

Intended for
Hydro Aluminium Kurri Kurri Pty Ltd

Document type
Remedial Action Plan

Date
November 2018

REMEDIAL ACTION PLAN

BUFFER ZONE ASBESTOS KURRI KURRI, NSW

REMEDIAL ACTION PLAN BUFFER ZONE ASBESTOS KURRI KURRI, NSW

Revision **Final**
Date **26 December 2018**
Made by **Kirsty Greenfield**
Checked by **Fiona Robinson**
Approved by
Description **Ramboll has prepared a remediation strategy for asbestos contamination at properties within the Buffer Zone associated with the former Hydro Aluminium Kurri Kurri Smelter. The strategy is presented in this Remedial Action Plan.**

Ref AS130417
AS130417_Buffer Zone Asbestos_RAP_Final.docx

Ramboll Australia Pty Ltd
Level 2, Suite 19B
50 Glebe Road
PO Box 435
The Junction
NSW 2291
Australia
T +61 2 4962 5444
F +61 2 4962 5888
www.ramboll.com

CONTENTS

EXECUTIVE SUMMARY	I
1. INTRODUCTION	1
1.1 Background	1
1.2 Objective	1
1.3 Regulatory Framework and Guidelines	2
2. SCOPE OF WORK	3
3. SITE IDENTIFICATION	4
3.1 Site Location	4
3.2 Site Boundaries	6
4. SITE HISTORY	7
5. SITE CONDITIONS	8
5.1 Topography	8
5.2 Geology	8
5.3 Regional Hydrogeology	8
5.4 Site Sensitivity	8
6. ASSESSMENT CRITERIA	10
6.1 Contaminants of Concern	10
6.2 Soil	10
6.3 Surface Water and Groundwater	11
7. SITE CHARACTERISATION	12
7.1 Assessment of Contamination	12
7.2 Asbestos Results	12
7.3 Buffer Zone Built Structures	15
7.4 Conceptual Site Model	16
7.5 Statement of Suitability for Existing and Proposed Site Use	17
8. BUFFER ZONE STATUS IN 2017	18
8.1 2017 Walkover	18
8.2 Completed Works and 2017 Observations	18
9. REMEDIAL ACTION PLAN	22
9.1 Remediation Goal	22
9.2 Extent of Remediation Required	22
9.3 Remediation Options	22
9.4 Rationale for the Selection of the Recommended Remedial Option	23
9.5 Contingency if the Remediation Strategy Fails	23
9.6 Interim Site Management Plan	24
10. REMEDIAL ACTION WORKS PLAN	25
10.1 HOLD POINT	25
10.2 Mobilisation	25
10.3 Remedial Methodology	25
10.3.1 Identification of Asbestos Impacts	25

10.3.2	Collection of Surficial Asbestos	25
10.3.3	Excavation of Buried Asbestos	25
10.3.4	Spoil Management	26
10.3.5	Materials Tracking	26
10.3.6	Imported Fill	26
10.3.7	Validation of Remediation	26
10.3.8	Reshaping and Final Landform	27
10.3.9	Smelter Site Stockpile Area	27
10.3.10	Demobilisation	28
11.	VALIDATION PLAN	29
11.1	Validation Sampling and Analysis	29
11.2	Validation Data Quality Objectives	29
11.2.1	Step 1: State the Problem	29
11.2.2	Step 2: Identify the Decisions	30
11.2.3	Identify Inputs to the Decision	30
11.2.4	Step 4: Define the Study Boundary	30
11.2.5	Step 5: Development of Decision Rules	30
11.2.6	Step 6: Specific Limits of Decision Error	30
11.2.7	Step 7: Optimise the Design for Obtaining Data	31
11.2.7.1	Imported Fill Sampling	32
11.3	Remediation Acceptance Criteria	32
11.4	Validation Reporting	33
12.	CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN	34
12.1	Construction Environmental Management Plan	34
12.2	Asbestos Management Protocol	34
12.2.1	Asbestos Related Permits and Approvals	34
12.2.2	Management of Unexpected Friable Asbestos	34
12.3	Site Access	35
12.4	Hours of Operation	35
12.5	Air Controls	35
12.5.1	Air Monitoring	35
12.5.2	Dust Control	35
12.5.3	Odour	35
12.6	Noise Control	36
12.7	Erosion and Sediment Control	36
12.8	Surface Water and Groundwater Control	36
12.8.1	Surface water	36
12.8.2	Groundwater	36
12.9	Traffic Control	37
12.10	Spill Response	37
12.11	Hazardous Materials	37
12.12	Flora and Fauna	37
13.	HEALTH AND SAFETY	39
14.	REMEDIATION SCHEDULE	40
15.	ENVIRONMENTAL CONTROLS CONTINGENCY PLAN	41
16.	REGULATORY COMPLIANCE REQUIREMENTS	42
17.	KEY PERSONNEL	44
18.	COMMUNITY RELATIONS PLAN	45
19.	LONG TERM MANAGEMENT	46
20.	REFERENCES	47
21.	LIMITATIONS	48

FIGURES

Figure 1	Site Location
Figure 2	Location and Proposed Zoning of Affected Lots
Figure 3	Parcel 2
Figure 4	Parcel 3
Figure 5	Parcel 4 Lot 16
Figure 6	Parcel 4 Lot 422
Figure 7	Parcel 6
Figure 8	Parcel 7
Figure 9	Parcel 8
Figure 10	Parcel 9 Lot 20
Figure 11	Parcel 9 Lot 439
Figure 12	Parcel 9 Lots 22 and 448
Figure 13	Parcel 10
Figure 14	Parcel 12
Figure 15	Parcel 13 Lot 458
Figure 16	Parcel 13 Lot 459
Figure 17	Parcel 13 Lot 460
Figure 18	Parcel 13 Lot 461
Figure 19	Parcel 13 Lot 462
Figure 20	Parcel 13 Lot 463
Figure 21	Parcel 14
Figure 22	Parcel 17

ACRONYMS AND ABBREVIATIONS

ACM	Asbestos Containing Materials
AEC	Area of Environmental Concern
AHD	Australian Height Datum
ALS	Australian Laboratory Services
ASET	Australian Safer Environment and Technology Pty Ltd. (Laboratory)
ANZECC	Australian and New Zealand Environment and Conservation Council
B(a)P	Benzo(a)pyrene
BGS	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene & Xylenes (Monocyclic aromatic Hydrocarbons)
CN	Cyanide (total or free)
CT	Certificate of Title
DP	Deposited Plan
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
Ha	Hectare
km	Kilometres
LOR	Limit of Reporting
m	Metres
MAH	Monocyclic Aromatic Hydrocarbons
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Fe: Iron, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
m BGL	Metres below ground level
µg/L	Micrograms per Litre
MW	Monitoring well
NATA	National Association of Testing Authorities
NC	Not Calculated
ND	Not Detected
NEHF	National Environmental Health Forum
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
OCPs	Organochlorine Pesticides
OH&S	Occupational Health & Safety
OPPs	Organophosphorus Pesticides
PAEC	Potential Area of Environmental Concern
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PQL	Practical Quantitation Limit
pH	a measure of acidity, hydrogen ion activity
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
SILs	Soil Investigation Levels
SVOCs	Semi Volatile Organic Compounds
TPHs	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
VENM	Virgin Excavated Natural Material
VOCs	Volatile Organic Compounds
µg/L	Micrograms per Litre
-	On tables is "not calculated", "no criteria" or "not applicable"

EXECUTIVE SUMMARY

Ramboll has been commissioned by Hydro Aluminium Kurri Kurri Pty Limited (Hydro) to prepare this Remedial Action Plan (RAP) for the implementation of remedial works at the Buffer Zone of the Hydro Aluminium Smelter near Kurri Kurri, New South Wales, 2320.

The Buffer Zone is land owned and managed by Hydro as part of the smelter operations. The smelter closure was announced in May 2014 and Hydro is now preparing land for future divestment and redevelopment. The Buffer Zone has been segmented into Parcels for redevelopment, with eleven Parcels impacted by asbestos (Parcels 3, 4, 6, 7, 8, 9, 10, 12, 13, 14 and 17). These Parcels are proposed to be rezoned for a range of uses, including residential, commercial/ industrial and environmental conservation, and remediation of the land for these purposes is required. The objective of this RAP is to describe the works necessary to render these Parcels suitable for their planned future land uses.

In the 1950s, Lots within the southern, eastern and north-eastern portions of the Buffer Zone were developed for rural residential landuse. Development included the construction of residential dwellings and farm buildings such as sheds for housing livestock (poultry and pigs). Buildings constructed during the 1950s and 1960s included asbestos containing (ACM) building materials. A number of these dwellings and associated sheds with ACM building materials were demolished in the 1980s, 1990s and more recently. Following demolition, ACM in the form of fibro fragments remain scattered across the footprints of the former buildings and buried within the Lot. ACM from building materials impacts Parcels 4, 6, 9, 10, 12 and 13.

The bulk of the western portion of the Buffer zone remains undeveloped bushland, with the only development a former hobby farm on Parcel 8. The hobby farm was demolished in the 1980s. Information from Hydro personnel indicated demolition wastes, including asbestos wastes, have been illegally dumped (not by Hydro or the previous Smelter owners, by others) in easily accessible areas of the Buffer Zone in the past. Wastes are generally dumped along road easements that are easily accessible on the edge of the bushland. Illegal dumping of ACM has impacted Parcels 3, 7, 8 and 14.

In addition, ACM building materials have been identified within current structures as reported in Hazardous Building Materials Audits completed by Ramboll in 2015. Some of these current structures were demolished in 2015 and 2016 and ACM fragments remain in soils within the footprint of these structures. Recent demolition has occurred at Parcels 2, 4, 9, 10 and 13. Parcels 2, 9, 10, 12, 13 and 17 contain current structures containing ACM that are not planned to be demolished.

A review of remediation options was undertaken and also included a review of remedial options applicable to all Hydro owned lands (a whole-of-site strategy). Remediation options were considered in terms of cost, risk of failure, long term legacy and onsite management, corporate responsibility and sustainability. The preferred strategy was the collection of surficial asbestos and the excavation of buried asbestos in order to remove all contaminant management requirements from the affected lots. Collected asbestos materials are to be relocated to the Smelter Site, where they will be incorporated within a whole-of-site remediation strategy.

This RAP outlines the remedial plan to be implemented at each affected lot to achieve the remediation objective. The RAP includes a detailed works methodology including validation requirements and environmental controls to be implemented during the works. The environmental controls are consistent with Ramboll Environ (March 2016) Hydro Aluminium Kurri Kurri Smelter Decommissioning and Demolition, Draft Environmental Management Plan. At the completion of works a validation report will be compiled including a clear statement of the suitability of each lot for the proposed future land use.

1. INTRODUCTION

The following Remedial Action Plan (RAP) details site conditions and requirements for remediation of areas of the Buffer Zone that have been impacted the demolition of structures constructed with asbestos-containing building materials (ACM) and by the illegal dumping and burial of asbestos (by others). Asbestos was not dumped or buried by Hydro or the previous Smelter owners. In addition, the RAP details validation requirements following the demolition of built structures comprising asbestos-containing building materials within the Buffer Zone and following remediation of illegally dumped ACM wastes.

The Buffer Zone is land owned by the Hydro Aluminium Kurri Kurri Smelter. Areas of the Buffer Zone with structures containing ACM are generally concentrated in the south east and north east of the Buffer Zone. Areas impacted by illegal dumping and burial of asbestos by others are generally located in the south and east of the Buffer Zone in Loxford, New South Wales (NSW) as shown in **Figure 1**.

