

Appendix D Materials Tracking

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1.0 INTRODUCTION

The primary focus of the remediation validation program was the verification of the engineered solution and assessment of the hydraulic performance of the cap and contain system. However, the cap and contain system also required construction of a designed landform into which the capping system was integrated; as well as for construction purposes, such as the creation of safe working platforms for the heavy machinery used to construct the containment wall and capping system. This was achieved through placement of materials already available on site as well as imported materials. This appendix identifies the categories of the site-derived and imported bulk materials that required validation and provides relevant methodologies and assessment criteria.

As part of the Remediation Action Plan (RAP) (Golder 2016), construction materials imported from offsite were required to be validated as either Virgin Excavated Natural Materials (VENM) or Excavated Natural Materials (ENM) as defined under the POEO Act 1997 and the POEO (Waste) Regulation 2005. The Assessment Criteria nominated within the RAP are presented in Section 2.0.

Orica and their respective contractors for the construction of the cut-off wall and capping system identified and imported the required materials to meet the required engineering specifications. As part of the importation process Orica obtained available documentation for the individual source quarries to confirm that the soil/rock met the VENM requirements. Upon importation from the site, Orica and Golder inspected, logged, photographed and sampled the soil to confirm it was consistent with the documentation provided by the source supplier.

Provided below is a summary of the VENM imported, and limited re-use of site soils, to the site and the associated documentation, inspections, and results of chemical analysis.

2.0 IMPORTED MATERIALS VALIDATION – ASSESSMENT CRITERIA

The adopted remediation validation guidelines for imported materials are presented in Table 1.

Table 1: Validation Criteria for Imported Materials

Analyte	ENM Exemption (NSW EPA, 2014b) (mg/kg)
Arsenic	20 ^a /40 ^b
Cadmium	0.5 ^a /1.0 ^b
Lead	50 ^a /100 ^b
Nickel	30 ^a /60 ^b
Mercury	0.5 ^a /1.0 ^b
Chromium	75 ^a /150 (Total) ^b
Copper	100 ^a /200 ^b
Zinc	150 ^a /300 ^b
Electrical conductivity	1.5 dS/m ^a / 3 dS/m ^b
pH*	5 to 9 ^a /4.5 to 10 ^b
Total polycyclic aromatic hydrocarbons (PAHs)	20 ^a /40 ^b
Benzo[a]pyrene	0.5 ^a /1 ^b
Total petroleum hydrocarbons (TPH)	250 ^a /500 ^b
Benzene	0.5 ^b
Toluene	65 ^b
Ethyl Benzene	25 ^b
Xylenes	15 ^b
Rubber, plastic, bitumen, paper, cloth, paint and wood	0.05% ^a /0.10% ^b

Notes:

a = Maximum average concentration for characterisation

b = Absolute maximum concentration

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

3.0 IMPORTED VENM

3.1 Source

The following types of VENM were imported onto the site from the identified quarries for the construction of the cut-off wall and capping system:

- Boral Seaham Quarry
 - Fine crushed rock
 - Barmac crusher dust
 - Drainage aggregate
 - Gabion rockfill
- Fraser Park Quarry
 - Clay/bentonite
- Boral Stockton Quarry
 - Sand
- Riverbend Quarry
 - Topsoil

Further details of the use of the imported VENM is provided in Table D1 (**Attachment 1**).

3.2 Source Documentation

The documentation obtained by Orica and provided by the individual source quarries is provided in **Attachment 2**. Whilst the level of detail varies between the sources, the documentation provides confidence that the soil and/or rock being imported meets the NSW EPA (2014) Waste Classification Guidelines definition of VENM, as “*natural material (such as clay, gravel, sand, soil or rock fines)*”:

- *that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities.*
- *that does not contain sulfidic ores or soils, or any other waste”.*

The information provided in the documentation from the quarries was verified through inspection and sampling and analysis of representative samples, as described below.

3.3 Inspection and Sampling

The imported soil/rock was initially stockpiled upon importation. Golder inspected and logged the stockpiled material to confirm it was consistent with the description provided by the quarries and that visual or olfactory evidence of contamination nor foreign materials were present. In addition, a photographic log of the imported material was maintained (see Attachment 3).

The volumes and description of the materials imported to the site are provided within Table D1.

3.3.1 Sampling Methodology

Samples were collected directly into soil jars provided by the laboratories using nitrile gloved hands.

The sampling density identified in the RAP was 1 per 100 m³ for VENM in accordance with the excavated natural material (ENM) exemption (NSW EPA, 2012). However, in communication with the Site Auditor (email

dated 11 December 2018) for the Boral Seaham Quarry a revised sample density of 1 in 500 m³ was agreed. The process of obtaining documentation for the source areas, inspections and sampling at this density was applied for other VENM sources.

The final density (Table D1) of sampling for each source area was higher than 1 in 500 m³. It is considered that, based on the processes in place (documentation, inspection and sampling and analysis) the density of sampling was sufficient to characterise the various sources of VENM.

