- Assume the soil is ASS until an assessment is conducted;
- Engage a suitably qualified environmental consultant to undertake an environmental assessment of the affected area and provide further advice; and
- Further remedial works may be required or additional control measures in order to maintain a safe work zone.

CHEMICAL CONTAMINATION

Unexpected chemical contamination or ASS may potentially be uncovered during excavation works.

Should unexpected chemical contamination be suspected during the excavation works (i.e. the identification of odorous or stained soil) the following steps should be followed:

- Cease works in the vicinity of the uncovered contamination;
- Inform the site foreman of the suspected contamination;
- Use a physical barrier to isolate the area;
- Assume the soil is contaminated until an assessment is conducted;
- Commission a suitably qualified environmental consultant to undertake an assessment to determine the next stage of works; and
- Further remedial works may be required or additional control measures in order to maintain a safe work zone.

Appendix E: Induction Records

ACID SULFATE SOIL MANAGEMENT PLAN INDUCTION RECORD

Name	Company	Date	Signature	Inducted by

Appendix F: Materials Tracking Record

ACID SULFATE SOIL MATERIALS TRACKING RECORD

Site:			Site Supervisor:		Logged by:	
Date	Volume of Material Removed (m3)	Liming Dose (kg/t)	Location Description (location and extent)	Material Description	Off-site Disposal Classification	Comments

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