1.1 Background

Hydro is evaluating options for redevelopment and possible divestment of land parcels following closure of the Hydro Aluminium Kurri Kurri Smelter in May 2014. A Rezoning Masterplan has been developed that identifies land parcels within the Buffer Zone as comprising land suitable for different uses, including residential, commercial/ industrial and environmental conservation. The Rezoning Masterplan is subject to change, however the main land uses identified are unlikely to change significantly. These land uses are based around Cessnock City Council zones Environmental Conservation (E2), General Residential (R1), Low Density Residential (R2), Rural Landscape (RU2), Public Recreation (RE1), Business Park (B7), General Industrial (IN1), Heavy Industrial (IN3), Neighbourhood Centre (B1) and Special Purpose Infrastructure (SP2) and Maitland Council zone General Residential (R1).

A Phase 1 Environmental Site Assessment, (previously prepared for all Hydro owned lands), had evaluated the potential for contamination of the Smelter Site and surrounding Buffer Zone and identified the presence of ACM fragments associated with the demolition of former structures and illegally dumped and buried asbestos (by others) at a number of locations within the west, south and east of the Buffer Zone.

A Phase 2 Environmental Site Assessment was conducted at each of these land parcels, which included a site inspection, excavation of test pits, soil sampling and analysis. The assessments confirmed the presence of ACM fragments on the ground surface associated with the demolition of former structures and illegally dumped and buried asbestos (by others) at a number of locations.

The presence of ACM fragments and illegally dumped and buried asbestos (by others) on these land parcels was considered to pose an unacceptable risk to human health and the environment in the context of the proposed landuses and remediation is required.

In addition, a Hazardous Materials Audit was completed at each Parcel that contains built structures, such as houses, garages and chicken sheds to assess the potential for the use of asbestos-containing building materials. A Hazardous Materials Register was then developed for each Parcel where asbestos-containing building materials have been used. Some of these built structures are to be demolished prior to the divestment of these Parcels. Validation of the removal of asbestos-containing building materials is required following the demolition works. Other buildings will remain intact and no remediation or validation works are required.

1.2 Objective

The objective of the works is to remediate Parcels within the Buffer Zone impacted by ACM fragments associated with the demolition of former structures and illegally dumped and buried asbestos (by others) to a level suitable for the proposed range of land uses and to validate the removal of ACM following demolition of built structures comprising ACM. This RAP forms part of

those works and provides a description of the impacted areas requiring remediation and the methodology to remediate and validate those areas in order to meet the project objective.

1.3 Regulatory Framework and Guidelines

This document has been prepared in reference to the following legislation:

- *Contaminated Land Management Act 1997*
- *Protection of the Environment Operations Act 1997*
- *Environmental Planning and Assessment Act 1979*
- *Work Health and Safety Regulation 2017*
- *Protection of the Environment Operations (Waste) Regulation 2014*

2. SCOPE OF WORK

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

- Review all previous reports prepared for the Buffer Zone including:
 - 'Phase 1 Environmental Site Assessment, Hydro Kurri Kurri Aluminium Smelter' dated October 2013, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 2', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 3', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 4', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 6', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 7', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 8', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 9', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 10', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 12', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 13', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 14', dated April 2015, ENVIRON
 - 'Phase 2 Environmental Site Assessment, Parcel 17', dated April 2015, ENVIRON
- Identify and evaluate possible remedial options for each Parcel including consultation with Hydro personnel in order to determine the most appropriate remedial option;
- Consultation with regulatory guidelines;
- Outline how the remedial options will be undertaken to meet the remediation objective;
- Establish Data Quality Objectives (DQOs) for the development of the validation plan;
- Develop a validation plan to validate completion of the remediation and confirm the suitability of each Parcel for the proposed use.

3. SITE IDENTIFICATION

3.1 Site Location

Site identification and locations details are presented in **Table 3-1**. **Table 3-2** describes the Lot and Deposited Plan details.

Table 3-1: Site Identification	
Site Owner	Hydro Aluminium Kurri Kurri Pty Limited (subject to Deed of Company Arrangement)
Street Address	Hart Road, Loxford, New South Wales, Australia , 2327
Local Government Area	Cessnock City Council, Maitland City Council
Parish	Heddon
County	Northumberland
Lot and DP Numbers	See Table 3.2
Site Area	See Table 3.2
Zoning (current)	RU2 – Rural Landscape and E2 – Environmental Conservation under Cessnock Local Environment Plan 2011 RU2 – Rural Landscape and E2 – Environmental Conservation under Maitland Local Environment Plan 2011
Proposed Land Use	Low density residential and environmental conservation. Parcel 9 proposed to be a Business Park (commercial/ industrial)
Site Elevation	Approximately 10m to 12m AHD
Site Map	Figure 1

Table 3-2: Buffer Zone Parcels affected by Asbestos			
Parcel	Lot/ DP and Address	Area (ha)	Type of Asbestos
Parcel 2	Lot 11 DP456946 Wangara	7.5	ACM building materials within poultry sheds
Parcel 3	Lot 1 DP998540	116.9	Dumped roof sheeting at one location
Parcel 4	Lot 422 DP755231 Dickson Road	3	ACM fragments in fill associated with former house demolition
	Lot 16 DP1082569 12 Horton Road	1.2	ACM fragments on surface along access track; ACM in current house
	Lot 1 DP589169 14 Horton Road	1.2	ACM in current house, garage, external laundry and former outside toilet
	Lot 444 DP755231 Scales Ave	2.9	ACM in current house
Parcel 6	Lot 15 DP1082775 Graham Land	13.6	Small stockpile of waste associated with demolished farm buildings
Parcel 7	Lot 10 DP1082775 Lumby Lane	17.9	Dumped roof sheeting
Parcel 8	Lot 14 DP1082775 Bishops Bridge Road	22.8	Small mound of dumped ACM fragments

Table 3-2: Buffer Zone Parcels affected by Asbestos			
Parcel	Lot/ DP and Address	Area (ha)	Type of Asbestos
Parcel 9	Lot 439 DP755231 McGarva Avenue	2.6	ACM fragments over demolished house footprint
	Lot 448 DP755231 5 Horton Road	2.5	ACM fragments over demolished house footprint
	Lot 449 DP755231 1 Horton Road	2.6	ACM fragments over demolished house footprint
	Lot 20 DP1082569 6 Horton Road	2.2	ACM fragments over demolished house footprint
	Lot 22 DP1082569 78 Hart Road	2.6	ACM fragments over demolished house footprint; ACM in current house
Parcel 10	Lot 453 DP755231 2 Dawes Ave	3	ACM fragments over demolished building footprint; ACM in current house
	Lot 682 and 536 DP755231 1 Dawes Ave	1.5	ACM fragments over demolished building footprint
	Lot 2 DP502196 4 Dawes Ave	2.2	ACM fragments over demolished building footprint; ACM in current house adjoining shed and fragments in soil around house
	Lot 451 DP755231 8 Dawes Ave	3.2	ACM in current house and fragments in soil below car port
	Lot 682 DP755231 2 Dawes Ave	0.2	ACM in current house
Parcel 12	Lot 10 DP1082569 1 McLeod Road	2.1	ACM in current house, garage and separate unit, ACM fragments on site surface
	Lot 11 DP1082569 3 McLeod Road	1.1	ACM in current house
	Lot 12 DP1082569 5 McLeod Road	1.1	ACM in current house
Parcel 13	Lot 458 DP755231 18 Bowditch Ave	3.8	Partially buried ACM at rear fenceline; ACM in current house and chicken sheds
	Lot 459 DP755231 16 Bowditch	3.8	ACM fragments over former shed footprint; ACM in current house and garage
	Lot 460 DP755231 14 Bowditch Ave	2.8	ACM in fill at rear of house; ACM in current house
	Lot 461 DP755231 12 Bowditch Ave	3.1	Two former building footprints the ACM fragments; ACM in current house
	Lot 462 DP755231 10 Bowditch Ave	3	ACM fragments over former building footprints
	Lot 463 DP755231 8 Bowditch Ave	3.1	Buried ACM in gully at rear of the lot; ACM in current house
Parcel 14	Lot 10 DP553543 22 Bowditch Ave	12.3	Stockpiled roof sheeting; ACM in current house
Parcel 17	Lot 1 DP73597 Wangara	342	ACM in current house and dairy shed

For the purposes of this RAP, the Municipal Landfill located within Parcel 9 is excluded. A separate RAP has been prepared for remediation of the Municipal Landfill.

3.2 Site Boundaries

The location of land parcels with asbestos issues are shown on **Figure 2**. In general, these parcels are bounded by:

- East: Rural residential properties and commercial areas including the Hunter Tafe;
- North: The Smelter site and undeveloped land within the Buffer Zone owned by Hydro;
- West: Hart Road, then undeveloped bushland within the Buffer Zone owned by Hydro; and
- South: the township of Kurri Kurri.

4. SITE HISTORY

Site history investigations included in the Phase 1 ESA for the Hydro Aluminium Kurri Kurri Smelter, dated 26 August 2013, indicate that a number of lots within the southern, eastern and north-eastern portions of the Buffer Zone were developed for rural residential landuse in the 1950s. Development included the construction of residential dwellings, sheds and farm buildings such as sheds for housing livestock (poultry and pigs). These buildings constructed during the 1950s and 1960s included asbestos containing (ACM) building materials. A number of these dwellings and associated sheds with ACM building materials were demolished in the 1980s, 1990s and more recently. Following demolition, ACM in the form of fibro fragments remain scattered across the footprints of the former buildings.

The bulk of the western portion of the Buffer zone remains undeveloped bushland, with the only development a former hobby farm on Parcel 8. The hobby farm was demolished in the 1980s.

Information from Hydro personnel indicated demolition wastes, including asbestos wastes, have been illegally dumped (by others) in easily accessible areas of the Buffer Zone in the past. Wastes are generally dumped along road easements that are easily accessible to the general public on the edge of the bushland.

The former Municipal Landfill located in Parcel 9 is not included in this RAP. A separate RAP has been prepared for the remediation of this area.

5. SITE CONDITIONS

5.1 Topography

Landforms in the north and east of the Buffer Zone comprise low-lying swamps, with many surface water drainage ponds and creeks, interspersed with topographical rises comprising residual soils. The north and east of the Buffer Zone are generally at an elevation of 10m to 18m AHD.

In the south and west of the Buffer Zone, the landform is predominantly residual hills with gully formations draining to the north and east. Elevation of land in the west of the Buffer Zone is generally between 18m and 33m AHD. Elevation of land in the south of the Buffer Zone is generally between 20 and 25m AHD.

5.2 Geology

According to the review of the regional geology described on the Hunter Coal Field Geological Sheet, most of the Hydro-owned lands are underlain by the Lower Permian-aged Rutherford Formation comprising, sandstone and siltstone.

The south eastern low-lying areas are underlain by Quaternary-aged undifferentiated alluvium (clays, sands and silts), associated with the modern surface water bodies.

Quaternary sediments which are associated with Wentworth Swamp and the Hunter River consist of gravel, sand, silt and clay.

5.3 Regional Hydrogeology

Regional groundwater is expected to follow regional topography and flow northeast towards the surface water bodies that discharge to the Hunter River.

Locally, groundwater in the south-east of the Buffer Zone is expected to flow to towards Swamp Creek, which flows north towards Wentworth Swamp. Groundwater in the south-west is expected to flow towards Blackwaterholes Creek, which flows north towards Wentworth Swamp.

According to the NSW Office of Environment and Heritage (Natural Resource Atlas), there are 17 licensed groundwater abstractions (bores) located within 2km of the smelter site. The majority of the groundwater bores are located within the aluminium smelter and buffer zone.

In addition, wells were installed for the ENVIRON 2012 and 2014 site investigation of the aluminium smelter and are located approximately one to two kilometres to the north of the site. These wells generally encountered water between two and five metres depth in residual clays and weathered siltstones.

