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Hydro Aluminium Kurri Kurri Pty Ltd

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HYDRO REMEDIATION PROJECT

MODIFICATION 2 TO SSD 6666 – PROJECT BOUNDARY AND ABORIGINAL HERITAGE AMENDMENTS

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HYDRO REMEDIATION PROJECT
MODIFICATION 2 TO SSD 6666 – PROJECT BOUNDARY AND ABORIGINAL HERITAGE AMENDMENTS

Project name	**Modification 2 to SSD 6666 – Project Boundary and Aboriginal Heritage Amendments**
Project no.	**3180001207**
Recipient	**Hydro Aluminium Kurri Kurri Pty Ltd**
Document type	**Statement of Environmental Effects**
Version	**V0**
Date	**07/09/2021**
Prepared by	**Claire Whitehill and Clare Butterfield**
Checked by	**Shaun Taylor**
Approved by	**Fiona Robinson**
Description	**Modification to SSD 6666 to revise the project boundary and vegetation clearance area and remove Condition B38 as the area of high archaeological significance of the northern area east of the Clay Borrow Pit was incorrectly classified.**

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

EXECUTIVE SUMMARY

Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) owns and operates the former Hydro Kurri Kurri Aluminium Smelter (the Smelter) located at Hart Road Loxford, New South Wales (NSW) within the Cessnock City Council local government area.

Development consent for State Significant Development (SSD) 6666 was issued under Part 4 of the *Environmental Planning and Assessment Act 1979* on 23 December 2020 for remediation of the Smelter (the Project). The areas required to complete the remediation of the Smelter have been revised by Hydro due to environmental and commercial reasons. In addition, an area within the project boundary has been incorrectly classified as having high archaeological sensitivity with historical evidence of smelter operations occurring.

A minor modification to the development consent for SSD 6666 is therefore required to reflect the revised project boundary and associated reduction in the project footprint, as well as removing the classification of high archaeological sensitivity from part of the Project site.

The Modification is generally comprised of the following activities:
- Revision of the project boundary which reduces the project footprint
- Reduction of the vegetation clearance area, and the associated re-calculated biodiversity credit requirements as described in Condition B41 of the development consent for SSD 6666
- Removal of the designation of the northern area east of the Clay Borrow Pit as a potential archaeological deposit/area of high archaeological sensitivity and therefore removal of Condition B38 of the development consent for SSD 6666
- Excavation of the fill material (including contaminated material) located within the previously determined potential archaeological deposit/area of high archaeological sensitivity

This Statement of Environmental Effects (SEE) has been prepared by Ramboll Australia Pty Ltd on behalf of Hydro to support the modification (Modification 2) to the development consent for SSD 6666 under section 4.55(1A) of the *Environmental Planning and Assessment Act 1979*. This SEE considers the potential environmental impacts of the Modification and the appropriate management and mitigation measures required.

To determine the potential environmental impacts of the Modification, an assessment was undertaken in relation to soils and water, hazards and risks, air quality and odour, noise and vibration, transport and access, visual, waste, biodiversity and heritage. The impact assessments undertaken for these environmental issues have confirmed that the potential impacts of the Modification would be minimal, and generally be consistent with, or an improvement to, to those of the currently approved Project.

GLOSSARY OF TERMS

Clay Borrow Pit	Historically used to source clay used for capping
Council	Cessnock City Council
Crushing Plant	The concrete and brick crushing plant
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
Hydro Land	Approximately 2,000 hectares of buffer zone land surrounding the Site owned by Hydro
Irrigation Area	Area of land used to discharge clean water from the Smelter's water management system located on part Lot 1, Deposited Plan 543057
Leachate	Contaminated liquid generated from water percolating through contaminated matter/materials
North East Dam	The eastern of the two dams located immediately north of the Site used as part of the water collection and treatment system for the Smelter. Water from the North East Dam discharges to the irrigation area in accordance with the EPL.
Stage 1 Demolition	Activities approved under Cessnock City Council approval DA 8/2015/399/1 as described in **Table 1-1**
Stage 2 Demolition	Activities approved under Cessnock City Council approval DA 8/2018/46 as described in **Table 1-1**
Temporary Water Treatment Plant	The onsite plant facility used to treat leachate
The EIS	*Environmental Impact Statement Former Hydro Aluminium Kurri Kurri Smelter Demolition and Remediation* (Ramboll, 2016)
The EPL	Environmental Protection Licence No. 1548
The Modification	The proposed modification to SSD 6666 to revise the project boundary and vegetation clearance area and remove Condition B38 as the area of high archaeological significance of the northern area east of the Clay Borrow Pit was incorrectly classified as described in this Statement of Environmental Effects
The Project	The remediation and demolition activities approved under development consent SSD 6666
The RtS	*Response to Submissions Report Former Hydro Aluminium Kurri Kurri Smelter Remediation* (Ramboll 2019)
The Site	The area containing the Smelter. It is located on Parts of Lot 3 of Deposited Plan (DP) 456769, Lot 16 DP1082775 Pt 1, Lot 318 DP755231, Lot 319 DP755231, Lot 411 DP755231, Lot412 DP755231, Lot 413 DP755231, Lot 414 DP755231, Lot 420 DP755231, Lot 769 DP755231, Lot 1 DP456769 and Lot 2 DP456769, Hart Road Loxford
The Smelter	The former Hydro Aluminium Kurri Kurri Pty Ltd aluminium smelter at Hart Road, Loxford

ACRONYMS AND ABRIEVIATIONS

AEP	Annual Exceedance Probability
AGL	Above ground level
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
AS	Australian Standard
AWS	Automatic Weather Station
BC Act	*Biodiversity Conservation Act 2016*
BOM	Bureau of Meteorology
CCO	Chemical Control Order
CEMP	Construction Environmental Management Plan
Cessnock DCP	*Cessnock Development Control Plan 2010*
Cessnock LEP	*Cessnock Local Environmental Plan 2011*
CLM Act	*Contaminated Land Management Act 1997*
CWS	Capped Waste Stockpile
DA	Development Application
DCP	Development Control Plan
EHC Act	*Environmentally Hazardous Chemicals Act 1985*
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
ha	Hectare
Heritage Act	*Heritage Act 1977*
ICNG	*Interim Construction Noise Guideline* (Department of Environment and Climate Change 2009)
kL	Kilo litre
km	Kilometre
L	Litre
LGA	Local Government Area
m	Meter
ML	Mega litre
mm	Millimetre

MNES	Matters of National Environmental Significance
NP&W Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
PAH	Polycyclic aromatic hydrocarbon
POEO Act	*Protection of the Environment Operations Act 1997*
POEO Regulation	*Protection of the Environment Operations (Waste) Regulation 2014*
Roads Act	*Roads Act 1993*
RtS	Response to Submissions
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy
SEPP 33	*State Environmental Planning Policy No 33 - Hazardous and Offensive Development*
SEPP 55	*State Environmental Planning Policy No 55 – Remediation of Land*
SEPP Infrastructure	*State Environmental Planning Policy (Infrastructure) 2007*
SEPP Koala Habitat	*State Environmental Planning Policy (Koala Habitat Protection) 2019*
SEPP S&RD	*State Environmental Planning Policy (State and Regional Development) 2011*
SSD	State Significant Development
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
WM Act	*Water Management Act 2000*

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1. BACKGROUND

1.1 Introduction

Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) owns and manages the former Hydro Kurri Kurri Aluminium Smelter (the Smelter) located at Hart Road Loxford, New South Wales (NSW) within the Cessnock City Council (Council) local government area (LGA) (the Site).

The Site locality is shown on **Figure 1-1**. The Site is approximately 80 hectares (ha) and is surrounded by approximately 2,000 ha of buffer zone land that is also owned and managed by Hydro, referred to as the Hydro Land.

Hydro received development consent for State Significant Development (SSD) 6666 issued under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 23 December 2020 for remediation of the Smelter. SSD 6666 is supported by *Environmental Impact Statement Former Hydro Aluminium Kurri Kurri Smelter Demolition and Remediation* (Ramboll 2016) (the EIS) and *Response to Submissions Report Former Hydro Aluminium Kurri Kurri Smelter Remediation* (Ramboll, 2020) (the RtS). The activities approved under the development consent for SSD 6666 are referred to as the Project.

Hydro has reviewed the area required to undertake the remediation activities and seeks a modification to the development consent for SSD 6666 to amend the Project boundary and reduce the Project footprint. The reduced Project footprint results in a reduction in the area of native vegetation which has had to be cleared for the Project and therefore requires a recalculation of the biodiversity credit requirements described in Condition B41 of SSD 6666.

In addition, an area designated as a potential archaeological deposit/area of high archaeological sensitivity within Condition B38 of SSD 6666 has been proven to be an area of historical fill placement, including some contaminated materials. This modification provides evidence of the historical site activities and justification of removal of Condition B38 from SSD 6666. The modification also seeks approval of the proposed management of the fill material in the form of filling voids within the Smelter (for suitable material) or alternatively, if required due to contamination levels, placed in the Containment Cell.

The above changes form Modification 2 (MOD 2) to the development for SSD 6666.

1.2 Document Purpose

This Statement of Environmental Effects (SEE) has been prepared by Ramboll Australia Pty Ltd (Ramboll) on behalf of Hydro to support a second modification to the development consent for SSD 6666 under section 4.55(1A) of the EP&A Act.

This SEE has been prepared in accordance with the Department of Planning, Industry and Environment *Modifying an Approved Project Draft Environmental Impact Assessment Guidance Series* (June 2017) and considers the following matters:

- The environmental impacts of the Modification

The appropriate management and mitigation measures required to minimise the potential environmental impacts.

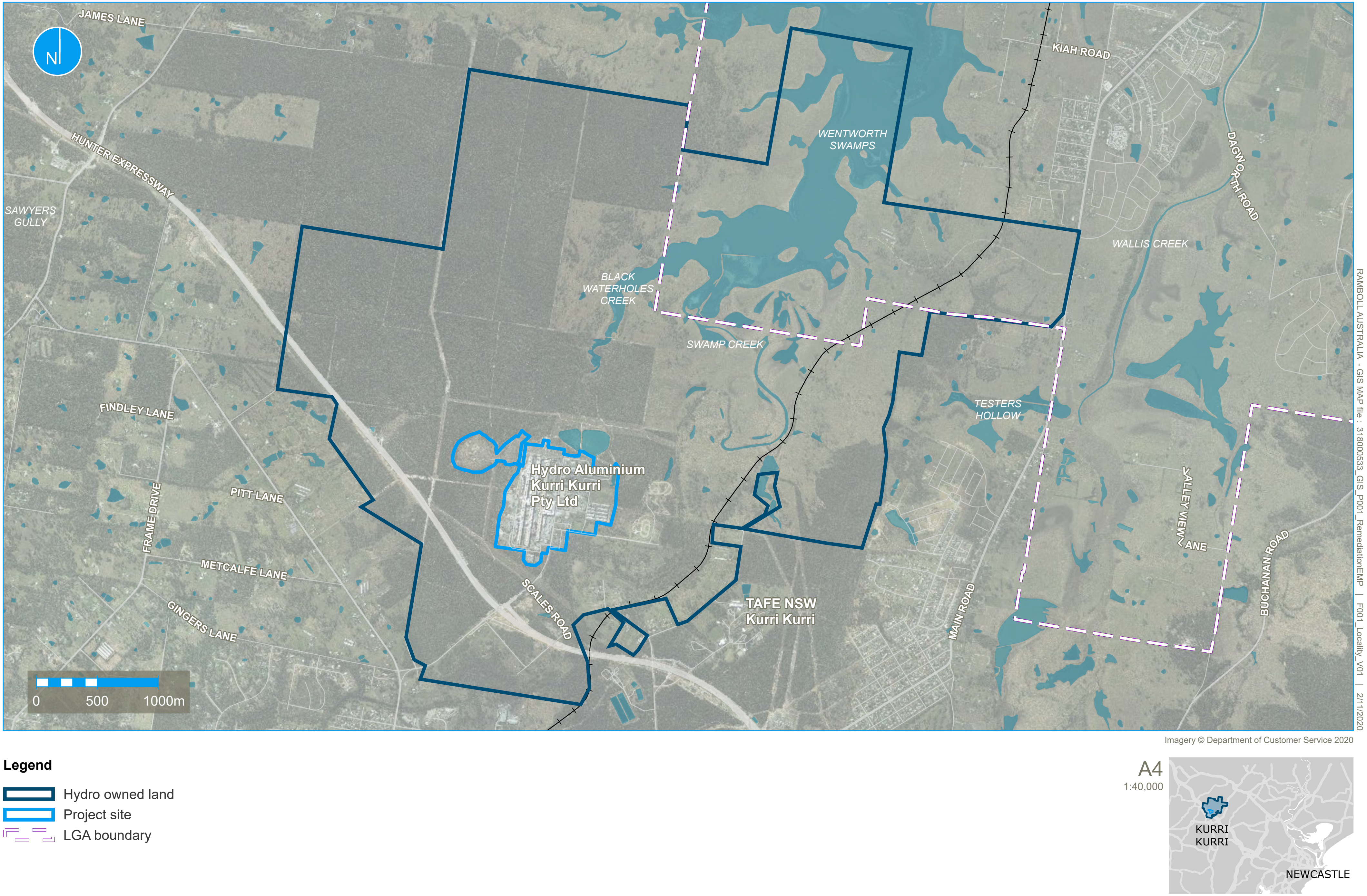


Figure 1-1 | Smelter and Hydro Land Locality Plan

1.3 The Proponent

The Proponent is Hydro Aluminium Kurri Kurri Pty Ltd (Hydro). The contact details for Hydro are:

PO BOX 1
Kurri Kurri NSW 2327
Phone: (02) 4937 1555
Website: https://regrowthkurrikurri.com.au/ (Hydro Remediation Project website)

1.4 Document Structure

This SEE has the following structure:

- **Section 1. Background**: introduces the SEE, provides an overview of the Modification and details of the Proponent, describes the Site location and setting and provides the historical context of the Site and the relevant existing approvals and licences.
- **Section 2. Modification Description**: provides a detailed description of the Modification, a comparison to the approved operation, information on the alternatives considered during the development of the Modification and a justification of the need for the Modification.
- **Section 3. Planning and Statutory Setting**: includes information on the requirements under relevant legislation and environmental planning instruments.
- **Section 4. Stakeholder Consultation**: a summary of the consultation that occurred during preparation of the SEE.
- **Section 5. Assessment of Environmental Effects**: provides details of the potential environmental impacts and proposed mitigation or management measures to address any potential impacts.
- **Section 6. Additional Management and Mitigation Summary**: a summary of the proposed additional management and mitigation measures and how each would be implemented.
- **Sections 7. Conclusion**: provides a justification of the Modification and conclusion to the SEE.
- **Appendices**: supporting documentation to supplement the SEE:
  - Biodiversity Assessment
  - Addendum Aboriginal Cultural Heritage Assessment Report
  - Data Gap Assessment

1.5 History of Activities Overview

Table 1-1 provides a summary of the key milestones relating to the Smelter to date, including previously granted post-operation development consents.

Table 1-1: Overview of key project milestones

Date	Milestone
1969	• Commencement of operations at the Smelter.
September 2012	• Smelting activities cease.
May 2014	• Hydro formally announce the closure of the Smelter.
August 2015	• Development Application (DA) 8/2015/399/1 submitted to Council for 'Stage 1 Demolition' of the Smelter. Stage 1 Demolition includes generally the following activities: • Demolition of designated buildings at the Smelter excluding: the storage buildings; transformer yard and major power supply infrastructure; three concrete stacks and one concrete water tower; and designated workshops, offices, electrical substations and water supply buildings • Construction of a contractor's compound to be used by the demolition contractor • Ancillary facilities such as car parks, offices and amenity buildings

Date	Milestone
	• A demolition materials stockpile area for approximately 35,000 tonnes (t) of scrap metal, 36,000 t of concrete and brick and small amounts of green and non-recyclable demolition waste • Sorting of recyclable metallic demolition materials and transportation to a metal recycling facility.
March 2016	• Council granted development consent for Stage 1 Demolition.
July 2016	• SSD 6666 EIS submitted for the remediation of contaminated soils, waste management including a Containment Cell, on site leachate treatment and 'Stage 2 Demolition'.
July 2017	• Stage 1 Demolition commenced.
January 2018	• Due to delays to the approval of SSD 6666, a separate application (DA 8/2018/46) for Stage 2 Demolition was submitted to Council. Stage 2 Demolition were subsequently withdrawn from SSD 6666.
May 2018	• DA 8/2018/46 for Stage 2 Demolition approved by Council. Stage 2 Demolition generally includes the following activities: • Completion of hazardous materials removal • Establishment and implementation of environmental controls (dust mitigation and water quality management) • Demolition of three concrete stacks and a water tower using detonation • Mechanical demolition of remaining buildings and structures • Material collection, separation, processing and storage • Transportation of recyclable metals offsite • Grading of former building footprints • Operation of a concrete and refractory crushing plant • Manage a large stockpile area in the west of the Smelter • Ferrous (steel) and non-ferrous (predominantly aluminium and copper) metals would be sorted and sized before being transported offsite for recycling.
July 2018	• Stage 2 Demolition commenced.
August 2020	• Final RtS report submitted for SSD 6666.
December 2020	• Development consent for SSD 6666 issued. SSD 6666 generally approves the following activities: • Continued use of the Stage 1 Demolition compounds, stockpile and storage areas • Establishment of environmental controls such as erosion and sediment and water quality controls • Construction of the Containment Cell including base and capping layers • Construction of a haul road to the Containment Cell • Transport and placement of remediation and non-recyclable demolition materials to the Containment Cell • Leachate and stormwater management/monitoring • Excavation of contaminated soils within the Site • Removal of the CWS • Transport of waste material removed from the CWS and excavated contaminated soils (including stockpiled soils sourced from other Hydro owned land) to the Containment Cell • Filling and grading following removal of contaminated materials • Leachate management system, pumping well network and dam decommissioning.

Date	Milestone
May 2021	• Modification 1 (MOD 1) to SSD 6666 submitted. The Modification sought the construction and operation of an onsite Temporary Water Treatment Plant and associated infrastructure. As of 20 August 2021 MOD 1 is still under consideration by the Department.
July 2021	• Stage 1A Works, which forms part of the SP2 Part 1 works defined in the Planning Agreement between Hydro and the Minister for Planning and Public Places, have been completed. Stage 1A Works are the: • Set up of contractor's temporary project facilities • Installation of temporary fencing at work areas • Installation of soil and water management infrastructure at the site of the Containment Cell • Stockpiling of excavated material at temporary stockpiles for later use; and • Clearing and excavation of clay borrow pit area for the Containment Cell.

1.6 Current Infrastructure

The current remaining infrastructure at the Smelter is shown on **Figure 1-2** and includes:

- Contractor compounds, stockpile areas and storage areas
- Capped Waste Stockpile (CWS): contains mixed smelter waste from the early 1970's to the early 1990's. It is known to contain spent pot lining, cryolite, alumina, floor sweepings (alumina, cryolite, carbon), shot blast dust (carbon, steel shot), cement, pot lining mix, asbestos containing materials, coal tar pitch and small amounts of other materials such as plastics, wood and steel
- Containment Cell: this area was previously known as the Clay Borrow Pit, as it was historically used to source clay used for capping the CWS. Construction of the Containment Cell and associated infrastructure has commenced in this area
- Site water management system including:
  - Subsurface and open surface water drainage throughout the Smelter
  - The Western Surge Pond, the Eastern Surge Pond and the Southern Surge Pond. These are the initial collection and treatment settling points for the Site stormwater
  - The North Dam: comprises two dams located immediately north of the Site used as part of the water collection and treatment system for the Site. The North West Dam collects water from the Western Surge Pond and some of the Site before it discharges to the North East Dam. Water from the North East Dam is then discharged to the irrigation area in accordance with the Hydro Environment Protection Licence (EPL)
  - Irrigation area located on part Lot 1 DP 543057
  - Water cart filling station
- Spent pot lining storage sheds: Sheds used for the storage of spent pot lining immediately south of the CWS continue to store spent pot lining and other smelter wastes. Some of these sheds are now being used for the storage of gypsum, which will be added to material from the CWS prior to its placement in the Containment Cell
- Remnant buildings: Several smelter buildings remain at the site. These include the Administration buildings, workshop buildings, buildings used for temporary waste storage and some former switchyard buildings.

1.7 The Project

As noted in Section 1.1 Hydro received development consent for SSD 6666 issued under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 23 December 2020 for remediation of the Smelter for the Project.

The key elements of the Project (as described in Schedule 1 of the development consent for the Project) are:

- Excavation of onsite contaminated areas
- Excavation and treatment of CWS material
- Construction of a purpose-built containment cell
- Placement of contaminated materials in the containment cell
- Treatment of contaminated groundwater plume originating from the CWS
- Ongoing management of the containment cell in perpetuity.

As of early August 2021, the following Project activities have been undertaken or are underway:

- Installation of environmental controls
- Vegetation clearance within the Containment Cell footprint
- Installation of the fauna proof fencing around the Containment Cell footprint
- Construction of the Containment Cell and associated infrastructure has commenced
- Stockpiling of excavated material
- Delivery and storage of gypsum.

Disturbance of the CWS has not yet commenced.

Hydro has successfully completed the majority of demolition activities on the site in accordance with two development consents received from Cessnock City Council. Currently the Project boundary includes areas subject to demolition activities which have been completed and are not to be impacted by the remediation activities under the development consent for SSD 6666.

In 2020 Hydro reached an agreement with an entity to purchase of the Site, with land being handed over in stages. A condition of that agreement was that the purchaser would be responsible for the demolition and remediation (if required) of the switchyard. The switchyard was decommissioned, which has allowed investigations to be undertaken to determine the presence, type and extent of contamination. Any contaminated material would be transported to an off site waste management facility and would not be placed in the Containment Cell.

The switchyard is within the proposed project footprint for the Hunter Power Project, proposed by Snowy Hydro. The purchaser of the land has an agreement in place with Snowy Hydro for the land to be remediated (confirmed via to a Site Audit Statement) suitable for development of the Hunter Power Project.

The Aboriginal Cultural Heritage Assessment Report (ACHAR) which forms part of the EIS identified an area of high archaeological significance in the northern extent of the project boundary east of the Clay Borrow Pit. This area is subject to Condition B38 of SSD 6666 which requires: '*To prevent impacts to subsurface archaeological deposits, stockpiles in the area of high archaeological sensitivity, as shown in* ***Figure 23*** *of the Aboriginal Cultural Heritage Assessment and titled Archaeological Sensitivity Figure, must be placed on geo-matting.'*

Further investigation of contamination with the Site, including the area east of the Clay Borrow Pit found that the northern area east of the Clay Borrow Pit had been significantly disturbed by earthworks (excavation and filling) in the early 1980's, and that earthworks are required to remove the fill material, including areas of waste and contaminated materials. As a result the area has negligible potential for subsurface Aboriginal archaeological deposits. This conclusion has been made following the review of additional information that was not available when preparing the original ACHAR, and in consultation with registered Aboriginal stakeholders.

The Project approved the clearance of 2.51 hectares of threatened ecological communities within the approved Project footprint, subject to preparation and approval of a Biodiversity Management Plan. It also requires the retirement of various biodiversity credits. The Department advised Hydro in a letter dated 12 March 2021 that the credits need to be retired within two years of commencement of the remediation works.

Further details on the Project are provided in Section 2.1.

1.8 Assessment Requirements

Due to the minimal environmental impact, if not environmental benefit, the Modification proposes, the Modification is being sought under Section 4.55(1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Under Section 4.55(1A):

- The proposed modification must be of minimal environmental impact
- The development as modified must be *substantially the same* as the development for which consent was originally granted and before that consent as originally granted was modified at all.

RAMBOLL AUSTRALIA - GIS MAP file : 318000533_GIS_P001_RemediationEMP | F002_Smelter_V02 | 2/11/2020

Aerial photography by Nearmap, flown 15.06.2020

Figure 1-2 | Existing Smelter Layout

2. MODIFICATION DESCRIPTION

2.1 Overview

The Modification is comprised of the following administrative changes:

- revision of the project boundary to reduce the Project footprint
- revision of the vegetation clearance area (a net reduction in the clearance area), and the associated re-calculated biodiversity credit requirements described in Condition B41 of the development consent for SSD 6666
- removal of the designation of the northern area east of the Clay Borrow Pit as a potential archaeological deposit/area of high archaeological sensitivity and subsequent removal of Condition B38 of the development consent for SSD 6666.

In addition to the changes described above, the Modification proposes the management of the fill material (including some contaminated material) in the area covered by Condition B38, for reuse in the filling of voids associated with the remediation activities, if required due to contamination levels, placed in the Containment Cell.

2.1.1 Project boundary change

The revised project boundary is shown on **Figure 3-2**. The revised project boundary would involve removal of the following key areas from the Site:

- Part of the south and southwest sections of the Site
- Land surrounding the Containment Cell
- The switchyard in the north of the Site

2.1.1.1 **South and southwest sections**

The Project boundary was originally developed in 2014 when demolition of Smelter buildings originally formed part of the project. Demolition was subsequently removed from the development subject to SSD 6666. Demolition activities within the south and southwest sections of the Site have been completed, and no remediation or associated activities (such as material stockpiling) under SSD 6666 need to occur in most of these areas.

Prior to, during and following these demolition activities limited remediation activities were required in these areas:

- Removal and off site disposal of hydrocarbon and PCB contaminated transformers, switches, transformer oil and soils from substations
- Removal of subsurface asbestos containing material used in the construction of buildings and infrastructure

The majority of the area in the south and southwest of the Smelter did not require remediation. Where remediation was required under SSD 6666, the validation consultant undertook validation sampling, analysis and reporting. This reporting was provided to the Site Auditor who has issued Interim Audit Advice (in advance of the Site Audit Statement) covering these areas, advising that they are satisfied with the remediation and validation activities undertaken in these areas, and that they are suitable for the proposed future industrial land use.

In accordance with the Contaminated Site Management Plan (part of the Soil and Water Management Plan, which in turn forms part of the Remediation Works Environmental Management Plan) these areas have been flagged or fenced off to restrict access and to avoid recontamination. As they are no longer required for the SSD 6666 development activities it is proposed to remove them from the SSD 6666 Project site.

2.1.1.2 Land surrounding the Containment Cell

A review of the Containment Cell construction methodology concluded that construction required a reduced footprint. As it is no longer required for the SSD 6666 development activities it is proposed to remove this excess area from the SSD 6666 Project, and accordingly reduce the approved area of vegetation clearance (refer to **Section 2.1.2**).

2.1.1.3 Switchyard

The EIS identified the switchyard as an area of environmental concern (AEC). Investigations could not be undertaken in this area while the switchyard was still live and operational.

The Response to Submissions noted that "*Following discussions with prospective purchasers about the potential for ongoing use of the transformer yard, Hydro does not currently intend to decommission the infrastructure*". In 2020 Hydro reached an agreement with an entity to purchase of the Site, with land being handed over in stages. A condition of that agreement was that the purchaser would be responsible for the demolition and remediation (if required) of the switchyard. The switchyard was decommissioned, which has allowed investigations to be undertaken to determine the presence, type and extent of contamination.

The remediation of the switchyard:

- Is not being undertaken by the contractor undertaking the remediation activities under SSD 6666: the purchaser has commissioned a separate contractor
- Does not require any of the contaminated material from the switchyard to be placed in the Containment Cell. It will be transported off site to a licensed waste facility
- Is being overseen by an EPA-accredited Site Auditor. A Site Audit Statement is to be issued on completion of remediation
- Is being undertaken as category two remediation works under *State Environmental Planning Policy No. 55 (Remediation of Land)* (SEPP 55)
- Is being undertaken to facilitate construction of the proposed Hunter Power Project (Kurri Kurri Power Station) (SSI-12590060).
  The switchyard is within the proposed project footprint for the Hunter Power Project (proposed by Snowy Hydro. The purchaser of the land has an agreement in place with Snowy Hydro for the land to be remediated (confirmed via to a Site Audit Statement) suitable for development of the Hunter Power Project.

2.1.2 Revised Biodiversity Assessment

Condition B41 of SSD 6666 defines the amount of approved vegetation clearance, and the biodiversity credits required to retired to offset this clearance:

> *'Prior to vegetation clearing for remediation works, or within another timeframe agreed with the Planning Secretary, the Applicant must, in accordance with the Biodiversity Conservation Act 2016, retire:*
> *(a) 155 ecosystem credits, including:*
> *i. 94 ecosystem credits for removal of 1.35 ha of Parramatta Red Gum – Narrow-leaved Apple*
> *– Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area; and*
> *ii. 61 ecosystem credits for removal of 1.15 ha of Spotted Gum – Red Ironbark – Narrow-leaved Ironbark – Grey Box shrub-gross open forest of the lower Hunter; and*
> *(b) 582 species credits, including:*
> *i. 19 species credits for Green-thighed frog (Litoria brevipalmata);*
> *ii. 35 species credits for Koala (Phascolarctos cinereus);*
> *iii. 313 species credits for Southern Myotis (Myotis macropus);*

iv. 89 species credits for Regent Honeyeater (Anthochaera phrygia);
v. 56 species credits for Eucalyptus parramattensis subsp. decadens (Eucalyptus parramattensis subsp. decadens); and
vi. 70 species credits for Small-flower Grevillea (Grevillea parviflora subsp. parviflora) to offset the removal of 2.5 hectares of vegetation on site.'

The reduction in Project footprint results in a corresponding reduction to the extent of native vegetation to be removed, the number of threatened flora to be disturbed, and the area of threatened fauna habitat that would be impacted. **Table 3-1** details the reduced amount of native vegetation clearance with the revised Project boundary compared to the approved clearance area.

Table 2-1: Summary of reduced impacts to native vegetation within the Project area

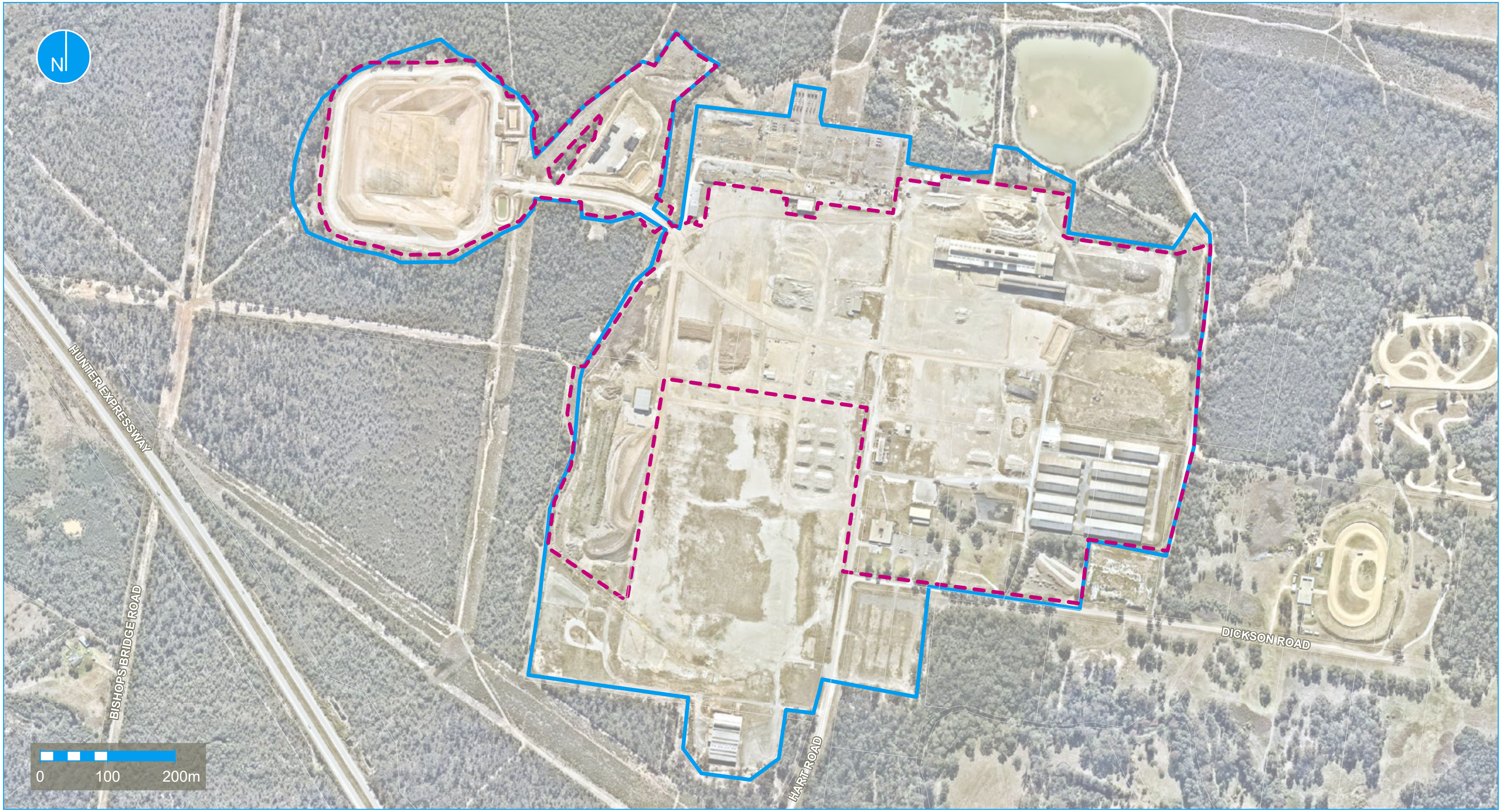
Vegetation Community	Conservation Status	Approved area of impact (ha)	Revised area of impact (ha)	Reduction in impact area (ha)
Parramatta Red Gum – Narrow-leaved Apple– Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area	Kurri Sand Swamp Woodland in the Sydney Basin Bioregion EEC	1.35	0.97	0.38
Spotted Gum – Red Ironbark – Narrow-leaved Ironbark – Grey Box shrub-gross open forest of the lower Hunter	Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion EEC	1.15	0.56	0.59
TOTAL		**2.50**	**1.53**	**0.97**

2.1.3 Area of high archaeological significance

The Aboriginal Cultural Heritage Assessment Report (AECOM, 2015) (ACHAR) that supported the EIS concluded that the northern area east of the Clay Borrow Pit was a potential archaeological deposit (PAD)/ area of high archaeological sensitivity. The ACHAR and EIS committed to avoiding disturbance of this area through the placement of geo-matting over the surface prior to the stockpiling of material in this area. This commitment was reflected in Condition B38 of SSD 6666.

Further investigation of contamination with the Site, including the area east of the Clay Borrow Pit found that the northern area east of the Clay Borrow Pit had been significantly disturbed by earthworks (excavation and filling) in the early 1980's, and that earthworks are required to remove the fill material, including areas of waste and contaminated materials. As a result the area has negligible potential for subsurface Aboriginal archaeological deposits. This conclusion has been made following the review of additional information that was not available when preparing the original ACHAR.

An ACHAR Addendum has been prepared by AECOM (AECOM, 2021) based on this additional information and follow up consultation with the registered Aboriginal stakeholders. The ACHAR Addendum is presented in **Appendix 3** and the key findings summarised in **Section 5.9**.



Aerial photography by Nearmap, flown 06.08.2021

RAMBOLL AUSTRALIA - GIS MAP file : 318001207_CommunityReferenceGroupMeeting | F001_RevisedBoundary_V02 | 18/08/2021

Legend

┅ Revised project site

▭ Project site

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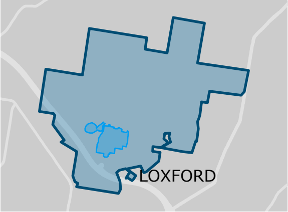

Figure 2-1 | Revised Project boundary

The Modification proposes the removal of Condition B38 from SSD 6666, and the subsequent amendment to the management measures in the Project's Aboriginal Heritage Management Plan (AHMP).

2.1.4 Remediation of area of fill placement

As the northern area east of the Clay Borrow Pit contains fill material, including some contaminated materials, the Modification proposes the area to be included in the remediation activities approved as part of the Project. The area is covered in the Data Gap Assessment (DGA) prepared by Ramboll (Ramboll, 2021) and is part of "AEC 30 Area East of the Clay Borrow Pit". The DGA was completed to assess the areas of environmental concern (AEC) that were not sampled as part of the Phase 2 Environmental Site Assessment (ESA) and Phase 2 ESA Additional Investigations.

The excavated material in this area would be either:

- Reused on site for excavated areas where deemed suitable; or
- Disposed of in the Contaminant Cell if unsuitable for reuse.

The remediation of this area is to be completed in conjunction with other remedial works at the Project site and is required for the Site to be considered suitable by the Site Auditor for the future land use. Remediation and validation works would be undertaken in accordance with the Smelter Site RAP and the Remediation Works Environmental Management Plan (RWEMP).

2.2 Remediation and waste management

The remediation of the northern area east of the Clay Borrow Pit would be undertaken consistent with the remediation activities detailed in Section 8.6 of the EIS and Section 2.1.3 of the RWEMP including rehabilitation and stabilisation of the remediated area, if contamination is present.

Table 2-3 outlines the waste streams that have the potential to be generated by remediation of fill material placed within the area described as the "*Area East of the Clay Borrow Pit*" (Ramboll, 2021) of which Hydro PAD1 falls wholly within (AECOM, 2021).

Preliminary investigations have been undertaken as part of the data gap assessment (DGA) surrounding the area of interest to provide an initial indication of the material. The investigation indicates contaminants of concerns associated with fill material of unknown quality such as heavy metals, soluble fluoride and cyanide are present. Further investigations (once this modification is approved) would be required to confirm the nature of the material and the extent of contamination.

Table 2-2: Waste Streams and Management

Waste Stream	Management Method
Fill material	Use within the project boundary to fill voids associated within the remediation activities.
Potential contaminated material	Investigate to confirm the type, location, level and extent of contamination Removal of contaminated material and transportation for stockpiling and environmental management at the Site prior to containment within the Containment Cell.

Where investigation deem it suitable the excavated fill material would be utilised within the remediation activities to fill the footprint of the Capped Waste Stockpile or other contaminated areas following their excavation and transfer to the Containment Cell. If the material is deemed to be contaminated, the material would then be disposed of within the Contaminant Cell.

2.3 Environmental management

A RWEMP has been prepared and approved by the Department to describe how environmental management would be undertaken during the Project. It was prepared to address the requirements of Condition C2 of the development consent for SSD 6666, including the specialist management plans required by Condition C3 of the development consent. The RWEMP would apply to the remediation of the additional area of fill material including its excavation and re-use or disposal, pending contamination assessment of material.

Hydro prepared several specialist management plans as part of the RWEMP in addition to those required by Condition C3 of the development consent. This included a Soil and Water Management Plan (SWMP) and an Aboriginal Heritage Management Plan (AHMP). The SWMP would be adhered to during the remediation of the northern area east of the Clay Borrow Pit. The AHMP will require amendment to remove the high archaeological sensitivity area however the finds procedures for skeletal remain and unexpected finds will continue to be followed.

The Soil and Water Management Plan, Aboriginal Heritage Management Plan and the Biodiversity Management Plan would be amended to reflect the Modification and any relevant changed to the SSD 6666 development consent conditions. These would be submitted to the Department for review and approval.

2.4 Remediation

2.4.1 Hours, duration and workforce

Remediation would be undertaken during the hours described in Condition B34 of the development consent for SSD 6666:

- 7:00am to 6:00pm Monday to Friday
- 7:00am to 1:00pm Saturday
- No construction works on Sunday or public holidays

Remediation would be sequenced into the existing remediation works and undertaken progressively based on the nature of the fill material, and the destination of the material (in as fill or disposal in the Containment Cell). The remediation work would not require additional personnel and would be undertaken by the Remediation Contractor.

2.4.2 Equipment and materials

Plant and equipment to be used during the construction works would include:

- Excavators
- Dozers
- Rollers
- Trucks
- Water truck
- Handheld tools and equipment.

2.4.3 Extent of excavation

Based on investigations to date it is estimated that the earthworks in the northern area to the east of the Clay Borrow Pit would require the following:

- Excavation of an area approximately 23 m in diameter to a minimum depth of 1.8m below ground level
- Excavation of approximately 774 m^3 of heavy metal and PAH impacted material to be placed in the Containment Cell (Ramboll, 2021).

The lateral and vertical extent of the contaminated material is to be confirmed through delineation works that would be completed prior to the commencement of remedial works. Validation sampling following remedial excavation works will confirm completion of remediation.

As noted in **Section 2.1.4** the excavated material in this area would be either:

- Reused on site for excavated areas where deemed suitable; or
- Disposed of in the Contaminant Cell if unsuitable for reuse.

Machinery (excavators and loaders) used in the remediation activities at the Site would be used for the excavation, loading and transportation of the excavated material.

2.5 Comparison of the Approved Project to the Modification

2.5.1 Project components

Table 2-4 provides a summary of the key components of the Modification and comparison to the approved Project under SSD 6666 as relevant. SSD 6666 will remain substantially the same if the Modification is approved.

Table 2-3: Comparison of the Approved Project to the Modification

Parameter	Approved Project	Proposed Modification
Project life	Four years (to 2021 - 2024)	No change
Project Site	As shown on Figure 3-2 of the EIS	Reduced Project footprint as shown on **Figure 3-1** of this SEE.
Hours of operation	Monday to Friday 7:00am to 6:00pm Saturdays 7:00am to 1:00pm Outside these hours provided inaudible at nearest receivers	No change.
Equipment	Excavators Graders Compactors / Rollers Dump trucks Forty tonne articulated trucks Scrapers / Dozers / Front end loaders Backhoes Vibrating drum roller Water truck Machinery service vehicle Refuelling vehicles Various hand operated equipment Concrete crushing plant Jackhammers	No change.
Area of high archaeological sensitivity	As shown on Figure 23 of the ACHAR	Removal of classification as "area of high archaeological sensitivity" and required protection techniques. Removal of Condition B38 from the development consent for SSD 6666.

Parameter	Approved Project	Proposed Modification
Biodiversity	Removal of 2.5 hectares of vegetation on site	Removal of 1.53 hectares of vegetation on site. Revision of Condition B41.

2.5.2 Development consent

A review of SSD 6666 was undertaken to:

- Consider compliance of the Modification with the existing conditions of consent
- Identify which conditions would require amendment to facilitate the Modification.

The key conditions that would specifically apply to the Modification are described in Table 2-5.

Table 2-4: Conditions of Consent Relevant to the Modification

Condition No.	Condition Summary	Relevance
B5	Requirement for preparation of a Containment Cell Management Plan (CCMP)	The Modification would not impede the successful implementation of the CCMP
B10	Preparation of a Remediation Validation Report	The Modification would form part of the remediation works described in the report
B13, B14 and B15	Work health and safety requirements, including the need to prepare and implement a Health and Safety Plan (HSP)	Work health and safety requirements are to be implemented, and the HSP to be reviewed and amended to incorporate the Modification (if required)
B17	Requirement for an Erosion and Sediment Control Plan (ESCP)	An ESCP is to be prepared and implemented for the additional area of remediation
B18 – B19	Requirement for installation of stormwater management system	The Modification would comply with the stormwater management implemented for the remediation activities and additional measures included to adequately manage stormwater in the area of Remediation
B20 – B22	Traffic and access management	Vehicles transporting material within the site associated with the Modification would comply with the Traffic Management Plan and Site Access Plan. No new roads are deemed necessary for the Modification.
B23 – B27	Waste management: statutory requirements	Any wastes from the northern area east of the Clay Borrow Pit are to be classified prior to placement in the Containment Cell or transported for reuse on site
B28 – B31	Air quality management and Air Quality Management Plan (AQMP)	The Modification would be undertaken in accordance with the AQMP
B32	Avoidance of generation of offensive odour	The Modification would be unlikely cause the emission of offensive odour

Condition No.	Condition Summary	Relevance
B34 and B35	Hours of operation and requirements for works undertaken outside of standard construction hours	Remediation activities would be undertaken within the nominated hours of work
B36 and B37	Remediation work noise limits and vibration criteria	The remediation works would be undertaken in accordance with the Noise and Vibration Management Plan (NVMP). Vibration levels would be within the existing described within Section 12 of the EIS.
B38	Use of geo-matting for areas of high archaeological sensitivity (per Figure 23 of ACHAR)	The area in Figure 23 is no longer considered an area of "high archaeological sensitivity" and no longer needs to be protected, and can be the subject of excavation activities.
B39 and B40	Unexpected find protocol for previously unidentified item or object of Aboriginal Heritage significance	The protocol would be adhered to as well as the procedures in the AHMP.
B41	Ecosystem and species credits required to offset the removal of 2.5ha of vegetation	The area of vegetation proposed to be removed has been reduced and the required credits have been recalculated. Refer to **Section 2.1.2**.
B42 and B43	Preparation of a Biodiversity Management Plan (BMP) for approval by the Planning Secretary. Vegetation clearing is not to commence until the BMP has received approval.	The BMP will be updated as required to reflect the changes of the Modification and submitted to the Planning Secretary for approval.
B47	Preparation of a Fire Safety Study and Construction Safety Study	The Modification activities would be consistent with the plans and reports that have been prepared to address this requirement
B48	Emergency Plan and Safety Management System	The Modification activities would be consistent with the plans and reports that have been prepared to address this requirement
B50 – B51	Safe storage of chemicals, fuels and oils	The Modification would comply with the Health and Safety Management Plan (HSMP) for the refuelling of vehicles and any service/repair work required on motor vehicles or mobile plant
C2	Requirement to prepare and implement the RWEMP	The RWEMP would apply to the Modification and would, where required, be amended to reflect the Modification as necessary
C6	Revision of plans and programs required under the consent to be submitted to the Planning Secretary for approval within six weeks of the review	Any plans or programs to be revised as a result of the Modification will be submitted to the Planning Secretary for approval.

Table 2-6 identifies the existing conditions requiring amendment, and the proposed amendments.

Table 2-5: Proposed Revisions to the Conditions of Consent

Existing Condition		**Proposed Revision(s)**
B38	To prevent impacts to subsurface archaeological deposits, stockpiles in the area of high archaeological sensitivity, as shown in ***Figure 23*** of the Aboriginal Cultural Heritage Assessment and titled *Archaeological Sensitivity Figure*, must be placed on geo-matting.	**Removal of condition**
B41	Prior to vegetation clearing for remediation works, or within another timeframe agreed with the Planning Secretary, the Applicant must, in accordance within the *Biodiversity Conservation Act 2016*, retire: a) 155 ecosystem credits, including: i. 94 ecosystem credits for removal of 1.35 ha of Parramatta Red Gum – Narrow-leaved Apple – Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area; and ii. 61 ecosystem credits for removal of 1.15 ha of Spotted Gum – Red Ironbark – Narrow-leaved Ironbark – Grey Box shrub-gross open forest of the lower Hunter; and b) 582 species credit, including: i. 19 species credits for Green-thighed frog (*Litoria brevipalmata*); ii. 35 species credit for Koala (*Phascolarctos cinereus*); iii. 313 species credits for Southern Myotis (*Myotis marcopus*) iv. 89 species credits for Regen Honeyeater (*Anthochaera Phrygia*) v. 56 species credits for Eucalyptus parramattensis subsp. decadens (*Eucalyptus parramattensis subsp. decadens*); and vi. 70 species credits for Small-flower Grevillea (*Grevillea parviflora* subsp. *parviflora*) to offset the removal of 2.5 hectares of vegetation on site.	Prior to vegetation clearing for remediation works, or within another timeframe agreed with the Planning Secretary, the Applicant must, in accordance within the *Biodiversity Conservation Act 2016*, retire: a) **98** ecosystem credits, including: i. **68** ecosystem credits for removal of **0.97** ha of Parramatta Red Gum – Narrow-leaved Apple – Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area; and ii. **30** ecosystem credits for removal of **0.56** ha of Spotted Gum – Red Ironbark – Narrow-leaved Ironbark – Grey Box shrub-gross open forest of the lower Hunter; and b) **71** species credit, including: i. **5** species credits for Green-thighed frog (*Litoria brevipalmata*); ii. ~~0 species credit for Koala (Phascolarctos cinereus);~~ iii. **9** species credits for Southern Myotis (*Myotis marcopus*) iv. **43** species credits for Regen Honeyeater (*Anthochaera Phrygia*)**; and** v. **14** species credits for Eucalyptus parramattensis subsp. decadens (*Eucalyptus parramattensis* subsp. *decadens*)~~; and~~ ~~vi. XX species credits for Small-flower Grevillea (*Grevillea parviflora* subsp. *parviflora*)~~ to offset the removal of **1.53** hectares of vegetation on site.

2.5.3 Substantially the same project

Consent for the Modification can be granted under Section 4.55(1A) of the EP&A Act if the consent authority can be "*satisfied that the proposed modification is of minimal environmental impact*" and "*satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all)*".

The Modification is considered present a minimal environmental impact, and to be substantially the same development to the approved under SSD 6666 as:

- The Modification represents an environmental improvement (through a reduction in vegetation clearance, removal of fill material and remediation of contamination)
- The overall nature the development remains similar and the scale is reduced
- The environmental impacts associated with the development are substantially the same or reduced
- The majority of the development remains unchanged to that approved.

The Modification provides an overall environmental benefit to the project by reducing the Project footprint and therefore providing a reduction in the area of vegetation clearing required. An additional small area of remediation which may have short term, minor impacts (similar to those described for the original development) is required which will provide an environmental benefit to the area through the removal of fill material and appropriate management. There is also an administrative change to an incorrectly designated area of high archaeological sensitivity.

2.6 Assessment of alternatives

The following alternative options to that which forms the Modification were considered for the Project:

- Option 1: No change to Project footprint
- Option 2: No change to archaeological sensitivity classification and fill material to remain insitu

2.6.1 Option 1: No change to Project footprint

No changes to the Project footprint would have resulted in the following:

- For biodiversity:
    - Clearance of an additional 0.97 hectares of threatened ecological communities and threatened species habitat, despite the construction review undertaken with the Remediation Contractor concluding this clearance was not required
    - Hydro would have been required to pay a significant amount to unnecessarily retire the required biodiversity credits, and taking these credits off the market and unavailable for projects that do require vegetation clearance
- For the switchyard:
    - Present potential regulatory complexities as the land is part of the proposed site for the Hunter Power Project (SSI-12590060)
    - Present potential contractual and commercial complexities as Hydro and the land purchaser have an agreement in place for the purchaser to remediate the land suitable for development of the Hunter Power Project. Hydro is not involved with the remediation of the switchyard
- For the land in the south and southwest of the Site, an increased risk that the land in the south and southwest of the Project site (which is remediated) could be accessed and potentially re-contaminated. Its removal from the Project footprint formalises the need for remediation vehicles to avoid this area.

  The completion of remediation of land in the south and southwest of the Project site means that the land would be available for the purchaser (or its potential partners) to develop the area once the requirements of the Planning Agreement, between Hydro and the Minister for Planning and Public Spaces, are satisfied (remediation is completed, the required financial contribution has been made to the Department, and a Site Audit Statement is forthcoming). The removal of this area from the Project footprint would remove potential regulatory complexities associated with any new development applications submitted for these developments.

2.6.2 Option 2: No change to archaeological sensitivity classification and fill material to remain insitu

Not removing the designation of the northern area to the east of the Clay Borrow Pit as an area of high archaeological sensitivity would have resulted in the following:

- Fill material (including contaminated material) could not be removed and allow the remediation and rehabilitation of this area, presenting potential environmental risks associated with retaining the fill and contaminated material in place
- Retain ongoing constraints to undertaking any activities in this area, including environmental improvement works
- Hydro would be required to identify other fill material (from within the Project site or off site) for use in the remediation of contaminated areas in the Site (filling areas where contaminated soils have been excavated to be placed in the Containment Cell).

2.7 Need for and Justification of the Modification

The Modification is required to:

- Amend the Project footprint to reflect only the area required to undertake the activities approved under the development consent for SSD 6666. This reduced footprint would reduce the potential for environmental incidents, including the recontamination of the remediated area in the south and southwest of the Site. It would also facilitate new employment-generating development in this area by removing potential regulatory and planning issues
- Remove the switchyard from the area subject to the development consent for SSD 6666. This would reflect the approach described in the Response to Submissions, and reflect that remediation of the switchyard is being undertaken independently of the Project. It would also remove potential regulatory and planning issues associated with the area also being subject to the proposed construction and operation of the Hunter Power Project (SSI-12590060)
- Amend (reduce) the amount of native vegetation clearance permitted under the development consent for SSD 6666 so that it reflects the reduced area of required vegetation clearance. This will provide a requirement for Hydro and the Remediation Contractor to limit vegetation clearance to that reduced amount
- Reduce the number of biodiversity credits required by Condition B41 to reflect the reduce area of vegetation clearance. This reduces the logistical and financial imposition on Hydro to identify and retire (purchase) the required credits currently described in Condition B41 of the development consent for SSD 6666
- The northern area to the east of the Clay Borrow Pit has been identified as being covered with a large amount of fill material, including contaminated materials. The removal of Condition B38 from the development consent for SSD 6666 is required to allow this to occur, and provide the environmental benefit associated with the removal and disposal or reuse of this material.

3. PLANNING AND STATUTORY SETTING

3.1 Local Planning

3.1.1 Cessnock Local Environment Plan

The Site is zoned under 'RU2 Rural Landscape' under the *Cessnock Local Environmental Plan 2011* (Cessnock LEP). The purpose of the RU2 Rural Landscape zone is to protect rural land and facilitate rural and agricultural activities. This zoning does not reflect the industrial land uses that has occurred at the Site since 1969. The Smelter has relied on existing use rights under the EP&A Act to carry it its operations (including obtaining development consent to expand the Smelter in 1993 and 2002).

The objective of the RU2 Rural Landscape zone is to '*minimise disturbance to the landscape from development through clearing, earthwork, access roads and construction of buildings'*. The reduction in the project footprint aligns with this objective.

Development for the purposes of 'waste disposal facility' is permissible with consent in the RU2 Rural Landscape zone. The Modification is an alteration to the approval which involves minimal environmental impact, consistency with the approved development, and does not change the intended land use. Therefore, the proposed modification is permitted under section 4.55(1A) of the EP&A Act.

3.2 State Matters

3.2.1 NSW Environmental Planning and Assessment Act 1979

The EP&A Act is the principal piece of environmental legislation which provides for development planning and control in NSW. Approval for the Smelter was granted under Part 4 of the EP&A Act. Section 4.55 of the EP&A Act addresses the modification of development consents.

Section 4.55(1A) of the EP&A Act allows for a development consent to be modified by the consent authority to which the original application was made, provided the modification involves minimal environment impact and is "*substantially the same development"* for which the consent was originally granted. As discussed in **Section 2.5** the Modification is substantially the same development to that approved under SSD 6666.

Section 4.15(1) of the EP&A Act stipulates the issues to be considered for a modification application by a consent authority as follows:

"*(1)* ***Matters for consideration—general***

In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application:

(a) the provisions of:

  (i) any environmental planning instrument, and
  (ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and
  (iii) any development control plan, and
  (iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and

> *(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph),*
> *(v) (Repealed)*
>
> *that apply to the land to which the development application relates,*
> *(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,*
> *(c) the suitability of the site for the development,*
> *(d) any submissions made in accordance with this Act or the regulations,*
> *(e) the public interest."*

This SEE addresses the relevant requirements of section 4.15(1) of the EP&A Act.

3.2.2 NSW Environmental Planning and Assessment Regulation 2000

In addition to the requirements under the EP&A Act, Clause 115 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) prescribes the information that must be lodged with a section 4.55 application.

Table 4-1 lists the information required to be lodged with a section 4.55 application and where each has been included in this SEE.

Table 3-1: Required Information for a Modification Application

Information Required	SEE Section
(a) the name and address of the applicant,	**Section 1.3**
(b) a description of the development to be carried out under the consent (as previously modified),	**Section 2**
(c) the address, and formal particulars of title, of the land on which the development is to be carried out,	**Section 1.3**
(d) a description of the proposed modification to the development consent,	**Section 2**
(e) a statement that indicates either: (i) that the modification is merely intended to correct a minor error, misdescription or miscalculation, or (ii) that the modification is intended to have some other effect, as specified in the statement,	**Section 1.2**
(f) a description of the expected impacts of the modification,	**Section 5**
(g) an undertaking to the effect that the development (as to be modified) will remain substantially the same as the development that was originally approved.	**Section 3.2.1**
(g1) in the case of an application that is accompanied by a biodiversity development assessment report, the reasonable steps taken to obtain the like-for-like biodiversity credits required to be retired under the report to offset the residual impacts on biodiversity values if different biodiversity credits are proposed to be used as offsets in accordance with the variation rules under the Biodiversity Conservation Act 2016,	**Section 5.8**
(h) if the applicant is not the owner of the land, a statement signed by the owner of the land to the effect that the owner consents to the making of the application (except where the application for the consent the subject of the modification was made, or could have been made, without the consent of the owner),	Not required

Information Required	**SEE Section**
(i) a statement as to whether the application is being made to the Court (under section 4.55) or to the consent authority (under section 4.56),	**Section 1.2**
and, if the consent authority so requires, must be in the form approved by that authority.	

3.2.3 NSW Protection of the Environment Operations Act 1997

The *NSW Protection of the Environment Operations Act 1997* (POEO Act) requires any person carrying out scheduled work to obtain an EPL that authorises that work to be carried out at the premises.

Hydro has an Environment Protection Licence (EPL) No. 1548 issued under the POEO Act that lists the following scheduled activities:
- “Chemical storage waste generation”, which relates to chemical storage at a scale greater than 100 T annual volume of waste generated or stored.
- “Contaminated soil treatment”.

Activities associated with the Modification would be undertaken in accordance with the EPL. Relevant conditions of the EPL relating to the Modification are summarised in **Table 3-2**.

Table 3-2: Relevant EPL conditions

Condition	**Relevance to the Modification**
L1.1	The licensee must comply with section 120 of the POEO Act (pollution of waterways)
O2	All plant and equipment installed at the premises or used in connection with the licensed activity must be maintained and operated in a proper and efficient manner
O3	Prescribes conditions relating to minimisation of dust generation and emissions
O5	The licensee must ensure that any liquid and/or non-liquid waste generated and/or stored and/or processed at the premises is assessed and classified in accordance with the Environmental Protection Authority's Waste Classification Guidelines
O6.2	The licensee must ensure that hazardous or restricted solid waste is stored or contained in a secure manner so as to prevent any hazard and the escape of waste and/or leachate
R2	The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act

Due to the small area and volume of fill to be remediated and the likely contents of the fill (based on extensive investigations on the site and Hydro land) the activities subject to the Modification would not trigger additional schedule activities listed in Schedule 1 of the POEO Act.

3.2.4 Other key NSW legislation

Table 3-3 identifies the key requirements of other NSW environmental legislation and its relevance to the Modification.

Table 3-3: Other Relevant NSW Legislation

Legislation	Relevance to the Modification
Biodiversity Conservation Act 2016 (BC Act)	The purpose of the BC Act is to conserve and protect biodiversity. Consideration of biodiversity impacts is included in **Section 5.8**. The Modification includes a reduction in the project footprint and a resulting reduction to the biodiversity impacts of the Project. The Modification will result in a net benefit to the original biodiversity impacts of the Project.
Contaminated Land Management Act 1997 (CLM Act)	Section 60 of the CLM Act requires landowners to notify the Environmental Protection Authority if their activities have resulted in contamination of the land. Hydro has previously consulted with the Environmental Protection Authority and the Environmental Protection Authority has determined that the Site does not warrant regulation under the Act. The Modification would not change this determination.
National Parks and Wildlife Act 1974 (NP&W Act)	The NPW Act is the primary legislation for the management and protection of Aboriginal relics and sites. Consideration of heritage impacts is included in The Modification seeks to remove the high archaeological sensitivity designation of Hydro-IA35-15 due to historical evidence of high disturbance to the area. Consideration of the sensitivity designation is included in **Section 5.9**.
Heritage Act 1977 (Heritage Act)	The Heritage Act is the primary legislation for the management and protection of non-indigenous heritage. Consideration of heritage impacts is included in **Section 5.9**. Modification is located on previously disturbed land and therefore is unlikely to result in any direct impacts to heritage. Requirements under the Heritage Act would apply to any unexpected finds if encountered.
Water Management Act 2000 (WM Act)	The licensing and approvals provisions of the WM Act apply (in general terms) to water sources that are subject to a Water Sharing Plan (WSP). The Modification does not involve the extraction or capture of any additional water at the Site and therefore a Water Access Licence under section 60A or an aquifer interference approval under section 91 is not required. In any event, under section 5.23 of the EP&A Act, a water use approval (section 89), water management work approval (section 90) or a controlled activity approval (section 91) under the WM Act is not required for approved SSD.
Roads Act 1993 (Roads Act)	Section 138 of the Roads Act requires that a person obtain the consent of the appropriate roads authority for the erection of a structure, or the carrying out of a work in, on or over a public road, or the digging up or disturbance of the surface of a public road. The Modification does not involve work in, over or disturbance of a public road and therefore no approvals are required under the Roads Act. The traffic impacts associated with the Modification are discussed in **Section 5.5**.
Waste Avoidance and Resource Recovery Act 2001 (WARR Act)	The WARR Act establishes a hierarchy of waste management (avoid, recover, dispose) encouraging efficient use of resources and minimising waste. Waste materials generated as a result of the Modification would be managed in accordance with the principles of the waste management hierarchy referred to in the WARR Act. A discussion on waste management for the Modification is in **Section 5.7**.

Legislation	Relevance to the Modification
Protection of the Environment Operations (Waste) Regulation 2014 (POEO Regulation)	The POEO Regulation describes the regulatory processes for waste management in accordance with the POEO Act. A discussion on waste management for the Modification is in **Section 5.7**.

3.2.5 State Environmental Planning Policies

Table 3-4 provides a summary of the relevant State Environmental Planning Policies (SEPPs) considered for the Modification.

