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Hazard Identification Assessment Report

Woodsreef Mine Major Rehabilitation Project

NSW Trade and Investment

Division of Resources & Energy

Report Number 610.10893.00030

1 December 2014

NSW Trade and Investment
Division of Resources & Energy
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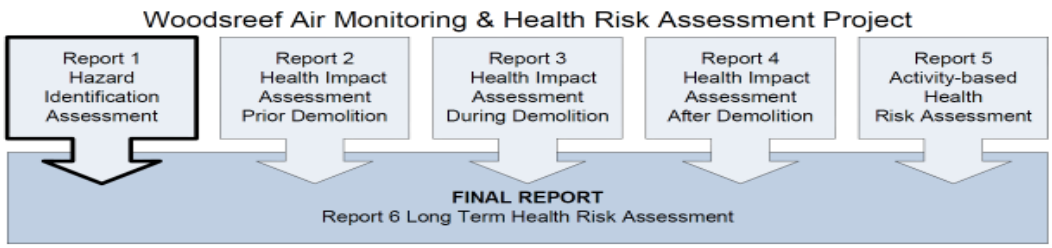

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NSW Trade and Investment

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PREPARED BY:

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
2 Lincoln Street Lane Cove NSW 2066 Australia

(PO Box 176 Lane Cove NSW 1595 Australia)
T: 61 2 9428 8100 F: 61 2 9427 8200
E: sydney@slrconsulting.com www.slrconsulting.com

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EXECUTIVE SUMMARY

The NSW Government Department of Trade & Investment, engaged SLR Consulting Australia Pty Ltd (SLR) to undertake Hazard Identification of the Woodsreef Mine site as part of the Woodsreef Mine Major Rehabilitation Project.

The objectives of the study were:

- To identify, characterise and rank sources of asbestos on site, on the basis of their potential to result in off-site migration of asbestos and exposure of the public to elevated levels of asbestos fibres; and

- The identification of appropriate risk management options to minimise the potential for the identified sources to result in off-site migration of asbestos.

A walk over inspection of the mine site was conducted on 12 to 14 March 2013. Observations were made on the site conditions, including crusting and evidence of ground surface migration noted.

Safety concerns due to the hazardous nature of the mine site, in particular waste / overburden, tailings stockpiles, restricted access to some areas of the site.

Samples of bulk materials were collected at forty six locations, representative of the broad areas within the mine site. These areas included

- Waste/Overburden,

- Tailings

- Road cuttings

- Siltation Systems sediments

- Mill Building vicinity

- Proposed Containment Cell vicinity

- Additional areas likely to have potential for off-site migration of asbestos containing materials.

These additional areas included the following locations:

- Ironbark Creek, adjacent to pumping station; to tyre mount; and floodplain

- Ironbark Creek, east flood plain, midway

- Ironbark Creek, start of walking track NE

- North of mine central waypoint, north side of Bundarra – Barraba Road

- Entrance to mine, east of building

- South end tailings, east road culvert, adjacent to private land

- Flora Trail adjacent to pit 1, west

- West of waste dump near pumping station
- North west of overburden

Samples were analysed for asbestos in SLR's NATA Accredited Laboratory.

The hazard assessment identified that sources of asbestos were present throughout almost all sampling sites. The only exceptions were two sites, Ironbark Creek (start of walking track NE), and one sample from Siltation Systems Sediments.

At the majority of locations respirable asbestos fibres were present in the soil. Asbestos fibres in this size range pose a significant hazard to human health if inhaled at elevated concentrations.

The functional areas of the mine site and additional sampling areas have been ranked based on the sources of asbestos on site, on the basis of their potential to result in off-site migration of asbestos and potential exposure of the public to elevated levels of asbestos fibres. The ranking have been set out below in **Table 1 & 2**.