The Hunter River Alluvium Groundwater Management Unit (GMU) is an important groundwater resource to the region. Groundwater extraction for irrigation, urban supply, drought supply, stock, domestic and commercial/ industrial use occurs, with volumes in excess of 10,000ML per annum extracted from the Hunter River Alluvium GMU. Aquifer storage and recovery is also an important use of this GMU. It is noted that the Hunter River GMU is not the primary drinking water supply in the region, although the protection of drinking water is a water quality objective for the Hunter River (NSW Water Quality and River Flow Objectives) (www.environment.nsw.gov.au/ieo/Hunter/index.htm).

5.4 Site Sensitivity

The site's sensitivity with respect to surface water and groundwater is considered to be moderate based on the following:

- Surface water and groundwater discharge into Swamp Creek, which is located 3.5km from Wentworth Swamp and 15km from the Hunter River within the Fishery Creek Catchment;
- Declining stream water quality and a reduction in diversity of native plants and animals has occurred within the Fishery Creek Catchment and water quality down gradient of the site has been impacted by historical coal mining;

- The Hunter River Groundwater Management Unit is used for irrigation, urban supply, drought supply, stock, domestic and commercial/ industrial use but it is not the main drinking water supply in the region.

6. ASSESSMENT CRITERIA

6.1 Contaminants of Concern

The contaminant of concern is asbestos associated with building materials and illegal dumping (by others) of bonded asbestos (e.g. Super 6 roof sheeting, fragments of fibro sheeting).

No other potential contaminants of concern were identified as part of the Phase 2 ESA completed at each Buffer Zone Parcel, as referenced in Section 2.

6.2 Soil

The guidelines proposed for the assessment of soil contamination in the Buffer Zone were sourced from the following reference:

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

The variation to the NEPM was approved on 19 June 2013 by the NSW EPA under the Contaminated Land Management Act 1997. The NEPM amendment 2013 provide revised health-based soil investigation levels (HILs), health based screening levels (HSLs), ecological-based investigation levels (EILs) and ecological based screening levels (ESLs) for various land uses.

The Health Screening Levels (HSLs) for asbestos are applicable for assessing human health risk via the exposure pathway of inhalation of airborne asbestos and are presented in **Table 6-1**. The HSLs are generic to all soil types.

Table 6-1: Health Screening Levels for Asbestos Contamination in Soil (w/w)				
Form of asbestos	Residential A	Residential B	Recreational C	Commercial/Industrial D
Bonded ACM	0.01%	0.04%	0.02%	0.05%
FA and AF ¹ (friable asbestos)	0.001%			
All forms of asbestos	No visible asbestos for surface soil			

1. The screening level of 0.001% w/w asbestos in soil for FA and AF (i.e. non-bonded/friable asbestos) only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres.

The future landuses of the Buffer Zone parcels affected by asbestos contamination include residential, commercial/ industrial and environmental conservation. It is considered that recreational activities, such as dog walking and jogging, will occur in the environmental conservation areas. Where a land parcel includes two potential land uses, the most sensitive land use guidelines has been selected. The most appropriate guidelines for these land uses are presented in **Table 6-2**.

Table 6-2: Proposed Land Uses and Appropriate Guidelines		
Parcel	Proposed Uses	Guidelines
Parcel 2	Residential	Residential A
Parcel 3	Majority: residential Smaller portions: environmental conservation and public recreation	Residential A
Parcel 4	Western portion: industrial Eastern portion: environmental conservation	Recreational C

Table 6-2: Proposed Land Uses and Appropriate Guidelines		
Parcel	Proposed Uses	Guidelines
Parcel 6	Environmental conservation	Recreational C
Parcel 7	Environmental conservation	Recreational C
Parcel 8	Environmental conservation	Recreational C
Parcel 9	Western portion: industrial Eastern portion: environmental conservation	Recreational C
Parcel 10	Majority: environmental conservation, Remainder: residential	Residential A
Parcel 12	Residential	Residential A
Parcel 13	Residential	Residential A
Parcel 14	Residential	Residential A
Parcel 17	Majority: environmental conservation, Remainder: residential	Residential A

6.3 Surface Water and Groundwater

Asbestos in soil is not soluble to groundwater and cannot be transported to surface water or groundwater via leaching. As such, the potential for asbestos contamination migrate to surface water or groundwater does not require assessment.

7. SITE CHARACTERISATION

7.1 Assessment of Contamination

Ramboll conducted a Phase 2 Environmental Site Assessment at each of the land parcels affected by asbestos contamination in 2013 to assess the nature and extent of the asbestos contamination. The scope of each investigation varied depending on the information obtained during the site history review.

In general, a preliminary reconnaissance investigation was undertaken over each lot within the Buffer Zone land parcels. The location of ACM fragments and other dumped wastes identified on the surface of a lot were detailed on Field Information Sheets and logged by GPS.

Where ACM fragments were associated with former buildings, the location of the former building was identified and a series of contiguous 10m by 10m grids were set up over the footprint and a walkover screening survey conducted comprising two passes with a 90° directional change between them, as per NEPM (2013). Any ACM fragments identified during the walkover were collected for analysis.

Where two dwellings had been recently demolished (Lot 20 and Lot 439 in Parcel 9), additional works were completed to assess potential impacts to shallow soil and potential on-site burial of ACM. During the screening walkover survey, all ACM fragments were collected, bagged and weighed. To assess the potential for penetration of ACM below the surface, two shallow test pits were excavated in the areas of highest ACM surface density (as identified during the walkover). Soil profiles were logged and 10L samples collected and sieved through a ≤ 7 mm sieve. The volume of ACM retained on the sieve was weighed. The sieved portion of the sample was collected and submitted for asbestos fines analysis.

Where ACM fragments had the potential to be buried or where fill material was identified, additional works comprising the excavation of test pits were completed using a backhoe. The nature and extent of the buried fill material was logged for assessment. ACM fragments were collected for laboratory analysis.

7.2 Asbestos Results

Table 7-1 presents a summary of the information obtained during the environmental investigations, including the Lot in which ACM was identified, whether ACM was identified in the field, the number and type of samples collected (fragments or soil), the number of results positive for asbestos and the type of asbestos as identified by the laboratory.

The majority of the asbestos that was identified at the land parcels was bonded fibro fragments. Degraded fibro fragments less than 7mm in size (asbestos fines) were detected on Parcel 4 at Lot 422, Dickson Road and on Parcel 10 at Lot 453, 2 Dawes Avenue.

Table 7-1: Summary of Asbestos Results					
Parcel	Lot and DP/ Address	ACM fragments identified in the field?	No. and type of samples	No. positive for asbestos	Type of asbestos
Parcel 3	Lot 1 DP998540	Yes	None	NA	Bonded roof sheeting
Parcel 4	Lot 422 DP755231 Dickson Road	No	5 soil	2	Chrysotile, loose bundle of friable asbestos fibres and fragment of friable cement sheeting <7mm
	Lot 16 DP1082569 12 Horton Road	Yes	2 fragments, 7 soil	2 0	Bonded fragments
Parcel 6	Lot 15 DP1082775 Pt 2 Graham Lane	Yes	2 soil	2	Chrysotile, several bonded fragments between 30x35mm and 50x45mm
Parcel 7	Lot 10 DP1082775 Pt 2 Lumby Lane	Yes	None	NA	Bonded roof sheeting
Parcel 8	Lot 14 DP1082775 Bishops Bridge Road	Yes	None	NA	Bonded fragments
Parcel 9	Lot 439 DP755231 McGarva Avenue	Yes	4 fragments, 1 soil	4 0	Chrysotile, crocidolite, amosite in fragments tested, >100 fragments observed on house footprint during walkover
	Lot 448 DP755231 5 Horton Road	Yes	None	NA	Bonded fragment
	Lot 449 DP755231 1 Horton Road	Suspected	1 fragment	1	Chrysotile, crocidolite, amosite, several bonded fragments 120x100mm
	Lot 20 DP1082569 6 Horton Road	Yes	4 fragments, 4 soil	4 0	Chrysotile, crocidolite, amosite in 4 fragments tested, >100 fragments observed on house footprint during walkover
	Lot 22 DP1082569 78 Hart Road	Suspected	1 fragment	1	Chrysotile, amosite, one bonded fragment 30x25mm
Parcel 10	Lot 453 DP755231 2 Dawes Ave	Suspected	2 fragments, 2 soil	2 0	Chrysotile, crocidolite, amosite, several bonded fragments 45x35mm, small fragments of friable cement sheeting <7mm and one friable fibre bundle

Table 7-1: Summary of Asbestos Results					
Parcel	Lot and DP/ Address	ACM fragments identified in the field?	No. and type of samples	No. positive for asbestos	Type of asbestos
	Lot 682 and Lot 536 DP755231 1 Dawes Ave	Suspected	1 fragment, 1 soil	1 0	Chrysotile, crocidolite, several degraded fragments 25x15mm
	Lot 2 DP502196 4 Dawes Ave	Suspected	1 fragment, 2 soil	1 0	Chrysotile, crocidolite, several bonded fragments 55x45mm
Parcel 12	Lot 10 DP1082569 1 McLeod Rd	Suspected	2 fragments, 4 soil	2 0	Chrysotile, crocidolite, two pieces of bonded ACM 25x25mm
Parcel 13	Lot 458 DP755231 18 Bowditch Ave	Yes	1 fragment, 7 soil	1 2	Chrysotile, crocidolite, amosite, several bonded fragments, 55x45mm
	Lot 459 DP755231 16 Bowditch Ave	Yes	1 fragment, 16 soil	1 1	Chrysotile, several bonded fragments 105x60mm
	Lot 460 DP755231 14 Bowditch Ave	Yes	1 fragment, 5 soil	1 0	Chrysotile, amosite, several bonded fragments 130x50mm
	Lot 461 DP755231 12 Bowditch Ave	Yes	1 fragment	1	Chrysotile, crocidolite, several bonded fragments, 45x25mm
	Lot 462 DP755231 10 Bowditch Ave	Yes	5 fragments, 3 soil	3 0	Chrysotile, crocidolite, amosite, bonded fragments between 20x40mm and 70x65mm
	Lot 463 DP755231 8 Bowditch Ave	Yes	7 fragments, 5 soil	6 0	Chrysotile, crocidolite, amosite, degraded fragments 50x80mm, 60x45mm
Parcel 14	Lot 10 DP553543 22 Bowditch Ave	Yes	None	NA	Roof sheeting

NA is not applicable

FA and AF are fibrous asbestos and asbestos fines.

7.3 Buffer Zone Built Structures

A number of Buffer Zone land parcels also contain built structures such as buildings and sheds constructed from asbestos-containing building materials. A Hazardous Materials Audit was completed at each Parcel containing a built structure and a Hazardous Materials Register developed from this. An outline of the parcels containing built structures and the results of the Hazardous Materials Audit are included in **Table 7.2**.

