

Waste Management Plan

Remediation Development Application, Barangaroo Block 5, EPA
Declaration Area Number 21122, Hickson Road, Millers Point, NSW



Waste Management Plan

Remediation Development Application, Barangaroo Block 5, EPA Declaration Area Number 21122, Hickson Road, Millers Point, NSW

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Glossary

Term	Description
ASS	Acid Sulfate Soils include actual acid sulfate soils (AASS) or potential acid sulfate soils (PASS). Actual and potential acid sulfate soils are often found in the same soil profile, with actual acid sulfate soils generally overlying potential acid sulfate soil horizons.
ASSMP	Acid Sulfate Soil Management Plan
Block 4 Remediation Area	Portion of the Declaration Area situated within Barangaroo South.
Block 5 Remediation Area	Portion of the Declaration Area located within Barangaroo Central (including remediation of some land adjacent to the Declaration Area on the west)
DECCW	NSW Department of Environment, Climate Change and Water (now NSW Environment Protection Agency)
EE	Excavation Enclosure
EPA Declaration Area	Remediation Site Declaration 21122
EPA	Environment Protection Authority
Ex-situ Remediation Methodology	Excavation of contamination and offsite disposal (with offsite pre-treatment, where required)
Hickson Road Remediation Area	Portion of the Declaration Area situated within the Hickson Road reserve
LLMP	Lend Lease (Millers Point) Pty Limited
MSDS	Material Safety Data Sheets
MTS	Material Tracking System
PASS	Potential Acid Sulfate Soils are soils which contain iron sulfides or sulfidic material which have not been exposed to air and oxidised. The field pH of these soils in their undisturbed state is pH 4 or more and may be neutral or slightly alkaline; however, they pose a considerable environmental risk when disturbed.
PDA	Project Development Agreement
RAP	Remedial Action Plan
RWP	Remediation Works Plan
SEARs	Secretary's Environmental Assessment Requirements
Site for the purpose of the Project Application	Area required for the purpose of the Block 5 Remediation Development Application identified as: - Block 5 Remediation Area; and - Any other areas of Barangaroo or Hickson Road required for staging and undertaking the remediation and stormwater diversion works.
Site Remediation Area	The Site Remediation Area comprises the Block 5 Remediation Area (including some land adjacent to the Declaration Area on the west).
SPGWT	Separate Phase Gasworks Waste and Tar
SROH	significant risk of harm
VMP	Voluntary Management Proposal
WTP	Water Treatment Plant

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) has been engaged by Lend Lease Millers Point (Lend Lease) to prepare a Waste Management Plan assessment report to accompany a Development Application for Remediation of Block 5 at Barangaroo Central to be submitted to the Minister for Planning pursuant to the Part 4 of the *Environmental Planning and Assessment Act* (1979).

The Waste Management Plan has been prepared to respond to the *Secretary's Environmental Assessment Requirements (SEARs) for Remediation Works including land within Block 5 and the EPA Declaration Area, Barangaroo Central (SSD 6533)* dated 13 June 2014.

Table 1 SEAR 4 – Waste Management

Requirement	Where Addressed in Document
<i>Provide details of the quantity and type of liquid and non-liquid waste generated, handled, processed or disposed of onsite. Waste must be classified according to the EPA's Waste Classification Guidelines 2008.</i>	Section 4
<i>Provide details of the quantity, type and specifications for all output products proposed to be produced. The description should include the physical, chemical and biological characteristics (including contaminant concentrations) of those output products as well as relevant accredited standards against which the products would comply.</i>	Section 5
<i>Provide details of intended (or potential) end uses for output products and the relevant product standards used against which those products would be assessed.</i>	Sections 2, 4 and 5
<i>Provide details of the layout, the treatment process and the environmental controls of the proposal.</i>	Sections 2 and 5
<i>Provide details of liquid waste and non-liquid waste management, including:</i> <i>the transportation, assessment and handling of waste arriving at or generated at the site;</i> <i>any stockpiling of wastes or recovered materials at the site;</i> <i>any waste processing related to the proposal, including reuse, recycling, reprocessing or treatment both on- and offsite;</i> <i>the method for disposing of all wastes or recovered materials;</i> <i>the emissions arising from the handling, storage, processing and reprocessing of waste; and</i> <i>the proposed controls for managing the environmental impacts of these activities.</i>	Section 5 Section 5 Section 2 Sections 4 and 5 Sections 2 and 5 Sections 2 and 5
<i>Provide details of spoil disposal (if applicable) with particular attention to:</i> <i>the quantity of spoil material likely to be generated;</i> <i>proposed strategies for the handling, stockpiling, reuse/recycling and disposal of spoil;</i> <i>proposed strategies for confirming that waste treatment and/or disposal facilities can lawfully accept waste generated by the proposed development and have received the waste once transported offsite;</i> <i>the need to maximise reuse of spoil material in the construction industry;</i> <i>identification of the history of spoil material and whether there is any likelihood of contaminated material, and if so, measures for the management of any contaminated material; and</i> <i>designation of transportation routes for transport of spoil.</i>	Section 4 Section 5 Section 6 Section 3 Section 2 Section 5
<i>Provide details of procedures for the assessment, handling, storage, transport and disposal of all hazardous and dangerous materials used, stored, processed or disposed of, in addition to the requirements for liquid and non-liquid wastes.</i>	Sections 2 and 5
<i>Provide details of the type and quantity of any chemical substances to be used or stored and describe arrangements for their safe use and storage.</i>	Sections 2 and 5

In addition, AECOM considered the "waste management" issues raised by DECCW (now EPA) in its MP 10_0023 submission letter dated 12 August 2010 in the context of SSD 6533-2014 as relevant.

DECCW Recommended Conditions of Approval for MP 10_0023 are reproduced in **Table 2**, and reference to where the relevant conditions are addressed in this document is provided.

Table 2 DECCW Recommended Approval Conditions MP 10_0023 - Waste

Condition	Report Section
The Waste Management Plan must include (but not be limited to):	
1. A stockpile, contamination soil and sediment management plan including (at a minimum):	
a) The exact locations where contaminated waste material (including Acid Sulphate Soils) and non-contaminated waste material will be stockpiled. Contaminated and non-contaminated waste material must be stockpiled separately and the designated areas must be clearly marked and labelled (on the plans and on the ground);	Section 5
b) Details of how stockpiled contaminated waste material will be kept separate from non-contaminated waste material;	Section 5
c) Details of how runoff from stockpiled contaminated waste material will be kept separate from non-contaminated runoff;	Section 5
d) Details of measures to be employed to manage leachate runoff from all stockpiles, including bunding, sediment ponds and hay bales. The Plan should include locations of each control measure, its specifications and its capacity to cope with runoff from a designed storm event (to be determined in consultation with DECCW);	Section 5
e) The maximum proposed heights and volumes for each stockpile to reduce the potential for dust and odour and greater detail on stockpile stabilisation and covering to minimise odour and vapour emissions;	Section 5
f) Procedures for minimising the movement of waste material around the site and double handling; and	Section 5
g) Additional information detailing how materials proposed to be recycled / reused will be segregated on the site during operations. Particularly in relation to those wastes categorised as "Building" waste.	Section 6
2. A detailed plan for in situ classification of waste material, including the sampling locations and sampling regime that will be employed to classify the waste, particularly with regards to the identification of 8 contamination hotspots. ¹	Section 2
3. A commitment to retaining all sampling and classification results for the life of the project to demonstrate compliance with DECCW's Classification Guidelines.	Section 5
4. Details in relation to the "Concrete Crushing and Screening Plant" to be installed at the site and its use, including (at a minimum):	
a) Location and specifications of the concrete crushing and screening plant;	Not proposed as part of SSD 6533-2014
b) Estimated quantities of concrete to be crushed per day;	
c) Measures that will be employed to prevent or minimise the emission of dust from the crushing activity; and	
d) Measures that will be employed to prevent or minimise the emission of noise from the crushing activity.	
5. Details in relation to the transport of waste material around the site (onsite) and from the site, including (at a minimum):	
a) A traffic plan showing transport routes from the southern to the northern end of the site;	Section 6
b) Location of the stockpiles at each stage as they migrate from the southern end of the site to the northern end of the site;	Section 5
c) Details of any garden waste mulching processes and garden waste stockpiles, including considerations for odour generation;	Section 5
d) A commitment to retain waste transport details for the life of the project to demonstrate compliance with the POEO Act; and	Section 6
e) The name and address of each licensed facility that will receive waste from the Barangaroo site (if appropriate).	Appendix B

Condition	Report Section
6. Details of the de-watering process, including the specifications for any onsite WTP.	Sections 2 and 5
7. A contingency plan for any event that may affect excavation and contaminated soil treatment operations at the site, particularly in relation to the expected volumes of materials excavated/generated at the site.	Refer to the VMP/Block 4 RAP

Notes: It is understood that the comment relating to the '8 contamination hotspots' relates to a previous DECCW comment regarding the *Amended Remedial Action Plan* (AECOM, 2010) prepared for the ORWS Area (located offsite to the south) and so is not relevant to the Block 5 remediation works. Consequently, the contamination hotspots are not discussed further in this WMP.

1.1 Barangaroo

Barangaroo is located on the north western edge of the Sydney Central Business District, bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and bounded to the south by a range of new development dominated by large CBD commercial tenants.

The 22 ha Barangaroo site is roughly rectangular in shape and has frontage to the harbour foreshore of 1.4km. Hickson Road delineates the eastern boundary.

The Barangaroo Concept Plan (as modified) is the statutory planning approval to guide the urban renewal of Barangaroo and currently provides for the development of mixed use precinct comprising commercial, retail, residential and community development and new public open space / public domain.

The Barangaroo Delivery Authority (BDA) is the state government authority that manages and delivers the development of Barangaroo.

1.2 NSW EPA Declaration Area (#21122)

In May 2009, the NSW Environment Protection Authority (EPA) determined that a portion of land at Millers Point (part of the Barangaroo Site and an adjacent portion of Hickson Road), was contaminated in such a way as to present a significant risk of harm (SROH) to human health and the environment. As a consequence the NSW EPA declared the area to be a remediation site (Declaration Number 21122; Area Number 3221) under the Contaminated Land Management Act 1997.

The Remediation Site Declaration 21122 indicates that the area of the declaration coincides with the known footprint of the former Millers Point gasworks facilities. This area is located on part of Barangaroo and part of Hickson Road adjacent to Barangaroo.

In accordance with Declaration Number 21122, the Declaration Area comprises:

- Part Lot 5 and Part Lot 3 DP 876514, Hickson Road, Millers Point, NSW 2000.
- Part of Hickson Road adjacent to:
 - 30-34 Hickson Road (Lot 11, DP1065410);
 - 36 Hickson Road (Lot 5, DP873158); and
 - 38 Hickson Road (SP72797) Millers Point.