Table 1 Potential to release asbestos fibres through off-site migration of asbestos and exposure of the public to elevated levels of asbestos fibres

Designated Area	Hazard Assessment		
Waste / Overburden	**High**	To	**Very High**
Road Cuttings	**Medium**	To	**Very High**
Tailings	**High**	To	**Very High**
Siltation Systems sediments	**Medium**	To	**Very High**
Mill Building vicinity	**Medium**	To	**High**
Containment Cell vicinity	**High**	To	**High**

Table 2 Potential to release asbestos fibres through off-site migration of asbestos and exposure of the public to elevated levels of asbestos fibres – additional areas

Additional Areas	Hazard Assessment
Ironbark Creek, adjacent to pumping station	Low
Ironbark Creek, adjacent to tyre mount, floodplain	High
Ironbark Creek, east flood plain, midway	Medium
Ironbark Creek, start of walking track north east	Medium
North of mine central waypoint, north side of Bundarra – Barraba Road	Very High
Entrance to mine, east of building	Medium
South end tailings, east road culvert, adjacent to private land	Medium
Flora Trail adjacent to pit 1, west	High
West of waste dump near pumping station	Very High
North west of overburden	Medium

Mitigation Measures

As the mine site is contaminated with significant volumes of naturally occurring and processed asbestos waste and tailings many high level or large scale asbestos mitigation controls (such as encapsulating and removal) are not feasible.

A mid-level risk management approach is required in order to implement risk mitigation controls. As there is variability between the different areas within and around the mine (and in some cases within areas themselves) and a number of locations are readily accessible by the public using the Barraba-Bundarra Road, controls need to be tailored in order to provide the best options for members of the public, workers and visitors to the site to control the environmental health hazards in and around the site. Refer to *Section 6.1* for further information for both generally classified area and for individual areas.

The primary control is to reduce public access to areas where there is an elevated asbestos hazard present and/or minimise off-site migrating of asbestos materials into publicly accessible areas such as locations where run-off is occurring across roads or is entering upstream creeks. As such the primary focus is on the need to maintain current sediment drains and culverts around the mine site, especially those along the Barra-Bundarra Road as well as preventing drainage into water courses that may lead to extensive off site migration into public areas.

A number of effective area specific controls that can provide the most practicable hazard controls to prevent public exposure and can be implemented without significant planning have been identified and their priority are highlighted by boxed text in section in *Section 6.1.1-6.1.7.*

The most effective controls that can be implemented can be summarised as:

- Encapsulation e.g. laying blue metal, shotcrete or other similar methods to suppress dust release, especially around the intersection of Crow Mountain (Mine) Road, the current look-out area and along identified edges of the Barraba-Bundarra Road, in particular near drainage points.
- Relocation or extension of the existing fence boundaries closer to the Barraba-Bundarra Road to capture as much unsealed areas as possible.
- Closure and fencing of the Picnic Area south of Iron Bark Creek Bridge should be considered. If not feasible, fencing with gates should in installed to restrict access following events or heavy rain. Information signage should be installed with recommendations to relocate to alternative camping, fishing and picnic areas on the western side of the creek. Gates will also allow for greater control of required access by utility companies.
- Closure and relocation of the flora trail and removal public signage to trail adjacent to the mine site should occur and the promotion of tourism activities adjacent to the mine site should be discouraged.

During the Mill Building demolition process, it is recommended that the Technical Scope of Works, Asbestos Management Plan (AMP) and monitoring program from the principal contractors be reviewed to ensure it meets adequate risk mitigation controls and shows an adequate understating of the unique environmental health hazards present both within and outside the demolition zone. Refer to *Section 6.2* for further information.

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1 INTRODUCTION

The NSW Trade & Investment engaged SLR Consulting Australia Pty Ltd (SLR) to undertake a Hazard Identification Assessment of the Woodsreef Mine site as part of the Woodsreef Mine Major Rehabilitation Project. The hazard identification was to conduct an assessment of the whole mine site to identify, characterise and rank sources of asbestos on site, on the basis of their potential to result in off-site migration of asbestos and exposure of the public to elevated levels of asbestos fibres. Where possible the study was to propose possible mitigation measures.

The Woodsreef Mine site is situated at the locality of Woodsreef, 15km from Barraba on the Bundarra – Barraba Road (NSW Department of Primary Industries Soil Conservation Service, 2013). The mine is situated where Crow Mountain Road joins the Bundarra – Barraba Road (See **Figure 1, Figure 2 & Figure 3**).

