



# Fill Management Plan (FMP)

**Mamre Road, Abbotts Road and Aldington Road Upgrade, Kemps  
Creek NSW**

Prepared for: Land Owners Group – East c/o AT&L

A101024.0241.00 | FMP.V1f | Date: 7 August 2024



**ADE**  
CONSULTING  
GROUP

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## Abbreviations

Abbreviation	Definition
ACM	Asbestos Containing Material
ADE	ADE Consulting Group Pty Ltd
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CLM	Contaminated Land Management
CoC	Chain of Custody
CoPCs	Contaminants of Potential Concern
EPA	Environment Protection Authority
ENM	Excavated Natural Material
ERM	Environmental Resources Management
FMP	Fill Management Plan
LOG-E	Land Owners Group- East
m BGL	meters Below Ground Level
NATA	National Association of Testing Authorities
NEPC	National Environmental Protection Council
NEMP	PFAS National Environmental Management Plan
NEPM	National Environmental Protection Measure
NSW	New South Wales
NSW EPA	New South Wales Environment Protection Authority
OPPs	Organophosphorus Pesticides
OCPs	Organochlorine Pesticides
OEH	Office of Environment and Heritage
PAHs	Polycyclic Aromatic Hydrocarbons
PFAS	Per-fluoroalkyl substances
POEO	Protection of Environmental Operations
SSRRE	Site-Specific Resource Recovery Exemption
SSRRO	Site Specific Resource Recovery Orders
VENM	Virgin Excavated Natural Material

# 1 INTRODUCTION & BACKGROUND

## 1.1 Introduction

ADE Consulting Group Pty Ltd (ADE) was commissioned by Land Owners Group – East (LOG-E) (the Client) to prepare a Fill Management Plan (FMP) for the assessment of imported fill material at Mamre Road, Abbots Road and Aldington Road Upgrade (AARU and MAIU), Kemps Creek NSW (hereafter referred to as ‘the site’). The FMP is applicable for assessing the suitability of soil/rock materials to be imported onto the site as part of the development works.

The purpose of the FMP is to set out the requirements for imported fill materials with respect to contamination. Application of this FMP to all soil / rock materials will provide a consistent approach to the management of imported materials with respect to their suitability for use as part of the site rehabilitation works. The site is currently accepting fill material classified as virgin excavated natural material (VENM), excavated natural material (ENM) and any Site-Specific Resource Recovery Exemption / Order (SSRRE) as granted by the New South Wales Environmental Protection Authority (NSW EPA).

ADE considers that it is the responsibility of Land Owners Group – East (LOG-E) and/or their nominated representative to ensure compliance with this FMP. It is recommended that the filling material suppliers are issued with a copy of this FMP. The suppliers will be requested to provide supporting information and evidence to verify that the imported material complies with this FMP. Land Owners Group – East (LOG-E) has the right to make the final decision on the suitability of the material imported onto the Site. This FMP may be updated from time to time to reflect changes to industry standards or site requirements.

## 1.2 Background

ADE understands that the proposed development location comprises an approximate 2.8 kilometre (km) for AARU and 1.2 km on Mamre Road stretch of road from the intersection of Mamre Road and Abbots Road, extending up Aldington Road, Kemps Creek. The Site has a length of 4 km, located within the Penrith City Council Local Government Area (LGA). The proposed works are for the purpose of complying with the client’s development application (DA) and includes various cut and fill activities and road widenings along the project area.

ADE has not been provided with detailed earthworks plans by the client.

## 1.3 Site Identification

A previous detailed site investigation (DSI) had been undertaken by ADE (ADE, 2023) and the contents are summarised as follows:

- The site comprises public road reserves and private land across multiple residential properties located at Abbots and Mamre Road, Kemps Creek, NSW. The site comprises Abbots Road reserve from the western end to Abbots / Aldington intersection, Aldington Road reserve from the junction to the north, and 5-10 metres (m) extension to private land of both roadsides with the total route length 2.8 km.
- The site is situated within the Local Government Area (LGA) of Penrith City Council and is zoned as ‘IN1 – General Industrial’ under the Penrith City Planning Certificate under section 10.7(2) of the Environmental Planning and Assessment Act 1979.

- The site has a moderate to steep sloping surface towards southwest, ranging from 44-74 m Australian Height Datum (AHD). The lowest point (44 m) on-site is in the southwestern portion of the site, with the highest point is located at the northern end of the Site.
- Immediately north of the site is an environmental conservation area. Industrial development is underway approximately 300m to the north of the Site. The site is predominantly surrounded by agricultural land, vacant grassland/ paddocks, public road reserves and rural residential properties to the east, south and west.
- 4 dams are identified on-site. The closest surface water body to the site is Kemps Creek. The closest portion of Kemps Creek is located approximately 350m west of the Site.

Please refer to Figure 1 in Appendix A – Figures for site location.

## 2 LEGISLATION, GUIDELINES and DEFINITIONS

Importation of materials onto the Site must fully abide by the provisions of relevant legislative framework and guidelines that have been issued and/or endorsed by the NSW Environmental Protection Authority (EPA) under the following Acts/Regulations:

- Environmental Planning and Assessment (EPA) Act 1979;
- Protection of the Environment Operations (POEO) Act 1997;
- Contaminated Land Management (CLM) Act 1997; and
- Schedule 3 of the State Environmental Planning Policy (State and Regional Development) 2011.

The relevant guidelines issued under the provisions of the aforementioned Acts/Regulations include:

- Australian Standards AS3798: Guidelines on Earthworks for Commercial & Residential Developments (1998) [AS3798];
- Department of Land and Water conservation (DLWC) (2002). *Site Investigations for Urban Salinity*;
- National Environment Protection Council (NEPC) (2013). National Environmental Protection (Assessment of Site Contamination) Measure Amended 2013. (ASC NEPM, 2013).
- NSW EPA (2014). *Excavated Natural Material Order 2014*;
- NSW EPA (2014a). *Waste Classification Guidelines Part 1: Classifying Waste*;
- NSW EPA (2015). *Guidelines on the duty to report contamination under the contaminated land management Act 1997*;
- NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme (3rd edition)*;
- NSW EPA (2020). *Guidelines for consultants reporting on contaminated land*;
- NSW EPA (2022). *Contaminated Land Guidelines, Sampling design part 1 – application*.
- The Heads of EPAs Australia and New Zealand [HEPA] (2020). *PFAS National Environmental Management Plan (NEMP)*; and
- Protection of the Environment Operations (Waste) Regulation 2014 (NSW) – Relevant associated resource recovery orders and exemptions issued under part 9, Clause 91 and 92.