The Barangaroo Delivery Authority has entered into a Voluntary Management Proposal (VMP) with the NSW EPA associated with EPA Declaration Area (Approval No. 20101719). Phase 1 of this VMP involves investigative works and undertaking remedial design to determine and obtain agreement on a proposed remediation methodology. Phase 2 of the VMP will involve the implementation of the agreed remediation works.

An independent, NSW EPA accredited Site Auditor has been appointed to undertake review of proposed remediation works, and prepare statutory audit statements prior to and following completion of remediation.

For the purposes of planning and staging works, the NSW EPA Declaration Area is divided into 3 areas as follows:

- Block 4 Remediation Area - the part of the Declaration Area on Barangaroo South;
- Block 5 Remediation Area - the part of the Declaration Area on Barangaroo Central (including remediation of some land adjacent to the Declaration Area on the west); and
- Hickson Road Remediation Area - the part of the Declaration Area located on Hickson Road.

1.3 Summary Site History and Key Contaminants

The Millers Point gasworks operated on the Declaration Area between 1840 and 1921 (refer to **Figure 2**). The Site has subsequently been used for various activities, but predominantly a commercial port facility and public road.

When NSW EPA declared parts of Barangaroo and Hickson Road a "Remediation Site", it described the nature of contamination as gasworks waste, with the following particular substances: polycyclic aromatic hydrocarbons (PAHs); benzene, toluene, ethylbenzene and total xylenes (BTEX); total petroleum hydrocarbons (TPH); ammonia and cyanide.

The *VMP/Block 4 Remedial Action Plan* (RAP) (AECOM, 2013b) provides more specific details regarding the type, magnitude and location of ground contamination as identified in previous site investigations.

1.4 Definition of the Site

For the purposes of the Block 5 Remediation Development Application, 'the Site' includes the area of land to be remediated (Site Remediation Area), plus any adjacent land used for the staging and undertaking of the proposed remediation and temporary stormwater diversion works.

The Site Remediation Area comprises the Block 5 part of the Declaration Area (including some land adjacent to the Declaration Area on the west).

Refer to **Figure 2** for the location of the Site Remediation Area, and the Site boundary for the purposes of this WMP.

1.5 Role of Lend Lease

Lend Lease has been appointed by the Barangaroo Delivery Authority as the Proponent to undertake the development for Barangaroo South.

Lend Lease has also been contracted by the Barangaroo Delivery Authority to undertake remediation of the Declaration Area.

1.6 Remediation Action Plan and Methodology

The proposed remediation of the Declaration Area is detailed in the *VMP/Block 4 RAP* (AECOM, 2013b).

The *VMP/Block 4 RAP* (AECOM, 2013b) included two potential methodology options for Block 5:

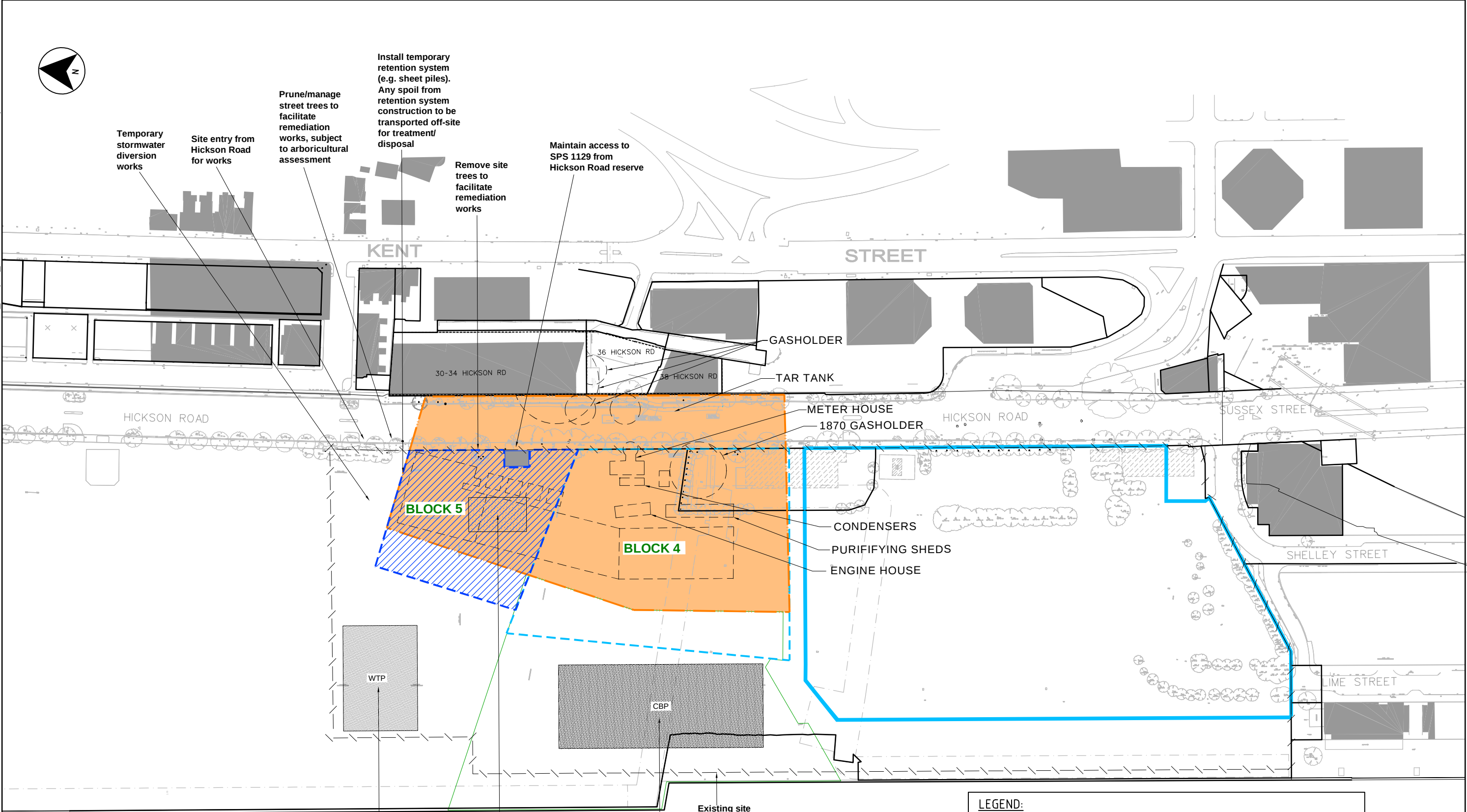
- In-situ remediation; or
- Ex-situ remediation.

The Development Application for Block 5 Remediation includes for the ex-situ remediation methodology as detailed in the *VMP/Block 4 RAP* (AECOM, 2013b).



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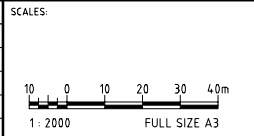
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Last modified: 01 Jul 14 - 12:01



LEGEND:

- DECLARATION AREA
- BLOCK 5 REMEDIATION AREA
- APPROXIMATE EXTENT OF FORMER GASWORKS FEATURES
- BLOCK 4 PERIMETER RETENTION WALL PROPOSED UNDER SSD 5897-2013
- EXISTING BLOCK 1, 2 AND 3 PERMANENT BASEMENT PERIMETER GROUNDWATER CONTROL AND RETENTION WALL CONSTRUCTED UNDER MP 10 0023 (STAGE 1a)

REVISIONS					
No.	BY	DATE	DESCRIPTION	APPD	
02	PAS	01.07.14	FINAL ISSUE	AR	
01	PAS	16.05.14	DRAFT ISSUE	AR	



THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001-2000			
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APPROVED	AR	DATE	01.07.14

DESIGNER:

AECOM

AECOM Australia Pty Ltd A.B.N. 20 093 846 925

WASTE MANAGEMENT PLAN, BLOCK 5, BARANGAROO

FIGURE 2:
SITE LAYOUT AND SURROUNDING AREA
REMEDATION DEVELOPMENT APPLICATION, BARANGAROO BLOCK 5

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1.6.1 Separate Phase Gasworks Waste and Tar

For the purposes of this report, and as referred to in the RAP, gasworks related contaminated materials will be referred to as Separate Phase Gasworks Waste and Tar (SPGWT) which includes the following materials:

- Tar Containing Materials (TCM), as per the following definition:
 - greater than 10% visible coal tar (where coal tar is a phase separated hydrocarbon by-product from coal gasification); and/or
 - contaminant concentrations exceeding the following limits:
 - Polycyclic Aromatic Hydrocarbons (PAHs) - 2,000 mg/kg; or
 - Benzo(a)Pyrene (B(a)P) - 150 mg/kg.
- Dense Non Aqueous Phase Liquids (DNAPLs).

1.7 Summary of Proposed Works for the Block 5 Remediation DA

The works proposed as part of the Block 5 Remediation DA includes the following:

- a) If required, temporary diversion of existing stormwater. These works (if required) would involve construction of new pipework network/pits and decommissioning existing pipes;
- b) Installing temporary retention structures (eg. sheet piling in bentonite slurry, secant piles) to facilitate proposed excavation, where required, including:
 - 1) temporary ground anchors or other restraint system as required into adjoining blocks and road reserve.
 - 2) support/retain the existing Sewer Pumping Station 1129 and associated infrastructure.
- c) Installation of temporary odour structure(s) over proposed excavation area.
- d) Dewatering and water treatment in an onsite water treatment plant
- e) Excavation of contaminated soil beneath odour structures, with appropriate air emission controls/monitoring
- f) Transfer of contaminated material directly offsite for landfill disposal, including where required to a licensed offsite treatment facility for pre-treatment (eg. for hazardous waste).
- g) Backfilling of Block 5 excavation with suitable fill (imported and/or won from Site).

1.8 Objectives of this Plan

This Waste Management Plan has been prepared in accordance with Lend Lease's overall environmental requirements and the requirements of the NSW *Protection of the Environment Operations Act 1997 (POEO Act)*, the NSW *Waste Avoidance and Resource Recovery Act 2001 (WARR Act)* and the National Waste Minimisation and Recycling Strategy. In all its onsite activities, Lend Lease will undertake initiatives to target elimination of the creation of waste and to use recycling and reuse procedures to reduce the amount of waste being directed to landfill. The specific objectives of the waste management processes outlined in this Waste Management Plan are as follows:

- to avoid whenever possible, and to minimise and/or reduce at all other times, the generation of wastes;
- to maximise recycling of "general" classed waste generated, thus minimising waste sent to landfill;
- to follow the preferred waste-reduction hierarchy of avoidance/reduction, re-use, recycle, treat and dispose;
- to attain local, State and Commonwealth waste minimisation legislation and environmental standards; and
- to prevent pollution and damage to the environment.