3.3.2 Chemical Analysis

VENM samples were analysed for the following suite of analytes consistent with the requirements of the RAP:

- Metals and metalloids: As, Cd, Cr, Cu, Hg, Pb, Ni & Zn;
- Organochlorine pesticides (OCPs);
- Polychlorinated Phenyls (PCBs);
- Polycyclic aromatic hydrocarbons (PAHs);
- Total Recoverable Hydrocarbons (TRH); and
- Benzene, toluene, ethyl benzene and xylenes (BTEX)

4.0 REUSE OF ON-SITE SOIL

The only re-used on site soil was from two stockpiles of grubbed surface soils which were re-used as part of Unit 1 (revegetation layer) of the Cap. The two stockpiles comprised materials that were grubbed from the surface of the remediation area before remediation works commenced and included:

Stockpile of Topsoil (T): Approximately 200 m³ was excavated from a depth of approximately 0.1 m from the footprint of the remediation area and stockpiled. Prior to excavation, in-situ sampling was performed by Orica on 9 November 2018, collecting eleven soils samples (T01 to T11) to assess metal concentrations in the surface soils.

Stockpile 2 (S2): Approximately 80 m³ of stockpiled grubbed soil from the working pad area. Three soil samples (S2E, S2C, S2W) were collected by Orica on 27 June 2019.

The characterisation of the soil for re-use is documented in Technical Memorandum “Assessment of Soil Stockpiles for On-site Reuse at Arsenic remediation Areas, Orica Kooragang Island” dated 2 August 2019 (Attachment 4). The technical memorandum also describes re-use of excess imported VENM within Unit 1 of the Cap.

It is noted that the Technical Memorandum (Attachment 4) discusses Stockpile 1 which contained excess VENM imported for Unit 3, which was subsequently used within Unit 1. The validation of the VENM material during importation was completed as part of the process outline within this Appendix. The confirmation that this stockpiled VENM was suitable for re-use as part of Unit 1 is documented within the Technical Memorandum.

5.0 CHARACTERISATION OF VENM

5.1 Results of Chemical Analysis

- Boral Seaham Quarry: Samples reported concentrations below the required assessment criteria (Section 2.0) with the exception of zinc (314 mg/kg) in sample SQB_006_131218. The zinc concentration in SQB_006_131218 marginally exceeded the absolute maximum concentration of 300 mg/kg. The source of the zinc is unclear and may have been inadvertently introduced in the laboratory or as part of sampling (e.g. cross contamination) as the other ten samples from this source reported zinc concentrations which were consistently between 19 mg/kg and 27 mg/kg. On the basis that other contaminants from this sample were comparable with the other 11 samples, it is considered that this zinc result is not representative of the source material imported and used at the site.
- Fraser Park Quarry: Samples reported concentrations below the required criteria (Section 2.0).
- Boral Stockton Quarry: Samples reported concentrations below the required criteria (Section 2.0).
- Riverbend Quarry: Samples reported concentrations below the required criteria (Section 2.0).

Analytical results tables are included in **Attachment 5**. Certified laboratory reports are included in **Attachment 6**.

5.2 Data Validation

To ensure that data of known quality are reported and to identify whether data are suitable to fulfil the overall project objectives, analytical data validation is conducted by Golder. The data validation process involves the checking of analytical procedure compliance and the assessment of accuracy, precision and completeness of analytical data. This data validation process was carried out on a "Per Source" basis, the summarised results of which are as follows:

- Boral Seaham Quarry: All data has been validated and is considered as appropriate for characterisation of imported VENM materials for a homogeneous source.
- Fraser Park Quarry: All data has been validated and is considered as appropriate for characterisation of imported VENM materials for a homogeneous source.
- Boral Stockton Quarry: All data has been validated and is considered as appropriate for characterisation of imported VENM materials for a homogeneous source.
- Riverbend Quarry: All data has been validated and is considered as appropriate for characterisation of imported VENM materials for a homogeneous source.

It is noted that field duplicate or field triplicate samples were not required as the samples were collected from highly homogeneous materials and are effectively replicate samples. Furthermore, it is noted that no rinsate blank samples were required as samples were collected using clean disposable gloves, and were placed directly into the sample containers by hand.

Data validation tables are included in **Attachment 7**.

6.0 CONCLUSIONS

Documentation was presented by Orica providing confirmation by the individual source quarries that the imported material is classified as VENM under the NSW EPA waste classification guidelines. Inspections of this material were carried out by Golder to confirm it was consistent with the descriptions provided in the documentation provided by the various quarries and that no evidence of contamination or of foreign deleterious materials were present. The results of the chemical analysis further supported the VENM classification and met the criteria for imported material within the RAP. It is considered that the imported VENM was suitable for use as part of the remediation system constructed.

Attachments

Attachment 1 – Table D1 – Imported VENM Tracking Sheet

Attachment 2 - Source documentation

Attachment 3 – Photograph Log

Attachment 4 - Technical Memorandum “Assessment of Soil Stockpiles for On-site Reuse at Arsenic remediation Areas, Orica Kooragang Island” dated 2 August 2019, Golder Associates Pty Ltd

Attachment 5 – Analytical Results Tables

Attachment 6 – Certified Laboratory Reports

Attachment 7 – Data Validation Tables

ATTACHMENT 1

**Table D1 VENM Importation
Summary**

ATTACHMENT 2

Source Documentation

ATTACHMENT 3

Photographic Log

ATTACHMENT 4

Technical Memorandum
“Assessment of Soil Stockpiles for
On-site Reuse at Arsenic
remediation Areas, Orica
Kooragang Island” dated 2
August 2019, Golder Associates
Pty Ltd

ATTACHMENT 5

Analytical Results Tables

ATTACHMENT 6

Certified Laboratory Reports

ATTACHMENT 7

Data Validation Tables