### 2.1 Definitions

#### 2.1.1 VENM Definition

The Protection of the Environment Operations Act (POEO Act) defines Virgin Excavated Natural Material (VENM) as:

Natural material (such as clay, gravel, sand, soil or rock fines):

- a) 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

- b) That does not contain any sulfidic ores or soils or any other waste and excludes excavated natural material that meets such criteria for virgin excavated natural material as may be approved for the time being pursuant to an EPA Gazettal notice.

### **2.1.1 ENM Definition**

Excavated Natural Material (ENM) is naturally occurring rock and soil (including material such as sandstone, shale, clay and soil) that has:

- a) Been excavated from the ground;
- b) Contains at least 98 per cent (by weight) natural material; and
- c) Does not meet the definition of VENM.

ENM does not include material that has been processed or contains acid sulfate soils or potential acid sulfate soils.

### **2.1.2 Site Specific Resource Recovery Exemptions (SSRRE)**

SSRRE contain the conditions that consumers must meet to use the resource recovery waste for application to land as fill. These conditions may include requirements regarding how to reuse or apply the waste, as well as record keeping, reporting and other requirements.

### **2.1.3 Site Specific Resource Recovery Orders (SSRRO)**

SSRRO contain the conditions that generators and processors of waste must meet to legally supply the resource recovery waste material for land application. These conditions may include material specifications, processing specifications, record keeping, reporting and other requirements.

## 3 IMPORTED MATERIAL ACCEPTANCE CRITERIA

Materials imported to the site must satisfy the minimum requirements detailed below. All materials to be imported must be accompanied by appropriate reports from qualified Environmental Consultants verifying the status of the material with respect to contamination.

All imported soil / rock material must be verified to be either VENM, ENM or other SSRRE as defined by the NSW EPA (2014) *Waste Classification Guidelines* (NSW EPA, 2014), current general resource recovery exemptions/orders (exemptions contain the conditions that consumers must meet to use the resource recovery waste for application to land as fill) or specific exemptions granted by the EPA, as defined above, or certified top soil for use in landscape designated areas.

As the NSW EPA has no specific VENM assessment criteria, VENM material should be reviewed on the basis of the source site history, “observation” and property of material and should meet the relevant background ranges for metals and BTEX adopted from Berkman 1989 and ANZECC 1992 (whichever is higher). Details of the source site address, history, environmental setting (geology, potential acid sulfate soil, salinity) and potential impact from surrounds, including consideration of per- and poly-fluoroalkyl substances (PFAS), should be addressed within the corresponding waste classification report.

As per HEPA 2020 NEMP 2.0 (2020), screening for PFAS contaminated materials should be screened if:

- sourced from locations that historically or currently use or store PFAS-containing products, noting that all PFAS formulations should be considered (refer to **Appendix A** – Activities Including PFAS: National Environmental Management Plan);
- identified as a point source (e.g., firefighting training facilities, foam installations, metal plating works, electricity generation and/or distribution facilities); and
- identified as a secondary source (e.g., landfill, wastewater treatment facility and/or biosolids use site).

### 3.1 Material Generator Requirements

The generator of the material must provide details on the source of the material prior to the material being imported onto Site. The details must include information such as suppliers’ details, source site details, environmental/geotechnical details, and general information on the soil.

### 3.2 VENM Acceptance Criteria

For VENM to be accepted, the concentrations of contaminants of potential concern (CoPCs) are to meet the relevant background ranges for metals adopted from The Field Geologists’ Manual (3<sup>rd</sup> ed.) (Berkman, 1989) and with respect to organic analytes, their analytical practical quantitation limits (see extract in **Appendix B– Table 4**). All VENM must be accompanied by an assessment report from a suitably qualified Environmental Consultant. The assessment should include appropriate levels of sample analyses conducted at the acceptable sampling density.

#### 3.2.1 VENM Sampling Density and Analysis

Samples for the assessment of VENM for both stockpiles and in-situ material must be collected at the density specified within **Appendix B– Table 1 & 2**. Samples for in-situ material must be collected from the surface, and

at depths where contamination is suspected. Additional samples should be collected if there is uncertainty in the data obtained and if further assessment is required.

Discrete samples must be collected and submitted to a National Association Testing Authorities (NATA) accredited laboratory for the analysis of the following contaminants of potential concern:

- Heavy Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc);
- Total Recoverable Hydrocarbons (TRHs);
- Benzene, Toluene, Ethyl-benzene, Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Polychlorinated Biphenyls (PCBs);
- Organochlorine Pesticides / Organophosphorus Pesticides (OCPs/OPPs);
- PFAS;
- Potential Hydrogen (pH); and
- Asbestos (presence/absence).

### 3.2.2 VENM Criteria

VENM criteria are provide in **Table 1** below.

**Table 1. Reference contaminants values for VENM apply to imported natural materials.**

Contaminants*	Berkman <sup>1</sup> (mg/kg)	ANZECC <sup>2</sup>
<b>TPH<sup>3, 4</sup></b> <b>C<sub>6</sub>-C<sub>10</sub></b> <b>C<sub>10</sub>-C<sub>36</sub></b> <b>C<sub>16</sub>-C<sub>34</sub></b> <b>C<sub>34</sub>-C<sub>40</sub></b>	For all organic analytes, the analytical practical quantitation limits are used as the reference levels for VENM Assessment.	
<b>BTEX<sup>3</sup></b> <b>Benzene</b> <b>Toluene</b> <b>Ethylbenzene</b> <b>Xylene</b> <b>m.p Xylene</b>	For all organic analytes, the analytical practical quantitation limits are used as the reference levels for VENM Assessment.	0.05-1 0.1-1 - - -
<b>Metals</b> <b>Arsenic</b> <b>Cadmium</b> <b>Chromium (III)</b> <b>Copper</b> <b>Lead</b> <b>Mercury</b> <b>Nickel</b> <b>Zinc</b>	1-50 1 5-1000 2-100 2-200 0.03 5-500 10-300	0.2-30 0.04-2 0.5-110 1-190 <2-200 0.001-0.1 2-400 1-180
<b>PAHs<sup>3, 5</sup></b> <b>Total PAHs</b> <b>Benzo(a)pyrene</b> <b>PCBs<sup>3</sup></b>	For all organic analytes, the analytical practical quantitation limits are used as the reference levels for VENM Assessment.	
<b>OCP / OPP<sup>3</sup></b> <b>Aldrin + Dieldrin</b> <b>Chlordane</b> <b>DDD, DDE, DDT</b> <b>Heptachlor</b>		

Contaminants*	Berkman <sup>1</sup> (mg/kg)	ANZECC <sup>2</sup>
Chlorpyrifos		
Asbestos	No presence of asbestos	
PASS	No sulfidic ores or indicators of potential acid sulfate soils	
pH <sup>6</sup>	4.5-10	6-8
PFAS <sup>7</sup>	The analytical practical quantitation limits are used as the reference levels for VENM Assessment.	