The remediation works propose to utilise the services of specialist contractors to implement the remediation of the Site. Details of the proposed remediation works are provided in the Development Application SSD 6533-2014, which includes the following document which can be read in conjunction with the Construction Management Plan (CMP) to be prepared for the works.

The proposed remediation works have been detailed in the *VMP/Block 4 RAP* (AECOM, 2013b) and include options for potential remediation methodologies for Block 5.

2.0 Project Description

The Development Application for Remediation of Block 5 seeks approval to remediate the contaminated portion of the Site, which have been declared by the NSW EPA as a remediation site under the *Contaminated Land Management Act* (1997). The Development Application incorporates undertaking ex-situ remediation across the majority of Block 5.

The works proposed also include the augmentation and diversion of existing stormwater drainage infrastructure within the Site, involving decommissioning existing pipes, and construction of a new pipe network to connect to the existing WTP and to connect to the existing Sydney Water Pipeline in the western part of the Site.

This WMP provides the processes to be followed during the Block 5 ex-situ remediation works.

2.1 Block 5 Remediation Area - Ex-situ Remediation

The Block 5 Remediation Area ex-situ remediation works would involve excavation of only contaminated materials to the depth required in the *VMP/Block 4 RAP* (AECOM, 2013b).

The majority of fill material requiring excavation (and remediation) is located in the eastern portion of the Block 5 Remediation Area where the fill material is relatively shallow (i.e. generally shallower than 10 m below ground level [bgl]). The depth to bedrock in the western portion of the Block 5 Remediation Area is in the order of 11 m bgl.

Materials excavated from the Block 5 Remediation Area would comprise heterogeneous fill materials, soil, and bedrock. The material would be excavated within an Excavation Enclosure (EE) constructed over the active excavation area. Materials would typically be excavated using dozers and hydraulic excavators and loaded to trucks by front end loaders and hydraulic excavators. Material would be classified in accordance with the NSW EPA (2014) *Waste Classification Guidelines* to determine whether it requires offsite treatment or is suitable for reuse without treatment.

Groundwater control and retention walls would be installed at the Block 5 Remediation Area to facilitate excavation.

SPGWT has been identified in one area of the Block 5 Remediation Area.

The three material types likely to be encountered during the excavation process under the Development Application are as follows:

- **Material not requiring offsite treatment** (for landfill disposal), which may be:
 - validated for potential reuse (either onsite or in other Barangaroo site areas; and/or
 - transported offsite for reuse under a waste exemption approved by the EPA, and/or
 - disposed offsite to a licensed landfill in accordance with the NSW EPA (2014) *Waste Classification Guidelines*.
- **Material requiring offsite treatment**, (hazardous waste) which would be transported directly offsite to a licensed treatment facility for treatment via stabilisation - the material would not be reused and would be disposed offsite to licensed landfill; or
- **Highly contaminated material requiring offsite treatment (referred to as 'SPGWT')** will be transported directly offsite to a licensed treatment facility for treatment and subsequent disposal at an appropriately licensed landfill, as part of the Development Application for Remediation of Block 5.

2.1.1 Schedule

An indicative schedule for implementation of the Block 5 ex-situ remediation works is presented in **Table 3** below. It is important to note that the schedule is subject to detailed remediation design development, works staging and required approvals.

Table 3 Remediation and Land Forming Work

Milestone	Indicative Duration	Notes
Block 5 Remediation Area – Ex-situ Remediation	24 months	Subject to detailed remediation design development, works staging and required approvals

2.2 Water Treatment

Groundwater flowing into the excavations made during the ex-situ remediation works, as well as groundwater discharging into trenches will be pumped via a dewatering system to an onsite Water Treatment Plant (WTP) potentially located to the north west of the Site (refer to **Figure 2**) or transported directly offsite by licensed liquid waste contractors.

2.2.1 Water Treatment Plant

All additional sources of contaminated water, including dewatering of materials within the EE structure, wheel-wash water and water used in the decontamination of plant and machinery, would similarly be pumped to the onsite WTP.

The WTP would nominally consist of an oil/water separator, clarifier, sludge thickener and settlement/balance tanks. The size and running capacity of the plant will be designed to treat peak flow and may be subject to change based on selected works staging.

Appropriate licences/permits would also be gained for the discharge of the treated water to the local stormwater system, which discharges into Sydney Harbour. This may include applying for a Trade Waste Licence from Sydney Water for disposal to sewer (if required). The Barangaroo Delivery Authority (BDA) has an existing EPL (13336) which permits contaminated groundwater treatment and discharge in accordance with the Licence conditions.

The final design, process and configuration of the onsite extracted groundwater WTP will be the subject of further design and development.

3.0 Legislative Requirements

3.1 Legislation, Regulation and Guidelines

Key legislation relevant to waste management in NSW includes:

- *Environmental Planning and Assessment Act 1979*;
- *Protection of the Environment Operations Act 1997*;
- *Waste Avoidance and Resource Recovery Act 2001*;
- *Environmental Planning and Assessment Regulation 2000*;
- *Protection of the Environment Operations (Waste) Regulation 2014*; and
- *Protection of the Environment Operations (General) Regulation 2009*.

3.1.1 Waste Classification Guidelines

The NSW EPA (2014) *Waste Classification Guidelines* reflect current waste management legislation, specifying requirements for the storage, handling and disposal of certain types of waste, the classification of waste and the environmental obligations for licensed and non-licensed premises.

3.1.2 NSW Government's Waste Reduction and Purchasing Policy

The Waste Reduction and Purchasing Policy (WRAPP) requires all State agencies to develop a Waste Reduction and Purchasing Plan to demonstrate procedures to minimise waste generation in four areas: paper products, office equipment and components, vegetation, and construction and demolition material. It also requires priority to be given to purchasing items with recycled content and the recycling of certain wastes. The main aim of WRAPP is to reduce waste into the State's landfills.

This Waste Management Plan is based on similar principles to the WRAPP.

3.1.3 NSW EPA "Construction and Demolition Waste Reduction Action Plan"

This plan contains a comprehensive program of steps to divert construction and building waste from landfill through reduction, recycling and minimisation principles.

It is the aim of this plan to align waste management for the Project construction with the principles of this plan.

3.1.4 NSW Government's Waste Hierarchy

The Waste Hierarchy describes an approach to waste management to ensure the most efficient use of resources, to reduce environmental harm, and to provide for the continual reduction in waste generation in line with the principles of Environmentally Sustainable Development (ESD).

The following hierarchy for managing waste, from most desirable to least desirable includes:

- avoid unnecessary resource consumption;
- recover resources (including reuse, reprocessing, recycling and energy recovery); and
- dispose (as a last resort).

It is on these principles that this WMP also rests.

4.0 Waste Types and Sources

4.1 Waste Types and Characteristics

The following types of waste are considered within this Waste Management Plan:

- impacted soils (i.e. potentially contaminated and/or treated soils removed from site, including sediment collected from sediment control devices);
- process wastes, including hazardous materials;
- Virgin Excavated Natural Material (VENM) and Treated Potential acid sulfate soils (PASS);
- VENM bedrock;
- groundwater (including treated groundwater, by-products and wastes);
- stormwater; and
- general refuse.

The types and sources of waste to be generated during the remediation works listed in the **Section 4.2**.

Table 4 and **Table 5** estimate the types and sources of wastes identified at the Site (both solid and liquid wastes) and provide a preliminary classification (classification will be confirmed based on testing of waste materials, as appropriate) in accordance with the NSW EPA (2014) *Waste Classification Guidelines*. A bulking factor of 30% has been assumed for all excavated material.

4.2 Waste Sources

The wastes likely to be generated during the Block 5 remediation works are detailed here.

Ex-situ remediation works would involve excavation of contaminated materials to the depth of bedrock across much of the Block 5 Remediation Area.

4.2.1 Excavation and Remediation of Block 5 Remediation Area

Wastes likely to be generated during the ex-situ Block 5 remediation works are estimated in **Table 4**. The estimated volumes will be refined with the waste classification works.

Table 4 Block 5 Excavated Waste

Source / Activity	Indicative Waste Type	Indicative Maximum Estimated Volume	EPA Waste Classification	Reuse/Recycle/Dispose
Demolition of hardstand	Concrete / asphalt (not contaminated)	4,860 m ³	General Solid Waste (non-putrescible)	Recycle
Block 5 - excavate to extent for VMP Remediation Works (up to 10m bgl)	Soil (not requiring treatment)	34,300 m ³	Likely General or Restricted Solid Waste and/or Special Waste (asbestos)	Offsite disposal
	Soil (requiring offsite treatment)	2,000 m ³	Likely Hazardous Waste requiring offsite treatment under an Immobilisation Approval as per the VMP/Block 4 RAP (AECOM, 2013b) and/or Special Waste (asbestos)	Treated material to be disposed offsite to landfill (trackable).
	Soil (SPGWT - requiring offsite treatment)	3,000 m ³	Likely Hazardous Waste requiring offsite treatment under an Immobilisation Approval as per the VMP/Block 4 RAP (AECOM, 2013b) and/or Special Waste (asbestos)	Treated material to be disposed offsite to landfill (trackable).
	PASS - refer to the Block 5 ASSMP (AECOM, 2014)	Unknown	VENM PASS or Treated material (to be re-used onsite) and/or Special Waste (asbestos)	Disposed within 24hrs at a licensed landfill as VENM PASS or treated onsite and reused as fill on the Barangaroo Site, or Block 5 reinstatement
Remove trees from Site	Green waste	100 m ³	General Solid Waste (putrescible)	Recycle as green waste
Odour filtration system	Filters	Two filters every 2-3 months	General Solid Waste (non-putrescible)	Dispose to landfill

4.2.2 Liquid Treatment

Liquid wastes likely to be generated during the site remediation works are quantified in **Table 5**.

Table 5 Liquid Waste

Activity	Indicative Waste Type	Indicative Maximum Estimated Volume (L)	EPA Waste Classification	Reuse/Recycle/Dispose
Potentially contaminated stormwater or other potentially contaminated water, after appropriate treatment	Trackable liquid wastes (contaminated stormwater, wheel wash and decontamination water)	Unknown	Liquid waste	Treat and discharge in accordance with EPL or Trade Waste Permit, or dispose offsite
Contaminated groundwater extraction	Trackable liquid wastes	>2,500,000 L	Liquid waste	Treat and discharge in accordance with EPL or Trade Waste Permit, or dispose offsite

5.0 Waste Management and Reuse

The key issues with respect to waste management that are addressed in this WMP are as follows:

- waste materials generated onsite will be managed so that recycling is maximised and the volume of waste transported to landfill is minimised, within the bounds of legislative and statutory approval requirements;
- wastes will be separated, characterised and properly disposed of to minimise the potential for impacts to the environment;
- liquid wastes will be managed and treated (where practicable) onsite to minimise offsite disposal requirements; and
- the volumes, plans for use and methods for disposal, including recycling and re-use initiatives, of all materials brought onto the Site will be listed, tracked and reported (where appropriate).