Figure 1 Woodsreef Mine Location

Figure 2 Woodsreef Mine Location in Relation to Barraba

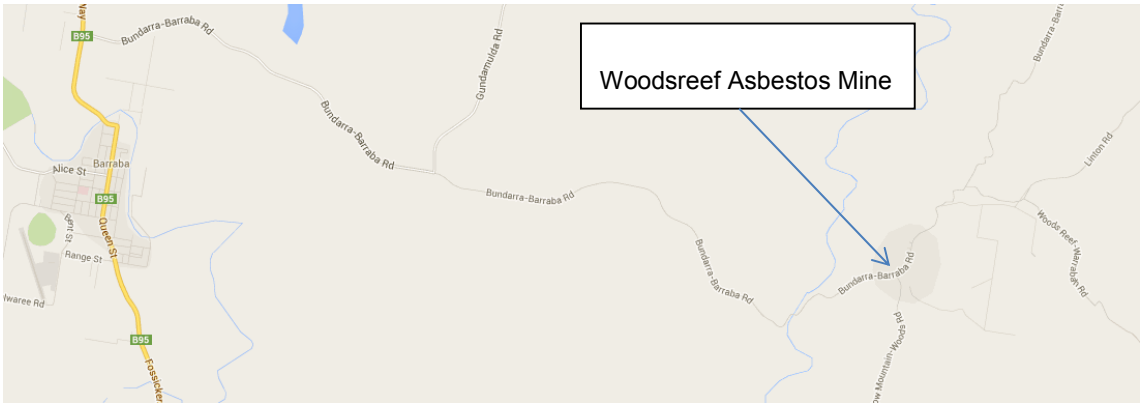
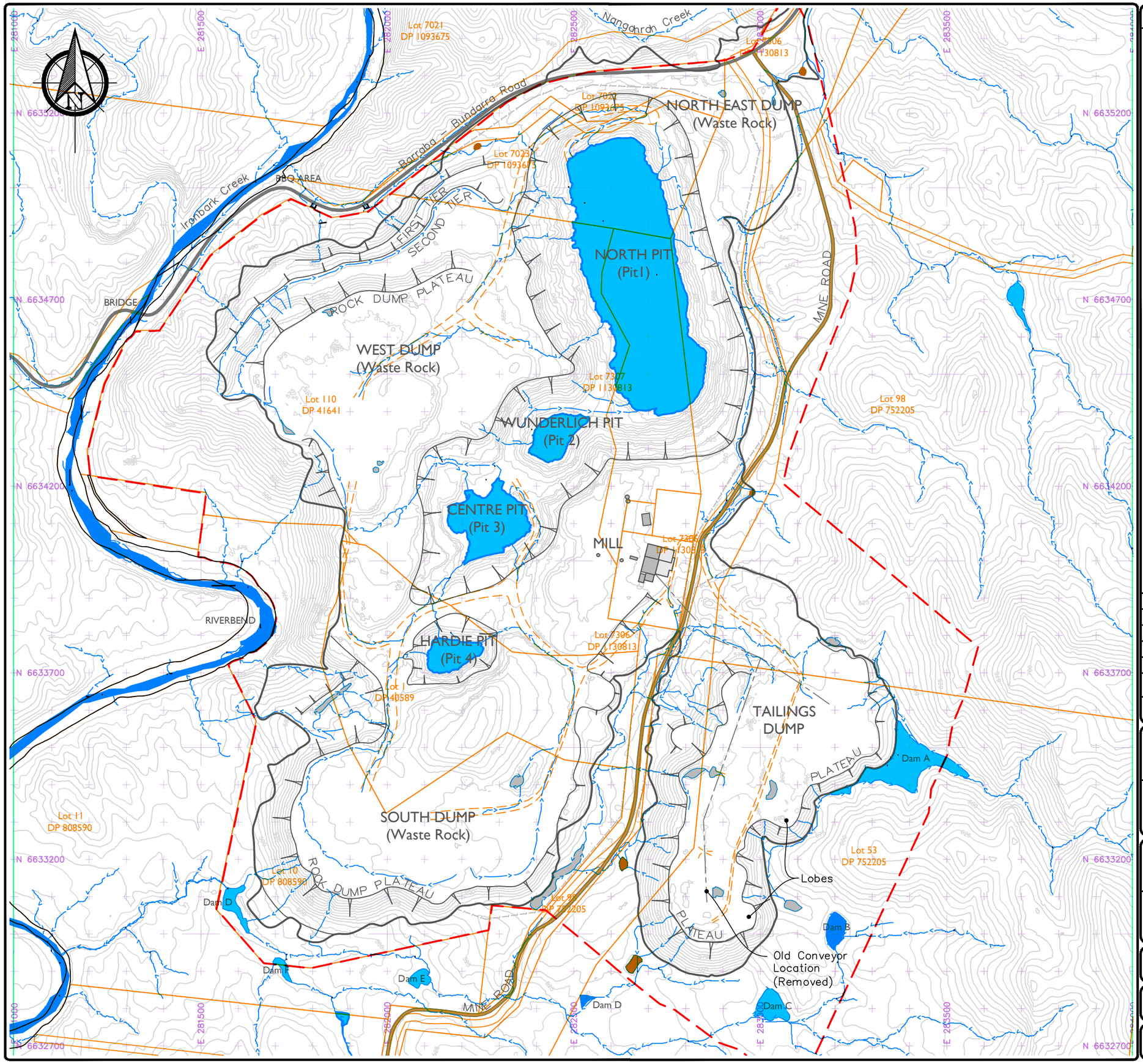