Table 3-4: Relevant State Environmental Planning Policies

Instrument	Relevance to the Modification
State Environmental Planning Policy (State and Regional Development) 2011 (SEPP S&RD)	The Project was approved as SSD as it was determined to be a 'waste and resource facility' under schedule 1 of the S&RD SEPP. The Modification would form part of the approved SSD Project.
State Environmental Planning Policy No 33 - Hazardous and Offensive Development (SEPP 33)	SEPP 33 requires the consent authority to consider whether an industrial proposal is a 'potentially hazardous industry' or a 'potentially offensive industry'. A Preliminary Hazards Analysis (PHA) is required for potentially hazardous developments to assist the consent authority to determine acceptability. SSD 6666 was defined as a potentially hazardous development and a PHA was prepared as part of the EIS. *Applying SEPP 33* (DoP, 2011), provides guidance as to when a project should be considered to be 'potentially hazardous industry' or a 'potentially offensive industry' including for modifications. *Applying SEPP 33* (DoP, 2011) states: "*If the proposed use or modifications are considered potentially hazardous or potentially offensive in their own right, then SEPP 33 applies… SEPP 33 would also apply if the proposed modifications are not potentially hazardous in themselves, but interact with the existing facility in a way that cumulative hazards (or offence) from the existing facility may be significantly increased*". The Modification is not considered to be potentially hazardous in its own right, nor would it change the conclusion of the PHA for the approved Project.
State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55)	The objective of SEPP 55 is to encourage the remediation of contaminated land for the purpose of reducing the risk of harm to human health and the environment. This includes specifying remediation activities that require development consent. SEPP 55 requires that land is suitable or can be made suitable for the proposed use under the modified consent. The remediation elements of the Project are deemed a Category 1 remediation works under SEPP 55, requiring development consent. The remediation is included as an element of the State Significant Development under the S&RD SEPP.

3.3 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the core piece of legislation protecting Matters of National Environmental Significance (MNES) and Commonwealth land. There are nine MNES identified under the EPBC Act:

- World Heritage Properties
- National Heritage Places
- Wetlands of international importance
- Listed threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions
- A water resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, a referral is required to be submitted to the Commonwealth Department of Agriculture, Water and the Environment for any 'action' that is considered likely to have a significant impact on any MNES. If the Department of Agriculture, Water and the Environment determines the action to be a 'controlled activity' approval is required from the Minister of the Environment.

The Smelter was previously referred under the EPBC Act and was deemed not a controlled action on 29 March 2016. As discussed in **Section 5.8** the Modification would not result in a significant impact on MNES. Therefore, a referral to the Department of Agriculture, Water and the Environment for the Modification is not required.

4. STAKEHOLDER CONSULTATION

Table 5-1 provides a summary of the consultation with relevant stakeholders undertaken for the Modification and any issues or comments raised. Copies of the correspondence (where available) issued and received in this consultation is provided in **Appendix 1**.

Table 4-1: Summary of Consultation undertaken for the Modification

Stakeholder	Method of Consultation	Date	Issues / Comments
Department of Planning, Industry and Environment (DPIE)	Letter (submitted)	28 May 2021	Description of the Modification and proposed assessment methodology
	Letter (received)	4 June 2021	Provide sufficient to justify the removal of the switchyard area from the project footprint, with particular focus on how this would impact the remediation timetable and Hydro's ability to satisfy the requirements of its SSD 6666 consent.
Biodiversity and Conservation Division of DPIE	Email (sent and received)	7 April 2021	Request for (and received) the original case prepared and submitted by ELA for the EIS.
	Online portal	20 April 2021	Online submission of biodiversity credit report (refer to Appendix A of the Biodiversity Assessment in **Appendix 2** of this SEE) No comments received as of 5 September 2021
Aboriginal stakeholders	Email and phone (sent and received)	Various, refer to Appendix 3	Refer to **Appendix 3**
Heritage NSW	Email	18 August 2021	Notification for update of the Aboriginal Heritage Information Management System No comments received as of 5 September 2021
Community Reference Group	Meeting presentation	19 August 2021	Presentation of the key elements of MOD2. No issued raised.

5. ASSESSMENT OF ENVIRONMENTAL EFFECTS

5.1 Soil and Water

5.1.1 Background

5.1.1.1 Topography

The Site is relatively flat at approximately 16 m Australian Height Datum (AHD) with a gentle slope from west to east and south to north. The Site increases in elevation to the west which is at an elevation of 25 m AHD.

The northern area to the east of the Clay Borrow Pit has an elevation of approximately 14 m AHD. Land within the Site generally slopes eastward and is predominantly very gently inclined (1-3%).

5.1.1.2 Hydrological

The Site is located in the Hunter catchment. Watercourses proximate to the Site are shown on **Figure 1-1**. Wentworth Swamp is the main water feature on the Hydro Land, with Swamp Creek, Black Waterholes Creek and several smaller watercourses tributaries of Wentworth Swamp. Swamp Creek flows in a northerly direction in the east of the Hydro Land, while Black Waterholes Creek flows in a northerly direction in the northwest of the Hydro Land. Both creeks flow into the Wentworth Swamp discharging to Wallis Creek, which then flows into the Hunter River. Swamp Creek is approximately 180 m to the east of the south-east corner of the Site.

An unnamed watercourse is located approximately 20m east of the northern area to the east of the Clay Borrow Pit. This unnamed watercourse is a tributary to Black Waterholes Creek.

The Site is located above the 1% Annual Exceedance Probability (AEP) flood level of 9.7 m AHD and the Probable Maximum Flood (PMF) level of 12.2 m AHD (apart from small areas in the west of the Site) (Ramboll Environ, 2015).

5.1.1.3 Surface water management

The existing surface water management system includes:

- Subsurface and open surface water drainage throughout the Site
- Three surge ponds located each in the west, east and south of the Site
- North East Dam (as described in **Section 1.6**).

Hydro undertakes a surface water monitoring program that encompasses the creek systems of Wentworth Swamp, ephemeral ponds within the Hydro Land and catchment dams located between 2 km and 7 km from the Site. Upstream and downstream locations are monitored monthly for pH, conductivity, fluoride, suspended solids and total dissolved solids, with several locations also monitored for free cyanide.

A water balance model was produced which found that the Site is capable of containing and controlling stormwater runoff for up to a 1 in 5-year, 3-hour storm event (PCB 2019).

5.1.1.4 **Contamination**

Several contamination investigations have been undertaken at the Site since operations ceased in 2012 (described in detail in the EIS).

The DGA completed by Ramboll (2021) has been included at **Appendix 4** and includes detailed assessment to close out data gaps in relation to each AEC or potential AEC identified in previous investigations.

To confirm the lateral and vertical extent of contamination delineation works would be completed following approval of the Modification and prior to the commencement of remedial works. Validation sampling following remedial excavation works would confirm completion of the required remediation.

5.1.1.5 **Groundwater**

Groundwater ranges between 1 m and 5 m below the natural ground surface in the estuarine sands in the eastern portion of the Site. The shallow groundwater travels north and northeast towards the Wentworth Swamps.

The Modification does not require any excavation to a depth that would intercept groundwater. Excavation would be limited to fill material placed within the northern area to the east of the Clay Borrow Pit.

5.1.2 Impact assessment

The reduction in the Project footprint would reduce the area that would be cleared of vegetation, and could be subject to soil disturbance, thereby reducing the potential for erosion and sediment loss. It also minimises the potential for contamination of areas that are not required for the Project.

The removal of the fill material in the area to the east of the Clay Borrow Pit would restore this area to similar to natural conditions. It would also remove contaminated soils from this area for management in the Containment Cell.

The earthworks in the area to the east of the Clay Borrow Pit could potentially result in erosion and sediment loss, with sediments and contaminants potentially entering the unnamed watercourse. The implementation of the mitigation measures described in the EIS and detailed in the Soil and Water Management Plan would minimise the potential for these to occur.

The Modification would not pose a risk to groundwater dependent ecosystems or licensed groundwater users.

5.1.3 Management and mitigation measures

Table 5-1 summarises the relevant mitigation measures from the EIS and the additional measures to be implemented for the Modification in relation to soils and water.

Table 5-1: Soils and Water Management Mitigation Measures

Relevant Mitigation Measures from the EIS
• Erosion and sediment controls would be installed prior to the commencement of the Works
• Surface water and groundwater monitoring would continue to be conducted consistent with the existing or updated EPL
• The surface water drainage system would be inspected and maintained as required on a monthly basis
• All Project personnel would be informed during the site induction of their obligations to minimise erosion and protect water quality
• Erosion and sediment controls would be inspected and maintained as required on a weekly basis and after a rain event
• Vehicles exiting the Project Site onto public roads would be inspected for mud and dirt. If required vehicles would be manually cleaned prior to exiting the Project Site
• Vehicle refuelling would be undertaken using mobile refuelling vehicles equipped with spill containment equipment and a spill kit
• All chemicals onsite would be stored in accordance with the applicable Safety Data Sheet
• An appropriate spill kit is to be onsite at all times and any spillage is to be immediately cleaned up. In the event of a large or hazardous spill, the fire brigade, police, ambulance and OEH would be contacted as appropriate
Additional Mitigation Measures
• The Soil and Water Management Plan (including the Soil and Erosion Control Plan) would be updated to reflect the works in the area to the east of the Clay Borrow Pit.

5.2 Hazards and Risks

5.2.1 Background

The preliminary hazard analysis (PHA) prepared as part of the EIS concluded that with a **major** consequence and a **rare** likelihood, the risk level of the Works phase of the Project according to *AS4360: Risk Management* is **medium**. Medium level risks can be managed with the standard measures described in the EIS.

5.2.2 Impact assessment

The potential hazards identified in the PHA relevant to the Modification are the:

- Potential for hazardous wastes (such as asbestos) and smelter wastes (such as spent pot lining) to be present in the Capped Waste Stockpile, resulting in potential health impacts (via inhalation or ingestion) during excavation, transportation and placement in the Containment Cell.
- Potential for generation of hazardous gases and liquids, and potential for exposure (inhalation, ingestion or skin contact) during excavation, transportation and placement of material from the Capped Waste Stockpile in the Containment Cell.

From the investigations completed to date none of the materials known to be in the Capped Waste Stockpile presenting the risks described above are expected to be located in the area to the east of the Clay Borrow Pit. The majority of the fill material is suitable for reuse within the Site (to fill areas excavated for remediation activities). Some of the material is contaminated and would be placed in the Containment Cell.

Therefore the risk level for the Project remains unchanged (**medium**).

5.2.3 Management and mitigation measures

Table 6-3 summarises the relevant mitigation measures from the EIS and the additional measures to be implemented for the Modification in relation to hazards and risks.

Table 5-2: Hazards and Risks Mitigation Measures

Relevant Mitigation Measures from the EIS
• Implementation of the Work Health and Safety Management Plan. • Oils, fuels and chemicals stored in accordance with the applicable Safety Data Sheet. • Provision of spill kits.
Additional Mitigation Measures
• No additional measures required.

5.3 Air Quality and Odour

5.3.1 Background

5.3.1.1 **Climate**

The Site generally experiences a dominant southeast flow, with notable southwest and northwest components at 10 m above ground level (AGL). At 30 m AGL, the dominant wind direction is less defined from the southeast, with more even distribution between the east to southwest. This means that dust and odour emissions are generally carried to the northwest, northeast or southeast.

Weather data was obtained from the Bureau of Meteorology (BoM) Automatic Weather Station (AWS) at Cessnock Nulkaba station (Station Number 061242) located approximately 12 km west-southwest of the Site. Peak temperature occurs during summer months (between November and February) with a mean maximum temperature of 24.6°C. The lowest temperatures are usually experienced between June and August with a mean minimum temperature of 11.3°C.

The region is characterised by moderate rainfall, with a mean annual rainfall of approximately 763 mm, and an annual rainfall range between 467 mm and 1,096 mm. Rainfall is most pronounced between November and March, with significantly lower rainfall during the colder months of the year. An average of 80 rain days occur per year.

On average, the region experiences an annual evaporation rate of 1,350 mm/year, with greatest evaporation rates occurring during the summer months.

5.3.1.2 **Sensitive receivers**

The Site is approximately 600 m to the north of the nearest sensitive receiver. The next nearest is approximately 750 m to the southeast. There are approximately 16 rural residences within 1 km of the Site, of which 7 are on Hydro Land (several of the Hydro-owned residences have been demolished since preparation of the EIS).

Other sensitive receptors in proximity to the Site include the Kurri Kurri TAFE, located approximately 1.5 km to the southeast, and the Kurri Kurri High School, approximately 1.9 km to the southeast.

5.3.1.3 Cumulative sources in the locality

Air quality in the area may be influenced by various air emission sources including:

- Open-cut and underground coal mining operations situated to the southeast and northwest
- Mobile sources, such as emissions from road and rail transport, in particular the Hunter Expressway to the immediate south of the Project
- Emissions from light industrial, commercial and residential activity
- Wind entrained dust from exposed areas
- Biogenic (natural) sources, including the contribution of sea salt to airborne aerosol concentrations
- More remote sources which contribute episodically to suspended particulates in the region including dust storms and bushfires.

5.3.1.4 Air quality criteria

Air quality modelling was undertaken for the Project as part of the EIS. In summary, the modelling indicates that at all the sensitive receiver locations assessed the predicted incremental and cumulative concentrations and deposition rates are below the applicable Environmental Protection Authority assessment criteria and National Environment Protection Measure (NEPM) advisory reporting goals.

5.3.2 Impact assessment

The activities in this Modification could result in the following air quality impacts:

- Dust generation during earthworks in the area to the east of the Clay Borrow Pit and from vehicle movements on paved and unpaved roads
- Generation of diesel combustion related pollutants (NO_2, SO_2, CO, polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs))

These impacts are consistent with the approved Project and would be appropriately managed following the mitigation measures described in the EIS and the Air Quality Management Plan.

5.3.3 Management and mitigation measures

Table 5-3 summarises the relevant mitigation measures from the EIS and the additional measures to be implemented for the Modification in relation to air quality and odour.

Table 5-3: Air Quality and Odour Mitigation Measures

Relevant Mitigation Measures from the EIS
• All Project personnel would be informed during the site induction of their obligations to minimise potential air quality and dust impact generation and the need to take reasonable and practical measures to minimise impacts.
• Maintain the five dust deposition monitoring locations around the Project Site established under the Air Quality Management Plan.
• Watering of the demolition areas and unsealed access roads.
• Wherever practicable, vehicles would use existing sealed roads.
• Speed limits would be imposed on internal roads in accordance with the Smelter Access Plan.
• Where possible construction vehicles and machinery would be turned off or throttled down when not in use.
• Construction vehicles and machinery would be maintained in accordance with manufacturer's requirements.
• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
• Record any exceptional incidents that cause dust and/ or air emissions, either on or offsite, and the action taken to resolve the situation in a log book.
• Carry out regular Project Site inspections to monitor compliance with the AQMP, record inspection results, and make an inspection log available to the Environmental Protection Authority and/or CCC upon request.
• Keep Project Site fencing, barriers and scaffolding clean using wet methods.

Relevant Mitigation Measures from the EIS

- Provide and maintain an adequate water supply on the Project Site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Vehicles entering and leaving the Project Site carrying potentially dust generating materials would be covered to prevent escape of materials during transport.
- Internal haul routes would be inspected for integrity and, where required, instigate necessary repairs to the surface as soon as reasonably practicable.

Additional Mitigation Measures

- No additional measures required.

5.4 Noise and Vibration

5.4.1 Background

5.4.1.1 Sensitive receivers

Section 5.3.1.2 provides context on the sensitive receptors in proximity to the Site. The Site is approximately 600 m to the north of the nearest sensitive receiver. The next nearest is approximately 750 m to the southeast.

5.4.1.2 Cumulative sources in the locality

Attended monitoring undertaken for the EIS identified a number of influences on the local noise environment, including:

- Traffic noise from the Hunter Expressway and Main Road-Cessnock Road
- Construction noise from new housing land at Cliftleigh and Gilleston Heights and at the Hunter TAFE
- Industrial activities (such as metal fabrication business)
- Occasional air traffic
- Sounds typical of the rural and bushland environment (such as agricultural activities and animal sounds).

5.4.1.3 Noise limits

As discussed in **Section 2.4.1**, works are permitted under the development consent for SSD 6666 between the hours of 7:00am to 6:00pm Monday to Friday and 7:00am to 1:00pm on Saturday. Construction activities for the Modification would be undertaken within these hours.

Works are permitted outside these hours under the following circumstances:

- Works that are inaudible at the nearest receivers
- Works agreed to in writing by the Planning Secretary
- Where it is required in an emergency to avoid the loss of lives, property of to prevent environmental harm.

Noise limits were determined for the Project in accordance with the *Interim Construction Noise Guideline* (NSW Department of Environment and Conservation (DECC), 2009a) (ICNG). Noise levels at all of the noise sensitive receivers were predicted to comply with the highly affected noise criteria during standard construction hours and outside standard construction hours.

5.4.2 Impact assessment

During construction activities noise and vibration impacts may result from earthworks in the area east of the Clay Borrow Pit, and heavy vehicles transporting the excavated material. These impacts are considered consistent with the approved Project and would be appropriately managed following the mitigation measures described in the EIS.

5.4.3 Management and mitigation measures

Table 6-4 summarises the relevant mitigation measures from the EIS and the additional measures to be implemented for the Modification in relation to noise and vibration.

Table 5-4: Noise and Vibration Mitigation Measures

Relevant Mitigation Measures from the EIS
• Local residents would be notified in advance of the Project of the nature and estimated timescales for completion of the Project. Thereafter ongoing notifications and updates on new or changes to Project activities would be provided in accordance with the Stakeholder Engagement Plan. • A 24-hour telephone number would be provided as a contact point for any complaints, issues or general enquiries regarding the Project. • All personnel would be informed of their obligations to minimise potential noise impacts during the site induction and the need to take reasonable and practical measures to minimise noise. • Truck drivers are to be informed of site access routes, acceptable delivery hours and must minimise extended periods of engine idling. • Vehicles and machinery would be selected with consideration of noise emissions. Where possible the sound power level of equipment and plant would comply with the sound power levels listed in the Noise and Vibration Impact Assessment in Appendix D (of the EIS) or it should be replaced with less noise intensive equipment. • Activities that would generate an audible noise at sensitive receptors would be limited to occur between 7:00 am to 6:00 pm Mondays to Fridays and 7:00 am to 1:00 pm on Saturdays. • Machines found to produce excessive noise compared to typical noise levels should be removed and replaced, or repaired or modified prior to recommencing Project. • Where possible construction vehicles and machinery would be turned off or throttled down when not in use. • Equipment would be inspected and maintained in accordance with manufacturer's requirements. • Use less noise-intensive equipment where reasonable and feasible. • Equipment with the most effective mufflers, enclosures and low-noise tool bits and blades must be procured and utilised where practicable for the Project. • Avoid unnecessary revving of engines and turn off plant that is not being used / required where practicable. • Use only non-tonal reverse alarms (broadband alternatives are needed). Where possible organise the site so that delivery trucks and haulage trucks only drive forward to avoid the use of reversing alarms. • Where practical fixed plant should be positioned as far away as possible from sensitive receptors. • Upon receiving a noise complaint regarding demolition activities, the following steps would be undertaken: • The person nominated in the Stakeholder Engagement Plan would investigate the source of the complaint. The aim would be to initiate an investigation no later than two hours after the complaint has been made (dependent on the nature of the complaint). • Where practicable a visit would be made to the complainant to verify the nature of the complaint • Where justified, appropriate action would be taken to amend the activity causing the complaint • Where three or more substantiated complaints of a similar nature are received (from at least two complainants), the work element must be reviewed in order to consider whether the work methods can be changed or if additional mitigation methods can be employed in order to prevent or reduce the likelihood of further complaints being made. • Attended monitoring should also be undertaken in response to substantiated complaints in order to validate and assess the source(s) giving rise to complaint(s). • Attended monitoring would be undertaken every three months to assess compliance with the relevant noise limits.
Additional Mitigation Measures
• No additional measures required.

5.5 Transport and Access

5.5.1 Background

The Hunter Expressway is part of the National Highway Network and is a major road in the Lower Hunter Region. The Hunter Expressway passes through to the south-west of the Site on Hydro owned land, with an interchange located on Hart Road. The northern end of Hart Road intersects with Dickson Road to provide access to the eastern parts of the Hydro Land.

John Renshaw Drive is a state road that connects with the Hunter Expressway south of the Site and forms part of the primary route (along with the New England Highway, Pacific Highway and Industrial Drive) to the Port of Newcastle and associated industrial areas.

Main Road-Cessnock Road is connected with the M15 Hunter Expressway via Kurri Kurri Interchange and passes through the Kurri Kurri town centre. It is an arterial route connecting Maitland and Cessnock via Gillieston Heights, Cliftleigh, Heddon Greta, Kurri Kurri, Weston and Abermain.

Site access for the Modification will be via Hart Road. Hart Road is undivided road with one lane in each direction and a post speed limit of 70 km/h.

5.5.2 Impact assessment

Traffic movements for the project remain as assessed for SSD 6666: between 2 and 57 truck movements (the total in both directions) per day.

These movements would generally be along Hart Road and Dickson Road via the Hunter Expressway. It is anticipated that the construction personnel trips would primarily be inbound in morning periods and outbound in afternoon/evening periods, while the heavy vehicle activity would occur over the course of the day.

The Modification is not expected generate any additional traffic movements. No excavated material would be removed from the Site, and the activities in the area east of the Clay Borrow Pit would be undertaken by personnel and equipment already undertaking remediation activities at the Site.

5.5.3 Management and mitigation measures

Table 6-3 summarises the relevant mitigation measures from the EIS and the additional measures to be implemented for the Modification in relation to transport and access.

Table 5-5: Transport and Access Mitigation Measures

Relevant Mitigation Measures from the EIS
• All personnel required to drive on the Project Site would be informed during the site induction of the access restrictions during the Project. • The initial internal access restrictions and alternative access routes would be established for the initial Project phase. • The initial internal access restrictions and alternative access routes would be altered as required to reflect the progression of the Project. • Speed limits would be imposed on internal roads in accordance with the Smelter Access Plan.
Additional Mitigation Measures
• No additional measures required.

5.6 Visual

5.6.1 Background

The Hydro Land surrounding the Site includes bushland, grazing land, rural residences and recreational facilities.

The established residential townships of Kurri Kurri, Weston and Heddon Greta are located to the south of the Site, while the growing residential areas of Gillieston Heights and Cliftleigh are located to the north-east and east respectively. Other areas to the north, east and west are predominantly rural and rural-residential land uses.

Immediately south of the Hydro Land in the northern area of Kurri Kurri is an industrial estate that includes a number of small to medium industrial operations. The Kurri Kurri TAFE is located approximately 1.5 km to the southeast of the Site and Kurri Kurri High School is approximately 1.9 km to the southeast of the Site.

Open-cut and underground coal mining operations are situated to the southeast and northwest of the Site, including the Bloomfield Open Cut, Donaldson Open Cut, Abel Underground and Tasman Underground mines located at a distance between 7 km and 12 km away.

The Smelter is not visible from many directions due to the surrounding native vegetation and the local topography. Since completion of demolition of most structures the Smelter site is less visible.

5.6.2 Impact assessment

The visual impact of the Modification would be consistent with the remaining Smelter infrastructure and as such is not expected to negatively affect the visual character of the existing landscape.

The adjustment of the Project boundary and the associated reduction in vegetation clearance would have a better visual impact outcome to that which has already been assessed in the EIS.

5.6.3 Management and mitigation measures

Table 6-6 summarises the relevant mitigation measures from the EIS and the additional measures to be implemented for the Modification in relation to visual impacts.

Table 5-6: Visual Mitigation Measures

Relevant Mitigation Measures from the EIS
• All personnel would be informed during the site induction of requirement to maintain the Project Site in an orderly condition. • Under the Stakeholder Engagement Plan the local community would be advised of Project activities, including those with the potential for visual impacts.
Additional Mitigation Measures
• No additional measures required.

5.7 Waste

5.7.1 Background

Construction would generate various wastes that would be managed in accordance with the Environmental Protection Authority's *Waste Classification Guideline* (2014).

The key waste stream from the Modification would be the fill material excavated from the area east of the Clay Borrow Pit. As discussed in **Section 2.1.4** the excavated material in this area would be either:

- Reused on site for excavated areas where deemed suitable; or
- Disposed of in the Contaminant Cell if unsuitable for reuse.

Other waste sources generated by the Modification would be consistent with the rest of the Project and may include:

- Construction waste such as concrete, timber, and steel and construction material packaging

- General domestic wastes such as food scraps, aluminium cans, glass bottles, plastic and paper containers and putrescible waste generated by site construction personnel.

These wastes would be managed using the existing waste management systems as described in Hydro's Waste Management Plan.

5.7.2 Impact assessment

The management of the fill material, including the contaminated material, would be managed in accordance with the procedures that apply to the management of other material within the Site. The management measures in the EIS and the Remediation Works Environmental Management Plan (in particular the Waste Management Plan and the Soil and Water Management Plan, which incorporates the Contaminated Soil Management Plan) would be implemented to minimise the potential impacts from the fill material.

As noted in **Section 5.7.1** the other wastes associated with the Modification would be managed in accordance with the existing waste management systems as described in Hydro's Waste Management Plan. As such they are unlikely to have any additional impacts.

5.7.3 Management and mitigation measures

Table 6-3 summarises the relevant mitigation measures from the EIS and the additional measures to be implemented for the Modification in relation to waste.

Table 5-7: Waste Mitigation Measures

Relevant Mitigation Measures from the EIS
• All Project personnel would be informed during the site induction of the waste management hierarchy and the measures to be implemented. • Promotion of efficient resource use, waste avoidance and waste minimisation. • Compounds and the stockpile area would be maintained in an organised condition, with waste materials to be transported to and stockpiled in the designated storage area. • Wastes would be managed to minimise the potential for windblown wastes spreading within or beyond the Project Site, including into watercourses. • Implementation of the materials tracking system described in Section 7.5.4 of the EIS. • Where possible recyclable wastes generated at the contractor's compound (paper, cans and bottles) would be collected by a recycling contractor. Remaining wastes would be collected for disposal at a licensed waste management facility. • Waste removal contractors transporting material from the Project Site would be required to provide dockets to confirm that waste was transported to a licensed waste management facility. • The environmental controls and containment measures placed on waste stockpiles would be inspected and maintained as required on a weekly basis and after rain and strong wind events.
Additional Mitigation Measures
• No additional measures required.

5.8 Biodiversity

5.8.1 Background

As part of the EIS, an ecological assessment was completed (Eco Logical Australia, 2016) that detailed the potential impacts of the Project on biodiversity values and calculated the biodiversity credits required to offset the impacts in accordance with the BBAM (GHD, 2021).

The Project was referred to the Australian Government Minister for the Environment and Energy under the EPBC Act due to the potential of impacts to MNES, specifically threatened species. The

Project was not deemed a controlled action and no additional assessment, approval or biodiversity offsets were required under the EPBC Act.

Impact avoidance to native vegetation and threatened biota has been a continual objective of the Project. Section 6.1 of the ecological assessment undertaken by Eco Logical Australia (2016) for the EIS described the measures taken to avoid and minimise impacts. This Modification further describes measures implemented to avoid impacts to native vegetation, threatened flora species and habitat for threatened fauna by the Project.

As stated in **Section 2.1.2**, Hydro commissioned GHD to undertake an assessment of the impacts of the revised Project boundary on biodiversity values and a recalculation of the offset requirement for the Project in accordance with BBAM (refer to **Appendix 2**).

The methodology employed by GHD included:

- Review of the *Hydro Aluminium Kurri Kurri Smelter Remediation and Demolition Ecological Assessment* (Eco Logical Australia, 2016) with a focus on the BBAM plot data collected and BioBanking credit calculations (Biobanking proposal case ID 0080/2015/1896D)
- A Geographical Information Systems (GIS) and aerial photography analysis to determine the Landscape Value score of the modified Project boundary
- Targeted threatened flora surveys within the modified Project boundary
- Targeted threatened fauna habitat assessments within the modified Project boundary
- Calculation of the Biodiversity credits in accordance with the methodology presented in the *BioBanking Assessment Methodology and Credit Calculator Operational Manual* (DECC, 2009b)using the BBAM calculator (Version 4).

5.8.2 Impact assessment

The Modification involves modifying the Project boundary that reduces the Project footprint. A result of the Project boundary change is a reduced impact to biodiversity values due to the reduction in extent of native vegetation impact required by the Project. The impact assessment has been divided into residual impacts and revised biobanking assessment.

5.8.2.1 **Residual Impacts**

The Modification will result in an overall reduction to the residual impacts on biodiversity values of the Project. Table 3-1 details the reduced impact to native vegetation as a result of the revised Project boundary.

The EIS determined the Project would impact the following threatened flora species listed as vulnerable under the BC Act:

- four *Eucalyptus parramattensis* subsp *decades* individuals
- a single clump of *Grevillea parviflora* subsp. *Parviflora* consisting of five stems.

Table 5-8 summarises the residual impact to threatened flora species and residual impact to habitat for threatened fauna species including species credit species.

Table 5-8: Flora and Fauna species residual impact of Modification

Species	Approved impact	Revised impact	Impact Reduction
Flora species (no. of individuals)			
Eucalyptus parramattensis subsp *decades*	4	1	3
Grevillea parviflora subsp *parviflora*	**5**	0	5
Threatened biota (hectares)			
Regent Honeyeater	1.15	0.56	0.59
Green-thighed Frog	1.46	0.36	1.10
Southern Myotis	14.23	0.4	13.83
Koala	1.35	0	1.35

The reduced Project footprint has subsequently resulted in the avoidance of all impacts to *Grevillea parviflora* subsp. *parviflora* and a reduction in impacts to *Eucalyptus parramattensis* subsp *decades* to one individual.

Table 5-8 shows the avoidance of 0.97 hectares of native vegetation has resulted in reduced impacts to habitat for threatened fauna.

The Modification has not resulted in any changes to the conclusions of the Assessments of Significance completed for threatened biota listed under the BC Act (then *Threatened Species Conservation Act 1995)* as part of the ecological assessment completed for the Project. The Modification would not result in any significant impacts to threatened biota listed under the BC Act (GHD, 2021)**.**

The Modification has resulted in reduced impacts to threatened biota listed under the EPBC Act identified as occurring or having potential to occur within the Project boundary. The Modification has not resulted in any changes to the determination by the Commonwealth Minister for the Environment of March 2016 that the Project was not a controlled action. The Modification would not result in any significant impacts to MNES listed under the EPBC Act. No additional assessment, approval or biodiversity offsets are required under the EPBC Act (GHD, 2021).

The Modification would not change the results of the cumulative impact assessment described in Section 6.2 of the ecological assessment prepared for the Project EIS (Eco Logical Australia, 2016)

5.8.2.2 **Credit Calculations**

The quantum of biodiversity credits required to offset the residual impacts of the Project (post application of the Modification) are based on the BioBanking calculations and expressed as BBAM credits.

The re-calculated credits for ecosystem, flora species and fauna species have been completed and are shown in **Table 5-9** and **Table 5-10**, against the requirements of Condition 41 of SSD 6666.

Table 5-9: Ecosystem credits required to offset the impacts associate with the Modification

Vegetation Zone	Biometric Vegetation Type	Approved impact area (ha)	Revised impact area (ha)	Credit conditions to be retired	Modification credit requirement	Difference
1a	Parramatta Red Gum – Narrow-leaved Apple– Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area	1.35	0.97	94	**68**	-26
5a	Spotted Gum – Red Ironbark – Narrow-leaved Ironbark – Grey Box shrub-gross open forest of the lower Hunter	1.15	0.56	61	**30**	-31

Table 5-10: Flora and Fauna species credits required to offset the impacts associate with the Modification

Species	Approved impact (no. of individuals)	Revised impact (no. of individuals)	Credit conditions to be retired	Modification credit requirement	Difference
Flora species					
Eucalyptus parramattensis subsp *decades*	4	1	56	**14**	-42
Grevillea parviflora subsp *parviflora*	**5**	0	70	**0**	-70
Fauna species					
Regent Honeyeater	1.15	0.56	89	**43**	-46
Green-thighed Frog	1.46	0.36	19	**5**	-14
Southern Myotis	14.23	0.4	313	**9**	-304
Koala	1.35	0	35	**0**	-35

5.8.3 Management and mitigation measures

Table 5-11 summarises the relevant mitigation measures from the EIS. No additional measures are deemed necessary for the Modification in relation to biodiversity.

The vegetation clearing for the Project has been completed. Project fencing has been erected to align within the revised Project boundary detailed in **Section 2.1.1** and in **Figure 3-1**. No clearing of native vegetation has occurred outside of the revised Project boundary identified within this Modification.

Table 5-11: Biodiversity Mitigation Measures

Relevant Mitigation Measures from the EIS
• Appropriate hybrid grass species (that cannot become weed issues in adjoining native vegetation) would be used in stabilising surfaces following completion of the Works.
Additional Mitigation Measures
• No additional measures required.

5.9 Heritage

5.9.1 Background

An AHIMS registered Aboriginal site, a potential archaeological deposit known as Hydro PAD1 (37-6-3872), was identified as part of AECOM's 2015 Aboriginal cultural heritage assessment report (ACHAR) (AECOM, 2015) which accompanied the EIS. Hydro PAD1 occupies an area of approximately 0.24 hectares in the north-western portion of the 2015 ACHAR study area. Since approval, more detailed information has become available relating to the soil profile in this location and the historical activities that that occurred as part of the operation of the Smelter which has revealed a low potential for Aboriginal artefacts to occur in this location.

The additional information that was reviewed to make this conclusion was:

- Subsurface soil data for land within and surrounding Hydro PAD1, forming part of a DGA report (Ramboll, 2021) for several Areas of Environmental Concern (AECs) at the Site
- An updated analysis of 13 historical aerial photographs of Hydro PAD 1. In particular, an 1983 aerial photograph of the then partially completed this pot line of the Smelter, showing part of Hydro PAD1. Significant ground disturbance (excavation and filling) are clearly evident on the 1983 and 1984 historical aerials for Hydro PAD1 and its environs (refer to Figure 7 and 8 in **Appendix 3** (AECOM).

From the DGA, it was found that two test pits (TP14 and TP15) excavated within the PAD area and a third (TP13) that was excavated immediately adjacent to the PAD contained fill deposits from the surface, extending to depths of up to 2.5m below ground level. This information correlates with the aerial analysis relating to the historical use of the site, especially land within and around Hydro PAD1. Around 1983, land within and to the south of Hydro PAD1 was extensively disturbed and/or filled. As noted this disturbance appears associated with the construction of the Smelter's third potline.

As land within Hydro PAD1 has historically been severely disturbed, natural soil profiles within bounds of Hydro PAD1 are likely to have been heavily modified. With this evidence, AECOM concluded that historical site activities remove the likelihood of potential archaeological deposit (PAD) and the area of the Modification is characterised as having low to nil heritage sensitivity. No Aboriginal heritage sites have been recorded within the disturbance area of the Modification.

The Addendum ACHAR prepared by AECOM (AECOM, 2021) is provided in **Appendix 3**. Eleven registered Aboriginal stakeholders provided a response to the draft Addendum ACHAR (as noted in **Appendix 3**), and all agreed with the conclusion of the assessment.

No heritage items of local or state significance have been identified within the Site boundary.

5.9.2 Impact assessment

Due to the absence of known heritage items within or in proximity to the Site, and the highly disturbed nature of the Site there is a low risk of Aboriginal heritage items to be present.

There are no additional potential impacts in comparison with the approved Project.

5.9.3 Management and mitigation measures

Table 5-12 summarises the relevant mitigation measures from the EIS and the additional measures to be implemented for the Modification in relation to heritage.

Table 5-12: Heritage Mitigation Measures

Relevant Mitigation Measures from the EIS
• All personnel required to undertake earthworks within the Project Site outside of the Smelter would be informed during the site induction of Aboriginal cultural heritage issues. • An unexpected finds procedure would be implemented in the event that a potential Aboriginal site was identified during the Works. This procedure would include: 1) All works would cease immediately in the area to prevent any further impacts to the site. 2) Notify the Works' Environment Officer. 3) Engage a suitably qualified archaeologist and RAP representative to determine the nature, extent and significance of the Aboriginal site and provide appropriate management advice. Management action(s) would vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts. 4) Prepare and submit an AHIMS site card for the Aboriginal site. • A standard procedure would be implemented for the management of any potential human skeletal remains identified throughout the Works. This procedure would include: 1) All work in the vicinity of the remains should cease immediately. 2) The location should be cordoned off and the appropriate authorities notified. 3) A physical or forensic anthropologist should be commissioned to inspect the remains in situ and make a determination of ancestry (Aboriginal or non-Aboriginal) and antiquity (pre-contact, historic or modern). Following completion of task three, the applicable action/s listed below would be implemented: - If the remains are identified as non-human, work can recommence immediately. - If the remains are identified as modern and human, the area would become a crime scene under the jurisdiction of the NSW Police. - If the remains are identified as pre-contact or historic Aboriginal, the site would be secured and OEH and all RAPs notified in writing. Where impacts to exposed Aboriginal skeletal remains cannot be avoided, remains would be retrieved via controlled archaeological excavation and reburied outside of the Disturbance Boundary in a manner and location determined by RAPs. - If the remains are identified as historic non-Aboriginal, the site would be secured and the NSW Heritage Branch contacted.
Additional Mitigation Measures
• No additional measures required.

6. ADDITIONAL MANAGEMENT AND MITIGATION MEASURES SUMMARY

No additional management measures are required to mitigate the Modification activities. The current Project environmental management measures and actions would minimise the potential environmental impacts of the Modification.

However the Remediation Works Environmental Management Plan would be amended to reflect the Modification. This would also include modification of the following management plans:

- Biodiversity Management Plan
- Soil and Water Management Plan (including the Erosion and Sediment Control Plan and Contaminated Soil Management Plan)
- Aboriginal Heritage Management Plan.

7. CONCLUSION AND JUSTIFICATION

The Modification is required to:

- Amend the Project footprint to reflect the area required to undertake the activities approved under the development consent for SSD 6666. This reduced footprint would reduce the potential for environmental incidents, including the recontamination of the remediated area in the south and southwest of the Site. It would also facilitate new employment-generating development in this area by removing potential regulatory and planning issues
- Remove the switchyard from the area subject to the development consent for SSD 6666. This would reflect the approach described in the Response to Submissions, and reflect that remediation of the switchyard is being undertaken independently of the Project. It would also remove potential regulatory and planning issues associated with the area also being subject to the proposed construction and operation of the Hunter Power Project (SSI-12590060)
- Amend (reduce) the amount of native vegetation clearance permitted under the development consent for SSD 6666 so that it reflects the reduced area of required vegetation clearance. This will provide a requirement for Hydro and the Remediation Contractor to limit vegetation clearance to that reduced amount
- Reduce the number of biodiversity credits required by Condition B41 to reflect the reduce area of vegetation clearance. This reduces the logistical and financial imposition on Hydro to identify and retire (purchase) the required credits currently described in Condition B41 of the development consent for SSD 6666
- The northern area to the east of the Clay Borrow Pit has been identified as being covered with a large amount of fill material, including contaminated materials. The removal of Condition B38 from the development consent for SSD 6666 is required to allow this to occur, and provide the environmental benefit associated with the removal and disposal or reuse of this material.

This Modification Application has been prepared in accordance with section 4.55 of the EP&A Act. It is concluded that, in accordance with section 4.55(1A) the modification would be:

- of minimal environmental impact
- substantially the same as the development for which consent was originally granted and before that consent as originally granted was modified at all.

It is requested that the existing approval of SSD 6666 be modified by the Department under Section 4.55 of the EP&A Act.

8. REFERENCES

AECOM. (2015). *Aboriginal Cultural Heritage Assessment Report - Hydro Aluminium Kurri Kurri Smelter.*

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Ramboll. (2020). *Response to Submissions Report Former Hydro Aluminium Kurri Kurri Smelter Remediation.*

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9. LIMITATIONS

Ramboll Australia Pty Ltd (Ramboll) prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Kurri Kurri Pty Ltd dated 3 May 2019 and in accordance with our understanding and interpretation of current regulatory standards.

Site conditions may change over time. This report is based on conditions encountered at the site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll’s professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll’s knowledge as at the date of the assessment.

Ramboll did not independently verify all of the written or oral information provided to Ramboll during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

9.1 User Reliance

This report has been prepared exclusively for Hydro Aluminium Kurri Kurri Pty Ltd and may not be relied upon by any other person or entity without Ramboll’s express written permission.

APPENDIX 1
AGENCY CONSULTATION CORRESPONDENCE

ENVIRONMENT
& HEALTH

Department of Planning, Industry and Environment
4 Parramatta Square
12 Darcy St
Parramatta NSW 2150
Attention: Sheelagh Laguna
Email: sheelagh.laguna@planning.nsw.gov.au

Dear Sheelagh,

Date 28/05/2021

Ramboll
Level 2, Suite 18 Eastpoint
50 Glebe Road
PO Box 435
The Junction
NSW 2291
Australia

T +61 2 4962 5444
https://ramboll.com

Ref SSD 6666

SSD 6666 Hydro Remediation Project: Modification Scoping Request for Modification No. 2

Introduction

Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) proposes to submit an application for a modification to the development consent for SDD 666 that incorporates the following:

- A revised Project boundary, which reduces the Project footprint
- An associated reduction in the vegetation clearance area, and the subsequent re-calculated biodiversity credit requirements as described in Condition B41
- The removal of the designation of the northern area (north of the powerlines) east of the Clay Borrow Pit as a potential archaeological deposit/ area of high archaeological sensitivity, and removal of Condition B38 from the development consent from SSD 6666
- The excavation of the fill material in this area. The removed material would either be reused in filling voids within the Smelter or (if required due to contaminant levels) placed in the Containment cell.

This would form Modification No. 2 (MOD 2).

Need for the Modification

The proposed changes that would form part of MOD 2 are needed based on the following:

- The reduction in the Project footprint is based on the following factors:
  - The Project footprint that was proposed as part of SSD 666 was based on the original development application that included demolition and remediation. It remained unchanged as there was an assumption that at least part of the demolition (which weas subsequently subject to two separate development applications to Cessnock City Council) and the remediation would occur concurrently and the space would be required. However, due to the time taken to receive development consent for SSD 6666 the majority of demolition is completed, and the need for much of the nominated Project footprint is no longer required.
  - The switchyard in the north of the Project footprint was originally nominated for demolition, and remediation if investigations (that could only be undertaken once it was decommissioned) identified contamination. However as noted in the RtS "*Following discussions with prospective purchasers about the potential for ongoing use of the transformer yard, Hydro does not currently intend to decommission the infrastructure.*"
    As the Department is likely to be aware, the switchyard is in the footprint of the gas fired power station proposed by Snowy Hydro. As of 1 June 2021 Hydro will hand control of the switchyard and other land associated with power station under licence to the McCloy Group. The McCloy Group and Stevens Group (MCloy Stevens, or MCS) have an agreement with Hydro to acquire the Hydro land (excluding the Containment Cell land). And demolition and remediation activities that would occur in this land would be the responsibility of MCS and undertaken independently of the demolition and remediation activities under Hydro's control. No materials from these activities would be placed in the Containment Cell
  - Hydro worked with the remediation contractor, Daracon, to review the Project footprint and identify areas where vegetation clearance could be avoided. This has been completed and reflected by a net reduction in vegetation clearance requirements.
- As a result of the reduced area of vegetation clearance, Hydro commissioned a review of the biodiversity credit calculations. This review has identified that the biodiversity credits required by Condition B41 need to be reduced
- Hydro has completed further investigations of the potential for contamination in the area identified as Aera of Concern (AEC) 30, which is the area east of the Clay Borrow Pit (or east of the Containment Cell location). The removal of material derived from the Hunter Expressway that was stored in this area allowed for investigations (including test pitting) to occur. These investigations showed that a significant depth of fill was present in this area. A review of a photograph from 1983 (when the third pot line was under construction) shows that this fill extended into the area that was identified by the Aboriginal heritage assessment (AECOM, 2016) as a potential archaeological deposit/ area of high archaeological sensitivity. Hydro needs Condition B38 to be removed to:
  - Facilitate additional investigations within this area to determine the depth and extent of fill, if there are any areas of contamination that requires remediation (including disposal in the Containment Cell), and the amount of clean fill that would be available for use in the filling of voids within the Project site (such as the footprint of the Capped Waste Stockpile).
  - Allow the excavation of the fill material to be completed
  - Ensure that the registered Aboriginal parties understand that this area is not a potential archaeological deposit/ area of high archaeological sensitivity and that the works can be undertaken without risking impacts to Aboriginal heritage
- The EIS and response to Submissions acknowledged the need to investigate the area east of the Clay Borrow Pit and the potential need for remediation. The fill material in this area would be removed for contamination (if required) and/ or aesthetic reasons (return the area to the natural ground level).

Proposed Assessment and Consultation

The following are the key tasks and consultation in the preparation of MOD 2:

- Recalculation of the biobanking offset calculation (completed). This has been prepared in consultation with the Biodiversity and Conservation Division (BCD) of the Department of Planning, Industry and Environment.
- Preparation of an Aboriginal heritage impact assessment addendum report. It is proposed that the archaeologist would:
  - Consult with the registered Aboriginal parties (RAPs) to discuss the purpose of the addendum report and invite them to be involved in the assessment
  - Further review of historical photographs and the data from test pits adjacent to the area to confirm that the area has been filled
  - A site walkover (with the RAPs if they wish to attend) to confirm these findings
  - Preparation of the addendum report in consultation with Heritage NSW
  - Consultation with Heritage NSW to remove the registration of the site as a potential archaeological deposit location
- Review the impact assessment and management measures for the Project to determine if MOD 2 presents any additional impacts or requires any additional management measures

As noted some of these tasks have been completed, and others have commenced.

We request that the Department confirms their agreement to the proposed assessment methodology and consultation. We would of course be available for a meeting to discuss.

Yours sincerely

Shaun Taylor
Senior Managing Consultant

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NSW GOVERNMENT
Planning,
Industry &
Environment

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Suite 18, 50 Glebe Road
The Junction NSW 2291

04/06/2021

Dear Mr Taylor

Hydro Kurri Kurri Aluminium Smelter Remediation (PMA-19306206)
Modification 2

I refer to your correspondence concerning a proposed modification to the **Hydro Kurri Kurri Aluminium Smelter Remediation**.

The Department has reviewed the proposed approach to preparing a modification application and is satisfied that the application may be progressed. As discussed on 3 June 2021, please ensure that sufficient information is provided to justify the removal of the switchyard area from the project footprint, with particular focus on how this would impact the remediation timetable and Hydro's ability to satisfy the requirements of its SSD 6666 consent.

Your next step will be to lodge your modification application through your dashboard on the new Major Projects website (http://www.planningportal.nsw.gov.au/major-projects).

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Commonwealth Department of Agriculture, Water and Environment to determine if an approval under the EPBC Act is required (http://www.environment.gov.au or 6274 1111).

If you have any questions, please contact Sheelagh Laguna on 02 9274 6574 or sheelagh.laguna@planning.nsw.gov.au.

Yours sincerely,

Chris Ritchie

Director
Industry Assessments

From: Phil Wood <Phil.Wood@environment.nsw.gov.au>
Date: 7 April 2021 at 10:38:39 am AEST
Subject: RE: BBAM calculator data

Those cases are now yours so you should be able to edit and submit them. You should also be able to create a copy if you wanted to keep the originals. The BBCC will allow up to 4 versions of the one assessment.

I can't really advise about the plot numbers – I suspect if you use a different number than ELA did you'll generate a different site value, but you can probably expect it will change given that you're changing the footprint anyway. Under BBAM you're only required to enter the minimum plot numbers required, but if you're trying to replicate what they've done you will probably need to use 10 plots.

However, it looks like these two versions were created in 2015. We updated the BBCC for the last time in August 2016, so there's a reasonable chance the data in there now is at least slightly different from when the case was first created, so even if you use exactly the same plot data they used you may get a different site value. I suspect you'll have to have a bit of a forensic dig around in the assessments to work out what the differences are.

Cheers,
Phil

From: Arien Quin <Arien.Quin@ghd.com>
Sent: Wednesday, 7 April 2021 9:30 AM
To: Phil Wood <Phil.Wood@environment.nsw.gov.au>
Subject: RE: BBAM calculator data

Can I please also just ask as I have not had to do an addendum for a BBAM project before – can I just edit the credit calculator you just sent me – Also ELA has included 10 plots (7 for one PCT and 3 for the other) in their assessment (although only two are required and only two of them fell within the SSD area). In the interest of consistency should I just also take the same approach and use the 10 plots they did to determine the site value scores ?

Thanks

Arien Quin
BSC (Botany) / BArts – Accredited BAM Assessor
Senior Ecologist, Team Leader (Newcastle)

I am currently working part time. My office days are Monday, Tuesday, Wednesday

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Please consider the environment before printing this email

From: Phil Wood <Phil.Wood@environment.nsw.gov.au>
Sent: Wednesday, 7 April 2021 9:18 AM
To: Arien Quin <Arien.Quin@ghd.com>
Subject: RE: BBAM calculator data

Hi Arien,

There are two versions of this assessment – the report is from version 2. I've just sent both to your account.

Cheers,
Phil

From: Arien Quin <Arien.Quin@ghd.com>
Sent: Wednesday, 7 April 2021 8:35 AM
To: Phil Wood <Phil.Wood@environment.nsw.gov.au>
Subject: BBAM calculator data

HI Phil

I am wondering if you can help me. GHD has been asked to prepare an addendum to a BBAM assessment that was completed back in 2019 at Kurri Kurri following a reduction in the project footprint (I have attached original BioBanking Credit Report).

ELA completed the original assessment and we have been given their plot data. The problem is however when I put the data we have for the site (i.e the plots that were completed within the SSD area) into the credit calculator I am getting a different generation of credits requires which indicates to me this isn't the actual data that was used in the original credit calculations. We have been in touch with ELA but they don't have records of the data that was uses and Antony Von Chrismar (who is the accredited assessor who run the calculations) has not gotten back to me regarding whether he still has access to the calculator and could check the plot data that was used for me (it would have only been two plots).

I am wondering if you are able to either transfer the case over to me or provide me with the plot data that was originally used (so I can then just adjust the area of impact).

If you could possibly give me a call to discuss options that would be greatly appreciated.

Thanks kindly

Arien Quin
BSC (Botany) / BArts – Accredited BAM Assessor
Senior Ecologist, Team Leader (Newcastle)

I am currently working part time. My office days are Monday, Tuesday, Wednesday

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Any views expressed in this email are those of the individual sender except where the sender expressly and with authority states them to be the views of the NSW Office of Environment and Heritage.

PLEASE CONSIDER THE ENVIRONMENT BEFORE PRINTING THIS EMAIL

From: McLaren, Andrew
To: David Gordon (David.Gordon@environment.nsw.gov.au)
Subject: Request for change of status - Hydro PAD1 (37-6-3872)
Date: Wednesday, 18 August 2021 9:09:47 AM
Attachments: Hydro_ACHAR_Addendum_2021_08_16_FNL.pdf

Morning David,

I am writing to request a change of status for AHIMS registered PAD site Hydro PAD1 (37-6-3872). The site is currently listed on AHIMS as 'Valid'. However, we request that this status be changed to 'Not a Site'. In support of this request, please find attached an Addendum ACHAR for the approved Hydro Kurri Kurri Aluminium Smelter Remediation Project (SSD-6666) (the Project), prepared specifically for this purpose.

Hydro PAD1 was originally identified as part of AECOM's 2015 Aboriginal cultural heritage assessment for the Project. At the time, Hydro PAD1 was identified as an area of high Aboriginal archaeological sensitivity on the basis of its landform context, as well as then examined historical aerial photographs and field observations, which suggested that this area retained a moderate degree of ground integrity. In order to avoid any impacts to potential subsurface deposits within its bounds, AECOM's (2015) ACHAR recommended that Hydro PAD1 should, in the event of its use for stockpiling, be protected through geo-matting. This recommendation was subsequently formalised in the Conditions of Approval (CoA) for SSD6666 as Condition B38 and included as management measure in the Project's Aboriginal Heritage Management Plan.

Presented in the attached Addendum ACHAR are the results of a reassessment of Hydro PAD1, made on the basis of a desktop review of 13 historical photographs for the site, spanning the years 1954 to 2019, as well as recently obtained subsurface soil profile data for land within and surrounding the PAD, generated as part of a broader contamination investigation across the Smelter site. Registered Aboriginal Parties (RAPs) involved in AECOM's 2015 Aboriginal cultural heritage assessment for the Project (n = 34) have also been consulted regarding the results of the current assessment (see Section 4.0).

Contra AECOM's (2015) earlier assessment of Hydro PAD1, the attached Addendum ACHAR finds that:

- Land within Hydro PAD1 was severely disturbed in or around 1983 as a result of heavy earthworks linked to the construction of the Smelter's third potline;
- Natural soil profiles within and to the south of Hydro PAD1 have been radically altered as a result of the above. For Hydro PAD1, a complete loss of potential artefact-bearing topsoils is inferred; and
- Land within Hydro PAD1 retains negligible potential for subsurface Aboriginal archaeological deposits and, as such, does not comprise an area of PAD.

In view of the above, we believe a change of status is warranted for this site.

Happy to discuss our request further, if required.

Kind regards,

Andy McLaren

Dr Andrew McLaren
Principal Aboriginal Heritage Specialist
M 0403 753 165
Andrew.McLaren@aecom.com

APPENDIX 2
BIODIVERSITY ASSESSMENT

Hydro Aluminium Kurri Kurri Pty Ltd

Biodiversity Assessments - Hydro Site

Hydro Aluminium Kurri Kurri Smelter Remediation and Demolition - Modification to Biobanking Offset Calculations

July 2021

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Appendices

Glossary of terms and acronyms

Term	Definition
BAM	Biodiversity Assessment Methodology
BBAM	The NSW BioBanking Assessment Methodology (OEH 2014)
BC Act	*Biodiversity Conservation Act 2017 (NSW)*
BCD	Biodiversity Conservation Division of NSW Department of Planning, Industry and Environment, formerly NSW Office of Environment and Heritage (OEH). Note that data maintained by the current BCD appears on the internet as published by OEH and is referenced as such in this report.
BCT	NSW Biodiversity Conservation Trust (BCT, formerly Nature Conservation Trust)
Biobank site	Land that is designated by a biobanking agreement under Part 7A of the former TSC Act to be a biobank site (see Biodiversity Stewardship Site – BSS).
Biobanking agreement	An agreement entered into between the landowner and the NSW Environment Minister under Part 7A of the former TSC Act for establishing a biobank site (see Biodiversity Stewardship Agreement – BSA).
Biodiversity credit	A unit of biodiversity value to measure specific development impacts or conservation gains in accordance with the FBA, the BBAM or the BAM. Includes ecosystem credits or species credits.
Biodiversity credit report	Specifies the number and type of biodiversity credits required to offset the impacts of a Major Project in accordance with the FBA or that would be generated through conservation and management of an offset site under a BioBanking agreement or a BSA.
Biodiversity offsets	Specific measures that are put in place to compensate for impacts on biodiversity values.
Biodiversity Stewardship Agreement (BSA)	An agreement entered into between the landowner and the Minister under Part 5 of the *Biodiversity Conservation Act 2016* (BC Act) for establishing a Biodiversity Stewardship Site.
Biodiversity Stewardship Site (BSS)	Land that is designated by a Biodiversity Stewardship Agreement to be a Biodiversity Stewardship Site. Equivalent to the former ‘biobank site’.
Biodiversity values	The composition, structure and function of ecosystems, including native species, populations and ecological communities, and their habitats.
Ecosystem credit	The class of biodiversity credits created or required for the impact on EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur within a vegetation type according to the BBAM, FBA and BAM.
EEC	Endangered ecological community
EIS	Environmental Impact Statement
ELA	EcoLogical Australia Pty Ltd
EPBC Act	The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPBC Act-listed biota	Threatened species and communities and migratory species listed under the EPBC Act.
FBA	The Framework for Biodiversity Assessment (OEH 2014a). The methodology to assess impacts on biodiversity that is used to assess all biodiversity values on the development site for a Major Project under the NSW *Environmental Planning and Assessment Act 197*9 (EPA Act) and in accordance with The NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a).
Food tree	A tree species that is recognised as being of value as a foraging resource for a given fauna species.
GIS	Geographic information systems
Habitat tree	A tree that is recognised as being of value as a shelter, roosting and/or nesting resource for fauna species. Includes hollow-bearing trees, stags (standing dead trees) and trees with nests or other signs of fauna occupancy.
Migratory species	Species that are listed as migratory under the EPBC Act.
NSW-listed biota	Threatened species, populations and communities listed under the NSW BC Act or FM Act.

Term	Definition
OEH	Former NSW Office of Environment and Heritage now Biodiversity Conservation Division of NSW Department of Planning, Industry and Environment. Note that data maintained by the current BCD appears on the internet as published by OEH and is referenced as such in this report.
PCT	Plant community type
The Project	The remediation of the former Hydro Aluminium Smelter located at Hart Road in Loxford, NSW that is the subject of this report.
Project modification area	The area that would be subject to direct impacts arising from the Project modification and that is the subject of this report.
Retired (credits)	Means biodiversity credits that have been used to offset the impacts of a particular development or to facilitate private land conservation and that are not available to offset the impacts of a development.
Species credit	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates according to the BBAM, FBA and BAM.
Species-credit type threatened species	Threatened species that are linked to species credits according to the BBAM (rather than ecosystem credits) because they cannot be reliably predicted to use an area of land based on habitat surrogates according to the BBAM.
TEC	Threatened ecological community listed under the EPBC Act and/or the BC Act.
The EPBC Act Offsets Policy	The *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy October 2012* (DSEWPaC 2012)
The locality	Land within a 10 km radius of the Project modification area.
Threatened biota	Threatened species, populations or communities listed under the EPBC Act, BC Act or FM Act.
TSC Act	The *Threatened Species Conservation Act 1995* (NSW), which was repealed and replaced by the BC Act in August 2017.

1. Introduction

1.1 Project background

Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) is in the process of remediating the former Hydro Aluminium Smelter (the Project). The Project involves the demolition of redundant smelter buildings and structures, remediation of the site and design, construction, and operation of a waste management facility. The Project is located at Hart Road in Loxford, NSW.

The Project was determined to be State Significant Development (SSD) requiring approval under Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). An Environmental Impact Statement (EIS) was prepared in July 2016 (*Former Hydro Aluminium Kurri Kurri Smelter Demolition and Remediation)* to assess the potential impacts of the Project in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (dated 18 November 2014). Approval for the Project was granted by the Department of Planning, Industry and Environment (DPIE) on 20 December 2020 (SSD-6666).

As part of the EIS for the Project an ecological assessment was completed (ELA 2016). This assessment detailed the potential impacts of the Project on biodiversity values and calculated the biodiversity credits required to offset these impacts in accordance with the Biobanking Assessment Methodology (BBAM) (OEH 2014).

The project was referred to the Australian Government Minister for the Environment and Energy under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to the potential of impacts to threatened species listed under the EPBC Act. The Australian Minister for the Environment determined on 29 March 2016 that the Project was not deemed to be a controlled action. No additional assessment, approval or biodiversity offsets are required under the EPBC Act.

1.2 Proposed modification

Hydro is proposing to modify the Project planning approval SSD 6666 under section 4.55 (1a) of the EP&A Act. The proposed modification includes:

- Revision of the project boundary which reduces the project footprint
- Revision of the vegetation clearance area, and the associated re-calculated biodiversity credit requirements

This *Hydro Aluminium Kurri Kurri Smelter Remediation and Demolition - Biobanking Offset Calculations Modification Report* (report) forms part of the application for the proposed modification to the Project approval, and informs the assessment of the revision of the vegetation clearance area.

The proposed modification has resulted in a reduced quantum of impact to biodiversity values. This includes a reduction in the extent of native vegetation that would be removed and a reduction to the number of threatened flora and area of threatened fauna habitat that would be impacted as a result of the Project.

In relation to biodiversity the proposed modification would require the modification of Condition of Approval B41.

1.3 Purpose and scope of this report

GHD has been engaged to assess the impacts of the revised Project boundary on biodiversity values and recalculate the offset requirements for the Project in accordance with the BBAM. The purpose of this Biobanking Offset Calculations Modification Report is to:

- Describe the background and legislative context for the assessment
- Outline the methods used in the assessment and the relationship to the previous ecological assessment (ELA 2016)
- Update the impact assessment for the Project including a description of measures to reduce impacts on biodiversity values and summary of the quantum of residual impacts
- Complete a revised BioBanking assessment with reference to the FBA and based on the reduced quantum of impact associated with the Project modification and updated field survey data and other information related to the assessment of impacts on threatened biota
- Calculate the biodiversity credits that would need to be retired to offset the residual impacts of the Project modification

This report forms part of the modification report for the Project (as described in Section 1.2).

1.4 SEARs

The EIS for the project was prepared in accordance with the SEARs issued on 18 November 2014. Relevant SEARs relating to biodiversity requirements are provided in Table 1-1.

Note that not all of these SEARs are applicable to this assessment as the purpose of this report is to assess the reduction in offset requirements associated with the proposed modification.