All workers on the Site will receive appropriate instruction and training, during their site induction program, in the required methods and procedures for waste segregation. Appropriate instructions will also be included in all relevant Safe Work Method Statements (SWMS). Signage on bin/waste areas (where appropriate) will indicate the type of waste that may be placed in that bin/area. Responsibility for correct waste and recyclable disposal and the overall success of waste management practices will be shared by all personnel at the Site.

As required by the *VMP/Block 4 RAP* (AECOM, 2013b), a Materials Tracking System (MTS) will be prepared for the Block 5 remediation works to appropriately track all excavated materials.

5.1 Waste Classification

A 'Waste Classification Strategy' for the Block 5 remediation works will be prepared and the NSW EPA will be consulted to obtain their agreement to the proposed classification approach.

Materials to be excavated for potential reuse will be selectively excavated based on:

- the findings of the previous investigations (AECOM 2010a, AECOM 2010b and AECOM 2012a);
- requirements of the *VMP/Block 4 RAP* (AECOM, 2013b);
- an *in situ* characterisation / validation program (if required); and
- field observations (visual and olfactory).

Wherever possible, this material will be either:

- reused onsite for backfilling works; and/or
- reused in other Barangaroo site areas; and/or
- transported offsite to a site that is approved to receive it under a waste exemption approved by the NSW EPA for reuse.

If field observations during the bulk excavation works indicate that some excavated material is significantly different to that determined by the previous investigations and an *in situ* characterisation / validation program (if required), the material will be stockpiled and additional discrete validation samples collected and analysed from each stockpile at a sampling frequency appropriate to the material fate.

5.1.1 Classification of Materials to be Disposed Offsite

Materials to be excavated, taken offsite and for either reuse/disposal will be pre-classified based on:

- the findings of the previous investigations (AECOM 2010a, AECOM 2010b and AECOM 2012a);
- an *in-situ* characterisation / validation program (if required as an outcome of the 'Waste Classification Strategy'); and
- field observations (visual and olfactory).

Similarly, if field observations during the bulk excavation works indicate that some excavated material is significantly different to that determined by the DGI and an *in situ* characterisation / validation program (if

required), the material will be stockpiled and additional discrete classification samples collected and analysed from each stockpile at a sampling frequency appropriate to the material fate.

All wastes generated as a result of the project will be classified in accordance with the NSW EPA (2014) *Waste Classification Guidelines* and those disposed offsite will be transported to a facility that can lawfully receive that waste.

5.1.2 Validation of Treated Materials for Reuse

If excavated material from the Site are proposed for potential onsite reuse, it will be tested and validated in accordance with the *VMP/Block 4 RAP* (AECOM, 2013a).

5.2 Stockpiling

Due to space constraints and the associated environmental impacts associated with stockpiling, it is essential to the ongoing efficiency of the project that stockpiling of materials either inside the EE structure or upon external surfaces (soils for reuse/recyclables) is maintained at a minimum. Limiting the quantity of material stockpiled onsite at any given time will also reduce the pressure on environmental controls, thereby reducing the risk of potential adverse environmental impacts.

It is proposed that with the exception of recyclables, waste materials will generally be stockpiled inside the EE structure where appropriate.

The EE structure will be of a size which will enable temporary stockpiling prior to offsite haulage within 1-2 days of excavation. Stockpile areas will be appropriately prepared to ensure that materials are segregated/labelled and all materials will be tracked using a Material Tracking System (MTS, as required by the *VMP/Block 4 RAP*). The location of stockpiles within the EE structure is subject to detailed design and staging.

Where possible, *in situ* characterisation / validation testing of material will be undertaken prior to excavation, to pre-classify materials and minimise interim stockpiling requirements.

5.2.1 Stockpile Locations

Stockpiles of contaminated material excavated during the works will be minimised through the sequential works staging and treatment.

It is proposed that with the exception of recyclables and site reuse materials, all materials will be stockpiled inside the EE structure prior to disposal, reuse or haulage offsite for offsite treatment works.

Stockpiled material which requires offsite treatment would need to be removed within 1-2 days of excavation to prevent delays caused by overcrowding within the EE structure.

The location of stockpiles will be confirmed via GPS as required by the MTS.

If required, untreated PASS must be kept wet at all times during excavation and subsequent handling, transport and storage until it can be disposed of/reused safely. The material must be received at the proposed pick up point within 16 hours of being excavated.

5.2.2 Stockpile Area Preparation

Stockpile areas will be prepared using the following methods:

- noting that the majority of the Site is covered by an existing hardstand surface, works will be undertaken initially to clear the area of any rubbish, rubble, structures and vegetation;
- diversion drains and bunds will be constructed around the perimeter of the stockpile areas to the extent necessary. Additional sediment and erosion control measures including silt fencing and hay bales may also be installed where necessary;
- signs will be erected at the entrance to the stockpile area and at locations around the stockpile specifying individual stockpile numbers and the type of materials stored; and
- buffer zones will be established around each stockpile area to enable access to the stockpiles and minimise impacts of the stockpile area on the surrounding facilities.

For treatment of PASS in an open area (if required), neutralisation should be carried out on a treatment or liming pad. A guard layer of neutralising agent should be spread onto the surface of the treatment pad prior to the

placement of soils. This will reduce risk by neutralising acidic leachate generated in the treatment pile and not neutralised during the treatment process. Management procedures to be utilised for treatment of acid leachate generated from exposure of PASS material and stormwater runoff are detailed in the *Block 5 Acid Sulfate Soils Management Plan* (AECOM, 2014).

5.2.3 Stockpile Construction and Maintenance

Where appropriate, drainage, sediment and erosion control measures would be installed within excavation and stockpiling areas at the commencement of the project, and maintained, repaired and replaced where necessary for the duration of the stockpiling activities. Stockpiles are to be established within a bunded area to capture and direct any leachate or runoff to a suitably sized pond for settlement (if appropriate) and, in the case of contaminated material stockpiles, treatment in the onsite extracted groundwater treatment plant.

Where appropriate, temporary spoil stockpile areas external to the EE structure may be lined with an impermeable HDPE plastic liner (or similar), surrounded by HDPE lined bund around the perimeter and covered by impermeable HDPE plastic covers/tarps, prior to transfer offsite to landfill or the offsite treatment facility.

Where required, temporary soil stockpiles would be located on areas lined with an impermeable HDPE plastic liner (or similar), surrounded by HDPE lined bund around the perimeter, and will be covered or stabilised by suitable dust/erosion/odour reduction measures such as:

- containment within the EE structure;
- tarping stockpiles with impermeable coverings when not in use;
- application of surfactant to exposed stockpile surfaces; and/or
- application of odour masking agent to air.

Stockpiles will be maintained in a tidy and safe condition with stable batter slopes typically of 2H:1V. Maximum heights of typical stockpiles will be as defined in **Table 6**.

Table 6 Indicative stockpile locations and dimensions by Material Type

Material Type/waste stream	Stockpile location	Height (m)	Max. Volume (m ³)
Green Waste (mulched)	External temporary stockpile	2-4	150
Clean recyclables	Remediation work area within the EE structure or external temporary stockpile	2-4	250
Reuse material	Remediation work area within the EE structure or external temporary stockpile	2-4	250
Untreated waste	Remediation work area within the EE structure or external temporary stockpile	4.5	4500
Screened oversize	Remediation work area within the EE structure or external temporary stockpile	3	150
Crushed oversize	Remediation work area within the EE structure or external temporary stockpile	2	50
Estimated total maximum volume of stockpiled material at any given time			5000-6000

Accurate tracking of stockpiles will be undertaken throughout the proposed works to ensure the traceability of each material type/waste stream, including the origin, destination and approximate volume of each stockpile and the confirmation of stockpile locations via registered survey. Potential changes in excavation and stockpiling volumes will be managed appropriately with reference to the Contingency section of the *VMP/Block 4 RAP* (AECOM, 2013b).

5.2.4 Cross-contamination

A number of sediment control and tyre cleaning devices will be constructed at the site to minimise the potential for cross-contamination. Cross-contamination prevention measures may include the following:

- establishment of decontamination units at the primary entrance/exit to the EE structure;
- cleaning of vehicle tyres prior to relocation to new area;

- inspection by access control personnel of vehicles or plant prior to entry to new area;
- installation of shaker grids at exits to structures;
- utilisation of crushed rock and/or geofabric armouring for exposed surfaces;
- covering loads; and/or
- correct classification and tracking of materials across the Site.

5.3 Handling and Storage

Lend Lease (through the specialist remediation contractors) will be responsible for safely handling, segregating and temporarily storing wastes and maintaining waste storage locations onsite.

Procedures will be prepared prior to construction by the specialist remediation contractors to ensure that double handling and the movement of waste material around the site is minimised.

The handling and storage of waste will be dictated by the various waste streams identified in **Section 4.0**. These various waste streams have been grouped into types for which the handling and storage of waste is common. These waste types are:

- General solid waste (non-putrescible) and general solid waste (putrescible), including:
 - amenities waste, office-generated waste, plastic packaging materials and food and beverage containers; and
 - recyclable wastes, consisting of green waste, cardboard and paper, concrete drilling spoil and other sundry amounts of broken concrete and/or asphalt and steel during demolition of buildings and hardstand areas;
- Trackable liquid wastes, consisting of contaminated stormwater, groundwater collected from monitoring activities and water used to decontaminate equipment;
- Trackable solid waste, consisting of contaminated soil from intrusive activities, such as drilling, trenching and sampling, SPGWT and PASS which cannot be appropriately treated or stabilised for reuse onsite, and asbestos; and
- VENM and treated PASS, potentially excavated during works.

All dangerous goods will be managed appropriately in accordance with a site-specific Health and Safety Plan and the requirements of the *Occupational Health and Safety (Dangerous Goods Amendment) Regulation (2005)*.

The management and handling of chemicals will be detailed in the site-specific Health and Safety Plan to be prepared for the works and will include copies of Material Safety Data Sheets.