Table 7-2: Summary of Hazardous Materials Audits			
Parcel	Lot and DP/ Address	Report Reference	Asbestos Identified?
Parcel 2	Lot 11 DP456946	Hazardous Materials Audit, Parcel 2, dated May 2014	Yes, in house and in two poultry sheds
Parcel 4	Lot 16 DP1082569 12 Horton Road	Hazardous Materials Audit, Parcel 4, dated April 2015	Yes, in house
	Lot 1 DP589169 14 Horton Road		Yes, in house, garage, external laundry and former outside toilet
	Lot 444 DP755231 Scales Ave		Yes, in house
Parcel 9	Lot 22 DP1082569 78 Hart Road	Hazardous Materials Audit, Parcel 9, dated April 2015	Yes, in house
Parcel 10	Lot 682 and Lot 536 DP755231 1 Dawes Ave	Hazardous Materials Audit, Parcel 10, dated April 2015	Yes, in house
	Lot 2 DP502169 4 Dawes Ave		Yes, in house, adjoining shed and fragments in soil around house
	Lot 451 DP755231 8 Dawes Ave		Yes, in house and fragments in soils below car port
	Lot 453 DP755231 2 Dawes Ave		Yes, in house
Parcel 12	Lot 10 DP1082569 1 McLeod Rd	Hazardous Materials Audit, Parcel 12, dated August 2014	Yes, in house, garage and separate unit
	Lot 11 DP1082569 3 McLeod Rd		Yes, in house
	Lot 12 DP1082569 5 McLeod Rd		Yes, in house

Table 7-2: Summary of Hazardous Materials Audits			
Parcel	Lot and DP/ Address	Report Reference	Asbestos Identified?
Parcel 13	Lot 458 DP755231 18 Bowditch Ave	Hazardous Materials Audit, Parcel 13, dated August 2015	Yes, in house and chicken sheds
	Lot 459 DP755231 16 Bowditch Ave		Yes, in house and garage
	Lot 460 DP755231 14 Bowditch Ave		Yes, in house
	Lot 461 DP755231 12 Bowditch Ave		Yes, in house and garage
	Lot 463 DP755231 8 Bowditch Ave		Yes, in house and garage
	Parcel 14		Lot 10 DP553543 22 Bowditch Ave
Parcel 17	Lot 1 DP73597 Pt 1 Wangara	Hazardous Materials Audit, Parcel 17, dated 2 May 2014	Yes, in house and former dairy shed

7.4 Conceptual Site Model

The land parcels form part of the Buffer Zone for the Hydro Kurri Kurri Aluminium Smelter. The Smelter was constructed in the late 1960s and was operational until May 2014. The Buffer Zone comprises land around the smelter that provides a buffer between the smelter and adjacent communities.

The western part of the Buffer Zone, including Parcels 6, 7 and 8, generally comprises undeveloped bushland. A small portion of Parcel 8 was developed as a hobby farm prior to the 1950s. The hobby farm comprised three small buildings, which were demolished in the late 1980s. There are road easements along some boundaries of Parcels 6, 7 and 8 which provide access to the edges of these parcels. Asbestos identified at Parcels 6, 7 and 8 was as small amounts of illegally dumped wastes (by others), such as roof sheeting and fragments of fibro sheeting. The asbestos was generally dumped with other construction wastes such as brick, tile and concrete, on the easily accessible boundaries of the parcels. The location of these dumped wastes are shown in **Figures 7, 8 and 9**.

The southern and eastern parts of the Buffer Zone, including Parcels 3, 4, 9, 10, 12, 13 and 14, generally comprise land that has been developed for rural residential use. Most of these parcels were subdivided in the 1950s and the land supplied to returning soldiers. The majority of the housing that was developed at this time included asbestos-containing building materials. Some of these structures are planned to be demolished and all asbestos-containing building materials removed.

Houses and sheds on Lot 422 (Parcel 4), Lots 439, 448, 449, 20 and 22 (Parcel 9), Lot 10 (Parcel 12), Lots 459, 461 and 462 (Parcel 13) have been demolished and remnant fibro fragments have been identified in surface soils. In addition, scattered and buried fibro fragments were identified on Lots 2, 435 and 536 (Parcel 10) and Lots 458, 460 and 463 (Parcel 13), likely from poor disposal practices associated with the demolition of former building structures. The location of the demolished houses and sheds and scattered and buried ACM are shown in **Figures 4, 5, 6, 10 to 21**.

Other developments in the eastern portion of the Buffer Zone included a landscaping business on Parcel 4. Asbestos in surface soils at the landscaping business is likely associated with the demolition of former structures. The fibro fragments have been distributed across the surface of the lot over time. Test pitting of fill material at the rear of the lot did not identify any buried asbestos within the fill. The location of the asbestos at the landscaping business is shown in **Figure 5**.

Parcel 3 and Parcel 14 are located in the central eastern portion of the Buffer Zone and comprise rural residential and farming landuse. Both parcels are susceptible to illegal dumping (by others) due to their infrequent use and both contain a small amount of illegally dumped asbestos roof sheeting. The location of the dumped asbestos is shown in **Figures 4 and 21**.

Parcel 2 and Parcel 17 are located in the north-eastern portion of the Buffer Zone and comprise farming landuse. The house and the two poultry sheds on Lot 11 and the house and dairy shed on Parcel 17 contain asbestos-containing building materials. The location of these structures is shown in **Figures 3 and 22**.

In terms of sources, pathways and receptors, the following is noted:

- Asbestos is the source of contamination at these Buffer Zone properties.
- Asbestos impacts have been limited to consideration of human receptors only.
- The only pathway for asbestos contamination to impact humans is inhalation. Other pathways such as ingestion and dermal contact are not relevant.
- A complete exposure pathway only exists between degraded ACM fragments where fibres can be liberated. Friable asbestos fibres were detected in ACM from Lot 422 Dickson Road and 2 Dawes Avenue (Lot 453). Degraded ACM fragments were detected in ACM from 1 Dawes Avenue (Lots 382 and 536) and 8 Bowditch Avenue (Lot 463). ACM fragments detected on other properties within the Buffer Zone have the potential to degrade over time and liberate fibres.

7.5 Statement of Suitability for Existing and Proposed Site Use

The proposed future development of the site for a range of uses, including low density residential (R2), Rural Landscape (RU2), General Industrial (IN7), Business Park (B7) and environmental conservation (E2) land use will alter the exposure scenarios to the asbestos contamination. A site plan showing the proposed zoning of each Parcel impacted by asbestos is included as **Figure 2**.

It is considered that the change in exposure/receptor conditions will pose a potential risk to human health, and remediation of the asbestos is required.

8. BUFFER ZONE STATUS IN 2017

8.1 2017 Walkover

Walkovers of Buffer Zone parcels affected by asbestos was completed by Ramboll and Hydro on 7 November and 18 December 2017. Between the time of the Phase 2 ESA investigation in 2013 and late 2017, some houses containing ACM have been demolished and some remedial works of dumped ACM have been completed. The parcels inspected include Parcel 4, Parcel 6, Parcel 7, Parcel 8, Parcel 9, Parcel 10, Parcel 13 and Parcel 14.

A summary of completed works and observations are presented in **Section 8.2. Figures 3 to 20** have been updated to reflect the 2017 status of each parcel. Ramboll are maintaining a spreadsheet of remedial works as they are completed.

8.2 Completed Works and 2017 Observations

Completed asbestos remedial works, completed house demolitions and observations from the 2017 walkovers are summarised in **Table 8-1**.

Table 8-1: Buffer Zone Status in 2017

Parcel	Lot and DP/ Address	Type of ACM	Remedial Works Completed?	House Demolition Completed?	Comments
Parcel 2	Lot 11 DP456946 Wangara	House and poultry shed with ACM	NA	Yes, 2016 Poultry sheds only	Validation that no ACM remains on footprint of demolished poultry sheds required. No plan to demolish current house.
Parcel 3	Lot 1 DP998540	Dumped roof sheeting	Yes, 2015	NA	No further works required.
Parcel 4	Lot 422 DP755231 Dickson Road	ACM fragments within buried fill	No	NA	Remediation of buried fill required.
	Lot 16 DP1082569 12 Horton Road	ACM fragments on surface, House with ACM	Yes, 2015	Yes	Validation of footprint of demolished building required.
Parcel 6	Lot 15 DP1082775 Pt 2 Graham Lane	ACM fragments in stockpile associated with old house demolition	No	NA	Remediation of one stockpile required.
Parcel 7	Lot 10 DP1082775 Pt 2 Lumby Lane	Dumped roof sheeting	No	NA	Remediation of dumped roof sheeting required.
Parcel 8	Lot 14 DP1082775 Bishops Bridge Road	Cement sheeting fragments (no ACM) identified on Bishops Bridge Road	No	NA	No further works required, as dumped waste did not include ACM and was located on Council land.
Parcel 9	Lot 439 DP755231 McGarva Avenue	ACM on surface due to house demolition	No	Yes, pre-2013	Remediation of ACM fragments over house footprint required.
	Lot 448 DP755231 5 Horton Road	ACM on surface due to house demolition	No	Yes, pre-2013	Remediation of ACM fragments over house footprint required.
	Lot 449 DP755231 1 Horton Road	ACM on surface due to house demolition	No	Yes, pre-2013	Remediation of ACM fragments over house footprint required.
	Lot 20 DP1082569 6 Horton Road	ACM on surface due to house demolition	No	Yes, pre-2013	Remediation of ACM fragments over house footprint required.
	Lot 22 DP1082569 78 Hart Road	ACM over footprint of former structure, House with ACM	No	No	Remediation of ACM fragments on surface required. No plan to demolish current house.

Table 8-1: Buffer Zone Status in 2017					
Parcel	Lot and DP/ Address	Type of ACM	Remedial Works Completed?	House Demolition Completed?	Comments
Parcel 10	Lot 453 DP755231 2 Dawes Ave	ACM over footprint of former structure, House with ACM	No	Yes, 2016	Remediation of ACM fragments within footprints of former structures and house required.
	Lot 682 and Lot 536 DP755231 1 Dawes Ave	ACM within fill used in horse arena, House with ACM	No	No	Remediation of fill with ACM required. No plan to demolish current house.
	Lot 2 DP502196 4 Dawes Ave	ACM fragments over footprint of former structure, House with ACM	No	Yes, 2016	Remediation of ACM fragments within footprints of former structures and house required.
	Lot 451 DP755231 8 Dawes Ave	House with ACM	NA	Yes, 2016	Remediation of ACM fragments within footprint of house required.
Parcel 12	Lot 10 DP1082569 1 McLeod Road	ACM over footprint of former structure, House with ACM	Yes	No	Validation that no ACM remains on surface required. No plan to demolish current house.
	Lot 11 DP1082569 3 McLeod Road	House with ACM	NA	No	No plan to demolish current house. No remediation or validation works required.
	Lot 12 DP1082569 5 McLeod Road	House with ACM	NA	No	No plan to demolish current house. No remediation or validation works required.
Parcel 13	Lot 458 DP755231 18 Bowditch Ave	Partially buried ACM at rear of lot, House and poultry shed with ACM	Yes, 2015	Yes, 2016 Poultry shed only	Remediation of ACM fragments on surface of poultry shed required. No plan to demolish current house.
	Lot 459 DP755231 16 Bowditch Ave	ACM over footprint of former structure, House with ACM	Yes, 2015	No	Remediation of ACM fragments within footprint of former structure required. No plan to demolish current house.
	Lot 460 DP755231 14 Bowditch Ave	ACM over footprint of former structure, House with ACM	Yes, 2015	No	Remediation of ACM fragments within footprint of former structure required. Validation that no ACM is present within footprint of two former poultry sheds required. No plan to demolish current house.

Table 8-1: Buffer Zone Status in 2017

Parcel	Lot and DP/ Address	Type of ACM	Remedial Works Completed?	House Demolition Completed?	Comments
	Lot 461 DP755231 12 Bowditch Ave	ACM over footprint of former structures included buried within septic tank, House with ACM	Yes, July 2015	No	Remediation of ACM fragments within footprint of former structure required. No plan to demolish current house.
	Lot 462 DP755231 10 Bowditch Ave	Fill mound with ACM, ACM in footprint of former structure	No	No	Remediation of ACM fragments within fill mound and in footprint of former structure required.
	Lot 463 DP755231 8 Bowditch Ave	Buried ACM in gully at rear of lot, ACM in footprints of former poultry sheds, House with ACM	No	Yes, 2016	Remediation of buried ACM required. Remediation of ACM fragments within footprint of former poultry sheds and house required.
Parcel 14	Lot 10 DP553543 22 Bowditch Ave	Stockpile of roof sheeting, House with ACM	Yes	Yes, 2016	Validation that no ACM remains on footprint of demolished building required.
Parcel 17	Lot 1 DP73597 Wangara	House and dairy sheds with ACM	NA	No	No plans to demolish current house and dairy sheds. No remediation or validation works required.

9. REMEDIAL ACTION PLAN

9.1 Remediation Goal

The goal of this remediation project is to remediate and validate the asbestos within the Buffer Zone parcels to render each affected land parcel suitable for its proposed future landuse, as outlined in **Table 6-2**.

