

Former Kurri Kurri Aluminium Smelter
Preliminary Environmental Assessment

Prepared for:
Hydro Aluminium Kurri Kurri Pty Ltd

Prepared by:
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HYDRO

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Glossary, Acronyms and Abbreviations

CBD	Central business district
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
Hydro land	Land owned and managed by Hydro incorporating the former smelter area and the surrounding Hydro owned lands
LEP	Cessnock Local Environmental Plan 2011
OEH	Office of Environment and Heritage
POEO Act	*Protection of the Environment Operations Act 1997*
SEAR	Secretary Environmental Assessment Requirements for the Environmental Impact Statement
Smelter site	The area containing the Smelter
Spent potlining	When the electrolytic pot that produces aluminum reaches end of life the pot contents are replaced and the waste generated is called Spent potlining. Spent potlining comprises a mixture of carbon material and refractory bricks and the predominant contamination is related to fluoride, sodium and potentially also cyanide compounds.
SSD	State Significant Development
S&RD SEPP	State Environmental Planning Policy (State and Regional Development) 2011
The Department	Department of Planning and Environment
The Project	The development to be the subject of the EIS, as described in Chapter 3 of this document.
The Project site	The area comprising the Smelter site and the containment cell site, containing the Project described in Chapter 3 of this document.
Works	The demolition, remediation and containment cell construction (and associated activities) elements of the Project

Executive Summary

This Preliminary Environmental Assessment (PEA) has been prepared by ENVIRON Australia Pty Ltd (ENVIRON) on behalf of Hydro Aluminium Kurri Kurri Pty Ltd (Hydro).

Hydro owns and manages the former Hydro Aluminium Kurri Kurri Smelter (the Smelter) and the surrounding buffer lands located at Loxford, NSW (the Hydro land).

Smelting activities ceased in September 2012, and in May 2014 Hydro formally announced the closure of the Smelter.

It is Hydro's strategic vision for the Hydro land to play a key role in allowing the Hunter Region to achieve the economic, employment and environmental objectives identified in the NSW State Plan 2021 and the Hunter Regional Action Plan. Hydro aims to achieve this strategic vision by facilitating the rezoning and development of the Project site for significant employment, residential, rural and biodiversity conservation purposes.

The proposed demolition, remediation and waste management activities subject of this PEA (the Project) is the first stage of Hydro's strategic vision for the Project site. The Project will render the Project site suitable for future use and achieve Hydro's commitment to meeting its corporate environmental and social responsibilities, and to managing its environmental legacies.

The key elements of the Project are:

- The demolition of Smelter buildings and structures within the Project site. This would include safe removal of hazardous materials prior to and during demolition.
- The remediation of contaminated soils located within the Project site, including materials within the capped waste stockpile (containing mixed smelter wastes) and contaminated soils around and below Smelter structures.
- The design and construction of a waste management facility, comprising a state of the art, modern and purpose built containment cell that would encapsulate certain waste materials from the demolition and remediation activities.
- The treatment of leachate and leachate impacted groundwater from the capped waste stockpile.

Following completion of the demolition, site remediation and construction of the containment cell, the following activities would be undertaken:

- Establishment and implementation of a containment cell monitoring program.
- Long term management of the containment cell through an Environmental Management Plan.

The Project is State Significant Development (SSD) for the purposes of the *Environmental Planning and Assessment Act 1979* (EP&A Act) because it comes within the category of 'waste and resource management facility' described in clause 23(5) of Schedule 1 to *State Environmental Planning Policy (State and Regional Development) 2011* (S&RD SEPP). As such, the Project will be assessed under Division 4.1 of Part 4 of the EP&A Act with the Minister for Planning (or a delegate) as the consent authority.

This PEA forms part of Hydro's written application to the Department of Planning and Environment for the Secretary Environmental Assessment Requirements to prepare the proposed Environmental Impact Statement (EIS) for the Project.

This PEA includes:

- A preliminary risk assessment which identifies and prioritises the expected environmental impact associated with the development.
- An overview of the strategies to mitigate and manage the potential impacts of the PEA.
- The options that were identified and analysed by Hydro in determining that the Project is the most appropriate option for waste management, demolition and remediation of Project site.
- Discusses the strategic context of the Project, including the benefits that redevelopment of the Hydro land (facilitated by the Project) would bring to the wider region and/or State.

The following environmental impacts have been identified as part of the preliminary risk assessment for the Project:

- Ecology.
- Noise and vibration.
- Air quality.
- Aboriginal heritage.
- Soils and contamination.
- Waste management.
- Hydrology and water quality.
- Social impacts.
- Traffic and access.
- Visual and aesthetics.
- Carbon and energy.
- Non-indigenous heritage.
- Cumulative impacts.

The preliminary risk assessment concluded that the Project would result in environmental and social improvements through: the remediation of contaminated soils within the Project site; relocation of these soils and the materials in the capped waste stockpile to be encapsulated within a state of the art, modern and purpose built containment cell; the onsite and downstream improvements associated with the treatment of leachate and leachate impacted groundwater; and that it facilitates the future re-use of the Project site and the Hydro land, including for employment land.

The need to minimise potential impacts from the Project on ecology, noise and vibration, air quality, Aboriginal heritage, water quality, the local visual environment, the local community and traffic would be inherent to the Project design and construction methodology. The implementation of the measures outlined in this PEA would further mitigate the potential

environmental and social impacts of the Project. These measures will be refined and developed during the detailed EIS process.

Hydro has undertaken a detailed assessment of alternative remediation and management options in determining that the Project is the preferred option. The remediation options were subjected to a quantitative and semi-quantitative assessment process considering environmental, social, economic, timeframe and risk factors, as well as consistency with Hydro's corporate responsibility commitments.

The benefits of the Project compared to other options considered are:

- The remediation and building demolition would render the Project site suitable for future use. This future use would generate environmental, economic and social benefits.
- The containment cell can be constructed within an area of the Project site that is favorable from an environmental as well as site re-use perspective.
- Best practice cell design can be implemented including state of the art quality control practices during all phases of design, construction and validation. A new design would allow installation of early warning systems controls during construction including leachate detection systems. This state of the art cell design allows the inclusion of untreated spent potlining within the containment cell without increasing the potential environmental risks, thereby removing the risk associated with spent potlining treatment
- All wastes and contaminated soils can be consolidated in one location using segregated compartments.
- The containment cell design can include a vegetation cover. This would offset the carbon footprint of the containment cell as well as reducing long term maintenance and monitoring requirements.
- The containment cell design can include the reuse of onsite materials (crushed concrete) as the drainage layers and as a subsurface fauna barrier to protect capping layers.
- Removal of the capped waste stockpile allows remediation and redevelopment of its footprint, making it available for future use.
- Removal of the capped waste stockpile allows active removal of leachate within this area and rehabilitation of impacted areas of vegetation.
- The onsite management of the material avoids off site transport of significant quantities of materials and the associated local community impacts.
- The onsite management of the material minimises materials going to the Cessnock Waste and Reuse Centre and avoids the associated landfill capacity demands.
- The containment cell provides a cost effective strategy for achieving site remediation objectives.

Hydro has commenced consultation with key stakeholders that will continue throughout preparation of the EIS. Key stakeholders include the local community, government agencies and indigenous stakeholders. Issues identified through this consultation would be addressed in the EIS.

1 Introduction

This Preliminary Environmental Assessment (PEA) has been undertaken by ENVIRON Australia Pty Ltd (ENVIRON) on behalf of Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) for the proposed demolition, remediation and management of derived wastes at the former Hydro Aluminium Kurri Kurri Smelter at Loxford, NSW (the Project).

The Project site is located approximately three kilometres north of the Kurri Kurri central business district (CBD) and approximately 33 kilometres to the northwest of the Newcastle CBD. **Figure 1** shows the location of the Project site.

1.1 Project Context

The former Hydro Aluminium Kurri Kurri Smelter (the Smelter) is located on Hart Road, Loxford near Kurri Kurri in New South Wales, Australia. The area owned and managed by Hydro incorporates the former smelter area and the surrounding Hydro owned lands, comprising approximately 2,000 hectares (the Hydro land).

Smelting activities ceased at the site in September 2012 and in May 2014 Hydro formally announced the closure of the Smelter.

It is Hydro's strategic vision for the Hydro land to play a key role in allowing the Hunter Region to achieve the economic, employment and environmental objectives identified in the NSW State Plan 2021 and the Hunter Regional Action Plan. Hydro aims to achieve this strategic vision by facilitating the rezoning and development of the Hydro land (including the Project site) for employment, residential, and biodiversity conservation purposes.

Hydro is committed to meeting its environmental and social commitments, and to managing environmental legacies within its landholdings. As part of this, Hydro is committed to managing waste on the Project site and undertaking demolition and remediation works to render the site safe for human health and the environment, and in doing so make it suitable for future use. This future use includes employment land, residential land, rural land and a large area dedicated for biodiversity conservation.

The Project is also required to facilitate the proposed future land uses that would provide environmental, social and economic benefits to the local area, the Hunter Region, and the state of NSW.

1.2 Project Overview

Hydro proposes to carry out demolition, remediation and waste management activities at the Project site to render it suitable for future use. The key elements of the Project are:

- The demolition of buildings and structures within the Smelter. This would include safe removal of hazardous materials prior to and during demolition.
- The remediation of contaminated soils within the Smelter, including materials within the capped waste stockpile (containing mixed smelter wastes) and accessible contaminated soils around and below Smelter structures.
- The design and construction of a waste management facility, comprising a state of the art, modern and purpose built containment cell that would encapsulate materials including:

  - Non-recyclable demolition waste from the existing Smelter buildings and structures.
  - Contaminated soils from the Smelter.
  - Materials within the existing capped waste stockpile located at the Smelter site.
  - Stored residual smelting process materials, including spent potlining.
  - Soils and materials derived from remediation elsewhere within the Hydro land.
- Validation of the remediated areas of the Smelter site and Hydro land as suitable for the proposed future use as employment land.
- The treatment of leachate and leachate impacted groundwater from the capped waste stockpile.

To facilitate these activities, the following would also be undertaken:

- Establishment, implementation and ongoing maintenance of environmental controls.
- Establishment and utilisation of a construction compound and ancillary facilities.
- Construction of an access road between the containment cell and the Smelter.
- The winning of suitable clay to be used in construction of the containment cell.
- The sorting, processing and transportation off site of recyclable materials.

Hydro proposes to commence these activities in the third quarter of 2015, and anticipates a project timeline of up to four years.

Following completion of the demolition, remediation and construction and closure of the containment cell, the following activities would be undertaken:

- Establishment and implementation of a containment cell monitoring program.
- Long term management of the containment cell through an Environmental Management Plan.

1.3 Purpose of Report

This PEA has been prepared as a supporting document to accompany a request for the Secretary Environmental Assessment Requirements (SEARs) to prepare an EIS for lodgement as part of a development application under Division 4.1 of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The PEA includes the following

- Project site details, including the local and regional context of the proposal, surrounding development and any potentially affected properties and the location of key infrastructure and key environmental features.
- A summary of the Project that describes the types of activities that will be undertaken during each stage of the Project.
- Permissibility of the Project and identification of strategic planning documents, environmental planning instruments and key development standards applying to the Project.

- Identification of environmental impacts based on a preliminary risk assessment and strategies to address any impacts.
- Justification of the Project.
- Details of community consultation.

2 Statutory and Planning Context

2.1 *Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and Environmental Planning and Assessment Regulation 2000 (the Regulation) are the principle pieces of environmental legislation which provide for development planning and control in NSW.

State Environmental Planning Policy (State and Regional Development) 2011 (S&RD SEPP) (refer to **Section 2.2.1**) declares certain development to be State Significant Development (SSD). SSD is assessed and determined under Part 4 of the EP&A Act by the Minister for Planning and Environment or his delegate.

As discussed in **Section 2.2.1** of the PEA, the Project is SSD because it comes within the category of 'waste and resource management facility' described in clause 23(5) of Schedule 1 to the S&RD SEPP.

The Project will be assessed as SSD under Division 4.1 of Part 4 of the EP&A Act. The Minister for Planning and Environment (or his delegate) is the consent authority for SSD assessed under Part 4 of the EP&A Act. An Environmental Impact Statement (EIS) must accompany the lodgment of a development application for SSD. This PEA accompanies an application for the Secretary Environmental Assessment Requirements which set out the requirements that the EIS must address.

2.2 NSW Environmental Planning Instruments

2.2.1 State Environmental Planning Policy (State and Regional Development)

A State Environmental Planning Policy (**SEPP**) may declare any development, or any class or description of development, to be SSD for the purposes of the EP&A Act.

Clause 8(1)(b) of the S&RD SEPP provides that development is declared to be SSD for the purposes of the EP&A Act if the development is specified in Schedule 1 or 2 to the S&RD SEPP.