5.3.1 General Solid Waste

A dedicated bin system will be used to manage the General Solid Waste - both putrescible and non-putrescible. That is, all recyclable, green waste and non-recyclable "general" classed waste materials will be generally separated into specifically allocated bins. Materials contained within these bins will be stored within the bins for collection, transport and re-processing / recycling or disposal, as soon as practicable.

A weekly collection service is recommended for initial operations, however this regime may later be adjusted to an as needs basis. Collection of the contents of all general waste and recycling bins will be managed by a licensed transport and disposal contractor where required. The contractor will administer the supply, delivery, removal and certified disposal (as required) of all general wastes generated at the Site.

5.3.2 Trackable Waste

Restricted, immobilised and liquid waste types classify as category 1 trackable wastes under the NSW EPA *Protection of Environment Operations (Waste) Regulation 2014*. Trackable wastes are those to which waste tracking requirements apply, as defined in either Part 1 and 3 or Part 2 of Schedule 1 to the *Protection of the Environment Operations (Waste) Regulation 2014*. Waste characterisation samples will be collected for all trackable waste and be classified according to the NSW EPA (2014) *Waste Classification Guidelines*.

Offsite transport of any trackable waste types will require tracking in accordance with NSW EPA waste tracking legislation and the MTS. Each load of trackable waste will be accompanied by an appropriately completed transport certificate prior to exiting the Site.

Trackable waste streams include SPGWT treated and disposed offsite, restricted waste and some liquid waste, contaminated groundwater and waste oils, and are to be containerised and stored onsite within containment areas. Maximum estimated quantities of trackable waste streams are presented in **Section 4.0**.

Both solid and liquid trackable wastes will either be containerised for disposal, as appropriate, or (in the case of liquids) treatment discharge to sewer under a Trade Waste Agreement. Wastes within containers will be classified by extracting samples from the material. This will take place when the container is full or when work is complete. The amount of waste stored within containers onsite will be recorded.

5.4 Liquid Waste Management

To the greatest extent possible, liquid waste material will be treated within onsite storage containers to reduce the amount of material requiring offsite disposal. Liquid waste may be treated in a WTP depending on the type and concentrations of contamination in the liquid waste as well as the operational capacity of the WTP at the time. The WTP would discharge treated water to stormwater or the harbour if it meets the criteria specified in an EPL or other permit (in accordance with appropriate licence conditions) or disposed offsite to a liquid waste facility if it fails these criteria.

If a suitable Trade Waste Agreement is able to be negotiated with Sydney Water Corporation (SWC) then agreed volumes and maximum concentrations of chemicals / contaminants may be disposed directly to SWC's sewer, in accordance with the terms of that Agreement with SWC.

5.4.1 Surface Water Management

Currently the Site is hardstand and relatively flat, with stormwater runoff being captured onsite and treated at the Site water treatment plant. The treated water from the plant is then discharged to Darling Harbour under the Site EPL (13336).

Surface water flows and stormwater will be managed by segregating clean water from impacted water and preventing the inflow of surface water to excavation areas using surface bunds and drainage diversions. The preferred hierarchy for management of stormwater onsite is as follows:

- Minimise volume of contaminated water during the works wherever possible by:
 - Directing surface water away from the Site, excavations, depressions, pits and stockpiles by the construction of drainage works such as bunds, diversion drains and stormwater control measures. Control measures may include the manipulation of offsite, upstream, stormwater inlets / grates to enable increased quantity of the incoming stormwater flow to be received. This can be achieved through the placement of geotextile sandbag (or similar) bunds on the downstream edge of the inlet / grate, and / or, through the enlargement of inlet / grate opening to facilitate this. These measures will minimise the flow of clean water into areas of the Site that contain contaminated materials.
 - Another measure that may be employed to limit offsite stormwater entering the Site is through the installation of an impermeable bund (e.g. geotextile gravel / sandbag bund, covered with a HDPE plastic liner) around the Site perimeter (on the inside of the perimeter fence) to minimise stormwater entering the Site. This perimeter bund also has the advantage of controlling any potential onsite water or sediments exiting the Site. Due to the remediation being completed in stages (refer to staging plans), the perimeter bund will only encompass the portion of the Site that is actively being remediated. The extent and detail of any proposed bunding will be the subject of further design development.
 - Staging works in a sequential manner to minimise the area of exposed soils and stockpiles.
- Recycling water where possible by using onsite as dust suppression for other site operations including wheel washing and truck washing. To ensure that the use of recycled water does not impact on surrounding areas, the following data will be obtained prior to undertaking these activities:
 - Chemical data which demonstrates that the water to be recycled complies with the reuse criteria, including consideration of potential for odour generation;
 - Definition of the area where the water is to be discharged;
 - Details of environmental protection measures installed to ensure that the use of recycled water will have no adverse environmental impact; and
- Appropriate tracking of recycled water reused at the Site.

- Containment and onsite treatment of contaminated stormwater falling on treatment areas and excavations within the extracted groundwater treatment plant. Surface water drainage will also be arranged so that surface water run-off from disturbed or contaminated areas does not enter remediated or undisturbed areas;
- Discharge to stormwater or sewer, with or without treatment, as per regulatory guidelines and in accordance with an EPL and/ or Trade Waste Permit to be obtained for the project; and
- Offsite disposal if liquid wastes do not meet EPL or Trade Waste Agreement criteria.

Undisturbed surface water runoff will continue to follow existing drainage patterns, unless diversion from active site areas is warranted.

Stormwater control devices will be inspected daily. Inspections of control devices during rain / storm events, will be undertaken at a higher frequency (to be determined based on the magnitude of the event), and on completion of the storm event to monitor the effectiveness of mitigation techniques. If warranted, the inspections will involve cleaning and/or replacement of devices if deemed that they are compromised.

Clean water captured onsite and used to the maximum extent possible for dust suppression. Excess clean water will be discharged to stormwater or sewer in accordance with the conditions of an EPL and/ or Trade Waste Agreement, respectively. If this water does not meet EPL or Trade Waste Agreement criteria it will be disposed offsite as liquid waste.

Further detailed explanation of the management and monitoring of surface water is addressed in the *Ex-situ Soil and Water Impact Assessment* (Worley Parsons, 2014).

5.4.2 Groundwater Management

Groundwater will be removed from the excavated remediation areas via installation of a dewatering system to be designed and managed by a specialist contractor. Groundwater extracted via this system will be treated in the onsite extracted groundwater treatment plant.

Extracted groundwater will be tested to ascertain contamination and treated to meet the criteria specified in the EPL or Trade Waste Agreement, or discharged to stormwater (in accordance with appropriate licence conditions) or disposed offsite if it fails to meet these criteria.

Groundwater collected during performance monitoring activities will be stored in containers onsite. This water will be tested and classified according to the NSW EPA (2014) *Waste Classification Guidelines* for appropriate offsite disposal. Testing will be conducted prior to disposal. The results of testing and the amounts disposed will be recorded and reported, as required, in waste disposal documentation.

5.4.3 Water Treatment Plant

A WTP (potentially located to the north west of the Site, refer to **Figure 2**) will be used to treat contaminated stormwater, wheel wash water, decontamination water, groundwater dewatered during the works.

It is acknowledged that stormwater discharges are to meet appropriate licence limits based on the ANZECC (2000) marine trigger values (or other criteria approved by NSW EPA), and that NSW EPA may require compliance with limits for other chemicals used in the process if there is a chance they could spill to stormwater systems. The exact size and running capacity of the plant will be based on selected works staging.

As the total volume of treated water may exceed 100 mega litres/year, the works will require an EPL to be issued by the NSW EPA under the *POEO Act* (1997) for the water treatment works. Appropriate licences/permits must also be gained for the discharge of the treated water to the local stormwater system, which discharges into Darling Harbour. A WTP commissioning phase will be undertaken in accordance with the EPL prior to any discharge of treated water. It is noted that the existing EPL 13336 for Barangaroo includes for water treatment and discharge from the site, so it is intended that water treatment for these remediation works would be undertaken in accordance with this license (including any approved variations, where required).

Contaminated and treated water will be containerised and stored onsite within a secondary containment area, while collected water will be analysed at the onsite laboratory or offsite NATA approved laboratory, to determine if the water meets the appropriate acceptance criteria specified in the EPL or Trade Waste Agreement.

Before any onsite collected water is discharged, to stormwater drains or sewer, approval, permits and/or licences from relevant authorities will be secured. Water that fails to meet the criteria of the applicable permits and/or licences will be pumped into waste storage containers for offsite disposal at a licensed waste management facility. The approximate amounts of stormwater either released or containerised for offsite disposal will be recorded, along with the results of laboratory testing, on a Stormwater Monitoring and Disposal Record Form. These

disposal documents will be retained by the Site Manager and reported, as required, with monthly waste generation reports.

5.4.4 Waste Oil, Grease and Lubricants

Small amounts of waste oil, grease, lubricants are expected to be generated from onsite maintenance of plant and machinery. These will be stored, as required, within containers within a bunded area for later offsite recycling by an appropriately licensed waste oil recycler.

In addition, any chemical and fuel spills that take place outside of the containment areas will be cleaned up, as detailed in an Emergency Response Plan (as required by the *VMP/Block 4 RAP*), to prevent contamination of run-off.

Sanitary wastes will be contained in the sumps of portable toilet facilities and removed via a licensed contractor and disposed at a licensed waste facility as liquid waste.

5.5 Solid Waste Management

Onsite solid waste management encompasses trackable contaminated waste, uncontaminated spoil material and demolition rubble, and PASS material.

A separate *Block 5 Acid Sulfate Soils Management Plan* (AECOM, 2014) has been developed to manage any treatment or disposal of PASS material which may be excavated during the remediation and land forming works and should be read in conjunction with this Waste Management Plan.

5.5.1 Trackable Solid Waste

If possible, excavated material from the Block 5 Remediation Area may be reused on the Barangaroo Site to reduce the amount of material requiring offsite disposal.

The materials to be excavated for the works comprise typically heterogeneous fill materials, soil, bedrock, SPGWT, PASS, as well other potential gas works related waste (for example ash). Therefore, prior to commencement of excavations, detailed excavation plans will be prepared outlining the anticipated classification of materials based on the additional *in situ* characterisation sampling of fill materials (if required) and the results of the preceding site investigations. The waste types requiring tracking may include:

- General Solid Waste;
- Restricted Solid Waste;
- Hazardous Waste; and
- Special Waste (asbestos).

Correlations between field observations (both visual and olfactory) and analytical data will also be used to guide the visual characterisation of fill materials during excavation.