**Notes:**

<sup>1</sup> Berkman (1989) Field Geologists' Manual;

<sup>2</sup> Australian and New Zealand Environment and Conservation Council/National Health and Medical Research Council (ANZECC/NHMRC): Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (1992), Environmental Soil Quality Guidelines Background A [ANZECC A].

<sup>3</sup> For all organic analytes the practical quantitation limit (PQL) must be low enough to meet the applicable land use criteria (HIL/HSL D).

<sup>4</sup> Some sources of natural shale rock may contain low level concentrations of TPH; in this instance it is at the discretion of Land Owners Group – East (LOG-E) or their nominated representative to accept the material as VENM.

<sup>5</sup> Some soils may contain natural concentrations of PAHs; in this instance it is at the discretion of Land Owners Group – East (LOG-E) or their nominated representative to accept the material as VENM.

<sup>6</sup> pH criteria (absolute maximum concentration) adopted from *The ENM Order* (2014).

<sup>7</sup> PFAS screening only required from source locations deemed as high risk during the initial assessment.

\* Other CoPCs may need to be analysed if there is the potential for the contaminant to occur in or adjacent to the source site.

### 3.3 ENM Acceptance Criteria

The ENM acceptance criteria has been adopted directly from the ENM Order (2014) which has been provided in **Appendix B**. The sampling requirements including sampling density and analysis are provided in **Tables 1, 2 and 3** of the ENM Order in **Appendix B**. Additional samples should be collected if there is uncertainty in the data obtained, if the source location is deemed at risk of PFAS contamination and if further assessment is required.

### 3.4 Site Specific Resource Recovery Orders and Exemptions

Material defined under a SSRRE/O granted by the EPA are required to meet the conditions defined therein prior to being accepted into the Land Owners Group – East (LOG-E) project. The importation of exempt material is subject to approval by Land Owners Group – East (LOG-E) at its absolute discretion.

### 3.5 Topsoil Acceptance Criteria

Topsoil may be proposed in areas of landscaping to promote healthy vegetation growth. The topsoil may be imported from a specialised supplier or from an approved site in accordance with the VENM criteria outlined in **Table 1** above.

### 3.6 Unsuitable Materials

The materials are not, or do not contain any of the unsuitable materials listed below:

- Acid Sulfate Soils
- Asbestos
- Biocides
- Chemical Storage Containers
- Contaminated Material
- Demolition Rubble
- Excessively Wet Soils
- Explosives
- Fibro
- Food Waste
- Fungicides
- Herbicides
- Vegetative Waste
- Household Domestic Waste
- Large Rock Fragments
- Liquid Waste
- Metals
- Non-validated Material
- Oil Filters and Rags
- Paint
- Pesticides
- Plastics and PVC
- Radioactive Waste
- Sanitary Waste
- Timber (inc. Treated)
- Tyres

## 4 APPROVAL and ASSESSMENT

### 4.1 Approval of Source Site

Materials will be judged as suitable or otherwise by LOG-E and/or their representative based on the provided documentation, and the apparent reliability or otherwise of the documentation and its conformance with this FMP.

1. An initial validation/classification report is submitted to LOG-E's nominated environmental representative, assigned unique identifier number, and screened against the requirements of this document, "FMP" (ADE, 2024)
  - a. For VENM, if material is deemed compliant with the FMP (ADE, 2024) and the subject material is deemed low risk, no check sampling will be required unless otherwise requested by LOG-E. Proceed to step 2.
  - b. For ENM or if the subject material is deemed moderate to high risk, check sampling must be collected, unless otherwise requested by LOG-E, by LOG-E's nominated environmental representative and analysed, via a NATA accredited laboratory, in accordance with the sample densities and analytes specified within **Table A1** in **Appendix C**. Proceed to step 2.
2. A site inspection is to be conducted by LOG-E or their nominated representative to document and visually assess the source materials and site conditions.
  - a. Where the site inspection notes differing material descriptions or site conditions with potential for contamination, LOG-E may request a site inspection/check sampling be carried out by their nominated environmental representative.
3. Should the source site inspection and check sample results (if collected) be found to comply with the FMP, a Memorandum of Review (MOR) including details of the initial classification, source site inspection(s), check sampling results and any conditions of approval will be provided to LOG-E as an approval to accept the material for import.

In certain circumstances, LOG-E may elect not to proceed with check sampling for any site at its discretion.

Material deemed compliant with this FMP via the initial classification report then, source site will be provided with a unique identifier No. (i.e. approval number). In addition, an upfront site inspection of the source materials and check samples will be collected and analysed against either VENM, ENM or other SSRRE criteria, via a NATA accredited laboratory, in accordance with the sample densities and analytes specified within **Table A1** in **Appendix C**.

If material being imported does not match the description within the approved classification report, then importation of material from source site will be stopped and deemed rejected until source site can verify/classify/justify material as being suitable for this FMP.

Any materials deemed 'not to comply' or 'yet to comply' with this protocol should not be imported onto the Site. If doubt arises with respect to any materials already imported onto the site, the materials shall remain stockpiled, fenced and signposted in a clearly defined area pending final assessment. If materials at the Site are deemed unacceptable for use for the development works, a specific management plan for these materials should be developed by a suitably qualified Environmental Consultant.

## 4.2 Truck Movement Records

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A record of truck movements should be maintained for trucks carrying material imported to the site providing the following information:

- The date and time of truck arrival;
- The source location of the material;
- Source site approval number (unique identification number confirming approved source);
- The truck registration details;
- Material type;
- The approximate volume/tonnage of material per load;
- Visual assessment of material at gate; and
- Record of load acceptance / rejection.

Materials not deemed consistent with the supporting documentation will be rejected from entering the site. Similarly, materials will be rejected if the volume exceeds that stated in the supporting documentation. A supplementary assessment may be made by the source site's consultant to allow for the additional volume; however, this must be submitted for review to LOG-E prior to acceptance.

## 4.3 Non-Compliance

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Any material imported to site that is found to be non-compliant (discovered during check testing or during general site activities), or subject to be, will be isolated and assessed by LOG-E and/or their representative. If the non-compliant material is found to be incompatible with the Site, it will be removed at the cost of the source site and/or the importing contractor. The cost of remediation and validation will be borne by the source site and/or the importing contractor

## 5 LIMITATIONS

This report has been prepared for use by LOG-E who have commissioned the works in accordance with the project brief only and has been based on information provided by the client. The advice herein relates only to this project and contents should be reviewed by a competent and experienced person with experience in said reports, before being used for any other purpose. ADE accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced or amended in any way without prior approval by the client or ADE and should not be relied upon by any other party, who should make their own independent enquiries.