9.2 Extent of Remediation Required

Asbestos contamination including surficial and buried asbestos requires remediation across the Parcels 2, 3, 4, 6, 7, 8, 9, 10, 12, 13 and 14 as shown in **Figures 3 to 21**. Remediation is not required at Parcel 17 as Hydro do not plan to demolish the existing asbestos-containing structures.

The contaminant profile identified comprises two situations where asbestos has been found:

- Illegally dumped asbestos waste, generally roof sheeting and fibro fragments. The majority of these wastes are on the surface at Parcels 3, 7, 8, 14, with some buried wastes on Parcel 13;
- Fibro fragments scattered across surface soils associated with the demolitions of former houses and sheds at Parcels 4, 6, 9, 10, 12 and 13.

In addition, asbestos-containing building materials are to be removed during the demolition of built structures from Parcels 2, 4, 10, 12, 13 and 14. Building demolition is not considered to be remediation, however validation of the removal of asbestos-containing building materials is required where structures are demolished.

9.3 Remediation Options

Based on the site characterisation presented in **Section 7**, a review of potential remediation options for the asbestos contamination was undertaken.

Table 9-1 presents a summary of the available remedial options considered for the Buffer Zone land parcels affected by asbestos contamination.

Option	Description	Advantages	Disadvantages
1	Do nothing	Cost effective solution. Only acceptable if a risk assessment for asbestos demonstrates that the concentrations present do not represent an unacceptable risk to human or ecological health (unlikely due to amount of ACM in surface soils). May not require an Environmental Management Plan to be registered with Council.	Does not address the aesthetic issues or risks from the presence of asbestos. Planning approval may be required. Impacts on land value and saleability. Retains potential long term liability for Hydro.
2	Collect surface AMC or excavate buried ACM and dispose to waste facility.	Removes long term management requirement from site. Improves land value. Planning approval requirements straightforward.	Consumes off site waste facility space. Disposal costs are high.

Table 9-1: Assessment of Remediation Options			
Option	Description	Advantages	Disadvantages
3	Encapsulation of wastes at another location within Hydro owned land	Relocates long term management requirements to a centralised area. Improves land value for the affected parcels.	Planning approval for disposal site will be required. Timeline is reliant on whole of site solution.
4	Encapsulate and manage in-situ	Encapsulation allows for capping and then rehabilitation by a green corridor or similar.	Requires long term management and registration of an Environmental Management Plan with Council. May reduce property values. Planning approval required.

9.4 Rationale for the Selection of the Recommended Remedial Option

Remediation options were considered in terms of cost, risk of failure, long term legacy and onsite management, corporate responsibility and sustainability. In terms of these evaluators Option 2 and Option 3 were preferred.

Hydro has conducted a whole-of-site remediation options study in 2014 to identify the most appropriate remediation strategy applicable to the issues across all Hydro owned lands. Option 3 allows asbestos wastes from the Buffer Zone to be incorporated with smelter derived wastes that require remediation on another part of the Smelter Site. This option will also remove the source of asbestos.

The Remedial Action Works Plan presented in **Section 9** details the steps required to complete the remediation program.

9.5 Contingency if the Remediation Strategy Fails

Table 9-2 outlines the potential failure scenarios that could occur and the contingency mechanisms that will be implemented to achieve the overall remediation objective.

Table 9-2: Remediation Contingency Planning	
Failure Scenario	Contingency Response
All asbestos wastes cannot be excavated due to safety or other risks	While all efforts will be undertaken to remove identified wastes/contamination, if a situation arises where it becomes impractical to completely remove fill/soil to meet the remediation objectives, (eg physical constraints, safety etc), alternative strategies may be employed to justify leaving contamination in place (eg specific risk assessment). Such alternatives will not proceed without consultation and full written approval of the Principal.
Unexpected materials are encountered such as drums of unknown materials/ liquids.	The Principal will be advised and consideration will be given to completing the works in accordance with regulations and guidelines for working with the unexpected find.
A whole-of-site strategy is not approved that incorporates the Buffer Zone asbestos wastes.	Consider the hierarchy of other preferred options being off site.

9.6 Interim Site Management Plan

Parcels 3, 6, 7 and 8 comprise undeveloped bushland and are fenced and managed by Hydro under the Buffer Zone Management Plan. No additional interim management is required.

Some lots on Parcels 4, 9, 10, 13 and 14 are leased to tenants. Interim management, in the form of collection of visible ACM fragments from the surface of the tenanted lots, should be completed.

10. REMEDIAL ACTION WORKS PLAN

10.1 HOLD POINT

The Remediation Contractor completing the asbestos remediation works must hold a valid Safework NSW licence for bonded and friable asbestos works.

Prior to commencing works, the Remediation Contractor is to provide the Principal for written approval a proposed remediation works methodology. The methodology is to describe:

- Mobilisation and site facilities required and proposed locations;
- Set up of asbestos work areas;
- Methods of asbestos collected, dust monitoring and health and safety requirements;
- Provision of Asbestos Clearance Certificate for each Parcel;
- Quality control procedures that demonstrate how the requirements of the RAP, including validation, will be met and documented.

The general objectives are outlined in the following Sections. The works methodology is to consider the remediation objective outlined in the RAP.

10.2 Mobilisation

Mobilisation and setup on site of the required plant and personnel. Notification to Safework NSW of asbestos removal works. Set up of work controls including environmental and safety systems and controls, both at each Lot and at the proposed area identified on the main Hydro Smelter site and referred to as the Smelter site stockpiled area (location to be advised). Environmental controls are listed within the Construction Environmental Management Plan (CEMP) in **Section 12**.

The Principal is to inspect each lot following site establishment and implementation of all controls.

10.3 Remedial Methodology

Removal of asbestos as identified in **Figures 3 to 21** is required. Asbestos is to be collected from the surface of affected areas and is to be excavated and removed from filled areas, an Asbestos Clearance Certificate is to be provided and no asbestos is to remain on the surface of each Lot at the completion of the remediation.

Further description of the remedial methodology is described below.

10.3.1 Identification of Asbestos Impacts

The Contractor shall identify the asbestos impacts on each Parcel in the field at the start of works. The asbestos impacts should match the description given in **Table 8.1**. In the event that the asbestos impact does not match the description in **Table 8.1** and is considerably larger in extent, the Contractor shall notify the Principal prior to commencing remediation.

10.3.2 Collection of Surficial Asbestos

The Contractor shall collect surficial asbestos via hen picking and raking or via excavation of the top 100mm of soil over former building footprints. Hen picking shall be completed in a methodical way across the footprint of former buildings and sheds, such as walking on grid lines that are evenly spaced and then changing direction by 90° and walking the grid again. Surface ACM fragments should be collected into fit-for-purpose heavy duty plastic bags that are labelled 'Caution: Asbestos'. These bags shall be labelled with the Lot number and sealed with tape. The bags shall be returned to the Smelter site stockpile area. Surface soil scraped via excavation shall be checked for ACM fragments and where identified, soil shall be loaded directly onto trucks where possible for transport to the Smelter site stockpile area.

10.3.3 Excavation of Buried Asbestos

The Contractor shall excavate buried asbestos and associated dumped wastes from Lots 458, 460 and 463 at Parcel 13. The area of buried asbestos shall be identified and then excavated until all wastes and any associated fill soils are removed. Wastes shall be loaded directly onto trucks where possible for transport to the Smelter site stockpile area.

If asbestos, waste materials and fill soils cannot be loaded directly into trucks, these materials should be stockpiled on black plastic to minimise contact with uncontaminated ground. If these materials are stockpiled directly on uncontaminated ground, validation of the removal of all asbestos, waste materials and fill will be required following the removal of the stockpiles.

10.3.4 Spoil Management

The following general principles should be incorporated into management of stockpiles:

- No stockpiles or other materials shall be placed on steep slopes;
- Control of dust from all stockpiles;
- All stockpiles will be placed on a level area as a low elongated mound.

Further erosion and sediment controls in accordance with the CEMP (refer to **Section 12.8**) are to be implemented.

10.3.5 Materials Tracking

A procedure shall be provided by the Contactor that includes:

- Tracking of asbestos as it are removed from each Lot in each Parcel;
- Truck logging at the site entrances and exits or materials being exported and imported;
- Logging of material destinations from/ to the Dickon Road Landfill and the smelter stockpiled site;
- All waste facility tipping dockets will be retained on file by the Contractor's Environmental Representative and be correlated to the truck logging sheets in a weekly materials tracking report.

It is not proposed that any contaminated soils will be transported from the site. The Hydro Smelter site is considered to be part of the site. Bishops Bridge Road, Sawyers Gully Road, Graham's Lane, Bowditch Avenue, McLeod Road, Dickson Road, Hart Road and Cessnock Road will be used to transport from one part of the site to another part of the site. As asbestos contamination is being retained on the site, waste tracking is not required.

In the event that contaminated soils are transported off site, these will need to be controlled as per the NSW EPA requirements of waste tracking and acceptance, where classified as a waste that must be tracked. Waste disposal dockets are to form part of the validation report.

These are as follows based on regulations current at the time of this RAP:

- Obtain a written consignment authorisation number from a licensed waste disposal or treatment facility before moving waste to the facility.
- Complete a waste data form signed by the consignor before the waste is dispatched.
- The waste consignor, the waste transporters and the waste facility must each keep a copy of the waste data form for up to four years for auditing purposes.
- The waste consignor must give a completed copy of the waste data form to the transporters, who must check that it is completed and then sign it. The driver must carry the waste data form in the vehicle.
- The transporters must give a completed copy of the waste data form to the waste facility on arrival at the destination. The waste facility operator must check the load details on the form. The waste data form must be signed by a representative of the waste facility on receipt of the waste at the destination.
- The waste consignor must receive from the waste facility written confirmation of receipt of the waste within 21 days of dispatch. This must be kept for up to four years for auditing purposes.

10.3.6 Imported Fill

All fill imported to the site shall be tracked including landscaping materials. All soil and landscaping materials shall be validated **PRIOR** to being received at the site to confirm it is ENM or VENM and meets the geotechnical requirements for backfill described in **Section 10.4.7**.

10.3.7 Validation of Remediation

Detailed validation requirements are presented in **Section 11**.

Generally validation will be undertaken after visual inspection identifies the lot is free of all asbestos materials followed by an Asbestos Clearance Certificate.

Validation of the exposed excavation shall be undertaken prior to reinstatement of the excavation. Excavation reshaping is not permitted until the Contractor's Environmental Consultant is satisfied that validation results show the remediation goal has been achieved **or, where the goal has not been achieved then** following written approval from the Principal or Principal's Representative.

10.3.8 Reshaping and Final Landform

Following excavation of materials and satisfactory validation of the soils remaining in the resultant void, reshaping of the remediation areas can proceed. The aim of reshaping is to return the area to its original condition prior to filling.

All reshaping works shall comply with the following requirements:

- The final landform shall be reshaped to conform with the surrounding topography;
- The levels and grades of the finished landform shall be such that it encourages the shedding of incident stormwater but are at grades that would not result in erosion;
- The finished landform shall comprise a surface layer not less than 100mm of topsoil and shall be vegetated with native grasses.
- Imported topsoil shall be validated PRIOR to being received at the site to confirm it is Excavated Natural Material (ENM) or Virgin Excavated Natural Material (VENM) and meets the geotechnical requirements for backfill.

The Principal is to inspect the site following completion of the final landform and soil stabilisation measures.

Hydro have available for use ENM classified material. This material is available for use in this project. The Contractor is to satisfy itself that this material meets the requirements outlined in this Section for use as backfill.

10.3.9 Smelter Site Stockpile Area

The Contractor will be responsible for the preparation of the Smelter site stockpile area on the Smelter site.

- The Principal shall identify the area to be used on the smelter.
- Materials transported from the Buffer Zone will be stored at this location.