Schedule 1 of the S&RD SEPP identifies 'waste and resource management facilities' as a category of SSD, including:

"(5) Development for the purpose of hazardous waste facilities that transfer, store or dispose of solid or liquid waste classified in the Australian Dangerous Goods Code or medical, cytotoxic or quarantine waste that handles more than 1,000 tonnes per year of waste."

The dominant feature of the Project is the construction, operation and ongoing management of the containment cell. The containment cell will be a state of the art, modern and purpose built facility for the purpose of disposing and managing various waste streams generated by the demolition and remediation of the Smelter.

The waste materials to be disposed of and managed in the containment cell include waste materials classified in the Australian Dangerous Goods Code (which is entitled '*Australian Code for the Transport of Dangerous Goods by Road & Rail*', Seventh Edition (National Transport Commission, 2011). Such waste materials include "Aluminium smelting by-

product". In relation to "Aluminium smelting by-product', this term is defined in the Dangerous Goods Code to mean:

"*Substances which in contact with water emit flammable gases. Substances which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities*".

The types of "Aluminium smelting by-product" that come within the above definition are listed in the Dangerous Goods Code to include "aluminium dross, aluminium skimmings, spent cathodes, spent potlining, and aluminium salt slags."

The Project includes the disposal of spent potlining to the containment cell. This includes spent potlining sourced from within the mixed smelter wastes currently within the capped waste stockpile, and the spent potlining in storage and remaining within the pots. As such, the containment cell will be a 'waste and resource management facility' described in clause 23 of Schedule 1 to the S&RD SEPP because it will be a facility specifically designed for the disposal and ongoing management of waste classified in the Australian Dangerous Goods Code, and it will handle more than 1,000 tonnes per year of waste (refer to **Section 3.3** for details).

The demolition and remediation elements of the Project are ancillary, incidental and directly related to the containment cell because such works are necessary to recover the waste that would be disposed of and managed in the containment cell. In light of this, clause 8(2) of the S&RD SEPP operates to declare the demolition and remediation elements of the Project to be state significant development.

2.2.2 Cessnock Local Environmental Plan 2011

The Project site is zoned 'RU2 Rural Landscape' under Cessnock Local Environmental Plan 2011 (the LEP).

As explained in **Section 2.2.1**, the dominant purpose of the Project is for 'waste disposal facility', which comes within the parent definition of a 'waste and resource management facility' under the LEP. The LEP defines a 'waste disposal facility' as:

"*a building or place used for the disposal of waste by landfill, incineration or other means, including such works or activities as recycling, resource recovery and other resource management activities, energy generation from gases, leachate management, odour control and the winning of extractive material to generate a void for disposal of waste or to cover waste after its disposal*".

Development for the purposes of 'waste disposal facility' is permissible with consent in the RU2 Zone. As noted in **Section 1.1** one purpose of the Project is to make the land suitable for future use. To facilitate a future land use the Project site is proposed to be subject to an LEP Amendment to rezone the land to IN1 General Industrial to reflect its industrial land history and future capability. If this rezoning did occur the 'waste disposal facility' would also be permitted with consent in this zone under Clause 2.3 of the current LEP.

Certain categories of demolition works are exempt or complying development under State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. For example, demolition of "an industrial building" would be deemed complying development

under Clause 7.1(1) of Part 7 of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 provided it complies with the requirements for demolition as complying development in Schedule 9 of the SEPP.

While demolition of the Smelter is included as part of the Project, due to project planning or site management issues demolition of certain industrial buildings may be required prior to approval of the Project. If this occurred, Hydro would apply for a complying development certificate.

2.3 Other NSW Legislation

2.3.1 *Protection of the Environment Operations Act 1997*

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

Scheduled work comprises those activities listed in Schedule 1of the POEO Act including 'contaminated soil treatment'. Clause 15 of Schedule 1 defines 'contaminated soil treatment' as:

"(1) This clause applies to contaminated soil treatment, meaning the on site or off site treatment of contaminated soil (including, in either case, incineration or storage of contaminated soil but excluding excavation for treatment at another site).

(2) The activity to which this clause applies is declared to be a scheduled activity if:

(b) where it treats contaminated soil originating exclusively on site, it has a capacity:

(ii) to treat (otherwise than by incineration) and store more than 30,000 cubic metres of contaminated soil".

The Project involves the treatment and storage of more than 30,000 cubic metres of contaminated soil. As such, an EPL is required to undertake the removal of the capped waste stockpile and the remediation of residual soils, including placement in the containment cell.

Hydro has an existing EPL (EPL 1548) which applies to the premises. It is proposed to amend this existing EPL to reflect the new scheduled activity to be carried out on the Project site.

2.3.2 Hazardous Chemical Act 1985

The *Environmentally Hazardous Chemicals Act 1985* (EHC Act) establishes the procedure for the declaration and management of environmentally hazardous chemicals and chemical wastes. The Environment Protection Authority can make and implement a Chemical Control Order for such declared chemicals or wastes.

A Chemical Control Order has been issued under the EHC Act that is applicable to aluminium smelter waste. This order requires a licence for the processing of aluminium smelter wastes containing leachable fluoride and/or leachable cyanide, and the disposal of aluminium smelter wastes (not containing leachable fluoride and/or leachable cyanide).

A licence under this Chemical Control Order was issued for the Smelter in the early 1990's for the management of the appropriate aluminium smelter wastes, including the capped waste stockpile.

Hydro has commenced consultation with the Environment Protection Authority regarding the Chemical Control Order and the requirement for a licence for the management of aluminium smelter waste in the containment cell.

2.3.3 Other Relevant Legislation

Applicable Legislation

Other NSW legislation and environmental planning instruments that may be relevant to the Project includes:

- *Contaminated Land Management Act 1997*
- *Fisheries Management Act 1994*
- *Heritage Act 1977*
- *Hunter Regional Environmental Plan (Heritage) 1989*
- *National Parks and Wildlife Act 1974*
- *Native Vegetation Act 2003*
- *Noxious Weeds Act 1993*
- *Work Health and Safety Act 2011*
- *Rural Fires Act 1993*
- *Threatened Species Conservation Act 1995*
- *Waste Avoidance and Resource Recovery Act 2001*
- *Water Act 1912*
- *Water Management Act 2000*
- State Environmental Planning Policy No 55 – Remediation of Land
- State Environmental Planning Policy No 44 – Koala Habitat Protection

These legislation and environmental planning instruments will be reviewed at the EIS stage and their relevance determined in relation to the Project.

Legislation Not Applicable to State Significant Development

In accordance with section 89J of the EP&A Act, the following authorisations are not required for approved SSD:

- The concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of that Act.
- A permit under section 201 (for dredging or reclamation works), 205 (harm to marine vegetation) or 219 (blockage of fish passageway) of the *Fisheries Management Act 1994*.
- An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*.
- An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*.
- An authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act repealed by that Act) to clear native vegetation.
- A bush fire safety authority under section 100B of the *Rural Fires Act 1997*.

- A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*.

2.4 NSW Government Policy

The Project is required in order for the Hydro land to accommodate future land uses. This includes employment land within, and in the vicinity of, the Project site and residential land, rural land and a large area dedicated for biodiversity conservation within the previous operational buffer lands of the Project site.

The Project will facilitate the transformation of the Hydro land (including the Project site) into a major employment hub for the Hunter Region. Given its central location within the region and proximity to the Hunter Expressway, the large area proposed for employment land (at least 300 hectares) could facilitate significant long term business development and employment opportunities for people and businesses from throughout the region.

It would also provide a large area of residential land (approximately 210 hectares) adjacent to existing urban release areas to meet housing demand for the growing population of the Hunter Region.

By facilitating these future land uses, the Project is consistent with the objectives and strategies of the NSW State Plan 2021 (Department of Premier and Cabinet, 2011) and the Hunter Regional Action Plan (Department of Premier and Cabinet, 2012). It will contribute to future land uses that would:

- Improve the performance of the NSW economy;
- Drive economic growth and diversity within the Hunter Region;
- Achieve the target of employment growth in NSW by an average of 1.25% per year to 2020; and
- Protect our natural environment.

2.5 Commonwealth *Protection of the Environment Operations 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 and Commonwealth land. The EPBC Act requires proponents attain approval from the Minister of the Environment if a project is considered a ‘controlled activity’ due to potential significant impacts on Matters of National Environmental Significance. A referral is submitted to the Department of the Environment for determination that an activity is a controlled activity.

The Commonwealth Government and the NSW Government signed a bilateral agreement in November 2013 that accredits the NSW planning system to undertake a single environmental assessment process for projects in NSW that require consideration under the EPBC Act. Approval would still be required from the Department of the Environment, which would be based on the assessment by the NSW Department of Planning and Environment.

As discussed in **Section 5.1**, there is the potential for species and communities listed under the EPBC Act to be impacted by the Project. The presence of these species and communities and the level of impact (if present) would be assessed in the EIS and the need for approval of a controlled action would be determined by the Minister of the Environment.

3 The Project

3.1 Project Site

3.1.1 Regional Context and Site Location

The Project site is located approximately three kilometres north of the Kurri Kurri central business district (CBD), approximately 10 kilometres south of the Maitland CBD and approximately 33 kilometres to the northwest of the Newcastle CBD at Hart Road in Loxford, NSW within the Cessnock local government area. Figure 1 shows the location of the Project site.

The area owned and managed by Hydro (the Hydro land) incorporates the Project site (including the Smelter) and covers approximately 2000 hectares. The Hydro land surrounding the Project site is predominantly native vegetation to the northwest and south; rural land to the northeast; and rural residential land holdings to the southeast. The Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club operate on Hydro land approximately 200 metres from the Smelter site.

The Hunter Expressway passes through the south-western corner of the Hydro land, and the South Maitland Railway passes through the eastern section of the Hydro land.

The established residential townships of Kurri Kurri, Weston and Heddon Greta are located to the south of the Hydro land, while the growing residential areas of Gillieston Heights and Cliftleigh are located to the northeast 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.

3.1.2 Existing Conditions

The Project site is shown in **Figure 2** and currently contains the following:

- The Smelter: This area contains the production, administration, laboratory and maintenance facilities of the former smelting operations. It also includes the adjoining car parks and sporting fields developed for smelter employees. The Smelter commenced operations in 1969 and underwent a number of expansions and upgrades. Production ceased in 2012 and the Smelter was closed in May 2014.

  Within the Smelter, spent potlining has been stored in purpose built sheds. Some of this material has been processed (in accordance with a 2005 planning approval) under contract by a third party.
- Capped waste stockpile: A capped waste stockpile is located in the eastern section of the Smelter site. This stockpile contains mixed smelter waste originating from the early 1970’s up until the early 1990’s.
- Clay borrow pit: Immediately to the west of the Smelter site is an area that was used to source clay use as capping for the capped waste stockpile. This is within the area identified in Figure 2 for the containment cell.
- Bushland: Native vegetation is located immediately north, south and west of the clay borrow pit.

3.1.3 Project Site Requirements

As discussed in **Section 1.1**, the key purpose of the Project is to undertake demolition, remediation and waste management activities to render the Project site suitable for future use.

To achieve this purpose the following tasks are required to be undertaken at the Project site:

- Remediation of contaminated soils.
- Demolish the Smelter buildings and structures.
- Treatment of leachate and leachate impacted groundwater.
- The design and construction of a waste management facility, comprising a state of the art, modern and purpose built containment cell that would encapsulate certain waste materials from the demolition and remediation activities.

Section 3.5 describes the detailed process Hydro has implemented to identify and assess the options available for undertaking these activities. Through this process the Project outlined in **Sections 3.3** and **3.4** was determined to be the preferred strategy.

3.2 Project Outline

3.2.1 Project Overview

The Project would have two key stages:

- The Works. The Works are the activities required to make the Project site suitable for future use. The key element of the Works is the construction of a waste management facility, comprising a state of the art, modern and purpose built containment cell. Other ancillary elements of the Works are:
  - Smelter demolition.
  - Site remediation.
  - Leachate and groundwater treatment.
- Containment Cell Long Term Management. Following completion of the Works, the containment cell would be subject to a monitoring and management program.

These activities are further discussed in **Sections 3.3** and **3.4**.

Figure 3 shows a preliminary layout of the Project. The Works design and construction methodology are currently being detailed and will be addressed in more detail in the EIS.

3.3 Works Overview

3.3.1 Smelter Demolition

The demolition methodology would be developed and detailed in the EIS. However it is expected to include the key tasks described in **Table 1**.