This report does not provide an assessment of the environmental status of the site, and it is limited to the scope defined herein. ADE's professional opinions are based upon its professional judgment, experience, and training.

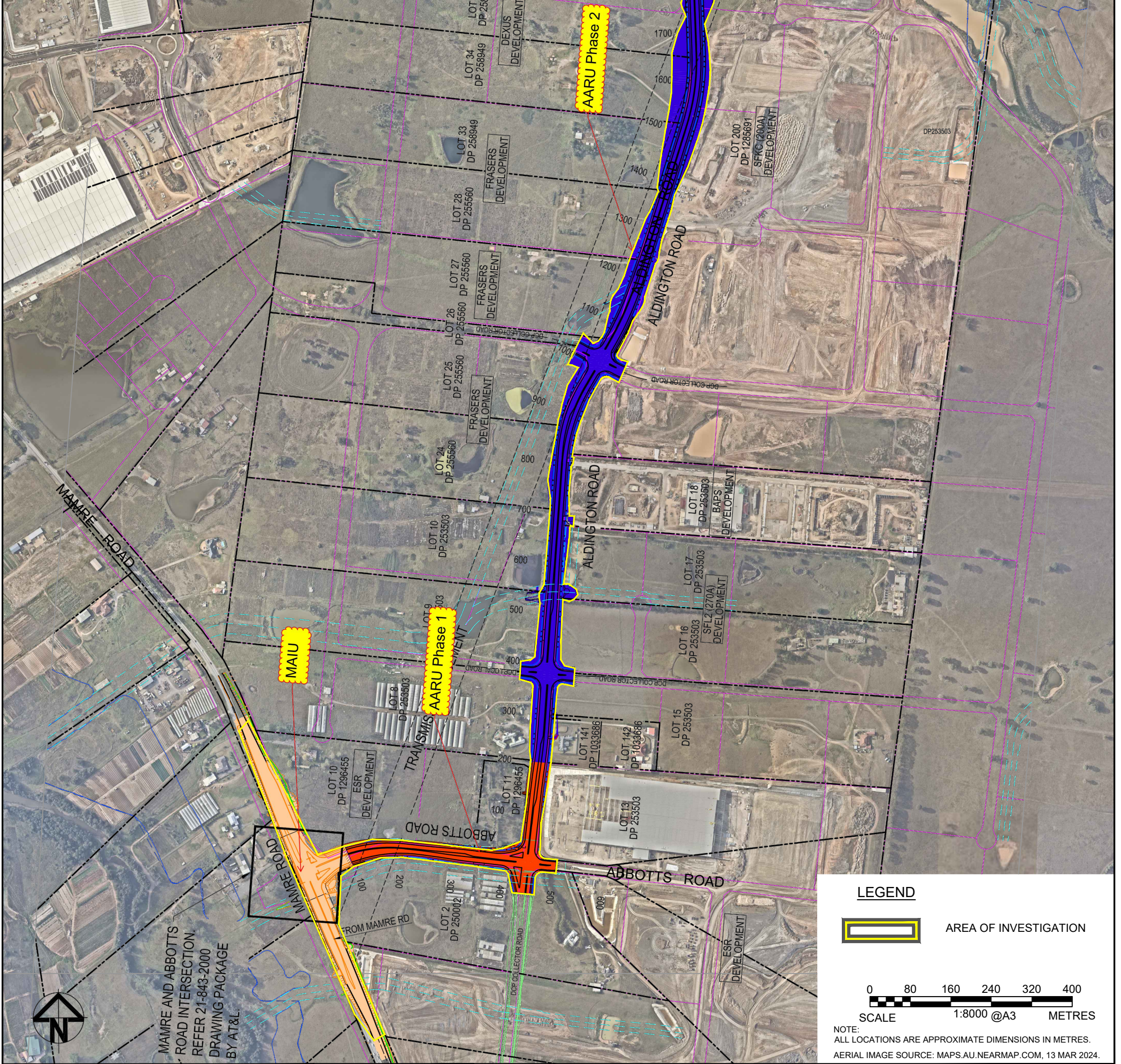
ADE has used a degree of care and skill ordinarily exercised in similar investigations by reputable members of the Environmental Industry within Australia. No other warranty, expressed or implied, is made or intended.

## 6 References

- Australian and New Zealand Environment and Conservation Council/National Health and Medical Research Council (ANZECC/NHMRC): Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (1992), Environmental Soil Quality Guidelines Background A [ANZECC A].
- Australian Standards AS3798: Guidelines on Earthworks for Commercial & Residential Developments (1998) [AS3798].
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- Department of Land and Water conservation (DLWC) (2002). *Site Investigations for Urban Salinity*.
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- NSW EPA (2014). *Excavated Natural Material Order 2014*.
- NSW EPA (2014a). *Waste Classification Guidelines Part 1: Classifying Waste*.
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- NSW EPA (2017). *Guidelines for the NSW Site Auditor Scheme (3<sup>rd</sup> edition)*.
- NSW EPA (2020). *Guidelines for consultants reporting on contaminated land*.
- NSW EPA (2022). *Contaminated Land Guidelines, Sampling design part 1 – application*.
- The Heads of EPAs Australia and New Zealand [HEPA] (2020). PFAS National Environmental Management Plan (NEMP).
- Protection of the Environment Operations (Waste) Regulation 2014 (NSW) – Relevant associated resource recovery orders and exemptions issued under part 9, Clause 91 and 92.

## Appendix A - Figure

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no.	description	drawn	approved	date	drawn	MC	client:
A	FIRST ISSUE	MC	LL	02/08/24	approved	NM	LAND OWNER'S GROUP - EAST
					date	02/08/2024	project:
					scale	AS SHOWN	MANRE ROAD, ALDINGTON AND ABBOTTS ROAD KEMPS CREEK, NSW
					original size	A3	title:
							FILL MANAGEMENT PLAN
							project no: A101024.0241.00
							figure no: FIGURE 1
							rev: A

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PLOT DATE: 2/08/2024 10:37:16 AM DWG FILE: C:\USERS\MIRANDA CHALUADE\CONSULTING\GROUP\PTY LTD\ENV-WORKING - DOCUMENTS\NSW\PROJECT\24.0241.00\AARU AND MAUUS WORKING\DOCS\4 CAD (MC)\A101024.0241.00\_FMP.DWG

MAMRE AND ABBOTTS ROAD INTERSECTION. REFER 21-843-2000 DRAWING PACKAGE BY AT&L

## **Appendix B – Activities Including PFAS: National Environmental Management Plan**

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## Appendix B. Activities associated with point sources of PFAS contamination

Tables B1 and B2 identify activities associated with PFAS contamination, with a focus on primary and secondary sources.