Table 1-1 Secretary's Environmental Assessment Requirements Scenario 2 requirements relevant to biodiversity

Requirements	Where addressed
1. The environmental assessment should include a detailed biodiversity assessment, including assessment of impacts on threatened biodiversity, native vegetation and habitat. This assessment should address the matters included in the following sections:	This report
2. A field survey of the site should be conducted and documented in accordance with relevant guidelines, including: • Threatened Biodiversity Survey and Assessment: Guidelines for Development and Activities – Working Draft • Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians • Threatened species survey and assessment guideline	This requirement is not applicable to this modification. These matters were addressed in the Project ecological assessment (ELA 2016)
3. The EA should contain the following information as a minimum:	
a) The requirements set out in the *Guidelines for Threatened Species Assessment* (Department of Planning July 2005)	N/A
b) Description and geo-referenced mapping of the study area	Figure 1
c) Description of survey methodologies used, including timing, location and weather conditions	Section 2
d) Details including qualifications and experience of all staff undertaking surveys, mapping and assessment of impacts as part of the EA	Section 2

Requirements	Where addressed
e) Detailed descriptions of all vegetation communities (both forested and non-woody eg. derived grasslands including classification and methodology used to classify) including all plot data. Plot data should be supplied to the OEH in electronic format (e.g. MS-Excel) and organised by vegetation community. Copies of all plot data (quadrat/transect sheets should also be provided)	Refer to Project EA Appendix 10 Section 5.2 and Appendix B. This requirement is not applicable to this modification.
f) Identification of national and state listed threatened biota known or likely to occur in the study area and their conservation status	Section 3
g) Description of the likely impacts of the proposal on biodiversity and wildlife corridors, including direct and indirect and construction and operation impacts. Wherever possible, quantify these impacts such as the amount of each vegetation community or species habitat to be cleared or impacted, or any fragmentation of a wildlife corridor	This requirement is not applicable to this modification. Refer to Project EIS Appendix 10 Section 6
h) The proposal should provide an assessment of the cumulative impacts of the proposal in relation to other nearby developments	This requirement is not applicable to this modification. Refer to Project EIS Appendix 10 Section 6
i) Identification of the avoidance, mitigation and management measures that will be put in place as part of the proposals to avoid or minimise impacts, including details about alternative options considered and how long-term management arrangements will be guaranteed.	Section 3.1
j) Description of the residual impacts of the proposal. If the proposal cannot adequately avoid or mitigate impacts on biodiversity then a biodiversity offset package is expected (see the requirements for this at point 6 below)	Section 4.5 and Section 4.6
k) Provision of specific Statement of Commitments relating to biodiversity	This requirement is not applicable to this modification.
4. As assessment of direct and indirect impacts of the proposal must be undertaken for threatened biodiversity known or considered likely to occur in the study area based on the presence of suitable habitat. This assessment must take into account:	
a) The factors identified in s.5A of the EP&A Act, and b) The guidance provided by the *Threatened Species Assessment Guideline – the Assessment of Significance*	Section 3.1.4 Section 3.1.5
5. Where an offsets package is proposed by a proponent for impacts to biodiversity (as a BioBanking Statement has not been sought) this package must be developed in accordance with the NSW offset principles for major projects (state significant development and infrastructure), which may be guided by the NSW OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A State significant development (SSD) and State significant infrastructure (SSI) projects.	Section 4
6. Where appropriate, likely impacts (both direct and indirect) on any adjoining and/or nearby National Parks and Wildlife Service estate or any marine and estuarine protected areas	This requirement is not applicable to this modification.

Requirements	Where addressed
7. With regard to the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, the assessment should identify any relevant Matters of National Environmental Significance and whether the proposal has been referred to the Commonwealth or already determined to be a controlled action	Refer to Project EA Appendix 10 and Project Referral (ELA 2015). The modification has resulted in a reduction to impacts to MNES and has not changed the conclusion of the referral.

1.5 Scope and limitations

This report: has been prepared by GHD for Hydro Aluminium Kurri Kurri Pty Ltd and may only be used and relied on by Hydro Aluminium Kurri Kurri Pty Ltd for the purpose agreed between GHD and the Hydro Aluminium Kurri Kurri Pty Ltd as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Hydro Aluminium Kurri Kurri Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report refer section 5. of this report GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Hydro Aluminium Kurri Kurri Pty Ltd, EcoLogical Australia, Dracon and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has not been involved in the preparation of the *Statement of Environmental Effects: Modification 2 to SSD 6666 – Project Boundary and Aboriginal Heritage Amendments* (Ramboll, 2021) (MOD 2 SEE) and has had no contribution to, or review of the MOD 2 SEE other than this Modification to Offset Calculations Report. GHD shall not be liable to any person for any error in, omission from, or false or misleading statement in, any other part of the MOD 2 SEE.

2. Methodology

2.1 Desktop assessment

The Project area and surrounding land was assessed as part of the ecological assessment completed for the Project Environmental Assessment (Project EA) (ELA 2016). This report was reviewed along with the BBAM plot data collected as part of the ELA assessment and BioBanking credit calculations for the Project (Biobanking proposal case ID 0080/2015/1896D).

2.2 Geographical Information System (GIS) analysis

Vegetation mapping and threatened species data that was completed in 2016 was provided to GHD as shape files (ELA 2016). This data was imported into ArcGIS software to calculate revised areas of impact to native vegetation and threatened biota known or assumed to occur within the Project area.

GIS analysis was also used to plot the assessment circles surrounding the modified Project area in which landscape scores are calculated. Native vegetation cover, extent and connectivity were assessed using aerial photography and GIS data supplied by ELA that was used for their assessment.

The assessment circles and GIS area calculations were used to enter information about landscape value and to determine the change in Landscape Value score by assessing the impact of the modified Project on native vegetation cover and connectivity as well as the size of adjacent remnant vegetation.

2.3 Threatened flora surveys

Targeted threatened flora surveys were completed within the Project modification area by two GHD ecologists on 8 October 2020. The purpose of this survey was to ground-truth threatened species points for *Eucalyptus parramattensis* subsp. *decadens* and *Grevillia parviflora* subsp. *parviflora* that were collected during the 2016 ecological survey of the site (ELA 2016). During this survey transects spaced five metres apart were walked throughout the revised Project area and any threatened flora recorded using an ArcGIS collector program.

2.4 Threatened fauna habitat assessments

To assist with the refinement of threatened fauna species polygons, habitat assessments were completed within the revised Project area for the following fauna species that were identified in the Project ecological assessment as requiring species credit calculations:

- Regent Honeyeater (*Anthochaera phrygia*)
- Green-thighed Frog (*Litoria brevipalmata)*
- Southern Myotis (*Myotis macropus*)
- Koala (*Phascolarctos cinereus*).

2.5 BioBanking assessment

Biodiversity credits were calculated according to the methodology presented in the *BBAM and Credit Calculator Operational Manual* (DECC 2009) and the *Draft Operational Manual for using the BioBanking Credit Calculator v2.0* (OEH 2014). The credit calculator is the software version of the methodology. Landscape values, vegetation zones, geographic habitat features and BBAM plot data previously used in the BBAM credit calculator to determine offset requirements for the approved Project was duplicated for the assessment of the revised area (data extracted from proposal ID 0080/2015/1896D). Revised areas for vegetation impacts and threatened fauna species polygons were calculated using GIS and entered into the BBAM calculator.

2.6 Staff qualifications

This report was prepared by Arien Quin (BBAM accreditation 0120) using credit calculator Version 4.0. The credit calculations have been submitted to the Biodiversity Conservation Division (BCD) and the biodiversity credit report is included as Appendix A.

The experience and qualifications of staff involved in the preparation of this report are provided in Table 2-1.

Table 2-1 Staff qualifications

Name	Position / Project Role	Qualifications	Years of experience
Ben Harrington	Technical director - Biodiversity Technical Review	BSc, MSc Accredited BBAM assessor Accredited BAM assessor	17+
Arien Quin	Senior ecologist BBAM credit calculations Reporting	BA/BSc (Botany major) Accredited BBAM assessor Accredited BAM assessor	14+
Alejandro Barreto	Senior ecologist Targeted flora surveys	BSc Biotechnology Accredited BAM Assessor	6+
Brayden Luke	Ecologist Targeted flora surveys	BSc	3+
Fiona MacKay	Senior GIS technician GIS analysis and calculations	Engineering Drafting Certificate	15 +

2.7 Assumptions

Calculations used in this report have relied upon Biobanking Assessment Methodology (BBAM) plot/transect data collected during the field surveys associated with the ecological assessments completed for the Project EA (ELA 2016). It has also used data contained in the BBAM calculator (proposal ID 0080/2015/1896D) that was provided by the Biodiversity Conservation Division (BCD). These data have not been independently verified by GHD. It is assumed that field data that was used to inform the Project EIS is accurate.

As part of detail design of the Project the project footprint was reduced to avoid areas of native vegetation that were approved for clearing. A ground survey of the revised footprint was completed by Dracon prior to vegetation clearing commencing, this data was provided to GHD as a DWG file that was then used to map the extent of vegetation clearing and determine project impacts on biodiversity. These data have not been ground-truthed or otherwise independently verified by GHD. It is assumed that this survey data is accurate.

3. Impact assessment

3.1 Impact avoidance

Section 6.1 of the ecological assessment completed as part of the Project EA outlines the measures undertaken to avoid and minimise impacts to native vegetation and threatened biota (ELA 2016).

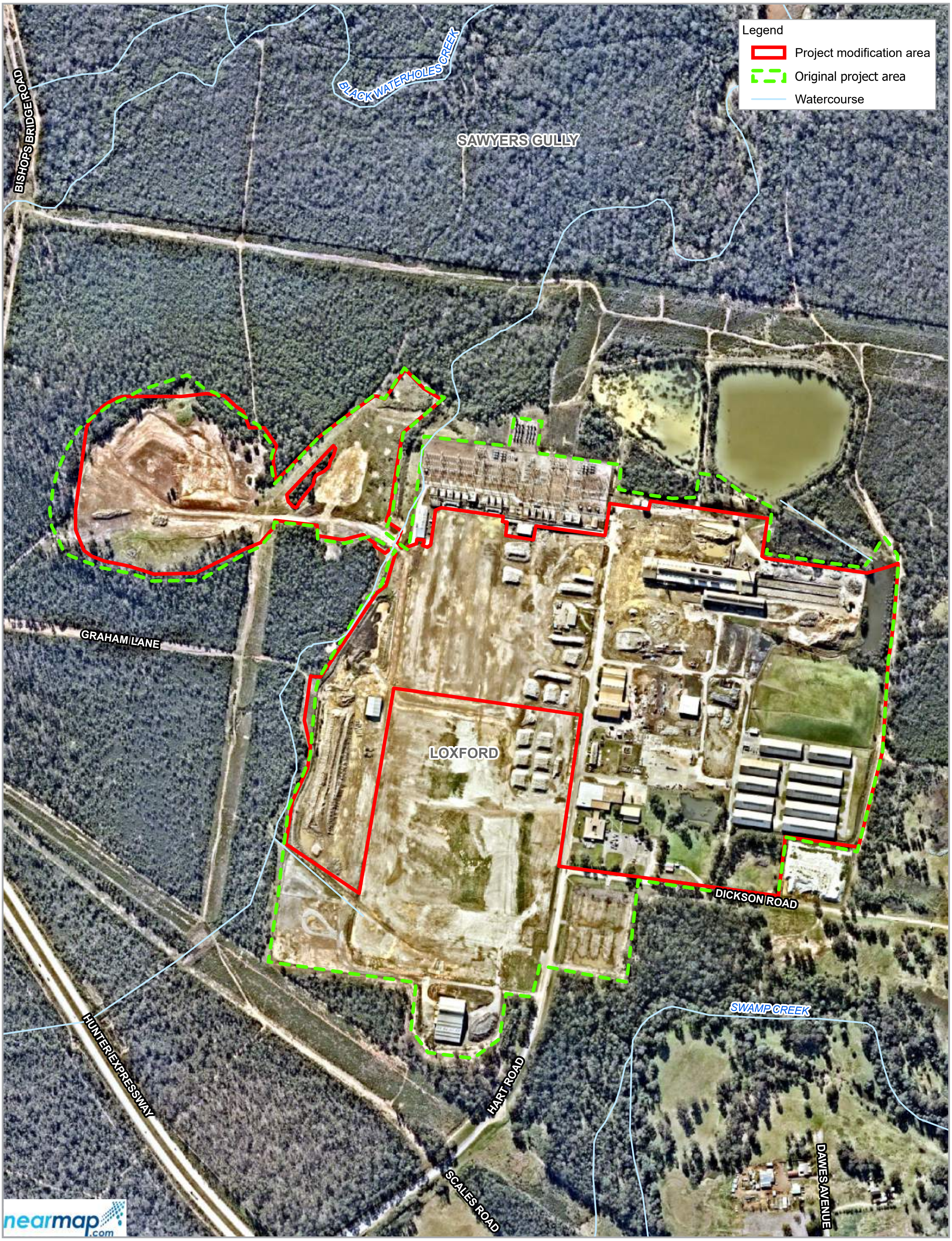
The proposed Project modification has resulted in further avoidance of impacts to additional areas of native vegetation, threatened flora species and habitat for threatened fauna. The reduced quantum of residual impact to biodiversity values are described below.

3.2 Residual impacts

3.2.1 Native vegetation

The Project EA determined that the Project would result in a residual impacts to 2.5 hectares of native vegetation. Including 1.35 hectares of Parramatta Red Gum -Narrow Leaved Apple-Prickly-leaved Paperbark Shrubby Woodland in the Cessnock- Kurri Kurri Area (HU 847) and 1.35 hectares of Spotted Gum-Red Ironbark- Narrow-leaved Ironbark -Grey Box Shrub-grass Open Forest of the Lower Hunter (HU 814). Vegetation in the impact area comprises part of local occurrences of endangered ecological communities (EECs) as summarised in in Table 3-1.

Avoidance of additional areas of native vegetation during detailed design has reduced the area of native vegetation to be cleared to 1.53 hectares. This includes 0.97 hectares of Parramatta Red Gum -Narrow Leaved Apple- Prickly-leaved Paperbark Shrubby Woodland in the Cessnock- Kurri Kurri Area (HU 847) and 0.56 hectares of Spotted Gum-Red Ironbark- Narrow-leaved Ironbark -Grey Box Shrub-grass Open Forest of the Lower Hunter (HU 814). A summary of the reduced impacts to native vegetation associated with the modification is provided in Table 3-1.



Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Hydro Aluminium Kurri Kurri Pty Ltd
Biodiversity Assessments - Hydro Site Hydro Aluminium Kurri Kurri Smelter Remediation and Demolition - Modification to Biobanking Offset Calculations

Project No.	**22-20284**
Revision No.	***0***
Date	**27/07/2021**

Project modification

Figure 3-1

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Data source: Nearmap: Aerial dated 20200615, extracted 20200825; LPI: DTDB / DCDB, 2017; ELA: Vegetation, 2017; Hydro: Cleared areas, 2021; . Created by:

Table 3-1 Summary of reduced impacts to native vegetation within the Project area

Vegetation Community	Conservation Status	Approved area of impact (ha)	Revised area of impact (ha)	Reduction in impact area (ha)
Parramatta Red Gum -Narrow Leaved Apple-Prickly-leaved Paperbark Shrubby Woodland in the Cessnock- Kurri Kurri Area (HU 847)	Kurri Sand Swamp Woodland in the Sydney Basin Bioregion EEC	1.35	0.97	0.38
Spotted Gum-Red Ironbark- Narrow-leaved Ironbark - Grey Box Shrub-grass Open Forest of the Lower Hunter (HU 814)	Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion EEC	1.15	0.56	0.59
TOTAL		**2.50**	**1.53**	**0.97**

3.2.2 Threatened flora

The Project EA determined that the proposal would impact four (4) *Eucalyptus parramattensis* subsp. *decadens* individuals (listed as a vulnerable species under the *Biodiversity Conservation Act 2016* (BC Act) and a single clump of *Grevillea parviflora* subsp. *parviflora* consisting of five (5) stems (listed as vulnerable species under the BC Act).

The reduction to the Project footprint associated with the modification has subsequently resulted in the avoidance of all impacts to *Grevillea parviflora* subsp. *parviflora* and a reduction in impacts to *Eucalyptus parramattensis* subsp. *decadens* to one (1) individual.

3.2.3 Threatened fauna

The avoidance of 0.97 hectares of native vegetation has also resulted in reduced impacts to habitat for threatened fauna including species credit species identified as having potential to occur in the Project area (ELA 2016). These reduced impacts are summarised in Table 3-2. It should be noted that the reduction in impact area for Southern Myotis also reflects supplementary habitat assessments conducted by GHD ecologists with reference to guidelines for the mapping of species polygons for threatened bats (OEH 2018) that were published after the original ecological assessment was completed (ELA 2016), Further discussion regarding impacts to these species is provide in Section 4.4.

Table 3-2 Summary of reduced impacts to species credit species within the Project area

Threatened biota	Habitat assessed as impacted in Project EA (ha) (ELA 2016)	Revised impacts to habitat associated with modification (ha)	Reduction in impact area (ha)
Regent honeyeater	1.15	0.56	0.59
Green-thighed Frog	1.46	0.36	1.10
Southern Myotis	14.23	0.4	13.83
Koala	1.35	0	1.35

3.3 Assessment under S5A of the EP&A Act

The proposed modification has not resulted in any changes to the conclusions of the Assessments of Significance that were completed for threatened biota listed under the BC Act (then *Threatened Species Conservation Act 1995)* as part of the ecological assessment completed for the Project EA. The Project modification would not result in any significant impacts to threatened biota listed under the BC Act.

3.4 Assessment under the EPBC Act

The proposed modification has resulted in reduced impacts to threatened biota listed under the EPBC Act identified as occurring or having potential to occur within the project area (ELA 2016).

The proposed modification has not resulted to any changes to the determination by the Australian Minister for the Environment of March 2016 that the Project was not a controlled action. The Project modification would not result in any significant impacts to MNES listed under the EPBC Act. No additional assessment, approval or biodiversity offsets are required under the EPBC Act.

3.5 Cumulative impacts

The proposed modification would not change the results of the cumulative impact assessment described in the Section 6.2 of the ecological assessment prepared for the Project EA (ELA 2016).

4. Revised BioBanking assessment

4.1 Overview

The BioBanking assessment that was completed as part of the Project EA (ELA 2016) has been reviewed and required offsets recalculated based on the revised Project footprint. The results of this assessment are provided below.

4.2 Landscape assessment

4.2.1 Assessment circles

The area of native vegetation within the 100 hectares and 1000 hectare assessment circles surrounding the Project modification area was calculated using ArcGIS. Approximately 41 hectares of native vegetation occurs within the 100 hectare buffer area. The proposed removal of 1.5 hectares of native vegetation would reduce the percentage cover to 39.5 percent, therefore the amount of vegetation within the 100 hectare circle would be reduced by one cover class after development (i.e. reduced to 36-40 % native vegetation cover).

The native vegetation cover within the 1000 hectare circle was calculated to be approximately 606 hectares. The represents a cover class between 56-60 percent. The removal of 1.5 hectares would not result in any changes to the cover class after development.

Table 4-1 summarises the results of the assessment for each circle before and after development. The assessment circles and landscape assessment for the revised Project area are shown in Figure 1.

The changes to cover classed outlined above are consistent with those outlined in the Project EA (ELA 2016) reflecting a minor reduction in the quantum of impact at the landscape scale.

Table 4-1 Area of vegetation in each assessment circle before and after development

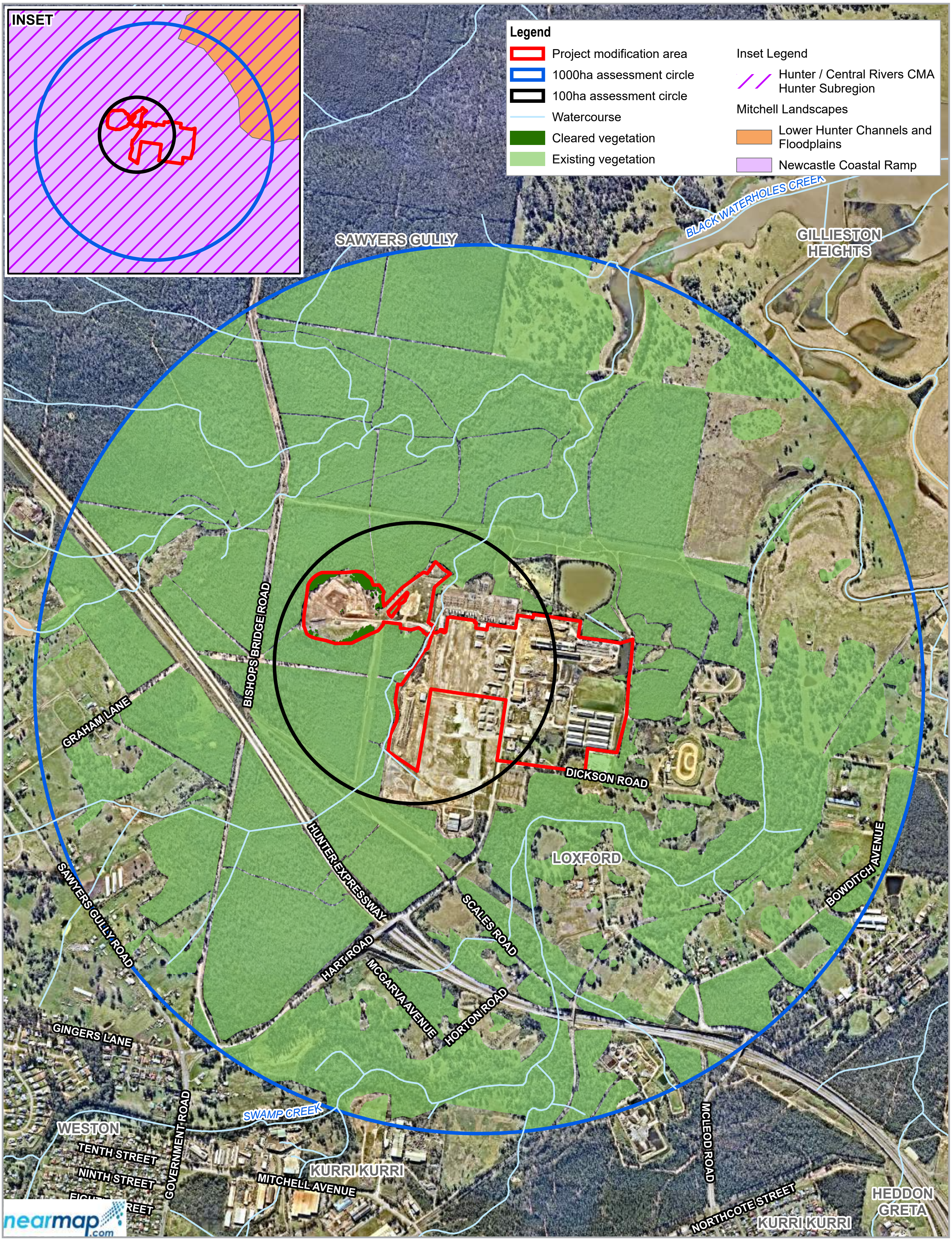
Assessment Circle	Before development	After development
100 hectare	41-45%	36-40%
1000 hectare	56-60%	56-60%

4.2.2 Connectivity assessment

The proposed modification has not resulted in any changes to the connectivity assessment completed as part of the Project EA (ELA 2016). The connectivity value (width) would remain within the >30-100 metre width class before and after development.

4.2.3 Patch size

The proposed modification has not resulted in any changes to patch size. Patch size for the assessment would remain at > 201 hectares.



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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Hydro Aluminium Kurri Kurri Pty Ltd
Biodiversity Assessments - Hydro Site Hydro Aluminium Kurri Kurri Smelter Remediation and Demolition - Modification to Biobanking Offset Calculations

Project No. **22-20284**
Revision No. **0**
Date **27/07/2021**

Landscape assessment

Figure 4-1

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Print date: 27 Jul 2021 - 09:42

Data source: DECCW: Mitchell Landscapes, 2008, CMA regions, 2012; Nearmap: Aerial dated 20200615, extracted 20200825; LPI: DTDB / DCDB, 2017; ELA: Vegetation, 2017; Hydro: Cleared areas, 2021; . Created by:

4.3 Vegetation zones

Impacts associated with the revised Project area include the removal of 1.53 hectares of native vegetation. This comprises impacts to two vegetation zones in the Project modification area:

- 0.97 hectares of Parramatta Red Gum -Narrow Leaved Apple- Prickly-leaved Paperbark Shrubby Woodland in the Cessnock- Kurri Kurri Area (HU 847) in moderate/good condition
- 0.56 hectares of Spotted Gum-Red Ironbark- Narrow-leaved Ironbark -Grey Box Shrub-grass Open Forest of the Lower Hunter (HU 814) in moderate/good condition

Both vegetation zones comprises occurrences of EECs listed under the BC Act.

Vegetation zones within the Project modification area are summarised in Table 4-2 and are shown in Figure 2. Plot data for each vegetation zone was copied from the BBAM calculator (proposal ID 0080/2015/1896D) (ELA 2016).

Table 4-2 Vegetation zones within the Project modification area

Veg Zone ID	Vegetation Type	Condition	Conservation Status	Area (ha)
1A	Parramatta Red Gum - Narrow Leaved Apple- Prickly-leaved Paperbark Shrubby Woodland in the Cessnock- Kurri Kurri Area (HU 847)	Moderate/good	Kurri Sand Swamp Woodland in the Sydney Basin Bioregion EEC	0.97
5A	Spotted Gum-Red Ironbark- Narrow-leaved Ironbark -Grey Box Shrub-grass Open Forest of the Lower Hunter (HU 814)	Moderate/good	Lower Hunter Spotted Gum - Ironbark Forest in the Sydney Basin Bioregion EEC	0.56

4.4 Assessment of threatened species

4.4.1 Predicted species

The proposed modification would result in impacts to the same vegetation types, patch size and connectivity widths and therefore the same suite of threatened species to those outlined in the Project EA are predicted to occur within the revised Project area (refer to Appendix B).

4.4.2 Candidate flora species

As outlined in Section 3.2.2 the proposed modification has resulted in reduced impacts to two threatened flora species that were recorded within the approved Project area. This includes:

- Avoidance of all impacts to *Grevillea parviflora subsp parviflora*
- A reduction in impacted from five (5) *Eucalyptus parramattensis subsp. decadens* individuals to one (1) individual

4.4.3 Candidate fauna species

As outlined in Section 3.2.3 the proposal has resulted in reduced impacts to fauna species identified as species credit species. These revised impacts are discussed below.

Regent Honeyeater

Within the Project modification area habitat for the Regent Honeyeater is associated with Spotted Gum-Red Ironbark- Narrow-leaved Ironbark -Grey Box Shrub-grass Open Forest of the Lower Hunter (HU 814). The species polygon for this species has been mapped and re-calculated based on a reduced impact on this vegetation type from 1.15 hectares to 0.56 hectares.

The revised species polygon for the Regent Honeyeater is shown in Figure 3.

Green-thighed Frog

Targeted surveys completed during the ecological assessment completed for the EA did not record this species (ELA 2016). However due to the species being recorded to the north of the Project area during a previous survey completed in 2004, the Project EA determined that there may be some marginal habitat for the Green-thighed Frog with a small number of sparsely vegetated retention ponds located along the edge of the Project area. The species polygon also included disturbed and hardstand area within the former smelter site that is unlikely to provide habitat for this species.

The supplementary habitat assessment and the Project modification has resulted in a reduction of impacts to Green-thighed Frog habitat from 1.43 hectares to 0.36 hectares.

The revised species polygon for the Green-thighed Frog is shown in Figure 3.

Southern Myotis

The species polygon for Southern Myotis presented in the ecological assessment for the Project EA includes 14.23 hectares of habitat for this species. The majority of this area is disturbed land and hardstand that would not provide habitat for this species (ELA 2016).

The species polygon for the Southern Myotis was refined with reference to the “species credit” threatened bats and their habitat: NSW survey guidelines for the Biodiversity Assessment Method (BAM) (OEH 2018). In accordance with this guideline the polygon boundaries have been aligned to native vegetation (equivalent to Plant Community Types under the BAM) within the Project modification area that are associated with the Southern Myotis and that occur within 200 metres of waterbodies with pools/stretches of water 3 metres or wider.

The revised species polygon for Southern Myotis is shown on Figure 3.

Koala

The ecological assessment that was completed for the approved Project has assumed that the Project site contains 1.35 hectares of Koala habitat. This assumption has been based on an historic BioNet Atlas Koala record from 1980 to the west of the Project area (although the report states that this record has an accuracy of 10 km and this record would not, alone, indicate high Koala activity in the area). Habitat for the species was assumed to be present on the site due to the presence of Kurri Sand Swamp vegetation (Parramatta Red Gum -Narrow Leaved Apple-Prickly-leaved Paperbark Shrubby Woodland in the Cessnock- Kurri Kurri Area (HU 847). Parramatta Red Gum is known to be an important Koala feed tree in the Port Stephens area (ELA 2016). There is little information known about the Koala population within the Cessnock Local Government Area and it is not known whether this tree species is an important food source for the Koala within the Cessnock area.

The Koala habitat information base combined with habitat assessments of the site have been used to determine the likelihood that the revised Project area would provide habitat for the Koala.

A review of the habitat within the site along with mapping provided in the Koala Habitat Information Base on the NSW Government SEED portal (DPIE 2019) indicates that the modified Project area is unlikely to contain koala habitat due to:

- The lack of recent Koala records in the locality (DPIE 2010)
- The site not being within an area of mapped regional Koala significance
- The site occurs within an area mapped to be of low habitat suitability for Koala (0-0.1) (with a high confidence)
- The likelihood of occurrence of koala within the revised project site is modelled as low (DPIE 2019)

Assessment of the above information combined with lack of recent local records and the disturbed nature of the vegetation within the revised Project area indicates that this vegetation has low likelihood of providing habitat for Koalas. For this reason a species polygon has not been included for the Koala.

4.5 Credit calculations

Revised credit calculations for the modification were completed by Arien Quin (accredited assessor 0120) using the BBAM calculator (version 4.0). The credit calculations have been submitted to BCD and the biodiversity credit report is included as Appendix A and summarised below.

The quantum of biodiversity credits required to offset the residual impacts of the Project modification are based on BioBanking calculations and expressed as BBAM credits. If offsets are secured from a stewardship site assessed under the BAM, then a credit equivalence statement would need to be obtained from the BCD to confirm the quantum of offset.

4.5.1 Ecosystem credits

Table 4-3 outlines the approved and revised areas of impact to native vegetation and the associated credit requirements that were included in the conditions of approval and that would be required as a result of the modification.

Table 4-3 Ecosystem credits required to offset the impacts associated with the Project modification

Veg zone	Biometric Vegetation Type	PCT ID	Approved impact area (ha)	Revised Impact area (ha)	Credits conditioned to be retired	Revised credit requirement	Difference
1a	Parramatta Red Gum - Narrow Leaved Apple-Prickly-leaved Paperbark Shrubby Woodland in the Cessnock-Kurri Kurri Area (HU 847)	1633	1.35	0.97	94	**68**	-26

Veg zone	Biometric Vegetation Type	PCT ID	Approved impact area (ha)	Revised Impact area (ha)	Credits conditioned to be retired	Revised credit requirement	Difference
5a	Spotted Gum-Red Ironbark-Narrow-leaved Ironbark - Grey Box Shrub-grass Open Forest of the Lower Hunter (HU 814)	1600	1.15	0.56	61	**30**	-31

4.5.2 Species credits - Flora

The revised flora species credits required to offset the impacts of the Project modification are provided in Table 4-4.

Table 4-4 Flora species credits required to offset the impacts associated with the Project modification

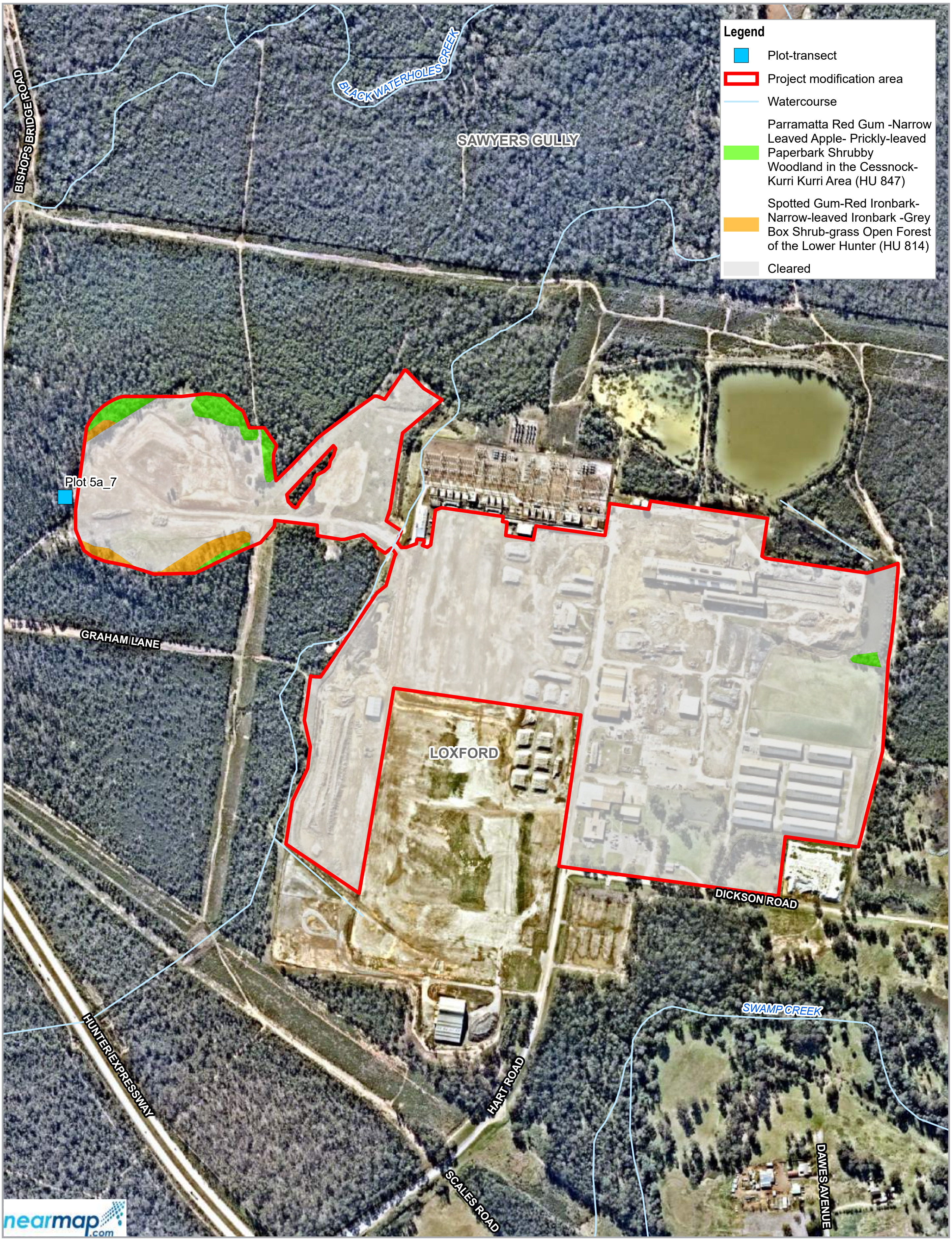
Species	Approved impact (no of individuals)	Revised Impact area (no of individuals	Credits conditioned to be retired	Revised credit requirement	Difference
Eucalyptus parramattensis subsp *decades*	4	1	56	**14**	-42
Grevillea parviflora subsp *parviflora*	5	0	70	**0**	-70

4.5.1 Species credits - Fauna

The revised fauna species credits required to offset the impacts of the Project modification are provided in Table 4-5.

Table 4-5 Fauna species credits required to offset the impacts associated with the Project modification

Species	Approved impact area (ha)	Revised Impact area (ha)	Credits conditioned to be retired	Revised credit requirement	Difference
Regent Honeyeater	1.15	0.56	89	43	-46
Green-thighed Frog	1.46	0.36	19	5	-14
Southern Myotis	14.23	0.4	313	9	-304
Koala	1.35	0	35	0	-35



Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Hydro Aluminium Kurri Kurri Pty Ltd
Biodiversity Assessments - Hydro Site Hydro Aluminium Kurri Kurri Smelter Remediation and Demolition - Modification to Biobanking Offset Calculations

Project No.	22-20284
Revision No.	0
Date	27/07/2021

Vegetation zones

Figure 4-2

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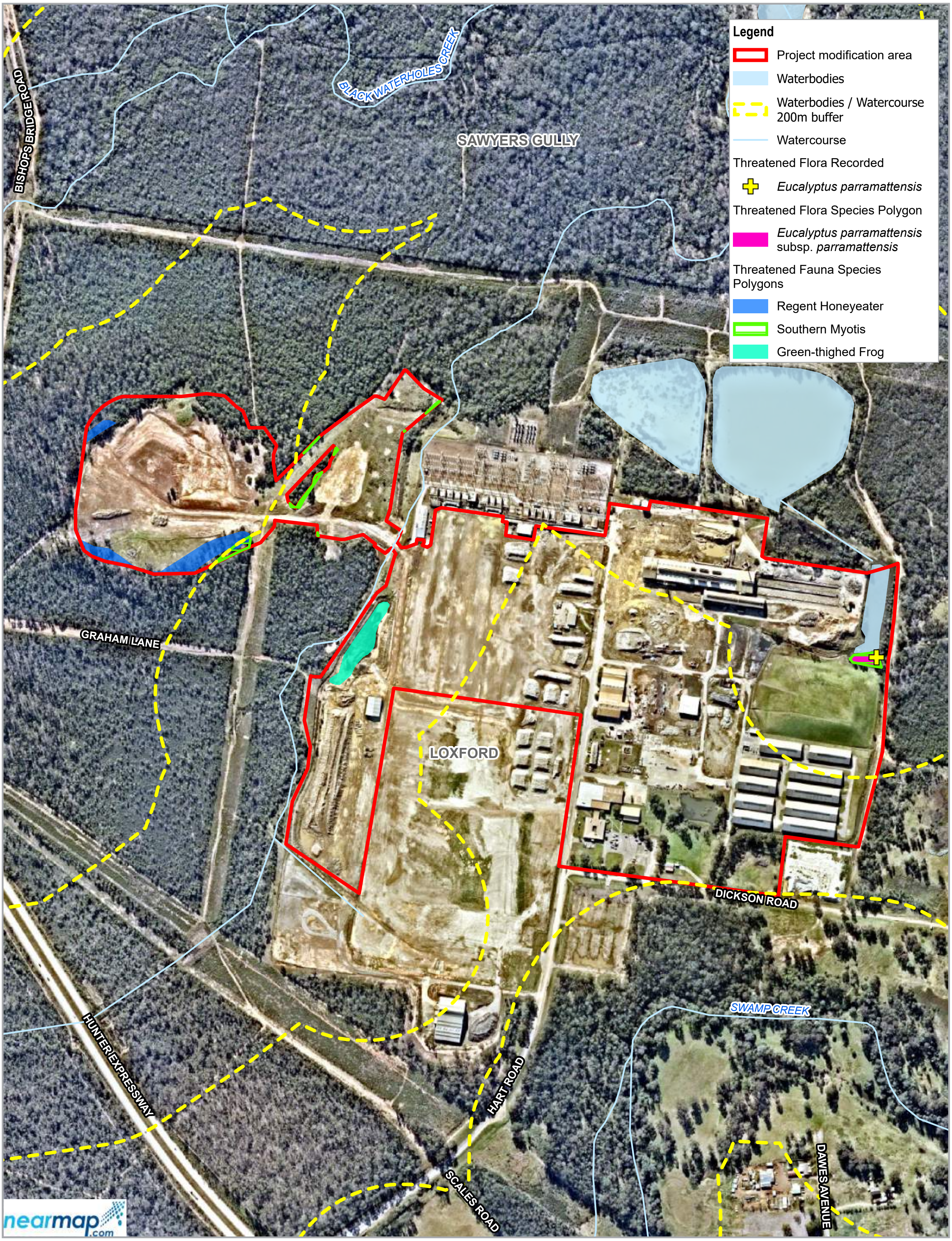
Print date: 27 Jul 2021 - 09:42

Data source: Nearmap: Aerial dated 20200615, extracted 20200825; LPI: DTDB / DCDB, 2017; ELA: Vegetation, 2017; Hydro: Cleared areas, 2021; . Created by:



Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Hydro Aluminium Kurri Kurri Pty Ltd
Biodiversity Assessments - Hydro Site Hydro Aluminium Kurri Kurri Smelter Remediation and Demolition - Modification to Biobanking Offset Calculations

Project No.	**22-20284**
Revision No.	**0**
Date	**27/07/2021**

Species polygons

Figure 4-3

Data source: Nearmap: Aerial dated 20200615, extracted 20200825; LPI: DTDB / DCDB, 2017; ELA: Vegetation, 2017; Hydro: Cleared areas, 2021; . Created by:

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\ghdnet\ghd\AU\Newcastle\Projects\22\20284\GIS\Maps\Deliverables\2220284_ProjectData\222028
Print date: 27 Jul 2021 - 09:42

5. Conclusion

Hydro is proposing to modify the Project planning approval SSD 666 under section 4.55 (1a) of the EP&A Act. The proposed modification includes:

- Revision of the project boundary which reduces the project footprint
- Revision of the vegetation clearance area, and the associated re-calculated biodiversity credit requirements

This assessment forms part of a proposed modification to the Project approval and informs the assessment of the revision of the vegetation clearance area.

The proposed modification has resulted in reduced impacts to biodiversity values. This includes a reduction in the extent of native vegetation required to be removed as well as a reduction to the number of threatened flora and area of threatened fauna habitat impacted as a result of the Project. The impacts of the Project modification include:

- Removal of 0.97 hectares of Parramatta Red Gum -Narrow Leaved Apple- Prickly-leaved Paperbark Shrubby Woodland in the Cessnock- Kurri Kurri Area (HU 847)
- Removal of 0.56 hectares of Spotted Gum-Red Ironbark- Narrow-leaved Ironbark -Grey Box Shrub-grass Open Forest of the Lower Hunter (HU 814)
- Removal of one *Eucalyptus parramattensis* subsp. *decadens* individual
- Removal of 0.56 hectares of Regent Honeyeater habitat
- Removal of 0.4 hectares of Southern Myotis habitat
- Removal of 0.36 hectares of Green-thighed Frog habitat

The credits required to offset the impacts of the revised Project have been calculated with reference to the BBAM using plot/transect data and GIS files supplied by ELA and building upon the original ecological assessment for the project (ELA 2016).

The residual impacts of the Project modification would require the purchase and retirement of the following credits:

- 68 ecosystem credits to offset impacts to 0.97 hectares of Parramatta Red Gum -Narrow Leaved Apple- Prickly-leaved Paperbark Shrubby Woodland in the Cessnock- Kurri Kurri Area (HU 847)
- 30 ecosystem credits to offset impacts to 0.56 hectares of Spotted Gum-Red Ironbark- Narrow-leaved Ironbark -Grey Box Shrub-grass Open Forest of the Lower Hunter (HU 814)
- 14 species credits to offset impacts to of one *Eucalyptus parramattensis* subsp. *decadens* individual
- 43 species credits to offset impacts to 0.56 hectares of Regent Honeyeater habitat
- Nine species credits to offset impacts to 0.4 hectares of Southern Myotis habitat
- Five species credits to offset impacts to 0.36 hectares of Green-thighed Frog habitat

The quantum of biodiversity credits required to offset the residual impacts of the Project modification are based on BioBanking calculations and expressed as BBAM credits. If offsets are secured from a stewardship site assessed under the BAM, then a credit equivalence statement would need to be obtained from the BCD to confirm the quantum of offset.

6. References

Department of Planning, Industry and Environment (DPIE) (2010) *Koala Sightings – BioNet*. [data set]. https://datasets.seed.nsw.gov.au/dataset/nsw-bionet-data-collection-koala-sightings/resource/data_quality_report/pdf. Department of Planning, Industry and Environment

Department of Planning, Industry and Environment (DPIE) (2019) *Koala Habitat Information Base*. [data set]. https://datasets.seed.nsw.gov.au/dataset/koala-habitat-information-base/resource/data_quality_report/pdf. Department of Planning, Industry and Environment

ELA (2016) *Hydro Aluminium Kurri Kurri Smelter Remediation and Demolition, Ecology Assessment*. Report prepared for Hydro Aluminium, Published as Appendix 10 in Project Environmental Impact Statement

OEH (2014) *BioBanking Assessment Methodology*. NSW Department of Environment and Climate Change, Sydney

OEH (2018) *'Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method*. Office of Environment and Heritage, Sydney, NSW

Ramboll Environ (2016)) *Fp*, report prepared for Hydro Aluminium

Appendices

Appendix A – Biodiversity credit report

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 20/04/2021 Time: 4:13:57PM Calculator version: v4.0

Major Project details

Proposal ID:	0120/2021/5109MP
Proposal name:	Hydro SSD - Smelter Remediation
Proposal address:	Hart Road Loxford NSW 2326
Proponent name:	Hydro Aluminium Australia Pty Ltd
Proponent address:	Hart Road NSW 2326
Proponent phone:	+10249371555
Assessor name:	Arien Quin
Assessor address:	Level 3 24 Honeysuckle Drive Newcastle NSW 2300
Assessor phone:	0405 443 341
Assessor accreditation:	0120

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area	0.97	68.00
Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter	0.56	30.00
Total	1.53	98

Credit profiles

1. Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter, (HU814)

Number of ecosystem credits created	30
IBRA sub-region	Hunter

Offset options - Plant Community types	Offset options - IBRA sub-regions
Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter, (HU814) Melaleuca decora low forest of the central Hunter Valley, Sydney Basin Bioregion, (HU564) Slaty Red Gum grassy woodland on hinterland foothills of the southern North Coast, (HU619) Grey Ironbark - Broad-leaved Mahogany - Forest Red Gum shrubby open forest on Coastal Lowlands of the Central Coast, (HU802) Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast, (HU803) Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter, (HU815)	Hunter and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area, (HU847)

Number of ecosystem credits created	68
IBRA sub-region	Hunter

Offset options - Plant Community types	Offset options - IBRA sub-regions
Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area, (HU847) Rough-barked Apple - Narrow-leaved Ironbark - Blakely's Red Gum - Bull Oak - Coast Banksia woodland on sands of the Warkworth area, (HU872)	Hunter and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Eucalyptus parramattensis subsp. decadens	Eucalyptus parramattensis subsp. decadens	1.00	14
Southern Myotis	Myotis macropus	0.40	9
Regent Honeyeater	Anthochaera phrygia	0.56	43
Green-thighed Frog	Litoria brevipalmata	0.36	5

Appendix B – Predicted threatened species

BioBanking Credit Calculator

Threatened species predicted on site

Proposal ID :	0120/2021/5109MP
Proposal name :	Hydro SSD - Smelter Remediation
Assessor name :	Arien Quin
Assessor accreditation number :	0120
Tool version :	v4.0
Report created :	20/04/2021 22:31

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common name	Scientific name	Vegetation type(s)
Barking Owl	Ninox connivens	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis subsp. gularis	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Brown Treecreeper (eastern subspecies)	Climacteris picumnus subsp. victoriae	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Bush Stone-curlew	Burhinus grallarius	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area

Common name	Scientific name	Vegetation type(s)
Corben's Long-eared Bat	Nyctophilus corbeni	HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Diamond Firetail	Stagonopleura guttata	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Eastern False Pipistrelle	Falsistrellus tasmaniensis	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Eastern Freetail-bat	Mormopterus norfolkensis	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Gang-gang Cockatoo	Callocephalon fimbriatum	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Glossy Black-Cockatoo	Calyptorhynchus lathami	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Greater Broad-nosed Bat	Scoteanax rueppellii	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis subsp. temporalis	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area

Common name	Scientific name	Vegetation type(s)
Hooded Robin (south-eastern form)	Melanodryas cucullata subsp. cucullata	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Little Eagle	Hieraaetus morphnoides	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Little Lorikeet	Glossopsitta pusilla	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Masked Owl	Tyto novaehollandiae	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Painted Honeyeater	Grantiella picta	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Powerful Owl	Ninox strenua	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Scarlet Robin	Petroica boodang	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter
Speckled Warbler	Chthonicola sagittata	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter

Common name	Scientific name	Vegetation type(s)
Speckled Warbler	Chthonicola sagittata	HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Spotted-tailed Quoll	Dasyurus maculatus	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Square-tailed Kite	Lophoictinia isura	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Squirrel Glider	Petaurus norfolcensis	HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Swift Parrot	Lathamus discolor	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Turquoise Parrot	Neophema pulchella	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Varied Sittella	Daphoenositta chrysoptera	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area
Yellow-bellied Glider	Petaurus australis	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area

Common name	Scientific name	Vegetation type(s)
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	HU814 - Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter HU847 - Parramatta Red Gum - Narrow-leaved Apple - Prickly-leaved Paperbark shrubby woodland in the Cessnock-Kurri Kurri area

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2220284-92605-123/https://projects.ghd.com/oc/Newcastle3/hydrobiodiversityass/Delivery/Documents/2220284_REP_SSD credit calculation addendum report.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	A. Quin	B. Harrington		M. Dunlop	MDunlop.	27/07/2021

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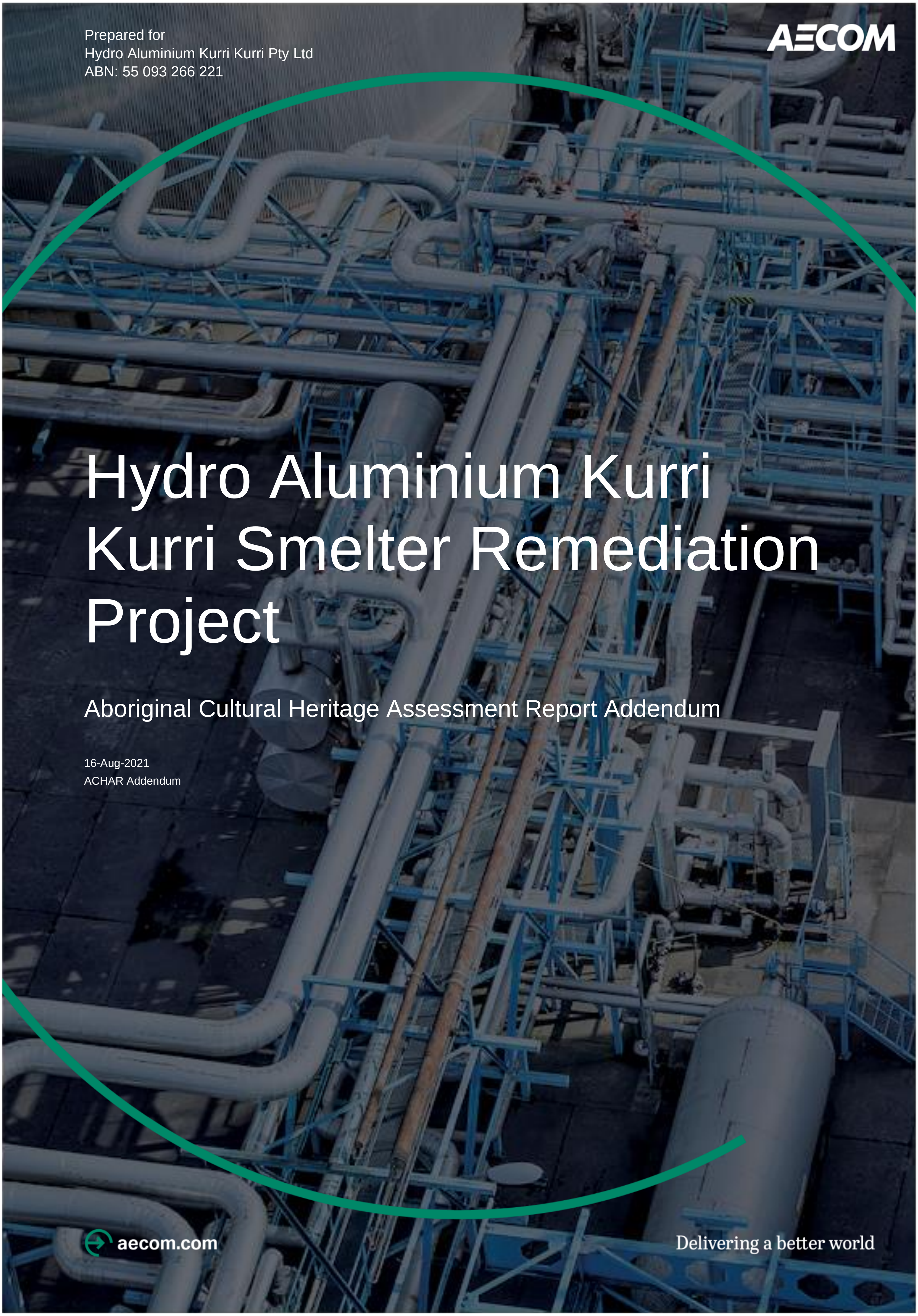
APPENDIX 3
ADDENDUM ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT

Prepared for
Hydro Aluminium Kurri Kurri Pty Ltd
ABN: 55 093 266 221



Hydro Aluminium Kurri Kurri Smelter Remediation Project

Aboriginal Cultural Heritage Assessment Report Addendum

16-Aug-2021
ACHAR Addendum

Hydro Aluminium Kurri Kurri Smelter Remediation Project

Aboriginal Cultural Heritage Assessment Report Addendum

Client: Hydro Aluminium Kurri Kurri Pty Ltd

ABN: 55 093 266 221

Prepared by

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16-Aug-2021

Aboriginal and Torres Strait Islander peoples are advised that this report contains references to people who have passed away.

Quality Information

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Ref	c:\aecom jobs\hydro addendum\report\reviewed version\hydro_achar_addendum_2021_08_16_fnl.docx
Date	16-Aug-2021
Prepared by	A.McLaren
Reviewed by	G.Oakes

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	02-Jul-2021	Draft #1	G.Oakes/Principal Archaeologist & Heritage Specialist	
B	08-Jul-2021	Draft #2	G.Oakes/Principal Archaeologist & Heritage Specialist	
C	16-Aug-2021	Final	G.Oakes/Principal Archaeologist & Heritage Specialist	

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Executive Summary

AECOM Australia Pty Ltd (AECOM) was commissioned by Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to prepare an Addendum Aboriginal Cultural Heritage Assessment Report (Addendum ACHAR) for the approved Hydro Kurri Kurri Aluminium Smelter Remediation Project (SSD-6666) (the Project). This Addendum ACHAR has been prepared to address a recently identified issue pertaining to AHIMS registered Aboriginal site Hydro PAD1 (37-6-3872), an area of Potential Archaeological Deposit (PAD) identified as part of AECOM's 2015 Aboriginal cultural heritage assessment for the Project. At the time, Hydro PAD1 was identified as an area of high Aboriginal archaeological sensitivity on the basis of its landform context, as well as then examined historical aerial photographs and field observations, which suggested that this area retained a moderate degree of ground integrity. In order to avoid any impacts to potential subsurface deposits within its bounds, AECOM's (2015) ACHAR recommended that Hydro PAD1 should, in the event of its use for stockpiling, be protected through geo-matting. This recommendation was subsequently formalised in the Conditions of Approval (CoA) for SSD6666 as Condition B38 and included as management measure in the Project's Aboriginal Heritage Management Plan (AHMP).

Presented in this report are the results of a reassessment of Hydro PAD1(37-6-3872), made on the basis of a desktop review of 13 historical photographs for the site, spanning the years 1954 to 2019, as well as recently obtained subsurface soil profile data for land within and surrounding the PAD, generated as part of a broader contamination investigation across the Smelter site. Registered Aboriginal Parties (RAPs) involved in AECOM's 2015 Aboriginal cultural heritage assessment for the Project (n = 34) have also been consulted regarding the results of the current assessment.

Contra AECOM's (2015) earlier assessment of Hydro PAD1, this Addendum ACHAR finds that:

- Land within Hydro PAD1 was severely disturbed in or around 1983 as a result of heavy earthworks linked to the construction of the Smelter's third potline;
- Natural soil profiles within and to the south of Hydro PAD1 have been radically altered as a result of the above. For Hydro PAD1, a complete loss of potential artefact-bearing topsoils is inferred; and
- Land within Hydro PAD1 retains negligible potential for subsurface Aboriginal archaeological deposits and, as such, does not comprise an area of PAD.

In view of these findings, the following recommendations are made regarding Hydro PAD1:

1. Hydro should lodge a request with the AHIMS Registrar to have the status of Hydro PAD1 in the AHIMS database changed from 'Valid' to 'Not a Site', thereby removing it as a development constraint. A copy of this Addendum ACHAR should be submitted in support of Hydro's request.
2. The AHMP for the Project should be updated to reflect the results of this Addendum ACHAR; and
3. Once finalised, all RAPs for the Project should be provided with a copy of this Addendum ACHAR.

1.0 Introduction and Background

1.1 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to prepare an Addendum Aboriginal Cultural Heritage Assessment Report (Addendum ACHAR) for the approved Hydro Kurri Kurri Aluminium Smelter Remediation Project (SSD-6666) (the Project). This Addendum ACHAR has been prepared to address a recently identified issue pertaining to AHIMS registered Aboriginal site Hydro PAD1 (37-6-3872), an area of Potential Archaeological Deposit (PAD) identified as part of AECOM's 2015 Aboriginal cultural heritage assessment for the Project (AECOM, 2015). At the time, Hydro PAD1 was identified as an area of high Aboriginal archaeological sensitivity on the basis of its landform context, as well as then examined historical aerial photographs and field observations, which suggested that this area retained a moderate degree of ground integrity. In order to avoid any impacts to potential subsurface deposits within its bounds, AECOM's (2015) ACHAR recommended that Hydro PAD1 should, in the event of its use for stockpiling, be protected through geo-matting. This recommendation was subsequently formalised in the Conditions of Approval (CoA) for SSD6666 as Condition B38 and included as management measure in the Project's Aboriginal Heritage Management Plan (AHMP) (Hydro, 2020).

In April 2021, Ramboll Australia Pty Ltd (Ramboll), acting on behalf of Hydro, notified AECOM that additional information concerning Hydro PAD1's status as an area of PAD had become available. This information comprised an oblique, 1983 aerial photograph of the then partially completed smelter, encompassing Hydro PAD1 in part, as well as subsurface soil data for land within and surrounding the PAD, obtained a part of a broader contamination assessment across the Smelter site. To this end, Hydro commissioned AECOM to undertake a reassessment of Hydro PAD1 and to document this in an Addendum ACHAR for the Project. Accordingly, this Addendum ACHAR presents the results of AECOM's reassessment of Hydro PAD1 and provides appropriate management advice.

1.2 Background to this Addendum ACHAR

In 2015, AECOM was commissioned by Hydro to prepare an Aboriginal Cultural Heritage Assessment Report (ACHAR) for the Project. AECOM's ACHAR formed part of an Environmental Impact Statement (EIS) prepared for the Project by Ramboll ENVIRON Australia Pty Ltd (Ramboll Environ). AECOM's assessment involved a combination of background research, Aboriginal community consultation and field survey. Aboriginal community consultation for AECOM's assessment was conducted in accordance with the then NSW Office of Environment and Heritage's (now Heritage NSW) *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010). A total of 34 Registered Aboriginal Parties (RAPs) were consulted for the assessment, with key consultation activities including RAP review of the draft assessment methodology and ACHAR, as well as the participation of RAP representatives in an archaeological survey of the EIS project area.

Archaeological survey of the EIS project area was undertaken on Friday 10 April 2015 by a combined field team of two AECOM archaeologists and two RAP field representatives. Survey resulted in the identification of one Aboriginal archaeological site within the EIS project area - an isolated stone artefact designated as Hydro-IA35-15 (37-6-3969) - as well as one area of high subsurface sensitivity, subsequently registered as Hydro PAD1 (37-6-3872). Hydro PAD1, comprising a cleared section of elevated low gradient terrain overlooking an unnamed 2nd order tributary of Black Waterholes Creek, was assessed in the field as retaining a moderate degree of ground integrity. This assessment was supported by an analysis of then examined historical aerial photographs.

For Hydro PAD1, an assessment of the potential impacts of the Project on this site identified it as being located in an area earmarked for stockpiling, with impacts potentially arising from sediment deposition and removal activities (AECOM, 2015: 97). To mitigate this risk, AECOM recommended that Hydro PAD1 should, in the event of its use for stockpiling, be protected through the use of geo-matting. This recommendation was subsequently formalised in the CoA for SSD6666, with Condition B38 stating that:

> *B38. To prevent impacts to subsurface archaeological deposits, stockpiles in the area of high archaeological sensitivity, as shown in Figure 23 of the Aboriginal Cultural Heritage Assessment and titled Archaeological Sensitivity Figure, must be placed on geo-matting.*

To satisfy Condition B38, the requirement for the geo-matting of Hydro PAD1 was included as a management measure in the Project's AHMP (Hydro, 2020: Table 1-1), which formed part of the Remediation Works Environmental Management Plan (RWEMP) approved by the Department of Planning Industry and Environment (DPIE) on 25 January 2021. As indicated in Section 1.1, in April 2021, Ramboll notified AECOM that additional information concerning Hydro PAD1's status as an area of PAD had become available. This information comprised an oblique, 1983 aerial photograph of the then partially completed smelter, encompassing part of Hydro PAD1, as well as subsurface soil data for land within and surrounding the PAD. To this end, Hydro commissioned AECOM to undertake a reassessment of Hydro PAD1.

1.3 Scope of this Addendum ACHAR

This Addendum ACHAR has been prepared to document the results of a reassessment of AHIMS registered Aboriginal site Hydro PAD1 (37-6-3872). Tasks undertaken as part of AECOM's reassessment of this site included:

- A desktop review of AECOM's (2015) ACHAR for the Project, as well as the Project's AHMP and CoA;
- A desktop review of 13 historical aerial photographs for Hydro PAD1 and its environs, spanning the years 1954 to 2019;
- A desktop review of the results of contamination test pitting within and surrounding Hydro PAD1, documented in Ramboll (2021); and
- Consultation with the 34 RAPs involved in AECOM's 2015 EIS assessment.