Table 1: Smelter Demolition Key Tasks

Key Task	Actions
Removal of mobile equipment and plant	• Remove mobile equipment and plant from within structures to a temporary storage area. • Transport from the site for reuse, sale or disposal.
Removal of remaining furniture, non-hazardous internal fittings, electrical systems and other materials	• Remove furniture, lighting and electrical systems, plasterboard and hardboard walls and other materials from structures to a temporary storage area. • Transport from the site for reuse, sale or retain in on site stockpiles for placement in the containment cell.
Hazardous materials removal	• Removal and management (including temporary storage) of materials in accordance with *Workplace Health and Safety Act 2011* and Regulation 2011. • Placement in the containment cell.
Cessation of spent potlining treatment	• Closure and decommissioning of the third party treatment facilities upon completion of contractual obligations. • Transportation of the remaining stockpiled spent potlining to the containment cell for placement. • Removal, potential temporary stockpiling and transportation of spent potlining remaining in potlines to the containment cell for placement.
Small scale demolition	• Physical and mechanical removal of metal sheeting and framework. • Mechanical demolition of brickwork and concrete.
Large scale demolition	• Demolition by explosion or other applicable methodology of key large structures (such as stacks).
Material collection, separation and storage	• Establish environmental controls. • Collection of demolished materials within the demolition waste stream (where possible). • Sorting (where required) and storage of collected demolition waste into the various streams. • Processing of materials (such as crushing of concrete).
Material transportation or disposal	• Municipal wastes transported to a licensed waste management facility for disposal. • Non-recyclable and non-reusable materials transported to containment cell for encapsulation. • Recyclable material transported to a licensed facility. • Reusable material used in containment cell construction (where suitable) or transported for sale or reuse.

Table 1: Smelter Demolition Key Tasks	
Key Task	**Actions**
Grading of former building footprint	• Infill of any subsurface voids: this could include reuse of suitable processed demolition waste. • Grading of ground surface. • Installation of surface water drainage and collection system. • Establish temporary vegetation ground cover (where appropriate).

3.3.2 Project Site Remediation

Remediation would involve removal of contaminated soils amongst and below the Smelter buildings and structures (including the capped wasted stockpile) and stockpiling of contaminated soils (within environmental controls) at the Smelter.

The remediation methodology would be developed and detailed in the EIS. However it is expected to include the key tasks described in Table 2.

Table 2: Project Site Remediation Key Tasks	
Key Task	**Actions**
Removal of the capped waste stockpile	• Establishment of environmental controls. • Progressive stripping of vegetative layer. • Progressive removal and stockpiling of capping material. • Direct excavation and loading of materials into trucks, without sorting or crushing, for delivery to the containment cell. • Daily cover materials using the stockpiled existing overlying capping layers to manage gas emissions and exposure to moisture. • Management of leachate within the capped waste stockpile through retention of the existing landfill outer bund and pumping through the water treatment system (refer to **Section 3.4.4**). • Validation that all impacted soils have been removed from the capped waste stockpile footprint. • Grading of ground surface. • Installation of surface water drainage and collection system. • Continued treatment of groundwater (refer to **Section 3.3.4**).
Excavation of the contaminated soils within the Smelter (including stockpiled soils sourced from other Hydro land)	• Establishment of environmental controls. • Direct excavation and loading of materials into trucks for delivery to the containment cell or temporary stockpiling locations. • Validation that all impacted soils have been removed from the source sites. • Grading of ground surface. • Installation of surface water drainage and collection system.

3.3.3 Containment Cell Construction and Material Encapsulation

The key element of the Works is the construction of a waste management facility - comprising a state of the art, modern and purpose built containment cell. The containment cell would be designed and constructed to encapsulate materials derived from the ancillary activities described in **Sections 3.3.1** and **3.3.2**. **Table 3** identifies these material streams and the preliminary estimate of quantities to be encapsulated in the containment cell.

Table 3: Containment Cell Material Streams

Material Stream	Estimated Quantity
Capped waste stockpile	100,000m^3 (189,000 tonnes)
Spent potlining in storage and remaining in pots	First cut spent potlining: 22,000m^3 (40,000 tonnes) Second cut spent potlining: 22,000m^3 (40,000 tonnes)
Contaminated soils on the smelter site	17,000m^3 (27,000 tonnes)
Contaminated soils, smelter wastes and other municipal wastes derived from other Hydro owned land	32,000m^3 (40,000 tonnes)
Demolition wastes generated during the site demolition (non-recyclable/ non-reusable)	30,000m^3 (20,000 tonnes)

The types and quantities of materials to be placed in the containment cell will continue to be assessed and documented in the EIS. Similarly the containment cell construction and materials encapsulation methodology would be developed and detailed in the EIS.

It is likely that the containment cell construction and material encapsulation would include the key tasks described in **Table 4**.

Table 4: Containment Cell Construction and Encapsulation Key Tasks

Key Task	Actions
Preliminaries and site preparatory works	• Establishment of environmental controls. • Clearance of native vegetation (approximately seven hectares). • Stripping of topsoil. • Construction of haulage and construction access roads. • Excavation of clay for lining material. • Earthworks for cell area and drainage.
Construction of the cell base liner	• A 1 m thick clay liner of permeability 1 x 10-9 m/s overlain by; • A 1.5 mm thick high density polyethylene (HDPE) liner overlain by; • Filter fabric to provide protection to the HDPE overlain by; • A 0.3 m sand leachate detection layer overlain by;

Table 4: Containment Cell Construction and Encapsulation Key Tasks	
Key Task	**Actions**
	• A 1.5 mm thick HDPE liner overlain by; • Filter fabric to provide protection to the HDPE overlain by; • A 0.3 m gravel drainage layer.
Construction of four segregated cells within the containment cell	The cells would be segregated as follows: • Capped waste stockpile materials. • First cut spent potlining. • Second cut spent potlining. • All other wastes and contaminated soils.
Excavation, transport and placement of remediation and demolition materials	• Capped waste stockpile materials: direct excavation and loading, without sorting or crushing. • Daily cover materials sourced from the existing overlying capping layers at the capped waste stockpile to manage gas emissions and exposure to moisture. • Spent potlining from within storage will be transported directly to the containment cell utilising daily cover to manage moisture content and gas generation. • All other materials (demolition waste and contaminated soils): transported to the containment cell for emplacement within the appropriate segregated cell. • All materials excavated and transported under strict environment and health and safety requirements.
Construction of the final capping layers	• A seal bearing surface • A 0.3 m sand gas collection layer overlain by; • A 0.6 m thick clay liner of permeability 1 x 10-9 m/s overlain by; • A 1.5 mm thick HDPE liner overlain by; • Filter fabric to provide protection to the HDPE overlain by; • A 0.3 m drainage layer overlain by; • A fauna protection barrier overlain by; • A 0.15 m topsoil layer, seeded and mulched to produce a low vegetation layer.

As noted in **Table 4**, construction of the containment cell is estimated to require clearance of approximately seven hectares of native vegetation, which has been identified as comprising endangered ecological communities (refer to **Section 5.1**). The exact area of vegetation clearance would be determined during the containment cell design development.

Hydro proposes to offset the native vegetation clearance through the conservation in perpetuity of endangered ecological communities located elsewhere within the Hydro land. The location and area required for conservation would be determined during preparation of the EIS (refer to **Section 5.1**) and during the further investigation of the future land uses noted in **Section 2.4**.

3.3.4 Leachate and Groundwater Treatment

This involves the treatment of leachate and leachate impacted groundwater from within and below the capped waste stockpile. This is likely to include the key tasks described in **Table 5**.

Table 5: Leachate and Groundwater Treatment Key Tasks

Key Task	Actions
Establish water treatment plant	• Install a pumping network within the footprint of the capped waste stockpile. • Construct/ install the water treatment plant, including environmental controls.
Operate water treatment plant (capped waste stockpile)	• Pump water contained within walls of capped waste stockpile to the treatment plant. • Treated water would be discharged to an existing dam in the north of the Project site (the North Dam).
Dam water treatment	• Treat fluoride and cyanide concentrations within the North Dam prior to evaporation or discharge if required. • Monitor fluoride and cyanide concentrations within the North Dam.
Groundwater monitoring	• Undertake groundwater monitoring to assess progress of treatment.
Water treatment plant, pumping well network and dam decommissioning	• Decommission and remove infrastructure when monitoring indicates that the remediation objective has been achieved.

3.3.5 Site Access

The Project site would continue to be accessed via Hart Road. Vehicles would use the following routes:

- Vehicles travelling to the south would travel on the Hunter Expressway via the Hart Road exit.
- Vehicles travelling to Maitland and surrounds would travel on the Hunter Expressway via the Hart Road interchange before exiting at the Main Road interchange and continuing on Main Road/ Cessnock Road.
- Vehicles travelling to the northwest would use the same route to the Main Road interchange, before using it as a roundabout and continuing northwest on the Hunter Expressway.
- Vehicles transporting municipal waste to the Cessnock Waste and Reuse Centre would travel along Sawyers Gully Road and then Old Maitland Road.

As such Project vehicles would avoid residential areas. Project vehicles would include personal vehicles of Works personnel, trucks for the delivery and removal of construction machinery and works compound components, removal of recyclable and reusable materials, transport of municipal wastes and delivery of materials.

Access and haul roads would be built within the Project site to connect the Smelter with the containment cell and ancillary facilities. These roads would be constructed of suitable materials sourced from within the Hydro land, generated during demolition activities or potentially transported from licensed facilities.

At the completion of the Works, the access road to the containment cell would be graded to be used for the operational phase. An access track would be maintained around the perimeter of the containment cell.

3.3.6 Additional Ancillary Facilities

To support and facilitate the Works, the following additional ancillary facilities would be required:

- A Works compound, which would include site offices, amenities, lunchroom and car parking for Works personnel.
- Stockpile areas. This would include: a temporary stockpile area for materials to be sorted prior to placement in the containment cell; storage area for recyclable and reusable materials; and stockpile area for materials to be used during construction of the containment cell, access roads and other ancillary facilities.

3.3.7 Duration and Hours of Activity

Project Duration

The Works are anticipated to take approximately three years to complete. This includes the following key milestones:

- Containment cell construction: Approximately six to 12 months from the commencement of the Project.
- Demolition: Approximately 18 months from commencement of the Project.
- Containment cell material emplacement and encapsulation: Approximately three years from the commencement of the Project.
- Remediation: At completion of the containment cell material emplacement and encapsulation.

These tasks would be undertaken concurrently wherever feasible.

Following completion of the Works and during operation of the containment cell the following tasks are anticipated:

- Leachate and groundwater treatment at the capped waste stockpile: It is anticipated this would need to continue for a short term period following completion of the containment cell until monitoring indicates that the remediation goals have been achieved and are being maintained.
- Groundwater, gas and leachate monitoring of the containment cell would be undertaken for several years on an annual basis and include annual reporting.
- Maintenance of the capping layer would be undertaken in perpetuity, routine inspection of the containment cell surface and general gardening.

Hours of Activity

The Project site is approximately 440 metres from the nearest resident, which is owned by Hydro. The nearest residence not owned by Hydro is approximately 500 metres to the south, and the next nearest residence is approximately 700 metres to the southwest.

Due to the distance to the nearest resident, Hydro is examining the potential to extend the Works hours to beyond the standard construction hours identified in the *Interim Construction Noise Guidelines* (DECC, 2009). This is discussed further in **Section 4.2**.

The proposed construction hours, and the type of works that could be undertaken outside standard construction hours (if deemed suitable) would be detailed in the EIS.

3.4 Containment Cell Operations Overview

The containment cell would be designed and constructed to require minimal post-construction operational requirements. The likely requirements are identified in Table 6.

Table 6: Containment Cell Operation Key Tasks

Key Task	Actions
Post construction monitoring	• Installation of groundwater monitoring wells and gas wells installed around the containment cell • Regular monitoring of groundwater monitoring wells and gas wells installed around the containment cell • Ongoing leachate monitoring (refer to **Section 3.3.4**) at the capped waste stockpile. • A contingency for leachate treatment at the containment cell if required. • Reporting of monitoring results.
Containment cell management	• Ongoing physical maintenance of the cell to maintain integrity of the cap • Ongoing maintenance of the vegetation layer. • Implementation of an Operational Environmental Management Plan

Hydro is currently examining options for the long term management of the containment cell, with the key focus being the requirement for responsible long term management (including its long term funding) of the containment cell.

4 Project Alternatives and Justification

4.1 Options Assessment

Hydro has undertaken a detailed assessment of alternative remediation and management options for the waste streams at the Smelter.

The objective of the assessment was to verify that the demolition, remediation and waste management comprised in the Project is the most appropriate option on social, environmental and economic grounds to achieve the objectives of the Project. As stated above, the primary objective of the Project is to render the Project site suitable for future land use.

Hydro considered a number of alternative options to manage the waste streams specified in **Table 7**. The findings of the alternative option assessment are explained below.