*Table B1. Activities associated with PFAS contamination due to a risk of fire*

<b>Activity</b>	<b>Description</b>
Airports and aviation infrastructure	On-site firefighting - see also further information below
Aluminium production	On-site firefighting
Battery production	On-site firefighting- see also further information below
Bitumen production	Kerosene use and storage
Brewing, distilling and refining	Ethanol production
Coal works	On-site firefighting
Dangerous goods production	On-site firefighting - likely to use specialised firefighting products and systems due to the presence of a range of hydrocarbons, polar solvents etc.
Explosives production	On-site firefighting - explosions
Food production	On-site firefighting associated with use of bulk oils and solvents - see also further information below
Fuel exploration, assessment, production, transport and storage including petrochemicals, other fossil fuels and renewable liquid fuels	On-site firefighting, also used as a surfactant for gas well stimulation
General chemical storage	On-site firefighting - likely to use a range of hydrocarbons, polar solvents etc.
Generation of electrical power	On-site firefighting - see also further information below
Hardware retailers	Firefighting foam deluge systems - see also further information below on the construction industry
Mining	On-site firefighting
Paints, polishes, adhesives production	On-site firefighting- see also further information below
Petroleum products other than fuels	On-site firefighting, potential use in processing
Underground infrastructure including car parks and tunnels	Firefighting foam deluge systems

Table B2. Activities associated with PFAS contamination more broadly

Activity	Description
Agriculture	Potentially used as an adjuvant or active ingredient in fertilisers and pesticides, firefighting foam used in the poultry industry to destroy infected flocks
Automotive industry including retailing, detailing and car wash facilities	Surface treatments including polishing, cleaning, stain and water protection products, lubricants, hydraulic fluids, tubing, oil pan, head gaskets, sealant, wire and cabling, fire retardant and metal plating applications
Aviation, aerospace and defence	As for automotive industry plus aviation-specific products, articles and activities, such as aviation hydraulic fluid
Battery use and disposal	Used in batteries, particularly for high-end use such as lithium-style batteries
Boating and marine supply industry	As for automotive industry plus marine-specific products, articles and activities, such as awnings, painting, waterproofing and sealant applications, and shipboard firefighting
Chrome/metal plating industry	High concentration PFAS mist suppressants used to reduce chromium exposure to workers
Commercial laundries and dry cleaners	Effluent from cleaning of fabrics containing or treated with PFAS
Construction industry	Tile coatings, stone coatings, paints, varnishes, sealants, other architectural coatings for films, facades and infrastructure, rigid foams, silicone rubber, thread sealant tapes and pastes and PPE
Electricity, telecommunication and information technologies	Wireless devices, hard drives, fibre optic cables, dirt-repellent coatings on glass surfaces such as smartphone screens, flame-resistant devices, fittings, coatings and wrappings, semiconductor etching, firefighting at electricity generation sites and in electricity distribution networks with oil-containing equipment such as transformers, reactors, large regulators, circuit breakers, pipe-type cable systems and bulk storage tanks, reported to be in high-end lithium batteries
Firefighting and fire protection sales and services	Storage and disposal of large quantities of firefighting foam associated with formulation, transport, sale and servicing of firefighting and fire protection products and services including refurbishment of deluge systems and fire extinguishers at fire protection retailers, rural supply stores, council depots and outstation service centres
Manufacturing of building products	As for construction industry
Manufacturing of chemicals, fertilisers and pesticides	Equipment and fittings including pipes, tanks and valves, use as an intermediate in the production of other substances, potentially used as an adjuvant in fertilisers and pesticides

Manufacturing of food, food packaging and food preparation products	Baking paper, aluminium foil, fast food wrappers, non-stick equipment including food processing facility surfaces, pipes, tanks and valves, and firefighting especially at facilities where bulk oil is used
Manufacturing of healthcare products	Surface protection for medical garments, small quantities in X-ray film, charged-coupled devices (CCDs), artificial blood, flexible tubing, needle coatings, denture cleaners, potentially in contact lenses
Manufacturing of household appliances	Heaters, heat lamps, irons, stoves, refrigerators, other flammable components, and high-end (lithium) batteries
Manufacturing of personal care products	Cosmetics, shampoo, shaving cream, dental floss, sunscreen, nail polish, talc, lotions
Manufacturing of textiles, leather, upholstery, carpets, clothing, shoes, outdoor gear	Widespread use of fluorinated compounds to provide stain, water and fire protection
Manufacturing of safety gear	Widespread use of fluorinated compounds to provide stain, water and fire protection for Personal Protective Equipment (PPE) and bulletproof clothing
Manufacturing of paints, polishes, coatings and adhesives	Historically used in sealants, adhesive products, coatings, paint and varnishes
Manufacturing of paper or pulp	Used in internal and surface sizing agents for paper manufacturing
Printing, packaging and merchandising	Used to apply grease, oil and water resistance to packaging product, also used in inks particularly for inkjet and photo printing
Recovery of waste oil	Collection and processing of PFAS-containing waste oil
Soap and detergents production	Household goods such as shampoos and cosmetics, commercial and industrial cleaning products such as floor polishes and vehicle cleaning agents
Solar energy	Used in photovoltaic solar cells to repel dirt and in lithium batteries
Sporting goods manufacturers and suppliers and sports facilities	Ski wax, high performance textiles including outdoor clothing, water-resistant treatments
Waste processing and disposal	PFAS-containing solid and liquid waste and leachate in landfill, high temperature incineration, chemical and other treatment regimes
Waste storage - hazardous, restricted solid, liquid, clinical, asbestos waste	On- and off-site storage and/or collection of waste PFAS-containing products
Wastewater treatment	Inputs from domestic sewage and commercial and industrial wastewater and outputs applied to land or discharged to the environment

## Appendix C – Excavated Natural Material Order 2014

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# **Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014**

## **The excavated natural material order 2014**

### **Introduction**

This order, issued by the Environment Protection Authority (EPA) under clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation), imposes the requirements that must be met by suppliers of excavated natural material to which 'the excavated natural material exemption 2014' applies. The requirements in this order apply in relation to the supply of excavated natural material for application to land as engineering fill or for use in earthworks.