1.4 Description of Project

Current and scheduled care and maintenance, decommissioning, demolition and remediation activities at the former Hydro Kurri Kurri Aluminium Smelter ('the Smelter') include:

- Management and maintenance of the existing infrastructure (such as the drainage and stormwater management infrastructure;
- Waste management (including waste oils, wastewater, hazardous materials and non-reusable materials, machinery and equipment);
- The removal of Smelter process materials from the Smelter to an approved facility;
- Use of some remaining buildings as temporary storage areas for waste materials;
- Transport of stored spent pot lining for off-site processing;
- Stockpiling of contaminated soils (from the Hydro Land);
- Completion of Stage 2 demolition activities;
- Containment Cell construction, material emplacement and capping of the cell;
- Capped Waste Stockpile removal and management;
- Removal of known contaminated soils within the Smelter to the Containment Cell;
- Leachate treatment and management;
- Rehabilitation and stabilisation of disturbed areas; and
- Hydro land management (such as weed control, waste management, management of leased residences).

1.5 Project Approvals

In 2015, a Statement of Environmental Effects (SEE) was prepared to support a Development Application (DA) to Cessnock City Council (Council) for 'Stage 1 Demolition' of the Site (DA

8/2015/399/1). Council granted development consent for Stage 1 Demolition in March 2016. Stage 1 Demolition commenced in July 2017.

In 2016, an EIS was prepared to assess the remediation of contaminated soils and waste management, including a Containment Cell and 'Stage 2 Demolition' (subject of SSD 6666). Due to delays to the approval of SSD 6666, a separate application (DA 8/2018/46) for Stage 2 Demolition was submitted to Cessnock City Council in January 2018 and was approved on 9 May 2018.

Activities associated with Stage 2 Demolition were subsequently withdrawn from SSD 6666. However, the remediation of contaminated soils, the Containment Cell construction and acceptance of waste remained the subject of SSD 6666. SSD 6666 was approved on 23 December 2020, with an associated Remediation Works Environmental Management Plan (RWEMP) approved by DPIE on 25 January 2021.

1.6 Hydro PAD1 (37-6-3872)

Hydro PAD1 occupies an area of approximately 0.24 hectares in the northwestern portion of the 2015 ACHAR study area (Figure 1 and Figure 2). Land within the site comprises part of Lot 319 on DP755231 and is Hydro-owned and managed. As defined by AECOM (2015), the PAD encompasses a section of cleared elevated terrain overlooking an unnamed 2nd order tributary of Black Waterholes Creek. In general terms, the PAD is bounded to the east by this tributary, to the west by an unsealed light vehicle track, to the south by an artificial bank and to the north by remnant native vegetation. Hydro PAD1 sits at an elevation of approximately 14 m AHD. Land within the site slopes eastward and is predominantly very gently inclined (1-3%).

Hydro PAD1 is registered on the AHIMS database under AHIMS ID 37-6-3872. The PAD's associated site card is attached as Appendix A.

1.7 Relevant Statutory Controls

1.7.1 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act), administered by Heritage NSW, is the primary legislation for the protection of Aboriginal cultural heritage in NSW. The NPW Act gives the Secretary of the Department of the Premier and Cabinet responsibility for the proper care, preservation and protection of 'Aboriginal objects' and 'Aboriginal places', defined under the Act as follows:

- An *Aboriginal object* is any deposit, object or material evidence (that is not a handicraft made for sale) relating to Aboriginal habitation of NSW, before or during the occupation of that area by persons of non-Aboriginal extraction (and includes Aboriginal remains).
- An *Aboriginal place* is a place declared so by the Minister administering the NPW Act because the place is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects.

Part 6 of the NPW Act provides specific protection for Aboriginal objects and places by making it an offence to harm them and includes a 'strict liability offence' for such harm. A 'strict liability offence' does not require someone to know that it is an Aboriginal object or place they are causing harm to in order to be prosecuted. Defences against the 'strict liability offence' in the NPW Act include the carrying out of certain 'Low Impact Activities', prescribed in Clause 58 of the *National Parks and Wildlife Amendment Regulation 2019* (NPW Regulation), and the demonstration of due diligence.

An Aboriginal Heritage Impact Permit (AHIP) issued under Section 90 of the NPW Act is required if impacts to Aboriginal objects and/or places cannot be avoided. An AHIP is a defence to a prosecution for harming Aboriginal objects and places if the harm was authorised by the AHIP and the conditions of that AHIP were not contravened.

Applications for AHIPs must be supported by an ACHAR compiled in accordance with Section 3 of Heritage NSW's *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH, 2011) and an Aboriginal Archaeological Report (AAR) compiled in accordance with Section 2.3 of Heritage NSW's *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b). A process of Aboriginal community consultation carried out in accordance with Heritage NSW's *Aboriginal Cultural Heritage Consultation Requirements for*

Proponents (DECCW, 2010a) must also be demonstrated. AHIPs may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons.

Pursuant to Section 4.41 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), AHIPs are not required for approved SSD projects. Impacts to Aboriginal heritage values associated with such projects are typically managed under AHMPs, which are statutorily binding once approved by DPIE.

Aboriginal heritage values within the Project's EIS study area are managed under a Project-specific AHMP (Hydro, 2020) (Appendix B). The AHMP comprised part of the RWEMP approved by DPIE on 25 January 2021. With respect to potential impacts to Hydro PAD1, the AHMP contains the following management measure:

> *Where possible, avoid the need to stockpile material in the area of high archaeological sensitivity* [Hydro PAD1]*. In the event that stockpiling in this area is required, geo-matting will be placed on the surface of the area prior to stockpiling.*

Responsibility for the implementation of this measure is assigned to Hydro's Environment Officer and the Remediation Contractor (refer to Table 3-2 in Appendix B).

1.8 Authorship

This report was prepared by AECOM Principal Aboriginal Heritage Specialist Dr Andrew McLaren, with technical review provided by Geordie Oakes (Principal Archaeologist and Heritage Specialist).

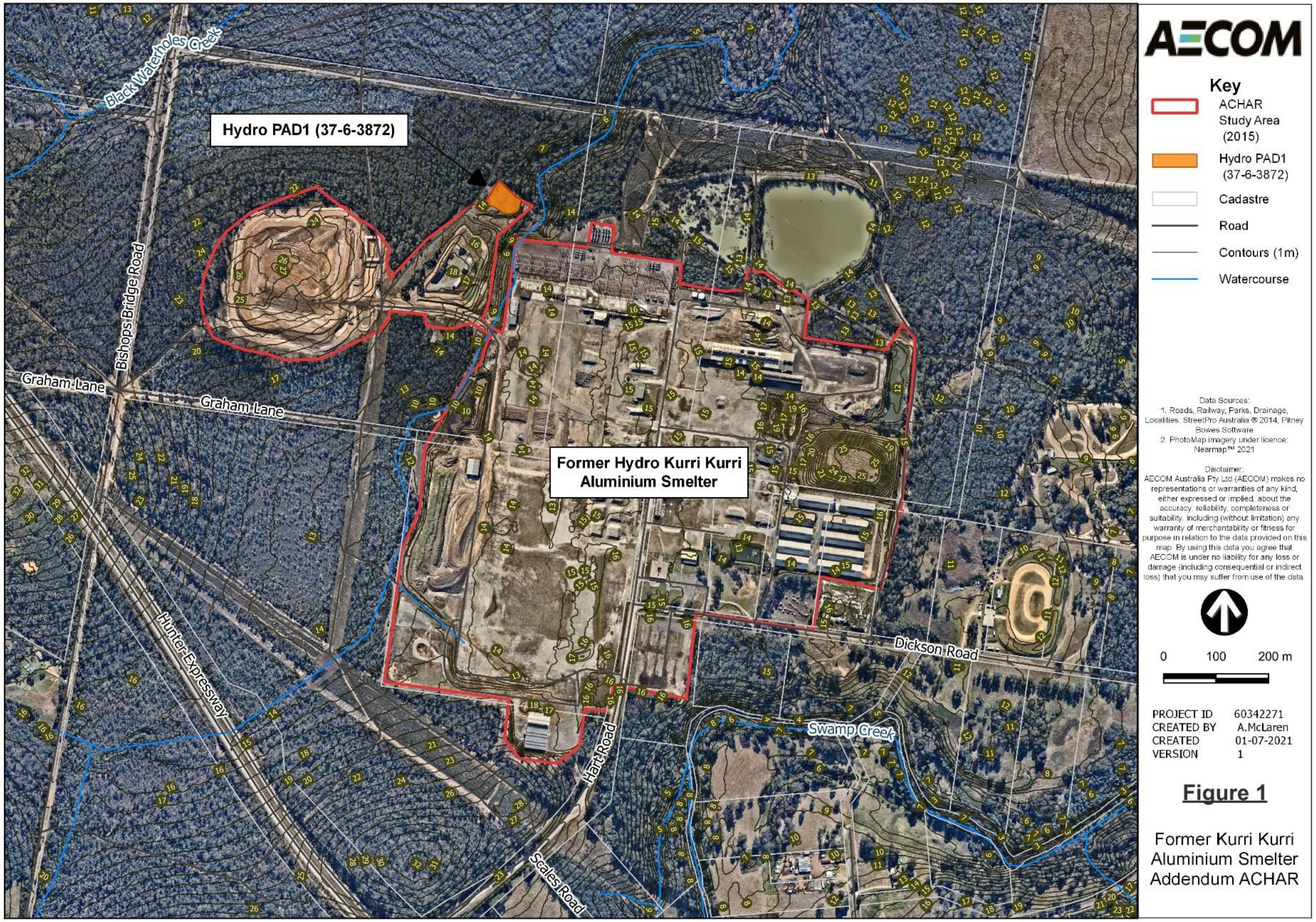


Figure 1 Location of Hydro PAD1 (37-6-3872) within former Hydro Kurri Kurri Aluminium Smelter complex

Figure 2 **Hydro PAD1 (37-6-3872)**

2.0 Historical Aerial Analysis

2.1 Introduction

Alongside field observations and subsurface soil profile data, historical aerial photographs provide an avenue for assessing levels of past ground disturbance within the boundary of Hydro PAD1. As indicated in Section 1.1, Hydro PAD1 was identified by AECOM (2015) as an area of high Aboriginal archaeological sensitivity on the basis of its landform context, as well as then examined historical aerial photographs and field observations, which suggested that this area retained a moderate degree of ground integrity.

In this section, we present the results of an updated analysis of 13 historical aerial photographs of Hydro PAD 1 and its environs; specifically, aerials from 1954, 1961, 1971, 1975, 1983 1984, 1994, 1998, 2004, 2010, 2015, 2017 and 2019 (Figure 3 to Figure 15 respectively). With the exception of a single oblique example (1983), provided to AECOM by Ramboll, all are vertical aerials. For ease of reference, results are presented in tabular format (Table 1), with key observations provided in Section 2.3.

2.2 Results

Table 1 presents the results of the historical aerial photograph analysis undertaken for Hydro PAD1.

Table 1 Historical aerial photograph analysis

Photograph details	Status of Hydro PAD1
1954 (black and white, vertical)	Land within PAD has been cleared of all native vegetation. No other ground disturbance phenomena are evident.
1961(black and white, vertical)	Land within PAD remains essentially unchanged from 1954 aerial. Some patchy regrowth is evident.
1971 (black and white, vertical)	Land within PAD remains essentially unchanged from 1961 aerial. Regrowth appears more established in places.
1975 (black and white, vertical)	Land within PAD remains essentially unchanged from 1975 aerial.
1983 (colour, oblique)	PAD partially encompassed by photo. Land within visible extent of PAD has been stripped and/or filled. Land to the south has likewise been stripped and/or filled.
1984 (black and white, vertical)	Disturbance visible on 1983 aerial extends across the entirety of PAD. Some patchy grass re-growth is visible. Stockpiles are evident to the south of PAD.
1994 (colour, vertical)	Land within PAD is now extensively grassed. A single tree is visible in the southwestern corner of the PAD.
1998 (colour, vertical)	Land within PAD remains essentially unchanged from 1994 aerial. Tree visible in 1994 aerial appears to have been removed.
2004 (colour, vertical)	Land within PAD remains essentially unchanged from 1998 aerial.
2010 (colour, vertical)	Land within PAD remains essentially unchanged from 2004 aerial. Patchy regrowth visible along northern boundary. Two small erosion scours also visible.
2015 (colour, vertical)	Land within PAD remains essentially unchanged from 2010 aerial.
2017 (colour, vertical)	Land within PAD remains essentially unchanged from 2015 aerial.
2019 (colour, vertical)	Land within PAD remains essentially unchanged from 2017 aerial.

2.3 Key Observations

Key observations to be drawn from the historical aerial analysis described in this section are as follows:

- Prior to *c*.1983, ground disturbance within Hydro PAD1 appears to have been limited to native vegetation removal;
- In or around 1983, land within and to the south of Hydro PAD1 was extensively stripped and/or filled. This disturbance, ostensibly associated with the construction of the Smelter's third potline, is clearly visible on the 1983 (Figure 7) and 1984 (Figure 8) aerials;
- Post-1984, no major, additional ground disturbance phenomena are evident within Hydro PAD1. Land within the site appears to have been left vacant and unused; and
- Aerials examined for this assessment suggest that, contra AECOM's 2015 assessment, land within Hydro PAD1 has been severely disturbed. Natural soil profiles within bounds of the PAD are likely to have been radically modified via heavy earthworks.

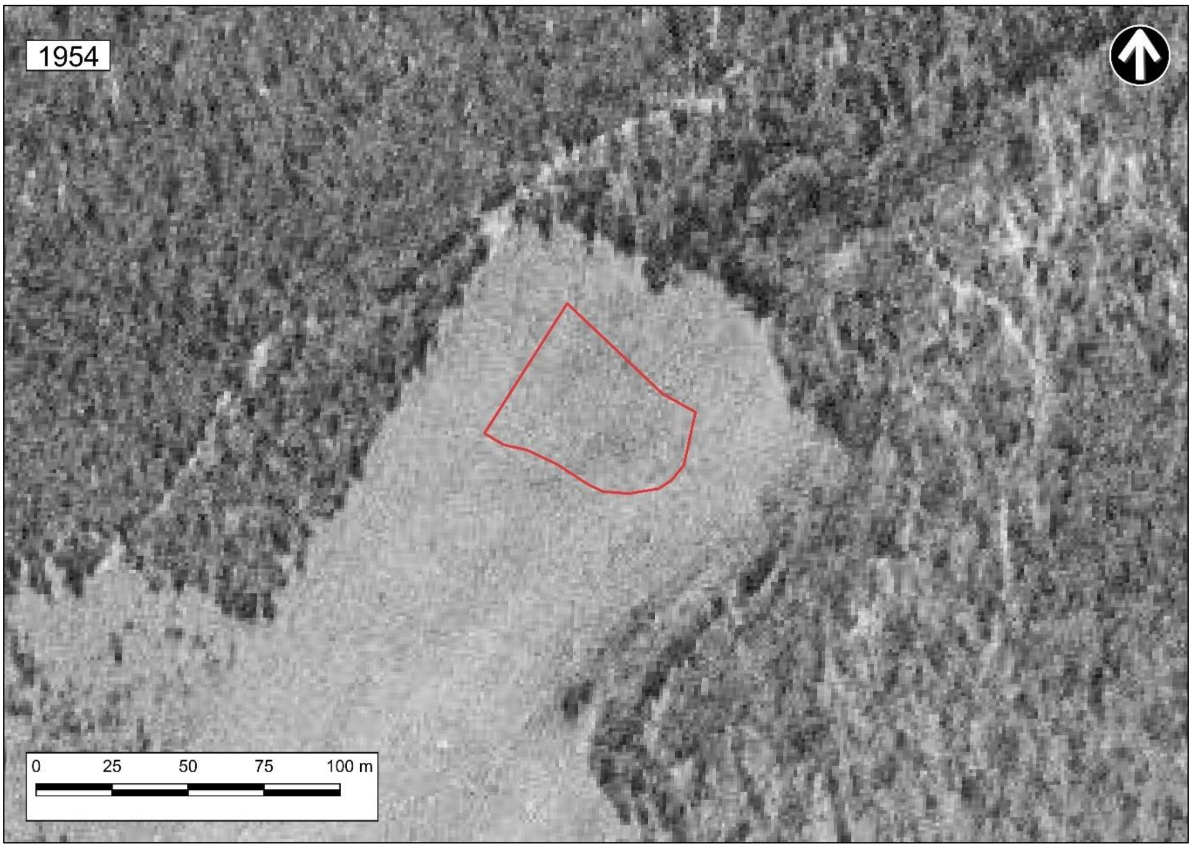


Figure 3 1954 aerial of Hydro PAD1 and environs

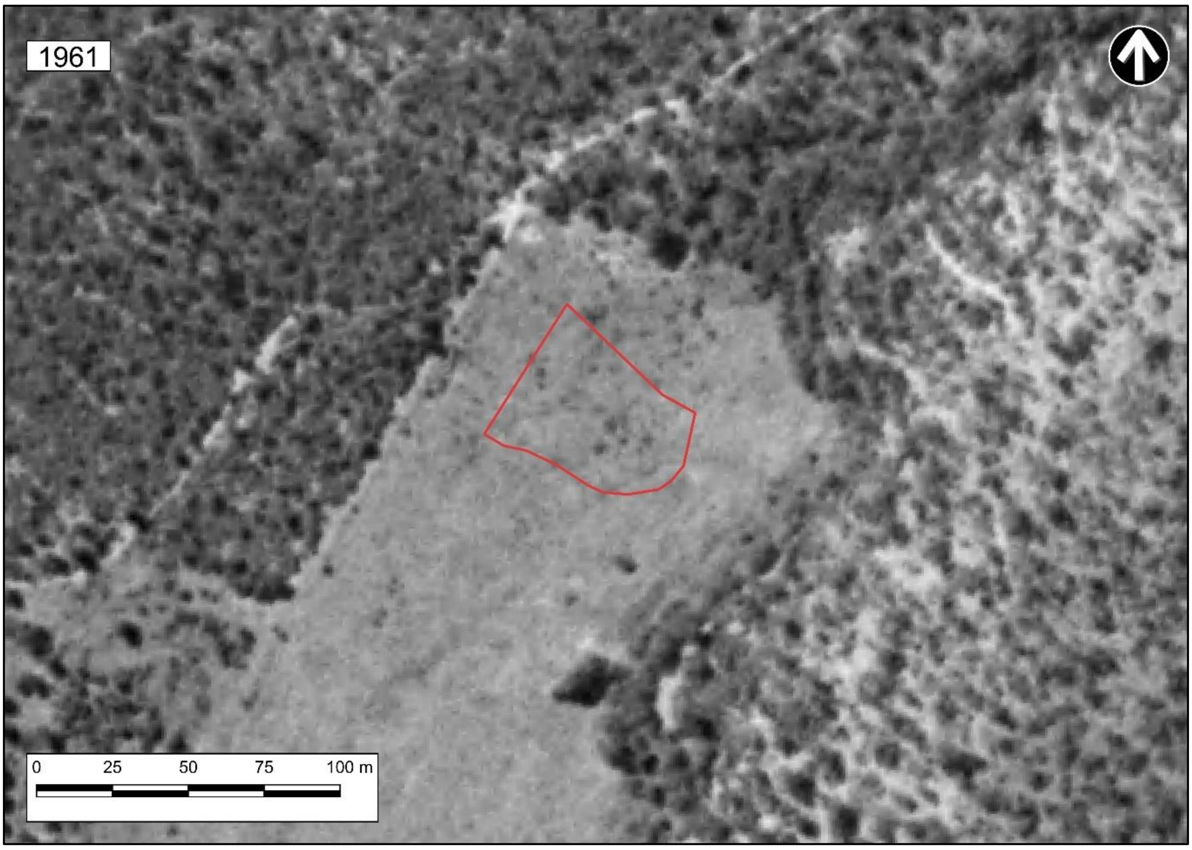


Figure 4 1961 aerial of Hydro PAD1 and environs

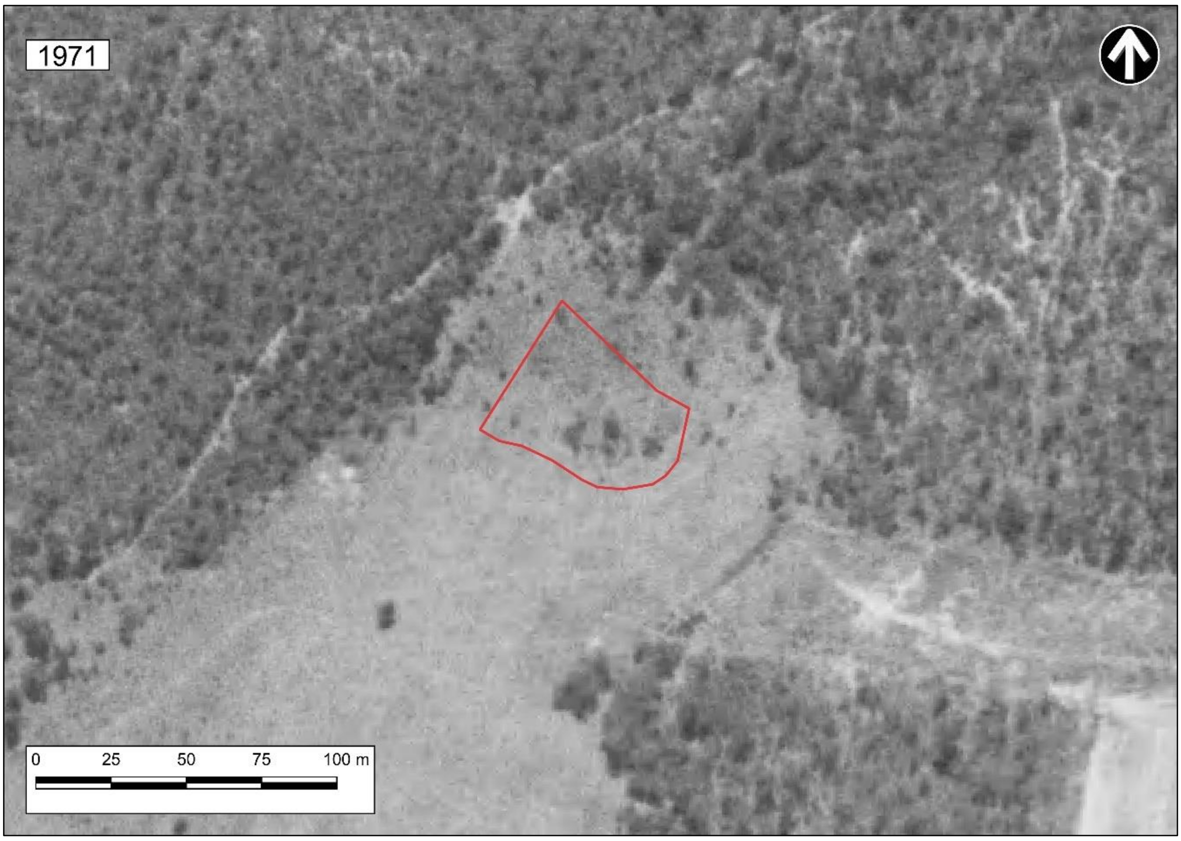


Figure 5 1971 aerial of Hydro PAD1 and environs

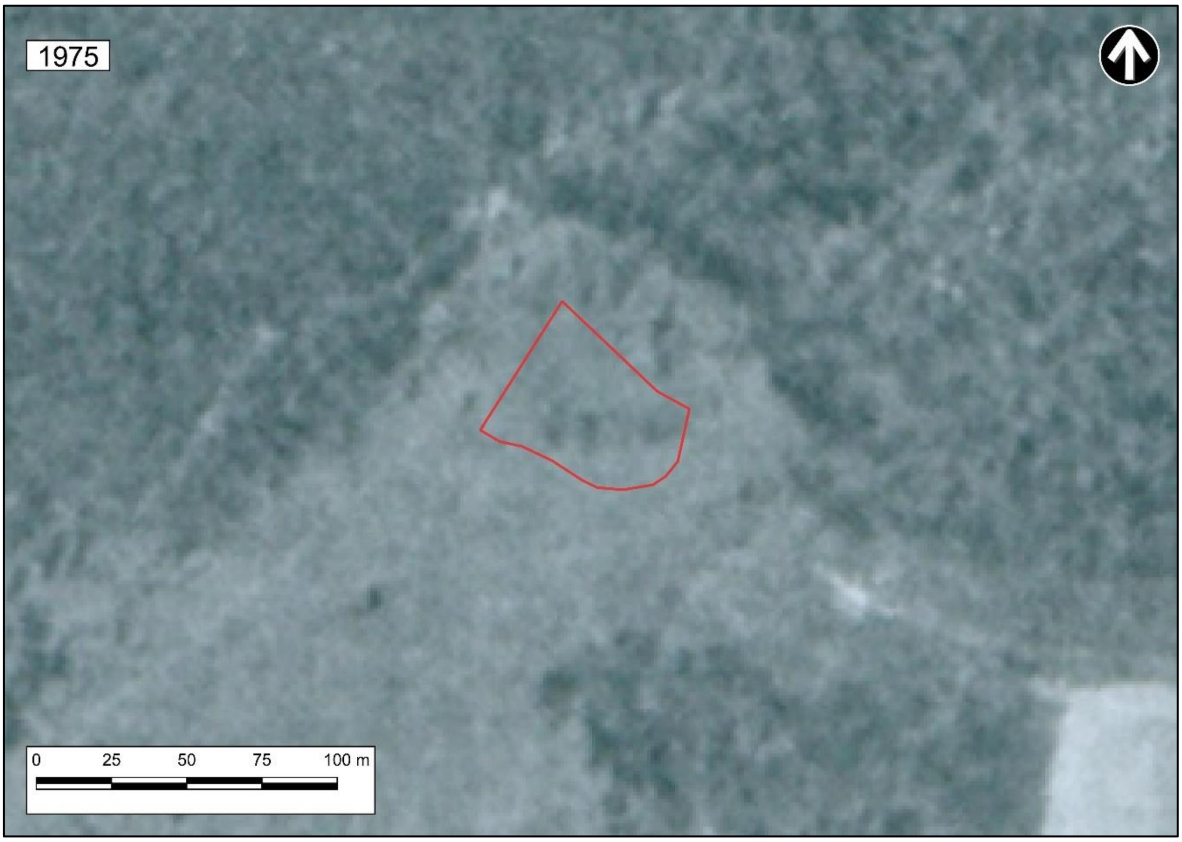


Figure 6 1975 aerial of Hydro PAD1 and environs

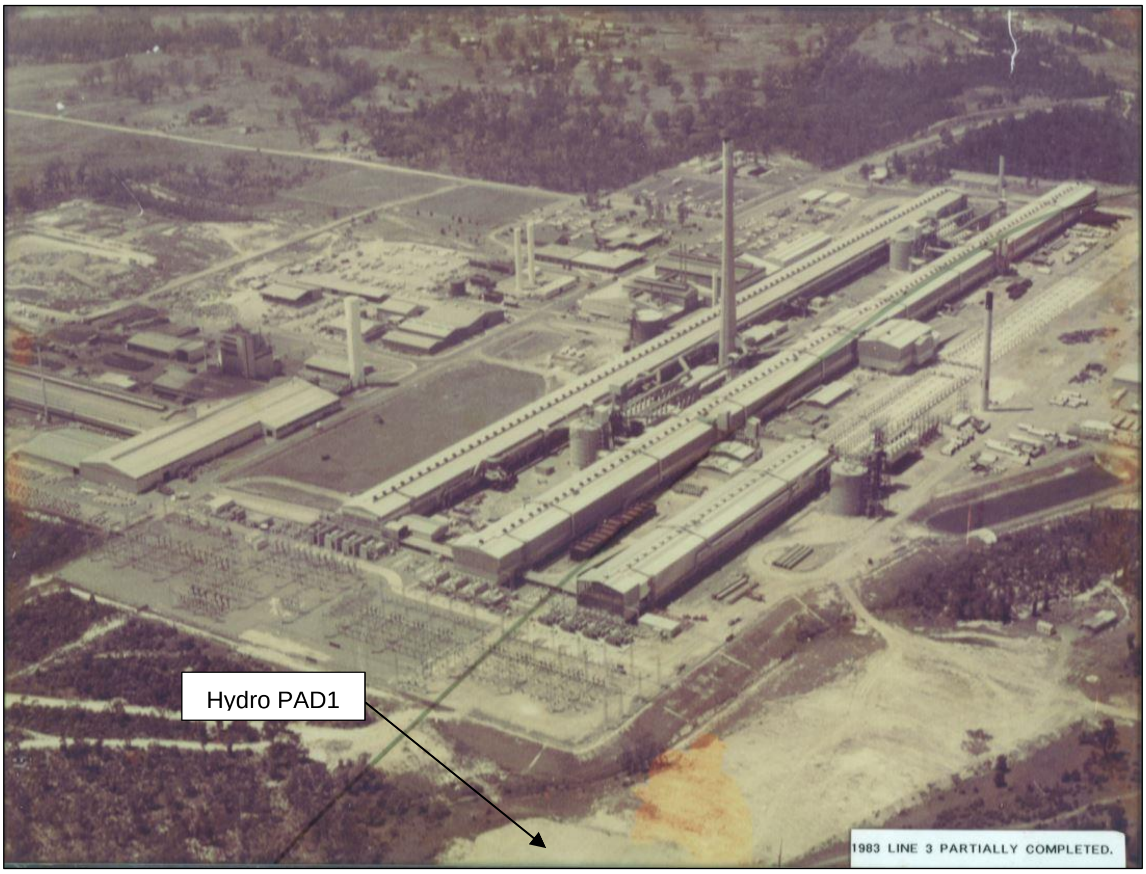


Figure 7 Oblique 1983 aerial of the Smelter site with location of Hydro PAD1 indicated.

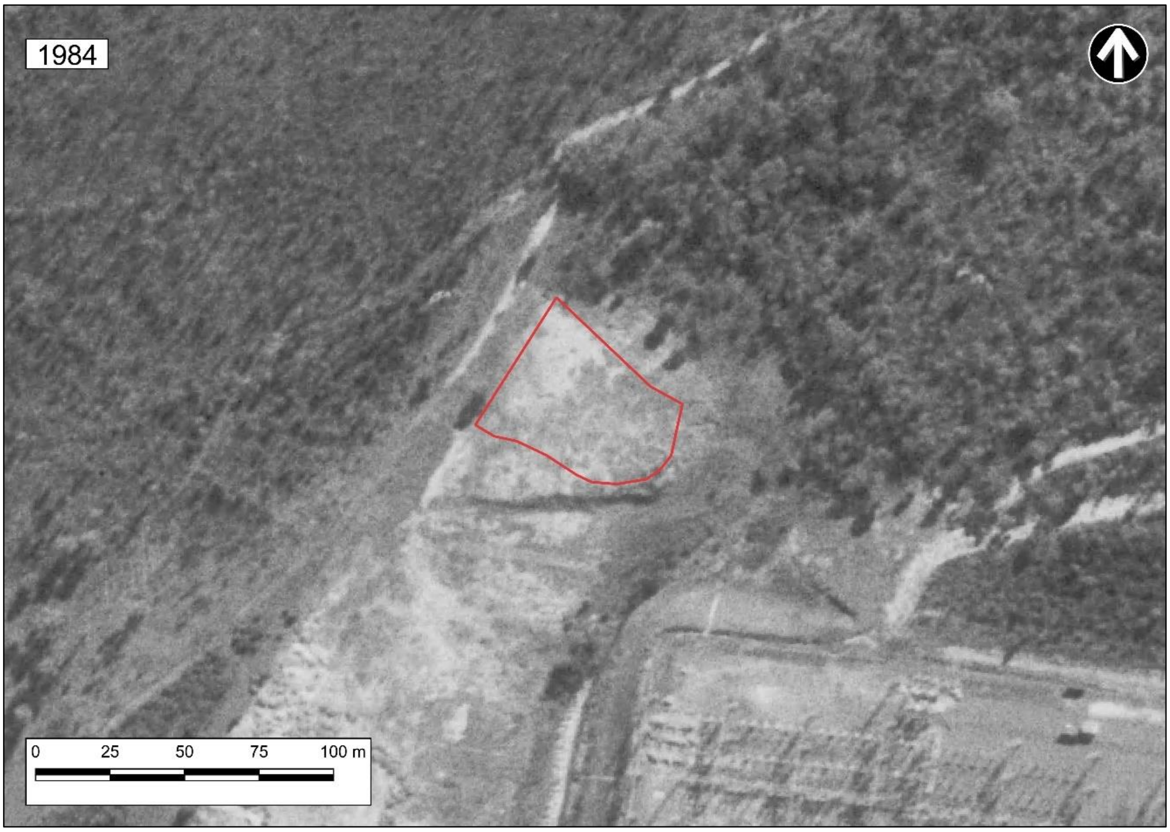


Figure 8 1984 aerial of Hydro PAD1 and environs

Figure 9 1994 aerial of Hydro PAD1 and environs

Figure 10 1998 aerial of Hydro PAD1 and environs

Figure 11 2004 aerial of Hydro PAD1 and environs

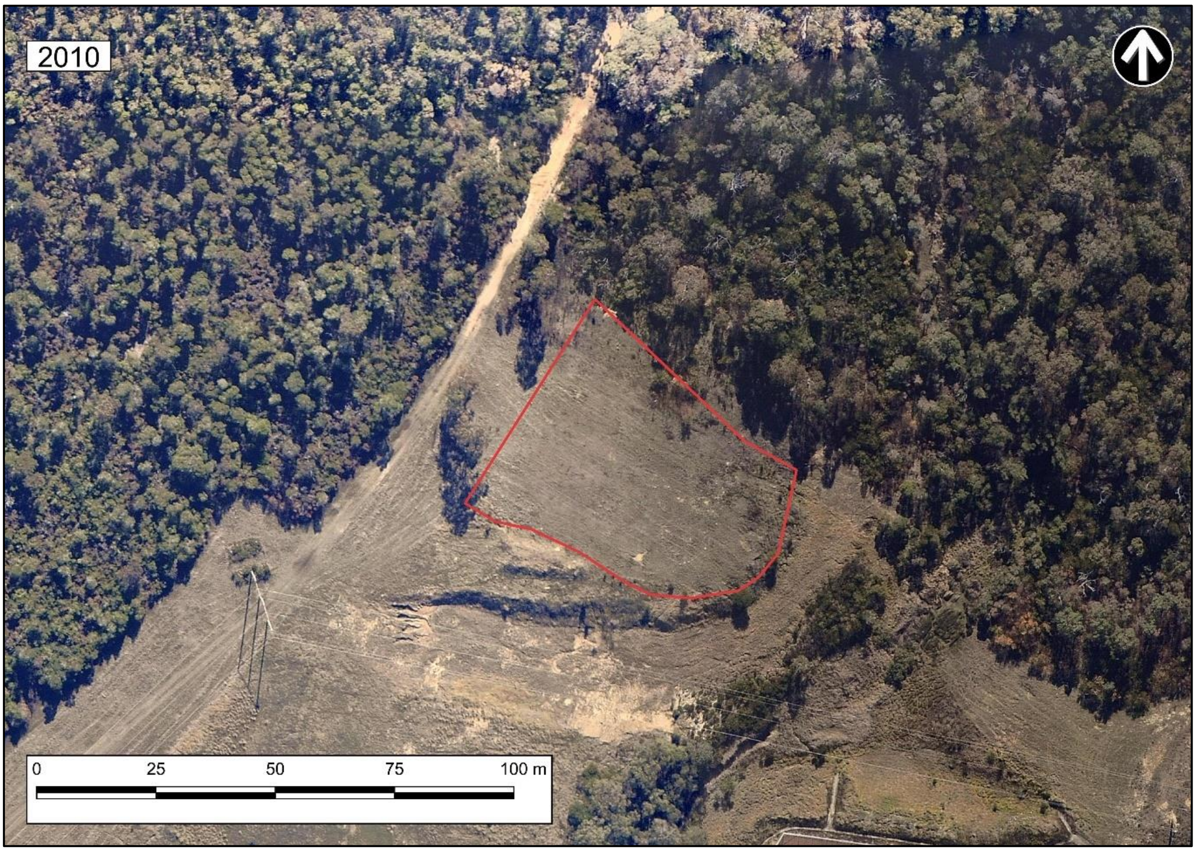


Figure 12 2010 aerial of Hydro PAD1 and environs

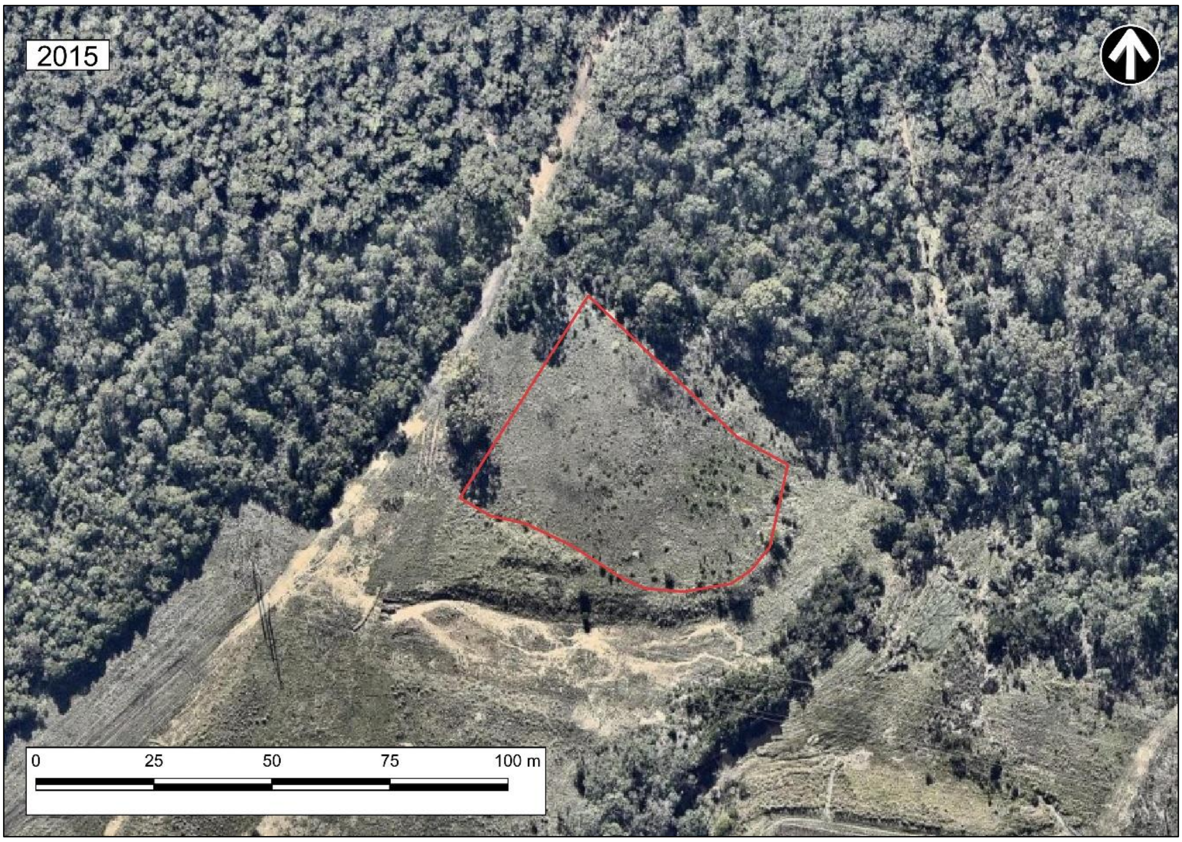


Figure 13 2015 aerial of Hydro PAD1 and environs

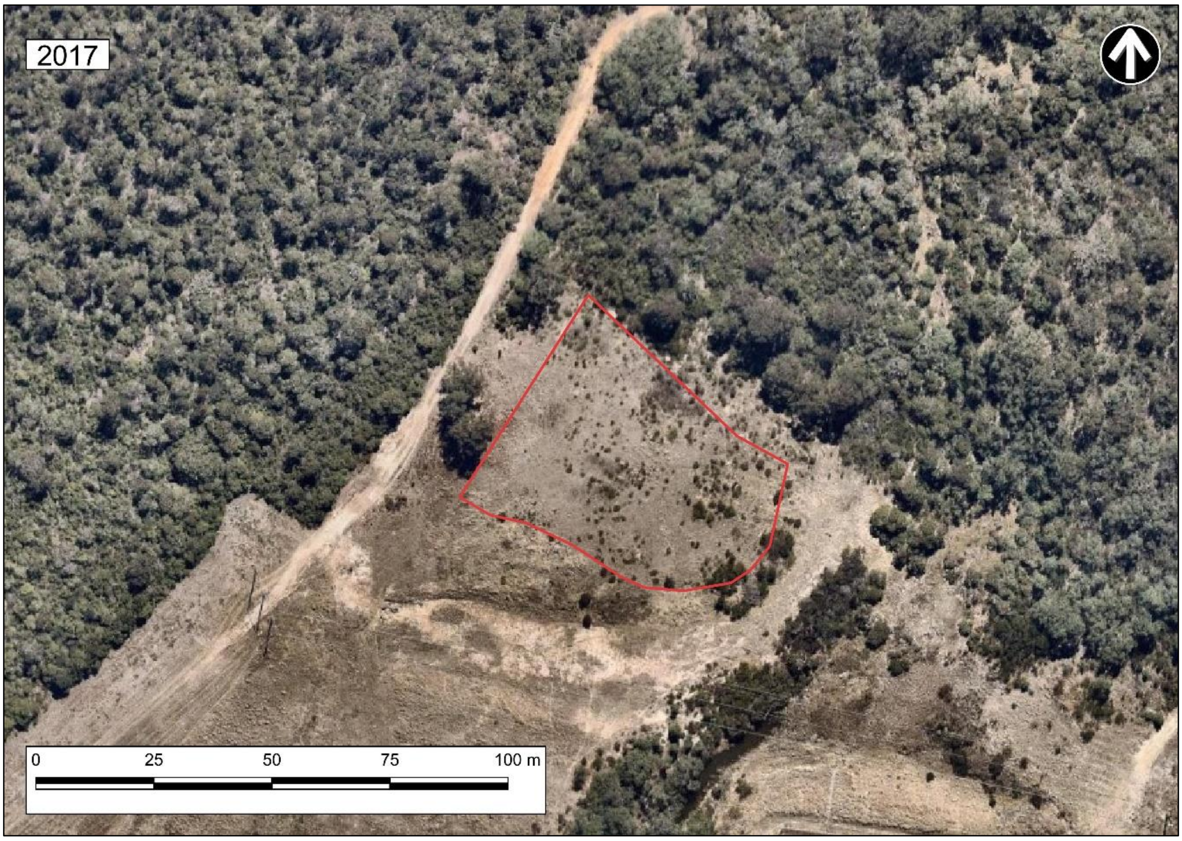


Figure 14 2017 aerial of Hydro PAD1 and environs

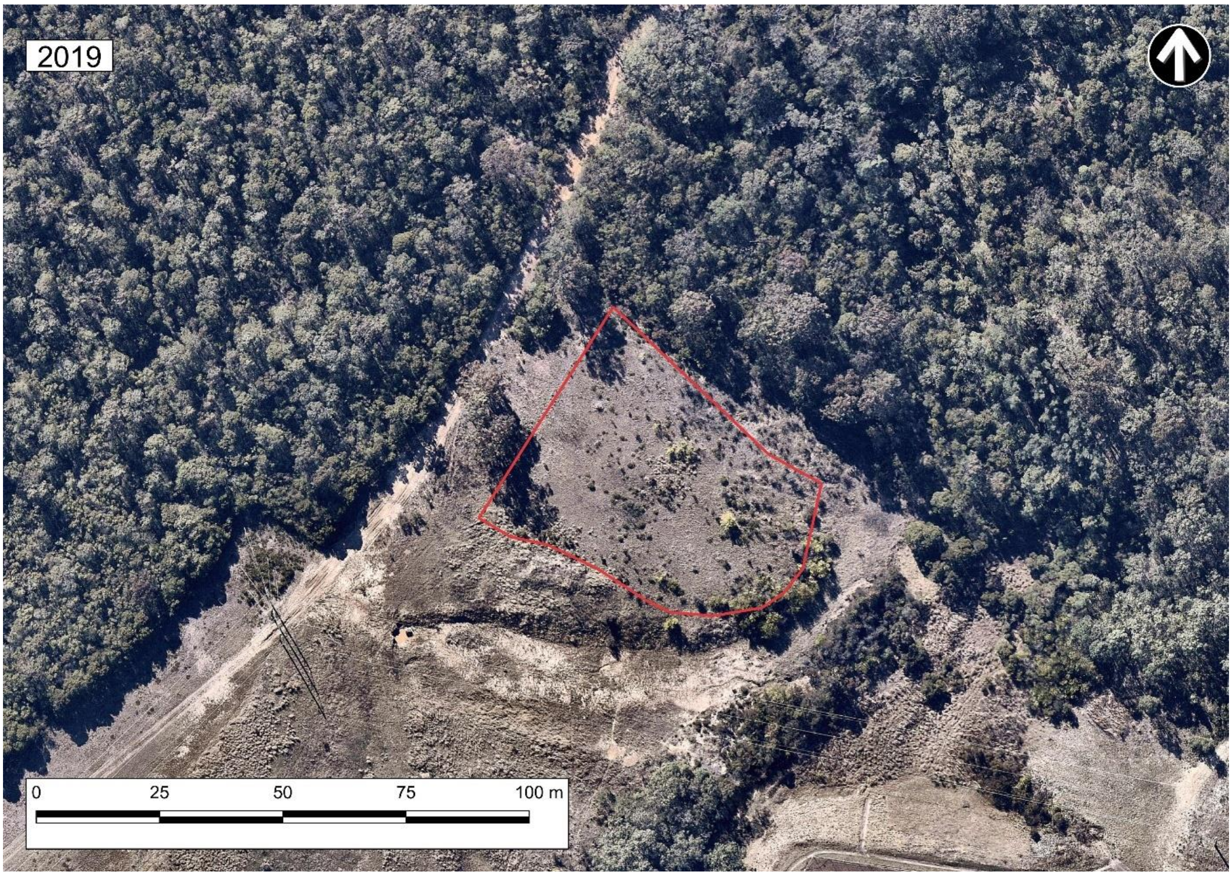


Figure 15 2019 aerial of Hydro PAD1 and environs

3.0 Contamination Investigation (2020)

3.1 Introduction

In 2021, Ramboll was engaged by Hydro to prepare a Data Gap Assessment (DGA) report for several Areas of Environmental Concern (AECs) at the Smelter site. Phase 2 Environmental Site Assessment (ESA) investigations at the Smelter, undertaken in 2012 and 2014, resulted in the identification and assessment of a total of 31 AECs within the Smelter site and its associated Buffer Zone. At the completion of ESA works, it was determined that data gaps remained at five of these areas (AEC 2, AEC 15, AEC 18, AEC 30 and AEC33), generally due to access constraints. The focus of the DGA report, therefore, was to close out data gaps associated with AEC 2, AEC 15, AEC 18, AEC 30 and AEC33. As shown on Figure 16, Hydro PAD1 falls wholly within AEC30, described by Ramboll (2021) as the "*Area East of the Clay Borrow Pit*". As part of Phase 2 ESA works at the Smelter site, AEC30 was identified as requiring further investigation on the basis of historical aerial photographs, which showed disturbance of surface soils across this area.

For AEC30, the data gap investigation was completed between 13 and 14 May 2020 and included:

- Mechanical excavation of 16 test pits (TP1 to TP16) on a systematic grid to a maximum depth of approximately 5 m below ground level (b.g.l);
- Collection of soil samples from a range of depths from fill and underlying natural material, with at least two sample collected per test pit. Soil samples were collected from the excavator bucket or spoil piles using dedicated disposable gloves;
- Test pit locations were recorded on a marked-up plan in the field and the coordinates recorded; and
- Laboratory analysis was completed for TRH, BTEX, PAH, soluble fluoride, free cyanide and heavy metals was completed on 14 selected samples targeting the fill.

Cross-referencing Ramboll's 2020 test pits against the mapped boundary of Hydro PAD1 indicates that two pits (TPs 14 and 15) were excavated within the PAD area and a third (TP13), immediately adjacent to it (Figure 16). All remaining test pits were located to the south of the artificial bank that borders Hydro PAD1 to the south.

3.2 Results

3.3 AEC30

Reference to Ramboll's test pit logs for AEC30, attached as Appendix C, indicates that all but one pit (TP1) were recorded as containing fill deposits from the surface (Table 2). These extended to a maximum depth of 4.8 m b.g.l (range: 0.5-4.8 m), with an average thickness of 2.5 m. Extant fill deposits contained a variety of foreign materials such as concrete, brick, metal and plastic. Summary information on intercepted fill depsoits within TPs 1 to 16 is provided in Table 2.

Laboratory analysis of soil samples collected from AEC30 identified two 'hot spots' where concentrations of Contaminants of Concern were found to exceed human health criteria by more than 2.5 times. These occurred as TPs 12 and 13.

Table 2 Summary of Ramboll's 2020 test pit results within AEC30

Test pit	Depth terminated (b.g.l)	Fill present?	Depth of fill	Foreign materials
1	2 m	None cited	-	None cited
2	2.7 m	Yes, from surface.	1.8 m	Large concrete boulder

Test pit	Depth terminated (b.g.l)	Fill present?	Depth of fill	Foreign materials
3	2.5 m	Yes, from surface.	1.8 m	Large concrete boulders, corrugated metal, plastic and cloth
4	1 m	Yes, from surface.	0.5 m	None cited
5	4 m	Yes, from surface.	3 m	Steel pole, metal
6	2.2 m	Yes, from surface.	1.9 m	None cited
7	4.2 m	Yes, from surface.	2.5 m	Concrete boulder, rubber tube
8	5.2 m	Yes, from surface.	4.8 m	Large concrete boulders, minor metal and reinforcing bar
9	5 m	Yes, from surface.	2.4 m	None cited
10	3 m	Yes, from surface.	2.7 m	Concrete, rope, brick and rio
11	5 m	Yes, from surface.	3.5 m	Rubber and concrete
12	2.7 m	Yes, from surface.	2.1 m	None cited
13	3.7 m	Yes, from surface.	2.2 m	Wire, cables, reinforcing bar, PVC, concrete, terracotta, plastic
14	3	Yes, from surface.	2.5 m	Concrete, reinforcing bar, brick and asphalt
15	1.7	Yes, from surface.	0.7 m	None cited
16	5	Yes, from surface.	4.5 m	Concrete, reinforcing bar and rusted metal, plastic, brick

3.4 Hydro PAD1

Of particular relevance to the current assessment are Ramboll’s (2020) observations for TPs 13, 14 and 15. As indicated in Table 2, soil profiles in all three of these pits were found to contain fill deposits from the surface, with those in TPs 13 and 14, located within the boundary of Hydro PAD1, extending to depths of 0.7 m and 2.5 m b.g.l respectively. In TP13, fill materials extended to a depth of 2.2 m b.g.l. Fill deposits in TPs 13 and 14 included foreign materials, while that in TP15 did not.

Reference to Ramboll’s soil descriptions for TPs 13, 14 and 15 suggest that, in all three instances, natural topsoils have been removed, with fill deposits directly overlying high plasticity sandy clays consistent with locally occurring subsoil units. As in other parts of AEC30, the removal of topsoils in these specific contexts appears to have occurred as part of the ground disturbance works evident on the 1983 and 1984 historical aerials for Hydro PAD1 and its environs, which clearly involved major stripping and filling works.

3.5 Key Observations

Key observations to be drawn from a review of Ramboll’s (2021) contamination investigation works across AEC30 are as follows:

- Natural soil profiles across AEC30, including Hydro PAD1, were severely disturbed as a result of the ground disturbance works evident on the 1983 and 1984 historical aerials for this area; and
- Logs for TPs 13, 14 and 15 suggest that natural topsoils within Hydro PAD1 have been removed, with fill deposits overlying high plasticity sandy clays consistent with locally occurring subsoils.

Figure 16 Map showing location of AEC30 and associated test pits relative to Hydro PAD1

4.0 RAP Consultation

Aboriginal community consultation acknowledges the right of Aboriginal people to be involved, through direct participation, on matters that directly affect their heritage. Involving Aboriginal people in all facets of the assessment process ensures that they are given adequate opportunity to share information about cultural values, and to actively participate in the development of appropriate management and/or mitigations measures. The successful identification, assessment and management of Aboriginal cultural heritage values are dependent on an inclusive and transparent consultation process.

4.1 RAP Consultation for Project EIS

As indicated in Section 1.2, RAP consultation for AECOM's (2015) Aboriginal cultural heritage assessment for the Project was undertaken in accordance with Heritage NSW's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010) (the Consultation Requirements). Ultimately, a total of 34 RAPs were consulted for the assessment, with key consultation activities including RAP review of the Project's draft assessment methodology and ACHAR, as well as the participation of RAP representatives in an archaeological survey of the EIS study area.

RAPs for AECOM's 2015 assessment are listed in Table 3 below.

Table 3 RAPs for AECOM's 2015 Aboriginal cultural heritage assessment

RAP	Primary contact person(s) - 2015
Steven Talbott	Steven Talbott
Amanda Heard	Amanda Heard
Wurrumay Consultant	Kerrie Slater
Tocomwall Pty Ltd	Danny Franks
Wallangan Cultural Services	Maree Waugh
Yinarr Cultural Services	Kathie Kinchela
Hunter Valley Cultural Consultants	Christine Archbold
Upper Hunter Heritage Consultants	Darrel Matthews
Giwiirr Consultants	Rodney Matthews/Michele Stair
Aboriginal Native Title Elders Consultants	Wonnarua Elders
Kawul Cultural Services (now Wurrumay Pty Ltd)	Vicky Slater
Wonn1 (Kauwul Pty Ltd)	Arthur Fletcher
Gidawaa Walang Cultural Heritage Consultancy	Ann Hickey
Wanaruah Local Aboriginal Land Council	Suzie Worth
Wonnarua Culture Heritage	Shannon Griffiths
Lower Hunter Wonnarua Cultural Services	Wonnarua Elder
Culturally Aware	Tracey Skene
Smith Dhagaans Cultural Group	Timothy Smith
Wattaka Wonnarua Cultural Consultancy Services	Des Hickey
Widescope Indigenous Group	Steven Hickey
A1 Indigenous Services	Carolyn Hickey
Amanda Hickey Cultural Services	Amanda Hickey

RAP	Primary contact person(s) - 2015
HTO Environmental Management Services	Paulette Ryan
Murrawan Cultural Consultants Pty Ltd	Robert Smith
Awabakal Traditional Owners Aboriginal Corporation	Kerrie Brauer
Lower Hunter Aboriginal Incorporated	David Ahoy
Cacatua General Services	Donna Sampson
AGA Services	Adam Sampson
Jarban and Mugrebea	Les Atkinson
Awabakal Descendants Traditional Owners Aboriginal Corporation	Peter Leven
Mindaribba LALC	Lea-Anne Ball
Guringai Traditional Owners	Todd Heard
Crimson Rosie	Jeff Matthews
Kauma Pondee Inc	Jill Green

4.2 RAP Consultation for this Addendum ACHAR

Consistent with Section 4 of the Consultation Requirements, on 8 July 2021, a draft of this Addendum ACHAR was issued to all RAPs for their review. The closing date for comments was 6 August 2021. However, responses were actively sought up to Friday 13 August 2021.

Ultimately, a total of 11 RAPs provided responses to the draft Addendum ACHAR, nine in writing and two verbally. Responses are summarised in in Table 4, with written responses provided in Appendix D. Where appropriate, AECOM has provided responses to RAP comments.

Table 4 RAP responses to draft Addendum ACHAR

RAP (Contact Person)	Date	Type	Summary of response	AECOM response
Steven Talbott	20-07-21	Written (e-mail)	Topsoils have, of course, been removed. However, there are still areas within the broader project area that are untouched. Has any consideration been given to these areas? Do decisions regarding future works in these areas rest solely with archaeologists?	As indicated in Section 1.3, this Addendum ACHAR deals specifically with Hydro PAD1. Existing data sources for this particular area, as noted by Mr Talbott, indicate that potential artefact-containing topsoils have been removed. Land outside of Hydro PAD1 but within the EIS project area was the subject of a full Aboriginal cultural heritage assessment in 2015 (see Section 1.2). Potential impacts to Aboriginal heritage values outside of Hydro PAD1 were addressed as part of this assessment and are the subject of an approved AHMP (Appendix B).
HTO Environmental Management Services (Paulette Ryan)	02-08-21	Written (e-mail)	Evidence of Aboriginal peoples' use of the Hunter Valley can be found everywhere. Changing things can be hard as we no longer have any control. We thank you for your support. Future methodologies should state that Aboriginal people be given the opportunity to view artefacts prior to bagging and/or be involved in the bagging process.	AECOM acknowledges HTO's concerns regarding the difficulties of change. AECOM's recommendations regarding Hydro PAD1 have been made on the basis of a thorough review of all existing data sources for the site, which clearly indicate the removal of potential artefact-containing topsoils. HTO's comments regarding future methodologies for artefact collection and bagging are noted. However, it is noted that these fall outside of the scope of this Addendum ACHAR. Additionally, AECOM notes that no test or salvage excavations were proposed as part of AECOM's 2015 Aboriginal cultural heritage assessment for the Project.
Widescope Indigenous Group (Steven Hickey)	10-08-21	Written (e-mail	I have reviewed the Addendum ACHAR and support the recommendations therein.	-
Culturally Aware (Tracey Skene)	10-08-21	Written (e-mail)	Sensitivity and respect is required regarding Wonnarua Elders who have passed away since 2015. I agree with the Addendum ACHAR for this development. My family lived in this town and know the cultural landscapes and stories of this area. Consideration should be given to engaging local Indigenous individuals and businesses in the broader remediation project to assist with Closing the Gap and	AECOM acknowledges the sensitivity regarding Elders who have passed away since 2015 and has modified this ACHAR accordingly.

RAP (Contact Person)	Date	Type	Summary of response	AECOM response
			fulfilling any Reconciliation Action Plans that Hydro may have.	
Wonn1 (Kauwul Pty Ltd) (Arthur Fletcher)	10-08-21	Written (e-mail)	Kauwul Pty Ltd, in general, support the Addendum ACHAR. Should there be any further impacts to identified sites, Wonnarua RAPs should be in attendance and given the opportunity to monitor such works. Consideration should also be given to engaging local Indigenous individuals and businesses in the broader remediation project.	As indicated in Section 1.3, this Addendum ACHAR deals specifically with Hydro PAD1. Land outside of Hydro PAD1 but within the EIS project area was the subject of a full Aboriginal cultural heritage assessment in 2015 (see Section 1.2). Potential impacts to Aboriginal heritage values outside of Hydro PAD1 were addressed as part of this assessment and are the subject of an approved AHMP (Appendix B).
Wallangan Cultural Services (Maree Waugh)	12-08-21	Verbal	I'm happy with the report and recommendations	-
A1 Indigenous Services (Carolyn Hickey)	12-08-21	Verbal	We support the Addendum ACHAR	-
Wurrumay Pty Ltd (Vicky Slater)	12-08-21	Phone (text)	I'm happy with ACHAR and recommendations	-
Mindaribba LALC	12-08-21	Written (e-mail)	Mindaribba LALC support the submission of the Addendum ACHAR for the Project and have no further comment	
Cacatua General Services	13-08-21	Written (e-mail)	Cacatua fully support the Addendum ACHAR	-
AGA Services	13-08-21	Written (e-mail)	AGA Services fully support the Addendum ACHAR	-

5.0 Key Findings and Recommendations

5.1 Key Findings

The key findings of the current assessment are as follows:

- Land within Hydro PAD1 was severely disturbed in or around 1983 as a result of heavy earthworks linked to the construction of the Smelter's third potline. On current evidence, both stripping and filling are inferred;
- Natural soil profiles within and to the south of Hydro PAD1 have been radically altered as a result of the above. For Hydro PAD1, a complete loss of potential artefact-bearing topsoils is inferred;
- Contra AECOM's (2015) initial assessment, land within Hydro PAD1 retains negligible potential for subsurface Aboriginal archaeological deposits and, as such, does not comprise an area of PAD;

5.2 Recommendations

In view of the key findings above, the following recommendations are made regarding Hydro PAD1:

1. Hydro should lodge a request with the AHIMS Registrar to have the status of Hydro PAD1 in the AHIMS database changed from 'Valid' to 'Not a Site', thereby removing it as a development constraint. A copy of this Addendum ACHAR should be submitted in support of Hydro's request.
2. The AHMP for the Project should be updated to reflect the results of this Addendum ACHAR; and
3. Once finalised, all RAPs for the Project should be provided with a copy of this Addendum ACHAR.

6.0 References Cited

AECOM Australia Pty Ltd. (2015). *Former Hydro Aluminium Smelter: Aboriginal Cultural Heritage Assessment*. Unpublished report for Hydro Aluminium Kurri Kurri Pty Ltd.

Hydro Aluminium Kurri Kurri Pty Ltd. (2020). *Kurri Kurri Aluminium Smelter Decommissioning, Demolition and Remediation: Aboriginal Heritage Management Plan*. Unpublished AHMP.

NSW Department of Environment Climate Change & Water. (2010a). *Aboriginal Cultural Heritage Consultation Requirements for Proponents*. Department of Environment, Climate Change and Water.

NSW Department of Environment Climate Change & Water. (2010b). *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. Department of Environment, Climate Change and Water.

NSW Office of Environment & Heritage. (2011). *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*. Office of Environment and Heritage.

Ramboll Australia Pty Ltd. (2021). *Data Gap Assessment: Hydro Aluminium Smelter Site, Lozford, NSW*. Unpublished report for Hydro Aluminium Kurri Kurri Pty Ltd.