Table 7: Material Description

Material type	Description
Capped waste stockpile	Spent potlining and other wastes including anode materials were stockpiled in the eastern portion of the Smelter for the period 1969 to 1992. Mixed smelter wastes comprising spent potlining and to an equal extent amounts of other solid wastes generated at the smelter including cryolite, alumina, floor sweepings (alumina, cryolite, carbon), shot blast dust (carbon, steel shot), cement, potlining mix and small amounts of other materials including plastic, wood and steel. The capped waste stockpile is expected to include a wide range of unwanted site materials that are differing in size and composition. Cross contamination is likely to have occurred between material types which limits the possibility of recycling and will require special handling. The stockpile is currently capped but is situated on sandy strata in a low lying area of the Smelter and within close proximity of the groundwater table.
Spent potlining in storage and remaining in pots	First and second cut spent potlining in storage (sheds) and in pots at the Smelter that will be remaining at the anticipated time of commencement of remediation. First cut component is anticipated to comprise approximately 40,000 tonnes. Second cut component to comprise approximately 40,000 tonnes.
Contaminated soils, smelter wastes and other municipal wastes derived from other Hydro owned land	Contaminated soils and materials within the buffer zone that have arisen during the operations of the Smelter. This includes fill in the Glen Main mine subsidence area, the Dickson Road Landfill area and soil contamination and wastes on other Hydro owned lands (including asbestos). Municipal wastes are sourced from non-smelter related activities and able to be sorted from mixed wastes. This includes municipal wastes within the Glen Main mine subsidence area. For all options municipal wastes would be disposed to landfill. The clay borrow pit includes refractories, concrete and bitumen currently stored within the area.
Contaminated soils on the smelter site	Soils within the Smelter footprint that have been impacted by contaminants during site operations. This includes soil and sediments impacted with fluoride and polycyclic aromatic hydrocarbons.
Demolition wastes	These are wastes generated during the Smelter demolition (non-recyclable/ non-reusable) and include asbestos containing materials, contaminated sludge and dusts and contaminated building materials.

The assessment reviewed each waste stream in isolation to identify the most appropriate option using the evaluators of cost, time, risk, legacy management and corporate sustainability. The waste streams were then evaluated using a whole-of-site strategy to identify the most suitable option. The largest and most complex waste stream is the capped waste stockpile. The options considered for this material are presented in the following. The options for the whole-of site strategy were then presented.

4.1.1 Capped Waste Stockpile

Options considered for remediation and management of the capped waste stockpile included retention or upgrade of the capped waste stockpile; sorting and recycling of materials combined with onsite containment; containment in a purpose built cell; off site landfilling; or treatment to achieve complete destruction. Each of these is discussed below.

Retention of the existing capped waste stockpile

This option is cost effective and represents the lowest health and environmental risks during the remedial works program. The ecological risk assessment indicated that leachate migration from the capped waste stockpile has not and is not likely to impact off site receptors including Swamp Creek and Wentworth Swamp. The stockpile is currently capped in accordance with a planning approval and environment protection licence, with testing showing that the cap is performing and reducing infiltration.

However, localised impact to vegetation is evident within the Hydro land that is unacceptable and steps to intercept and treat leachate in groundwater were considered. Retention of the existing capped waste stockpile would limit the extent to which capture of leachate impacted groundwater could be achieved due to the presence of the stockpile itself and the ongoing generation of leachate.

Additionally, long term management requirements and uncertainty of the long term performance were considered to be unacceptable due to the absence of a landfill base and the unconsolidated nature of the stockpile potentially resulting in a reduction in cap performance over time. The ongoing management requirements and the risk of failure were not acceptable and this option was not further considered.

Upgrade of the existing capped waste stockpile

Similar to the option above, this option was cost effective and represented low health and environmental risks. An ecological risk assessment indicated that leachate migration from the capped waste stockpile has not and is not likely to impact off site receptors including Swamp Creek and Wentworth Swamp. The stockpile is currently capped in accordance with a planning approval and environment protection licence, with testing showing that the cap is performing and reducing infiltration.

Low permeability residual clay is present at depths of around 10 metres beneath the current capped waste stockpile. The migration of leachate could be further reduced through the placement of a vertical subsurface low permeability wall constructed and keyed into the underlying clays. Cap upgrades to key into the wall would then create an effective barrier to leachate migration.

However, barrier wall construction has inherent risk due to the subsurface method of emplacement. It was also recognised that, in the event of failure, the stockpile remains in close proximity to the groundwater system and could result in ongoing environmental harm.

The risks associated with this option were not considered to be acceptable and this option was not considered further.

Sorting of the capped waste stockpile for reuse

Investigations were undertaken to evaluate the ability to segregate the materials for reuse, or treatment and reuse. While successful examples of mechanical and optical sorting of wastes are available, this evaluation identified the significant risk of the resultant material streams being contaminated by the presence of the spent potlining (fluoride and cyanide) and therefore would be unsuitable for reuse without treatment. Treatment to produce a marketable reuse material was considered to be unlikely based on Hydro's experience that the market for segregated first and second cut spent potlining and anodes is unreliable. Reuse opportunities were not identified within New South Wales and difficult to achieve globally. Therefore it was more likely that this material would ultimately require off site landfilling or onsite containment. When assessing the long term environmental and human health risks associated with this option, there was very little risk reduction gained from high level sorting compared to an onsite containment strategy without treatment or sorting. This is because the proposed onsite containment would be a purpose built cell engineered to contain the specific materials with an acceptable risk level.

Coarser level sorting by mechanical means was also considered for the purpose of recycling metal, concrete, bake furnace refractory bricks, anodes, spent potlining and possibly other materials. However the risk of contamination of material streams as described previously and the risk posed by the potential presence of unknown hazardous materials (such as asbestos containing materials) meant that it would require significant time and effort to sort uncontaminated recyclable material, and that hand sorting would likely be required.

The limitation with any sorting approach is the cross contamination of these materials that has likely occurred during the period of time when the stockpile was uncapped. It was therefore considered that only metals may be effectively recycled due to the ability to clean these materials, and that because of stringent requirements that exist for recycling of other materials, these materials could not be recycled. Additionally, if recycling is possible, a suitable end market or end use has not currently been identified.

This option also considered the suitability of sorting mixed first and second cut spent potlining for reuse within the treatment process currently used at the Smelter as described in **Section 4.1.2**.

Due to the cross contamination of the spent potlining from the capped waste stockpile, the specific requirements of the processing facilities and end product quality requirements this option was considered to have a high risk of failure. As noted in Section **4.1.2** the current market for better quality treated spent potlining is unreliable and of relatively low demand globally. As such a market for treated spent potlining (assuming a suitable quality could be recovered) from the capped waste stockpile has not been identified.

Construction of a purpose built containment cell

This is the option that forms part of the Project. The justification for this option is provided in **Section 4.2**.

4.1.2 Other materials

Strategies considered applicable to other site materials included in-situ and ex-situ options. In-situ options such as capping layers were not considered favourable because of several

isolated land parcels requiring ongoing management through environmental management plans. This segmented approach to long term management was not considered to be practical and resulted in the potential for sterilisation of some land parcels.

Ex-situ options included containment adjacent to the capped waste stockpile; containment in a separate purpose built containment cell; offsite disposal and onsite destruction. Due to economies of scale, ex-situ options were evaluated in combination with the capped waste stockpile and described in **Section 4.1.3.**

Spent Potlining

Management options for the spent potlining were considered. Spent potlining referred to here is segregated spent potlining that is currently stored in sheds on the Smelter site and also retained within pots awaiting removal and segregation when each pot is demolished.

Some of the spent potlining has been processed offsite at other aluminium smelters within NSW and Victoria, and more recently on site (through a fine grinding and batching plant) by a third party. Treatment is by a thermal process that removes cyanides and reduces (but does not eliminate) leachability of fluorides. The treatment renders the spent potlining sufficiently inert to permit transport internationally for reuse in the cement industry.

This process has been undertaken at Hydro for the last seven years and has treated a small proportion of the spent potlining generated at the Smelter over that time. There is currently 80,000 tonnes of spent potlining stored within the sheds and within the pots, which could require 10 years to 20 years (or greater) for completion of treatment. The rate of treatment is primarily driven by the market demand for the treated spent potlining, which has generally been extremely variable since treatment commenced.

A timeframe of 10 years to 20 years (or greater) for completion of spent potlining treatment is unacceptable to Hydro. It does not provide the required certainty for planning the remediation of the Smelter site and will sterilise a large area of the Smelter site for this timeframe. This would and constrain the Hydro land's ability to achieve the economic, employment and environmental objectives identified in the NSW State Plan 2021 and the Hunter Regional Action Plan for the Hunter Region. There is no evidence that the variability in market demand for treated spent potlining will change.

Hydro examined spent potlining management methods implemented globally. Appendix A includes an extract from an article from *Journal of Metals* (Holywell, G. & Breault, R., 2013) that summarises the management options that are or previously have been implemented at a number of aluminium smelters. A number of the international management options for the reuse of spent potlining are not applicable as the option is not available in Australia, or it is not viable to transport the spent potlining to the international location due to market conditions.

The options considered for the management of the spent potlining include offsite disposal and onsite treatment, however these posed a number of issues and risks (as discussed in **Section 4.1.3**). In addition to these environmental and social issues and risks, untreated spent potlining (subject to the EPA issuing an exemption to the Chemical Control Order to allow it to be transported in NSW) would still be subject to the uncertain market conditions that are applicable to the treated spent potlining.

Off site treatment of the spent potlining at an existing local facility (permitted to treat second cut spent potlining, but is not permitted to treat first cut spent potlining) was also considered.

This option also posed issues relating to uncertain market demand for the treated spent potlining. This presented Hydro with the potentially long term storage of the spent potlining. A larger risk to Hydro is that ongoing treatment at this facility is not certain over this timeframe for a number of reasons, and should cessation of this treatment occur Hydro would be required to source an alternate solution.

The proposal for containment of the spent potlining includes segregation of first cut and second cut spent potlining from the remainder of materials contained. This will allow for enhanced and specific management of the spent potlining within the containment cell (as outlined in **Section 3.3**). It provides certainty on the management of the spent potlining as it is not at risk to market fluctuations or the financial stability and commitment of a treatment facility. It allows for certainty around the remediation solution and remediation timeframe, and removes the need for parallel and potentially conflicting site uses and the need to develop a significant alternate solution in the event that a reuse solution is unsuccessful. Inclusion of the spent potlining within the containment cell provides this state of the art environmental protection and management certainty without the significant cost implications of a number of the other considered options.

4.1.3 Whole-of-site strategies

The whole-of-site strategy evaluated a range of combined in-situ and ex-situ management and remediation options suitable for all site materials.

Upgrading the Capped Waste Stockpile and combining this with a New Containment Cell

Several options were considered with the variations including a new containment cell located either adjacent or separated from the capped waste stockpile; and a new containment cell containing all remaining material streams or excluding the spent potlining in storage/pots.

This option is cost effective and represented low health and environmental risks. The capped waste stockpile would remain and could be upgraded with a low permeability wall constructed and keyed into the underlying clays. Cap upgrades to key into the wall would then create an effective barrier to leachate migration.

However, retention of the existing capped waste stockpile would limit the extent to which capture of leachate impacted groundwater could be achieved due to the presence of the stockpile itself and the ongoing generation of leachate.

Additionally, long term management requirements and uncertainty of the long term performance of the capped waste stockpile were considered to be unacceptable due to the absence of a landfill base and the unconsolidated nature of the stockpile potentially resulting in a reduction in cap performance over time.

When considered in combination with a containment cell in a second location it was recognised that long term management and monitoring requirements were increased and a larger land footprint would require development restrictions.

The ongoing management requirements and the risk of failure (relating to the capped waste stockpile) were not acceptable and this option was not further considered.

Off Site Disposal

This option would require all material to be transported from the Project site. Some of the materials could be disposed of to the Cessnock Waste and Reuse Centre or another local licensed waste management facility. The remainder of the material streams would be transported to an appropriately licensed landfill facility in Sydney, interstate or internationally.

Offsite disposal was not consistent with Hydro's commitment to corporate responsibility: This option has a significant carbon footprint due to the transportation requirements and has an adverse impact on the local community (there would be a significant number of trucks travelling between the Project site and the disposal location). Environmental impacts would be transferred from the Project site to the receiving location rather than being managed. It could also adversely impact on the landfilling capacity at the Cessnock Waste and Reuse Centre. This option also has significantly higher costs than any other option.

On site destruction (plasma arc treatment)

Potential treatment technologies applicable for the capped waste stockpiles materials, spent potlining and all other materials were assessed. This assessment identified plasma arc treatment as a potential alternative to achieve removal of hazardous components including fluorides, cyanides, hydrocarbons and asbestos from all material streams. Research of global technologies identified that plasma arc gasification pilot scale trials have been undertaken on materials similar to those at the Project site. However there is significant uncertainty as to whether the process generates an inert and/or reusable end product. As a result there is a risk that the material would still require disposal, significantly increasing costs and the time to complete the works, and negating potential environmental benefits.

4.2 Project Justification

The remediation options were subjected to a quantitative and semi-quantitative assessment process considering environmental, social, economic, timeframe and risk factors, as well as consistency with Hydro's corporate responsibility commitments.