### **1. Waste to which this order applies**

1.1. This order applies to excavated natural material. In this order, excavated natural material means naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

- a) been excavated from the ground, and
- b) contains at least 98% (by weight) natural material, and
- c) does not meet the definition of Virgin Excavated Natural Material in the Act.

Excavated natural material does not include material located in a hotspot; that has been processed; or that contains asbestos, Acid Sulfate Soils (ASS), Potential Acid Sulfate soils (PASS) or sulfidic ores.

### **2. Persons to whom this order applies**

2.1. The requirements in this order apply, as relevant, to any person who supplies excavated natural material, that has been generated, processed or recovered by the person.

2.2. This order does not apply to the supply of excavated natural material to a consumer for land application at a premises for which the consumer holds a licence under the POEO Act that authorises the carrying out of the scheduled activities on the premises under clause 39 'waste disposal (application to land)' or clause 40 'waste disposal (thermal treatment)' of Schedule 1 of the POEO Act.

### **3. Duration**

3.1. This order commences on 24 November 2014 and is valid until revoked by the EPA by notice published in the Government Gazette.

## 4. Generator requirements

The EPA imposes the following requirements on any generator who supplies excavated natural material.

### Sampling requirements

- 4.1. On or before supplying excavated natural material, the generator must:
  - 4.1.1. Prepare a written sampling plan which includes a description of sample preparation and storage procedures for the excavated natural material.
  - 4.1.2. Undertake sampling and testing of the excavated natural material as required under clauses 4.2, 4.3, and 4.4 below. The sampling must be carried out in accordance with the written sampling plan.
- 4.2. The generator must undertake sampling and analysis of the material for ASS and PASS, in accordance with the NSW Acid Sulfate Soil Manual, Acid Sulfate Soils Management Advisory Council, 1998 and the updated Laboratory Methods Guidelines version 2.1 – June 2004 where:
  - 4.2.1. the pH measured in the material is below 5, and/or
  - 4.2.2. the review of the applicable Acid Sulfate Soil Risk Maps (published by the former Department of Land and Water Conservation and available at <http://www.environment.nsw.gov.au/acidsulfatesoil/riskmaps.htm>) indicates the potential presence of ASS.
- 4.3. For stockpiled material, the generator must:
  - 4.3.1. undertake sampling in accordance with Australian Standard 1141.3.1-2012 Methods for sampling and testing aggregates – Sampling – Aggregates (or equivalent);
  - 4.3.2. undertake characterisation sampling by collecting the number of samples listed in Column 2 of Table 1 with respect to the quantity of the waste listed in Column 1 of Table 1 and testing each sample for the chemicals and other attributes listed in Column 1 of Table 4. For the purposes of characterisation sampling the generator must collect:
    - 4.3.2.1. composite samples for attributes 1 to 10 and 18 in Column 1 of Table 4.
    - 4.3.2.2. discrete samples for attributes 11 to 17 in Column 1 of Table 4.
    - 4.3.2.3. The generator must carry out sampling in a way that ensures that the samples taken are representative of the material from the entire stockpile. All parts of the stockpile must be equally accessible for sampling.
    - 4.3.2.4. for stockpiles greater than 4,000 tonnes the number of samples described in Table 1 must be repeated.
  - 4.3.3. store the excavated natural material appropriately until the characterisation test results are validated as compliant with the maximum average concentration or other value listed in Column 2 of Table 4 and the absolute maximum concentration or other value listed in Column 3 of Table 4.

**Table 1**

<b>Sampling of Stockpiled Material</b>		
<b>Column 1</b>	<b>Column 2</b>	<b>Column 3</b>
<b>Quantity (tonnes)</b>	<b>Number of samples</b>	<b>Validation</b>
<500	3	Required
500 – 1,000	4	
1,000 – 2,000	5	
2,000 – 3,000	7	
3,000 – 4,000	10	

4.4. For in situ material, the generator must:

- 4.4.1. undertake sampling by collecting discrete samples. Compositing of samples is not permitted for in-situ materials.
- 4.4.2. undertake characterisation sampling for the range of chemicals and other attributes listed in Column 1 of Table 4 according to the requirements listed in Columns 1, 2 and 3 of Table 2. When the ground surface is not comprised of soil (e.g. concrete slab), samples must be taken at the depth at which the soil commences.
- 4.4.3. undertake sampling at depth according to Column 1 of Table 3.
- 4.4.4. collect additional soil samples (and analyse them for the range of chemicals and other attributes listed in Column 1 of Table 4), at any depth exhibiting discolouration, staining, odour or other indicators of contamination inconsistent with soil samples collected at the depth intervals indicated in Table 3.
- 4.4.5. segregate and exclude hotspots identified in accordance with Table 2, from material excavated for reuse.
- 4.4.6. subdivide sites larger than 50,000 m<sup>2</sup> into smaller areas and sample each area as per Table 2.
- 4.4.7. store the excavated natural material appropriately until the characterisation test results are validated as compliant with the maximum average concentration or other value listed in Column 2 of Table 4 and the absolute maximum concentration or other value listed in Column 3 of Table 4.

**Table 2**

<i>In Situ Sampling at surface</i>				
Column 1	Column 2	Column 3	Column 4	Column 5
Size of <i>in situ</i> area (m <sup>2</sup> )	Number of systematic sampling points recommended	Distance between two sampling points (m)	Diameter of the hot spot that can be detected with 95% confidence (m)	Validation
500	5	10.0	11.8	Required
1000	6	12.9	15.2	
2000	7	16.9	19.9	
3000	9	18.2	21.5	
4000	11	19.1	22.5	
5000	13	19.6	23.1	
6000	15	20.0	23.6	
7000	17	20.3	23.9	
8000	19	20.5	24.2	
9000	20	21.2	25.0	
10,000	21	21.8	25.7	
15,000	25	25.0	28.9	
20,000	30	25.8	30.5	
25,000	35	26.7	31.5	
30,000	40	27.5	32.4	
35,000	45	27.9	32.9	
40,000	50	28.3	33.4	
45,000	52	29.3	34.6	
50,000	55	30.2	35.6	

Table 2 has been taken from NSW EPA 1995, *Contaminated Sites Sampling Design Guidelines*, NSW Environment Protection Authority.