Appendix A

Hydro PAD1 (37-6-3872) - AHIMS Site Card

Aboriginal Site Recording Form

AHIMS Registrar
PO Box 1967, Hurstville 2220 NSW

AHIMS site ID: 37-6-3872

Date recorded: 08-03-2018

Site Location Information

Site name: Hydro PAD 1

Easting: 357445

Northing: 6371592

Coordinates must be in GDA (MGA)

Horizontal Accuracy (m): 1

Zone: 56

Location method: Differential GPS

Recorder Information

(The person responsible for the completion and submission of this form)

Title	Surname	First name
Dr.	McLaren	Andrew

Organisation: AECOM Australia Pty Ltd

Address: Level 8, 420 George Street, Sydney, NSW 2000

Phone: 0289340547

E-mail: andrew.mclaren@aecom.com

Site Context Information

Land Form Pattern: Rolling Hills

Land Use: Service Corridor

Land Form Unit: Terrace

Vegetation: Cleared

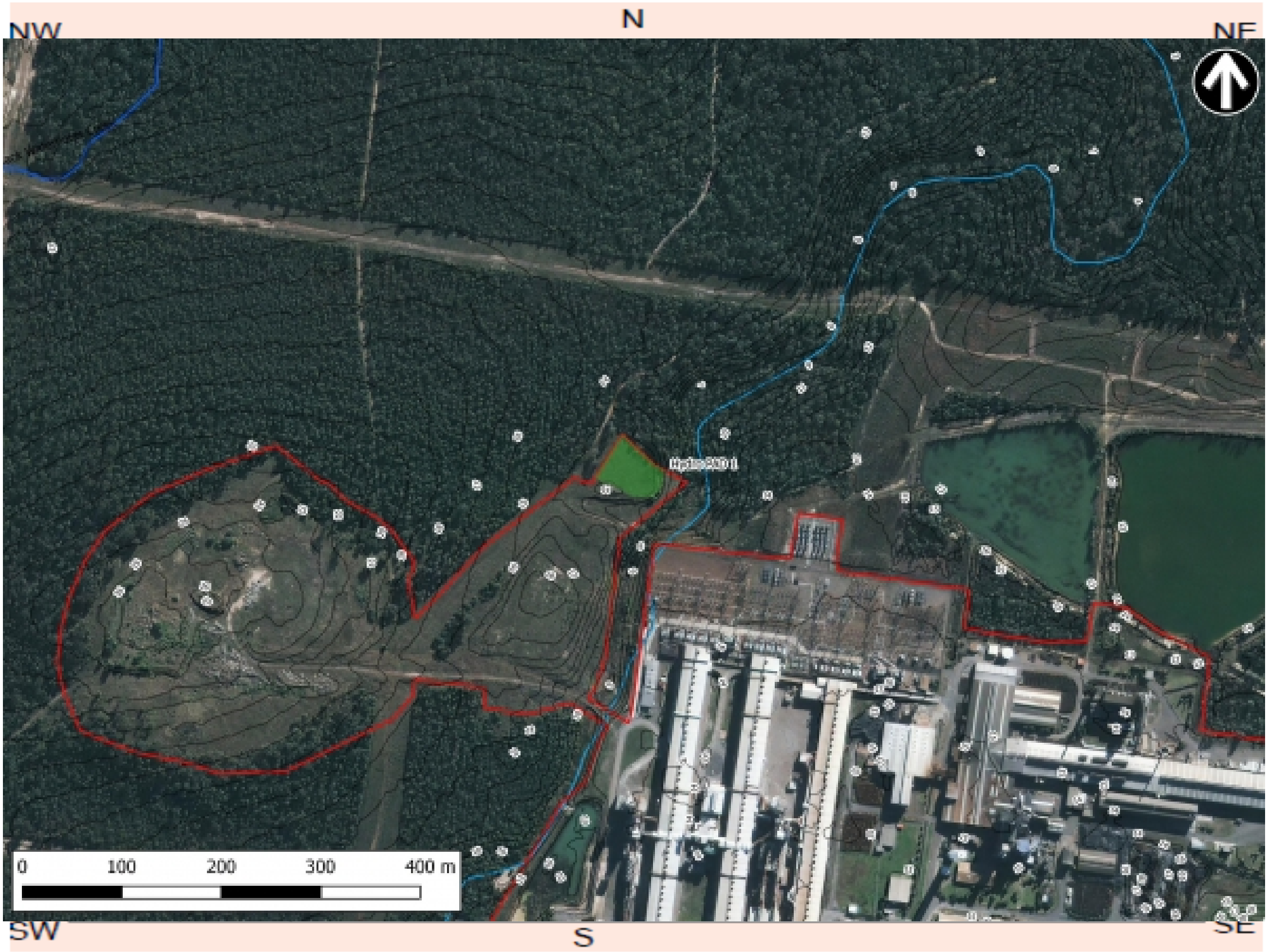
Distance to Water (m): 40

Primary Report: AECOM. 2015. Former Hydro Aluminium Smelter: ACHA. Unpublished.

How to get to the site: Site located within former Hydro Aluminium Smelter Site, off Hart Road, in Kurri Kurri (private property). Contact Hydro Aluminium Kurri Kurri Pty Ltd for access. See attached location map.

Other site information:

Site location map



Site contents information

open/closed site: Open

Site condition: Good

Features:

	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
1. Potential Archaeological Deposit		60	50				

Description:

Cleared section of elevated low gradient terrain (left bank terrace) overlooking unnamed 2nd order tributary of Black Waterholes Creek. Field observations and historical aerial photographs suggest that this area retains moderate GI.

Features:

	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees: Scar Depth (cm)	Scarred Trees: Regrowth (cm)	Scarred Trees: Scar shape	Scarred Trees: Tree Species
2.							

Description:

Features:

	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
3.							

Description:

Features:

	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
4.							

Description:

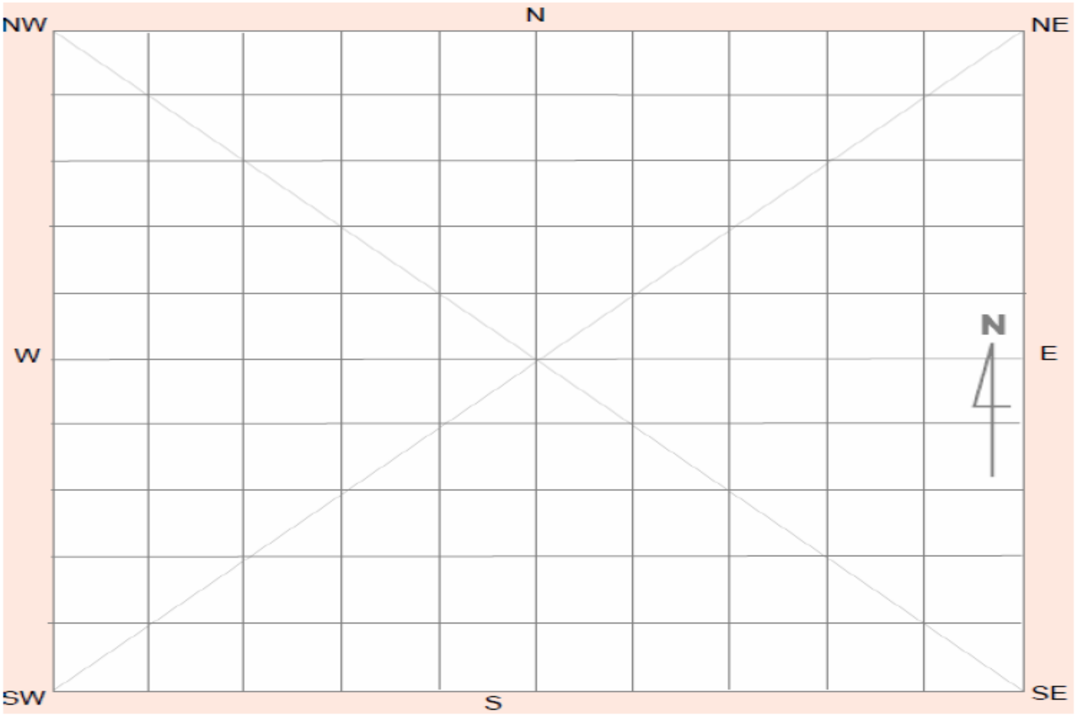
Features:

	Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
5.							

Description:

Other Site Info:

Site plan



Site photographs

Description: View across Hydro PAD 1

Description:

Description:

Description:

Site restrictions

Do you want to Restrict this site?:

Restriction type: Gender General Location

Why is this site restricted?:

Further information contact

Title **Surname** **First name**

Organisation:

Address:

Phone: **E-mail:**

Appendix B

AHMP

Intended for
Hydro Aluminium Kurri Kurri Pty Ltd

Document type
Final Report

Date
December, 2020

KURRI KURRI ALUMINIUM SMELTER DECOMMISSIONING, DEMOLITION AND REMEDIATION

ABORIGINAL HERITAGE MANAGEMENT PLAN

Ref	**318000533**
Document ID	**Hydro Kurri Kurri EMP_Appendix J_FINAL_Aboriginal Heritage_20201223**
Revision	**Final Rev 0**
Date	**23/12/2020**
Made by	**B Sinclair/ T Jackson**
Checked by	**S Taylor**
Approved by	**F Robinson**
Description	**Ramboll was engaged by Hydro Aluminium Kurri Kurri Pty Ltd to prepare a Remediation Works Environmental Management Plan (RWEMP) to describe how environmental management will be undertaken at the former Hydro Aluminium Kurri Kurri aluminium smelter at Hart Road Loxford, NSW and the surrounding land owned by Hydro. This Aboriginal Heritage Management Plan forms a component of the RWEMP.**

CONTENTS

FIGURES

TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AHIMS	Aboriginal Heritage Information Management System
AHMP	Aboriginal Heritage Management Plan
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EP&A Act	*Environmental Planning and Assessment Act 1979*
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
OEH	Office of Environment and Heritage
WHS	Workplace Health and Safety
RAP	Registered Aboriginal Party/ Parties
RWEMP	Remediation Works Environmental Management Plan

GLOSSARY

Council	Cessnock City Council
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
Department	Department of Planning, Industry and Environment
Hydro Land	The land owned by Hydro Aluminium Kurri Kurri Pty Ltd which includes the Smelter and surrounding land.
Remediation	Remediation of contaminated land and soils at the Smelter and on Hydro Land, including the construction of a Containment Cell as addressed in the State Significant Development application to the Department of Planning and Environment SSD 6666.
Stage 1 Demolition	Demolition of Smelter buildings addressed in the development application 8/2015/399/1.
Stage 2 Demolition	Demolition of Smelter buildings, three concrete stacks, one water tower, subsurface structures to 1.5m below ground surface and operation of a concrete crushing plant addressed in the development application to Cessnock City Council 8/2018/46/1.
The Smelter	The former Hydro Aluminium Kurri Kurri Pty Ltd aluminium smelter at Hart Road, Loxford.

1. INTRODUCTION

1.1 Background

This Aboriginal Heritage Management Plan (AHMP) has been prepared by Ramboll Australia Pty Ltd on behalf of Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to support the Remediation Works Environmental Management Plan (RWEMP) which addresses the decommissioning, demolition and remediation activities at the former Hydro Aluminium Kurri Kurri Smelter (the Smelter) at Hart Road Loxford and the management of the surrounding land owned by Hydro (the Hydro Land).

1.2 Objectives

The objectives of this AHMP are to:

- Outline relevant legislation and guidelines.
- Identify known Aboriginal heritage items within the buffer lands.
- Identify measures to minimise impacts to Aboriginal heritage items within the buffer lands.
- Establish the roles and responsibilities of all parties involved in Aboriginal heritage management.
- Establish supervision, monitoring, auditing and reporting framework for the AHMP.

1.3 Purpose and Scope

The purpose of the AHMP is to specify procedures for management of Aboriginal heritage issues and impacts during activities at the Smelter and on the Hydro Land.

The AHMP has been developed with reference to the following legislation and guidelines:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *National Parks and Wildlife Act 1974*
- *Heritage Act 1977*
- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW, 2010)

1.4 Regulatory Requirements

A list of the development consent conditions related to management of Aboriginal archaeology and where they are addressed in this document are outlined in **Table 1-1**.

Table 1-1: Project Approval Conditions

No.	Condition	Location in AHMP
SSD 6666		
	ABORIGINAL HERITAGE	
B38	To prevent impacts to subsurface archaeological deposits, stockpiles in the area of high archaeological sensitivity, as shown in **Figure 23** of the Aboriginal Cultural Heritage Assessment and titled *Archaeological Sensitivity Figure*, must be placed on geo-matting.	Section 2.22.1
	Unexpected Finds Protocol	
B39	If any previously unidentified item or object of Aboriginal heritage significance is identified on site:	Section 4
B39(a)	all work in the immediate vicinity of the suspected Aboriginal item or object must cease immediately;	Section 4
B39(b)	a 10 m wide buffer area around the suspected item or object must be cordoned off; and	Section 4
B39(c)	the OEH must be contacted immediately.	Section 4
B40	Work in the immediate vicinity of the Aboriginal item or object may only recommence in accordance with the provisions of Part 6 of the *National Parks and Wildlife Act 1974* (NSW).	Section 4

No.	Condition	Location in AHMP
DA 8/2015/399/1		
	No specific conditions pertaining to Aboriginal Archaeology.	N/A
DA 8/2018/46/1		
Advisory Note 4	As required by the *National Parks and Wildlife Act 1974* and the *Heritage Act 1977*, in the event that Aboriginal cultural heritage or historical cultural fabric or deposits are encountered/discovered where they are not expected, works must cease immediately and Council and the Heritage Division of the Office of Environment and Heritage (OEH) must be notified of the discovery. In the event that archaeological resources are encountered, further archaeological work may be required before works can re-commence, including the statutory requirement under the *Heritage Act 1977* to obtain the necessary approvals/permits from the Heritage Division of the OEH.	Section 4

2. EXISTING ENVIRONMENT AND POTENTIAL IMPACTS

2.1 Existing Environment

An Aboriginal Cultural Heritage Assessment (AECOM, 2015) was undertaken to identify Aboriginal archaeological sites, areas of potential archaeological significance and any areas of cultural significance within the Smelter and the Hydro Land.

The assessment was undertaken in accordance with the NSW Office of Environment and Heritage *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC, 2005) and with reference to the NSW Office of Environment and Heritage's *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) and *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011). Aboriginal community consultation for the assessment was conducted in accordance with OEH's *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010). A total of 32 Registered Aboriginal Parties were involved in the assessment.

Figure 2-1 shows the locations of recorded Aboriginal relics and areas of potential archaeological deposits within the Smelter and surrounds.

2.2 Potential Impacts

The majority of the Project Site has been significantly disturbed through development of the Smelter. However, there are areas of minimally to moderately disturbed terrain in the northern and western portions of the Project Site. One new Aboriginal archaeological site (an isolated stone artefact, Hydro-IA35-15) was identified during survey.

An area of high archaeological sensitivity is also located within the northern section of the proposed Containment Cell material stockpile area (**Figure 2-1**). This area of high archaeological sensitivity has been registered on the Aboriginal Heritage information System (AHIMS) as "Hydro PAD 1" with a Site ID of 17-6-3872. In the event this area was used for stockpiling materials, physical impacts to the integrity of natural soil profiles within this area could occur as a result of sediment deposition and removal activities (including associated heavy vehicle movements). This could in turn impact on Aboriginal archaeological relics present in this area.

Activities within the Hydro Land (such as contamination remediation) also have the potential to impact on previously unidentified Aboriginal heritage relics where the activity requires works in relatively undisturbed areas.

Aerial photography by Nearmap, flown 15.06.2020

RAMBOLL AUSTRALIA - GIS MAP file : 318000533_GIS_P001_RemediationEMP | F023_AbHer_V01 | 29/10/2020

Figure 2-1 | Aboriginal Archaeological Sites - Smelter Site and Surrounds

3. IMPLEMENTATION

3.1 Roles and Responsibilities

Key personnel responsible for implementation of this AHMP are in **Table 3-1** and consistent with the overall RWEMP.

Table 3-1: Hydro Personnel and Environmental Management Responsibilities

Position	Responsibilities
OVERALL SITE MANAGEMENT	
Managing Director	Make certain that the Hydro Team and contractors are implementing this plan and associated plans and procedures; and have attained and are complying with applicable development approvals and permits. Provide adequate resources and funding for the implementation of this plan. Review and approve RWEMP (including this AHMP).
Principal Environmental Consultant	Provide advice in relation to environmental management and performance. Review and modify the RWEMP (including this AHMP) as directed by the Managing Director/Project Manager.
Principal Communications Consultant	Manage the mechanisms available for the community to receive information and to make enquiries or complaints about activities
SMELTER DECOMISSIONING, DEMOLITION AND REMEDIATION ACTIVITIES	
Project Manager	Make certain that any proposed works or changes to existing activities, that may have an impact on the environment or the community (including areas with known or potential Aboriginal heritage significance), have the necessary legislative approval prior to the commencement of works. Make certain that the environmental aspects and issues, associated with proposed works or changes to existing activities, are adequately addressed in the EMP and sub plans (including this AHMP). Review and approve the EMP and sub-plans on an annual basis or when changes to activities at the Smelter occur. Facilitate implementation of the RWEMP and sub-plans (including this AHMP).
Construction Manager	Verify that the work of contractors and Hydro personnel on the Project are undertaken in accordance with this RWEMP (including this AHMP). Provide appropriate training to contractors and Hydro personnel on the Project regarding environment and community requirements and responsibilities. Review and approve the contractors' environmental management documentation prior to commencement of activities and inform contractors of changes to the RWEMP.
Contract Administrator	Provide relevant environmental legislative, regulatory and management requirements in tender documentation. Verify that the work of contractors is undertaken in accordance with the EMP (including this AHMP) and other relevant environmental procedures and standards.
Workplace Health and Safety (WHS) Manager	Provide Hydro personnel with the necessary tools and training to enable effective implementation of the RWEMP (including this AHMP). Implement and maintain an induction package to be provided to all personnel working at the Smelter and Hydro Land, which will include information relevant to the environmental and community management.

Position	Responsibilities
CARE, MAINTENANCE AND HYDRO LAND MANAGEMENT ACTIVITIES	
Demolition Contractor	Comply with the requirements of the AHMP as it applies to Smelter demolition activities. Implement the measures and actions as described in the AHMP through a Demolition EMP and supporting sub-plans and specific procedures that comply with this AHMP. Develop and implement procedures for self-checking environmental management compliance with the Demolition Contractor's procedures and this AHMP. Report potential or actual environmental incidents associated with demolition activities at the Smelter, and assist as required in the investigation, implementation of corrective actions and recording of the incident.
Remediation Contractor	Comply with the requirements of the AHMP as it applies to Smelter and relevant Hydro Land remediation activities. Specifically, the appropriate management of the Hydro-IA35-15 and Hydro PAD 1 as identified in **Section 2.1** of this AHMP. Implement the environmental measures and actions as described in the AHMP through a Remediation EMP and supporting sub-plans and specific procedures that comply with this AHMP. Develop and implement procedures for self-checking management compliance with the Remediation Contractor's procedures and this AHMP. Report potential or actual environmental incidents associated with remediation activities at the Smelter and relevant Hydro Land, and assist as required in the investigation, implementation of corrective actions and recording of the incident.
Environmental Officer/ Hydro Land Manager	Verify that the work of contractors and Hydro personnel on Hydro Land are undertaken in accordance with this EMP (including this AHMP). Undertake a weekly inspection of activities on the Hydro Land that will occur for two weeks or more.
ALL AREAS AND ACTIVITIES	
Contractors	Comply with the requirements of the EMP (including this AHMP) as it applies to site environmental management and control. Implement the environmental measures and actions as described in the EMP and the relevant sub-plans (including this AHMP) through procedures and management plans that comply with this EMP and the relevant sub-plans. Develop and implement procedures for self-checking environmental management compliance with Contractor's procedures and the EMP. Report potential or actual environmental incidents associated with activities at the Smelter or on Hydro Land, and assist as required in the investigation, implementation of corrective actions and recording of the incident.
All Personnel	Implementation of the relevant environmental measures described in the RWEMP (including this AHMP) applicable to their activities. Stop work in the event of an actual or potential environmental incident After ceasing the activity that is the known or potential source, report potential or actual environmental incidents associated with activities at the Smelter or on Hydro Land, and assist as required in the investigation, implementation of corrective actions and recording of the incident.

3.2 Management Measures

Hydro will implement a number of controls to manage Aboriginal heritage impacts that may be generated from activities at the Smelter and the Hydro Land. The Aboriginal heritage management measures are outlined in **Table 3-2**.

Table 3-2: Aboriginal Heritage Management Measures

Management Measures	Action	Timing / Frequency	Responsibility	Further Detail
The known artefact and the identified area of high archaeological sensitivity are to be collected or protected prior to undertaking remediation activities that would have a direct impact	Surface collection and relocation of the identified isolated artefact Hydro-IA35-15.	Prior to remediation	Project Manager/ Principal Environmental Consultant Qualified Archaeologist and/or RAP field representative	**Section 2.2** (potential impacts)
	Where possible, avoid the need to stockpile material in the area of high archaeological sensitivity. In the event that stockpiling in this area is required, geo-matting will be placed on the surface of the area prior to stockpiling.	Prior to activities	Environment Officer Remediation Contractor	**Section 2.2** (potential impacts)
Prior to undertaking activities within the Hydro Land, the potential impacts on known Aboriginal heritage relics are to be considered.	**Figure 2-1** will be reviewed to identify if any mapped Aboriginal heritage sites are within or adjoining the proposed activity location.	Prior to activities	Environment Officer	**Figure 2-1**
	The proposed activity methodology will avoid disturbance of Aboriginal heritage items. This includes review of the mapping and ground truthing recorded Aboriginal heritage items.	Prior to activities	Environment Officer Remediation Contractor	**Section 2.2** (potential impacts)
	In the event that disturbance of an Aboriginal heritage item is required, the approval requirements for disturbance are to be identified and approval obtained.	Prior to activities	Environment Officer Remediation Contractor Principal Environmental Consultant	
Prior to undertaking activities within the Hydro Land, the potential to encounter previously unidentified Aboriginal heritage relics are to be considered.	An assessment is to be undertaken in accordance with *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW, 2010).	Prior to activities	Environment Officer	Refer to **Appendix 1** and the known Aboriginal heritage sites and potential archaeological deposits shown in **Figure 2-1**
	In the event that the assessment identifies the potential for Aboriginal heritage relics to be disturbed, further investigations will be undertaken by a qualified archaeologist to determine if relics will or could be disturbed.	Prior to activities	Environment Officer Qualified Archaeologist	Refer to **Appendix 1** and the known Aboriginal heritage sites and potential archaeological deposits shown in **Figure 2-1**

Management Measures	Action	Timing / Frequency	Responsibility	Further Detail
	In the event that disturbance of an Aboriginal heritage item is required, the approval requirements for disturbance are to be identified and approval obtained.	Prior to activities	Environment Officer Remediation Contractors Demolition Contractors Principal Environmental Consultant	
Previously unidentified Aboriginal heritage items encountered during activities are not to be damaged or disturbed.	All personnel required to undertake earthworks within the Project Site outside of the Smelter will be informed during the site induction of Aboriginal cultural heritage issues.	Prior to and during activities	Project Manager Environmental Officer Remediation Contractor	Section 3.3.2 of the RWEMP (inductions and training)
	In the event that a potential Aboriginal heritage item is unearthed, the unexpected finds procedure in **Section 4** of this AHMP will be implemented.	As required	Project Manager Environmental Officer Remediation Contractor	**Section 4**
Management of any potential human skeletal remains identified during the Works.	Implement the standard procedure detailed in **Section 4** of this AHMP.	As required	Project Manager Environmental Officer Remediation Contractors Demolition Contractors	**Section 4**
Record any incidents by Hydro or its contractors that cause impacts to Aboriginal heritage items and the action taken to resolve the situation.	Record Aboriginal heritage related incidents in the incident register and implement corrective actions.	As required	Environment Officer Remediation Contractors Demolition Contractors	Section 3.5.4 of the RWEMP (incidents) Section 5.4 of the RWEMP (corrective action)
	Report any disturbance of Aboriginal sites to the Office of Environment and Heritage	If required	Environment Officer	
	Review corrective actions	Monthly	Environment Officer	Section 5.4 of the RWEMP (corrective action)

4. FINDS PROCEDURE

4.1 Skeletal Remains Finds

A standard procedure will be implemented for the management of any potential human skeletal remains identified throughout the demolition and remediation activities. In the event that potential human skeletal remains are identified the following procedure will be followed:

1) All work in the vicinity of the remains will cease immediately.

2) The location will be cordoned off and the NSW Police notified.

3) A physical or forensic anthropologist should be commissioned to inspect the remains *in situ* and make a determination of ancestry (Aboriginal or non-Aboriginal) and antiquity (pre-contact, historic or modern).

Following completion of task three, the applicable action/s listed below will be implemented:

- If the remains are identified as non-human, work can recommence immediately.
- If the remains are identified as modern and human, the area will become a crime scene under the jurisdiction of the NSW Police.
- If the remains are identified as pre-contact or historic Aboriginal, the site will be secured and OEH and all RAPs notified in writing. Where impacts to exposed Aboriginal skeletal remains cannot be avoided, remains will be retrieved via controlled archaeological excavation and reburied outside of the Disturbance Boundary in a manner and location determined by RAPs.

If the remains are identified as historic non-Aboriginal, the site will be secured, and the OEH contacted.

4.2 Unexpected Finds Procedure

An unexpected finds procedure will be implemented in the event that a potential Aboriginal site was identified during demolition and remediation activities. This procedure will include:

1) All works would cease immediately in the area to prevent any further impacts to the site.

2) Notify the Hydro Environment Officer.

3) Engage a suitably qualified archaeologist and RAP representative to determine the nature, extent and significance of the Aboriginal site and provide appropriate management advice. Management action(s) would vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts.

4) Prepare and submit an AHIMS site card for the Aboriginal site.

5. MONITORING AND REVIEW

5.1 Monitoring

Hydro will undertake regular monitoring to ensure the site activities are not causing a detrimental environmental or community impact and to maintain compliance with relevant approvals and licences.

All internal and external environmental reporting requirements will be undertaken in accordance with the RWEMP.

Reporting will also be undertaken in accordance with relevant legislation, guideline and notification requirements, as outlined in **Section 1.3**.

5.2 Non-conformances

The need for preventative or corrective action arises from the identification of non-conformance with environmental legal requirements, Hydro environmental requirements or the potential for non-conformances to occur.

Non-conformances will be resolved, reported and recorded in accordance with Section 3.5.5 of the RWEMP.

5.3 Complaints

Community Complaints are considered environmental incidents and are investigated and documented accordingly. This will include any complaints relating to Aboriginal heritage at the Smelter.

Investigations will be conducted by relevant personnel, including provision of feedback to the complainant. Corrective actions will be documented and regularly reviewed until completion and signed off.

Handling of complaints will be undertaken in accordance with Section 3.5.6 of the RWEMP.

5.4 Review and Improvement

Continual improvement of the AHMP will be achieved by the continual evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The Managing Director is responsible for ensuring that a regular review of the RWEMP and specialist management plans (including this AHMP) is undertaken.

6. REFERENCES

AECOM. 2015. *Former Hydro Aluminium Smelter: Aboriginal Cultural Heritage Assessment*.

Hydro Aluminium. 2006. *Hydro Aluminium Kurri Kurri Property Management Plan*.

Ramboll. 2018. *Environmental Impact Statement: Former Hydro Aluminium Kurri Kurri Smelter Stage 2 Demolition*.

Ramboll. 2020. *Response to Submissions Report: Former Hydro Aluminium Kurri Kurri Smelter Remediation*.

Ramboll Environ. 2015. *Statement of Environmental Effects - Demolition of Former Aluminium Smelter Buildings at Kurri Kurri*.

Ramboll Environ. 2016. *Environmental Impact Statement: Former Hydro Aluminium Kurri Kurri Smelter Demolition and Remediation*.

SMEC. 2011. *Hydro Aluminium Kurri Kurri Property Management Plan Annual Report 2010*.

7. LIMITATIONS

Ramboll Australia Pty Ltd prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Pty Ltd dated 20 July 2018 and in accordance with our understanding and interpretation of current regulatory standards.

Site conditions may change over time. This report is based on conditions encountered at the site at the time of the report and Ramboll Australia Pty Ltd disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll Australia Pty Ltd's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll Australia Pty Ltd's knowledge as at the date of the assessment.

Ramboll Australia Pty Ltd did not independently verify all of the written or oral information provided to Ramboll Australia Pty Ltd during the course of this investigation. While Ramboll Australia Pty Ltd has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll Australia Pty Ltd was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

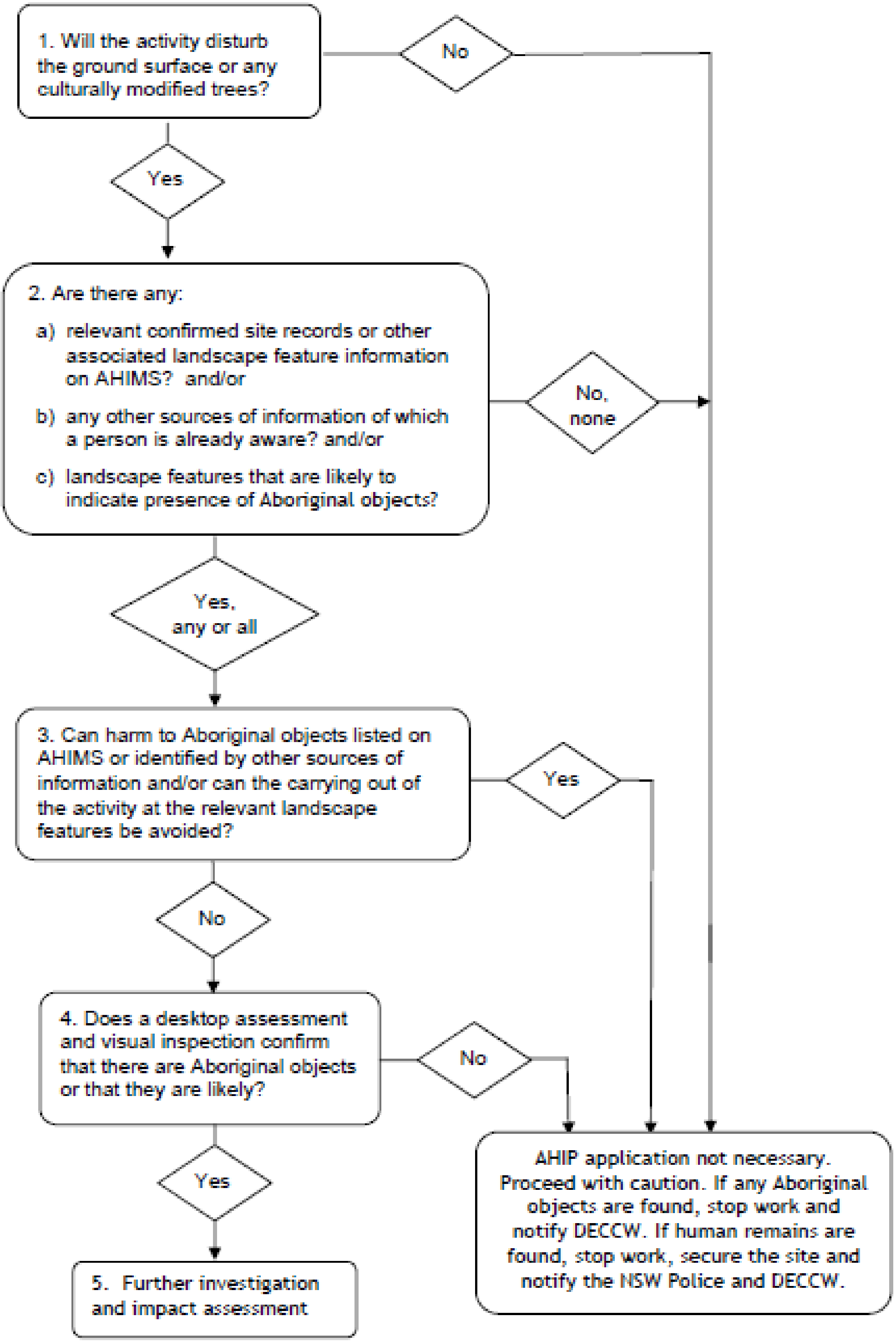
7.1 User Reliance

This report has been prepared exclusively for Hydro Aluminium Pty Ltd. It may not be relied upon by any other person or entity without Ramboll Australia Pty Ltd's express written permission.

APPENDIX 1

DUE DILIGENCE FLOWCHART (*DUE DILIGENCE CODE OF PRACTICE FOR THE PROTECTION OF ABORIGINAL OBJECTS IN NEW SOUTH WALES,* DECC 2010)

8 The generic due diligence process



Appendix C

AEC30 Test Pit Logs

TEST PIT NUMBER AECBP_TP1

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Investigation

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				░		GRASS overlying SAND; fine grained, pale brown, loose, moist to dry, grass root fibres, with fine to medium sub angular gravel	AECBP_TP1_0.1-0.2	
			1 2	▨		CLAY; natural, high plasticity, dark brown with some red and black mottling	AECBP_TP1_0.9-1.0	
			3 4 5 6			Test Pit AECBP_TP1 terminated at 2m		

TEST PIT NUMBER AECBP_TP2

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assessment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				☒		FILL; Gravelly clayey SAND, fine grained, pale brown, dry to moist	AECBP_TP2_0.2-0.3	
			1	☒		FILL; Gravelly CLAY, pale brown with orange and grey mottling, large concrete boulder, natural wood, becoming brown at 1m bgl	AECBP_TP2_1.2-1.3	
			2	▨		CLAY; natural, high plasticity, dark brown with some red and black mottling	AECBP_TP2_2.0-2.1	
			3 4 5 6			Test Pit AECBP_TP2 terminated at 2.7m		

TEST PIT NUMBER AECBP_TP3

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▨		FILL; Gravelly sandy CLAY, brown, loose, large concrete boulders, corregated metal, plastic and cloth	AECBP_TP3_0.3-0.4	
			1	▨			AECBP_TP3_1.3-1.4	
				▨		FILL; SAND, orange, loose		
			2	▧		CLAY; high plasticity, dark brown with some red mottling	AECBP_TP3_2.3-2.4	
			3			Test Pit AECBP_TP3 terminated at 2.5m		
			4					
			5					
			6					

TEST PIT NUMBER AECBP_TP4

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assesment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; grass overlying Sandy CLAY, pale brown		
				▩		FILL; Clayey silty SAND, brown, rootlets	AECBP_TP4_0.1-0.2	
			1	▨		CLAY; high plasticity, dark brown with red mottling	AECBP_TP4_0.8-0.9	
			2 3 4 5 6			Test Pit AECBP_TP4 terminated at 1m		

TEST PIT NUMBER AECBP_TP5

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20 **R.L. SURFACE** **DATUM**

CONTRACTOR DARACON **SLOPE** 90° **BEARING** ---

EQUIPMENT Excavator **HOLE LOCATION**

HOLE SIZE **LOGGED BY** JK **CHECKED BY** KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▨		FILL; Grass overlying sandy CLAY, pale brown, with medium to large sub-rounded gravels, dry to moist, orange/brown mottling		
				▨			AECBP_TP5_0.3-0.4, DO1_130520, T01_130520	
			1	▨		With Sandstone, yellow, medium grained		
				▨			AECBP_TP5_1.3-1.4	
			2	▨				
				▨		Steel pole, metal		
				▨		FILL; Gravelly CLAY, grey, high plasticity		
				▨		FILL; SAND, grey		
			3	▧		CLAY; natural, high plasticity, dark brown with orange mottling, stiff		
			4	▧			AECBP_TP5_3.9-4.0	
						Test Pit AECBP_TP5 terminated at 4m		
			5					
			6					

RAMBOLL

TEST PIT NUMBER AECBP_TP6

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assessment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 13/5/20
COMPLETED 13/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; Grass overlying gravelly sandy CLAY, brown, loose, grass root fibres	AECBP_TP6_0.3-0.4	
				▩		FILL; SAND, fine to medium grained, yellow/pale brown, loose, with fine to medium sub-rounded gravel		
			1	▩		FILL; Sandy gravelly CLAY, pale brown, with fine to medium gravels	AECBP_TP6_0.8-0.9	
			2	▨		Sandy CLAY; brown/grey with orange sandstone banding	AECBP_TP6_2.0-2.1	
			3 4 5 6			Test Pit AECBP_TP6 terminated at 2.2m		

TEST PIT NUMBER AECBP_TP7

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			1 2	▩		FILL; Grass overlying gravelly sandy CLAY/clayey SAND, pale brown, trace rubber tube, with pockets of sandstone/weathered clayey sand, orange/pale grey Concrete boulder at 0.5m bgl	AECBP_0.4-0.5 AECBP_TP7_1.6-1.7	
			3 4	▨		Sandy CLAY; natural, brown/grey with orange mottling, stiff, medium to high plasticity, medium grained sand	AECBP_TP7_4.0-4.1	
			5 6			Test Pit AECBP_TP7 terminated at 4.2m		

TEST PIT NUMBER AECBP_TP8

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▨		FILL; Grass overlying sandy gravelly CLAY, pale brown, with large concrete boulders	AECBP_TP8_0.2-0.3	
			1	▨				
				▨		FILL; sandy CLAY, brown/grey, medium plasticity, fine to large sub-rounded gravel to cobbles/boulders		
			2	▨			AECBP_TP8_1.9-2.0	
			3	▨		Some slight green staining (organic odour)		
			4	▨		Minor metal and reinforcing bar, natural wood and timber		
			5	▧		Sandy CLAY/clayey SAND; natural, grey, stiff, high plasticity, organic odour	AECBP_TP8_5.0-5.1	
						Test Pit AECBP_TP8 terminated at 5.2m		
			6					

TEST PIT NUMBER AECBP_TP9

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			1 2	▩		FILL; Gravelly sandy CLAY, pale brown with orange/grey mottling, fine to medium sub-angular and sub rounded gravels	AECBP_TP9_0.3-0.4 AECBP_TP9_1.8-1.9	
			3 4	▨		Clayey SAND; grey, fine grained, dense, rootlets at 3.0m bgl, organic odour	AECBP_TP9_3.0-3.1	
			5	▨		Clayey SAND; extremely weathered SANDSTONE, grey/orange mottled, friable	AECBPJ_TP9_4.8-4.9	
			6			Test Pit AECBP_TP9 terminated at 5m		

TEST PIT NUMBER AECBP_TP10

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			1			FILL; Grass overlying gravelly sandy CLAY, pale brown, fine to medium gravel, with concrete, rope and brick, rio	AECBP_TP10_0.6-0.7 AECBP_TP10_1.7-1.8	
			2			FILL; SAND, grey, loose, fine to medium grained	AECBP_TP10_1.8-1.9	
						FILL; SAND, pale brown/yellow, loose, fine grained		
			3			Sandy CLAY; orange/grey mottled, very stiff, medium to high plasticity, dry to moist	AECBP_TP10_2.9-3.0	
			4 5 6			Test Pit AECBP_TP10 terminated at 3m		

TEST PIT NUMBER AECBP_TP11

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Report
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 14/5/20
COMPLETED 14/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; Sandy gravelly CLAY, pale brown with orange/grey mottling, fine to large sub-rounded gravel		
			1					
							AECBP_TP11_1.1-1.2	
						Rubber in side wall		
			2					
			3			FILL; Clayey SAND/sandy CLAY, pale brown/grey, fine to large sub-rounded to rounded gravel, some concrete		
							AECBP_TP11_3.4-3.5, D02_140520, T02_140520	
						Silty SAND; grey, loose, fine grained, dry to moist, with rootlets		
			4					
			5				AECBP_TP11_4.5-5.0	
						Test Pit AECBP_TP11 terminated at 5m		
			6					

RAMBOLL

TEST PIT NUMBER AECBP_TP12

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assessment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; Grass overlying gravelly sandy CLAY, pale brown	AECBP_TP12_0.3-0.4	
			1	▩		FILL; SAND, pale orange/white, medium to coarse grained, loose	AECBP_TP12_0.9-1.0	
			2	▩		FILL; Clayey SAND, pale brown/orange, medium grained, weathered, friable, dense		
				⁙		SAND; fine grained, pale brown, loose, with rootlets	AECBP_TP12_2.6-2.7	
			3			Test Pit AECBP_TP12 terminated at 2.7m		
			4					
			5					
			6					

TEST PIT NUMBER AECBP_TP13

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; Grass overlying SAND, pale brown/yellow, fine to medium grained, with grass root fibres		
			1	▩		FILL; Gravelly sandy CLAY, high plasticity, soft, fine to medium angular and rounded gravels, wire, cables, reinforcing bar, pvc	AECBP_TP13_0.3-0.4	
			2	▩		FILL; Gravelly clayey SAND, grey, medium grained, fine to large gravel to cobbles, concrete, terracotta, plastic, timber, tile	AECBP_TP13_1.6-1.7	
			3	▨		Sandy CLAY; grey/black, high plasticity, fine grained sand		
				░		SAND; orange/grey mottled, medium grained with sandstone boulders, weathered, very dense	AECBP_TP13_3.6-3.7	
			4 5 6			Test Pit AECBP_TP13 terminated at 3.7m		

TEST PIT NUMBER AECBP_TP14

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; Grass overlying gravelly sandy CLAY, pale brown/orange, fine to medium gravels	AECBP_TP14_0.3-0.4	
			1 2	▩		FILL; Clayey gravelly SAND, pale brown, medium grained, fine to medium sub-angular gravels, concrete, reinforcing bar, brick, asphalt	AECBP_TP14_1.0-1.1	
				▩		FILL; SAND, fine to medium grained, pale brown/grey	AECBP_TP14_2.3-2.4	
			3	▨		Sandy CLAY; high plasticity, very stiff, brown with trace orange mottling		
			4 5 6			Test Pit AECBP_TP14 terminated at 3m		

TEST PIT NUMBER AECBP_TP15

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assessment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 14/5/20
COMPLETED 14/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; Grass overlying gravelly clayey SAND, pale brown/orange With some natural wood	AECBP_TP15_0.3-0.4	No foreign material content observed
			1	▨		Clayey SAND/sandy CLAY; grey, high plasticity	AECBP_TP15_0.7-0.8	
				⁚		SAND; fine grained, pale brown/white		
				⁚		SANDSTONE; dense, orange, medium grained, becoming white	AECBP_TP15_1.6-1.7	
			2 3 4 5 6			Test Pit AECBP_TP15 terminated at 1.7m		

TEST PIT NUMBER AECBP_TP16

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assesment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				☒		FILL; Grass overlying gravelly sandy CLAY, orange/pale brown, with concrete and reinforcing bar, rusted metal in side wall	AECBP_TP16_0.4-0.5	Foreign material content observed to ~3m bgl
			1	☒		FILL; SANDSTONE, white with orange mottling		
			2 3	☒		FILL; gravelly sandy CLAY, orange/pale brown, concrete, plastic, brick	AECBP_TP16_3.0-3.1	
			4	☒		FILL; Clayey SAND, grey to black with rootlets, fine grained, natural wood	AECBP_TP16_3.5-3.6, D03_140520	
			5	▨		Clayey SAND; grey, fine grained, trace orange mottling, dense	AECBP_TP16_5.0	
			6			Test Pit AECBP_TP16 terminated at 5m		

BOREHOLE / TEST PIT 318000344 VALIDATION ASSISTANCE MAY 2020.GPJ GINT STD AUSTRALIA.GDT 4/12/20

Appendix D

RAP responses to draft Addendum ACHAR

From:	steve talbott <talbo.minda@hotmail.com>
Sent:	Tuesday, 20 July 2021 11:19 AM
To:	McLaren, Andrew
Subject:	[EXTERNAL] Re: Addendum ACHAR for review - Hydro Kurri Kurri Aluminium Smelter Remediation Project

---

From: McLaren, Andrew <Andrew.McLaren@aecom.com>
Sent: Thursday, 8 July 2021 11:25 AM
To: McLaren, Andrew <Andrew.McLaren@aecom.com>
Subject: Addendum ACHAR for review - Hydro Kurri Kurri Aluminium Smelter Remediation Project

Dear Registered Aboriginal Party (RAP),

Please find attached for your review a draft Addendum ACHAR for the approved Hydro Kurri Kurri Aluminium Smelter Remediation Project (SSD-6666) (the Project) in Kurri Kurri. This Addendum ACHAR has been prepared to address a recently identified issue pertaining to AHIMS registered Aboriginal site Hydro PAD1 (37-6-3872), an area of Potential Archaeological Deposit (PAD) identified as part of AECOM's 2015 Aboriginal cultural heritage assessment for the Project. At the time, Hydro PAD1 was identified as an area of high Aboriginal archaeological sensitivity on the basis of its landform context, as well as then examined historical aerial photographs and field observations, which suggested that this area retained a moderate degree of ground integrity.

Presented in the attached Addendum ACHAR are the results of a reassessment of Hydro PAD1 made on the basis of a desktop review of 13 historical photographs for the site, spanning the years 1954 to 2019, as well as subsurface soil profile data for land within and surrounding the PAD, generated as part of a broader contamination investigation across the Smelter site. AECOM's re-assessment has found that land within Hydro PAD1 area was severely disturbed in the early 1980s as a result of smelter construction activities. Historical aerials and subsurface soil data for the PAD indicate that natural soil profiles within Hydro PAD1 were radically altered as a result of these works, with natural topsoils completely removed and replaced with imported fill.

In view of these findings, Hydro PAD1 is no longer considered to comprise an area of PAD and AECOM, on behalf of Hydro, propose to consult with the AHIMS registrar to have the status of Hydro PAD1 on the AHIMS database changed to "Not a Site".

Comments on the Addendum ACHAR can be provided by phone, e-mail or letter. The closing date for comment is 6 August 2021.

Kind regards,

Andy McLaren

Dr Andrew McLaren
Principal Aboriginal Heritage Specialist
M 0403 753 165
Andrew.McLaren@aecom.com

AECOM
Level 21, 420 George Street, Sydney, NSW 2000
PO Box Q410, QVB PO, Sydney, NSW, 1230
T +61 2 8934 0000   F +61 2 8934 0001
www.aecom.com

Hi Andrew

Off course it has been removed but there are ares still inside of project area that is still untouched n has any consideration been giving to these areas or is it all decide by u as archeologists that determents where n if any furthers works in those areas is untaken

Thanks
Steve talbott
0476893944

From:	Paulette Ryan <hto.paulette@gmail.com>
Sent:	Monday, 2 August 2021 1:55 AM
To:	McLaren, Andrew
Subject:	[EXTERNAL] Re: Addendum ACHAR for review - Hydro Kurri Kurri Aluminium Smelter Remediation Project

Thank you for your email
My I say everywhere your bound to come across same evidence of our feetprint as a hunter traditional owner I know this I've walk this understanding the change of things can be hard we no longer have control
But we thank you for your support and I would like to put down in the meagoly that the artefact go from the pit to the backet to the syving outpost I my self was ask to leave a work site as it was a very hot day standing all day syving when I noticed that they were baging the aterfacts
From the pits of cause it upset me I asked them to stop doing that as they come to our hands first we identified the aterfacts and then we have it baged
If that agreeable with use please keep me informed I know it's late but I think better late at night

Again thank you
Kind regards Paulette Ryan from HTO
hto.paulette@gmail.
0431109001
4 Kenney Stree singleton 2330

On Thu., 8 Jul. 2021, 11:26 am McLaren, Andrew, <Andrew.McLaren@aecom.com> wrote:

> Dear Registered Aboriginal Party (RAP),
>
> Please find attached for your review a draft Addendum ACHAR for the approved Hydro Kurri Kurri Aluminium Smelter Remediation Project (SSD-6666) (the Project) in Kurri Kurri. This Addendum ACHAR has been prepared to address a recently identified issue pertaining to AHIMS registered Aboriginal site Hydro PAD1 (37-6-3872), an area of Potential Archaeological Deposit (PAD) identified as part of AECOM's 2015 Aboriginal cultural heritage assessment for the Project. At the time, Hydro PAD1 was identified as an area of high Aboriginal archaeological sensitivity on the basis of its landform context, as well as then examined historical aerial photographs and field observations, which suggested that this area retained a moderate degree of ground integrity.
>
> Presented in the attached Addendum ACHAR are the results of a reassessment of Hydro PAD1 made on the basis of a desktop review of 13 historical photographs for the site, spanning the years 1954 to 2019, as well as subsurface soil profile data for land within and surrounding the PAD, generated as part of a broader contamination investigation across the Smelter site. AECOM's re-assessment has found that land within Hydro PAD1 area was severely disturbed in the early 1980s as a result of smelter construction activities. Historical aerials and subsurface soil data for the PAD indicate that natural soil profiles within Hydro PAD1 were radically altered as a result of these works, with natural topsoils completely removed and replaced with imported fill.
>
> In view of these findings, Hydro PAD1 is no longer considered to comprise an area of PAD and AECOM, on behalf of Hydro, propose to consult with the AHIMS registrar to have the status of Hydro PAD1 on the AHIMS database changed to "Not a Site".

Comments on the Addendum ACHAR can be provided by phone, e-mail or letter. The closing date for comment is 6 August 2021.

Kind regards,

Andy McLaren

Dr Andrew McLaren
Principal Aboriginal Heritage Specialist
M 0403 753 165
Andrew.McLaren@aecom.com

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Level 21, 420 George Street, Sydney, NSW 2000
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T +61 2 8934 0000   F +61 2 8934 0001
www.aecom.com

McLaren, Andrew

From:	Tracey Skene <tracey@marrung-pa.com.au>
Sent:	Tuesday, 10 August 2021 12:40 PM
To:	McLaren, Andrew
Subject:	[EXTERNAL] Re: Addendum ACHAR - Hydro Kurri Kurri Aluminium Smelter Remediation Project

Good morning Andrew,

Sorry with a hectic week last week I had forgotten to respond.

1st point :
I like to say is under cultural respect please be aware Uncle Tom Miller has passed away and would like to remind yourself and your company this is sensitive , and to remember to just include Wonnarua Elder which I find more appropriate.

And a acknowledgment and a sincere sorry for this , as he was a very respected Elder that our Family and still sensitive with it.

2nd
I agree with the addendum ACHAR for this development.
I Fully understand bout the history of disturbances as I my family lived in this town and know the cultural landscapes and stories of this area and it's surrounding cultural Landscapes.

3rd:
In regards to any other work other than pad areas I would like to have ground disturbances while any construction are taking place there should be a Wonnarua traditional stakeholders present to see if anything arises out of the sub soil areas.

4th:
If there is any opportunities for Aboriginal community gain any Employment or contracts with this Development would be appreciate and also assist with our Closing the Gaps and fulfilling any Reconciliation Action plans that the Developer may have in place and if not I'm happy to assist with them putting one together.

Also happy to assist with Screening and mentoring Aboriginal Employment opportunities for them with my Employment & Training Company.

Thanks
Tracey

On Tue, 10 Aug 2021 at 10:37 am, McLaren, Andrew <Andrew.McLaren@aecom.com> wrote:

> Morning Tracey,
>
> Hope all’s well at your end.
>
> Was just following up re our the Addendum ACHAR for the Hydro Kurri Kurri Aluminium Smelter Remediation Project, sent across on the 8th of July. Attached again in case.
>
> Closing date for comment was last Friday (6 August) but just wanted to check in to see if you had a comment / response.
>
> All the best,
>
> Andy McLaren
>
> **Dr Andrew McLaren**
> Principal Aboriginal Heritage Specialist
> M 0403 753 165
> Andrew.McLaren@aecom.com
>
> **AECOM**
> Level 21, 420 George Street, Sydney, NSW 2000
> PO Box Q410, QVB PO, Sydney, NSW, 1230
> T +61 2 8934 0000   F +61 2 8934 0001
> www.aecom.com
>
> Please consider the environment before printing this email.

--
Kind regards
Tracey Skene
7 Crawford Place,Millfield NSW 2325
Mobile 0474106537

To help protect your privacy, Microsoft Office prevented automatic download of this picture from the Internet.

From:	WIDESCOPE . <widescope.group@live.com>
Sent:	Tuesday, 10 August 2021 2:14 PM
To:	McLaren, Andrew
Subject:	[EXTERNAL] RE: Addendum ACHAR - Hydro Kurri Kurri Aluminium Smelter Remediation Project

Hi Andrew,

Thank you for the reminder, I have review and support the recommendations out lined in the Aboriginal Cultural Heritage Assessment Report (ACHAR)

Regards
Steven Hickey

From: McLaren, Andrew
Sent: Tuesday, 10 August 2021 10:35 AM
To: Widescope.group@live.com
Subject: Addendum ACHAR - Hydro Kurri Kurri Aluminium Smelter Remediation Project

Morning Steve,

Hope all's well at your end.

Was just following up re our the Addendum ACHAR for the Hydro Kurri Kurri Aluminium Smelter Remediation Project, sent across on the 8th of July. Attached again in case.

Closing date for comment was last Friday (6 August) but just wanted to check in to see if you had a comment / response.

All the best,

Andy McLaren

Dr Andrew McLaren
Principal Aboriginal Heritage Specialist
M 0403 753 165
Andrew.McLaren@aecom.com

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McLaren, Andrew

From:	Tara Dever <ceo@mindaribbalalc.org>
Sent:	Thursday, 12 August 2021 10:58 AM
To:	McLaren, Andrew
Subject:	[EXTERNAL] RE: Addendum ACHAR - Hydro Kurri Kurri Aluminium Smelter Remediation Project
Importance:	High

Good morning Andrew,

The Mindaribba LALC support the submission of the Addendum ACHAR for the Hydro Kurri Kurri Aluminium Smelter Remediation Project and have no further comment.

Warm regards, Tara

Tara Dever
Chief Executive Officer
Mindaribba Local Aboriginal Land Council
PO Box 401, East Maitland, NSW 2323
Ph: 02 4015 7000

I acknowledge the Traditional Owners and Custod [illegible] Wonnarua People; and pay my respect to all Aboriginal Elders Past, Present and Emerging.

"Our Spirituality is a oneness and an interconnectedness with all that lives and breathes .... even with all that does not live or breath" Mudrooroo Narogin

From: McLaren, Andrew <Andrew.McLaren@aecom.com>
Sent: Tuesday, 10 August 2021 10:24 AM
To: Tara Dever <ceo@mindaribbalalc.org>
Subject: Addendum ACHAR - Hydro Kurri Kurri Aluminium Smelter Remediation Project

Morning Lea-Anne,

Hope all's well at your end.

Was just following up re our the Addendum ACHAR for the Hydro Kurri Kurri Aluminium Smelter Remediation Project, sent across on the 8th of July. Attached again in case.

Closing date for comment was last Friday (6 August) but just wanted to check in to see if you had a comment / response.

All the best,

Andy McLaren

Dr Andrew McLaren
Principal Aboriginal Heritage Specialist
M 0403 753 165
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From:	cacatua4service@tpg.com.au
Sent:	Friday, 13 August 2021 8:20 AM
To:	McLaren, Andrew
Subject:	[EXTERNAL] Re: Addendum ACHAR - Hydro Kurri Kurri Aluminium Smelter Remediation Project

Andrew,

As per our earlier phone conversation, Cacatua General Services and AGA Services had their meeting Thursday 12th August 2021.

The Addendum ACHAR to the Hydro Kurri Kurri Smelter Remediation Project was tabled. Both groups are familiar with the project as they have been on site and we had tabled the first draft of the ACHAR at an earlier meeting.

Both AGA and Cacatua are in full support of the Addendum ACHAR to the Hydro Kurri Kurri Smelter Remediation Project. that was supplied.

Cacatua agree 8 disagree 0

AGA agree 3 disagree 0

Thank you
George Sampson
Cacatua

Ashley Sampson
AGA

APPENDIX 4
DATA GAP ASSESSMENT

Intended for
Hydro Aluminium Kurri Kurri Pty Ltd

Document type
Report

Date
April 2021

DATA GAP ASSESSMENT
HYDRO ALUMINIUM SMELTER SITE, LOXFORD, NSW

RAMBOLL Bright ideas. Sustainable change.

DATA GAP ASSESSMENT
HYDRO ALUMINIUM SMELTER SITE, LOXFORD, NSW

Project name	**Data Gap Assessment**
Project no.	**318000585**
Recipient	**Hydro Aluminium Kurri Kurri Pty Ltd**
Document type	**Report**
Version	**Draft**
Date	**12/4/2021**
Prepared by	**Kirsty Greenfield EIANZ CEnvP Site Contamination Specialist No. 40104**
Checked by	**Fiona Robinson EIANZ CEnvP Site Contamination Specialist No. 40100**
Approved by	**Fiona Robinson EIANZ CEnvP Site Contamination Specialist No. 40100**
Description	**Ramboll has completed additional investigations to close out data gaps associated with Areas of Environmental Concern and Potential Areas of Environmental Concern at the Hydro Aluminium Kurri Kurri Smelter, Loxford, New South Wales.**

2020/2021
No. SC40104

2020/2021
No. SC40100

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ACN 095 437 442
ABN 49 095 437 442

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Appendices

EXECUTIVE SUMMARY

Ramboll Australia Pty Ltd (Ramboll) was engaged by Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to close out data gaps at several Areas of Environmental Concern (AECs) located at the Hydro Aluminium Kurri Kurri Smelter, off Hart Road, Loxford, New South Wales (NSW), Australia.

This Data Gap Assessment report forms part of a remediation and validation program that was undertaken at the former Hydro Aluminium Kurri Kurri Smelter (the Smelter) during demolition works between July 2017 and October 2020. This report has been prepared as an Appendix and is to be read in conjunction with a Cover Report documenting the suitability of a portion of the Smelter Site for the proposed commercial/industrial use.

Further background information pertaining to site identification, site setting, site history, environmental investigations (Phase 1 ESA, Phase 2 ESA and Phase 2 ESA Additional Investigations) completed by Ramboll and preparation of the Smelter Site Remedial Action Plan (the Smelter Site RAP) is included in the Cover Report.

The Phase 2 ESA and Phase 2 ESA Additional Investigations identified nine AECs that required remediation based upon source-pathway-receptor linkages identified in the CSM developed for the Smelter Site. The Smelter Site RAP was prepared to detail the remediation and validation program required to render the Smelter Site suitable for future commercial/industrial land use. The Smelter Site RAP identified that the preferred remedial strategy was excavation of waste and impacted materials and relocation to an engineered Containment Cell proposed to be constructed on the Smelter Site.

At the time the Smelter Site RAP was prepared, data gaps remained at the following AECs generally due to access issues:

- AEC 2 Anode Waste Pile
- AEC 15 West Surge Pond
- AEC 18 Pot Rebuild Area
- AEC 30 Area East of the Clay Borrow Pit (located outside the Smelter fence within Buffer Zone land)

An additional data gap was identified during Stage 1 Demolition Works at the Smelter Site, which required investigation, as follows:

- AEC 33 Western Paint Area (located outside the Smelter fence within Buffer Zone land)

Soil investigations were completed at each of these AECs during the Demolition Works between August 2017 and August 2020. Based on the results of the data gap investigations, soil contamination was not identified at the following AECs and no further works are required:

- AEC 15 West Surge Pond
- AEC 18 Pot Rebuild Area
- AEC 33 Western Paint Area

Remediation is required at AEC 2 Anode Waste Pile to remediate PAH impacts to shallow fill material. The data gap investigation has vertically and laterally delineated the extent of remediation required, with excavation works to be completed at four separate areas. Approximate volumes and tonnages are provided in this report.

The data gaps investigation completed at AEC 30 identified two ‘hot spots’ where concentrations of Contaminants of Concern exceeded the human health criteria by more than 2.5 times. Remediation of soil with elevated lead and PAH concentrations surrounding test pits TP12 and TP13 is required. The diameter of these ‘hot spots’ has been estimated and approximate volumes and tonnages are provided in this report, however further delineation works can be completed prior to remediation to confirm the extent of remediation required.

Remediation of AEC 2 and AEC 30 is to be completed in conjunction with other remedial works at the Smelter Site and is required for the Smelter Site to be considered suitable for the future land use. Remediation and validation works should be undertaken in accordance with the Smelter Site RAP.

1. INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was engaged by Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to close out data gaps at several Areas of Environmental Concern (AECs) located at the Hydro Aluminium Kurri Kurri Smelter, off Hart Road, Loxford, New South Wales (NSW), Australia.

1.1 Background

This Data Gap Assessment (DGA) report forms part of a remediation and validation program that was undertaken at the former Hydro Aluminium Kurri Kurri Smelter (the Smelter) during demolition works between July 2017 and November 2020. This report has been prepared as an Appendix and is to be read in conjunction with a Cover Report documenting the suitability of a portion of the Smelter Site for the proposed commercial/industrial use.

The focus of the DGA report is to close out data gaps associated with AECs that were accessible during Stage 1 and Stage 2 Demolition Works. Further background information pertaining to site identification, site setting, site history, environmental investigations (Phase 1 ESA, Phase 2 ESA and Phase 2 ESA Additional Investigations) completed by Ramboll and preparation of the Smelter Site Remedial Action Plan (the Smelter Site RAP) is included in the Cover Report.

The Phase 2 ESA and Phase 2 ESA Additional Investigations identified nine Areas of Environmental Concern (AECs) that required remediation based upon source-pathway-receptor linkages identified in the Conceptual Site Model (CSM) developed for the Smelter Site. A Remedial Action Plan (the Smelter Site RAP) was prepared to detail the remediation and validation program required to render the Smelter Site suitable for future commercial/industrial land use. The Smelter Site RAP identified that the preferred remedial strategy was excavation of waste and impacted materials and relocation to an engineered Containment Cell proposed to be constructed on the Smelter Site.