The Contractor shall undertake site preparation works, (in the area identified by Hydro) to ensure:

- The layout of the Smelter site stockpile area will be suitable for placement of the anticipated material volumes (or as indicated by the Principal), in terms of allowance for space and access;
- During active construction of the stockpiles, appropriate erosion and sediment controls have been installed (refer to **Section 12.7**);
- Upon completion of the stockpiling works, (following the asbestos remediation works), the Contractor shall undertake works to ensure long-term stabilization of the soil stockpile. These are envisaged to include:
 - Placement, shaping and compaction of stockpile landform to encourage runoff but not erosion;
 - Placement of either a suitable plastic cover or a topsoil layer (min 100mm) and vegetation (eg, hydromulch) over the finer materials stockpile. Hydro has a stockpile of ENM material available that could be used for this topsoil material. The Contractor is to satisfy itself that this material is suitable; and
 - Surface water diversion and erosion control measures as appropriate to divert stormwater away from and around stockpiles, and capture any sediment in runoff from the stockpiles.

The Principal is to inspect the works at the smelter stockpiling site on completion of these works.

10.3.10 Demobilisation

At the completion of the works, the Contractor is to demobilise. The Contractor is to remove all project infrastructure and wastes unless agreed to remain in writing by the Principal.

11. VALIDATION PLAN

The following is the validation sampling, analysis and quality plan (SAQP) to be implemented to validate the remedial objective has been achieved for the Buffer Zone parcels affected by asbestos contamination and built structures comprising asbestos-containing building materials. The remedial objective is to render each affected land parcel suitable for its proposed future landuse.

11.1 Validation Sampling and Analysis

The bulk of the asbestos was identified as bonded ACM. Asbestos fines were identified at Parcel 4 on Lot 422, Dickson Road and at Parcel 10 on Lot 453, 2 Dawes Ave.

Remedial excavations are unlikely to require backfilling, so the excavated surface will be the land surface at the completion of the remedial works at the majority of the Lots. As the validation criteria is no visible asbestos in surface soils, the validation methodology will be visual.

As asbestos fines were identified at Lot 422 (Parcel 4) and Lot 453 (Parcel 10), validation soil samples for laboratory analysis for asbestos fines will be completed on these lots. Otherwise soil sampling and laboratory analysis will not be completed unless greater than 10% of the total bonded ACM observed during remediation is significantly damaged.

Validation will involve:

- Visual assessment and documentation (photographic) of remaining soils for absence of asbestos materials;
- Visual assessment and documentation (photographic) of house footprints following demolition of built structures;
- Visual assessment will involve establishment of a 10 m grid across the impacted area, walking of each grid square with two passes with a 90° direction change;
- Validation soil sampling for asbestos fines at Lot 422 (Parcel 4) and Lot 453 (Parcel 10);
- Completion of Asbestos Clearance Certificate for each Lot within each Parcel.

11.2 Validation Data Quality Objectives

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

11.2.1 Step 1: State the Problem

It its current state, the affected Parcels are not considered suitable for the proposed landuses and remediation is required. Remediation of the following site contaminants is required:

- Illegally dumped asbestos waste, generally roof sheeting and fibro fragments. The majority of these wastes are on the surface at Parcels 3, 7, 8, 14, with some buried wastes on Parcel 13;
- Fibro fragments scattered across surface soils associated with the demolitions of former houses and sheds at Parcels 4, 6, 9, 10, 12 and 13.

Further details of the site contaminants are presented in **Sections 7 and 8**.

The remediation methodology is detailed above in **Section 10**. The remediation process involves the removal of all asbestos wastes for temporary storage at the Smelter Site for later inclusion in a whole-of-site strategy. The site of origin is to be re-instated with clean soils, where required.

In addition, some built structures comprising asbestos-containing building materials are to be demolished. Validation is required to assess that asbestos-containing building materials have been removed from each affected Parcel.

11.2.2 Step 2: Identify the Decisions

The validation SAQP is to ensure that that remediation has been carried out successfully and that strategies are in place to ensure that each Lot is not re-contaminated in the future. **Sections 7, 8 and 9** of this RAP outline the extent of the site contaminants, the validity of the data, the remediation strategy proposed and the appropriateness of this remediation strategy for the site contaminants.

To validate the effectiveness of the remediation strategy, visual validation of the removal of asbestos materials is required to meet the validation criteria of no visible asbestos in surface soil. Validation sampling will be completed at Lot 422 (Parcel 4) and Lot 453 (Parcel 10) as asbestos fines were previously identified at these Lots.

The site will be considered remediated when the remediation and validation program has been carried out successfully. Remediation is deemed to be successful when:

- All asbestos materials have been removed from each Lot in each affected Parcel and appropriately relocated. Excavations have been reinstated with suitable material to an accepted landform, where required;
- All asbestos-containing building materials from the demolition of built structures have been removed from each Lot in each affected Parcel and appropriately relocated.

11.2.3 Identify Inputs to the Decision

For the remediation area, the following inputs into the decision making process are required:

- A visual evaluation of the removal of all asbestos materials from each Lot;
- A visual evaluation of the removal of all asbestos-containing building materials from the surface of each footprint of a built structure following demolition;
- Laboratory analysis for asbestos fines for validation soil samples collected from Lot 422 in Parcel 4 and Lot 453 in Parcel 10; Provision of an Asbestos Clearance Certificate for each Lot.
- Documented materials tracking that demonstrates all materials have been appropriately relocated as described in **Section 10.4.3**.

11.2.4 Step 4: Define the Study Boundary

The site boundaries have been outlined and defined within this RAP and are presented in **Figure 2**. Remediation applies to areas impacted with surficial and buried asbestos.

The temporal boundary is that the remediation works need to be completed within timing that matches Hydro's requirements.

11.2.5 Step 5: Development of Decision Rules

Decision rules for the validation of the remedial works are based around visual validation of the removal of surficial and buried asbestos materials. The decision rules are as follows:

- Can it be visually confirmed that surficial and buried asbestos materials have been removed from each affected Lot?
- If visual validation cannot be confirmed, additional excavation should be completed until the excavation can be validated as being in alluvial sands.
- Can it be confirmed that asbestos fines have been removed from Lot 422 (Parcel 4) and Lot 453 (Parcel 10)? If chemical validation cannot be confirmed, additional excavation should be completed and additional validation sampling undertaken until validation samples are free of asbestos.

11.2.6 Step 6: Specific Limits of Decision Error

Acceptable limits and the manner of addressing possible decision errors are outlined in the sections below:

- The decision to be made is that all surficial and buried asbestos materials have been excavated from each affected Lot and that the resultant excavation is within alluvial sand.
- Possible decision errors include deciding that all surficial and buried asbestos materials have been removed when they have not.
- The decision to be made is that all asbestos-containing building material have been removed from the footprint of a built structure following demolition;

- Possible decision errors include deciding that all asbestos-containing building materials have been removed when they have not.
- As the validation of the removal of surficial and buried asbestos materials is visual, there is no acceptable limit on decision errors.

11.2.7 Step 7: Optimise the Design for Obtaining Data

Each Lot is to be photographed during the following the removal of surficial and buried asbestos. The photolog shall be used to demonstrate compliance with the remedial strategy.

Details of the validation program is presented in **Table 11-1**.

Table 11-1: Validation Sampling Program		
Validation Method	Validation Requirements	Chemical Analysis
Visual validation of the removal of asbestos wastes	The surface of each Lot and any excavations are to be photographed and a photographic log maintained and included in the Validation Report.	None
Visual validation of the removal of asbestos-containing building materials associated with built structures	A 10 m grid is to be established. Each grid square will be walked with two passes with a 90° direction change and any ACM fragments collected. The identification of any ACM fragments on the surface is considered a fail and additional remedial work to remove ACM will be required. It is noted that the surface soils will be disturbed by the excavation process achieving a similar affect to surface raking. The footprint of each built structure is to be photographed following demolition and a photographic log maintained and included in the Validation Report.	None
Parcel 4 Lot 422 (includes asbestos fines)	The excavation area is anticipated to be 3500 m ² . Validation soil samples from the base will be collected on a 30 m grid. Validation soil samples from the walls will be collected at a rate of one sample per 10 lineal metres. Each validation soil sample will comprise a 500 ml sample.	Asbestos
Parcel 10 Lot 453 (includes asbestos fines)	The impacted area is anticipated to be 1000 m ² . A 10 m grid will be established for visual validation, as per other building footprints. Validation soil samples will also be collected at a rate of one sample per grid square. Each validation soil sample will comprise a 500 ml sample.	Asbestos
Asbestos Clearance Certificate	A suitably qualified asbestos assessor is to provide an Asbestos Clearance Certificate indicating that no visual ACM remains at each affected Lot.	None

Table 11-1: Validation Sampling Program		
Validation Method	Validation Requirements	Chemical Analysis
Stockpile Areas	Materials may be temporarily stockpiled on site prior to relocation to the Smelter Site, where they cannot be directly loaded into trucks. Visual validation of these areas following removal of the materials will be required.	None

Contingency for validation sampling:

- In the event that more than 10% of the total bonded ACM at a lot is significantly damaged, validation sampling and analysis for presence/ absence of free fibres will be completed. Validation sampling will be completed on a 10 m grid across the impacted area.
- In the event that visually impacted or odorous soils are excavated as part of the remedial works, validation sampling of the base of the excavation in the vicinity of the visually impacted or odorous soils will be completed;
- The analytical suite for the validation samples will vary and will depend on the visual impact or odour. Soils impacted with an oily sheen or hydrocarbon odour will result in validation sampling for hydrocarbons. Discoloured soils will result in validation sampling for a suite of analytes, including heavy metals, fluoride and cyanide.
- Discrete sampling will be undertaken by collecting surface soil using a steel trowel or collection directly from the soil surface by hand. Discrete samples will be spaced in a 30m grid formation across the area to ensure that an even coverage of the site is achieved.
- Decontamination of sampling equipment will be undertaken before sampling and between samples by cleaning with "Decon 90/Xtran" and potable water.
- Disposable gloves will be worn for all sample collection.
- Where walls of excavations are present and are not proposed to be excavated and are deeper than 0.2m, discrete sampling will be undertaken from each soil type present every 10 lineal metres.
- All samples will be given a unique identifier and marked on a plan.

11.2.7.1 Imported Fill Sampling

Any imported fill that is proposed to be brought to the site during the remediation project is to be VENM or ENM. The history of the source site and accompanying laboratory certification must show that the site has not been previously contaminated and a visual inspection of the source material is to be conducted. VENM material must be accompanied by a VENM certificate as outlined by the EPA. Refer to <http://www.epa.nsw.gov.au/wr/venm.htm>.

Imported ENM is to meet the criteria outlined in the ENM exemption issued under the Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A, The excavated natural material exemption 2012.

11.3 Remediation Acceptance Criteria

Remediation acceptance criteria is a visual validation of the removal of surficial and buried asbestos materials, with the resultant excavation (where required) to be within alluvial sands and visual validation of the removal of asbestos-containing building materials from the footprint of built structures that have been demolished.

Remediation acceptance criteria for validation soil sampling at Lot 422 (Parcel 4) and Lot 453 (Parcel 10) will be 0.001% asbestos fines.

11.4 Validation Reporting

At the completion of the remediation and validation works, a Validation Report will be prepared in general accordance with the relevant sections of NSW OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites*. The Validation Report will include:

- Executive summary;
- Scope of work;
- Site Description;
- Summary of site history and previous investigations;
- Remediation activities undertaken, including the extent of the remedial works to remove surficial and buried asbestos materials and observations made during remedial works;
- Supporting factual evidence of the remediation work including photographic, field records and materials tracking data;
- Visual validation of the removal of all surficial and buried asbestos materials;
- Visual validation of the removal of all asbestos-containing building materials from each Lot comprising a built structure that is to be demolished;
- Analytical results for validation soil samples from Lot 422 (Parcel 4) and Lot 453 (Parcel 10).
- Asbestos Clearance Certificate indicating that no visual asbestos remains at each affected Lot;
- A statement indicating the suitability of each affected Lot for its proposed landuse.