The Project described in **Sections 3.3** and **3.4** was identified as the preferred option as it provided the best overall outcome when all these factors were considered.

The benefits of the Project compared to other options considered are:

- As discussed in **Section 1.2** the remediation and building demolition would render the Project site suitable for future use. This future use would generate environmental, economic and social benefits.
- The containment cell can be constructed within an area of the Project site that is favorable from an environmental as well as site re-use perspective.
- Best practice cell design can be implemented including state of the art quality control practices during all phases of design, construction and validation. A new design would allow installation of early warning systems controls during construction including leachate detection systems. This state of the art cell design allows the inclusion of untreated spent potlining within the containment cell without increasing the potential environmental risks, while removing the risk associated with spent potlining treatment (as discussed in **Section 4.1.2**). The option addresses these environmental and market risks associated with spent potlining without the significant costs associated with other options.

- All wastes and contaminated soils can be consolidated in one location using segregated compartments.
- There are a number of examples of containment cells in New South Wales and throughout Australia. Details on some examples are provided in Appendix B.
- The containment cell design can include a vegetation cover. This would offset the carbon footprint of the containment cell as well as reducing long term maintenance and monitoring requirements.
- The containment cell design can include the reuse of onsite materials (crushed concrete) as the drainage layers and as a subsurface fauna barrier to protect capping layers.
- Removal of the capped waste stockpile allows remediation and redevelopment of its footprint, making it available for future use.
- Removal of the capped waste stockpile allows active removal of leachate within this area and rehabilitation of impacted areas of vegetation.
- The onsite management of the material avoids off site transport of significant quantities of materials and the associated local community impacts.
- The onsite management of the material minimises materials going to the Cessnock Waste and Reuse Centre and avoids the associated landfill capacity demands.
- The containment cell provides a cost effective strategy for achieving site remediation objectives.

5 Preliminary Environmental Assessment

5.1 Ecology

5.1.1 Existing Environment

The majority of the Project site has been cleared of native vegetation for historical rural land use, construction of the Smelter or creation of the clay borrow pit.

Areas to the north, south and west of the clay borrow pit within the Project site contain native vegetation listed as an endangered ecological community under the *Threatened Species Conservation Act 1995* (TSC Act) as Kurri Kurri Sand Swamp Woodland and Lower Hunter Spotted Gum – Ironbark Forest.

A search of the Atlas of NSW Wildlife undertaken on 12 June 2014 identified 38 fauna species and eight flora species listed under the TSC Act within a ten kilometre radius of the Project site. Of these, 10 fauna species and six flora species are also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Two flora species (*Grevillea parviflora subsp. parviflora* and *Eucalyptus parramattensis subsp. decadens*) and one fauna species (Grey-headed Flying-fox *Pteropus poliocephalus*) have been recorded within the Project site.

5.1.2 Potential Impacts

As discussed in **Section 3.3**, the Project would require the clearance of up to approximately seven hectares of Kurri Kurri Sand Swamp Woodland and Lower Hunter Spotted Gum – Ironbark Forest endangered ecological communities and known threatened flora and potential threatened fauna species habitat. The containment cell is proposed to include the former clay borrow pit which has already been cleared of native vegetation.

As part of its future land use planning, Hydro proposes to conserve a significant area of native vegetation. These areas also include the Kurri Kurri Sand Swamp Woodland and Lower Hunter Spotted Gum – Ironbark Forest endangered ecological communities, as well as Freshwater Wetlands on Coastal Floodplains, River-flat Eucalypt Forest on Coastal Floodplains and Central Hunter Ironbark-Spotted Gum-Grey Box Forest endangered ecological communities. Part of this conservation area would be used to offset the clearance required for the Project.

5.1.3 Proposed EIS Methodology

It is proposed that the EIS would include a terrestrial flora and fauna impact assessment to assess the potential impact of the Project on species, populations and communities listed under the TSC Act and EPBC Act. The assessment would be undertaken in accordance with the applicable NSW Office of Environment and Heritage (OEH) and Commonwealth Department of the Environment assessment guidelines. This would include:

Desktop Assessment

A desktop assessment would be performed including:

- Review and assessment of existing ecological assessments covering the Project site and surrounds, to describe the existing environment of the Project site.

- Review of threatened species databases to confirm and update (where applicable) local records of threatened species, populations and ecological communities listed under the TSC and EPBC Acts.
- Review of local and regional vegetation mapping.
- Review of any publicly available ecological assessments undertaken in the local area.
- Review of the Project design and layout to consider the potential impacts on the ecological features of the Project site.

Fieldwork

Field survey would be undertaken to ground-truth vegetation mapping and determine the extent, condition and conservation significance of vegetation and habitats.

Field surveys within the Project site would include:

- Assessment of vegetation type, condition and connectivity; vegetation mapping and identification of endangered ecological communities listed under the TSC Act and EPBC Act.
- BioBanking assessment (plots and/or transects) to record vegetation type and condition for biodiversity offsetting considerations.
- Identification of potential habitat for threatened flora species and targeted searches for threatened flora species with the potential to occur.
- Terrestrial fauna habitat assessment, including searches potential threatened fauna habitat or resources (such as feed trees and hollow-bearing trees) and evidence of fauna activity (such as diggings and scats) to assess habitat values within the Project site and the potential for threatened fauna species to occur.
- Observations of native fauna, including diurnal birds and mammals, frogs and reptiles. This would include opportunistic observations and potentially targeted surveys.

Impact assessment

The terrestrial flora and fauna impact assessment would include:

- Project site overview including fauna habitat, vegetation communities, threatened species, legislative context, methodology and existing ecological conditions within the Project site.
- Results of the desktop review and fieldwork.
- Assessment of the potential impacts of the Project on flora and fauna. This would consider impacts on fauna and their habitats (particularly threatened species as relevant).
- Assessments of Significance, according to the seven factors listed under section 5A of the EP&A Act (the ‘seven-part test’), for species listed on the TSC Act.
- Assessments of Significance according to the EPBC Act Significant Impact Guidelines 1.1 Matters of National Environmental Significance, for species listed on the EPBC Act.
- Recommendations to avoid or mitigate impacts, including a preliminary description of the biodiversity offsetting that would be provided.

5.2 Noise and Vibration

5.2.1 Existing Environment

Since the cessation of production at the Smelter in October 2012, the main noise source in the local area until March 2014 was the construction of the adjacent Hunter Expressway. It is now operational and noise attenuation mitigates its noise contribution in sections adjacent to the Project site. Other noise sources include maintenance activities at the Smelter site, local road traffic, the industrial facilities south of the Hydro land in Kurri Kurri, rural and agricultural activities, trains operating on the South Maitland Railway, animal (native and domestic) noises and events held at the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club, which are located on Hydro land approximately 200 metres from the Project site.

As discussed in **Section 3.3** the Project site is approximately 440 metres from the nearest sensitive receiver, which is a rural residence owned by Hydro. The nearest rural residence not owned by Hydro is approximately 500 metres to the south, and the next nearest is approximately 700 metres to the southeast. There are approximately 24 rural residences within 1000 metres of the Project site, of which 15 are on Hydro land.

The nearest residential area to the Project site is Weston, which is approximately 1,800 metres to the southwest. The Kurri Kurri TAFE is located approximately 1300 metres to the southeast and Kurri Kurri High School is approximately 1900 metres to the southeast.

5.2.2 Potential Impacts

A number of the activities described in **Section 3.3** have the potential to generate noise. However given the distance to the nearest sensitive receiver, and the low population density within 1000 metres of the Project site, it is expected that the majority of the Works would not impact on sensitive receivers. Occasional activities that could involve greater noise generation (such as blasting to demolish the stack) would be undertaken in the middle of the day, and after notifying residents in advance, so as to reduce the potential impact.

Due to the distance to sensitive receivers, Hydro proposes to assess the potential to undertake noise-sensitive activities outside of standard construction hours. The assessment described in **Section 5.2.3** would determine what activities could be undertaken within the Project site outside standard construction hours without resulting in a noise impact on sensitive receivers.

As noted in **Section 5.2.1**, the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club are approximately 200 metres from the Smelter site. The speedway generally holds events once a fortnight on weekends (primarily Saturday) and the junior club generally holds events once a month on weekends (over two days). Due to the limited occupation of the facilities, and the nature of the activities held at the facilities, people attending events are unlikely to be adversely affected by Project noise. However there is the potential for cumulative noise impacts on sensitive receivers that may need to be managed and would be considered in the EIS.

The Works would also include activities that could generate vibration. However due to the distance of the Project site from sensitive receivers and infrastructure (overhead power lines would be approximately 150 metres to the southwest of the nearest activity, and the Hunter Expressway approximately 400 metres to the southwest) any vibration impacts are likely to be limited to infrastructure within and servicing the Smelter site. The Works methodology

would be designed to avoid or manage potential vibration impacts on any infrastructure to be retained within the Smelter site.

As discussed in **Section 3.3.1** the demolition activities may include the use of explosives in the demolition of major structures, such as the stacks. As such there is the potential for blasting overpressure generation. Blasting would be undertaken in accordance with *AS 2187: Explosives – Storage, Transport and Use* and other industry standards to minimise and manage potential impacts.

5.2.3 Proposed EIS Methodology

The following key tasks would be undertaken as part of a noise and vibration impact assessment to assess the noise and vibration impacts associated with the Project:

- Undertake noise monitoring to determine the background noise levels for the Project site and surrounds.
- Based on noise monitoring results, establish Project specific noise and vibration goals with consideration to the following publications:
  - *Industrial Noise Policy* (EPA, 2000)
  - *Interim Construction Noise Guideline* (DECCW, 2009)
  - *Assessing Vibration – A Technical Guideline* (DEC, 2006)
  - *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZECC, 1990)
- Identify the likely principal noise, vibration and blasting overpressure sources for each of the Works elements.
- Undertake modelling to predict noise, vibration and blasting overpressure impacts generated during the Works. This would include predictions for standard construction hours, evening and night time and consideration of cumulative noise with other sources (such as the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club, and the Hunter Expressway).
- Assess the predicted noise, vibration and blasting overpressure levels against the project specific goals.
- Identify activities that could be undertaken within the Project site outside standard construction hours without resulting in noise impacts on sensitive receivers.
- Identify mitigation measures to be implemented to manage potential noise, vibration and blasting overpressure impacts so that the Project complies with applicable criteria.

5.3 Air Quality

5.3.1 Existing Environment

As discussed in **Section 5.1.1** the Project site is approximately 440 metres from the nearest sensitive receiver, which is a rural residence owned by Hydro. The nearest rural residence not owned by Hydro is approximately 500 metres to the south, and the next nearest is approximately 700 metres to the southwest. There are approximately 24 rural residences within 1,000 metres of the Project site, of which 15 are on Hydro land.

The nearest residential area is Weston, which is approximately 1,800 metres to the southwest. The Kurri Kurri TAFE is approximately 1300 metres to the southeast and Kurri Kurri High School is approximately 1900 metres to the southeast.

The local air environment is likely to be fair to good. Potential local air quality influences include road transport (including the Hunter Expressway and local roads), Bloomfield Colliery (approximately eight kilometres to the southeast), agricultural activities and dust from unsealed roads in adjoining rural areas. Dust is also likely to be generated during events at the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club.

5.3.2 Potential Impacts

The Project has the potential to generate air quality impacts. Earthworks during remediation activities and construction and infilling of the containment cell have the potential to generate dust. Demolition of the Smelter structures also has the potential to generate dust, including potential temporary dust plumes from the detonation of the stacks.

Hazardous materials from with the building and infrastructure as well as remnants from the smelter operations would be removed prior to building demolition. This would minimise the potential for hazardous dust to become air borne and reduce the potential for impacts on sensitive receivers, and for contamination of surrounding areas.

Due to the distance to the nearest sensitive receivers and the dust control management measures to be implemented as part of the Works there is a low potential for dust from the Works to have an adverse impact on receivers. The implementation of standard dust control measures (such as dust suppression, minimising the area of exposed soils and appropriate demolition techniques) would reduce the potential for dust generation. This would include a review of activities that are undertaken, and management measures implemented, when events are held at the Kurri Kurri Speedway and the Junior Motorcycle Club which are approximately 200 metres from the Smelter site, and during winds (direction and speed) that could transport dust towards sensitive receivers.

5.3.3 Proposed EIS Methodology

The EIS would include a section on air quality that would address the following:

- The existing climactic and air quality of the Project site and surrounding area.
- The potential dust and vehicle emissions sources during the Works.
- The potential sensitive receivers that could be impacted by these potential dust and vehicle emissions during the Works.
- The management measures to be implemented to minimise the potential for dust and vehicle emissions to impact on sensitive receivers.

5.4 Aboriginal Heritage

5.4.1 Existing Environment

The Smelter site has been significantly disturbed through construction and ongoing operation of the Smelter. Similarly much of the proposed containment cell location has been subject to extensive earthworks that have removed the topsoil and subsoils. However approximately seven hectares of the proposed containment cell location is relatively undisturbed native vegetation.