All remediation excavation works will be undertaken in accordance with the following procedures and in accordance with the *VMP/Block 4 RAP* (AECOM, 2013b), in sequence:

- prior to commencement of excavations on each work shift, all necessary environmental, OH&S measures and related equipment will be established and all worker PPE and respiratory controls will be checked to ensure they are in full working order in accordance with the OH&S Management Plans;
- all excavation plant operators, haulage operators and supervisors will be made familiar with the excavation strategy, and all workers will be made aware of their responsibilities prior to the commencement of each shift;
- prior to the commencement of excavation, stockpile areas will be prepared with adequate capacity to receive the excavated contaminated materials;
- exclusion zones will be set up around the active remediation works areas as required;
- all internal truck haulage roads will be made suitable for transportation and haulage of the excavated materials;
- all haulage trucks will be covered prior to exiting the exclusion zone/excavation area and will be decontaminated at the end of each shift of haulage operations in accordance with the environmental management plan (EMP). All haulage trucks will be fitted with liquid seals which will be inspected daily to

ensure their integrity. Additives may also be added to sludge materials to make the material more spadeable and to mitigate leakages from trucks during offsite transportation; and

- all personnel, vehicles and equipment leaving the excavation enclosure will be decontaminated in accordance with the EMP.

All excavated materials handled during the remediation works will be tracked in order to allow verification of the correct movement and handling. The system will track materials from excavation-to-disposal, and will provide detailed information on the location and quantity of all material movements both on and offsite. The tracking system shall include accurate tracking of stockpiles throughout the material handling stage and may include confirmation of stockpile locations via GPS to reduce the risk of cross-contamination between stockpiles.

As part of this process, accurate records shall be kept to ensure that backfilling of excavations (where required) and reuse of material only occurs following the successful validation of the subject materials. Plans will be made with respect to the extent of each excavation. A register of all analytical results for stockpiles and excavations will be maintained throughout the validation works.

Excess treated contaminated spoil, SPGWT or PASS will then be disposed at an appropriate licensed facility, in accordance with all relevant requirements for that classification.

5.5.2 Uncontaminated Spoil Material

Demolition rubble will be placed into skip bins for characterisation prior to being disposed at a licensed recycling facility. Alternatively, demolition rubble may be transported offsite for reuse under a waste exemption, subject to approval by the NSW EPA.

Uncontaminated non-PASS excavated material will be transported offsite via trucks for reuse under a waste exemption, subject to approval by the NSW EPA.

5.6 Documentation

Copies of all reuse and disposal documentation will be supplied to Lend Lease and filed with all other site records.

Lend Lease will keep records of recycling and waste management which will form part of the monthly environmental management and health and safety performance indicators. The Construction Manager will be responsible for implementing the MTS, preparing monthly reports and statistical information that includes all the following:

- number, waste type and size of bins / containers / trucks (tonnage and volume, in litres for liquid waste and cubic metres for solids) removed from the Site;
- total tonnage and volume generated of each waste type (volume in litres for liquid waste and cubic metres for solids);
- copies of an appropriately completed transport certificates and landfill weighbridge dockets for each load of trackable waste transported offsite in accordance with NSW EPA waste tracking legislation;
- total tonnage and volume of spoil transported within the Barangaroo Site for reuse (volume in cubic metres);
- final onsite location of reused spoil by volume;
- classification letters and validation testing results;
- approximate amounts of stormwater either released or containerised for offsite disposal, along with the results of laboratory testing, on a Stormwater Monitoring and Disposal Record Form;
- PASS testing and treatment validation results (if required);
- total tonnage and volume of each waste type recycled (in litres for liquid waste and cubic metres for solids); and
- The final destination of waste material.

Details of waste types, volumes and destinations will be recorded on Waste Management Forms, including a Monthly Recycling and Waste Management Statistics form (refer to **Appendix A** or equivalent), in accordance with the MTS. A summary of this information (including landfill weighbridge dockets) will be included in the 'Validation Report' as required by the *VMP/Block 4 RAP* (AECOM, 2013b).

This information will be collated for record keeping and appropriate communication to any relevant authorities, where required. During the works, all trackable wastes will be transported and tracked in accordance with the *POEO Act* (1997) and the MTS.

Citations of non-conformance issued in accordance with the protocols of this Waste Management Plan, as well as with respect to any breaches of government and/or other regulatory stipulations will be recorded. The Site Manager will review and analyse the cause of detected non-conformances and develop a corrective action to prevent recurrence. Details of the non-conformance, including any immediate corrective actions undertaken will be recorded, reviewed and accepted by the Site Manager.

6.0 Reuse and Waste Disposal

The following is a summary of the measures proposed for appropriately avoiding, reducing, reusing, recycling and/or disposing of all wastes during remediation.

6.1 Waste Avoidance and Reduction

Where possible, the onsite waste management system to be established will utilise waste avoidance through the reuse of suitable excavated materials on Barangaroo Site in accordance with Section 7.3 of the *VMP/Block 4 RAP* (AECOM, 2013b), and/or transported offsite for reuse under a waste exemption approved by the EPA (i.e. reused on other development sites excluding Barangaroo). The proposed works will also treat and discharge surface and groundwater.

6.2 Reuse and Recycling

Waste separation and segregation will be promoted on the Site, to facilitate reuse and recycling as a priority of the waste management program. Waste streams that are the subject of this WMP, will generally be separated onsite into dedicated bins/ areas where practicable, for either reuse onsite or collection by a waste contractor and transport to offsite recycling facilities.

Wherever allowable under the requirements for that classification, empty drums or bins will be cleaned for re-use again for the same purpose for this Project, if required, and/or for a similar purpose for other projects.

6.2.1 Spoil Reuse

Where possible, some of the Site's uncontaminated spoil may be reused and/or transported offsite for reuse under a waste exemption approved by the NSW EPA. If contaminated material requires treatment via stabilisation it will not be reused at Barangaroo or any other site and will be taken to a NSW EPA approved landfill under the required Immobilisation Approval.

6.2.2 Recyclable Materials

Wastes will be segregated to enable the offsite recycling of demolition rubble, office wastes and general wastes, including the recycling of waste steel, paper, cardboard, timber, oil, concrete, asphalt and green waste.

6.3 Waste Disposal

Where waste is required to be handled and stored onsite prior to any onsite reuse or offsite recycling or disposal, the following measures will apply:

- liquid wastes will be stored in appropriate containers in bunded areas until they can be appropriately disposed of. Bunded areas will have the capacity to hold 110% of the volume of the largest container;
- hazardous waste will be managed by appropriately qualified and licensed contractors, in accordance with the requirements of the *POEO Act* (1997); and
- all other recyclable or non-recyclable wastes and liquids are to be stored in appropriate receptacles (e.g. bins or skips) in appropriate locations onsite and covered where required. Appropriate waste / recycling contractors will be commissioned to regularly remove/empty the bins to approved disposal or recycling facilities. All appropriately separated, potentially recyclable materials will only be transported to its relevant recycling facility that can guarantee appropriate recycling, re-use and re-processing for future re-use.

Waste storage strategies for classified wastes prior to their offsite disposal are outlined in **Table 7**. Waste disposal will be in accordance with the *Protection of the Environment Operations Act* (1997) and the *Waste Avoidance and Resource Recovery Act* (2001). Wastes that are unable to be reused or recycled will be disposed of offsite at an EPA-approved waste management facility following classification. Details of waste types, volumes and destinations are to be recorded in the Waste Management Forms (**Appendix A** or equivalent).

The nominated disposal contractor will be responsible for providing dockets to the Construction Manager for the removal and appropriate disposal of all trackable waste from the Project.

If required, a list of potential waste oil recycling companies endorsed by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities can be found on the website www.oilrecycling.gov.au.

Table 7 Indicative Waste disposal and storage strategy for classified wastes (subject to design development)

Key Waste Stream	Indicative Segregation Areas / Containers Commonly Available
Site Office and Work Site Wastes	
Organic food scraps	240L MGB
Food packaging / cans / bottles / wrappers	240L MGB
Paper and / or other office based wastes	240L MGB
Glass/plastic/ cans/paper/ cardboard – potentially recyclable	240L bins specified for 'Recyclables Only' as per domestic recycling bins
Plastic wrapping/containers– collected and littered	240L bins – general waste or into recycling bin as appropriate
Printer Cartridges	Bin provided (capacity of up to 20 – 25 standard cartridges)
Miscellaneous construction wastes (cables, parts, etc.)	10m ³ skip bins – to be combined with other miscellaneous construction wastes
Scrap timber / scrap metal	10m ³ skip bins
Sediment fences	Timber in timber bins / shade cloth stored onsite
Chemicals Storage and Management	
Drums and containers (empty and containing no residue)	Stored in bunded areas
Waste oil, grease, lubricants	Sealed drums / containers stored within bunded area
Oily rags and filters	200L (or thereabouts) bins
Used spill management materials such as absorbent pads / used absorbent materials used to mop up oil spills / any soil contaminated from dripping machinery or other hydrocarbon / chemical sources	Bins and / or tanks suitably bunded
Other Site Waste	
Trackable solid wastes	Stored in the EE within a bunded area
Broken concrete / asphalt	10m ³ skip bins
Sediment build up behind erosion and sediment control devices	Regularly cleared from behind control structures, before they are at capacity
Treated liquid waste	Stormwater, extracted groundwater and other potentially contaminated liquids will be containerised, where appropriate, stored within the containment area and tested to determine appropriate disposal methods.
Trackable liquid wastes (waters and fluid unable to be treated for discharge, waste oils)	Sealed in drums and stored within bunded area

6.4 Treatment/Disposal Facilities and Offsite Transport Routes

All disposal methods and transport routes will be documented in accordance with all relevant legislation.

A number of licensed waste management facilities are available to accept the various types of wastes that will be generated by the proposed works, some of which are detailed in **Table 8**.

Table 8 Appropriately Licensed Waste Management Facilities

Waste Type	Appropriate Waste Management Facilities
General Solid Waste (putrescible)	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions)
General Solid Waste (non-putrescible)	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions) Erskine Park Landfill (Transpacific) Horsley Park Waste Management Facility (Veolia) Kemps Creek Landfill Facility (SITA Environmental Solutions)
Special Waste (asbestos) ¹	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions) Erskine Park Landfill (Transpacific) Horsley Park Waste Management Facility (Veolia) Kemps Creek Landfill Facility (SITA Environmental Solutions)
Liquid Waste	Worth Recycling South Windsor Site
Restricted Waste	Kemps Creek Landfill Facility (SITA Environmental Solutions)
Green Waste	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions) Horsley Park Waste Management Facility (Veolia)
Timber	Eastern Creek Waste & Recycling Centre (WSN Environmental Solutions) Horsley Park Waste Management Facility (Veolia)
Untreated PASS Material classified as VENM	South Windsor Plant (Worth Recycling)
Hazardous Waste	South Windsor Plant (Worth Recycling) Kooragang Island (Transpacific)

Notes:

1. According to the NSW EPA (2014) *Waste Classification Guidelines*, Special Waste refers to any waste that contains asbestos including Asbestos Containing Material.