The Smelter Site RAP also identified data gaps relating to AECs that were either inaccessible or required additional data to assess remedial requirements, as follows:

- AEC 2 Anode Waste Pile: Delineation of PAH impacted fill material required following removal of stockpiled ahead-of-schedule anodes and anode carbon
- AEC 15 West Surge Pond: Soluble fluoride analysis required
- AEC 18 Pot Rebuild Area: Assessment of fill material required
- AEC 30 Area East of the Clay Borrow Pit (located outside the Smelter fence within Buffer Zone land): Assessment of fill material required

An additional data gap was identified during demolition works between 2017 and 2020 at the Smelter Site, which required investigation, as follows:

- AEC 33 Western Paint Area (located outside the Smelter fence within Buffer Zone land): Soil investigations required

Other remediation and validation works required in the Smelter Site RAP completed during Stage 1 and Stage 2 Demolition Works are reported separately, as follows:

- Remediation of subsurface asbestos (**the Subsurface Asbestos Validation Report**)
- Remediation of electrical substations (**the Substations Validation Report**)
- Remediation and validation works associated with Stage 1 and Stage 2 Demolition, including removal of hazardous materials from buildings prior to demolition, crushing of materials for on-site reuse, backfilling of sumps, pits and voids, on-site and off-site materials tracking and preparation of a free-draining final surface (**the Demolition Validation Report**)

- Remediation and validation of accessible AECs, Unexpected Finds and identified contamination associated with the removal of subsurface infrastructure at the Cast House (**the Early Works Validation Report**)
- Remediation and validation of identified contamination associated with Carbon Plant AECs and the removal of subsurface infrastructure at the Carbon Plant and Technical Services (**the Eastern Smelter Site Validation Report**)
- Remediation and validation of an underground storage tank (**the UST Validation Report**).

The location and layout of the Smelter Site and associated Buffer Zone land is shown in **Figure 1, Appendix 1**.

1.2 Objective

The objective of the investigations was to close out data gaps in relation to each AEC or potential AEC, as follows:

- AEC 2 Anode Waste Pile: PAH impacted fill material was identified beneath stockpiled ahead-of-schedule anodes and anode carbon during the Phase 2 ESAs. Vertical and lateral delineation of the extent of contamination was required following removal of the stockpiled material in 2019 and prior to the completion of remedial works.
- AEC 15 West Surge Pond: Total fluoride concentrations exceeded the site criteria in sediments within the pond in the Phase 2 ESA. Analysis of soluble fluoride concentrations was required, as this is the bioavailable portion.
- AEC 18 Pot Rebuild Area: Investigation of backfill used to fill voids beneath floor slabs in Pot Rebuild Building 77A was required to assess the suitability of this material to remain on site.
- AEC 30 Area East of the Clay Borrow Pit: Investigation of potential fill material at an area of the Smelter Site outside the Smelter fence where historical aerial photographs showed disturbance of surface soils.
- AEC 33 Western Paint Area: During demolition works, infrastructure was identified in an area of the Smelter Site outside the Smelter fence that appeared to be a former area used for painting of equipment. Following removal of infrastructure, soil investigations were undertaken.

1.3 Scope of Work

To meet the objective, Ramboll completed the following scope of work:

- Review previous reports prepared for the Smelter Site
- Field investigations, as follows:
  - AEC 2 Anode Waste Pile: Completion of grid-based infill test pitting to laterally and vertically delineate the extent of PAH contamination in soil beneath the former ahead-of-schedule anodes and anode carbon stockpile (details on off-site recycling of anodes is reported in the Demolition Validation Report)
  - AEC 15 West Surge Pond: Sampling of sediments and comparison of laboratory results against the site-specific criteria for soluble fluoride
  - AEC 18 Pot Rebuild Area: Collection and analysis of samples of fill material used as backfill in Building 77A and comparison of laboratory results against the site criteria
  - AEC 30 Area East of the Clay Borrow Pit: Completion of grid-based test pitting across the area of disturbed terrain, collection and analysis of soil samples for contaminants typically associated with fill material of unknown origin and comparison of results against the site criteria
  - AEC 33 Western Paint Area: Completion of grid-based surface soil sampling following the removal of infrastructure associated with painting

- Identification of suitable site criteria for Contaminants of Concern (CoCs) and Contaminants of Potential Concern (CoPCs) from relevant regulatory guidelines
- Development of a Conceptual Site Model for each AEC
- Preparation of this Data Gap Assessment report.

1.4 Regulatory Framework and Guidelines

This document has been prepared in reference to the following regulations and guidelines:

- *Contaminated Land Management Act 1997*
- *Protection of the Environment Operations Act 1997*
- *Environmental Planning and Assessment Act 1979*
- NEPC (1999) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM 2013)
- NSW EPA (1995) Sampling Design Guidelines
- NSW EPA (2018) Guidelines for the NSW Site Auditor Scheme (3rd Edition)
- NSW EPA (2020) Guidelines for Consultants Reporting on Contaminated Land

2. ASSESSMENT OF CONTAMINATION

A total of 23 AECs were identified and assessed at the Smelter Site and in the Buffer Zone as part of the Phase 2 ESA undertaken in 2012. An additional 8 AECs were identified and assessed at the Smelter Site during the Phase 2 ESA Additional Investigations undertaken in 2014 following the closure of the Smelter allowing access to areas and buildings that were previously inaccessible.

At the completion of these ESA works, data gaps remained at AEC 2, AEC 15, AEC 18 and AEC 30 generally due to access constraints. AEC 33 Western Paint Area was identified during Stage 1 Demolition Works.

A summary of soil contamination identified at each AEC during Phase 2 ESA and Phase 2 ESA Additional Investigations is provided in **Table 2-1**.

Table 2-1 Summary of AECs with Data Gaps

AEC	Description	Contaminant of Concern	Sample ID	>HIL D (mg/kg)	>ESL/EIL C/I (mg/kg)
AEC 2 Anode Waste Pile	Long-term stockpiling of 'ahead-of-schedule' anodes	BaP TEQ[1]/ BaP	MW12 SB105 MW103: 0.0 – 0.01 MW103: 0.3 – 0.4	56.9 55 42 **250**	**-** **-** **-** **160**
AEC 15 West Surge Pond	Stormwater pond	Fluoride[2]	D1	38,500[2]	-
AEC 18 Pot Rebuild Area	Fill of unknown nature used to backfill concrete-lined scrap buckets	Heavy metals, TRH, BTEX, PAHs, cyanide, fluoride	Not previously sampled	N/A	N/A
AEC 30 Area East of the Clay Borrow Pit	Potential filling of disturbed area	Heavy metals, TRH, BTEX, PAHs, cyanide, fluoride	Not previously sampled	N/A	N/A
AEC 33 Western Paint Area	Painting of reinforcing bar	Heavy metals, TRH, BTEX, PAHs, cyanide, fluoride	Not previously sampled	N/A	N/A

[1]BaP TEQ Benzo(a)pyrene Toxicity Equivalent Quotient
[2]Total fluoride
***Bold**: Hot Spots – concentrations > 2.5 times the guidelines*

2.1 Preliminary Conceptual Site Model

A Conceptual Site Model (CSM) is a representation of the source, pathway and receptor linkages at a site. A preliminary CSM was developed for AEC 2 Anode Waste Pile and AEC 15 West Surge Pond as part of the Phase 2 ESA Additional Investigations and is presented in **Table 2-2**. A preliminary CSM has also been developed for AEC 18 Pot Rebuild Area, AEC 30 Area East of the Clay Borrow Pit and AEC 33 Western Paint Area based on known information and is also presented in **Table 2-2.**

Table 2-2 Preliminary Conceptual Site Model

Element of CSM	Ramboll's Comments				
	AEC 2 Anode Waste Pile	**AEC 15 West Surge Pond**	**AEC 18 Pot Rebuild Area**	**AEC 30 Area East of Clay Borrow Pit**	**AEC 33 Western Paint Area**
Contaminant source and mechanism	The mechanism of contamination is likely to be the deposition of PAHs as a result of long-term storage of ahead-of-schedule anodes at this location. Anodes are formed from calcined petroleum coke, recycled anodes and pitch binder. Anodes are baked prior to use and therefore PAHs present have low volatility and solubility and are generally present in total form.	The West Surge Pond forms part of a closed stormwater system which receives runoff from paved areas of the western portion of the Smelter Site via conduits. The mechanism of contamination is likely the result of deposition of fluoride from the smelting process and transport to the pond via runoff prior to site remediation works.	Building 77A at the Pot Rebuild Area comprised three concrete scrap bucket pits and a crucible pit that were backfilled with fill of unknown quality. The contaminant mechanism is the potential for contaminated fill to have been used as backfill material.	Historical aerial photographs show that the Area East of the Clay Borrow Pit has been disturbed and may have been filled. The nature of the fill material used is unknown.	Infrastructure including a concrete sump, structural steel and a concrete slab with thick paint on the surface was identified in the bush between Pot Line 3 and the Clay Borrow Pit. An arial photograph from 1983 during the construction of Pot Lint 3 shows the infrastructure in this area. This photograph is included in **Appendix 2**. This area is considered likely to have been used for bitumen coating of reinforcing steel used in the pot room floor slabs during construction of Pot Line 3. This activity may have led to contamination of surface soils.
Affected media	PAHs have been identified in fill material to a maximum depth of 0.4 m below ground surface (bgs). The source of contamination (ahead-of-schedule anode stockpile) has been removed. Groundwater investigations completed in July 2014 identified that PAH concentrations in groundwater around AEC 2 were below ANZECC (2000) guidelines for 95% Protection of Freshwater Species.	Total fluoride concentrations of 5,850 mg/kg and 38,500 mg/kg have been identified in sediment at the West Surge Pond.	Backfill within the three scrap bucket pits.	Potential fill material at the Area East of the Clay Borrow Pit.	Potential affected media includes surface soils.
Receptor identified	Potential receptors include future commercial/industrial workers, visitors, intrusive maintenance workers and onsite ecology within the context of a commercial/industrial land use.			Human access to AEC 30 and AEC 33 is currently restricted via fencing and locked gates and potential receptors include current and future site users. Potential ecological receptors include terrestrial flora and fauna within this disturbed portion of Buffer Zone land.	
Exposure pathways	Potential exposure pathways include direct contact and inhalation of dust (indoors and outdoors).	The potential exposure pathway includes direct contact with contaminated sediments.	As a concrete floor has been placed over the backfilled scrap bucket pits, there are currently no exposure pathways. However, if removed, direct contact with fill would occur.	The potential exposure pathways are dependent on the type of contamination within the fill material (if any) and may include direct contact or inhalation.	Potential exposure pathways include direct contact or ingestion of impacted soils.
Presence of preferential pathways for contaminant movement	AEC 2 is partially paved with concrete slabs. There is preferential movement of PAHs within anode dust into subsoils at the unpaved portions of the AEC.	Fluoride contamination is related to the aerial deposition of fluoride from scrubbers at the Pot Lines and Carbon Plant. Fluoride contamination would preferentially settle into surface sediments within the dam.	As the scrap bucket pits are brick-lined and capped with concrete, any contaminants within the backfill material would remain within each scrap bucket pit, with no preferential pathways for contaminant movement.	Preferential pathways may exist for contaminant movement within fill material at the Area East of the Clay Borrow Pit and will be assessed during the current investigation.	As the area where infrastructure was located was within bushland, preferential pathways are unlikely for contaminant movement within surface soils.
Evaluation of data gaps	Further delineation sampling required following removal of ahead-of-schedule anode stockpile.	Previous analysis has been completed for total fluoride. Sampling of sediment for soluble fluoride is required as this is the bioavailable portion.	Assessment of the backfill for suitability is required.	Assessment of the nature and quality of fill for suitability is required.	Assessment of potential impacts to surface soil is required following removal of infrastructure as part of Stage 1 Demolition Works.

3. DATA GAPS SAMPLING, ANALYSIS AND QUALITY PLAN

The following is the sampling, analysis and quality plan (SAQP) implemented to complete the data gap assessment at the identified AECs.

3.1 Data Quality Objectives

In order to achieve the objectives and purpose of the data gap investigations, both the field and laboratory programs must be representative of the actual extent of contamination in soil and sediment. As such, specific Data Quality Objectives (DQOs) have been developed for the validation of field and analytical data obtained during the investigation. The DQO process is a systemic, seven step process that defines the criteria that the validation sampling should satisfy in accordance with the requirements of EPA (2017) Guidelines for the NSW Site Auditor Scheme (3rd Edition).

DQOs relating to the Data Gaps Assessment are outlined in **Table 3-1**. In relation to the Study Boundary, all AECs are located within the Smelter Site, which is defined as:

- Part Lot 16 DP1082775
- Lot 1, Lot 2, Lot 3 DP456769
- Lot 318, 319, Lot 411, Lot 412, Lot 413, Lot 414, Lot 769 DP755231

Table 3-1 Data Quality Objectives

DQO	Outcome				
	AEC 2 Anode Waste Pile	**AEC 15 West Surge Pond**	**AEC 18 Pot Rebuild Area**	**AEC 30 Area East of the Clay Borrow Pit**	**AEC 33 Western Paint Area**
Step 1: State the Problem	The vertical and lateral extent of PAH soil contamination is required to be delineated to inform remediation volumes.	Concentrations of total fluoride exceeded the site-specific commercial/industrial criteria. Laboratory analysis of soluble fluoride is required, as this is the bio-accessible portion of fluoride.	Unknown backfill has been used at the Pot Rebuild Area to backfill three concrete-lined scrap bucket pits.	Historical aerial photographs show disturbance of surface soils and the potential for fill material has not been investigated.	This AEC was identified during demolition works and the assessment of potential soil impacts is required.
Step 2: Identify the Decisions	Determine the vertical and lateral extent of PAH soil contamination.	Asses the concentration of soluble fluoride within sediments.	Assess the suitability of backfill material to remain on site.	Assess the suitability of potential fill material to remain on site.	Determine the extent of potential contamination following demolition and removal of infrastructure.
Step 3: Identify Inputs to the Decision	Historical data from previous investigations completed by Ramboll. Soil stratigraphy and PAH concentrations in soil.	Soluble fluoride concentrations in sediments.	Soil stratigraphy within the three concrete-lined scrap bucket pits and soil concentrations of contaminants typically found within fill material; heavy metals, PAHs, TRH/ BTEX, OCP, PCBs and site-specific contaminants; fluoride and cyanide.	Soil stratigraphy and concentrations of contaminants typically found within fill material; PAH, TRH/BTEX, heavy metals and site-specific contaminants; fluoride and cyanide.	PAH, TRH/BTEX, heavy metals, fluoride and cyanide concentrations in surface soil collected by Ramboll in 2020.
Step 4: Define the Study Boundaries	AEC 2 is located within the Smelter Site adjacent the Capped Waste Stockpile. Spatial boundaries are defined in **Figure 2a, Appendix 1**. Vertical boundaries will be to natural material. The temporal boundary is limited to data collected during the April 2012, June 2014 and August 2019 sampling events.	AEC 15 is located on the western perimeter of the Smelter Site. Spatial boundaries are defined in **Figure 3, Appendix 1**. Sampling will target deposited sediments within the upper 100 to 200 mm. The temporal boundary is limited to data collected during the September 2018 sampling event.	AEC 18 is located in the southern portion of the Smelter Site. Spatial boundaries are defined in **Figure 4, Appendix 1**. The vertical boundary will be shallow fill material beneath the concrete layer. The temporal boundary is limited to data collected during the May 2018 sampling event.	AEC 30 is located within the Buffer Zone, directly east of the Clay Borrow Pit. Spatial boundaries are defined in **Figure 5a, Appendix 1**. The vertical boundary will be the base of the fill material. The temporal boundary is limited to data collected during the May 2020 sampling event.	AEC 33 is located within the Buffer Zone north west of the Smelter Site. Spatial boundaries are defined in **Figure 6, Appendix 1**. Sampling will target surficial soils and the vertical boundary is the upper 100 mm. The temporal boundary is limited to data collected during the April 2020 sampling event.
Step 5: Develop a Decision Rule	The types of data quality required, appropriate field methods (including sampling procedure and preservation of samples) and the quality of analytical data undertaken by the commercial laboratories are summarised in the following. • All sample analyses are to be conducted using National Association of Testing Authorities (NATA) registered methods in accordance with NEPC (2013) guidelines. • All samples are to be extracted within the laboratory specified acceptable sample holding time. • Samples are to be appropriately preserved and handled in accordance with the sampling methodology outlined in Step 7. • PQLs are to be less than the adopted assessment criteria. Duplicates, spikes, blanks, and control samples are to meet the DQIs presented in Step 6.				
Step 6: Specify Limits on Decision Errors	This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this investigation must be appropriate to allow decisions to be made with confidence. Specific limits for this investigation have been adopted in accordance with the appropriate guidance from NEPM (2013). To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined DQIs in relation to precision, accuracy, representativeness, comparability and completeness. The DQIs and data assessment criteria are outlined in **Table 3-2**.				
Step 7: Optimise the Design for Obtaining Data	Excavation of nine test pits on a grid between previous sampling locations. Collection of soil samples from a range of depths from fill and underlying natural material, with at least three samples per test pit. Analysis for PAHs.	Collection of sediment samples from the accessible eastern boundary of the pond at a rate of 1 sample per 20 lineal metres. Analysis for soluble fluoride.	Concrete cutting and access the first scrap bucket pit to remove and inspect the backfill. Coring of the remaining three scrap bucket pits using a concrete cutter to assess consistency of backfill material used. Analysis for heavy metals, TRH, BTEXN, PAHs, OCPs, PCBs, soluble fluoride and total cyanide of one sample from the first scrap bucket pit. One sample was considered adequate on the basis of visually consistent soil and low soil volumes <15 m^3.	Excavation of 16 test pits on a grid-based pattern. Collection of soil samples from a range of depths from fill and underlying natural material, with at least two samples per test pit. Heavy metals, TRH, BTEXN, PAHs, OCPs, PCBs, soluble fluoride and total cyanide.	Surface soil sampling on a grid-based pattern. Heavy metals, TRH, BTEXN, PAHs, OCPs, PCBs, soluble fluoride and total cyanide.

3.2 Data Quality Indicators

DQIs have been established to set acceptance limits on field and laboratory data collected as part of the data gaps assessment. The DQIs are outlined in **Table 3-2.**

Table 3-2: Data Quality Indicators

DQI	Field	Laboratory
Completeness – a measure of the amount of useable data from a data collection activity	Site visits completed Photographic log maintained All critical locations sampled Experienced sampler Documentation correct	All critical samples analysed All analysis completed according to standard operating procedures Appropriate methods Appropriate Practical Quantitation Limits (PQLs).
Comparability – the confidence that data may be considered to be equivalent for each sampling and analytical event	Experienced sampler Climatic conditions noted during sampling Same types of samples collected using approved sampling methods	Same analytical methods used Same sample PQLs Same NATA accredited laboratories used Same units
Representativeness – the confidence that data are representative of each medium present on-site	Same personnel used for sampling Appropriate media sampled	All samples analysed according to standard operating procedures
Precision – a quantitative measure of the variability of the data	Collection of intra-laboratory duplicates at a rate of 1 in 10 primary samples for soil Collection of inter-laboratory duplicate samples at a rate of 1 in 20 primary samples for soil	Analysis of field duplicate samples, relative percent difference (RPDs) to be $\leq$30%. Laboratory duplicates analysed, RPDs to be $\leq$ 30%.
Accuracy – a quantitative measure of the closeness of the reported data to the “true” value	Sampling methodologies appropriate and complied with	Analysis of: Method blanks Matrix spikes Surrogate spikes Laboratory control samples Results for blank samples to be non-detect. Results for spike samples to be between 70% and 130%.
Sensitivity – the limit of reporting shall be lower than the site criteria	Not applicable	Selection of Practical Quantitation Limits (PQLs) that are below the site criteria

4. QUALITY ASSURANCE AND QUALITY CONTROL

A quality assurance/quality control (QA/QC) assessment was completed for the field investigations and is presented in **Table 4-1** and **Table 4-2**. An assessment was made of data completeness, comparability, representativeness, precision and accuracy based in the field and laboratory considerations and a summary is provided in **Table 4-3**.

Table 4-1 QA/QC – Sampling and Analysis Methodology Assessment

Methodology	**Ramboll's Comments**				
	AEC 2 Anode Waste Pile	**AEC 15 West Surge Pond**	**AEC 18 Pot Rebuild Area**	**AEC 30 Area East of the Clay Borrow Pit**	**AEC 33 Western Paint Area**
Sampling Pattern and Locations	The data gap investigations was completed on 9 August 2019 and included: • Excavation of nine test pits (TP201 to TP209) on a systematic grid to a maximum depth of 1.2 m bgs. • Collection of soil samples from a range of depths from fill and underlying natural material, with at least three samples collected per test pit. Soil samples were collected directly from the wall of the excavation where practical. • Sample locations were recorded on a marked-up plan in the field and the coordinates recorded using a hand-held GPS. • Laboratory analysis was completed for PAHS on samples from a range of depths.	The data gap investigations were completed on 11 September 2018 and included: • Collection of six soil samples at a rate of one sample per 20 lineal meters. • Sample locations were recorded on a marked-up plan in the field and the coordinates recorded using a hand-held GPS. • Laboratory analysis was conducted on all samples for soluble fluoride.	The data gap investigation was completed on 23 May 2018 and included: • Removal of the concrete floor and backfill material. • Collection of one soil sample from the backfill material from one of the scrap bucket pits which was excavated and stockpiled adjacent to the pit. • Subsequent scrap bucket pits were concrete core drilled using water. The colour of the backfill material coming up with the water slurry was observed and recorded. • Laboratory analysis was completed on the sample for TRH, BTEXN, PAHs, OCPs, PCBs, heavy metals, soluble fluoride and total cyanide.	The data gap investigation was completed between 13 and 14 May 2020 and included: • Excavation of 16 test pits (AECBP_TP1 to AECBP_TP16) on a systematic grid to a maximum depth of approximately 5 m bgs. • Collection of soil samples from a range of depths from fill and underlying natural material, with at least two samples collected per test pit. Soil samples were collected from the excavator bucket or spoil piles using dedicated disposable gloves. • Test pit locations were recorded on a marked-up plan in the field and the coordinates recorded. • Laboratory analysis was completed for TRH, BTEX, PAH, soluble fluoride, free cyanide and heavy metals was completed on 14 selected samples targeting the fill.	Investigations of surface soil were completed 8 April 2020 and included the collection of four surface soil samples on a systematic grid across the area from which infrastructure was removed. These four soil samples were analysed for TRH, BTEX, PAH, soluble fluoride, free cyanide and heavy metals.
Sampling Density	Nine sampling locations were completed during the data gap investigations, adding to the seven sampling locations previously completed in 2012 and 2014 equalling a total of 16 sampling locations over an area of approximately 5,100 m^2.	Samples were collected from six locations along the accessible eastern bank of the pond during the data gap assessment. The West Surge Pond is approximately 3,200 m^2 in size.	One sample was collected from backfill soil excavated from one of the filled below ground scrap bucket pits. The excavated material totalled approximately 5 m^3 and was excavated and stockpiled next to the pit.	Samples were collected from 16 test pits over an area of approximately 25,000 m^2.	Four surface soil samples were collected over an area of approximately 1,340 m^2.
Sample depths	Soil samples were collected through the fill profile and into natural soil, including surface (0-0.2), 0.2-0.4, 0.4-0.6, 0.6-0.8 m bgs to identify the vertical extent of impact.	Samples were collected from the surface of the pond sediment.	Samples could not be collected in-situ. The sample was instead collected from excavated material stockpiled beside the scrap bucket pit.	Soil samples were collected from various depths throughout the fill profile to identify the vertical extent of impact.	Soil samples were collected from the ground surface to target surface impacts.
Sample Collection Method	An excavator was used to dig test pits. Samples were collected directly from the wall of the test pit where depth permitted. Where depth did not permit, samples were collected from the centre of the excavator bucket. Disposable nitrile gloves were worn during sampling and changed between sampling locations.	Samples were collected directly by hand. Dedicated disposable gloves were worn and changed between sampling locations.	Backfill in the first scrap bucket pit was fully excavated using an excavator. Soil samples were collected from backfill material stockpiled adjacent to the excavation using dedicated disposable nitrile gloves.	An excavator was used to dig test pits. Samples were collected from the excavator bucket or spoil piles using disposable nitrile gloves that were changed between sample locations.	A trowel was used to loosen surface soils. Soil samples were collected directly from the ground surface using dedicated disposable gloves.
Decontamination Procedures	Decontamination was not required, as soil samples were collected directly from the wall of the excavation or from the centre of the excavator bucket using dedicated disposable gloves.	Dedicated sampling equipment was used, so decontamination was not required.	Decontamination was not required as the soil sample was collected from a stockpile using dedicated disposable gloves.	Decontamination was not required as the soil samples were collected from the centre of the excavator bucket or spoil pile using disposable gloves that were changed between sampling locations.	Decontamination was not required as the soil samples were collected directly from the ground surface using dedicated disposable gloves following loosening of soil with a trowel.
Sample handling and containers	All soil samples were placed into laboratory-supplied, acid-rinsed glass jars. Samples were placed on ice following collection and during transportation to the laboratory.				
Chain of Custody	Samples were transported to the laboratory under chain of custody conditions. The chain of custody forms were signed by the laboratory on receipt of the samples.				
Detailed description of field screening protocols	Field screening for volatiles was not completed as volatiles were not a main contaminant of concern at these AECs.				
Calibration of field equipment	No field equipment was used that required calibration.				
Sampling Logs	The lithology of soil samples was documented during sampling on daily field notes attached as **Appendix 2**. A photographic log is included as **Appendix 3.**				

Table 4-2 QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Ramboll's Assessment				
	AEC 2 Anode Waste Pile	**AEC 15 West Surge Pond**	**AEC 18 Pot Rebuild Area**	**AEC 30 Area East of the Clay Borrow Pit**	**AEC 33 Western Paint Area**
Field quality control samples	Three intra-laboratory duplicate samples and two inter-laboratory duplicate samples were collected for 25 primary samples collected as part of the data gaps assessment. The rate of analysis was 12% for intra-laboratory duplicate samples and 8% for inter-laboratory duplicate samples, exceeding the required rate of 5%.	No QA/QC samples were collected as part of the data gap assessment as only six primary sediment samples were collected. This is considered acceptable based on the small number of primary samples collected in this batch.	No QA/QC samples were collected during this sampling event, as one primary sample was collected. This is considered acceptable based on the small number of primary samples collected in this batch.	One intra-laboratory duplicate sample and one inter-laboratory duplicate sample was submitted for the 16 primary samples analysed. The rate of analysis for both intra- and inter-laboratory duplicate samples was 6.25%, which exceeds the required rate of 5%.	One intra-laboratory duplicate sample was collected for four primary samples, equalling a duplicate rate of 25% (exceeding the required rate of 5%).
Field quality control results	Relative Percentage Differences (RPDs) for all analytes were below the criterion (30%) with the exception of the following: • TP204_0-0.2/D01_90819 - Fluoranthene (42.0%), Pyrene (47.7%), Chrysene (33.3%), Benzo(g,h,i)perylene (48.1%) Total PAHs (32.3%) • TP206_0.02/D02_90819 – Pyrene (199.3%), Benzo(a)pyrene (198.9%) and Total PAHs (199.7%) • TP204_0-0.2/T01_80919 – Phenanthrene (30.3%), Anthracene (34.5%), Fluoranthene (42.0%), Pyrene (47.7%), Benz(a)anthracene (32.8%), Chrysene (41.7%), Benzo(b,j+k)fluoranthene (47.1%), Benzo(a)pyrene (35.4%), Benzo(g.h.i)perylene (48.1%), Total PAHs (40.0%), Benzo(a)pyrene TEQ (30.3%). All analytes presenting exceedances in the RPD criteria were below the assessment criteria. The highest chemical concentrations were generally reported in the primary sample, except for inter-laboratory duplicate pair TP204_0-0.2/ T01_80919. High RPD differences are likely due to the non-homogenous nature of the sample material.	Not applicable	Not applicable	RPDs for all analytes were below the criterion (30%) with the exception of the following: • AECBP_TP11_3.4-3.5/D02_140520 – Aluminium (38.6%), Chromium (35.3%), Copper (60.0%), Lead (96.3%) Zinc (54.5%) • AECBP_TP11_3.4-3.5/T02_140520 – Fluoride (46.2%), Copper (54.5%), Zinc (46.8%). All analytes presenting exceedances in the RPD criteria were below the assessment criteria except for zinc. Zinc concentrations exceeded human health an ecological criterion in the primary and duplicate sample in both duplicate pairs. High RPD differences are likely due to the non-homogenous nature of the sample material.	RPDs for all analytes were below the criterion (30%) except for the following: • WPA-V04/Dup1 – Aluminium (41.9%), Chromium (46.2%), Copper (40.0%), Lead (60.0%), Nickel (42.9%), Zinc (74.5%), Benzo(b+j+k)fluoranthene (66.7%), Benzo(a)pyrene (66.7%), Total PAH (111.1%). All analytes presenting exceedances in the RPD criteria were below the assessment criteria. The highest chemical concentrations were generally reported in the primary sample. RPD exceedances for Benzo(b+j+k)fluoranthene and Benzo(a)pyrene are the result of low level detections close to the LOR.
NATA registered laboratory and NATA endorsed methods	Envirolab was used as the primary laboratory and ALS was used as the secondary laboratory. Envirolab and ALS laboratory certificates are NATA stamped and both laboratories are accredited for the analyses performed for this assessment. Sample batches for each sampling event are recorded below. Laboratory reports are included in **Appendix 4.**				
Laboratory Reports	Envirolab Batches 223749 and 223749-A, ALS Batches ES1925940 and ES1926778	Envirolab Batch 200888	Envirolab Batch 192436	Envirolab Batch 243000 and 243000-A, ALS Batch ES2016984	Envirolab Batch 240638
Analytical methods	A summary of analytical methods are included in the laboratory test certificates.				
Holding times	Review of the Chain of Custody documentation and laboratory certificates indicate that holding times were met for all samples.				
Practical Quantitation Limits (PQLs)	PQLs for soil analytes were below the assessment criteria.				
Laboratory quality control samples	Laboratory quality control samples including duplicates, laboratory control samples, matrix spikes, surrogate spikes and blanks were undertaken by the laboratories at appropriate frequencies.				
Laboratory quality control results	All results for laboratory soil duplicates, laboratory control samples, matrix spikes and surrogates were acceptable and no detections were made in blank samples.				

Assessment of the Data Quality Indicators of completeness, comparability, representativeness, precision and accuracy, which are outlined in **Section 6.2.6**, is made in **Table 4-3** below.

Table 4-3 QA/QC – Assessment of DQIs

DQI	Ramboll Comments
Completeness	Completeness is a measure of whether all the data necessary to meet the project objectives was collected. All samples were collected as per the respective sampling plans. Ramboll considers the data gap investigations to be complete.
Comparability	Comparability is a measure of confidence that the data may be considered to be equivalent for each sampling and analysis event. Sampling events were completed between 2018 and 2020, with results from AEC 2 and AEC 15 added to previous 2012 and 2014 data. The 2012 and 2014 sampling events were completed by Kirsty Greenfield and Fiona Robinson with the aid of a drilling rig (push tubes). The 2019 sampling event at AEC 2 and 2020 sampling event at AEC 30 was completed by Jordyn Kirsch using an excavator. The 2019 sampling event at AEC 18 and 2020 sampling event at AEC 33 were completed by Kirsty Greenfield using hand tools. The 2020 The field techniques used are standard techniques that produce comparable soil samples. Laboratory analysis for each sampling event was undertaken by the same NATA registered laboratories using the same accredited analytical methods. The soil data collected during this investigation is considered to be comparable.
Representativeness	Representativeness is the confidence that the data is representative of each media present at the site. In the field, representativeness was achieved by completing an adequate number of soil sampling locations at each AEC.
Precision	Precision is a measure of the reproducibility of the data. In the field, Ramboll achieved precision by using standard operating procedures for the collection of soil samples and by collecting duplicate and triplicate samples for analysis. RPD results for duplicate samples were considered acceptable. At the laboratory, precision was assessed using blind replicate and split samples. No detections were made in blank samples.
Accuracy	Accuracy is a measure of the closeness of a measurement to the true parameter value. In the field, Ramboll achieved accuracy by using standard operating procedures for the collection of soil samples. At the laboratory, precision is assessed using blind replicate samples and split samples. All results for laboratory control samples, matrix spikes and surrogates were acceptable and no detections were made in blank samples.
Sensitivity	Sensitivity is a measure of the suitability of the laboratory LOR against the adopted assessment criteria. Sensitivity is achieved through the laboratory PQL, which must fall below assessment criteria values to allow for appropriate comparison of data. PQLs for each analyte were below the respective assessment criteria.

Overall, the DQIs of completeness, comparability, representativeness, precision, accuracy and sensitivity have been met. It is considered that the data is of suitable quality to meet the project objectives.

5. BASIS FOR ASSESSMENT CRITERIA

5.1 Contaminants of Concern

The proven or potential Contaminants of Concern (CoCs) associated with each AEC is as follows:

- AEC 2 Anode Waste Pile: PAHs associated with storage of ahead-of-schedule anodes
- AEC 15 West Surge Pond: Soluble fluoride associated with the aerial deposition of fluoride from scrubber stacks
- AEC 18: Pot Rebuild Area: CoCs associated with fill material of unknown quality and with the aluminium smelter - heavy metals, PAHs, TRH, BTEX, soluble fluoride, cyanide
- AEC 30 Area East of the Clay Borrow Pit: CoCs associated with fill material of unknown quality and with the aluminium smelter - heavy metals, PAHs, TRH, BTEX, soluble fluoride, cyanide
- AEC 33 Western Paint Area: CoCs associated with bitumen painting of reinforcing steel and associated with the aluminium smelter - heavy metals, PAHs, TRH, BTEX, soluble fluoride, cyanide

5.2 Proposed Land Use

The Smelter Site comprises a parcel of land that includes the former aluminium smelter located within a perimeter fence and the portion of the Buffer Zone immediately surrounding the former smelter. The entire Smelter Site is currently zoned Rural Landscape (RU2).

A rezoning masterplan has been developed for the Smelter and Buffer Zone, with the following proposed land uses for the Smelter Site:

- Land within the perimeter fence is proposed to be rezoned to General Industrial (IN1) in the south and Heavy Industrial (IN3) in the north
- Land immediately outside the perimeter fence to the north and north east, including the two North Dams is proposed to be rezoned Heavy Industrial (IN3)
- Land immediately outside the perimeter fence to the east and south east is proposed to be rezoned to General Industrial (IN1)
- Remaining land outside the perimeter fence within the Smelter Site is proposed to remain Rural Landscape (RU2) with the exception of the Containment Cell and access road
- The Containment Cell and access road are proposed to be rezoned Special Purpose Infrastructure (SP2)

A plan showing the proposed rezoning is included in **Figure 7, Appendix 1**.

5.3 Soil Criteria

The criteria proposed for the data gap assessment were sourced from the following reference:

- National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPC 1999) (NEPM)

The variation to the NEPM was approved in 2013 by the NSW Environment Protection Authority (EPA) under the Contaminated Land Management Act 1997. The NEPM provides revised health-based soil investigation levels (HILs), health-based screening levels (HSLs), ecological-based investigation levels (EILs) and ecological based screening levels (ESLs) for various land uses. The NEPM 2013 also introduces health-based and ecological screening levels and management limits for petroleum hydrocarbons (HSLs and ESLs). The levels have been derived from recent assessments that more accurately define the exposure mechanisms and risks from sites contaminated with petroleum hydrocarbons.

5.3.1 Sediment Criteria

In relation to the assessment of sediments at the West Surge Pond, the following reference was consulted:

- Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines (Simpson et al. 2013)

This reference does not include a sediment quality guideline value (SQGV) for fluoride. Derivation of a SQGV is not considered to be warranted for the West Surge Pond for the following reasons:

- The West Surge Pond is a man-made pond that receives stormwater from the western portion of the Smelter Site and is not part of a natural ecological system and does not support high value ecology
- The West Surge Pond is part of a closed-loop stormwater system at the Smelter Site, with excess stormwater pumped to the North Dams. Excess stormwater from the North Dams is spray-irrigated under licence to an Irrigation Area located in the Buffer Zone. A separate Ecological Risk Assessment has been completed to assess the risk of fluoride concentrations in soil elevated above the background level as a result of spray-irrigation of stormwater with elevated fluoride from the North Dams
- Elevated fluoride in sediment within the West Surge Pod is not expected to have any impact on local aquatic or terrestrial ecology as there is no off-site migration of sediments (except as noted via the irrigation of North Dam waters
- Fluoride does not biomagnify up the food chain (ATSDR 2003) and off-site ecological receptors are therefore not being impacted
- The West Surge Pond is likely to be decommissioned in the future and will be filled in. Assessment of soluble fluoride concentrations in sediment is primarily to assess remedial requirements in relation to human health on a commercial/ industrial site. Ecological receptors will be limited in extent under the future land use and as such, assessment of risk to ecology is not required.

5.3.2 Within Smelter Fence

Land within the Smelter fence is to be rezoned and will be used for commercial/industrial use. Under this land use, it is anticipated this portion of the Smelter Site will be used for light industrial activities such as warehousing, logistics, storage etc. The guidelines for commercial/industrial land use are therefore considered to be the most relevant. Commercial/industrial guidelines are applicable to AEC 2, AEC 15 and AEC 18, which are located within the Smelter fence.

The guidelines adopted for the Smelter Site from the NEPM are as follows:

- HIL D – Health investigation level for commercial/industrial land use. The HILs are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of 3 m below the surface for industrial use
- HSLs for commercial/industrial use - Health screening levels for soil vapour intrusion from petroleum hydrocarbons are guidelines that prevent accumulation of vapours at concentrations that may represent a health risk. The HSLs are derived for various depths and are for the same generic land uses as for the HILs. The guidelines are relevant were soils are beneath building or structures such as confined spaces
- EIL for commercial/industrial use – ecological investigations levels applicable for assessing risk to terrestrial ecosystems. EILs depend on specific soil physicochemical properties and generally apply to the top 2m of soil

- ESLs for commercial/industrial use – ecological screening levels developed for selected petroleum hydrocarbon compounds and fractions and are applicable for assessing risk to terrestrial ecosystems. These are also generally applicable to the top 2m of soil.
- Management Limits where concentrations above these limits may indicate poor aesthetics, high odour and potentially explosive vapour. Management limits are to be applied after consideration of relevant ESLs and HSLs.

The applicable guidelines for heavy metals, PAHs, fluoride and cyanide in soil are presented in **Table 5-1**.

Table 5-1 Commercial/Industrial Soil Assessment Criteria (mg/kg) – Health and Ecological Investigation Levels

Contaminant of Concern	HIL D	EIL
Cyanide and Fluoride		
Cyanide (free)	1500	-
Fluoride	17,000[1]	-
Heavy Metals		
Aluminium	NL[1]	-
Arsenic	3000	160
Cadmium	900	-
Chromium (VI)	3600	-
Chromium (III)	-	320 (1% clay)
Copper	240,000	210[2]
Lead	1500	1800
Nickel	6000	140[2]
Zinc	400,000	440[2]
Mercury	730	-
PAHs		
Naphthalene	-	370
Carcinogenic PAHs (as BaP TEQ)	40	-
Total PAHs	4000	-

[1] Site-specific commercial/industrial fluoride value calculated in the Preliminary Screening Level Health Risk Assessment for Fluoride and Aluminium (ENVIRON 2013)

[2] EILs were calculated using the average CEC (7.26meq/100g), soil pH (5.5) and total organic carbon (1.3%) values from eight soil samples collected in the Buffer Zone during the March 2014 investigations (see **Appendix 5**). The NEPM (2013) EIL calculator spreadsheet was used to generate the numbers and a site-specific ambient background concentration (ABC) was not included (rather a default ABC was used as calculated in the EIL calculator)

[3] NL: indicates that the site-specific risk-based aluminium screening criteria for industrial soil is a concentration greater than physically possible in soil, and therefore the criteria is defined as 'Non-Limiting' or NL (ENVIRON 2013).

Petroleum hydrocarbons are assessed for vapour intrusion into a building. The applicable vapour intrusion assessment criteria for petroleum hydrocarbons in soil are presented in **Table 5-2**.

Table 5-2: Soil Assessment Criteria for Vapour Intrusion – HSL D (mg/kg) – Sand

Contaminant of Concern	0 to <1m	1m to <2m	2m to <4m	4m+
BTEXN				
Toluene	NL[1]	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	230	NL	NL	NL
Naphthalene	NL	NL	NL	NL
Benzene	3	3	3	3
TRH				
F1[3] C6-C10	260	370	630	NL
F2[4] >C10-C16	NL	NL	NL	NL

[1] The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

[2] (For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

[3] To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction.

[4] To obtain F2 subtract naphthalene from the >C10-C16 fraction.

ESLs and management limits are also available for petroleum hydrocarbons. ESLs for areas of ecological significance and Management Limits for open space land use were considered the most conservative for the site. The applicable ESLs and management limits for petroleum hydrocarbons in soil are presented in **Table 5-3**.

NEPM (2013) includes a low reliability ecological screening criterion for benzo(a)pyrene of 1.4 mg/kg for commercial/industrial land use. This criterion has been adopted from Environment Canada (1999) benzo(a)pyrene soil quality guideline, which is based on toxicity data for a single invertebrate species (an earthworm). Environment Canada revised their benzo(a)pyrene soil quality guideline in 2010 using the Species Sensitivity Distribution method, which is the preferred method for the derivation of ecological investigation levels and can only be used where sufficient toxicity data are available that adhere to rigorous quality control requirements. Ramboll has elected to use the revised Environment Canada soil quality guideline of 72 mg/kg, for commercial/industrial land use, as the most relevant ecological investigation level for benzo(a)pyrene at the Smelter Site as this guideline has been derived from a larger and more up-to-date toxicity database than the NEPM (2013) low reliability criterion.

Table 5-3 ESLs and Management Limits for Petroleum Hydrocarbons in Soil (mg/kg)

		Commercial/Industrial	
Contaminant of Concern	**Soil texture**	**ESLs (mg/kg dry soil)**	**Management Limits[1] (mg/kg dry soil)**
TRH			
F1[2, 3] C6- C10	Coarse	215	700
F2 >C10-C16	Coarse	170	1000
F3 >C16-C34	Coarse	1700	3500
F4 >C34-C40	Coarse	3300	10,000
BTEX			
Benzene	Coarse	75	-
Toluene	Coarse	135	-
Ethyl benzene	Coarse	165	-
Xylene	Coarse	180	-
PAH			
Benzo(a)pyrene	Coarse	72	-

[1] Management limits are applied after consideration of relevant ESLs and HSLs.

[2] Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

[3] To obtain F1, subtract the sum of BTEX from C6-C10 fraction.

[4] Benzo(a)pyrene ESL criteria from Canadian Council of Ministries of the Environment (2010) Canadian Soil Quality Guidelines Carcinogenic and Other Polycyclic Aromatic Hydrocarbons (PAHs) (Environmental and Human Health Effects) Scientific Criteria Document (revised).

5.3.3 Outside Smelter Fence

AEC 30 and AEC 33 are located outside the Smelter fence within Buffer Zone land in the north west portion of the Smelter Site. This area is currently zoned Rural Landscape (RU2) and is not proposed to be rezoned. Although this portion of the Smelter Site is disturbed land, it is located near undisturbed bushland that will likely remain undeveloped.

As this area will remain undeveloped bushland, there is likely to be limited use of AEC 30 and AEC 33 by humans. NEPM does not include human health criteria for undeveloped bushland. As a Tier 1 screening assessment, the most conservative guidelines for low density residential land use will be used. For the protection of ecology, guidelines for Areas of Ecological Significance are considered to be the most relevant.

The guidelines adopted for the Buffer Zone from the NEPM are as follows:

- HIL A – Health investigation level for residential use with gardens and accessible soil. The HILs are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of 3 m below the surface for residential use.
- HSLs for residential use - Health screening levels for soil vapour intrusion from petroleum hydrocarbons are guidelines that prevent accumulation of vapours at concentrations that may represent a health risk. The HSLs are derived for various depths and are for the same generic land uses as for the HILs. The guidelines are relevant were soils are beneath building or structures such as confined spaces.

- EILs for areas of ecological significance – ecological investigations levels applicable for assessing risk to terrestrial ecosystems. EILs depend on specific soil physicochemical properties and generally apply to the top 2 m of soil.
- ESLs for areas of ecological significance – ecological screening levels developed for selected petroleum hydrocarbon compounds and fractions and are applicable for assessing risk to terrestrial ecosystems. These are also generally applicable to the top 2m of soil.
- Management Limits where concentrations above these limits may indicate poor aesthetics, high odour and potentially explosive vapour. Management limits are to be applied after consideration of relevant ESLs and HSLs.

The applicable assessment criteria for heavy metals and PAHs in soil are presented in **Table 5-4**.

NEPM (2013) do not provide criteria for fluoride in soils in Australia. As there is no EIL for fluoride, fluoride concentrations will be assessed against the background concentration for the Smelter Site and Buffer Zone lands.

Table 5-4 Bushland Soil Assessment Criteria (mg/kg) – Health and Ecological Investigation Levels

Contaminant of Concern	HIL A	EIL
Cyanide and Fluoride		
Cyanide (free)	250	-
Fluoride	440	4.3[2]
Heavy Metals		
Aluminium	-	-
Arsenic	100	40
Cadmium	20	-
Chromium (VI)	100	60 (CR III, 1% clay)
Copper	6000	20[1]
Lead	300	470
Nickel	400	5[1]
Zinc	7400	85[1]
Mercury	40	-
PAHs		
Naphthalene	-	10
Carcinogenic PAHs (as BaP TEQ)	3	-
Total PAHs	300	-

[1] EILs were calculated using site-specific data of pH 4.7, cation exchange capacity 0.7 meq/100g and total organic carbon 0.8%. The NEPM (2013) EIL Spreadsheet was used to generate these numbers and a site-specific ambient background concentration (ABC) was not included, rather a default ABC was used as calculated in the NEPM (2013) EIL Calculator. Calculation spreadsheets are included in **Appendix 5.**

[2] Background fluoride concentration for Smelter Site and Buffer Zone lands.

The applicable assessment criteria for petroleum hydrocarbons in soil are presented in **Table 5-5** and **Table 5-6**.

Table 5-5 Soil Assessment Criteria for Vapour Intrusion – HSL A (mg/kg) – Sand

Contaminant of Concern	0 to <1m	1m to <2m	2m to <4m	4m+
BTEXN				
Toluene	160	220	310	540
Ethylbenzene	55	NL	NL	NL
Xylenes	40	60	95	170
Naphthalene	3	NL	NL	NL
Benzene	0.5	0.5	0.5	0.5
TRH				
F1[3] C6-C10	45	70	110	200
F2[4] >C10-C16	110	240	440	NL

[1] The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

[2] (For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

Table 5-6 ESLs and Management Limits for Petroleum Hydrocarbons in Buffer Zone Soil (mg/kg)

Contaminant of Concern	Soil texture	Areas of Ecological Significance	Residential, Parkland and Public Open Space
		ESLs (mg/kg dry soil)	Management Limits[1] (mg/kg dry soil)
TRH			
F1[2, 3] C6- C10	Coarse	125*	700
F2 >C10-C16	Coarse	25*	1000
F3 >C16-C34	Coarse	-	2500
F4 >C34-C40	Coarse	-	10,000
BTEX			
Benzene	Coarse	10	-
Toluene	Coarse	10	-
Ethyl benzene	Coarse	1.5	-
Xylene	Coarse	10	-
PAH			
Benzo(a)pyrene	Coarse	0.7	-

ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.

[1] Management limits are applied after consideration of relevant ESLs and HSLs.

[2] Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

[3] To obtain F1, subtract the sum of BTEX from C6-C10 fraction.

6. COMPLETED INVESTIGATIONS AND RESULTS

6.1 AEC 2 Anode Waste Pile

Data gap investigation works were completed on 9 August 2019 and comprised the following:

- Excavation of nine test pits (TP201 to TP209) on an approximate grid to fill in gaps between previous sampling locations
- Each test pit extended through fill material into natural sands to a maximum depth of 1.2 m below ground surface (bgs)
- Collection of soil samples within fill material and at the top of natural sand
- Analysis of soil samples for PAHs.

Fill material generally comprised black gravelly sand/sandy gravel and a thick concrete slab (between 200 and 300 mm) was observed at the surface of four of the test pits. Test pit logs are attached in **Appendix 2**.

Laboratory results from the data gap investigation have been collated with laboratory results from the Phase 2 ESA and Phase 2 ESA Additional Investigations on a depth basis, as summarised in **Table 6-1**.

Concentrations of BaP and BaP TEQ exceeding the site assessment criteria were identified at seven sampling locations in the north western portion and south eastern portion of AEC 2. BaP and BaP TEQ exceedances were generally reported at locations that did not have concrete capping, with the exception of TP206. PAH impacts were not identified within fill material in the north eastern, central or south western portions.

The majority of the PAH impacts were limited to surface soils less than 0.2 m bgs. Deeper impacts were identified at two sampling locations to a maximum depth of 0.6 m bgs. PAH impacts were not detected at depths greater than 0.6 m bgs.

Table 6-1 Summary of PAH Results for AEC 2 Anode Waste Pile

Depth (m bgs)	No. Samples	Maximum Concentration BaP TEQ (mg/kg)	No. Samples > HIL D[1]	Maximum Concentration BaP (mg/kg)	No. Samples > ESL[2]
0-0.2	15	150	**6**	99	**1**
0.2-0.4	15	250	**2**	160	**2**
0.4-0.6	7	190	**1**	140	**1**
0.7-0.8	1	<0.5	0	<0.5	0

[1] HIL D criteria of 40 mg/kg for BaP TEQ

[2] ESL criteria of 72 mg/kg for BaP (commercial/industrial land use)

Shallow PAH impacts at AEC 2 Anode Waste Pile have been vertically and laterally delineated and the following remedial works are proposed and are presented in **Figure 2b, Appendix 1**:

- Excavation of Area 1a in the north western portion of the Anode Waste Pile to a minimum depth of 0.3 m bgs
- Excavation of Area 1b in the south eastern portion of the Anode Waste Pile to a minimum depth of 0.3 m bgs
- Excavation of Area 2a along the northern boundary of the Anode Waste Pile to a minimum depth of 0.4 m bgs
- Excavation of Area 2b in the south eastern portion of the Anode Waste Pile to a minimum depth of 0.7 m bgs
- Relocation of PAH contaminated soil to the 60C Contaminated Stockpile for interim storage prior to relocation into the Containment Cell once constructed

- Collection of soil validation samples from the walls and base of each excavation at a rate of one sample per wall or per 10 lineal metres and one sample per 25 m^2 on the excavation floor
- Analysis of soil validation samples for PAHs
- Comparison of analytical results to the Smelter Site criteria
- Additional excavation will be required where validation soil results exceed the Smelter Site criteria as outlined in the RAP
- Materials tracking of relocated contaminated soil to the on-site containment cell

The approximate volume of PAH impacted material to be excavated is estimated in **Table 6-2**.

Table 6-2 Estimated Volume of PAH Impacted Material at AEC 2 Anode Waste Pile

Depth (m bgs)	Volume Estimates (m^3) Range			Bulk Density (T/m^3)[1]	Mass Estimates (T)	
	Estimate	Low	High		Low	High
0-0.3	600	450	650	2	900	1300
0-0.7	400	300	450	2	550	900
Total	**1000**	**750**	**1100**	**-**	**1450**	**2200**

[1] Bulk Density of 2 T/m^3 adopted though will be depending on a number of factors including moisture and compaction. Value adopted as a reasonable estimate given the approximate nature of the volume estimations.

6.2 AEC 15 West Surge Pond

Data gap investigation works were completed on 11 September 2018 and involved the following:

- Collection of six samples from the accessible eastern bank of the West Surge Pond
- Analysis of samples for soluble fluoride.

Laboratory results from the data gaps investigation are presented in **Appendix 4** and summarised in **Table 6-3**. Tabulated results have been compared against assessment criteria and are included in **Appendix 6**.

Soluble fluoride concentrations were significantly lower than total fluoride concentrations, which were reported at 5,850 mg/kg and 38,500 mg/kg in the Phase 2 ESA. As the soluble fluoride concentrations are below the site-specific human health commercial/industrial criterion of 17,000 mg/kg, the sediments are suitable for use on the Smelter Site and remediation is not required.

Assessment against ecological criterion is not considered to be required for the Smelter Site based on the future commercial/ industrial land use and the limited extent of ecological receptors present under this land use.

Table 6-3 Summary of Soluble Fluoride Results for AEC 15 West Surge Pond

Soil Sample ID	Soluble Fluoride Concentration (mg/kg)	Results Exceeding Site Criteria of 17,000 mg/kg
WSP01	25	0
WSP02	83	0
WSP03	97	0
WSP04	150	0
WSP05	110	0
WSP06	89	0

6.3 AEC 18 Pot Rebuild Area

Data gap investigation works were completed on 23 May 2018. During the data gaps investigation, the first backfilled scrap bucket pit inspected was completely excavated, including the removal of the concrete cap and then removal of backfill material. The backfill material was observed to comprise 20 concrete floor slabs with approximately 5 m^3 of dark grey/black fill soil within the void space around the floor slabs. One sample of the dark grey/black fill material was collected for laboratory analysis.

To assess the remaining two scrap bucket pits, the concrete floor above the backfilled void was cored with a concrete core cutter. The concrete floor slabs, which contain reinforcement bar, were also cored with a concrete core cutter. As the concrete core cutter requires the use of water, the fill material between the floor slabs could not be sampled. The colour of the slurry from the concrete core cutter was visually assessed. In each case, the slurry colour was dark grey/black and considered to be consistent with the fill material identified in the first scrap bucket pit.

Subsequent scrap bucket pits were concrete core drilled using water. The colour of the backfill material coming up with the water slurry was observed and recorded but no samples were collected due to the difficulty in sampling the water slurry.

Results from backfill sample 77A-Pit 1 from the first scrap bucket pit for contaminants of concern are outlined in **Table 6-4**. Tabulated results have been compared against site criteria and are included in **Appendix 6**.

Contaminant concentrations were below the adopted site criteria and remediation of backfill material within the scrap bucket pits was not required. 77A was not demolished and the concrete slab remains in situ.

Table 6-4 Summary of Results for Sample 77A-Pit 1 at AEC 18: Pot Rebuild Area

Contaminant of Concern	Concentration (mg/kg)	No. Results Exceeding Site Criteria
Cyanide and Fluoride		
Total Cyanide	<0.5	0
Soluble Fluoride	82	0
Heavy Metals		
Arsenic	<4	0
Cadmium	0.6	0
Chromium	24	0
Copper	14	0
Lead	14	0
Mercury	<0.1	0
Nickel	38	0
Zinc	47	0
TRH		
TRH C6-C10 less BTEX (F1)	<25	0
TRH >C10-C16 less naphthalene (F2)	<50	0
TRH >C16-C34	290	0
TRH > C34-C40	<100	0
BTEX		

Contaminant of Concern	Concentration (mg/kg)	No. Results Exceeding Site Criteria
Benzene	<0.2	0
Toluene	<0.5	0
Ethylbenzene	<1	0
Xylene	<1	0
PAHs		
Naphthalene	<0.1	0
Benzo(a)pyrene	13	0
Benzo(a)pyrene TEQ	24	0
Total PAHs	130	0
OCPs/PCBs		
OCPs	<LOR	0
PCBs	<0.1	0

6.4 AEC 30 Area East of the Clay Borrow Pit

The Area East of the Clay Borrow Pit appeared to have been disturbed in historical aerial photographs and may contain fill material. A stockpile of material classified as Excavated Natural Material (ENM) originating from the construction of the Hunter Expressway within the Buffer Zone was placed at this location in 2014. Investigations of potential fill material at the Area East of the Clay Borrow Pit could not be completed until the ENM Stockpile was relocated in early 2020.

Data gap investigation works were completed on 14 May 2020 and involved the following:

- Excavation of 16 test pits (AECBP_TP01 to AECBP_TP16) on an approximate grid across the area identified to have been disturbed based on historical aerial photographs
- Extension of each test pit into natural soils beneath fill material to a maximum depth of 5.1 m bgs
- Logging of the nature and percentage of foreign materials within fill material
- Analysis of these soil samples for heavy metals, PAHs, THE/BTEX, soluble fluoride and cyanide

Foreign material was identified within test pits at nine of the 13 sampling locations; TP3, TP5, TP7, TP8, TP10, TP11, TP13, TP14, TP16 and included an assortment of concrete, brick, metal and plastic. Foreign material within each test pit was visually estimated to be less than 10%, except for TP3 which had a higher than average foreign material content, mostly comprising concrete boulders. One broken fibre cement fragment was found at the ground surface during field work at an undisturbed location. The fragment was removed for laboratory analysis which confirmed the presence of asbestos. No fragments of asbestos fibre cement sheeting were identified within any of the test pits or elsewhere on the site surface.

Laboratory results from the data gaps investigation are summarised in **Table 6-5**. Two 'hot spots' were identified where concentrations of Contaminants of Concern exceeded the human health criteria by more than 2.5 times, as follows:

- TP12: 0.3-0.4: Lead concentration of 880 mg/kg, exceeding HIL A 300 mg/kg
- TP13: 1.6-1.7: BaP TEQ concentration of 12 mg/kg, exceeding HIL A of 3 mg/kg

Concentrations of soluble fluoride, arsenic, copper, lead, nickel, zinc and BaP exceeded the ecological criteria at a number of locations.

Table 6-5 Summary of Results for AEC 30 Area East of the Clay Borrow Pit

Contaminant of Concern	No. of Samples	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	No. Results Exceeding Criteria
Cyanide and Fluoride				
Cyanide (free)	14	<0.5	<0.5	0
Fluoride	14	2.5	53	**13 (EIL)**
Heavy Metals				
Aluminium	18	1500	11000	0
Arsenic	18	<4	83	**1 (EIL)**
Cadmium	18	<0.4	0.5	0
Chromium	18	2	18	0
Copper	18	<1	440	**11 (EIL)**
Lead	18	4	880	**2 (HIL) 1 (EIL)**
Mercury	18	<0.1	<0.1	0
Nickel	18	2	14	**9 (EIL)**
Zinc	18	1	7500	**1 (HIL) 12 (EIL)**
TRH				
TRH C6-C10 less BTEX (F1)	14	<25	<25	-
TRH >C10-C16 less naphthalene (F2)	14	<50	<50	-
TRH >C16-C34	14	<100	240	-
TRH > C34-C40	14	<100	<100	-
BTEX				
Benzene	14	<0.2	<0.2	-
Toluene	14	<0.5	<0.5	-
Ethylbenzene	14	<1	<1	-
Xylene	14	<1	<1	-
PAHs				
Naphthalene	14	<0.1	<0.1	-
Sum of PAH	14	<0.05	64	0
Benzo(a)pyrene	14	<0.05	7.6	**1 (ESL)**
Benzo(a)pyrene TEQ (LOR)	14	<0.5	12	0

- indicates no criterion

Remediation of soil with elevated lead and BaP concentrations exceeding human health criteria surrounding test pits TP12 and TP13 is required. Delineation of the 'hot spot' area at test pit TP13 is recommended to identify the extent of impact prior the completion of remedial works.

The following remedial works are proposed and are presented in **Figure 5b, Appendix 1**:

- Excavation of an area of 23 m diameter[1] around test pit TP12 in the south eastern portion of AEC30 to a minimum depth of 0.5 m bgs
- Excavation of an area of 23 m diameter[1] around test pit TP13 in the northern portion of AEC30 to a minimum depth of 1.8 m bgs
- Relocation of impacted soil from TP12 and TP13 for reuse within the Smelter fence as backfill material, as the PAH and heavy metal concentrations do not exceed HIL D
- Collection of soil validation samples from the walls and base of each excavation at a rate of one sample per wall or per 10 lineal metres and one sample per 25 m^2 on the excavation floor
- Analysis of soil validation samples for heavy metals and PAHs
- Comparison of analytical results to the bushland criteria
- Additional excavation will be required where validation soil results exceed the bushland criteria as outlined in **Section 5.2.2**
- Materials tracking of relocated impacted soil to within the Smelter fence line

The approximate volume of heavy metal and PAH impacted material to be excavated is estimated in **Table 6-6**.

Table 6-6 Estimated Volume of Impacted Material at AEC 30 Area East of Clay Borrow Pit

Depth (m bgs)	Volume Estimates (m^3) Range			Bulk Density (T/m^3)[1]	Mass Estimates (T)	
	Estimate	Low	High		Low	High
TP12: 0-0.5	215	200	430	2	400	860
TP13: 0-1.8	774	750	1548	2	1500	3096
Total	**989**	**950**	**1978**	**-**	**1900**	**3956**

[1] Bulk Density of 2 T/m^3 adopted though will be depending on a number of factors including moisture and compaction. Value adopted as a reasonable estimate given the approximate nature of the volume estimations.

In relation to the soluble fluoride and heavy metal concentrations exceeding the ecological criteria, remediation is not considered to be required as this portion of the Smelter Site is the proposed location of a leachate pond that forms part of the construction of the Containment Cell. Construction of the leachate pond will result in further disturbance to this area, including excavation and relocation of impacted soil from the south east corner.

6.5 AEC 33 Western Paint Area

Data gap investigation works were completed on 8 April 2020 following the removal of infrastructure from this area (concrete sump, structural steel and concrete slab) and involved the following:

- Collection of four surface soil samples on a grid across the cleared area following the removal of infrastructure and clearing of surface soils
- Analysis of these soil samples for heavy metals, PAHs, THE/BTEX, soluble fluoride and cyanide

To complete remedial works, surface vegetation was cleared from an area of approximately 1,340 m^2 around the infrastructure. Surface soils were observed to comprise of sandy clay and sand fill. Laboratory result are summarised in **Table 6-7**. Concentrations of soluble fluoride, nickel and zinc were identified exceeding the ecological criteria. Remediation is not considered to be required as undisturbed bushland in this area was observed to be unimpacted and further disturbance would have no ecological benefit.

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[1] 23 m diameter is based on Table A of NSW EPA (1995) Sampling Design Guidelines, hot spot diameter likely for 0.5 hectare site.