**Table 3**

<i>In Situ Sampling at Depth</i>	
Column 1	Column 2
Sampling Requirements *	Validation
<p>1 soil sample at 1.0 m bgl from each surface sampling point followed by 1 soil sample for every metre thereafter.</p> <p>From 1.0 m bgl, sample at the next metre interval until the proposed depth of excavation of the material is reached. If the proposed depth of excavation is between 0.5 to 0.9 m after the last metre interval, sample at the base of the proposed depth of excavation.</p>	<p>Required if the depth of excavation is equal to or greater than 1.0 m bgl</p>

\* Refer to Notes for examples

## Chemical and other material requirements

- 4.5. The generator must not supply excavated natural material waste to any person if, in relation to any of the chemical and other attributes of the excavated natural material:
- 4.5.1. The chemical concentration or other attribute of any sample collected and tested as part of the characterisation of the excavated natural material exceeds the absolute maximum concentration or other value listed in Column 3 of Table 4:
- 4.5.2. The average concentration or other value of that attribute from the characterisation of the excavated natural material (based on the arithmetic mean) exceeds the maximum average concentration or other value listed in Column 2 of Table 4.
- 4.6. The absolute maximum concentration or other value of that attribute in any excavated natural material supplied under this order must not exceed the absolute maximum concentration or other value listed in Column 3 of Table 4.

**Table 4**

Column 1	Column 2	Column 3
Chemicals and other attributes	Maximum average concentration for characterisation (mg/kg 'dry weight' unless otherwise specified)	Absolute maximum concentration (mg/kg 'dry weight' unless otherwise specified)
1. Mercury	0.5	1
2. Cadmium	0.5	1
3. Lead	50	100
4. Arsenic	20	40
5. Chromium (total)	75	150
6. Copper	100	200
7. Nickel	30	60
8. Zinc	150	300
9. Electrical Conductivity	1.5 dS/m	3 dS/m
10. pH *	5 to 9	4.5 to 10
11. Total Polycyclic Aromatic Hydrocarbons (PAHs)	20	40
12. Benzo(a)pyrene	0.5	1
13. Benzene	NA	0.5
14. Toluene	NA	65
15. Ethyl-benzene	NA	25
16. Xylene	NA	15
17. Total Petroleum Hydrocarbons C <sub>10</sub> -C <sub>36</sub>	250	500
18. Rubber, plastic, bitumen, paper, cloth, paint and wood	0.05%	0.10%

\* The ranges given for pH are for the minimum and maximum acceptable pH values in the excavated natural material.

## Test methods

- 4.7. The generator must ensure that any testing of samples required by this order is undertaken by analytical laboratories accredited by the National Association of Testing Authorities (NATA), or equivalent.
- 4.8. The generator must ensure that the chemicals and other attributes (listed in Column 1 of Table 4) in the excavated natural material it supplies are tested in accordance with the test methods specified below or other equivalent analytical methods. Where an equivalent analytical method is used the detection limit must be equal to or less than that nominated for the given method below.
  - 4.8.1. Test methods for measuring the mercury concentration.
    - 4.8.1.1. Analysis using USEPA SW-846 Method 7471B Mercury in solid or semisolid waste (manual cold vapour technique), or an equivalent analytical method with a detection limit < 20% of the stated absolute maximum concentration in Column 3 of Table 2 (i.e. < 0.20 mg/kg dry weight).
    - 4.8.1.2. Report as mg/kg dry weight.
  - 4.8.2. Test methods for measuring chemicals 2 to 8.
    - 4.8.2.1. Sample preparation by digesting using USEPA SW-846 Method 3051A Microwave assisted acid digestion of sediments, sludges, soils, and oils (or an equivalent analytical method).
    - 4.8.2.2. Analysis using USEPA SW-846 Method 6010C Inductively coupled plasma - atomic emission spectrometry, or an equivalent analytical method with a detection limit < 10% of the stated absolute maximum concentration in Column 3 of Table 2, (e.g. 10 mg/kg dry weight for lead).
    - 4.8.2.3. Report as mg/kg dry weight.
  - 4.8.3. Test methods for measuring electrical conductivity and pH.
    - 4.8.3.1. Sample preparation by mixing 1 part excavated natural material with 5 parts distilled water.
    - 4.8.3.2. Analysis using Method 103 (pH) and 104 (Electrical Conductivity) in Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).
    - 4.8.3.3. Report electrical conductivity in deciSiemens per metre (dS/m).
  - 4.8.4. Test method for measuring Polynuclear Aromatic Hydrocarbons (PAHs) and benzo(a)pyrene.
    - 4.8.4.1. Analysis using USEPA SW-846 Method 8100 Polynuclear Aromatic Hydrocarbons (or an equivalent analytical method).
    - 4.8.4.2. Calculate the sum of all 16 PAHs for total PAHs.
    - 4.8.4.3. Report total PAHs as mg/kg dry weight.
    - 4.8.4.4. Report benzo(a)pyrene as mg/kg.

- 4.8.5. Test method for measuring benzene, toluene, ethylbenzene and xylenes (BTEX).
- 4.8.5.1. Method 501 (Volatile Alkanes and Monocyclic Aromatic Hydrocarbons) in Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).
- 4.8.5.2. Report BTEX as mg/kg.
- 4.8.6. Test method for measuring Total Petroleum Hydrocarbons (TPH).
- 4.8.6.1. Method 506 (Petroleum Hydrocarbons) in Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).
- 4.8.6.2. Report as mg/kg dry weight.
- 4.8.7. Test method for measuring rubber, plastic, bitumen, paper, cloth, paint and wood.
- 4.8.7.1. NSW Roads & Traffic Authority Test Method T276 Foreign Materials Content of Recycled Crushed Concrete (or an equivalent method).
- 4.8.7.2. Report as percent.

### **Notification**

- 4.9. On or before each transaction, the generator must provide the following to each person to whom the generator supplies the excavated natural material:
- a written statement of compliance certifying that all the requirements set out in this order have been met;
  - a copy of the excavated natural material exemption, or a link to the EPA website where the excavated natural material exemption can be found; and
  - a copy of the excavated natural material order, or a link to the EPA website where the excavated natural material order can be found.

### **Record keeping and reporting**

- 4.10. The generator must keep a written record of the following for a period of six years:
- the sampling plan required to be prepared under clause 4.1.1;
  - all characterisation sampling results in relation to the excavated natural material supplied;
  - the volume of detected hotspot material and the location;
  - the quantity of the excavated natural material supplied; and
  - the name and address of each person to whom the generator supplied the excavated natural material.
- 4.11. The generator must provide, on request, the characterisation and sampling results for that excavated natural material supplied to the consumer of the excavated natural material.

## 5. Definitions

In this order:

**application or apply to land** means applying to land by:

- spraying, spreading or depositing on the land; or
- ploughing, injecting or mixing into the land; or
- filling, raising, reclaiming or contouring the land.

**Bgl** means below ground level, referring to soil at depth beneath the ground surface.

**composite sample** means a sample that combines five discrete sub-samples of equal size into a single sample for the purpose of analysis.