Table 8 above is an indicative list of NSW EPA licenced waste facilities. Further to this list, prior to disposing of wastes off site, appropriately licenced waste facilities will be nominated by the designated contractors to Lend Lease. Prior to offsite treatment/disposal, the Lend Lease Environment Manager will check current license conditions of any proposed treatment/disposal facility to confirm that they can lawfully accept the waste to be received. The confirmation of the suitability of the treatment/disposal facility for receipt of the material will be retained on the Lend Lease project file.

Transport routes to appropriately licensed landfill sites will generally be as per designated routes shown on the transport route maps presented in **Appendix B** or as required for other licensed facilities. There may be times when the transport routes need to change depending on prevailing traffic conditions.

The contact details of some of the various licensed waste management facilities are also provided in **Appendix B**.

Trucks must adhere to all applicable road rules when exiting the Site, and follow only approved transport routes to minimise impacts on external traffic. All loads must be inspected and clean prior to leaving the Site, and must be covered with water proof tarps to reduce potential odour and dust emissions.

6.5 Internal Haul Roads

The Site is currently covered in hardstand; which would be retained wherever possible. As such, haul roads between the excavation and potential reuse areas would generally be paved, while roads within these excavation and reuse areas could potentially be unpaved.

Regular cleaning/sweeping of the paved haul roads will be required as part of the excavation activities to ensure silt build up does not occur.

Lend Lease proposes to cover haulage trucks with tarps prior to exiting the Site, and trucks would be decontaminated (where required) prior to leaving site and/or at the end of each shift of haulage operations in accordance with the EMP.

Truck movements will generally be limited to the nominated internal roadways to provide greater control over vehicle emissions and accidental spillage of materials (should it occur).

7.0 Monitoring, Inspection, Auditing and Reporting Program

7.1 Monitoring

7.1.1 Waste Register

Contractors performing works on the Site will complete the Waste Management Forms (refer to **Appendix A** or equivalent) for all wastes generated and/or subject to disposal from the Site. The appropriate completion of these Forms is the responsibility of the Construction Manager / Contractors.

Landfill weighbridge dockets / receipts / manifests will also be retained for waste tracking to record the date of waste removal and identify the waste transport contractor and destination of the wastes from each worksite. These registers will be submitted to Lend Lease on a monthly basis. A summary of this information (including landfill weighbridge dockets) will be included in the 'Validation Report' as required by the *VMP/Block 4 RAP* (AECOM, 2013b).

7.1.2 Waste Management

Waste control, management and the status of general site litter is to be monitored by the Site Manager daily.

7.2 Inspections and Audits

Daily inspections will be undertaken to ensure that waste management and environmental controls are functioning correctly and are well maintained.

Routine Site Audits would be undertaken on a weekly to fortnightly basis, depending on the onsite activities and specific environmental issues. The outcomes of these audits are to be reported to Lend Lease.

7.3 Reporting

Monthly compliance reports will be prepared and submitted to Lend Lease. The issues to be included in compliance reports have been discussed in the preceding sections of this Plan. A summary of those issues is also provided below.

Monthly reports and other statistical information collected and reported will include the following:

- number, waste type and size of bins / containers / trucks (tonnage and volume, in litres for liquid waste and cubic metres for solids) removed from the Site;
- total tonnage and volume generated of each waste type (volume in litres for liquid waste and cubic metres for solids);
- copies of an appropriately completed transport certificate for each load of trackable waste transported offsite in accordance with NSW EPA waste tracking legislation;
- total tonnage and volume of spoil transported within Barangaroo for reuse (volume in cubic metres);
- final onsite location of reused spoil by volume;
- classification documents and validation testing results;
- approximate amounts of stormwater either released or containerised for offsite disposal, along with the results of laboratory testing, on a Stormwater Monitoring and Disposal Record Form;
- PASS testing and treatment validation results (if required);
- total tonnage and volume of each waste type recycled (in litres for liquid waste and cubic metres for solids); and
- the final destination of waste material.

All issues of non-compliances and the response to relevant waste management, disposal and/or recycling issues, and any perceived non-compliance with any of the intent of this WMP will also be reported and all such issues addressed appropriately.

8.0 Roles and Responsibilities

Key responsibilities for waste management are summarised in **Table 9**.

Table 9 Key Roles and responsibilities

Role	Responsibility
Construction Manager	Responsible for compliance with all applicable legislation and contract obligations.
Site Manager	Responsible for day to day site management, including ensuring that appropriate waste management measures are implemented and maintained onsite.
Site Workers	Responsible for undertaking and maintaining mitigation measures listed in this Plan when undertaking site work and informing the Construction Manager of any potential waste management impacts to the Site and/or to the surrounding environment or community.
Health & Safety Manager	Responsible for conducting Site inductions for all workers and visitors, including discussion of the requirements of this WMP.
Environment Manager	Responsible for compliance with all applicable environmental legislation and licences and agreement conditions. Responsible to ensure a qualified environmental scientist is present throughout the excavation works, to ensure the environmental management plan is adhered too, and inspections recorded.

8.1 Training and Awareness

In order to encourage full participation of all staff in the effective implementation of this Plan, employee awareness and training will include the following:

- introduction to general waste reduction principles;
- introduction to the Waste Hierarchy principles; and
- all relevant site specific waste storage and recycling methods implemented onsite, including recycling bin locations, waste separation processes (to be communicated via during toolbox talks, etc.).

Employees with managerial and supervisory responsibilities in terms of organising work site activities, rubbish removal logistics and waste register and reporting responsibilities will be trained appropriately in these procedures.

Signage on each bin/waste area will indicate the type of waste that may be placed in that bin/area. Responsibility for correct waste and recyclable placement and the overall success of waste management practices will be shared by all personnel at the Site.

9.0 Conclusion

AECOM has been engaged by Lend Lease to prepare a WMP to accompany a Development Application for Remediation of Block 5 to be submitted to the Minister for Planning and Environment pursuant to Part 4 of the *Environmental Planning and Assessment Act (1979)*.

This Waste Management Plan has been prepared to respond to the SEARs for Remediation Works including land within Block 5 and the EPA Declaration Area, Barangaroo Central (SSD 6533) dated 13 June 2014.

This WMP concludes that:

- Lend Lease (through the specialist remediation contractors) will be responsible for safely handling, segregating and temporarily storing wastes and maintaining waste storage locations onsite, and will be dictated by the various waste streams identified.
- Where possible, the onsite waste management system to be established at the Site will aim to maximise waste avoidance through reuse:
 - onsite in accordance with Section 7.3 of the *VMP/Block 4 RAP* (AECOM, 2013a); and/or
 - at offsite locations under a waste exemption approved by the NSW EPA (i.e. reused on other development sites excluding Barangaroo).
- Materials separation and segregation will be promoted on the Site, to facilitate reuse and recycling as a priority of the waste management system.
- All wastes generated as a result of the project will be classified in accordance with the NSW EPA (2014) *Waste Classification Guidelines* and those disposed offsite will be transported to a facility that can lawfully receive that waste.
- Details of waste types, volumes and destinations will be recorded on Waste Management Forms, including a Monthly Recycling and Waste Management Statistics form, in accordance with the MTS. This information will be collated for record keeping and appropriate communication to any relevant authorities, where required.

10.0 References

AECOM Australia, (2010a). Data Gap Investigation. EPA Declaration Area (Parts of Barangaroo Site and Hickson Road, Millers Point, NSW. 23 September.

AECOM. (2010b). Data Gap Investigation, Other Remediation Works (North) Area. 20 October, 2010. AECOM Australia Pty. Ltd.

AECOM (2011a). Human Health and Ecological Risk Assessment, Declaration Site (Development Works) Remediation Works Area - Barangaroo. 9 June 2011.

AECOM (2012a). Supplementary Data Gap Investigation, VMP Area, Hickson Road, Millers Point, NSW. 9 March (Final).

AECOM (2012b). Human Health and Ecological Risk Assessment VMP Remediation Works Area (Addressing the NSW EPA Remediation Site Declaration 21122, Millers Point). 25 October 2012.

AECOM Australia, 2013a. VMP Remediation Extent, VMP Remediation Works Area, (Parts of Barangaroo and Hickson Road), Millers Point, NSW. 23 July.

AECOM Australia, 2013b. Remedial Action Plan, NSW EPA Declared Remediation Site 21122 and Block 4 (Stage 1b) Development Works, Barangaroo, Millers Point, NSW. 23 July.

AECOM Australia, 2014. *Acid Sulfate Soils Management Plan, Remediation Development Application, Barangaroo Block 5, EPA Declaration Area Number 21122, Hickson Road, Millers Point, NSW.* May 2014;

AECOM Australia, 2015. Preliminary Hazard Analysis, Barangaroo Declaration Area Number 21122, Hickson Road, Millers Point, NSW. 20 February.

Australian and New Zealand Environment and Conservation Council, 2000. Australian and New Zealand Water Quality Guidelines for Fresh and Marine Waters.

Occupational Health and Safety (Dangerous Goods Amendment) Regulation (2005).