Table 6-7 Summary of Results for AEC 33 Western Paint Area

Contaminant of Concern	No. of Samples	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	No. Results Exceeding Criteria
Cyanide and Fluoride				
Cyanide (free)	4	<0.5	<0.5	0
Fluoride	4	7.1	15	**4 (EIL)**
Heavy Metals				
Aluminium	4	2600	7800	-
Arsenic	4	5	6	0
Cadmium	4	<0.4	<0.4	0
Chromium	4	6	29	0
Copper	4	3	15	0
Lead	4	9	29	0
Mercury	4	<0.1	<0.1	0
Nickel	4	4	17	**3 (EIL)**
Zinc	4	30	210	**1 (EIL)**
TRH				
TRH C6-C10 less BTEX (F1)	14	<25	<25	0
TRH >C10-C16 less naphthalene (F2)	14	<50	<50	0
TRH >C16-C34	14	<100	<100	0
TRH > C34-C40	14	<100	<100	0
BTEX				
Benzene	14	<0.2	<0.2	0
Toluene	14	<0.5	<0.5	0
Ethylbenzene	14	<1	<1	0
Xylene	14	<1	<1	0
PAHs				
Naphthalene	4	<0.1	<0.1	-
Sum of PAH	4	0.58	4.8	0
Benzo(a)pyrene TEQ (LOR)	4	<0.5	0.7	0

7. UPDATED CONCEPTUAL SITE MODEL

The preliminary CSM presented in **Section 2.1** has been updated based on the results of the data gap investigations, as outlined in **Table 7-1**.

Table 7-1 Updated Conceptual Site Model

Element of CSM	Ramboll's Comments
Contaminant source and mechanism	Following the completion of the data gap assessment, contaminant sources and mechanisms were identified at AEC 2 Anode Waste Pile, comprising PAHs in fill material. The mechanism of contamination is likely to be deposition of PAHs from the long-term storage of ahead-of schedule-anodes at this location. Soil investigations at AEC 30 Area East of Clay Borrow Pit identified two hot spot locations where contaminant concentrations exceeded 2.5 times human health criteria. These locations are considered to be a source of contamination, likely due to the nature of the fill used in this area. Contaminant sources were not identified at AEC 15 West Surge Pond, AEC 18 Pot Rebuild Area or AEC 33 Western Paint Area.
Affected media	Affected media at AEC 2 Anode Waste Pile is shallow soils to a maximum depth of 0.6 m bgs. Natural clay below fill material at this AEC has not been impacted with PAHs. Affected media at AEC 30 Area East of Clay Borrow Pit is soil, to a minimum depth of 0.5 m at TP12 and a minimum depth of 1.8 m at TP13.
Receptor identification	Potential receptors at AEC 2 Anode Waste Pile include future commercial/industrial workers, visitors and intrusive maintenance workers. Potential receptors at AEC 30 Area East of Clay Borrow Pit are limited to current and future site users. Access to AEC 30 is currently restricted via fencing and locked gates.
Exposure pathways	Potential exposure pathways at both AECs include direct contact and inhalation of dust (indoors and outdoors).
Presence of preferential pathways for contaminant movement	PAH impacts at AEC 2 Anode Waste Pile were identified in the north western portion and south eastern portion in locations where the surface was not covered with concrete slabs. PAHs within anode dusts have preferentially migrated into subsurface soils where ahead-of-schedule anodes were stockpiled directly on the ground. Lead and BaP impacts at AEC 30 are likely limited to the area that has been filled with impacted material. No preferential pathways were identified during soil investigations.
Evaluation of data gaps	Based on the results of the investigation, it is considered that the lateral and vertical extent of contamination at AEC 2 Anode Waste Pile has been delineated and no data gaps remain that may impact on the proposed remediation as outlined in the RAP (Ramboll 2018). Groundwater investigations completed in July 2014 identified PAH concentrations in groundwater around AEC 2 were below ANZECC (2000) guidelines for 95% Protection of Freshwater Species therefore risk of PAH mobility to groundwater is considered low. The lateral and vertical extent of two hot spots at AEC 30 (TP12 and TP13) are unknown. Delineation works can be completed prior to the commencement of remedial works to confirm the extent of contamination. Validation sampling following remedial excavation works will close out this data gap.

8. CONCLUSIONS AND RECOMMENDATIONS

Ramboll Australia Pty Ltd was engaged by Hydro Aluminium Kurri Kurri Pty Ltd to close out data gaps at several Areas of Environmental Concern (AECs) located at the former Hydro Aluminium Smelter located on Hart Road Kurri Kurri NSW.

The Phase 2 ESA and Phase 2 ESA Additional Investigations identified nine AECs that required remediation based upon source-pathway-receptor linkages identified in the CSM developed for the Smelter Site. The Smelter Site RAP was prepared to detail the remediation and validation program required to render the Smelter Site suitable for future commercial/industrial land use. The Smelter Site RAP identified that the preferred remedial strategy was excavation of waste and impacted materials and relocation to an engineered Containment Cell proposed to be constructed on the Smelter Site.

At the time the Smelter Site RAP was prepared, data gaps remained at the following AECs generally due to access issues:

- AEC 2 Anode Waste Pile
- AEC 15 West Surge Pond
- AEC 18 Pot Rebuild Area
- AEC 30 Area East of the Clay Borrow Pit (located outside the Smelter fence within Buffer Zone land)

An additional data gap was identified during Stage 1 Demolition Works at the Smelter Site, which required investigation, as follows:

- AEC 33 Western Paint Area (located outside the Smelter fence within Buffer Zone land)

Soil investigations were completed at each of these AECs during the Demolition Works between August 2017 and August 2020. Based on the results of the data gap investigations, soil contamination was not identified at the following AECs and no further works are required:

- AEC 15 West Surge Pond
- AEC 18 Pot Rebuild Area
- AEC 33 Western Paint Area

Remediation is required at AEC 2 Anode Waste Pile to remediate PAH impacts to shallow fill material. The data gap investigation has vertically and laterally delineated the extent of remediation required, with excavation works to be completed at four separate areas. Approximate volumes and tonnages are provided in this report.

The data gaps investigation completed at AEC 30 identified two ‘hot spots’ where concentrations of Contaminants of Concern exceeded the human health criteria by more than 2.5 times. Remediation of soil with elevated lead and PAH concentrations surrounding test pits TP12 and TP13 is required. The diameter of these ‘hot spots’ has been estimated and approximate volumes and tonnages are provided in this report, however further delineation works can be completed prior to remediation to confirm the extent of remediation required.

Remediation of AEC 2 and AEC 30 is to be completed in conjunction with other remedial works at the Smelter Site and is required for the Smelter Site to be considered suitable for the future land use. Remediation and validation works should be undertaken in accordance with the Smelter Site RAP.

9. LIMITATIONS

Ramboll Australia Pty Ltd prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Kurri Kurri Pty Ltd and in accordance with our understanding and interpretation of current regulatory standards.

A representative program of sampling and laboratory analyses was undertaken as part of this investigation, based on past and present known uses of the Site. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous.

Site conditions may change over time. This report is based on conditions encountered at the Site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment.

Ramboll did not independently verify all of the written or oral information provided to Ramboll during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

9.1 User Reliance

This report has been prepared exclusively for Hydro Aluminium Kurri Kurri Pty Ltd and may not be relied upon by any other person or entity without Ramboll's express written permission.

10. REFERENCES

ATSDR (2003) Toxicological Profile for Fluorides, Hydrogen Fluoride and Fluorine

Environ Australia Pty Ltd (2013) Preliminary Screening Level, Health Risk Assessment for Fluoride and Aluminium, Part of the Kurri Kurri Aluminium Smelter, Hart Road, Loxford

Environ Australia Pty Ltd (2012) Stage 1 Phase 2 Environmental Site Assessment, Hydro Kurri Kurri Aluminium Smelter

Environ Australia Pty Ltd (2015) Stage 2 Phase 2 Environmental Site Assessment, Hydro Kurri Kurri Aluminium Smelter

NEPC (1999) National Environmental Protection (Assessment of Site Contamination) Amendment Measure (NEPM) 2013

New South Wales Environment Protection Authority (EPA) (1995) Sampling Design Guidelines

New South Wales Department of Environment and Conservation (NSW EPA 2017) Guidelines for the NSW Site Auditor Scheme (Third Edition)

Ramboll (July 2018) Remedial Action Plan, Hydro Aluminium Smelter Kurri Kurri

Simpson et al. (2013) Revision of ANZECC/ARMCANZ Sediment Quality Guidelines

APPENDIX 1
FIGURES

RAMBOLL AUSTRALIA - GIS MAP file : 318000344_GIS_P007_DataGap | F001_AEC_Overview_V03 | 27/01/2021

Aerial photography by Nearmap, flown 17.01.2021

Legend

🟩 Smelter site
🟦 Smelter fence (approximate)
🟥 Area of environmental concern

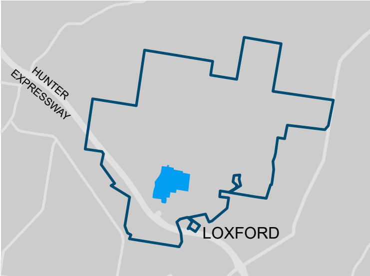
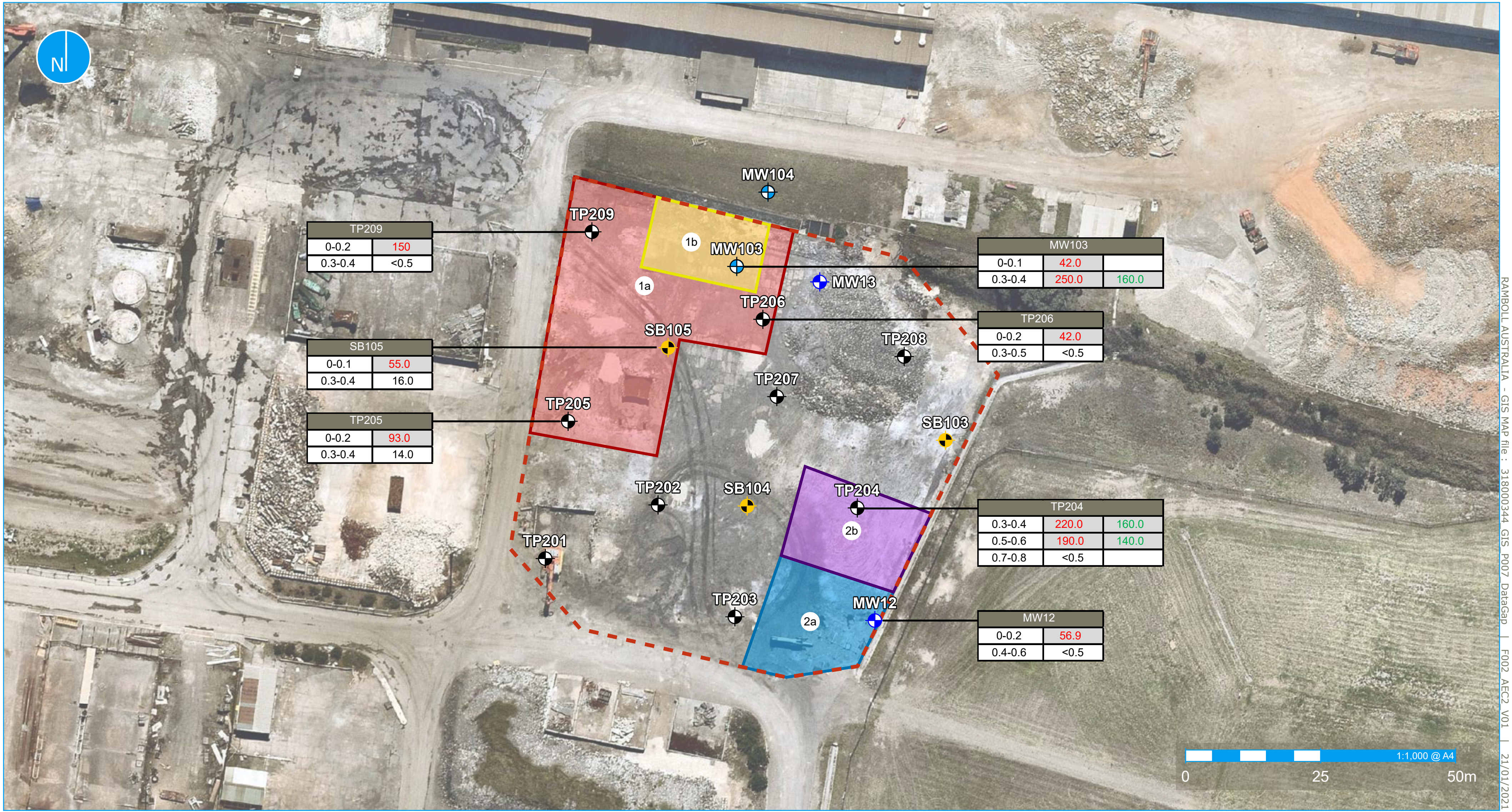


Figure 1 | Location of AECs within Smelter Site



TP209		
0-0.2	150	
0.3-0.4	<0.5	

SB105		
0-0.1	55.0	
0.3-0.4	16.0	

TP205		
0-0.2	93.0	
0.3-0.4	14.0	

MW103		
0-0.1	42.0	
0.3-0.4	250.0	160.0

TP206		
0-0.2	42.0	
0.3-0.5	<0.5	

TP204		
0.3-0.4	220.0	160.0
0.5-0.6	190.0	140.0
0.7-0.8	<0.5	

MW12		
0-0.2	56.9	
0.4-0.6	<0.5	

RAMBOLL AUSTRALIA - GIS MAP file : 318000344_GIS_P007_DataGap | F002_AEC2_V01 | 21/01/2021

Aerial photography by Nearmap, flown 18.10.2019

Legend

- - - Approximate extent of soil contamination
⊕ Additional investigation location (2018)
⊕ Groundwater well and soil sampling location (2012)
⊕ Groundwater well location (2014)
⊕ Soil sampling location (2014)

Excavation areas
🟥 Area 1a
🟨 Area 1b
🟦 Area 2a
🟪 Area 2b

Soil sample exceedances

Sample depth (m)	Benzo(a)pyrene TEQ	Benzo(a)pyrene
	NEPM 2013 HIL D Commercial / Imdustrial (40mg/kg)	CCME 2010 Commercial / Imdustrial (72mg/kg)

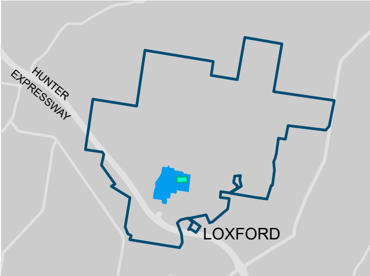


Figure 2 | Sampling Locations and Extent of Contamination at AEC 2: Anode Waste Pile

RAMBOLL AUSTRALIA - GIS MAP file : 318000344_GIS_P007_DataGap | F003_AEC15_V02 | 21/01/2021

Aerial photography by Nearmap, flown 18.10. 2019

Legend

⊕	Sampling location (2018)
🟦	West Surge Pond

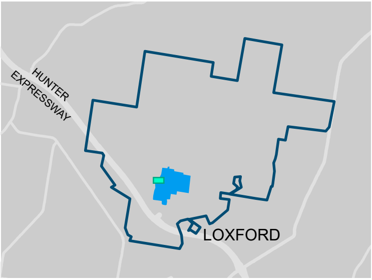


Figure 3 | Sampling Locations at AEC 15: West Surge Pond

RAMBOLL AUSTRALIA - GIS MAP file : 318000344_GIS_P007_DataGap | F004_AEC18_V03 | 27/01/2021

Aerial photography by Nearmap, flown 18.10. 2019

Legend

⊕ Sampling location (2018)

▨ 77A Pot Rebuild Building

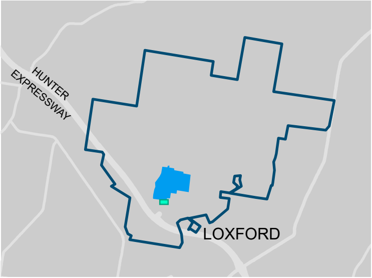
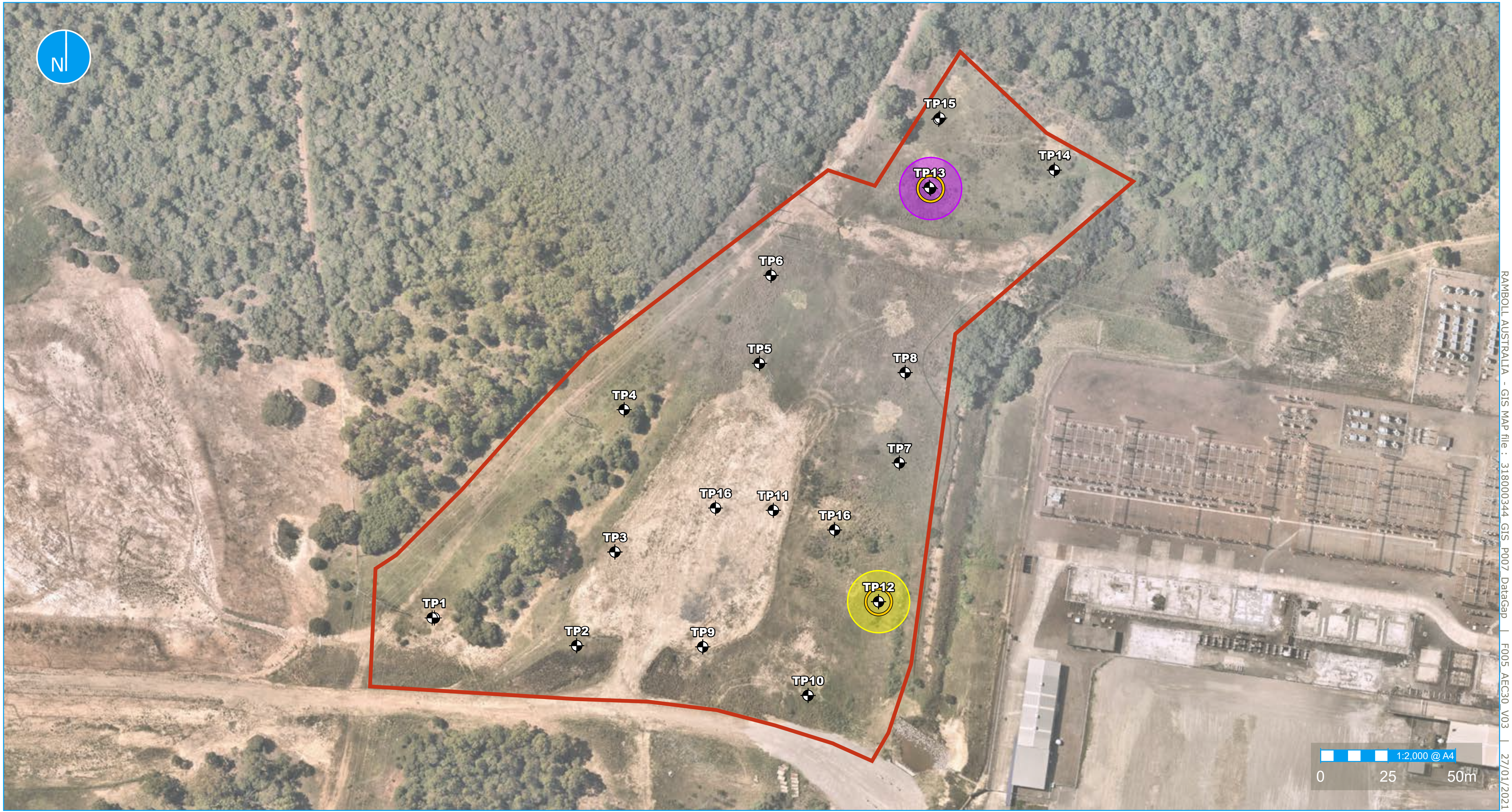


Figure 4 | Sampling Locations at AEC 18: Pot Rebuild Area



RAMBOLL AUSTRALIA - GIS MAP file : 318000344_GIS_P007_DataGap | F005_AEC30_V03 | 27/01/2021

Aerial photography by Nearmap, flown 17.01.2021

Legend

▭	Area of environmental concern
⌖	Sampling location
○	Contamination hotspot

Excavation areas

🟨	Minimum depth of 0.5m
🟪	Minimum depth of 1.8

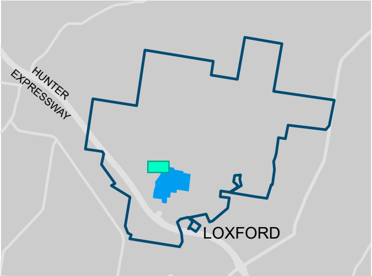


Figure 5 | Sampling Locations at AEC 30: Areas East of the Clay Borrow Pit

Aerial photography by Nearmap, flown 17.01.2021

RAMBOLL AUSTRALIA - GIS MAP file : 318000344_GIS_P007_DataGap | F006_AEC33_V03 | 27/01/2021

Legend

▭	Area of environmental concern
⌖	Sampling location

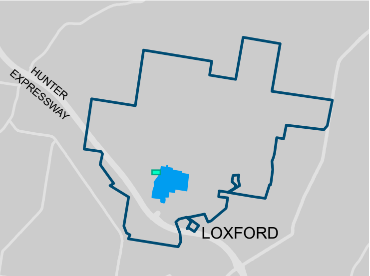
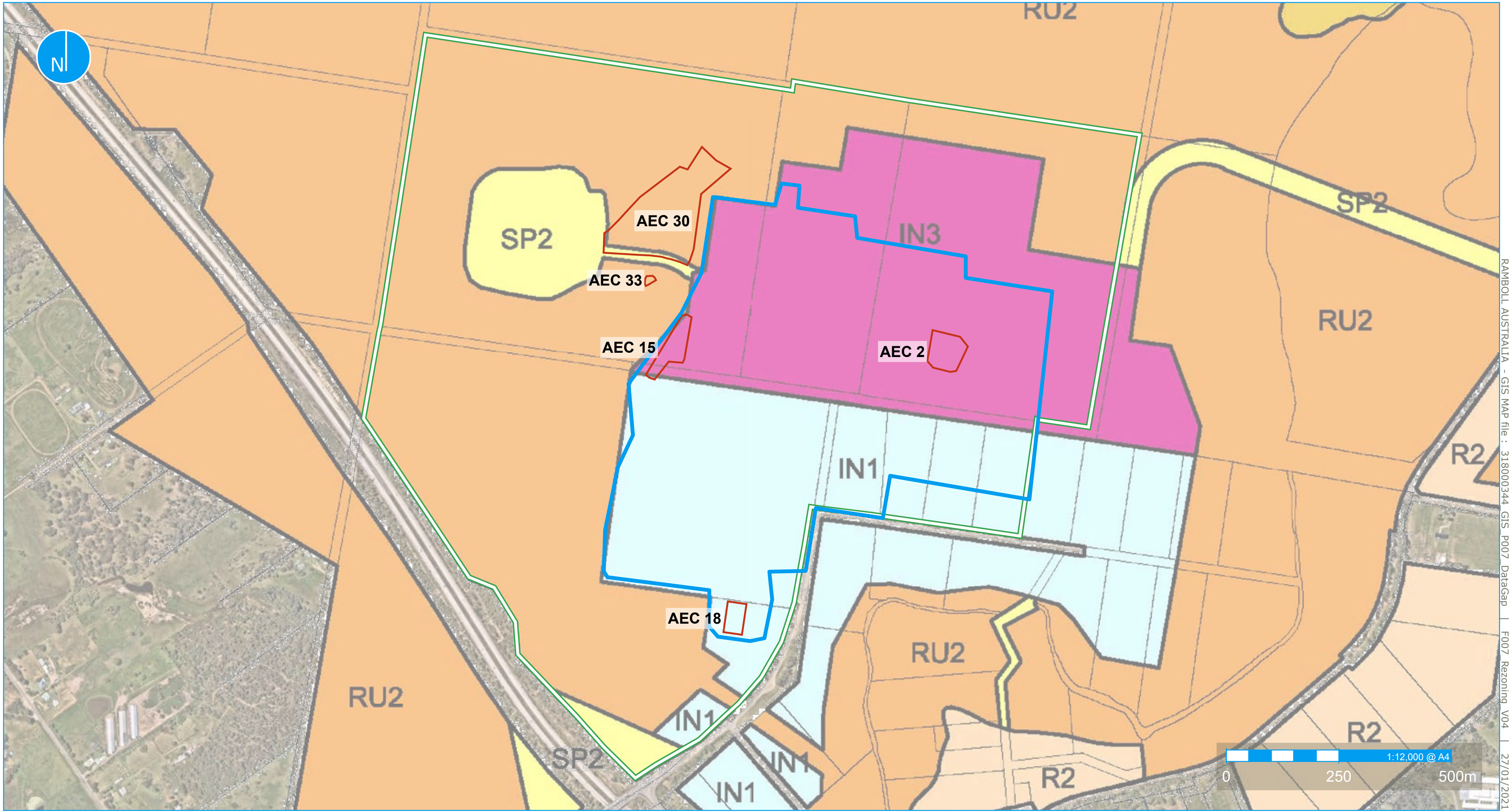


Figure 6 | Sampling Locations at AEC 33: Western Paint Area



RAMBOLL AUSTRALIA - GIS MAP file : 318000344_GIS_P007_DataGap | F007_Rezoning_V04 | 27/01/2021

Aerial photography by Nearmap, flown 17.01. 2021

Legend

- ▭ Smelter site
- ▭ Smelter fence (approximate)
- ▭ Area of environmental concern

Rezoning (adapted from Hydro Kurri Kurri Rezoning Master Plan)

B1	NEIGHBOURHOOD CENTRE (5046m²)
B7	BUSINESS PARK (37.43ha)
IN1	GENERAL INDUSTRIAL (86.55ha)
IN3	HEAVY INDUSTRIAL (36.29ha)
R1	GENERAL RESIDENTIAL (54.21ha)
R2	LOW DENSITY RESIDENTIAL (128.1ha)
RE1	PUBLIC RECREATION (14.17ha)
SP2	SPECIAL PURPOSE INFRASTRUCTURE (38.73ha)

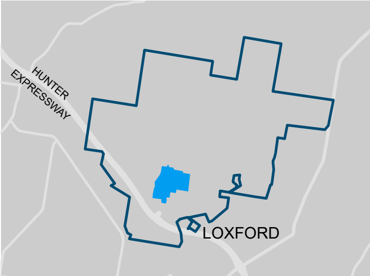


Figure 7 | Rezoning

APPENDIX 2
TEST PIT LOGS AND FIELD NOTES

TEST PIT NUMBER AECBP_TP1

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Investigation

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				⁙		GRASS overlying SAND; fine grained, pale brown, loose, moist to dry, grass root fibres, with fine to medium sub angular gravel	AECBP_TP1_0.1-0.2	
			1 2	▨		CLAY; natural, high plasticity, dark brown with some red and black mottling	AECBP_TP1_0.9-1.0	
			3 4 5 6			Test Pit AECBP_TP1 terminated at 2m		

TEST PIT NUMBER AECBP_TP2

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty
Ltd **PROJECT NUMBER** 318000585
PROJECT NAME Data Gap Assessment
PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; Gravelly clayey SAND, fine grained, pale brown, dry to moist	AECBP_TP2_0.2-0.3	
			1	▩		FILL; Gravelly CLAY, pale brown with orange and grey mottling, large concrete boulder, natural wood, becoming brown at 1m bgl	AECBP_TP2_1.2-1.3	
			2	▨		CLAY; natural, high plasticity, dark brown with some red and black mottling	AECBP_TP2_2.0-2.1	
			3 4 5 6			Test Pit AECBP_TP2 terminated at 2.7m		

TEST PIT NUMBER AECBP_TP3

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▨		FILL; Gravelly sandy CLAY, brown, loose, large concrete boulders, corregated metal, plastic and cloth	AECBP_TP3_0.3-0.4	
			1	▨			AECBP_TP3_1.3-1.4	
				▨		FILL; SAND, orange, loose		
			2	▧		CLAY; high plasticity, dark brown with some red mottling	AECBP_TP3_2.3-2.4	
			3 4 5 6			Test Pit AECBP_TP3 terminated at 2.5m		

TEST PIT NUMBER AECBP_TP4

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assesment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 13/5/20
COMPLETED 13/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▨		FILL; grass overlying Sandy CLAY, pale brown		
				▨		FILL; Clayey silty SAND, brown, rootlets	AECBP_TP4_0.1-0.2	
			1	▨		CLAY; high plasticity, dark brown with red mottling	AECBP_TP4_0.8-0.9	
						Test Pit AECBP_TP4 terminated at 1m		
			2					
			3					
			4					
			5					
			6					

TEST PIT NUMBER AECBP_TP5

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assessment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; Grass overlying sandy CLAY, pale brown, with medium to large sub-rounded gravels, dry to moist, orange/brown mottling	AECBP_TP5_0.3-0.4, DO1_130520, T01_130520	
			1	▩		With Sandstone, yellow, medium grained	AECBP_TP5_1.3-1.4	
			2	▩		Steel pole, metal		
				▩		FILL; Gravelly CLAY, grey, high plasticity		
			3	▩		FILL; SAND, grey		
				▧		CLAY; natural, high plasticity, dark brown with orange mottling, stiff	AECBP_TP5_3.9-4.0	
			4			Test Pit AECBP_TP5 terminated at 4m		
			5					
			6					

TEST PIT NUMBER AECBP_TP6

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▨		FILL; Grass overlying gravelly sandy CLAY, brown, loose, grass root fibres	AECBP_TP6_0.3-0.4	
				▨		FILL; SAND, fine to medium grained, yellow/pale brown, loose, with fine to medium sub-rounded gravel		
			1	▨		FILL; Sandy gravelly CLAY, pale brown, with fine to medium gravels	AECBP_TP6_0.8-0.9	
			2	▨		Sandy CLAY; brown/grey with orange sandstone banding	AECBP_TP6_2.0-2.1	
			3 4 5 6			Test Pit AECBP_TP6 terminated at 2.2m		

TEST PIT NUMBER AECBP_TP7

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty
Ltd **PROJECT NUMBER** 318000585

PROJECT NAME Data Gap Assessment
PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; Grass overlying gravelly sandy CLAY/clayey SAND, pale brown, trace rubber tube, with pockets of sandstone/weathered clayey sand, orange/pale grey		
							AECBP_0.4-0.5	
						Concrete boulder at 0.5m bgl		
			1					
							AECBP_TP7_1.6-1.7	
			2					
				▨		Sandy CLAY; natural, brown/grey with orange mottling, stiff, medium to high plasticity, medium grained sand		
			3					
			4					
							AECBP_TP7_4.0-4.1	
						Test Pit AECBP_TP7 terminated at 4.2m		
			5					
			6					

RAMBOLL

TEST PIT NUMBER AECBP_TP8

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assessment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; Grass overlying sandy gravelly CLAY, pale brown, with large concrete boulders		
							AECBP_TP8_0.2-0.3	
			1					
						FILL; sandy CLAY, brown/grey, medium plasticity, fine to large sub-rounded gravel to cobbles/boulders		
			2				AECBP_TP8_1.9-2.0	
			3			Some slight green staining (organic odour)		
			4			Minor metal and reinforcing bar, natural wood and timber		
						Sandy CLAY/clayey SAND; natural, grey, stiff, high plasticity, organic odour		
			5				AECBP_TP8_5.0-5.1	
						Test Pit AECBP_TP8 terminated at 5.2m		
			6					

TEST PIT NUMBER AECBP_TP9

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 13/5/20

COMPLETED 13/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; Gravelly sandy CLAY, pale brown with orange/grey mottling, fine to medium sub-angular and sub rounded gravels		
							AECBP_TP9_0.3-0.4	
			1					
							AECBP_TP9_1.8-1.9	
			2					
						Clayey SAND; grey, fine grained, dense, rootlets at 3.0m bgl, organic odour		
							AECBP_TP9_3.0-3.1	
			3					
			4					
						Clayey SAND; extremely weathered SANDSTONE, grey/orange mottled, friable		
							AECBPJ_TP9_4.8-4.9	
			5					
						Test Pit AECBP_TP9 terminated at 5m		
			6					

TEST PIT NUMBER AECBP_TP10

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assessment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 13/5/20 **COMPLETED** 13/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			1			FILL; Grass overlying gravelly sandy CLAY, pale brown, fine to medium gravel, with concrete, rope and brick, rio	AECBP_TP10_0.6-0.7 AECBP_TP10_1.7-1.8	
			2			FILL; SAND, grey, loose, fine to medium grained	AECBP_TP10_1.8-1.9	
						FILL; SAND, pale brown/yellow, loose, fine grained		
			3			Sandy CLAY; orange/grey mottled, very stiff, medium to high plasticity, dry to moist	AECBP_TP10_2.9-3.0	
			4 5 6			Test Pit AECBP_TP10 terminated at 3m		

TEST PIT NUMBER AECBP_TP11

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Report
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0.0	▨		FILL; Sandy gravelly CLAY, pale brown with orange/grey mottling, fine to large sub-rounded gravel		
			1	▨			AECBP_TP11_1.1-1.2	
				▨		Rubber in side wall		
			2	▨				
			3	▨		FILL; Clayey SAND/sandy CLAY, pale brown/grey, fine to large sub-rounded to rounded gravel, some concrete		
				⁙		Silty SAND; grey, loose, fine grained, dry to moist, with rootlets	AECBP_TP11_3.4-3.5, D02_140520, T02_140520	
			4	⁙				
			5	⁙			AECBP_TP11_4.5-5.0	
						Test Pit AECBP_TP11 terminated at 5m		
			6					

TEST PIT NUMBER AECBP_TP12

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; Grass overlying gravelly sandy CLAY, pale brown	AECBP_TP12_0.3-0.4	
			1			FILL; SAND, pale orange/white, medium to coarse grained, loose	AECBP_TP12_0.9-1.0	
						FILL; Clayey SAND, pale brown/orange, medium grained, weathered, friable, dense		
			2			SAND; fine grained, pale brown, loose, with rootlets	AECBP_TP12_2.6-2.7	
			3			Test Pit AECBP_TP12 terminated at 2.7m		
			4					
			5					
			6					

TEST PIT NUMBER AECBP_TP13

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assessment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▦		FILL; Grass overlying SAND, pale brown/yellow, fine to medium grained, with grass root fibres		
			1	▦		FILL; Gravelly sandy CLAY, high plasticity, soft, fine to medium angular and rounded gravels, wire, cables, reinforcing bar, pvc	AECBP_TP13_0.3-0.4	
			2	▦		FILL; Gravelly clayey SAND, grey, medium grained, fine to large gravel to cobbles, concrete, terracotta, plastic, timber, tile	AECBP_TP13_1.6-1.7	
			3	▨		Sandy CLAY; grey/black, high plasticity, fine grained sand		
				░		SAND; orange/grey mottled, medium grained with sandstone boulders, weathered, very dense	AECBP_TP13_3.6-3.7	
			4 5 6			Test Pit AECBP_TP13 terminated at 3.7m		

TEST PIT NUMBER AECBP_TP14

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				▩		FILL; Grass overlying gravelly sandy CLAY, pale brown/orange, fine to medium gravels	AECBP_TP14_0.3-0.4	
			1 2	▩		FILL; Clayey gravelly SAND, pale brown, medium grained, fine to medium sub-angular gravels, concrete, reinforcing bar, brick, asphalt	AECBP_TP14_1.0-1.1	
				▩		FILL; SAND, fine to medium grained, pale brown/grey	AECBP_TP14_2.3-2.4	
			3	▨		Sandy CLAY; high plasticity, very stiff, brown with trace orange mottling		
			4 5 6			Test Pit AECBP_TP14 terminated at 3m		

TEST PIT NUMBER AECBP_TP15

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd

PROJECT NAME Data Gap Assessment

PROJECT NUMBER 318000585

PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20

R.L. SURFACE

DATUM

CONTRACTOR DARACON

SLOPE 90°

BEARING ---

EQUIPMENT Excavator

HOLE LOCATION

HOLE SIZE

LOGGED BY JK

CHECKED BY KG

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; Grass overlying gravelly clayey SAND, pale brown/orange With some natural wood	AECBP_TP15_0.3-0.4	No foreign material content observed
			1			Clayey SAND/sandy CLAY; grey, high plasticity	AECBP_TP15_0.7-0.8	
						SAND; fine grained, pale brown/white		
						SANDSTONE; dense, orange, medium grained, becoming white	AECBP_TP15_1.6-1.7	
						Test Pit AECBP_TP15 terminated at 1.7m		
			2					
			3					
			4					
			5					
			6					

TEST PIT NUMBER AECBP_TP16

PAGE 1 OF 1

CLIENT Hydro Aluminium Kurri Kurri Pty Ltd
PROJECT NAME Data Gap Assesment
PROJECT NUMBER 318000585
PROJECT LOCATION AEC 30

DATE STARTED 14/5/20 **COMPLETED** 14/5/20
R.L. SURFACE
DATUM
CONTRACTOR DARACON
SLOPE 90°
BEARING ---
EQUIPMENT Excavator
HOLE LOCATION
HOLE SIZE
LOGGED BY JK
CHECKED BY KG
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			1	▨		FILL; Grass overlying gravelly sandy CLAY, orange/pale brown, with concrete and reinforcing bar, rusted metal in side wall	AECBP_TP16_0.4-0.5	Foreign material content observed to ~3m bgl
				▨		FILL; SANDSTONE, white with orange mottling		
			2 3	▨		FILL; gravelly sandy CLAY, orange/pale brown, concrete, plastic, brick	AECBP_TP16_3.0-3.1	
			4	▨		FILL; Clayey SAND, grey to black with rootlets, fine grained, natural wood	AECBP_TP16_3.5-3.6, D03_140520	
			5	▧		Clayey SAND; grey, fine grained, trace orange mottling, dense	AECBP_TP16_5.0	
			6			Test Pit AECBP_TP16 terminated at 5m		

APPENDIX 3
PHOTOGRAPHIC LOG

Photograph 1: AEC 2 Anode Waste Pile prior to data gap investigation.

Photograph 2: AEC 2 Anode Waste Pile TP201.

Photograph 3: AEC 2 Anode Waste Pile TP202.

Photograph 4: AEC 2 Anode Waste Pile TP203.

Photograph 5: AEC 2 Anode Waste Pile TP203.

Photograph 6: AEC 2 Anode Waste Pile TP204.

Report:	Data Gap Assessment	Approved: KG	Project No.: 318000585	Date: 14/01/2021
Site:	Hydro Aluminium, Kurri Kurri NSW			
Client:	Hydro			RAMBOLL

Photograph 7: AEC 2 Anode Waste Pile TP205.

Photograph 8: AEC 2 Anode Waste Pile TP206. Water at base of excavation.

Photograph 9: AEC 2 Anode Waste Pile TP207.

Photograph 10: AEC 2 Anode Waste Pile TP208.

Photograph 11: AEC 2 Anode Waste Pile TP209. Water at base of excavation.

Photograph 12: West Surge Pond. View south.

Photograph 13: West Surge Pond locality of WSP101.

Photograph 14: Sample WSP101.

Photograph 15: West Surge Pond locality of WSP102.

Photograph 16: Sample WSP102.

Photograph 17: West Surge Pond locality of WSP103.

Photograph 18: Sample WSP103.

Photograph 19: West Surge Pond locality of WSP104.

Photograph 20: Sample WSP104.

Photograph 21: West Surge Pond locality of WSP105.

Photograph 22: Sample WSP105.

Photograph 23: West Surge Pond locality of WSP106.

Photograph 24: Sample WSP106.

Photograph 25: AEC 18 Pot Rebuild Area 77A-Pit 1 concrete floor slabs.

Photograph 26: AEC 18 Pot Rebuild Area 77A-Pit 1 backfill material.

Photograph 27: AEC 18 Pot Rebuild Area 77A-Pit 2.

Photograph 28: AEC 18 Pot Rebuild Area 77A-Pit 2 slurry from concrete core cutter.

Photograph 29: AEC 18 Pot Rebuild Area 77A-Pit 3.

Photograph 30: AEC 18 Pot Rebuild Area 77A-Pit 3 slurry from concrete core cutter.

Photograph 31: AEC 30 Area East of the Clay borrow Pit. View south.

Photograph 32: AEC 30 Area East of the Clay Borrow Pit. View north east.

Photograph 33: AEC 33 Area East of the Clay Borrow Pit AECBP_TP1.

Photograph 34: AEC 33 Area East of the Clay Borrow Pit AECBP_TP2.

Photograph 35: AEC 33 Area East of the Clay Borrow Pit AECBP_TP3. Foreign material observed.

Photograph 36: Metal in test pit spoil AECBP_TP3.

Photograph 37: Large concrete boulders in test pit spoil AECBP_TP3.

Photograph 38: Plastic in test pit spoil AECBP_TP3.

Photogaph 39: AEC 33 Area East of the Clay Borrow Pit AECBP_TP4.

Photograph 40: AEC 33 Area East of the Clay Borrow Pit AECBP_TP5.

Photograph 41: AEC 33 Area East of the Clay Borrow Pit AECBP_TP6.

Photograph 42: AEC 33 Area East of the Clay Borrow Pit AECBP_TP7.

Photograph 43: AEC 33 Area East of the Clay Borrow Pit AECBP_TP8. Foreign material observed.

Photograph 44: Boulders in test pit spoil AECBP_TP8.

Photograph 45: Rio and natural wood in test pit spoil AECBP_TP8.

Photograph 46: AEC 33 Area East of the Clay Borrow Pit AECBP_TP9.

Photograph 47: AEC 33 Area East of the Clay Borrow Pit AECBP_TP10. Foreign material observed.

Photograph 48: Brick and rope in test pit spoil AECBP_TP10.

Photograph 49: Large boulders and brick in test pit spoil AECBP_TP10.

Photograph 50: AEC 33 Area East of the Clay Borrow Pit AECBP_TP11. Foreign material observed.

Photograph 51: Boulders in test pit spoil AECBP_TP11.

Photograph 52: AEC 33 Area East of the Clay Borrow Pit AECBP_TP12.

Photograph 53: AEC 33 Area East of the Claly Borrow Pit AECBP_TP13. Foreign material observed.

Photograph 54: Large Boulders in test pit spoil AECBP_TP13.

Photograph 55: Plastic in test pit spoil AECBP_TP13.

Photograph 56: Timber in test pit spoil AECBP_TP13.

Photograph 57: Cloth in test pit spoil AECBP_TP13.

Photograph 58: AEC 33 Area East of the Clay Borrow Pit AECBP_TP14. Foreign material observed.

Photograph 59: Brick in test pit spoil AECBP_TP14.

Photograph 60: Concrete boulders in test pit spoil AECBP_TP14.

Photograph 61: Asphalt in test pit spoil AECBP_TP14.

Photograph 62: AEC 33 Area East of the Clay Borrow Pit AECBP_TP15.

Photograph 63: AEC 33 Area East of the Clay Borrow Pit AECBP_TP16. Foreign material observed.

TP64: Brick in test pit spoil AECBP_TP16.

TP65: Plastic sheeting in test pit spoil AECBP_TP16.

TP66: AEC 33 Area East of Clay Borrow Pit ACM fragment identified at surface of undisturbed soil.

Photograph 67: AEC 33 Western Paint Area prior to removal of infrastructure.

Photograph 68: AEC 33 Western Paint Area prior to removal of infrastructure.

Photograph 69: AEC 33 Western Paint Area following removal of infrastucture.

Photograph 70: AEC 33 Western Paint Area following removal of infrastucture.

APPENDIX 4
LABORATORY REPORTS

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CERTIFICATE OF ANALYSIS 243000

Client Details

Client	Ramboll Australia Pty Ltd
Attention	Kirsty Greenfield
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**318000344**
Number of Samples	53 Soil
Date samples received	15/05/2020
Date completed instructions received	15/05/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	22/05/2020
Date of Issue	22/05/2020

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NATA
ACCREDITED FOR TECHNICAL COMPETENCE

vTRH(C6-C10)/BTEXN in Soil

Our Reference		243000-4	243000-6	243000-12	243000-16	243000-18
Your Reference	UNITS	AECBP_TP2_1.2-1.3	AECBP_TP3_0.3-0.4	AECBP_TP5_1.3-1.4	AECBP_TP6_0.8-0.9	AECBP_TP7_0.4-0.5
Date Sampled		13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2020	15/05/2020	15/05/2020	15/05/2020	15/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	85	83	90	89	90

vTRH(C6-C10)/BTEXN in Soil

Our Reference		243000-22	243000-24	243000-28	243000-33	243000-35
Your Reference	UNITS	AECBP_TP8_1.9-2.0	AECBP_TP9_0.3-0.4	AECBP_TP10_0.6-0.7	AECBP_TP11_3.4-3.5	AECBP_TP12_0.3-0.4
Date Sampled		13/05/2020	13/05/2020	13/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2020	15/05/2020	15/05/2020	15/05/2020	15/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	86	74	84	78	85

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		243000-39	243000-41	243000-45	243000-48	243000-52
Your Reference	UNITS	AECBP_TP13_1.6-1.7	AECBP_TP14_0.3-0.4	AECBP_TP15_0.7-0.8	AECBP_TP16_3.0-3.1	D02_140520
Date Sampled		14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2020	15/05/2020	15/05/2020	15/05/2020	15/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	80	78	84	80	89

svTRH (C10-C40) in Soil						
Our Reference		243000-4	243000-6	243000-12	243000-16	243000-18
Your Reference	UNITS	AECBP_TP2_1.2-1.3	AECBP_TP3_0.3-0.4	AECBP_TP5_1.3-1.4	AECBP_TP6_0.8-0.9	AECBP_TP7_0.4-0.5
Date Sampled		13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2020	15/05/2020	15/05/2020	15/05/2020	15/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	72	77	70	73	71

svTRH (C10-C40) in Soil						
Our Reference		243000-22	243000-24	243000-28	243000-33	243000-35
Your Reference	UNITS	AECBP_TP8_1.9-2.0	AECBP_TP9_0.3-0.4	AECBP_TP10_0.6-0.7	AECBP_TP11_3.4-3.5	AECBP_TP12_0.3-0.4
Date Sampled		13/05/2020	13/05/2020	13/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2020	15/05/2020	15/05/2020	15/05/2020	15/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	72	78	74	76	72

svTRH (C10-C40) in Soil						
Our Reference		243000-39	243000-41	243000-45	243000-48	243000-52
Your Reference	UNITS	AECBP_TP13_1.6-1.7	AECBP_TP14_0.3-0.4	AECBP_TP15_0.7-0.8	AECBP_TP16_3.0-3.1	D02_140520
Date Sampled		14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2020	15/05/2020	15/05/2020	15/05/2020	15/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	130	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	140	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	240	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	240	<50	<50	<50	<50
Surrogate o-Terphenyl	%	80	71	74	91	76

PAHs in Soil						
Our Reference		243000-4	243000-6	243000-12	243000-16	243000-18
Your Reference	UNITS	AECBP_TP2_1.2-1.3	AECBP_TP3_0.3-0.4	AECBP_TP5_1.3-1.4	AECBP_TP6_0.8-0.9	AECBP_TP7_0.4-0.5
Date Sampled		13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2020	15/05/2020	15/05/2020	15/05/2020	15/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	0.06	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	0.3	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	101	101	100	97	100

PAHs in Soil						
Our Reference		243000-22	243000-24	243000-28	243000-33	243000-35
Your Reference	UNITS	AECBP_TP8_1.9-2.0	AECBP_TP9_0.3-0.4	AECBP_TP10_0.6-0.7	AECBP_TP11_3.4-3.5	AECBP_TP12_0.3-0.4
Date Sampled		13/05/2020	13/05/2020	13/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2020	15/05/2020	15/05/2020	15/05/2020	15/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	1.2	<0.1	0.2	<0.1	0.1
Pyrene	mg/kg	1.2	<0.1	0.2	<0.1	0.1
Benzo(a)anthracene	mg/kg	0.5	<0.1	0.2	<0.1	<0.1
Chrysene	mg/kg	0.6	<0.1	0.2	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	0.9	<0.2	0.4	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.5	<0.05	0.2	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	<0.1	0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.4	<0.1	0.2	<0.1	<0.1
Total +ve PAH's	mg/kg	6.1	<0.05	1.6	<0.05	0.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.8	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.8	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.8	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	99	98	100	99	103

PAHs in Soil						
Our Reference		243000-39	243000-41	243000-45	243000-48	243000-52
Your Reference	UNITS	AECBP_TP13_1.6-1.7	AECBP_TP14_0.3-0.4	AECBP_TP15_0.7-0.8	AECBP_TP16_3.0-3.1	D02_140520
Date Sampled		14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	15/05/2020	15/05/2020	15/05/2020	15/05/2020	15/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.2	<0.1	0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	2.4	0.4	0.3	<0.1	0.2
Anthracene	mg/kg	0.8	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	9.3	0.7	0.5	<0.1	0.2
Pyrene	mg/kg	9.6	0.6	0.4	<0.1	0.2
Benzo(a)anthracene	mg/kg	6.9	0.4	0.3	<0.1	0.1
Chrysene	mg/kg	5.8	0.4	0.2	<0.1	0.1
Benzo(b,j+k)fluoranthene	mg/kg	11	0.8	0.4	<0.2	0.2
Benzo(a)pyrene	mg/kg	7.6	0.4	0.2	<0.05	0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	4.1	0.3	0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	1.6	0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	4.8	0.3	0.2	<0.1	<0.1
Total +ve PAH's	mg/kg	64	4.4	2.8	<0.05	1.3
Benzo(a)pyrene TEQ calc (zero)	mg/kg	12	0.7	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	12	0.7	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	12	0.7	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	95	100	103	101	103

PAHs in Soil		
Our Reference		243000-54
Your Reference	UNITS	AECBP_TP13_1.6-1.7 - [TRIPLICATE]
Date Sampled		14/05/2020
Type of sample		Soil
Date extracted	-	19/05/2020
Date analysed	-	19/05/2020
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	0.2
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	1.8
Anthracene	mg/kg	0.5
Fluoranthene	mg/kg	11
Pyrene	mg/kg	11
Benzo(a)anthracene	mg/kg	7.4
Chrysene	mg/kg	7.4
Benzo(b,j+k)fluoranthene	mg/kg	14
Benzo(a)pyrene	mg/kg	8.8
Indeno(1,2,3-c,d)pyrene	mg/kg	4.2
Dibenzo(a,h)anthracene	mg/kg	1
Benzo(g,h,i)perylene	mg/kg	6.8
Total +ve PAH's	mg/kg	74
Benzo(a)pyrene TEQ calc (zero)	mg/kg	12
Benzo(a)pyrene TEQ calc(half)	mg/kg	12
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	12
Surrogate p-Terphenyl-d14	%	87

Acid Extractable metals in dust						
Our Reference		243000-4	243000-6	243000-12	243000-16	243000-18
Your Reference	UNITS	AECBP_TP2_1.2-1.3	AECBP_TP3_0.3-0.4	AECBP_TP5_1.3-1.4	AECBP_TP6_0.8-0.9	AECBP_TP7_0.4-0.5
Date Sampled		13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Date analysed	-	19/05/2020	19/05/2020	19/05/2020	19/05/2020	19/05/2020
Aluminium	mg/kg	2,700	8,000	4,200	7,700	6,500
Arsenic	mg/kg	<4	<4	4	10	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	6	16	7	11	9
Copper	mg/kg	4	26	8	45	30
Lead	mg/kg	7	38	26	91	61
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	10	12	3	4	3
Zinc	mg/kg	60	210	84	620	370

Acid Extractable metals in dust						
Our Reference		243000-22	243000-24	243000-28	243000-33	243000-35
Your Reference	UNITS	AECBP_TP8_1.9-2.0	AECBP_TP9_0.3-0.4	AECBP_TP10_0.6-0.7	AECBP_TP11_3.4-3.5	AECBP_TP12_0.3-0.4
Date Sampled		13/05/2020	13/05/2020	13/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Date analysed	-	19/05/2020	19/05/2020	19/05/2020	19/05/2020	19/05/2020
Aluminium	mg/kg	6,100	11,000	5,400	4,600	8,400
Arsenic	mg/kg	83	4	7	6	21
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	0.5
Chromium	mg/kg	8	16	9	7	15
Copper	mg/kg	81	8	52	35	440
Lead	mg/kg	89	16	82	70	880
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	11	3	10	5	6
Zinc	mg/kg	550	120	560	440	7,500

Acid Extractable metals in dust						
Our Reference		243000-39	243000-41	243000-45	243000-48	243000-52
Your Reference	UNITS	AECBP_TP13_1.6-1.7	AECBP_TP14_0.3-0.4	AECBP_TP15_0.7-0.8	AECBP_TP16_3.0-3.1	D02_140520
Date Sampled		14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Date analysed	-	19/05/2020	19/05/2020	19/05/2020	19/05/2020	19/05/2020
Aluminium	mg/kg	8,000	8,100	5,900	4,100	6,800
Arsenic	mg/kg	26	5	<4	<4	8
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	18	15	8	6	10
Copper	mg/kg	320	32	6	3	65
Lead	mg/kg	360	44	16	6	200
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	10	14	4	2	6
Zinc	mg/kg	4,800	270	62	23	770

Misc Soil - Inorg						
Our Reference		243000-4	243000-6	243000-12	243000-16	243000-18
Your Reference	UNITS	AECBP_TP2_1.2-1.3	AECBP_TP3_0.3-0.4	AECBP_TP5_1.3-1.4	AECBP_TP6_0.8-0.9	AECBP_TP7_0.4-0.5
Date Sampled		13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Free Cyanide in soil	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Misc Soil - Inorg						
Our Reference		243000-22	243000-24	243000-28	243000-33	243000-35
Your Reference	UNITS	AECBP_TP8_1.9-2.0	AECBP_TP9_0.3-0.4	AECBP_TP10_0.6-0.7	AECBP_TP11_3.4-3.5	AECBP_TP12_0.3-0.4
Date Sampled		13/05/2020	13/05/2020	13/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Free Cyanide in soil	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Misc Soil - Inorg						
Our Reference		243000-39	243000-41	243000-45	243000-48	243000-52
Your Reference	UNITS	AECBP_TP13_1.6-1.7	AECBP_TP14_0.3-0.4	AECBP_TP15_0.7-0.8	AECBP_TP16_3.0-3.1	D02_140520
Date Sampled		14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Date analysed	-	18/05/2020	18/05/2020	18/05/2020	18/05/2020	18/05/2020
Free Cyanide in soil	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Misc Inorg - Soil						
Our Reference		243000-4	243000-6	243000-12	243000-16	243000-18
Your Reference	UNITS	AECBP_TP2_1.2-1.3	AECBP_TP3_0.3-0.4	AECBP_TP5_1.3-1.4	AECBP_TP6_0.8-0.9	AECBP_TP7_0.4-0.5
Date Sampled		13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	21/05/2020	21/05/2020	21/05/2020	21/05/2020	21/05/2020
Date analysed	-	21/05/2020	21/05/2020	21/05/2020	21/05/2020	21/05/2020
Fluoride (1:5 soil:water)	mg/kg	4.8	40	6.2	9.2	35

Misc Inorg - Soil						
Our Reference		243000-22	243000-24	243000-28	243000-33	243000-35
Your Reference	UNITS	AECBP_TP8_1.9-2.0	AECBP_TP9_0.3-0.4	AECBP_TP10_0.6-0.7	AECBP_TP11_3.4-3.5	AECBP_TP12_0.3-0.4
Date Sampled		13/05/2020	13/05/2020	13/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	21/05/2020	21/05/2020	21/05/2020	21/05/2020	21/05/2020
Date analysed	-	21/05/2020	21/05/2020	21/05/2020	21/05/2020	21/05/2020
Fluoride (1:5 soil:water)	mg/kg	42	13	35	10	33

Misc Inorg - Soil						
Our Reference		243000-39	243000-41	243000-45	243000-48	243000-52
Your Reference	UNITS	AECBP_TP13_1.6-1.7	AECBP_TP14_0.3-0.4	AECBP_TP15_0.7-0.8	AECBP_TP16_3.0-3.1	D02_140520
Date Sampled		14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	21/05/2020	21/05/2020	21/05/2020	21/05/2020	21/05/2020
Date analysed	-	21/05/2020	21/05/2020	21/05/2020	21/05/2020	21/05/2020
Fluoride (1:5 soil:water)	mg/kg	53	32	22	2.5	9.5

Method ID	Methodology Summary
Inorg-014	Cyanide - free, total, weak acid dissociable by segmented flow analyser (in line dialysis with colourimetric finish). Solids/Filters and sorbents are extracted in a caustic media prior to analysis. Impingers are pH adjsuted as required prior to analysis. Cyanides amenable to Chlorination - samples are analysed untreated and treated with hyperchlorite to assess the potential for chlorination of cyanide forms. Based on APHA latest edition, 4500-CN_G,H.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	243000-6
Date extracted	-			15/05/2020	4	15/05/2020	15/05/2020		15/05/2020	15/05/2020
Date analysed	-			18/05/2020	4	18/05/2020	18/05/2020		18/05/2020	18/05/2020
TRH C_6 - C_9	mg/kg	25	Org-023	<25	4	<25	<25	0	86	78
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	4	<25	<25	0	86	78
Benzene	mg/kg	0.2	Org-023	<0.2	4	<0.2	<0.2	0	93	89
Toluene	mg/kg	0.5	Org-023	<0.5	4	<0.5	<0.5	0	82	79
Ethylbenzene	mg/kg	1	Org-023	<1	4	<1	<1	0	83	71
m+p-xylene	mg/kg	2	Org-023	<2	4	<2	<2	0	87	76
o-Xylene	mg/kg	1	Org-023	<1	4	<1	<1	0	80	70
naphthalene	mg/kg	1	Org-023	<1	4	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	89	4	85	83	2	86	81

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	39	15/05/2020	15/05/2020		[NT]	[NT]
Date analysed	-			[NT]	39	18/05/2020	18/05/2020		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	39	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	39	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	39	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	39	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	39	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	39	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	39	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-023	[NT]	39	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	39	80	88	10	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	243000-6
Date extracted	-			15/05/2020	4	15/05/2020	15/05/2020		15/05/2020	15/05/2020
Date analysed	-			18/05/2020	4	18/05/2020	18/05/2020		18/05/2020	18/05/2020
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	4	<50	<50	0	111	106
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	4	<100	<100	0	92	102
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	4	<100	<100	0	108	118
TRH $>C_{10}$ -C_{16}	mg/kg	50	Org-020	<50	4	<50	<50	0	111	106
TRH $>C_{16}$ -C_{34}	mg/kg	100	Org-020	<100	4	<100	<100	0	92	102
TRH $>C_{34}$ -C_{40}	mg/kg	100	Org-020	<100	4	<100	<100	0	108	118
Surrogate o-Terphenyl	%		Org-020	85	4	72	77	7	104	77

QUALITY CONTROL: svTRH (C10-C40) in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	39	15/05/2020	15/05/2020		[NT]	[NT]
Date analysed	-			[NT]	39	18/05/2020	18/05/2020		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	39	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	39	130	430	107	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	39	140	180	25	[NT]	[NT]
TRH $>C_{10}$ -C_{16}	mg/kg	50	Org-020	[NT]	39	<50	<50	0	[NT]	[NT]
TRH $>C_{16}$ -C_{34}	mg/kg	100	Org-020	[NT]	39	240	530	75	[NT]	[NT]
TRH $>C_{34}$ -C_{40}	mg/kg	100	Org-020	[NT]	39	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	39	80	92	14	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	243000-6
Date extracted	-			18/05/2020	4	15/05/2020	15/05/2020		18/05/2020	18/05/2020
Date analysed	-			19/05/2020	4	18/05/2020	18/05/2020		19/05/2020	19/05/2020
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	98	94
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	94	92
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	110	108
Anthracene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	102	99
Pyrene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	102	99
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	86	84
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	4	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	4	<0.05	<0.05	0	100	103
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	4	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	99	4	101	98	3	99	97

QUALITY CONTROL: PAHs in Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	39	15/05/2020	15/05/2020		[NT]	[NT]
Date analysed	-			[NT]	39	18/05/2020	18/05/2020		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	39	<0.1	0.6	143	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	39	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	39	0.2	8.3	191	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	39	0.1	7.9	195	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	39	2.4	48	181	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	39	0.8	18	183	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	39	9.3	35	116	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	39	9.6	38	119	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	39	6.9	19	93	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	39	5.8	16	94	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	39	11	19	53	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	39	7.6	14	59	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	39	4.1	5.6	31	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	39	1.6	1.2	29	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	39	4.8	6.5	30	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	39	95	104	9	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in dust					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	243000-6
Date prepared	-			18/05/2020	4	18/05/2020	18/05/2020		18/05/2020	18/05/2020
Date analysed	-			19/05/2020	4	19/05/2020	19/05/2020		19/05/2020	19/05/2020
Aluminium	mg/kg	10	Metals-020	<10	4	2700	2600	4	128	##
Arsenic	mg/kg	4	Metals-020	<4	4	<4	<4	0	88	95
Cadmium	mg/kg	0.4	Metals-020	<0.4	4	<0.4	<0.4	0	87	79
Chromium	mg/kg	1	Metals-020	<1	4	6	5	18	84	93
Copper	mg/kg	1	Metals-020	<1	4	4	2	67	86	#
Lead	mg/kg	1	Metals-020	<1	4	7	7	0	85	106
Mercury	mg/kg	0.1	Metals-021	<0.1	4	<0.1	<0.1	0	95	83
Nickel	mg/kg	1	Metals-020	<1	4	10	8	22	88	85
Zinc	mg/kg	1	Metals-020	<1	4	60	51	16	92	#

QUALITY CONTROL: Acid Extractable metals in dust					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	39	18/05/2020	18/05/2020		[NT]	[NT]
Date analysed	-			[NT]	39	19/05/2020	19/05/2020		[NT]	[NT]
Aluminium	mg/kg	10	Metals-020	[NT]	39	8000	6700	18	[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	39	26	12	74	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	39	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	39	18	14	25	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	39	320	310	3	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	39	360	390	8	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	39	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	39	10	8	22	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	39	4800	4800	0	[NT]	[NT]

Client Reference: 318000344

QUALITY CONTROL: Misc Soil - Inorg					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	243000-6
Date prepared	-			18/05/2020	4	18/05/2020	18/05/2020		18/05/2020	18/05/2020
Date analysed	-			18/05/2020	4	18/05/2020	18/05/2020		18/05/2020	18/05/2020
Free Cyanide in soil	mg/kg	0.5	Inorg-014	<0.5	4	<0.5	<0.5	0	95	93

QUALITY CONTROL: Misc Soil - Inorg					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	39	18/05/2020	18/05/2020		[NT]	[NT]
Date analysed	-			[NT]	39	18/05/2020	18/05/2020		[NT]	[NT]
Free Cyanide in soil	mg/kg	0.5	Inorg-014	[NT]	39	<0.5	<0.5	0	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	243000-45
Date prepared	-			21/05/2020	12	21/05/2020	21/05/2020		21/05/2020	21/05/2020
Date analysed	-			21/05/2020	12	21/05/2020	21/05/2020		21/05/2020	21/05/2020
Fluoride (1:5 soil:water)	mg/kg	0.5	Inorg-026	<0.5	12	6.2	6.4	3	96	77

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

PAHs in Soil - The laboratory RPD acceptance criteria has been exceeded for 243000-39. Therefore a triplicate result has been issued as laboratory sample number 243000-54.