A review of the OEH Aboriginal Heritage Information Management System found that there were 21 Aboriginal relic sites within 200 metres of the Project site (seven of these were removed or destroyed during construction of the Hunter Expressway). Ten of these sites were located on unsealed roads and power line easements adjoining the boundary of the Project site.

5.4.2 Potential Impacts

As discussed in **Section 3.3**, construction of the containment cell would require clearance and disturbance of up to seven hectares of bushland. Due to the limited disturbance that has occurred in this area and the presence of known Aboriginal relics adjoining the Project site there is the potential for Aboriginal heritage and cultural relics to be present within the previously undisturbed areas of the Project site.

There is the potential that construction of the containment cell would require the removal or destruction of Aboriginal heritage and cultural relics. Where possible other Project elements (such as access roads) could be constructed to avoid impacts on Aboriginal heritage and cultural relics.

5.4.3 Proposed EIS Methodology

The following key tasks will be undertaken as part of An Aboriginal Cultural and Heritage Impact Assessment to assess the potential impacts on Aboriginal culture and heritage associated with the Project:

- Implement the Aboriginal consultation process to meet Stages 1 to 4 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010).
- Review the OEH Aboriginal Heritage Information Management Systems database and obtain relevant site cards and reports.
- Mapping of all identified registered Aboriginal heritage objects identified from these reviews.
- Survey of targeted areas within the Project site with a qualified archaeologist and representatives of Aboriginal stakeholders.
- Preparation of a draft Aboriginal Cultural Heritage Assessment report which will include the following tasks:
  - Documentation of all Aboriginal consultation to meet the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010).
  - Mapping of existing sites identified during the earlier due diligence assessment, any additional sites or areas of Potential Archaeological Deposits (PADs) identified during the field survey to meet the requirements of the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011) and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010).
  - Assessment of the significance of any sites and/or PADs identified during the survey.
  - Identification of potential impacts resulting from the proposal to any sites.
  - Provision of recommendations to reduce or mitigate any impacts within the relevant legislative context.

- Documentation of the findings within the assessment report in accordance with *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011) and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010).

The draft assessment report would be issued to the Aboriginal stakeholders for review and comment before finalising for inclusion in the EIS.

5.5 Soils and Contamination

5.5.1 Existing Environment

Contamination

Hydro has commissioned a number of investigations of contaminated soils within the Smelter site. This includes the following:

- Sediment within the dams and drainage lines containing elevated benzo(a)pyrene concentrations and fluoride concentrations exceeding acceptable concentrations.
- Onsite soils contaminated with polycyclic aromatic hydrocarbons, total petroleum hydrocarbons and/or fluoride.
- Fluoride impacted soils between the Pot Lines.
- Potentially contaminated soils below structures for demolition and removal.
- The capped waste stockpile contains contaminated soils and smelter wastes (including spent potlining, cryolite, alumina, floor sweepings (alumina, cryolite, carbon), shot blast dust (carbon, steel shot), cement, potlining mix and small amounts of other materials including plastic, insulation materials, wood and steel). Soils below the stockpile are likely to be contaminated from the stockpile contents.

In addition to these contaminated soils within the Smelter site, Hydro is temporarily stockpiling contaminated soils and materials removed from other areas in the Hydro land (as discussed in **Section 3.3.3**). These soils and materials were removed during category 2 remediation works under State Environmental Planning Policy No 55—Remediation of Land and transported to a location within the Smelter site with appropriate environmental controls for stockpiling.

5.5.2 Potential Impacts

Soils

As discussed in **Section 3.3** clay sourced from within the Project site would be used in construction of the containment cell. Investigations are currently underway to determine the suitability of the clay for use in the containment cell and that there is sufficient quantity available to achieve the required containment. This will assist in further development of the containment cell design.

The Works have the potential to result in erosion and sediment loss from a number of sources, including:

- Earthworks for the sourcing of this clay.
- Construction of the containment cell, access roads and ancillary facilities.
- Clearance of native vegetation required for the clay extraction and containment cell construction, exposing soils.

- Stockpiling of excavated materials.
- Dirt and material tracked onto public roads.
- Excavation of contaminated soils.
- Demolition of the Smelter.

Contamination

The purpose of the Project is to remediate the Project site so that Hydro meets its environmental and social commitments, manages environmental legacies and facilitates the proposed future land uses.

The contaminated soils within the Smelter site would be removed and placed in the containment cell. The containment cell would be designed and operated to avoid future environmental and human health impacts from the contaminated soils.

5.5.3 Proposed EIS Methodology

Soils

The EIS would discuss the existing soil and geological conditions of the Project site, and discuss the potential impacts on soils during the Works. The EIS would also identify the erosion and sediment control measures to be implemented as part of the Works to minimise the potential for erosion and sediment loss.

Contamination

The EIS would be supported by a Remedial Action Plan (RAP) that is currently under preparation. This would include information on contamination within the Project site (the location, contaminants and level of contamination) and the measures to be implemented to remediate the Project site.

The Project Description in the EIS would detail the methodology for the removal of contaminated soils, their temporary storage and placement within the containment cell so as to minimise the potential impacts on human health and the environment, including erosion control and dust management.

The Project Description would also detail the methodology for ongoing operation and management of the containment cell so that contaminated soils within the cell do not impact on the surrounding area.

5.6 Waste Management

5.6.1 Potential Impacts

As discussed in **Section 3.3**, the majority of demolition materials would be made available for recycling or reuse. These materials would be processed, temporarily stockpiled and then transported off site.

Municipal wastes would be transported to the Cessnock Waste and Reuse Centre on Old Maitland Road. It is not anticipated that the type or quantity of municipal waste would have an impact on the operations of the centre.

Non-recyclable and non-reusable materials generated during the Works (including materials from the capped waste stockpile) would be placed in the containment cell. The containment cell would be operated, managed and maintained as outlined in **Section 3.4**. The containment cell would be designed and operated to minimise the potential for environmental impacts.

The Works would also generate other wastes, including:

- Green waste: from clearance of vegetation for the containment cell and ancillary facilities.
- Construction wastes: packaging and excess materials from construction materials used in the containment cell and other elements.
- General waste: food wrapping, office waste and other general materials.
- Human wastes: from toilet facilities provided for Works personnel.

5.6.2 Proposed EIS Methodology

The Project Description would describe the type and quantity of wastes to be generated during demolition and remediation, and how they are going to be managed. This would include a detailed description of the containment cell and the environmental controls incorporated into its design.

In addition the EIS would describe the other waste streams generated during the Works, and identify the waste management method to be implemented.

5.7 Hydrology and Water Quality

5.7.1 Existing Environment

Swamp Creek is the main watercourse in the Hydro land. The creek flows in a northerly direction in the east of the Hydro land, through the Wentworth Swamp before connecting with Wallis Creek, which then flows into the Hunter River.

An unnamed watercourse crosses the Project site, between the containment cell location and the Smelter site. Another watercourse is located to the north of the containment cell. Both of these unnamed watercourses are tributaries to Wentworth Swamp (and therefore Wallis Creek). Other small ephemeral watercourses and low lying areas are located to the east of the Project site and drain to Swamp Creek.

Two dams are located in the north of the Project site. These have previously been used as part of the water collection and treatment system for the Smelter, and continue to capture surface water runoff from the Smelter site.

5.7.2 Potential Impacts

The Works include a number of activities that would require implementation of measures to protect water quality and manage hydrological conditions. This would include:

- Clearing of vegetation for the construction of the containment cell.
- Earthworks for the construction of the containment cell.
- Temporary stockpiling of excavated materials, including contaminated soils.

- Construction of access roads and compound facilities. This includes construction of an access road crossing over the unnamed watercourse to connect the Smelter site with the containment cell.
- The uncovering and removal of the capped waste stockpile.
- Management of runoff generated within the Smelter site during demolition, including dust suppression water.
- Management of material placement within the containment cell.

The Smelter site and the containment cell are located above the 1% Annual Exceedence Probability (AEP) flood level. However areas to the north and a narrow corridor along the unnamed watercourse are below this level. The crossing of the unnamed watercourse would be designed and constructed to not generate adverse flood impacts upstream of the crossing and to maintain flows in the watercourse.

Due to the size of the containment cell it could potentially impact on local hydrology and surface flows. The design of the containment cell would consider and address these potential impacts.

One of the key elements of the Project is the leachate and groundwater treatment (as described in **Section 3.3.4**). The purpose of this work is to treat leachate within and below the capped waste stockpile to enhance the activities currently being undertaken by Hydro to further improve the quality of groundwater which ultimately flows to Swamp Creek.

The containment cell is to be designed and operated so that the contents of the cell would not impact on surface water or groundwater quality. Details on the containment cell design measures to achieve this would be detailed in the EIS.

5.7.3 Proposed EIS Methodology

The Project Description in the EIS would include details on the following:

- Water quality control measures to be implemented during the Works. It would also include the procedures to be implemented to manage the removal of the capped waste stockpile and the placement of material within the containment cell to minimise the potential for contaminated runoff to escape into receiving waters.
- The access road alignment and construction, including how the unnamed watercourse crossing would be designed and constructed to maintain flows in the watercourse and minimise upstream flooding impacts.
- The leachate and groundwater treatment process.
- Assessment of the potential impacts on hydrology and water quality from the containment cell, and the measures to be implemented to avoid, mitigate or manage such impacts.

The EIS would include a Hydrology and Water Quality section addressing these potential impacts and the proposed mitigation measures.

5.8 Social

5.8.1 Existing Environment

As discussed in **Section 3.1**, the Project site is north of the residential townships of Kurri Kurri, Weston and Heddon Greta, while the growing residential area of Gillieston Heights is

located to the northeast. Other areas to the north, east and west contain rural-residential land uses, a number of which are located on Hydro land. Also located within the Hydro land are the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club.

5.8.2 Potential Impacts

The Works have the potential to impact on these residential, rural residential and recreational areas as considered in **Sections 5.2** (Noise and Vibration), **5.3** (Air Quality), **5.9** (Traffic and Access) and **5.10** (Visual and Aesthetics) for up to a four year period (as discussed in **Section 3.3**).

However the Works also provide a potential social benefit to these local communities through direct and indirect employment opportunities. The local community also benefits from the continuation of Hydro's commitment to its environmental obligations and managing environmental legacies.

As discussed in **Section 1.1**, Hydro is committed to undertaking remediation and building demolition to render the Hydro land safe for human health and the environment, and in doing so make it suitable for future use. For the Project site this includes employment land. Therefore the Project would provide medium to long term social and economic benefits to the local community and the wider Hunter Region.

As discussed in **Section 5.12** the Smelter played a significant role in the recent social and industrial history of the local area and the Hunter Region. Previous employees and local residents may have an interest in the Smelter demolition.

5.8.3 Proposed EIS Methodology

In addition the assessments described in **Sections 5.2** (Noise and Vibration), **5.3** (Air Quality), **5.9** (Traffic and Access) and **5.10** (Visual and Aesthetics) the EIS would also include a section addressing the other potential social impacts and benefits associated with the Project.

As discussed in **Section 6.1** Hydro is undertaking a number of stakeholder engagement activities. The EIS would acknowledge relevant issues raised during this engagement and how these issues are addressed in the Project.

As discussed in **Section 5.12** the EIS would describe the history of the Smelter.

5.9 Traffic and Access

5.9.1 Existing Environment

The Project site is serviced by the following key local, state and national roads:

- Hart Road is the access to the Project site. It is a local road and intersects with Government Road/ Sawyers Gully Road to the south of the Project site.
- Dickson Road is a local road that intersects with the northern end of Hart Road, and continues in an easterly direction. It provides access to parts of the Hydro land, including properties leased by the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club.
- Government Road/ Sawyers Gully Road is used by traffic to connect with Mitchell Avenue, which becomes part of Main Road B58.

- Hunter Expressway passes immediately south of the Project site. Ramps at the Hart Road interchange allow vehicles travelling from the south to exit the expressway and access the Project site, and vehicles can exit Hart Road to travel south.

  Vehicles can travel north from the Project site on the Hunter Expressway by travelling south from the Hart Road interchange before using the Main Road interchange as a roundabout to then travel north.

5.9.2 Potential Impacts

Section 3.3 discusses the potential sources of traffic on public roads generated by the Works, and the likely routes that Works vehicle would travel. **Section 3.3** also discusses the access roads that would be constructed within the Project site for the haulage of materials for construction activities, demolition activities and to transport materials for placement in the containment cell.

Works vehicles travelling on public roads would include personal vehicles of Works personnel, trucks for the delivery and removal of construction machinery and works compound components, removal of recyclable and reusable materials, transport of municipal wastes and delivery of materials.