NSW EPA, 2014. *Waste Classification Guidelines.*

Worley Parsons, 2014. *Ex-situ Soil and Water Impact Assessment.*

Appendix A

Waste Management Forms

WASTE MANAGEMENT FORM

[illegible]

Monthly Recycling and Waste Management Statistics					
Month					
Number of Bins:					
For each bin, list its weight, volume and waste type					
Bin	Bin Tonnage	Bin Volume	Waste Type		
Total Tonnage of Waste Generated	Total Volume of Waste Generated	Tonnage of Waste Recycled	Volume of Waste Recycled	% Recycled (by weight)	% Recycled (by volume)
Description of Reuse/Recycling initiatives					

Appendix B

Transport Route Maps and Waste Facility Contact Details

Appendix B Transport Route Maps and Waste Facility Contact Details

Eastern Creek Waste & Recycling Centre – WSN Environmental Solutions

Wallgrove Road
Eastern Creek NSW 2766
Phone: (02) 9934 7091

Erskine Park Landfill – Transpacific

50 Quarry Road
Erskine Park NSW 2759
Phone: (02) 9834 3411
Fax: (02) 9834 3306

Horsley Park Waste Management Facility – Veolia

716-52 Wallgrove Road
Horsley Park NSW 2164
Phone: (02) 9620 1944
Fax: (02) 9620 2867

Kemps Creek Landfill Facility – SITA Environmental Solutions

1725 Elizabeth Drive
Kemps Creek NSW 2171
Phone: (02) 9756 6899
Fax: (02) 4774 9385

Worth Recycling South Windsor Site

Corner Blackman Cres and Fairey Road
South Windsor NSW 2222
Phone: (02) 4577 6900
Fax: (02) 4577 6708

Kooragang Island – Transpacific

Raven Street, Kooragang, NSW 2304
Phone: (02) 4928 3108
Fax: (02) 4920 1639

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Site

Kurnell Landfill Company:
Kemps Creek Waste Landfill Facility:
Horsley Park Waste Management Facility:
Eastern Creek Waste Management Centre:
Worth Recycling South Windsor Site:

Material Accepted

VENM PASS material
Restricted waste, asbestos waste, general solid waste (non-putrescible)
Asbestos waste, general solid waste (non-putrescible)
Asbestos waste, general solid waste (putrescible and non-putrescible)
Liquid waste truck haulage route

Truck Haul Routes to the various Waste Management Facilities

Lend Lease (Millers Point) Pty Ltd
Waste Management Plan
Barangaroo Declaration Area No. 21122,
Hickson Road, Millers Point NSW

Figure
F3

Remediation and Land Forming Works Project Application MP 10 0026

Map Document: G:\Projects\601\60153531 Barangaroo\FIGURES\Waste Management Plan\60153531 F2 Rev A

A4 Size



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- VENM PASS truck haulage route
- Liquid waste truck haulage route
- Restricted waste, asbestos waste, general solid waste (non-putrescible)
- Asbestos waste, general solid waste (non-putrescible)
- Asbestos waste, general solid waste (putrescible and non-putrescible)

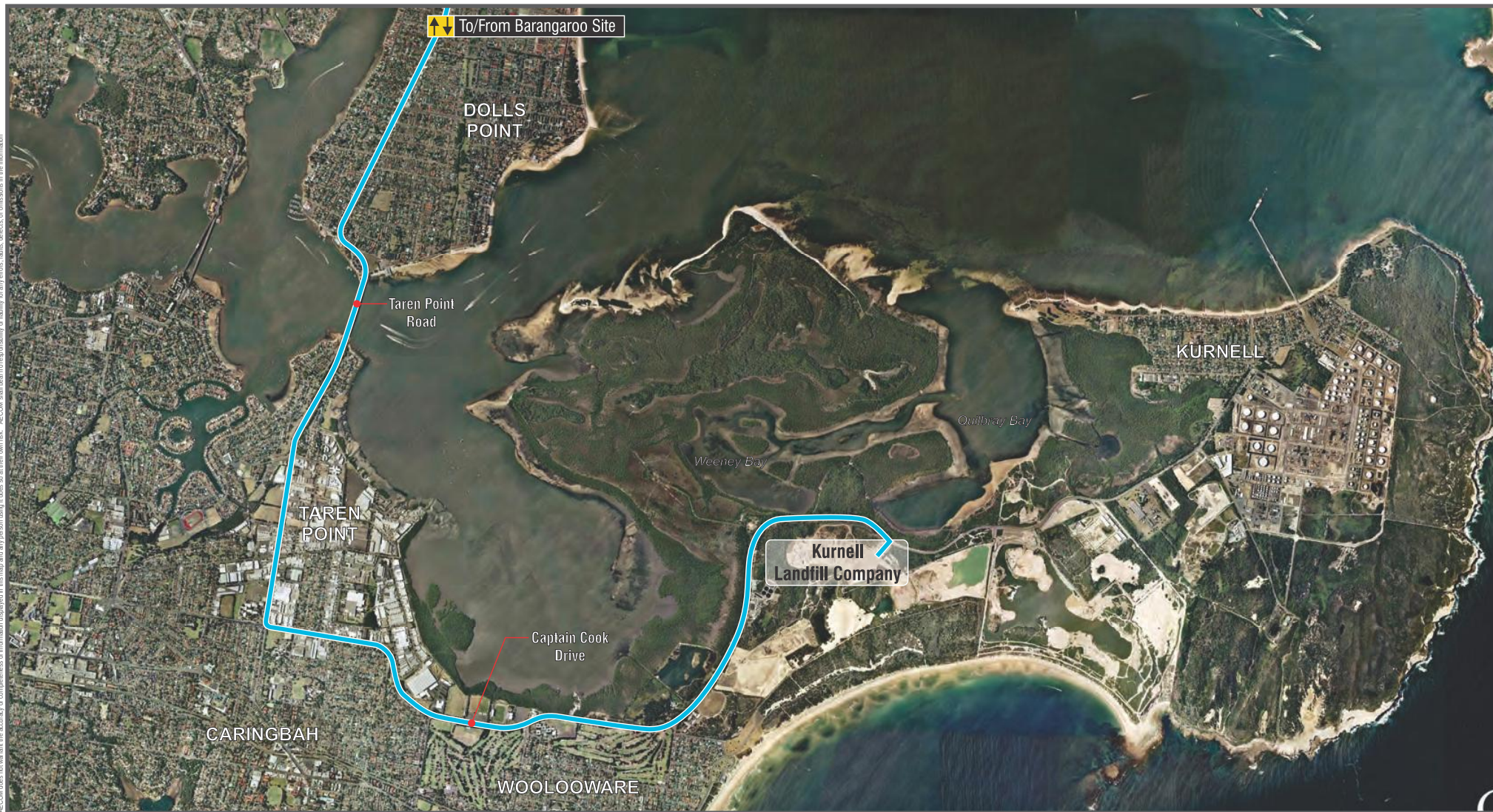
Remediation and Land Forming Works Project Application MP 10 0026

Detailed Truck Haul Routes from the Site for all Waste Types

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Figure
F4

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VENM PASS truck haulage route

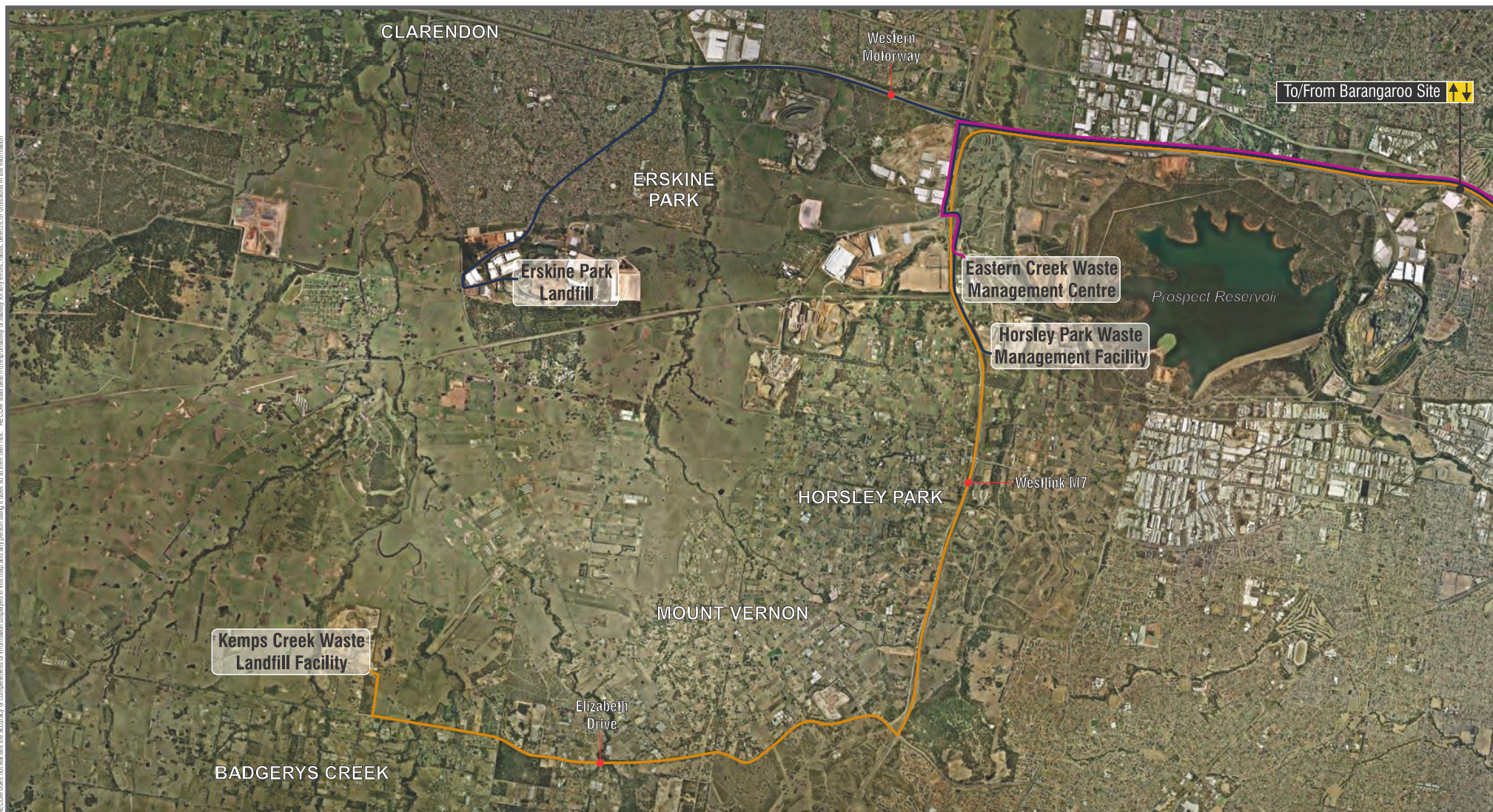
Remediation and Land Forming Works Project Application MP 10 0026

Detailed Truck Haul Route for PASS Material transport to Kurnell Landfill Company

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Barangaroo Declaration Area No. 21122,
Hickson Road, Millers Point NSW

Figure
F5

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- Restricted waste, asbestos waste, general solid waste (non-putrescible)
- Asbestos waste, general solid waste (non-putrescible)
- Asbestos waste, general solid waste (putrescible and non-putrescible)

Remediation and Land Forming Works Project Application MP 10 0026

Truck Haul Route to Eastern Creek Waste Management Facility, Kemps Creek Landfill Facility, Erskine Park Landfill and Horsley Park Waste Management Facility

Lend Lease (Millers Point) Pty Ltd

Waste Management Plan

Barangaroo Declaration Area No. 21122,

Hickson Road, Millers Point NSW

Figure

F6

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 Liquid waste truck haulage route

Remediation and Land Forming Works Project Application MP 10 0026

Truck Haul Route for Liquid Waste to Worth Recycling South Windsor Site

Lend Lease (Millers Point) Pty Ltd
Waste Management Plan
Barangaroo Declaration Area No. 21122,
Hickson Road, Millers Point NSW

Figure
F7