8 metals in soil :
- # Percent recovery is not possible to report due to the inhomogeneous nature of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.
- ## Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200   fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 243000-A

Client Details

Client	Ramboll Australia Pty Ltd
Attention	Kirsty Greenfield
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**318000344**
Number of Samples	53 Soil
Date samples received	15/05/2020
Date completed instructions received	01/06/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	04/06/2020
Date of Issue	04/06/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Hannah Nguyen, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Acid Extractable metals in dust						
Our Reference		243000-A-35	243000-A-36	243000-A-37	243000-A-38	243000-A-39
Your Reference	UNITS	AECBP_TP12_0.3-0.4	AECBP_TP12_0.9-1.0	AECBP_TP12_2.6-2.7	AECBP_TP13_0.3-0.4	AECBP_TP13_1.6-1.7
Date Sampled		14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/06/2020	02/06/2020	02/06/2020	02/06/2020	02/06/2020
Date analysed	-	02/06/2020	02/06/2020	02/06/2020	02/06/2020	02/06/2020
Aluminium	mg/kg	8,000	5,700	1,500	10,000	11,000
Arsenic	mg/kg	15	6	<4	9	24
Cadmium	mg/kg	0.5	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	13	9	2	16	16
Copper	mg/kg	410	47	<1	55	260
Lead	mg/kg	680	230	4	150	370
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	5	6	2	11	8
Zinc	mg/kg	7,000	800	1	560	4,300

Acid Extractable metals in dust		
Our Reference		243000-A-40
Your Reference	UNITS	AECBP_TP13_3.6-3.7
Date Sampled		14/05/2020
Type of sample		Soil
Date prepared	-	02/06/2020
Date analysed	-	02/06/2020
Aluminium	mg/kg	3,000
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	4
Copper	mg/kg	<1
Lead	mg/kg	4
Mercury	mg/kg	<0.1
Nickel	mg/kg	2
Zinc	mg/kg	5

Moisture						
Our Reference		243000-A-35	243000-A-36	243000-A-37	243000-A-38	243000-A-39
Your Reference	UNITS	AECBP_TP12_0.3-0.4	AECBP_TP12_0.9-1.0	AECBP_TP12_2.6-2.7	AECBP_TP13_0.3-0.4	AECBP_TP13_1.6-1.7
Date Sampled		14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/06/2020	02/06/2020	02/06/2020	02/06/2020	02/06/2020
Date analysed	-	03/06/2020	03/06/2020	03/06/2020	03/06/2020	03/06/2020
Moisture	%	8.2	9.3	5.4	15	12

Moisture		
Our Reference		243000-A-40
Your Reference	UNITS	AECBP_TP13_3.6-3.7
Date Sampled		14/05/2020
Type of sample		Soil
Date prepared	-	02/06/2020
Date analysed	-	03/06/2020
Moisture	%	11

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.

QUALITY CONTROL: Acid Extractable metals in dust						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-9	243000-A-36
Date prepared	-			02/06/2020	35	02/06/2020	02/06/2020		02/06/2020	02/06/2020
Date analysed	-			02/06/2020	35	02/06/2020	02/06/2020		02/06/2020	02/06/2020
Aluminium	mg/kg	10	Metals-020	<10	35	8000	8100	1	128	#
Arsenic	mg/kg	4	Metals-020	<4	35	15	21	33	102	103
Cadmium	mg/kg	0.4	Metals-020	<0.4	35	0.5	0.6	18	104	95
Chromium	mg/kg	1	Metals-020	<1	35	13	13	0	100	102
Copper	mg/kg	1	Metals-020	<1	35	410	450	9	98	127
Lead	mg/kg	1	Metals-020	<1	35	680	850	22	103	#
Mercury	mg/kg	0.1	Metals-021	<0.1	35	<0.1	<0.1	0	107	81
Nickel	mg/kg	1	Metals-020	<1	35	5	5	0	101	101
Zinc	mg/kg	1	Metals-020	<1	35	7000	8200	16	107	#

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Report Comments

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Andrew (Fitzy) Fitzsimons

From: Aileen Hie
Sent: Monday, 1 June 2020 12:39 PM
To: Andrew (Fitzy) Fitzsimons
Subject: FW: Results for Registration 243000 318000344

Follow Up Flag: Follow up
Flag Status: Flagged

Ref: 243000-A

Due: 4/6/20

Kind Regards,

Aileen Hie | Customer Service Coordinator | Envirolab Services Pty Ltd
(Monday to Friday 10am to 6pm)
***Celebrating 15 years of* Great Science. Great Service.**
12 Ashley Street Chatswood NSW 2067
T 612 9910 6200 **F** 612 9910 6201
E ahie@envirolab.com.au | **W** www.envirolab.com.au

View reduced sampling bottle provision for PFAS in water | **COVID-19 Update**

Please note that all samples submitted to the Envirolab Group laboratories will be analysed under the Envirolab Group Terms and Conditions. The Terms and Conditions are accessible by clicking this link

From: Kirsty Greenfield <kgreenfield@ramboll.com>
Sent: Monday, 1 June 2020 9:31 AM
To: Aileen Hie <AHie@envirolab.com.au>
Cc: Nick Sarlamis <NSarlamis@envirolab.com.au>; Jordyn Kirsch <JKIRSCH@ramboll.com>
Subject: RE: Results for Registration 243000 318000344

Hi Aileen,

For this Batch 243000, I'd like to have the following samples analysed for heavy metals (standard 8):

-TP12: 0.3-0.4 (re-run due to high zinc and copper concentrations) - 35
-TP12: 0.9-1.0 - 36
-TP12: 2.6-2.7 - 37
-TP13: 0.3-0.4 - 38
-TP13: 1.6-1.7 (re-run due to high zinc and copper concentrations) - 39
-TP13: 3.6-3.7 - 40

Can you provide results by Thursday 4 June?

Thanks,

Kind regards
Kirsty Greenfield
Managing Consultant

D +61 (2) 49625444
kgreenfield@ramboll.com

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 42 43 44

Sydney Lab - Envirolab Services
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Perth Lab - MPL Laboratories
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Ph 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
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Ph 07 3266 9532 / brisbane@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
Ph 0406 350 706 / adelaide@envirolab.com.au

Client: Ramboll Environ Australia Pty Ltd
Contact Person: Kirsty Greenfield
Project Mgr: Kirsty Greenfield
Sampler: Jordyn Kirsch
Address:
Level 2, Suite 18, 50 Glebe Road,
The Junction NSW 2291
Phone: 02 4962 5444 **Mob:** 407149176
Email: kgreenfield@ramboll.com

Client Project Name / Number / Site etc (ie report title): 318000344
PO No.:
Envirolab Quote No. : 18SY036
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equls /
Lab Comments:

Sample information																				Comments
Envirolab Sample ID	**Client Sample ID or information**	**Depth**	**Date sampled**	**Type of sample**	TRH/ BTEX	PAH	SOLUBLE FLUORIDE	CYANIDE	8 Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	Aluminium										**Provide as much information about the sample as you can**
1	AECBP_TP1_0.1-0.2		13/05/2020	Soil																HOLD
2	AECBP_TP1_0.9-1.0		13/05/2020	Soil																HOLD
3	AECBP_TP2_0.2-0.3		13/05/2020	Soil																HOLD
4	AECBP_TP2_1.2-1.3		13/05/2020	Soil	X	X	X	X	X	X										
5	AECBP_TP2_2.0-2.1		13/05/2020	Soil																HOLD
6	AECBP_TP3_0.3-0.4		13/05/2020	Soil	X	X	X	X	X	X										
7	AECBP_TP3_1.3-1.4		13/05/2020	Soil																HOLD
8	AECBP_TP3_2.3-2.4		13/05/2020	Soil																HOLD
9	AECBP_TP4_0.1-0.2		13/05/2020	Soil																HOLD
10	AECBP_TP4_0.8-0.9		13/05/2020	Soil																HOLD
11	AECBP_TP5_0.3-0.4		13/05/2020	Soil																HOLD
12	AECBP_TP5_1.3-1.4		13/05/2020	Soil	X	X	X	X	X	X										
13	AECBP_TP5_2.1-2.2		13/05/2020	Soil																HOLD
14	AECBP_TP5_3.9-4.0		13/05/2020	Soil																HOLD

Relinquished by (Company): Ramboll
Print Name: Jordyn Kirsch
Date & Time: 14/05/2020
Signature:

Received by (Company): ELS
Print Name: Helen
Date & Time: 15-5-20 10:30
Signature:

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: (if applicable)
Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book
Page No:

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 243000
Date Received: 15-5-20
Time Received: 10:30
Received by: Helen
Temp: [✓ Cool]/Ambient
Cooling: [✓ Ice]/Icepack
Security: Intact/Broken/[✓ None]

243000

ENVIROLAB GROUP

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 42 43 44

Sydney Lab - Envirolab Services
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7a The Parade, Norwood, SA 5067
Ph 0406 350 706 / adelaide@envirolab.com.au

Client: Ramboll Environ Australia Pty Ltd
Contact Person: Kirsty Greenfield
Project Mgr: Kirsty Greenfield
Sampler: Jordyn Kirsch
Address:
Level 2, Suite 18, 50 Glebe Road,
The Junction NSW 2291
Phone: 02 4962 5444 **Mob:** 407149176
Email: kgreenfield@ramboll.com

Client Project Name / Number / Site etc (ie report title): 318000344
PO No.:
Envirolab Quote No. : 18SY036
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equis /
Lab Comments:

Sample information																			Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRH/ BTEX	PAH	SOLUBLE FLUORIDE	CYANIDE	8 Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	Aluminium								HOLD	Provide as much information about the sample as you can
15	AECBP_TP6_0.3-0.4		13/05/2020	Soil															HOLD
16	AECBP_TP6_0.8-0.9		13/05/2020	Soil	X	X	X	X	X	X									
17	AECBP_TP6_2.0-2.1		13/05/2020	Soil															HOLD
18	AECBP_TP7_0.4-0.5		13/05/2020	Soil	X	X	X	X	X	X									
19	AECBP_TP7_1.6-1.7		13/05/2020	Soil															HOLD
20	AECBP_TP7_4.0-4.1		13/05/2020	Soil															HOLD
21	AECBP_TP8_0.2-0.3		13/05/2020	Soil															HOLD
22	AECBP_TP8_1.9-2.0		13/05/2020	Soil	X	X	X	X	X	X									
23	AECBP_TP8_5.0-5.1		13/05/2020	Soil															HOLD
24	AECBP_TP9_0.3-0.4		13/05/2020	Soil	X	X	X	X	X	X									
25	AECBP_TP9_1.8-1.9		13/05/2020	Soil															HOLD
26	AECBP_TP9_3.0-3.1		13/05/2020	Soil															HOLD
27	AECBP_TP9_4.8-4.9		13/05/2020	Soil															HOLD
28	AECBP_TP10_0.6-0.7		13/05/2020	Soil	X	X	X	X	X	X									

Relinquished by (Company): Ramboll
Print Name: Jordyn Kirsch
Date & Time: 14/05/2020
Signature:

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Print Name: Helen
Date & Time: 15-5-20.
Signature: Helen

Lab use only:
Samples Received: Cool or Ambient (circle one)
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243000

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The Junction NSW 2291
Phone: 02 4962 5444 **Mob:** 407149176
Email: kgreenfield@ramboll.com

Client Project Name / Number / Site etc (ie report title): 318000344
PO No.:
Envirolab Quote No. : 18SY036
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equis /
Lab Comments:

Sample information																				Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRH/ BTEX	PAH	SOLUBLE FLUORIDE	CYANIDE	8 Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	Aluminium									HOLD	Provide as much information about the sample as you can
29	AECBP_TP10_1.7-1.8		13/05/2020	Soil																HOLD
30	AECBP_TP10_1.8-1.9		13/05/2020	Soil																HOLD
31	AECBP_TP10_2.9-3.0		13/05/2020	Soil																HOLD
32	AECBP_TP11_1.1-1.2		14/05/2020	Soil																HOLD
33	AECBP_TP11_3.4-3.5		14/05/2020	Soil	X	X	X	X	X	X										
34	AECBP_TP11_4.9-5.0		14/05/2020	Soil																HOLD
35	AECBP_TP12_0.3-0.4		14/05/2020	Soil	X	X	X	X	X	X										
36	AECBP_TP12_0.9-1.0		14/05/2020	Soil																HOLD
37	AECBP_TP12_2.6-2.7		14/05/2020	Soil																HOLD
38	AECBP_TP13_0.3-0.4		14/05/2020	Soil																HOLD
39	AECBP_TP13_1.6-1.7		14/05/2020	Soil	X	X	X	X	X	X										
40	AECBP_TP13_3.6-3.7		14/05/2020	Soil																HOLD
41	AECBP_TP14_0.3-0.4		14/05/2020	Soil	X	X	X	X	X	X										
42	AECBP_TP14_1.0-1.1		14/05/2020	Soil																HOLD

Relinquished by (Company): Ramboll
Print Name: Jordyn Kirsch
Date & Time: 14/05/2020
Signature:

Received by (Company): SMS
Print Name: Helen
Date & Time: 15/05/20 10:30
Signature: Helen

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: (if applicable)
Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Page No:

243000

CHAIN OF COUNTODY - Client

ENVIROLAB GROUP - National phone number 1300 42 43 44

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt Myaree, WA 6154
Ph 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
Ph 03 9763 2500 / melbourne@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph 07 3266 9532 / brisbane@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
Ph 0406 350 706 / adelaide@envirolab.com.au

Client: Ramboll Environ Australia Pty Ltd
Contact Person: Kirsty Greenfield
Project Mgr: Kirsty Greenfield
Sampler: Jordyn Kirsch
Address:
Level 2, Suite 18, 50 Glebe Road,
The Junction NSW 2291
Phone: 02 4962 5444 **Mob:** 407149176
Email: kgreenfield@ramboll.com

Client Project Name / Number / Site etc (ie report title): 318000344
PO No.:
Envirolab Quote No. : 18SY036
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equis /
Lab Comments:

Sample information																			Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRH/ BTEX	PAH	SOLUBLE FLUORIDE	CYANIDE	8 Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	Aluminium								HOLD	Provide as much information about the sample as you can
43	AECBP_TP14_2.3-2.4		14/05/2020	Soil															HOLD
44	AECBP_TP15_0.3-0.4		14/05/2020	Soil															HOLD
45	AECBP_TP15_0.7-0.8		14/05/2020	Soil	X	X	X	X	X	X									
46	AECBP_TP15_1.6-1.7		14/05/2020	Soil															HOLD
47	AECBP_TP16_0.4-0.5		14/05/2020	Soil															HOLD
48	AECBP_TP16_3.0-3.1		14/05/2020	Soil	X	X	X	X	X	X									
49	AECBP_TP16_3.5-3.6		14/05/2020	Soil															HOLD
50	AECBP_TP16_5.0		14/05/2020	Soil															HOLD
51	D01_130520		14/05/2020	Soil															HOLD
52	D02_140520		14/05/2020	Soil	X	X	X	X	X	X									
53	D03_140520		14/05/2020	Soil															HOLD
54	T01_130520		14/05/2020	Soil															Please send to ALS to hold
55	T02_140520		14/05/2020	Soil	X	X	X	X	X	X									Please send to ALS

Relinquished by (Company): Ramboll
Print Name: Jordyn Kirsch
Date & Time: 14/05/2020
Signature:

Received by (Company): ELS
Print Name: Helen
Date & Time: 15/5/20
Signature: Helen

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: (if applicable)
Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book   Page No:

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EN2003358**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: KIRSTY GREENFIELD	Contact	:
Address	: Eastpoint Complex | Suite 19B, Level 2 50 Glebe Road PO Box 435 THE JUNCTION NSW 2291	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: +61 02 49344354	Telephone	: +61 2 4014 2500
Project	: 318000344	Date Samples Received	: 19-May-2020 12:58
Order number	: ----	Date Analysis Commenced	: 20-May-2020
C-O-C number	: ----	Issue Date	: 25-May-2020 16:42
Sampler	: Jordyn Kirsch		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Descriptive Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alana Smylie	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EA200: Asbestos Identification Samples were analysed by Polarised Light Microscopy including dispersion staining.
- **EA200 Legend**
- EA200 'Am' Amosite (brown asbestos)
- EA200 'Cr' Crocidolite (blue asbestos)
- EA200 'Ch' Chrysotile (white asbestos)
- EA200: 'UMF' Unknown Mineral Fibres. "-" indicates fibres detected may or may not be asbestos fibres. Confirmation by alternative techniques is recommended.
- EA200: N/A - Not Applicable

Analytical Results

Sub-Matrix: **SOLID** (Matrix: **SOLID**)			*Client sample ID*	**AECBP_ACM1**	----	----	----	----
			Client sampling date / time	14-May-2020 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EN2003358-001**	--------	--------	--------	--------
				Result	----	----	----	----
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples								
Asbestos Detected	1332-21-4	0.1	g/kg	**Yes**	----	----	----	----
Asbestos Type	1332-21-4	-	--	**Ch + Am**	----	----	----	----
Asbestos (Trace)	1332-21-4	5	Fibres	**N/A**	----	----	----	----
Sample weight (dry)	----	0.01	g	**24.2**	----	----	----	----
Synthetic Mineral Fibre	----	0.1	g/kg	**No**	----	----	----	----
Organic Fibre	----	0.1	g/kg	**No**	----	----	----	----
APPROVED IDENTIFIER:	----	-	--	**A. SMYLIE**	----	----	----	----

Analytical Results

Descriptive Results

Sub-Matrix: **SOLID**

Method: Compound	*Client sample ID - Client sampling date / time*	*Analytical Results*
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples		
EA200: Description	AECBP_ACM1 - 14-May-2020 00:00	Several pieces of asbestos cement sheeting approximately 40x30x5mm.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EN2003358**	Page	: 1 of 3
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: KIRSTY GREENFIELD	Contact	:
Address	: Eastpoint Complex | Suite 19B, Level 2 50 Glebe Road PO Box 435 THE JUNCTION NSW 2291	Address	: 5/585 Maitland Road Mayfield West NSW Australia 2304
Telephone	: +61 02 49344354	Telephone	: +61 2 4014 2500
Project	: 318000344	Date Samples Received	: 19-May-2020
Order number	: ----	Date Analysis Commenced	: 20-May-2020
C-O-C number	: ----	Issue Date	: 25-May-2020
Sampler	: Jordyn Kirsch		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 1		
No. of samples analysed	: 1		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alana Smylie	Asbestos Identifier	Newcastle - Asbestos, Mayfield West, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

- **No Method Blank (MB) or Laboratory Control Spike (LCS) Results are required to be reported.**

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EN2003358**	Page	: 1 of 4
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Newcastle
Contact	: KIRSTY GREENFIELD	Telephone	: +61 2 4014 2500
Project	: 318000344	Date Samples Received	: 19-May-2020
Site	: ----	Issue Date	: 25-May-2020
Sampler	: Jordyn Kirsch	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix**: SOLID**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA200: AS 4964 - 2004 Identification of Asbestos in bulk samples							
Snap Lock Bag: Separate bag received (EA200) AECBP_ACM1	**14-May-2020**	**----**	----	----	**20-May-2020**	10-Nov-2020	✓

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Asbestos Identification in Bulk Solids	EA200	SOLID	In house: Referenced to AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples Analysis by Polarised Light Microscopy including dispersion staining

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095
Ph: 08 8359 0890 E: adelaide@alsglobal.com

☐MACKAY 78 Harbour Road Mackay QLD 4740
Ph: 07 4944 0177 E: mackay@alsglobal.com

☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304
Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com

☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164
Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

☐BRISBANE 2 Byth Street Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

☐MELBOURNE 2-4 Westall Road Springvale VIC 3171
Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

☐NOWRA 4/13 Geary Place North Nowra NSW 2541
Ph: 02 4423 2063 E: nowra@alsglobal.com

☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818
Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680
Ph: 07 7471 5600 E: gladstone@alsglobal.com

☐MUDGEE 1/29 Sydney Road Mudgee NSW 2850
Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

☐PERTH 10 Hod Way Malaga WA 6090
Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Ramboll

OFFICE: L2 Suite 18, 50 Glebe Rd, The Junction NSW 2291

PROJECT: **PROJECT NO.** 318000344

ORDER NUMBER: **PURCHASE ORDER NO.:**

PROJECT MANAGER: Kirsty Greenfield **CONTACT PH:** +61 4 07149176

SAMPLER: Jordyn Kirsch **SAMPLER MOBILE:** 0407149176

COC Emailed to ALS? (YES / NO) **EDD FORMAT (or default):**

Email Reports to (will default to PM if no other addresses are listed): kgreenfield@ramboll.com, jkirsch@ramboll.com

Email Invoice to (will default to PM if no other addresses are listed): kgreenfieldl@ramboll.com

TURNAROUND REQUIREMENTS :
(Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)
[✓ ☐] Standard TAT (List due date): ######
☐ Non Standard or urgent TAT (List due date):

ALS QUOTE NO.: EN-222-17

COUNTRY OF ORIGIN: Australia

COC SEQUENCE NUMBER (Circle)
COC: [✓ 1] 2 3 4 5 6 7
OF: [✓ 1] 2 3 4 5 6 7

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No [✓ N/A]
Free ice / frozen ice bricks present upon receipt? Yes [✓ No] N/A
Random Sample Temperature on Receipt: / °C
Other comment:

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
Jordyn Kirsch	AL 12:58pm		
DATE/TIME:	DATE/TIME:	DATE/TIME:	DATE/TIME:
19-5-2020	19/5/2020		

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	**SAMPLE DETAILS** MATRIX: Solid(S) Water(W)			**CONTAINER INFORMATION**		**ANALYSIS REQUIRED including SUITES** (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								**Additional Information**
LAB ID	**SAMPLE ID**	**DATE / TIME**	**MATRIX**	**TYPE & PRESERVATIVE** *(refer to codes below)*	**TOTAL BOTTLES**	**Asbestos (Presence/Absence)**								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	AECBP_ACM1	14-05-20 0:00	Solid	B	1	x								
				TOTAL	1	1								

Environmental Division
Newcastle
Work Order Reference
EN2003358

Telephone : + 61 2 4014 2500

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order : **ES2016984**
Client : **RAMBOLL AUSTRALIA PTY LTD**
Contact : KIRSTY GREENFIELD
Address : Eastpoint Complex | Suite 19B, Level 2 50 Glebe Road PO Box 435
THE JUNCTION NSW 2291
Telephone : +61 02 49344354
Project : 318000344
Order number : ----
C-O-C number : ----
Sampler : Jordyn Kirsch
Site : ----
Quote number : EN/222
No. of samples received : 2
No. of samples analysed : 1

Page : 1 of 6
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 18-May-2020 15:00
Date Analysis Commenced : 20-May-2020
Issue Date : 25-May-2020 18:01

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Client sample ID*	**T02_140520**	----	----	----	----
			Client sampling date / time	14-May-2020 00:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES2016984-002**	--------	--------	--------	--------
				Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**11.2**	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	**5280**	----	----	----	----
Arsenic	7440-38-2	5	mg/kg	**5**	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	**7**	----	----	----	----
Copper	7440-50-8	5	mg/kg	**20**	----	----	----	----
Lead	7439-92-1	5	mg/kg	**83**	----	----	----	----
Nickel	7440-02-0	2	mg/kg	**5**	----	----	----	----
Zinc	7440-66-6	5	mg/kg	**709**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	1	mg/kg	<1	----	----	----	----
EK040S: Fluoride Soluble								
Fluoride	16984-48-8	1	mg/kg	**16**	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	----	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	----	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	T02_140520	----	----	----	----
Client sampling date / time				14-May-2020 00:00	----	----	----	----
				ES2016984-002	--------	--------	--------	--------
				Result	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	----	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	----	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg	**130**	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	**130**	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	----	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**81.6**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**90.9**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**64.6**	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**99.9**	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			Client sample ID	**T02_140520**	**----**	**----**	**----**	**----**
			Client sampling date / time	14-May-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	**ES2016984-002**	**--------**	**--------**	**--------**	**--------**
				Result	----	----	----	----
EP075(SIM)T: PAH Surrogates - Continued								
Anthracene-d10	1719-06-8	0.5	%	**94.4**	**----**	**----**	**----**	**----**
4-Terphenyl-d14	1718-51-0	0.5	%	**102**	**----**	**----**	**----**	**----**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**112**	**----**	**----**	**----**	**----**
Toluene-D8	2037-26-5	0.2	%	**96.3**	**----**	**----**	**----**	**----**
4-Bromofluorobenzene	460-00-4	0.2	%	**90.7**	**----**	**----**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2.4.6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

QUALITY CONTROL REPORT

Work Order : **ES2016984**
Client : **RAMBOLL AUSTRALIA PTY LTD**
Contact : KIRSTY GREENFIELD
Address : Eastpoint Complex | Suite 19B, Level 2 50 Glebe Road PO Box 435
THE JUNCTION NSW 2291
Telephone : +61 02 49344354
Project : 318000344
Order number : ----
C-O-C number : ----
Sampler : Jordyn Kirsch
Site : ----
Quote number : EN/222
No. of samples received : 2
No. of samples analysed : 1

Page : 1 of 7
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 18-May-2020
Date Analysis Commenced : 20-May-2020
Issue Date : 25-May-2020

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
\# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3032955)									
ES2016984-002	T02_140520	EG005T: Lead	7439-92-1	5	mg/kg	83	64	26.5	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	709	833	16.1	0% - 20%
ES2017163-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	32	33	0.00	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	21	35	49.0	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	19	19	0.00	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	10	10	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	20	28	33.7	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	10800	11300	4.40	0% - 20%
ES2016984-002	T02_140520	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	7	9	29.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	6	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	5	12	76.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	20	48	81.4	No Limit
		EG005T: Aluminium	7429-90-5	50	mg/kg	5280	6380	18.8	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3032958)									
ES2016989-001	Anonymous	EA055: Moisture Content	----	0.1	%	42.1	40.8	3.17	0% - 20%
ES2017163-003	Anonymous	EA055: Moisture Content	----	0.1	%	23.8	23.1	2.83	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3032956)									
ES2017163-003	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
ES2016984-002	T02_140520	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 3034507)									
ES2016984-002	T02_140520	EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EK040S: Fluoride Soluble (QC Lot: 3032407)									
ES2016984-002	T02_140520	EK040S: Fluoride	16984-48-8	1	mg/kg	16	17	10.2	0% - 50%
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3030810)									
ES2016784-001	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3030811)									
ES2016784-001	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	100	160	43.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3030827)									
ES2016784-001	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3030811)									
ES2016784-001	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	120	190	50.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3030827)									
ES2016784-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080: BTEXN (QC Lot: 3030827)									
ES2016784-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEXN (QC Lot: 3030827) - continued									
ES2016784-001	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3032955)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	6134 mg/kg	113	70.0	130
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	21.7 mg/kg	104	86.0	126
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	4.64 mg/kg	95.8	83.0	113
EG005T: Chromium	7440-47-3	2	mg/kg	<2	43.9 mg/kg	90.6	76.0	128
EG005T: Copper	7440-50-8	5	mg/kg	<5	32 mg/kg	102	86.0	120
EG005T: Lead	7439-92-1	5	mg/kg	<5	40 mg/kg	95.5	80.0	114
EG005T: Nickel	7440-02-0	2	mg/kg	<2	55 mg/kg	99.8	87.0	123
EG005T: Zinc	7440-66-6	5	mg/kg	<5	60.8 mg/kg	99.1	80.0	122
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3032956)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	2.57 mg/kg	78.0	70.0	105
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3034507)								
EK026SF: Total Cyanide	57-12-5	1	mg/kg	<1	40 mg/kg	121	81.0	129
EK040S: Fluoride Soluble (QCLot: 3032407)								
EK040S: Fluoride	16984-48-8	1	mg/kg	<1	25 mg/kg	110	69.0	117
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3030810)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	6 mg/kg	107	77.0	125
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	6 mg/kg	107	72.0	124
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	6 mg/kg	103	73.0	127
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	6 mg/kg	106	72.0	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	6 mg/kg	107	75.0	127
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	6 mg/kg	111	77.0	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	6 mg/kg	110	73.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	6 mg/kg	114	74.0	128
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	6 mg/kg	104	69.0	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	6 mg/kg	107	75.0	127
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	6 mg/kg	100	68.0	116
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	6 mg/kg	106	74.0	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	6 mg/kg	115	70.0	126
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	6 mg/kg	106	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	6 mg/kg	101	62.0	118
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	6 mg/kg	105	63.0	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3030811)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	300 mg/kg	92.9	75.0	129

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3030811) - continued								
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	450 mg/kg	98.1	77.0	131
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	300 mg/kg	98.1	71.0	129
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3030827)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	26 mg/kg	102	68.4	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3030811)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	375 mg/kg	93.8	77.0	125
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	525 mg/kg	104	74.0	138
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	225 mg/kg	85.5	63.0	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3030827)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	31 mg/kg	107	68.4	128
EP080: BTEXN (QCLot: 3030827)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	1 mg/kg	98.4	62.0	116
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	1 mg/kg	100	67.0	121
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	1 mg/kg	100	65.0	117
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	2 mg/kg	101	66.0	118
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	1 mg/kg	104	68.0	120
EP080: Naphthalene	91-20-3	1	mg/kg	<1	1 mg/kg	87.8	63.0	119

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3032955)							
ES2016984-002	T02_140520	EG005T: Arsenic	7440-38-2	50 mg/kg	74.4	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	78.6	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	78.8	70.0	130
		EG005T: Copper	7440-50-8	250 mg/kg	77.0	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	103	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	77.4	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	95.9	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3032956)							
ES2016984-002	T02_140520	EG035T: Mercury	7439-97-6	5 mg/kg	83.8	70.0	130
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3034507)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	Concentration	MS	Low	High
EK026SF: Total CN by Segmented Flow Analyser (QCLot: 3034507) - continued							
ES2016984-002	T02_140520	EK026SF: Total Cyanide	57-12-5	40 mg/kg	121	70.0	130
EK040S: Fluoride Soluble (QCLot: 3032407)							
ES2016984-002	T02_140520	EK040S: Fluoride	16984-48-8	25 mg/kg	# 64.0	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3030810)							
ES2016784-001	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 mg/kg	89.3	70.0	130
		EP075(SIM): Pyrene	129-00-0	10 mg/kg	86.7	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3030811)							
ES2016784-001	Anonymous	EP071: C10 - C14 Fraction	----	523 mg/kg	91.5	73.0	137
		EP071: C15 - C28 Fraction	----	2319 mg/kg	99.2	53.0	131
		EP071: C29 - C36 Fraction	----	1714 mg/kg	108	52.0	132
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3030827)							
ES2016784-001	Anonymous	EP080: C6 - C9 Fraction	----	32.5 mg/kg	104	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3030811)							
ES2016784-001	Anonymous	EP071: >C10 - C16 Fraction	----	860 mg/kg	115	73.0	137
		EP071: >C16 - C34 Fraction	----	3223 mg/kg	112	53.0	131
		EP071: >C34 - C40 Fraction	----	1058 mg/kg	95.7	52.0	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3030827)							
ES2016784-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	37.5 mg/kg	103	70.0	130
EP080: BTEXN (QCLot: 3030827)							
ES2016784-001	Anonymous	EP080: Benzene	71-43-2	2.5 mg/kg	95.3	70.0	130
		EP080: Toluene	108-88-3	2.5 mg/kg	86.0	70.0	130
		EP080: Ethylbenzene	100-41-4	2.5 mg/kg	89.6	70.0	130
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2.5 mg/kg	86.6	70.0	130
		EP080: ortho-Xylene	95-47-6	2.5 mg/kg	90.3	70.0	130
		EP080: Naphthalene	91-20-3	2.5 mg/kg	101	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2016984**	Page	: 1 of 6
Client	: **RAMBOLL AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: KIRSTY GREENFIELD	Telephone	: +61-2-8784 8555
Project	: 318000344	Date Samples Received	: 18-May-2020
Site	: ----	Issue Date	: 25-May-2020
Sampler	: Jordyn Kirsch	No. of samples received	: 2
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Matrix Spike (MS) Recoveries							
EK040S: Fluoride Soluble	ES2016984--002	T02_140520	**Fluoride**	16984-48-8	64.0 %	70.0-130%	**Recovery less than lower data quality objective**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) T02_140520	**14-May-2020**	----	----	----	**21-May-2020**	28-May-2020	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) T02_140520	**14-May-2020**	**21-May-2020**	10-Nov-2020	✓	**21-May-2020**	10-Nov-2020	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) T02_140520	**14-May-2020**	**21-May-2020**	11-Jun-2020	✓	**22-May-2020**	11-Jun-2020	✓
EK026SF: Total CN by Segmented Flow Analyser							
Soil Glass Jar - Unpreserved (EK026SF) T02_140520	**14-May-2020**	**21-May-2020**	28-May-2020	✓	**22-May-2020**	04-Jun-2020	✓
EK040S: Fluoride Soluble							
Soil Glass Jar - Unpreserved (EK040S) T02_140520	**14-May-2020**	**21-May-2020**	21-May-2020	✓	**25-May-2020**	18-Jun-2020	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) T02_140520	**14-May-2020**	**20-May-2020**	28-May-2020	✓	**21-May-2020**	29-Jun-2020	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) T02_140520	**14-May-2020**	**20-May-2020**	28-May-2020	✓	**20-May-2020**	28-May-2020	✓
Soil Glass Jar - Unpreserved (EP071) T02_140520	**14-May-2020**	**20-May-2020**	28-May-2020	✓	**21-May-2020**	29-Jun-2020	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) T02_140520	**14-May-2020**	**20-May-2020**	28-May-2020	✓	**20-May-2020**	28-May-2020	✓
Soil Glass Jar - Unpreserved (EP071) T02_140520	**14-May-2020**	**20-May-2020**	28-May-2020	✓	**21-May-2020**	29-Jun-2020	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) T02_140520	**14-May-2020**	**20-May-2020**	28-May-2020	✓	**20-May-2020**	28-May-2020	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Fluoride - Soluble	EK040S	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	18	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Fluoride - Soluble	EK040S	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Fluoride - Soluble	EK040S	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Fluoride - Soluble	EK040S	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Cyanide by Segmented Flow Analyser	EK026SF	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 6.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Total Cyanide by Segmented Flow Analyser	EK026SF	SOIL	In house: Referenced to APHA 4500-CN C / ASTM D7511. Caustic leachates of soil samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM (2013) Schedule B(3)
Fluoride - Soluble	EK040S	SOIL	In house: Referenced to APHA 4500 F--C Soluble Fluoride is determined after a 1:5 soil/water extract using an ion selective electrode.
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270E. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260D. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
NaOH leach for CN in Soils	CN-PR	SOIL	In house: APHA 4500 CN. Samples are extracted by end-over-end tumbling with NaOH.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.

CHAIN OF CUSTODY - Client

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Sydney
Work Order Reference
ES2016984

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Client: Ramboll Environ Australia Pty Ltd
Contact Person: Kirsty Greenfield
Project Mgr: Kirsty Greenfield
Sampler: Jordyn Kirsch
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The Junction NSW 2291
Phone: 02 4962 5444 **Mob:** 407149176
Email: kgreenfield@ramboll.com

Client Project Name / Number / Site etc (ie report title): 318000344
PO No.:
Envirolab Quote No. : 18SY036
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equis /
Lab Comments:

Sample Information																					Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRH/ BTEX	PAH	SOLUBLE FLUORIDE	CYANIDE	8 Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	Aluminium											Provide as much information about the sample as you can
1	AECBP_TP1_0.1-0.2		13/05/2020	Soil																	HOLD
2	AECBP_TP1_0.9-1.0		13/05/2020	Soil																	HOLD
3	AECBP_TP2_0.2-0.3		13/05/2020	Soil																	HOLD
4	AECBP_TP2_1.2-1.3		13/05/2020	Soil	X	X	X	X	X	X											
5	AECBP_TP2_2.0-2.1		13/05/2020	Soil																	HOLD
6	AECBP_TP3_0.3-0.4		13/05/2020	Soil	X	X	X	X	X	X											
7	AECBP_TP3_1.3-1.4		13/05/2020	Soil																	HOLD
8	AECBP_TP3_2.3-2.4		13/05/2020	Soil																	HOLD
9	AECBP_TP4_0.1-0.2		13/05/2020	Soil																	HOLD
10	AECBP_TP4_0.8-0.9		13/05/2020	Soil																	HOLD
11	AECBP_TP5_0.3-0.4		13/05/2020	Soil																	HOLD
12	AECBP_TP5_1.3-1.4		13/05/2020	Soil	X	X	X	X	X	X											
13	AECBP_TP5_2.1-2.2		13/05/2020	Soil																	HOLD
14	AECBP_TP5_3.9-4.0		13/05/2020	Soil																	HOLD

Relinquished by (Company): Ramboll
Print Name: Jordyn Kirsch
Date & Time: 14/05/2020
Signature:

ELS Sydney
C. Mulenze
18/5/20 1000
CM

Received by (Company): ELS
Print Name: Helen
Date & Time: 15-5-20 10:30
Signature:

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: (if applicable)
Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Page No:

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 243000
Date Received: 15-5-20
Time Received: 10:30
Received by: Helen
Temp: [✓ Cool]/Ambient
Cooling: [✓ Ice]/Icepack
Security: Intact/Broken/[✓ None]

[illegible] AS - 18/5/20 11.6C
1500

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CHAIN OF COUSTODY - Client

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Client: Ramboll Environ Australia Pty Ltd
Contact Person: Kirsty Greenfield
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Sampler: Jordyn Kirsch
Address:
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Phone: 02 4962 5444 **Mob:** 407149176
Email: kgreenfield@ramboll.com

Client Project Name / Number / Site etc (ie report title): 318000344
PO No.:
Envirolab Quote No. : 18SY036
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equis /
Lab Comments:

Sample information																				Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRH/ BTEX	PAH	SOLUBLE FLUORIDE	CYANIDE	8 Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	Aluminium									HOLD	Provide as much information about the sample as you can
43	AECBP_TP14_2.3-2.4		14/05/2020	Soil																HOLD
44	AECBP_TP15_0.3-0.4		14/05/2020	Soil																HOLD
45	AECBP_TP15_0.7-0.8		14/05/2020	Soil	X	X	X	X	X	X										
46	AECBP_TP15_1.6-1.7		14/05/2020	Soil																HOLD
47	AECBP_TP16_0.4-0.5		14/05/2020	Soil																HOLD
48	AECBP_TP16_3.0-3.1		14/05/2020	Soil	X	X	X	X	X	X										
49	AECBP_TP16_3.5-3.6		14/05/2020	Soil																HOLD
50	AECBP_TP16_5.0		14/05/2020	Soil																HOLD
51	D01_130520		14/05/2020	Soil																HOLD
52	D02_140520		14/05/2020	Soil	X	X	X	X	X	X										
53	D03_140520		14/05/2020	Soil																HOLD
① 54	T01_130520		14/05/2020	Soil																Please send to ALS to hold
② 55	T02_140520		14/05/2020	Soil	X	X	X	X	X	X										Please send to ALS

Relinquished by (Company): Ramboll
Print Name: Jordyn Kirsch
Date & Time: 14/05/2020
Signature:

ELS Sydney
C. Mavenzo
18/5/20 @ 1000
am

Received by (Company): ELS
Print Name: Helen
Date & Time: 15/5/20
Signature: Helen

Lab use only:
Samples Received: Cool or Ambient (circle one)
Temperature Received at: (if applicable)
Transported by: Hand delivered / courier

White - Lab copy / Blue - Client copy / Pink - Retain in Book

Page No:

Rec. Scoff Ypo 18/5/20 1160
1500

APPENDIX 5
EIL CALCULATIONS

Inputs
Select contaminant from list below
Cu
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
0.7
Enter soil pH (calcium chloride method) (values from 1 to 14)
4.7
Enter organic carbon content (%OC) (values from 0 to 50%)
0.8
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
low

Outputs		
Land use	Cu soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	25	20
Urban residential and open public spaces	25	30
Commercial and industrial	30	35

Inputs
Select contaminant from list below
Ni
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
0.7
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
low

Outputs		
Land use	Ni soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	25	5
Urban residential and open public spaces	25	5
Commercial and industrial	25	6

Inputs
Select contaminant from list below
Zn
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
0.7
Enter soil pH (calcium chloride method) (values from 1 to 14)
4.7
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method) (values from 0 to 50%) to obtain estimate of background concentration
7
or for aged ABCs only
Enter State (or closest State)
NSW
Enter traffic volume (high or low)
low

Outputs		
Land use	Zn soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	35	85
Urban residential and open public spaces	45	100
Commercial and industrial	50	120

APPENDIX 6
RESULTS TABLES

Table 5:
AEC 30 Area East of the Clay Borrow Pit
Data Gap Assessments Validation Results

	NEPM 2013 HIL A Low Denisty Residential	NEPM 2013 Soil Vapour Intrusion HSL A Sand¹ 0-1m	NEPM 2013 Soil Vapour Intrusion HSL A Sand¹ 1-2m	NEPM 2013 Soil Vapour Intrusion HSL A Sand¹ 2-4m	NEPM 2013 Soil Vapour Intrusion HSL A Sand¹ 4+m	NEPM 2013 EIL Areas of Ecological Significance	NEPM 2013 ESL² Areas of Ecological Significance	NEPM 2013 Management Limits Residential Parkland Public Open Space ³	Sample Type:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
									Lab Report number:		243000	243000	243000	243000	243000	243000	243000	243000	243000	243000
									Sample date:		13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020	13/05/2020	14/05/2020	14/05/2020
									Sample ID:		**AECBP_TP2_1.2-1.3**	**AECBP_TP3_0.3-0.4**	**AECBP_TP5_1.3-1.4**	**AECBP_TP6_0.8-0.9**	**AECBP_TP7_0.4-0.5**	**AECBP_TP8_1.9-2.0**	**AECBP_TP9_0.3-0.4**	**AECBP_TP10_0.6-0.7**	**AECBP_TP11_3.4-3.5**	**AECBP_TP12_0.3-0.4**
									Project Name:		Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment
									Site:		AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30
Analyte grouping/Analyte									**Units**	**LOR**										
Cyanide and Fluoride																				
Free Cyanide in soil	250								mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoride (1:5 soil:water)	440					4.3			mg/kg	0.5	4.8	40	6.2	9.2	35	42	13	35	10	33
EG005T: Total Metals by ICP-AES																				
Aluminium									mg/kg	10	2700	8000	4200	7700	6500	6100	11000	5400	4600	8400
Arsenic	100					40			mg/kg	4	<4	<4	4	10	5	83	4	7	6	21
Cadmium	20								mg/kg	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.5
Chromium	100					60			mg/kg	1	6	16	7	11	9	8	16	9	7	15
Copper	6,000					20			mg/kg	1	4	26	8	45	30	81	8	52	35	440
Lead	300					470			mg/kg	1	7	38	26	91	61	89	16	82	70	880
Nickel	400					5			mg/kg	1	10	12	3	4	3	11	3	10	5	6
Zinc	7,400					85			mg/kg	1	60	210	84	620	370	550	120	560	440	7500
EG035T: Total Recoverable Mercury by FIMS																				
Mercury	40								mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																				
Naphthalene		3	NL	NL	NL	10			mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1
Anthracene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene									mg/kg	0.1	<0.1	<0.1	<0.1	0.1	<0.1	1.2	<0.1	0.2	<0.1	0.1
Pyrene									mg/kg	0.1	<0.1	<0.1	<0.1	0.1	<0.1	1.2	<0.1	0.2	<0.1	0.1
Benz(a)anthracene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1	0.2	<0.1	<0.1
Chrysene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	0.2	<0.1	<0.1
Benzo(b+j+k)fluoranthene									mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.9	<0.2	0.4	<0.2	<0.2
Benzo(a)pyrene							0.7		mg/kg	0.05	<0.05	<0.05	<0.05	0.06	<0.05	0.5	<0.05	0.2	<0.05	<0.05
Indeno(1.2.3.cd)pyrene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.1	<0.1	<0.1
Dibenz(a.h)anthracene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g.h.i)perylene									mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	0.2	<0.1	<0.1
Sum of polycyclic aromatic hydrocarbons	300								mg/kg	0.05	<0.05	<0.05	<0.05	0.3	<0.05	6.1	<0.05	1.6	<0.05	0.2
Benzo(a)pyrene TEQ (zero)									mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ (half LOR)									mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ (LOR)	3								mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions																				
C6 - C10 Fraction									mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
C6 - C10 Fraction minus BTEX (F1)		45	70	110	200		125	700	mg/kg	25	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
>C10 - C16 Fraction									mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C16 - C34 Fraction (F3)								2500	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C34 - C40 Fraction (F4)								10000	mg/kg	100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10 - C40 Fraction (sum)									mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
>C10 - C16 Fraction minus Naphthalene (F2)		110	240	440	NL		25	1000	mg/kg	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
EP080: BTEXN																				
Benzene		0.5	0.5	0.5	0.5		10		mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene		160	220	310	540		10		mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene		55	NL	NL	NL		1.5		mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
m+p-xylene									mg/kg	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
o-Xylene									mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
naphthalene		3	NL	NL	NL				mg/kg	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total +ve Xylenes		40	60	95	170	10	10		mg/kg	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3

Blank Cell indicates no criterion available

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

CRC Care Technical Report no.10, *Health Screening Levels for petroleum hydrocarbons in soil and groundwater* September 2011

[1] For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out. Generally SAND has been adopted in these scenarios.

[2] The most conservative ESL guideline value has been adopted for all analytes

[3] Management limits are applied after consideration of relevant ESLs and HSLs. Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

NL = Non Limiting. No HSL is presented for these chemicals as a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario.

Health Investigation Levels for chromium based on chromium (VI)

Chromium (III) EIL, based on a low clay content (% clay) of 1%

Nickel EIL, based on CEC of 5cmol/kg

Copper EIL, based on CEC of 5cmol/kg

Zinc EIL, based on slightly acidic soil pH of 4.0 and CEC of 5cmol/kg

To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction.

To obtain F2 subtract naphthalene from the >C10-C16 fraction.

Benzo(a)Pyrene ESL derived ecological guideline (95% confidence limits) based on CRC CARE Technical Report no. 39 Risk-based remediation and management guidance for benzo(a)pyrene developed using a species sensitivity distribution (SSD) for eco-toxicity data from five independent studies involving one soil bacteria, three soil invertebrate taxa and four plant taxa (13 endpoints) in preference to NEPM low reliability data.

The Health Investigation Level for Cresols has been compared to 3- & 4-Methylphenol. There are three forms of Cresols, of which 2-Methyphenol has been reported separately.

Concentration in **red** font and grey box exceed the adopted HIL/HSL 'A' for Residential use

Concentration in **green** font and grey box exceed the adopted EIL/ESL for Areas of Ecological Significance

Concentrations in box exceed the screening value >2.5 times

Where one or more guideline value is exceeded, the highest guidleline value will be highlighted

** EIL values calculated using site-specific CEC (7.26 meq/100g), pH (5.5) and TOC (1.3%) data collected from the Buffer Zone during the March 2014 investigations

Table 5:
AEC 30 Area East of the Clay Borrow Pit
Data Gap Assessments Validation Results

	NEPM 2013 HIL A Low Denisty Residential	**NEPM 2013 Soil Vapour Intrusion HSL A Sand^1 0-1m**	**NEPM 2013 Soil Vapour Intrusion HSL A Sand^1 1-2m**	**NEPM 2013 Soil Vapour Intrusion HSL A Sand^1 2-4m**	**NEPM 2013 Soil Vapour Intrusion HSL A Sand^1 4+m**	**NEPM 2013 EIL Areas of Ecological Significance**	**NEPM 2013 ESL^2 Areas of Ecological Significance**	**NEPM 2013 Management Limits Residential Parkland Public Open Space ^{3}**	**Sample Type:**		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
									Lab Report number:		243000-A	243000-A	243000-A	243000-A	243000	243000-A	243000-A	243000	243000	243000
									Sample date:		14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020	14/05/2020
									Sample ID:		**AECBP_TP12_0.3-0.4**	**AECBP_TP12_0.9-1.0**	**AECBP_TP12_2.6-2.7**	**AECBP_TP13_0.3-0.4**	**AECBP_TP13_1.6-1.7**	**AECBP_TP13_1.6-1.7**	**AECBP_TP13_3.6-3.7**	**AECBP_TP14_0.3-0.4**	**AECBP_TP15_0.7-0.8**	**AECBP_TP16_3.0-3.1**
									Project Name:		Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment	Data Gap Assessment
									Site:		AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30	AEC 30
Analyte grouping/Analyte									**Units**	**LOR**										
Cyanide and Fluoride																				
Free Cyanide in soil	250								mg/kg	0.5	-	-	-	-	<0.5	-	-	<0.5	<0.5	<0.5
Fluoride (1:5 soil:water)	440					4.3			mg/kg	0.5	-	-	-	-	**53**	-	-	**32**	**22**	2.5
EG005T: Total Metals by ICP-AES																				
Aluminium									mg/kg	10	8000	5700	1500	10,000	8000	11,000	3,000	8100	5900	4100
Arsenic	100					40			mg/kg	4	15	6	<4	9	26	24	<4	5	<4	<4
Cadmium	20								mg/kg	0.4	0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	100					60			mg/kg	1	13	9	2	16	18	16	4	15	8	6
Copper	6,000					20			mg/kg	1	**410**	**47**	<1	**55**	**320**	**260**	<1	**32**	6	3
Lead	300					470			mg/kg	1	**680**	230	4	150	**360**	**370**	4	44	16	6
Nickel	400					5			mg/kg	1	5	**6**	2	**11**	**10**	**8**	2	**14**	4	2
Zinc	7,400					85			mg/kg	1	**7000**	**800**	1	**560**	**4800**	**4300**	5	**270**	62	23
EG035T: Total Recoverable Mercury by FIMS																				
Mercury	40								mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																				
Naphthalene		3	NL	NL	NL	10			mg/kg	0.1	-	-	-	-	<0.1	-	-	<0.1	<0.1	<0.1
Acenaphthylene									mg/kg	0.1	-	-	-	-	<0.1	-	-	<0.1	<0.1	<0.1
Acenaphthene									mg/kg	0.1	-	-	-	-	0.2	-	-	<0.1	0.1	<0.1
Fluorene									mg/kg	0.1	-	-	-	-	0.1	-	-	<0.1	<0.1	<0.1
Phenanthrene									mg/kg	0.1	-	-	-	-	2.4	-	-	0.4	0.3	<0.1
Anthracene									mg/kg	0.1	-	-	-	-	0.8	-	-	<0.1	<0.1	<0.1
Fluoranthene									mg/kg	0.1	-	-	-	-	9.3	-	-	0.7	0.5	<0.1
Pyrene									mg/kg	0.1	-	-	-	-	9.6	-	-	0.6	0.4	<0.1
Benz(a)anthracene									mg/kg	0.1	-	-	-	-	6.9	-	-	0.4	0.3	<0.1
Chrysene									mg/kg	0.1	-	-	-	-	5.8	-	-	0.4	0.2	<0.1
Benzo(b+j+k)fluoranthene									mg/kg	0.2	-	-	-	-	11	-	-	0.8	0.4	<0.2
Benzo(a)pyrene							0.7		mg/kg	0.05	-	-	-	-	**7.6**	-	-	0.4	0.2	<0.05
Indeno(1.2.3.cd)pyrene									mg/kg	0.1	-	-	-	-	4.1	-	-	0.3	0.1	<0.1
Dibenz(a.h)anthracene									mg/kg	0.1	-	-	-	-	1.6	-	-	0.1	<0.1	<0.1
Benzo(g.h.i)perylene									mg/kg	0.1	-	-	-	-	4.8	-	-	0.3	0.2	<0.1
Sum of polycyclic aromatic hydrocarbons	300								mg/kg	0.05	-	-	-	-	64	-	-	4.4	2.8	<0.05
Benzo(a)pyrene TEQ (zero)									mg/kg	0.5	-	-	-	-	12	-	-	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ (half LOR)									mg/kg	0.5	-	-	-	-	12	-	-	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ (LOR)	3								mg/kg	0.5	-	-	-	-	**12**	-	-	0.7	<0.5	<0.5
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions																				
C6 - C10 Fraction									mg/kg	25	-	-	-	-	<25	-	-	<25	<25	<25
C6 - C10 Fraction minus BTEX (F1)		45	70	110	200		125	700	mg/kg	25	-	-	-	-	<25	-	-	<25	<25	<25
>C10 - C16 Fraction									mg/kg	50	-	-	-	-	<50	-	-	<50	<50	<50
>C16 - C34 Fraction (F3)								2500	mg/kg	100	-	-	-	-	240	-	-	<100	<100	<100
>C34 - C40 Fraction (F4)								10000	mg/kg	100	-	-	-	-	<100	-	-	<100	<100	<100
>C10 - C40 Fraction (sum)									mg/kg	50	-	-	-	-	240	-	-	<50	<50	<50
>C10 - C16 Fraction minus Naphthalene (F2)		110	240	440	NL		25	1000	mg/kg	50	-	-	-	-	<50	-	-	<50	<50	<50
EP080: BTEXN																				
Benzene		0.5	0.5	0.5	0.5		10		mg/kg	0.2	-	-	-	-	<0.2	-	-	<0.2	<0.2	<0.2
Toluene		160	220	310	540		10		mg/kg	0.5	-	-	-	-	<0.5	-	-	<0.5	<0.5	<0.5
Ethylbenzene		55	NL	NL	NL		1.5		mg/kg	1	-	-	-	-	<1	-	-	<1	<1	<1
m+p-xylene									mg/kg	2	-	-	-	-	<2	-	-	<2	<2	<2
o-Xylene									mg/kg	1	-	-	-	-	<1	-	-	<1	<1	<1
naphthalene		3	NL	NL	NL				mg/kg	1	-	-	-	-	<1	-	-	<1	<1	<1
Total +ve Xylenes		40	60	95	170	10	10		mg/kg	-	-	-	-	-	<3	-	-	<3	<3	<3

Blank Cell indicates no criterion available

LOR = Limit of Reporting

Concentrations below the LOR noted as <value

National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

CRC Care Technical Report no.10, *Health Screening Levels for petroleum hydrocarbons in soil and groundwater* September 2011

[1] For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out. Generally SAND has been adopted in these scenarios.

[2] The most conservative ESL guideline value has been adopted for all analytes

[3] Management limits are applied after consideration of relevant ESLs and HSLs. Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

NL = Non Limiting. No HSL is presented for these chemicals as a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario.

Health Investigation Levels for chromium based on chromium (VI)

Chromium (III) EIL, based on a low clay content (% clay) of 1%

Nickel EIL, based on CEC of 5cmol/kg

Copper EIL, based on CEC of 5cmol/kg

Zinc EIL, based on slightly acidic soil pH of 4.0 and CEC of 5cmol/kg

To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction.

To obtain F2 subtract naphthalene from the >C10-C16 fraction.

Benzo(a)Pyrene ESL derived ecological guideline (95% confidence limits) based on CRC CARE Technical Report no. 39 Risk-based remediation and management guidance for benzo(a)pyrene developed using a species sensitivity distribution (SSD) for eco-toxicity data from five independent studies involving one soil bacteria, three soil invertebrate taxa and four plant taxa (13 endpoints) in preference to NEPM low reliability data.

The Health Investigation Level for Cresols has been compared to 3- & 4-Methylphenol. There are three forms of Cresols, of which 2-Methyphenol has been reported separately.

Concentration in **red** font and grey box exceed the adopted HIL/HSL 'A' for Residential use

Concentration in **green** font and grey box exceed the adopted EIL/ESL for Areas of Ecological Significance

Concentrations in box exceed the screening value >2.5 times

Where one or more guideline value is exceeded, the highest guidleline value will be highlighted

** EIL values calculated using site-specific CEC (7.26 meq/100g), pH (5.5) and TOC (1.3%) data collected from the Buffer Zone during the March 2014 investigations

Table 6:
AEC 30 Area East of the Clay Borrow Pit
QA/QC Results

	Sample Type:		Soil	Soil	**RPD%**
	ALS Sample number:		243000	ES2016984	
	Sample date:		14/05/2020	14/05/2020	
	Sample ID:		AECBP_TP11_3.4-3.5	D02_140520	
	Project Name:		Data Gap Assessment	Data Gap Assessment	
	Site:		AEC 30	AEC 30	
	Duplicate Type:		PRIMARY	Duplicate of AECBP_TP11_3.4-3.5	
Analyte grouping/Analyte	**Units**	**LOR**			
Fluoride and Cyanide					
Free Cyanide in soil	mg/kg	0.5	*0.25*	*0.25*	*0*
Fluoride (1:5 soil:water)	mg/kg	0.5	10	9.5	*5*
Total Metals by ICP-AES					
Aluminium	mg/kg	10	4600	6800	*39*
Arsenic	mg/kg	4	6	8	*29*
Cadmium	mg/kg	0.4	*0.2*	*0.2*	*0*
Chromium	mg/kg	1	7	10	*35*
Copper	mg/kg	1	35	65	**60**
Lead	mg/kg	1	70	200	**96**
Mercury	mg/kg	0.1	*0.05*	*0.05*	*0*
Nickel	mg/kg	1	5	6	*18*
Zinc	mg/kg	1	440	770	**55**
Polynuclear Aromatic Hydrocarbons					
Naphthalene	mg/kg	0.1	*0.05*	*0.05*	*0*
Acenaphthylene	mg/kg	0.1	*0.05*	*0.05*	*0*
Acenaphthene	mg/kg	0.1	*0.05*	*0.05*	*0*
Fluorene	mg/kg	0.1	*0.05*	*0.05*	*0*
Phenanthrene	mg/kg	0.1	<0.1	0.2	NC
Anthracene	mg/kg	0.1	*0.05*	*0.05*	*0*
Fluoranthene	mg/kg	0.1	<0.1	0.2	NC
Pyrene	mg/kg	0.1	<0.1	0.2	NC
Benz(a)anthracene	mg/kg	0.1	*0.05*	0.1	**67**
Chrysene	mg/kg	0.1	*0.05*	0.1	**67**
Benzo(b,j+k)fluoranthene	mg/kg	0.2	*0.1*	0.2	**67**
Benzo(a)pyrene	mg/kg	0.05	*0.025*	0.1	**120**
Indeno(1.2.3.cd)pyrene	mg/kg	0.1	*0.05*	*0.05*	*0*
Dibenz(a.h)anthracene	mg/kg	0.1	*0.05*	*0.05*	*0*
Benzo(g.h.i)perylene	mg/kg	0.1	*0.05*	*0.05*	*0*
Sum of polycyclic aromatic hydrocarbons	mg/kg	-	*0.025*	1.3	**192**
Benzo(a)pyrene TEQ (zero)	mg/kg	-	*0.25*	*0.25*	*0*
Benzo(a)pyrene TEQ (half LOR)	mg/kg	-	*0.25*	*0.25*	*0*
Benzo(a)pyrene TEQ (LOR)	mg/kg	-	*0.25*	*0.25*	*0*
Total Petroleum Hydrocarbons					
C6 - C9 Fraction	mg/kg	25	*12.5*	*12.5*	*0*
C10 - C14 Fraction	mg/kg	50	*25*	*25*	*0*
C15 - C28 Fraction	mg/kg	100	*50*	*50*	*0*
C29 - C36 Fraction	mg/kg	100	*50*	*50*	*0*
Total Recoverable Hydrocarbons - NEPM 2013 Fractions					
C6 - C10 Fraction	mg/kg	25	*12.5*	*12.5*	*0*
C6 - C10 Fraction minus BTEX (F1)	mg/kg	25	*12.5*	*12.5*	*0*
>C10 - C16 Fraction	mg/kg	50	*25*	*25*	*0*
>C16 - C34 Fraction (F3)	mg/kg	100	*50*	*50*	*0*
>C34 - C40 Fraction (F4)	mg/kg	100	*50*	*50*	*0*
>C10 - C40 Fraction (sum)	mg/kg	50	*25*	*25*	*0*
>C10 - C16 Fraction minus Naphthalene (F2)	mg/kg	50	*25*	*25*	*0*
BTEXN					
Benzene	mg/kg	0.2	*0.1*	*0.1*	*0*
Toluene	mg/kg	0.5	*0.25*	*0.25*	*0*
Ethylbenzene	mg/kg	1	*0.5*	*0.5*	*0*
meta- & para-Xylene	mg/kg	2	*1*	*1*	*0*
ortho-Xylene	mg/kg	1	*0.5*	*0.5*	*0*
Naphthalene	mg/kg	1	*0.5*	*0.5*	*0*
Total Xylenes	mg/kg	-	*1.5*	*1.5*	*0*

Blank Cell indicates no criterion available
LOR = Limit of Reporting
Values that are *underlined and italicised* indicate a value at half LOR
Bold indicates value > 30% RPD
NC = Not Calculated