As discussed in **Section 3.3** Works vehicles would avoid residential streets and maximise travel on arterial and state roads. Hart Road and the intersection of Hart Road and Government Road/ Sawyers Gully Road serviced the significant traffic that was generated when the Smelter was operational (including truck movements). It is expected these roads and the intersection would be sufficient in servicing the substantially lower traffic volumes that would use this road and intersection during the Works.

It is anticipated that much of the traffic entering and exiting the Project site would use the Hunter Expressway Hart Road interchange, thereby minimising traffic utilising the Hart Road and Government Road/ Sawyers Gully Road intersection and other local roads. It is unlikely that the Project would have an adverse impact on the level of service of the Hunter Expressway Hart Road interchange or the Hart Road and Government Road/ Sawyers Gully Road intersection.

There is the potential that traffic controls would be required to manage construction vehicles at the intersection of Hart Road and Dickson Road. Such controls would be developed in consultation with Cessnock City Council and the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club.

Traffic generated during operation of the containment cell would be limited to maintenance vehicles travelling to the Project site as required to monitor and maintain the containment cell as required. It is not expected to impact on local traffic.

5.9.3 Proposed EIS Methodology

The Project Description would address the potential traffic generation during the Works, estimating numbers and likely types of vehicles. It would also confirm the routes that would be travelled by Project vehicles and identify traffic controls that may be required on public roads to minimise potential safety, access and traffic impacts. This would include the controls required to minimise potential access and safety issues for vehicles accessing the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club.

A Traffic Impact Assessment would be undertaken to confirm that the traffic generated by the Works would not adversely impact upon the Level of Service of the intersection of Hart Road and Government Road/ Sawyers Gully Road, or the Hunter Expressway Hart Road interchange. It would also inform the traffic controls to be implemented and described in the Project Description.

5.10 Visual and Aesthetics

5.10.1 Existing Environment

The existing visual environment of the area is dominated by four main elements:

- The native vegetation immediately adjacent to the north, west and southwest of the Project site.
- The cleared agricultural land to the east and northeast of the Project site.
- The Hunter Expressway, including noise attenuation barriers and bridges, to the south of the Project site.
- The Smelter.

From many directions the majority of the Smelter is not visible due to the surrounding native vegetation and the local topography. The tallest chimney stack visible is primarily the only Smelter structure visible from residential areas to the south and east. Some rural residences to the northeast, east and southwest have views of the Smelter, as do motorists travelling on part of the Hunter Expressway.

5.10.2 Potential Impacts

The Smelter has been part of the visual environment of the local area since 1969. Its removal from the visual landscape is likely to be considered a neutral or positive visual impact by the local community. However the Smelter's demolition would facilitate the future redevelopment of the Project site for industrial activities that would likely to be visible from those rural residences to the northeast, east and southwest of the Project site, and motorists travelling on part of the Hunter Expressway.

The containment cell would be designed and constructed to minimise elevation and be generally consistent with the existing landform. With the clearance of native vegetation required to facilitate construction of the containment cell there is the potential that it could be visible from within and outside the Hydro land.

Over the long term, the Project site would provide a landscaped open space area within the future employment hub. The landscaped area would provide visual relief to the overall built form and complement landscape treatments to riparian corridors and road reserves. In the interim, a grass layer would be provided to the containment cell to mitigate potential visual impacts.

The Project site would largely be out of view during the Works from the majority of surrounding residences, but would be visible from Hart Road and Dickson Road (including the speedway and motorcycle club on Dickson Road), and some rural residences to the northeast, east and southwest of the Project site. There would be potential temporary visual impacts during the Works.

5.10.3 Proposed EIS Methodology

The EIS would assess the potential visual impact of the Project, including both the final landform and during construction. The visual impact assessment would:

- Identify the visual corridors to the Project site and the existing visual landscape from these areas.
- Determine the future visual landscape upon completion of the Works from these areas and assess the potential visual impacts.
- Assess the potential visual impacts during the Works and identify management measures (if required) to mitigate potential impacts.

5.11 Carbon and Energy

5.11.1 Potential Impacts

The Works would include a number of machinery and equipment that would use energy and generate greenhouse gas emissions, including:

- Operation of plant and machinery for earthworks, demolition, material processing and associated activities.
- Electricity to supply ancillary facilities, lighting and other equipment.
- The clearance of native vegetation to facilitate construction of the containment cell.
- Vehicles for the transport of material within the Project site, machinery and materials to the Project site and wastes and reusable material from the Project site.

The materials within the containment cell would generate greenhouse gas emissions.

5.11.2 Proposed EIS Methodology

The EIS would include a Greenhouse Gas Assessment, which would include the following:

- Identification of the Works activities that would generate greenhouse gas emissions.
- Where possible quantification of the greenhouse gas emissions associated with those activities.
- Quantification the greenhouse gas emissions associated with the placement of materials in the containment cell.
- A description of the energy efficiency and greenhouse gas management measures to be implemented during the Works and operation of the containment cell.

5.12 Non-Indigenous Heritage

5.12.1 Existing Environment

A search of the NSW Heritage Inventory did not identify any heritage items of local or state significance within the Project site. The nearest listed heritage item is the South Maitland Railway (of local significance) which is approximately 700 metres to the east/ southeast of the Project site.

The Smelter played a significant role in the recent social and industrial history of the local area and the Hunter Region from the commencement of operations in 1969 until the cessation of production in 2012. It was a significant employer for over 40 years and played a key role in the local area.

5.12.2 Potential Impacts

Demolition of the Smelter forms a key element of the Project. All structures within the Smelter site would be removed.

5.12.3 Proposed EIS Methodology

The EIS would describe the history of the smelter.

5.13 Cumulative Impacts

5.13.1 Potential Impacts

The Works have the potential to generate cumulative impacts with other activities in the local area, including:

- Noise and air quality impacts generated from the Hunter Expressway, the Kurri Kurri Speedway and Kurri Kurri Junior Motorcycle Club, the South Maitland Railway and nearby industrial operations.
- The visual impact of other major landscape elements, such as the Hunter Expressway (including noise attenuation barriers).
- Vegetation clearance undertaken within the local area of similar habitat and ecological communities.
- Future construction activities or developments that may be undertaken in the local area.

In addition, activities undertaken within the Works could be undertaken concurrently and have cumulative impacts.

5.13.2 Proposed EIS Methodology

The assessments described in **Sections 5.1** (Ecology), **5.2** (Noise and Vibration), **5.3** (Air Quality), and **5.10** (Visual and Aesthetics) would consider the contributions of other activities in the local area when considering the overall impact of the Project.

These assessments would also review the activities described in **Section 3** and identify those that are likely to occur concurrently. The impacts of these concurrent activities would be considered where applicable.

6 Stakeholder Engagement

6.1 Local Community

Following the announcement of the closure of the Smelter in May 2014, Hydro commenced a stakeholder engagement program to involve the community in the future of the Hydro land. A website (http://www.hydro.com/Kurri) has been established to provide information on the plans for the Hydro land, including the Project.

In addition, a number of consultation and communication methods have been established:

- The establishment of the Community Reference Group.
- A community information line 1800 066 243.
- A community information email address: community.kurri@hydro.com.
- Letters and newsletters which have been and will continue to be sent to neighbours and other interested stakeholders.

The community would be invited to comment on the Project throughout the EIS preparation and the Works, and issues raised in submissions would be addressed.

6.2 Indigenous Stakeholders

Consultation with the local indigenous community would be undertaken as part of the Aboriginal Heritage Impact Assessment (as described in **Section 4.4**) and their knowledge and interests would form a key part to understanding the potential for the Project to impact on Aboriginal heritage and culture.

Hydro has been consulting through the future land use investigations, and would build on this existing relationship.

6.3 Government Agencies

Hydro has maintained communications with key government agencies during identification and assessment of options for the Project site and the Hydro land, and would continue communications during the EIS preparation period. This includes the Environment Protection Authority, Cessnock City Council, the Department of Planning and Environment (including the Office of Environment and Heritage), Roads and Maritime Services and Maitland City Council (the northeast corner of the Hydro land is within the Maitland local government area).

7 Next Steps

The purpose of this PEA is to provide preliminary information on the environmental benefits and risks of the Project. This will assist the Department and other relevant agencies to understand the Project and develop the requirements for the EIS in accordance with the EP&A Act and Regulation.

An EIS will then be prepared in accordance with the Secretary Environmental Assessment Requirements issued by the Department of Planning and Environment, and relevant legislation, regulations and policies.

Consultation during preparation of the EIS will be undertaken so that stakeholders and members of the community are provided with the opportunity to identify issues that would be included and addressed in the EIS.

8 References

Australian and New Zealand Environment Conservation Council (ANZECC) 1990. *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*.

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Holywell, G. and Breault, R. (2013). *An Overview of Useful Methods to Treat, Recover or Recycle Spent Potlining*. Journal of Metals, 65 (11), p. 1441- 1451

Office of Environment and Heritage (OEH). 2011. Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW .

9 Limitations

ENVIRON Australia prepared this report in accordance with the scope of work as outlined in our proposal to Hydro Aluminium Kurri Kurri Pty Ltd dated 5 September 2012 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, information provided by the client and publicly available information. ENVIRON disclaims responsibility for any changes that may have occurred after this time.

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

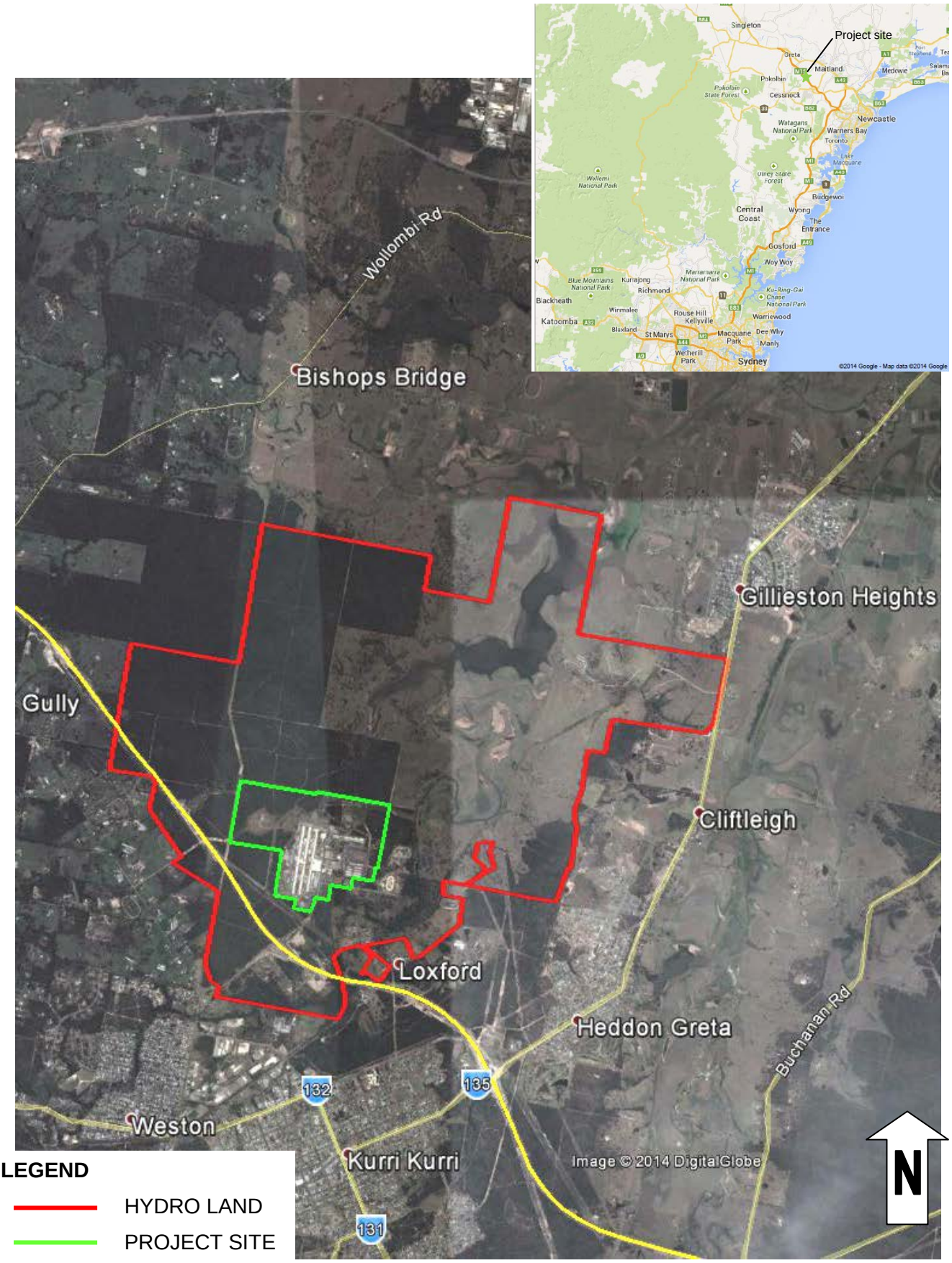
ENVIRON did not independently verify all of the written or oral information provided to ENVIRON during the course of this investigation. While ENVIRON has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided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