The Validation Report will be prepared in accordance with the NSW EPA (1997) *Guidelines for Consultants Reporting on Contaminated Sites* and the Department of Environment and Conservation (2017) *Guidelines for the NSW Site Auditor Scheme* 3rd Edition.

12. CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

12.1 Construction Environmental Management Plan

The contractor is to prepare a CEMP consistent with the "Guideline for the Preparation of Environmental Management Plans" (NSW Department of Infrastructure, Planning and Natural Resources, 2004). The CEMP is to include the controls presented in **Sections 12.2 to 12.12**. The CEMP should also be consistent with Ramboll Environ (March 2016) Hydro Aluminium Kurri Kurri Smelter Decommissioning and Demolition, Draft Environmental Management Plan.

12.2 Asbestos Management Protocol

Fragments of bonded asbestos have been identified at a number of Lots in the Buffer Zone. Asbestos fines have been identified at Parcel 4 on Lot 422, Dickson Road and at Parcel 10 on Lot 453, 2 Dawes Ave. The Contractor is to submit an Asbestos Removal Control Plan in accordance with SafeWork Australia (2011) How to Safely Remove Asbestos to the Principal for written approval 10 working days prior to the commencement of any asbestos removal.

The purpose of this protocol is to describe:

- The permits and approvals required to be attained prior to the works for the removal and management of the identified ACM and to account for additional ACM that may be encountered.
- The procedures to be implemented in removing the identified ACM.
- The procedures to be implemented in the event that additional ACM is encountered.

12.2.1 Asbestos Related Permits and Approvals

The Contractor is required to possess a Class A friable asbestos removal licence issued by SafeWork NSW or an equivalent asbestos removal licence issued in another Australian jurisdiction.

The Contractor is responsible for notifying SafeWork NSW of the asbestos removal work five days prior to the commencement of the works. The Notification of Asbestos Removal Work is to address the removal of ACM that may be encountered below the surface. The Contractor is required to prepare an Asbestos Removal Control Plan consistent with this Protocol.

The Contractor must notify a licensed waste management facility of the requirement to dispose of ACM prior to transporting the material to a facility. The Contractor would be required to provide the Contractor's Environmental Consultant with a docket from the facility confirming that the material was appropriately disposed as ACM at the facility and for that docket to be included in the Validation Report, refer to **Section 11**.

12.2.2 Management of Unexpected Friable Asbestos

Bonded ACM and asbestos fines derived from the breakup of bonded fragments only were encountered at the effected lots during previous investigations at the site. However there is the potential for friable asbestos such as lagging to be present and uncovered when undertaking the asbestos removal works.

In the event that unexpected friable ACM is unearthed, the Contractor would be required to undertake the following:

- Notify the Principal of the discovery.
- Remove and manage the friable material in accordance with the Asbestos Removal Control Plan and the Code.
- Transport the contained material to a location as directed by the Principal. This could include disposal at a licensed waste management facility or temporary storage at the Smelter site.

12.3 Site Access

During remediation works access to the site is to be strictly controlled by the Contractor. The contractor should include signage at the entry to the work area identifying the nature of the works, the contractor details and the Contractor's details.

Only authorized persons who have been inducted into the safety and environmental controls on the site will be permitted to work on the site. Visitors to the site will be accompanied by such inducted personnel.

Vehicle access to the site will be along established tracks where possible.

If the construction of additional access tracks is required, these shall be detailed for approval from the Principal's Representative prior to commencement of any construction works.

12.4 Hours of Operation

The Contractor shall only undertake works associated with the Project that may generate an audible noise at the closest residential receptor during the following hours unless under direction from a relevant authority for safety reasons or in the event of an emergency:

- 7.00 am to 6.00 pm, Monday to Friday;
- 7.00 am to 1:00 pm on Saturdays; and
- At no time on Sundays or public holidays.

12.5 Air Controls

12.5.1 Air Monitoring

Asbestos air monitoring is required to be completed at Parcel 4 on Lot 422, Dickson Road and at Parcel 10 on Lot 453, 2 Dawes Ave, where asbestos fines have been identified. Asbestos air monitoring should be completed by an appropriately experienced Occupational Hygienist and should involve the set-up of at least four air monitoring pumps, one on each boundary of the work area. Asbestos air monitoring should be completed daily for the duration of the asbestos works on these two Lots and results should be made available to site personnel within 24 hours. The results should also be included in the Validation Report.

12.5.2 Dust Control

Dust emissions shall be managed to avoid dust generation that could impact on a sensitive receiver. The CEMP is to identify the dust control measures the contractor will implement to meet this objective.

The following dust control procedures would be implemented:

- Securely covering all loads entering or exiting the site.
- Use of water carts on unsealed roads, parking and other trafficable areas.
- Control of dust from all stockpiles by water sprays.
- All vehicles to travel on designated access roads.
- Temporarily ceasing an activity that generates dust that could affect a sensitive receiver.

12.5.3 Odour

Given the nature and extent of the surficial and buried asbestos identified in the Buffer Zone, there is a low potential for odours to be emitted.

Should a complaint be received by the Contractor regarding odour, the source of the odour is to be located and appropriate control measures identified and implemented.

Control measures could include:

- Use of appropriate covering techniques such as the use of plastic sheeting to cover specific excavation faces or stockpiles.
- Use of fine mist sprays.
- Any equipment and machinery used on site need to have been maintained in accordance with manufacturers' requirements to minimise exhaust emissions.

Records of odours and control measures (if required) shall be kept by the Contractor.

12.6 Noise Control

The remediation works shall comply with the "Interim Construction Noise Guideline" (DECCW, 2009). This would include remediation works being restricted to the hours described in **Section 12.4**.

The CEMP is to identify the noise control measures the contractor will implement to comply with the guideline. The following noise control measures should be considered:

- Construction vehicles and machinery would be selected with consideration of noise emissions. Equipment should be fitted with appropriate silencers (where applicable) and be maintained in accordance with manufacturer's requirements. Machines found to produce excessive noise compared to typical noise levels should be removed and replaced, or repaired or modified prior to recommencing works.
- Where possible construction vehicles and machinery would be turned off or throttled down when not in use.
- All site staff would be informed of their obligations to minimise potential noise impacts on residents during the site induction and the need to take reasonable and practical measures to minimise noise.

12.7 Erosion and Sediment Control

The CEMP is to include erosion and sediment control measures consistent with Managing Urban Stormwater: Soils and Construction (4th Ed) (Landcom, 2004) for Lots that have buried asbestos requiring excavation, those being Lot 16 in Parcel 4 and Lots 458, 460 and 463 in Parcel 13.

The erosion and sediment control plan is to be prepared and implemented for the work area in each of these Lots and the Smelter site stockpile location.

The following erosion and sediment control measures should be considered:

- Installation of silt fences in drainage channels downgradient of the remediation work areas and any stockpile areas.
- Any material which is collected at the silt fences (or other sediment control measures) should be managed with the soil component of the excavated fill material.

Once a week and following rain events the sediment control measures would be inspected and maintained as required.

12.8 Surface Water and Groundwater Control

12.8.1 Surface water

Previous analysis of soils has identified that potential contaminants of concern were generally identified at concentrations below the laboratory detection limits and therefore the generation of dissolved contaminants in surface water runoff is not expected. Surface water controls are required to manage erosion and sediment control (refer to **Section 12.7**), and surface water collected within excavations.

The CEMP is to identify the measures the contractor will implement to manage surface water quality on Lot 16 in Parcel 4 and Lots 458, 460 and 463 in Parcel 13. The following control measures should be considered:

- Erosion and sediment controls outlined in **Section 12.7** are implemented;
- Diversion of surface water upgradient of the excavation and stockpile areas (where required) from the areas of disturbance.
- Stockpile areas are to be on flat land where possible and out of any drainage lines.
- Water collected within excavations would drain from the excavation area through sediment controls (as outlined in **Section 12.7**). Where the water is required to be pumped from the excavation it is to be subjected to the sediment controls outlined in **Section 12.7** prior to discharge to the site surface water management system.
- The Contractor is to keep themselves informed of weather conditions and the potential for rain events and proactively manage the site.

12.8.2 Groundwater

Groundwater will not be encountered during removal of the surficial and buried asbestos from the Buffer Zone.

12.9 Traffic Control

The lots from which asbestos is to be removed in the Buffer Zone are generally located in the east, south-east and south-west of the Buffer Zone. Local public roads such as Bishops Bridge Road, Graham's Lane, Hart Road and Bowditch Avenue will be used as haulage routes between the affected lots and the Smelter site. Travel to and from the affected lots site shall meet the following objectives:

- Comply with road traffic rules;
- Minimise noise, vibration and odour to adjacent premises; and
- Maximise travel on state and arterial roads and avoid use of local roads.

The CEMP should also include the following measures:

- Deliveries of soil, materials, equipment or machinery are to occur during standard construction hours (refer to **Section 12.4**).
- Securely cover all loads to prevent any dust or odour emissions during transportation.
- Vehicles are not to track soil, mud or sediment onto the road.

12.10 Spill Response

The Contractor is to develop a spill response protocol to be implemented in the event that site activities result in a spill.

Examples where spills could occur are:

- Transport of contaminated material from the site, involving loss of load anywhere including private and public property;
- Fuel spill during machinery use or refuelling that occurs anywhere including private or public property.

12.11 Hazardous Materials

The CEMP shall include measures for the storage, transport and use of any hazardous materials and dangerous goods during site activities. This will reference the guidance and requirements in the following:

- *Protection of the Environment Operations Act 1997* and associated regulations;
- *Work Health and Safety Act 2011* and the *Work Health and Safety Regulation 2011*;
- Australian Standard (AS1216) *Class Labels for Dangerous Goods*;
- Australian Standard (AS1940-2004) *The storage and handling of flammable and combustible liquids*; and
- Australian Standard (AS3833): *The Storage and Handling of mixed classes of dangerous goods in packages and intermediate bulk containers*.

Relevant Safe Data Sheets (SDS) for each material, chemical or hazardous substance used at the workplace is to be obtained from the manufacturer or suppliers of those goods prior to its arrival on site. All substances brought on to site must be registered on the SDS Register. This register must be developed and controlled by the site environmental manager who will be responsible for the receipt of such substances / materials in accordance with the Hazardous Substances Regulation, the Dangerous Goods Act and the Dangerous Goods Regulations.

12.12 Flora and Fauna

The CEMP is to include procedures for the clearance of vegetation (if required). This should include:

- Strategies for minimising vegetation clearance within the worksite and protection of vegetated areas adjoining the work area.
- Weed control measures.
- Measures for the management and disposal of cleared vegetation matter.
- Stockpiles and other materials are not to be stored below the drip line of any tree.

13. HEALTH AND SAFETY

A site-specific health and safety plan detailing procedures and requirements that are to be implemented will need to be developed for the remediation works including as a minimum but not limited to, the requirements described below.

The objectives of the health and safety plan are:

- To apply standard procedures that reduce risks resulting from the works;
- To ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- To have procedures to protect other site workers and the general public.

These objectives will be achieved by:

- Assignment of responsibilities;
- An evaluation of hazards;
- Establishment of personal protection standards and mandatory safety practices and procedures; and
- Provision for contingencies that may arise while operations are being conducted at the site.

Specifically the Health and Safety plan is to address the following identified hazards:

- The stability of excavations;
- The presence of services;
- The presence of livestock, wildlife including snakes;
- The presence of contaminants as described within this document;
- The presence of other site personnel, work and traffic.

The Contractors Health and Safety plan is to be compliant with:

- Hydro Aluminium's Contractor Work Health and Safety Plan Revision 8. This requires the Contractor and all employees and subcontractors to be inducted to the Hydro site and for Hydro work permits to be obtained prior to starting any work.
- *Work Health and Safety Act 2011*
- *Work Health and Safety Regulation 2017*
- Applicable state and federal regulations, legislation and codes of practice.