**consumer** means a person who applies, or intends to apply excavated natural material to land.

**discrete sample** means a sample collected and analysed individually that will not be composited.

**generator** means a person who generates excavated natural material for supply to a consumer.

**hotspot** means a cylindrical volume which extends through the soil profile from the ground surface to the proposed depth of excavation, where the level of any contaminant listed in Column 1 of Table 2 is greater than the absolute maximum concentration in Column 3 of Table 2.

**in situ material** means material that exists on or below the ground level. It does not include stockpiled material.

**in situ sampling** means sampling undertaken on *in situ* material.

**N/A** means not applicable.

**stockpiled material** means material that has been excavated from the ground and temporarily stored on the ground prior to use.

**systematic sampling** means sampling at points that are selected at even intervals and are statistically unbiased.

**transaction** means:

- in the case of a one-off supply, the supply of a batch, truckload or stockpile of excavated natural material that is not repeated.
- in the case where the supplier has an arrangement with the recipient for more than one supply of excavated natural material, the first supply of excavated natural material as required under the arrangement.

**Manager Waste Strategy and Innovation**  
**Environment Protection Authority**  
**(by delegation)**

## Notes

The EPA may amend or revoke this order at any time. It is the responsibility of each of the generator and processor to ensure it complies with all relevant requirements of the most current order. The current version of this order will be available on '[www.epa.nsw.gov.au](http://www.epa.nsw.gov.au)'

In gazetting or otherwise issuing this order, the EPA is not in any way endorsing the supply or use of this substance or guaranteeing that the substance will confer benefit.

The conditions set out in this order are designed to minimise the risk of potential harm to the environment, human health or agriculture, although neither this order nor the accompanying exemption guarantee that the environment, human health or agriculture will not be harmed.

Any person or entity which supplies excavated natural material should assess whether the material is fit for the purpose the material is proposed to be used for, and whether this use may cause harm. The supplier may need to seek expert engineering or technical advice.

Regardless of any exemption or order provided by the EPA, the person who causes or permits the application of the substance to land must ensure that the action is lawful and consistent with any other legislative requirements including, if applicable, any development consent(s) for managing operations on the site(s).

The supply of excavated natural material remains subject to other relevant environmental regulations in the POEO Act and Waste Regulation. For example, a person who pollutes land (s. 142A) or water (s. 120), or causes air pollution through the emission of odours (s. 126), or does not meet the special requirements for asbestos waste (Part 7 of the Waste Regulation), regardless of this order, is guilty of an offence and subject to prosecution.

This order does not alter the requirements of any other relevant legislation that must be met in supplying this material, including for example, the need to prepare a Safety Data Sheet. Failure to comply with the conditions of this order constitutes an offence under clause 93 of the Waste Regulation.

## Examples

### *In situ* sampling at depth

Example 1.

If the proposed depth of ENM excavation is between 1 m bgl and 1.4 m bgl, then:

- 1 sample on surface (as per the requirements of Table 2).
- 1 sample at 1 m bgl.
- No further depth sampling after 1 m bgl, unless required under section 4.4.4.

Example 2.

If the proposed depth of ENM excavation is at 1.75 m bgl, then:

- 1 sample on surface (as per the requirements of Table 2).
- 1 sample at 1 m bgl.
- 1 sample at 1.75 m bgl.
- No further depth sampling after 1.75 m bgl, unless required under section 4.4.4.

Example 3.

If the proposed depth of ENM excavation is at 2.25 m bgl, then:

- 1 sample on surface (as per the requirements of Table 2).
- 1 sample at 1 m bgl.
- 1 sample at 2 m bgl.
- No further depth sampling after 2 m bgl, unless required under section 4.4.4.

## Appendix D – Proposed Check Sampling Densities

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**Table A1. Source Site Check Sampling and Analytical Requirements for ENM, VENM and SSRRM<sup>4</sup>**

Filling/Material	Minimum sample number / frequency <sup>4</sup>	Minimum analyte suite to include <sup>1,2</sup>	Additional Analysis Required <sup>2,3</sup>
VENM	0m <sup>3</sup> – 15,000m <sup>3</sup> = 3 samples	Heavy metals <sup>2</sup> PAHs TRH BTEX PCBs OCP / OPPs Asbestos (if present above VENM layer) Field oxidation and/or Chromium Reducible Sulphur (CRS) (if within area of Potential Acid Sulfate Soils) pH PFAS	Any contaminant considered to be potentially present in the material based on site information
	15,001m <sup>3</sup> – 50,000m <sup>3</sup> = 5 sample		
	For sites >50,000 m <sup>3</sup> and for sites which are irregular in shape (i.e., not a square site, a sampling program will be adopted on a case-by-case basis. With approval from the client prior to commencement of validation in such circumstances.		
ENM	30% of sampling density outlined within the NSW <i>ENM Order 2014</i> – refer to <b>Appendix B</b>	Heavy metals <sup>2</sup> Electrical conductivity pH PAHs TRH BTEX PCBs OCP / OPPs Asbestos Foreign materials (rubber, plastic, bitumen, paper, cloth, paint and wood) Field oxidation and/or CRS (if within area of Potential Acid Sulfate Soils) PFAS	Any contaminant considered to be potentially present in the material based on site information
SSRRM	Stockpiles: 30% of sampling density outlined within the VIC <i>EPA's Industrial Waste Resource Guidelines – Soil Sampling (IWRG702-2009)</i>  In-situ: 30% of sampling density outlined within the NSW EPA's (2022), <i>Contaminated Land Guidelines, Sampling design part 1 – application</i> .	Heavy metals <sup>2</sup> PAHs TRH BTEX PCBs OCP / OPPs Asbestos Field oxidation and/or Chromium Reducible Sulfur (CRS) (if within area of Potential Acid Sulfate Soils) PFAS	Any contaminant considered to be potentially present in the material based on site information

**Note:**

<sup>1</sup> not all samples necessarily require testing for all analytes.

<sup>2</sup> Heavy metals = arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc. BTEX = benzene, toluene, ethylbenzene, xylenes. OCPs = organochlorine pesticides (a scheduled chemical). OPPs = organophosphate pesticides. PAH = polycyclic aromatic hydrocarbons. PCBs = polychlorinated biphenyls. TRH = total recoverable hydrocarbons. CRS = Chromium Reducible Sulfur. PFAS = per- and poly-fluoroalkyl substances.

<sup>3</sup> Based on advice from a suitably qualified environmental consultant.

<sup>4</sup> For special alignments such as large infrastructure tunnels, Land Owners Group – East (LOG-E) and their nominated Environmental Consultant will consider the sampling density on a case-by-case basis.



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