Figures

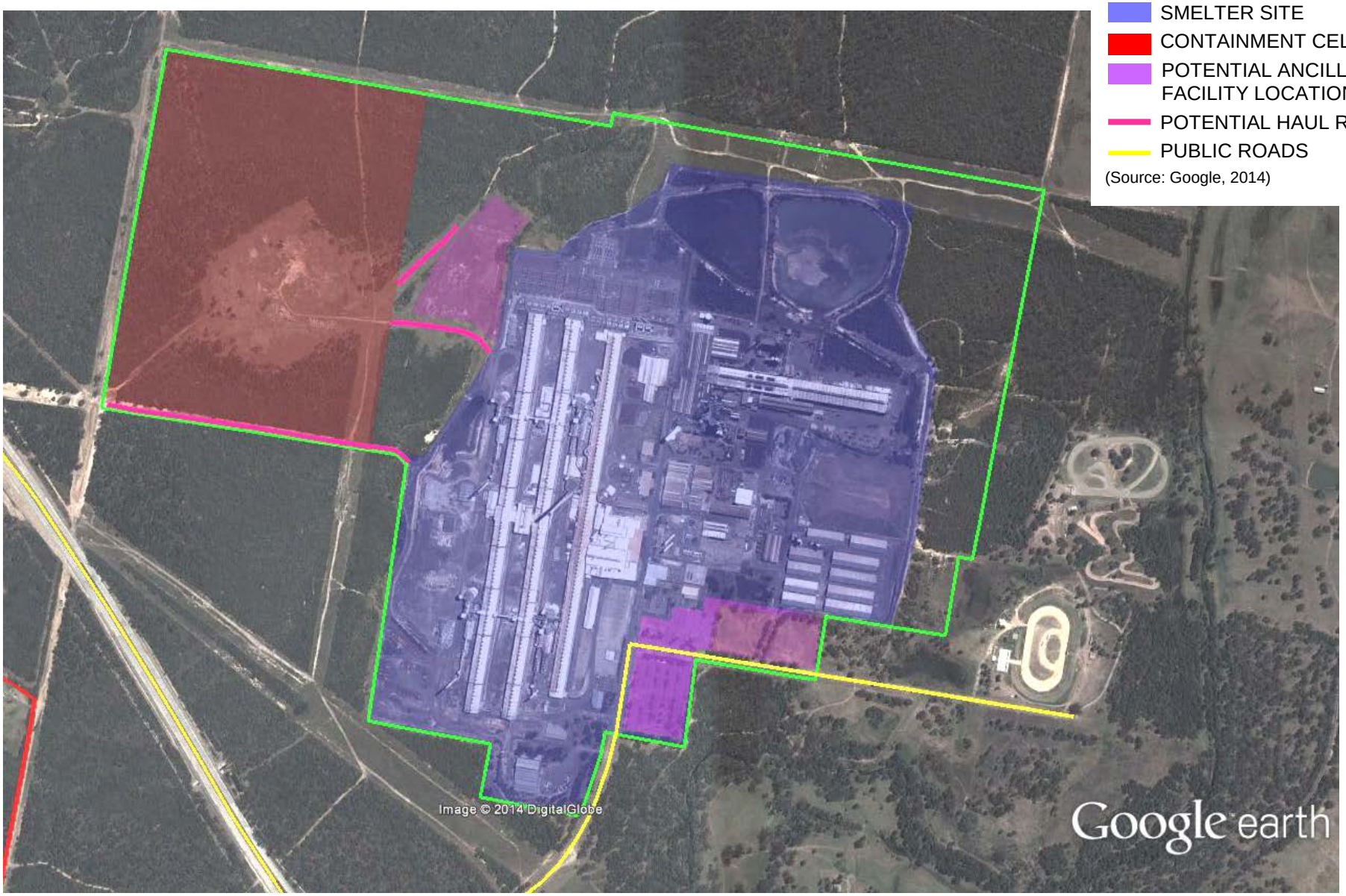


HYDRO ALMUNIUM KURRI KURRI PTY LTD
PRELIMINARY ENVIRONMENTAL ASSESSMENT

PROJECT SITE LOCATION

(Source: Google, 2014)

ENVIRON JOB NO:AS130349 DATE: 21/08/2014 FIGURE 1



HYDRO ALUMINIUM PRELIMINARY KURRI KURRI ENVIRONMENTAL ASSESSMENT | PROJECT SITE LAYOUT

ENVIRON | JOB NO:AS130349 | DATE: 21/08/14 | FIGURE 2

Appendix A

International Examples of Spent Potlining Management

Table II. Examples of current storage

	Company	Specific location
Stored in lined sites	RTA	Kitimat, British Columbia, Canada
	RUSAL	Sayanogorsk, Russia
	Alba	Bahrain
	Aluar	Puerto Madryn, Argentina
	Elkem	Norway
	Vendanta	Jharsguda, India
Stored in unlined sites	Egyptalum	Nag Hammadi, Egypt
	RUSAL	Novokuznetsk, Russia
	RUSAL	Volgograd, Russia
	Hydro	Kurri Kurri, NSW, Australia
	RTA	Isal, Iceland
Stored in buildings	RTA	Arvida, Saguenay-Lac-Saint-Jean, Quebec, Canada
	RUSAL	Taishet, Khakass, Russia
Stored in hazard waste sites	Dubal	Dubai, United Arab Emirates
	NALCO	Angul, India
	Hindalco	Aditya, India
Stored in industrial waste sites	Hydro aluminium	Noah Langøya, Norway

Table III. SPL reused untreated

Company	Industry	Location
Albras-Aluar	Cement	Brazil
SELCA Tomago	Steel	Italy
Inespal, Hydro	Rockwool	Germany
RUSAL	Steel, cement (trials)	Bratsk; Novokuznetsk, Irkutsk[12]
BHP Hillside, Bayside	Cement	South Africa
Sterlite Industries	Cement	Korba
Shandong, Guizhou aluminum smelter	Alumina plants	China
Hydro's process[13] for Al/Si alloys	Aluminum industry	

Table IV. Pilot and industrial processes

			Development			
Owner	Process	Goal	Pilot	Demo Plant	Industrial	Status
RTA (Pechiney)	SPLIT	Industrial waste	x	x		Stopped
Outotec (Lurgi)	Gasification	ALF_3 and industrial waste	x	x		Stopped
Nova PB	Rotary kiln	Industrial waste	x	x		Stopped
Alcoa (Alcoa of Australia)	Ausmelt	AlF_3 and industrial waste	x	x		Stopped
Alcoa (Elkem)	Arc furnace	Recovery pig iron and industrial waste	?			Stopped[22]
RT (Comalco)	COMTOR	Bayer liquor/industrial waste			x	In operation
Ormet/Alcoa	VORTEC	AlF_3/industrial waste	x			Stopped
Regain	Rotary kiln	Partially detoxified SPL			x	
Chalco Zhengzhou	Rotary Kiln	Industrial waste	x			
Chalco Pingguo	Rotary Kiln	Industrial waste?			x	Ongoing
Alcoa (Reynolds)	Rotary kiln	Industrial waste	x	x	x	In operation
Yichun Smelter	Flotation	Industrial waste	?			
RTA	LCL&L	Bayer Liquor, CaF_2 and industrial waste	x	x	x	In operation
BEFESA	Hydrometallurgy	Industrial waste			x	In operation

Industrial wastes are landfilled or recovered through the cement industry.

Source : Holywell, G. & Breault, R. (2013). *An Overview of Useful Methods to Treat, Recover or Recycle Spent Potlining*. Journal of Metals, 65 (11), p. 1441- 1451

Appendix B

Examples of Containment Cells

Project Title	Project Description
Pasminco Cockle Creek Smelter Remediation Project Boolaroo, NSW	Pasminco Cockle Creek Smelter Pty Ltd obtained approval from the Department of Planning and Environment on 27 February 2007 for remediation of contaminants. The Project includes a containment cell comprising: • A drainage layer and leachate collection and conveyance system to be placed at the base of the cell; • Materials placement; and • Capping of roof and side walls. The cell is approved to contain 450,000 m^3 of material, with an area of 19.4 hectares. The batter height ranges from nine to 12 metres above surrounding ground levels. Contaminants to be placed in the proposed cell include: • Slag materials that are residuals from the zinc and lead production smelting process; • Lead blast furnace that is effectively a solidified mass which is relatively impermeable and stable; and • Miscellaneous contaminated soil and fill.
Mayfield Site Remediation (Lot 223, Industrial Drive Mayfield, NSW)	BHP Billiton obtained approval from the Department of Planning and Environment on 2 August 2002 for remediation of part of former Newcastle Steelworks site. The Project includes excavating and re-contouring about 67,500 cubic metres of contaminated material and capping. Types of contaminants include: • Blast furnace, Basic Oxygen Steelmaking (BOS), and Brecketts fines slag; • Coke ovens by-products; • Coal washery slurry; • Grease and oils; • Industrial waste (including sheet metal and wire rope); and • Refractory, bottom and fly ash. A modification to the application (Amendment Application) was lodged by Koppers and approved by the Department of Planning and Environment for a barrier wall that is to be 417m in length and have an average depth of 18m to isolate DNAPL contaminants (mainly Polycyclic Aromatic Hydrocarbons) from groundwater.
Worth Place Park Remediation Project Newcastle, NSW	Hunter Development Corporation obtained approval from the Department of Planning and Environment on 2 December 2008 to remediate soils contaminated with Polycyclic Aromatic Hydrocarbons at Worth Place Park. The cap and contain strategy was approved involving placement of a 0.5m of clean fill over the contaminated area. An identification layer of geo-fabric is to be placed at the capping layer/existing surface interface. The remediation area is approximately 2820m^2.

Project Title	Project Description
Remediation by Landfilling of Mine Tailings Ponds at Ayrfield Colliery North Rothbury, NSW	Leaway Pty Ltd obtained approval from the Department of Planning and Environment on 24 April 2002 for land remediation of Coal Washery Tailings Ponds on the Former Ayrfield Colliery No. 3 site at North Rothbury. A total volume of some 105,000m^3 of waste building material was approved to be landfilled at the site, over a period of approximately seven years. Approval was received for placing a one metre cap over the inert waste.
GPT redevelopment Charlestown, NSW	The Project was approved by Lake Macquarie City Council in November 2007. It involves, among other development, a containment cell comprising the following elements: • Cut to fill 30,000m^3 of asbestos Impacted soil followed by capping with marker layer and 6,000m^3 of engineered clay cap. • Chase and excavate to stockpile 850m^3 of lead slag impacted soil. • Construction of on-site lead slag encapsulation cell including the supply and installation of GCL layer. • Contaminants include asbestos and lead.
Stockland Development Woodville, Western Australia	Stockland Developments Pty Ltd obtained approval from City of Charles Sturt Council for excavation and on-site containment, comprising a 1.3-2 m layer placed directly beneath a 1.0-1.3 m layer of soil. The majority of the site contamination is associated with near surface soils. The site is approximately 151,685m^2 in size. Contaminants typically consist of metals (arsenic, zinc, copper), PAHs and organics.
Decommissioning, Demolition & Remediation Former Lead Battery Mine Facility, Northampton, Western Australia	WA Department of Treasury and Finance obtained approval from the WA Department of Environment Regulation for, among other development, encapsulation of building waste and lead tailings in an on-site containment cell in 2010. The project comprised the removal of 500m^3 of asbestos impacted soils and the construction of an onsite containment cell. It also included the excavation and placement of 35,000m^3 of lead tailings in the containment cell. A HDPE liner and geotextile protection layer was placed at the base of the containment cell. A 300mm topsoil layer and spray grass application was placed on top of the containment cell. Goldcorp is responsible for maintaining the containment cell.
Redevelopment Brompton, South Australia	Angas Consortium (Joint Venture between Kinsmen Developments, Australian Property Projects and Adelaide Civil) in conjunction with the SA Land Management Corporation (now Renewal SA) redeveloped former industrial sites (covering approximately 8 hectares) at Brompton, South Australia. The sites contained approximately 500,000m^3 of uncontrolled fill with an average fill depth of eight metres. Site contamination consisted of metals (lead, copper, zinc) and organics (PAH, TPH, BTEX, OCP, pentachlorophenol). An on-site containment cell to hold the impacted fill material (20,000m^3) was proposed.

Project Title	Project Description
Dayboro Remediation, Queensland	The Project involved, among other development, remediation of chemical contamination and placement of 200m^3 of soils into a designed and constructed containment cell. The Project was carried by the Queensland Department of Main Roads as part of the construction of Section B (Sankeys Road to Traveston Road) of the Bruce Highway Upgrade (Cooroy to Curra).