14. REMEDIATION SCHEDULE

The final remediation schedule will be discussed with the Contractor. A proposed indicative schedule up to the completion of a draft validation report is outlined in **Table 14-1**.

Table 14-1: Remediation Schedule		
Task	Estimated Duration	Estimated Completion Date
Cessnock City Council and Maitland City Council Category 2 Notification	30 days	TBA
Contractor Procurement	4 – 6 weeks	TBA
Preliminaries (documentation)	3 weeks	TBA
Site establishment and mobilisation	1 week	TBA
Site works	6 – 8 weeks	TBA
Demobilisation	1 week	TBA
Validation reporting	3 weeks	TBA

15. ENVIRONMENTAL CONTROLS CONTINGENCY PLAN

This section of the RAP describes the contingency plans to respond to site incidents that may occur during remedial works and could impact on the surrounding environment and the community.

The environmental controls described in **Section 1** are designed to be sufficiently protective under the normal range of site conditions. The contingencies presented in **Table 15-1** are to be implemented where unexpected site conditions or circumstances arise.

Table 15-1: Environmental Controls Contingency Plan		
Contingency Event	Contingency	Responsibility
Discovery of unexpected materials including friable asbestos but excluding ACM	Contact the Principal's representative, then sort materials to a segregated stockpile and discuss possible disposal options with the Principal or the Principal's representative.	Principal following notification from the Remediation Contractor.
Receival of a noise complaint	Identify noise source and implement noise control measures	Remediation Contractor
Receival of a dust or odour complaint	Identify odour or dust source and implement control measures	Remediation Contractor
Flooding event/sediment laden discharge	Assess and improve sediment and erosion control measures and stockpile management.	Remediation Contractor

16. REGULATORY COMPLIANCE REQUIREMENTS

Approvals required for the remediation of the asbestos-impacted Buffer Zone sites are outlined in **Table 16-1**.

Table 16-1: Key Relevant Legislation and Regulations	
Legislation or Regulation	Relevance
State Environmental Planning Policy 55 – Remediation of Land (SEPP 55)	<p>Under SEPP 55, remediation work is permissible in any zone, regardless of any provision in another environmental planning instrument (such as a local environmental plan). SEPP 55 also establishes:</p> <ul style="list-style-type: none"> • Category 1 remediation works: remediation that required development consent. This includes remediation that is: designated development; likely to have a significant impact on ecological values; deemed as requiring development consent by another SEPP; within a sensitive land zone under a local environmental plan; or not consistent with a contaminated land planning guideline made by the relevant council. • Category 2 remediation works: remediation which does not require development consent. This is any remediation that is not deemed Category 1 remediation works. <p>The asbestos remediation works are considered to fall under Category 2 and Hydro will notify Cessnock City Council and Maitland City Council 30 days prior to commencement of remediation works.</p>
<i>Contaminated Land Management Act 1997 (CLM Act)</i>	<p>The objective of the CLM Act is to establish a process for investigating and (where appropriate) remediating land that the EPA considers to be contaminated significantly enough to require regulation. Section 60 of the CLM Act requires landowners to notify the EPA if their activities have resulted in contamination of the land. It was concluded that the site does not warrant regulation under the Act.</p>
<i>Protection of the Environment Operations Act 1997 (POEO Act)</i>	<p>The POEO Act is the primary legislation for the management and control of pollution of the environment. This includes the licensing of premises that are listed as scheduled premises under Schedule 1 of the POEO Act. The Smelter site storage area is regulated under Environment Protection Licence (EPL) 1548. Activities proposed for the remediation works are consistent with the scheduled activities permitted by the EPL.</p>
<i>Waste Avoidance and Recovery Act 2001 (WARR Act)</i>	<p>The WARR Act establishes a hierarchy of waste management (avoid, recover, dispose) encouraging efficient use of resources and minimising waste. Waste materials generated during remediation of the site would be managed consistent with the principles of the waste management hierarchy referred to in the WARR Act.</p>

Table 16-1: Key Relevant Legislation and Regulations	
Legislation or Regulation	Relevance
<i>Work Health and Safety Regulation 2017</i>	Chapter 9 of the Regulation relates to asbestos and identifies prohibitions and exceptions for work involving asbestos or ACM. Of interest to the remedial works is Part 8.7 Asbestos removal work, which includes licencing requirements for asbestos removalists, training requirements and requirements to notify the regulator about asbestos removal work.
Cessnock Local Environmental Plan 2011 (Cessnock LEP)	The Cessnock LEP is the key local land use planning document for the Cessnock local government area. Category 2 remediation works are permissible without consent however SEPP55 requires notification to Council, as outlined above.
<i>Local Land Services Act 2013 (LLS Act)</i>	The LLS Act regulates the management of native vegetation in rural zoned lands within specific local government areas in NSW, including Cessnock. Native vegetation clearing associated with environmental protection works (such as remediation) and/or associated with an activity that does not require development consent (such as Category 2 remediation works) does not require approval.
<i>Biodiversity Conservation Act 2016 (BC Act)</i>	The BC Act regulates the clearing of native vegetation in NSW. Native vegetation clearing associated with an activity that does not require development consent (such as Category 2 remediation works) does not require approval.
<i>National Parks and Wildlife Act 1974 (NPW Act)</i>	Under the NOW Act it is an offence to harm protected fauna. Protected fauna are native fauna species. In the event that a tree is required to be removed the contractor is to avoid harm to native fauna.
<i>Water Act 1912</i>	A groundwater interception licence is required for works that intercept groundwater. However minor temporary dewatering activities that is estimated to be less than three megalitres per year (including both construction dewatering and subsequent managed inflows) will generally not require a licence or approval from the Office of Water. Groundwater is not expected to be intercepted during the works. In the event that it is intercepted, it is likely to require dewatering of less than 3 megalitres per year. Perched water is expected to be intercepted during the works. This perched water is not considered to be groundwater.

17. KEY PERSONNEL

The key stakeholders and their roles and responsibilities are outlined in **Table 17-1**.

Table 17-1: Roles and Responsibilities		
Stakeholder	Name and Contact Details	Role/Responsibility
Principal	Hydro Aluminium Kurri Kurri Pty Ltd	Owner of the Smelter site and ultimately responsible for all works on the site. Will engage/contract all other parties.
Principal's Environmental Representative	TBA	Person employed by or sub-contracted to Hydro to oversee/provide technical advice on remediation works and ensure works are completed in association with relevant guidelines.
Remediation Contractor	TBA	Company contracted to undertake remediation works. Will supply all plant and personnel to conduct works as outlined in this RAP and as required under local, state and federal legislation.
Remediation Supervisor or Project Manager	TBA	Responsible Person appointed by Contractor to supervise/coordinate all aspects of remedial works on behalf of the Contractor. Is the primary point of contact for the project.
Contractors Environmental Representative	TBA	Responsible for implementation, monitoring and management of the RAP.
Contractor's Environmental Consultant	TBA	Appropriately qualified environmental consulting company/person appointed to validate the implementation of the RAP. The Contractor's Environmental Consultant will supervise the works, conduct validation sampling and undertake all activities necessary to prepare validation report that documents the implementation of the RAP for submission and review by the Principal
Contaminated Land Auditor	TBA	The Contaminated Land Audit will be prepared for the site in accordance with the Contaminated Land Management Act 1997. The Contaminated Land Auditor will be appointed by Hydro.

18. COMMUNITY RELATIONS PLAN

Keeping the community informed about activities at the Smelter and the future of the Hydro Land has been an integral activity in the development of the future of the Hydro Land.

Hydro has implemented a number of community engagement activities to inform the community about the remediation works and to identify the community's concerns and issues.

Table 18.1 describes the community engagement activities undertaken by Hydro in planning for remedial works at the site.

Table 18.1: Hydro Community Engagement Activities

Engagement Format	Details
Information and Feedback Mechanisms	<p>The following communication methods have been and will continue to be available throughout the remediation works to provide the community with a range of ways to contact the Hydro team, gain access to information and provide comment.</p> <p>Website: http://www.hydro.com/en/Press-room/Kurri-Kurri/Community-input/</p> <p>Email: community.kurri@hydro.com</p> <p>Phone: 1800 066 243</p> <p>Mailing Address: PO Box 1, Kurri Kurri NSW 2327</p> <p>Information about the remediation works continues to be uploaded onto the website to provide the community ready access to information about the proposed works.</p>
Community Reference Group	<p>Hydro established the Community Reference Group in 2014. The group is comprised of local community representatives with the following aims:</p> <ol style="list-style-type: none"> 1. Create a forum for discussion and exchange of information on topics related to the Project. 2. Assist Hydro to understand the values, aspirations and preferences that the community has for the Smelter Site and identify related local issues that will need to be taken into consideration in the development, environmental assessment and management, construction/demolition and rezoning/divestment phases of the project. 3. Act as a communication link between Hydro, the community and other stakeholders. <p>The first meeting of the Community Reference Group was held in July 2014 and it continues to meet on a bi-monthly basis.</p> <p>Minutes of the Community Reference Group meetings are posted on the Hydro Aluminium Kurri Kurri website.</p>
Community Drop-In Sessions	<p>Community drop in sessions were held on 23 April 2015 (the Project Site), 28 May 2015 (Weston), 2 June 2015 (Gillieston Height) and 10 June 2015 (Kurri Kurri).</p> <p>The drop-in sessions were held to allow interested parties to ask questions about the remediation works and raise any concerns.</p>
Community Information Notices and Fact Sheets	<p>Hydro has developed a number of Community Information Notices and Information Newsletters on the various aspects of the future of the Hydro Land, including the remediation. This has included:</p>

Table 18.1: Hydro Community Engagement Activities

Engagement Format	Details
	<ul style="list-style-type: none"> • Information Notices in the Cessnock Advertiser and Maitland Mercury providing information on demolition activities, contamination and remediation, and the future land uses at the Smelter and the Hydro Land. • Information Newsletters on these elements were placed on the Hydro Aluminium Kurri Kurri website.
Issues Database	Through the activities described above, Hydro has received a number of community submissions, raising various issues including traffic congestion, recycling of waste materials, flora and fauna and conservation.

19. LONG TERM MANAGEMENT

This RAP has been designed to remove any requirement for long term site management from the lots within the Buffer Zone in relation to contamination. Once remediation is complete and the site has been validated as suitable for the proposed range of land uses, no further management is proposed. Interim soil and erosion management of the site prior to redevelopment will be undertaken in accordance with the site CEMP.

Management of stockpiled materials at the Smelter site stockpile area is required until such time the disposal method is determined and available. For this period the stockpile management will be in accordance with the current Hydro stormwater management practices.

20. REFERENCES

ANZECC & NHMRC (ANZECC 1992) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites;

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 1 ESA, Hydro Kurri Kurri Aluminium Smelter, 22 October 2013;

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 2, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 3, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 4, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 6, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 7, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 8, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 9, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 10, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 12, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 13, April 2015

ENVIRON Australia Pty Ltd (ENVIRON 2013) Phase 2 Environmental Site Assessment, Parcel 14, April 2015

Hunter Catchment Management Trust (HCMT 2000) Wallis and Fishery Creeks Total Catchment Management Strategy;

NEPC (1999) National Environmental Protection (Assessment of Site Contamination) Amendment Measure (NEPM) 2013;

New South Wales Department of Environment and Conservation (NSW DEC 2017) Guidelines for the NSW Site Auditor Scheme (Third Edition);

NSW DECC (2008) Waste Classification Guidelines.

Western Australia Department of Health (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

21. LIMITATIONS

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

A representative program of sampling and laboratory analyses was undertaken as part of this investigation, based on past and present known uses of the site. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous.

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

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

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

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

21.1 User Reliance

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