Figure 3 Woodsreef Asbestos Mine Site Plan

(Source: NSW Department of Primary Industries Soil Conservation Service, 2013)



SCALE CHECK (Millimetres) 0 10 20 30 40 50 60 70 A3

LEGEND

- Mine Site Nominal Boundary
- Mine Footprint (Disturbed Area)
- Security Fencing
- Drainage Lines
- Cadastra, Lot & DP
- Contours (5 m from 5m DTM)
- Sediment Basins
- Existing Depressions
- Existing Dams

ISSUE	DESCRIPTION	DATE
1	REVISED FOR REVIEW	20/02/2013
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CLIENT

NSW MINERAL RESOURCES

36 Marina Drive
Coffs Harbour
NSW 2450
Ph. 02 6691 9623

Department of Primary Industries
Soil Conservation Service

PROJECT TITLE

WOODSREEF DERELICT ASBESTOS MINE DRAINAGE ASSESSMENT

DRAWING TITLE

General Site Plan

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The mine is situated in an area of high asbestos mineralisation and accordingly areas beyond the mine would be expected to contain naturally occurring asbestos (NOA).

The mine site is approximately 290 hectares in size and is reported to contain a 75 million tonne waste rock dump and 25 million tonne tailings dump. The site also contains two derelict buildings and four open pits (*Parsons Brinckerhoff, 2012 & NSW Department of Primary Industries Soil Conservation Service, 2013*). The mine has been derelict since 1983.

The mine site can be functionally divided into the following areas: Open Pits (four on site), Mill Building Area, Waste Dump (three sites, south, west and northeast), and a Tailings Dump. Crow Mountain Road (also known as Mine Road) winds along the eastern perimeter of the mine except for a section of road that runs in-between the South Waste Dump and the Tailings Dump (See Figure 3 above).

The Mill Building is slated for demolition in 2014. It is proposed that a Containment Cell be dug to the west of the Mill Building. The building is to be demolished and buried in the Containment Cell.

The Waste Dumps consist of processed rocks and overburden. The Tailings have been reported as partially processed ore, understood to be predominately asbestos, stockpiled for later reprocessing that never occurred (*NSW Department of Primary Industries Soil Conservation Service, 2013*).

Water drainage on the mine site shows drainage flows both back onto the mine site and flows off the mine site. A siltation / drainage system is in place, partially left over from the mine operations and partially retrofitted by the Soil Conservation Service. These were designed to improve drainage and minimise asbestos containing sediments being transported off site with water flows (*NSW Department of Primary Industries Soil Conservation Service, 2013*).

The potential for natural processes, such as rain and wind, to transport materials from the mine site to areas outside the mine boundary will be a major factor in determining the likelihood of the general public being exposed to asbestos from the mine. The ability of the mine site materials and soils to resist these forces of erosion will vary over time. The characteristics of the parent material to form a stable crust will reduce the potential for off-site migration caused by both wind and rain. If the materials do start to migrate under the influence of natural forces such as rain and water movement, then the direction of water drainage from the source materials will determine if the materials leave the mine site. Therefore the ability of a surface to form a stable crust and the probable water drainage flows from the area of the mine, are primary factors when determining the likely hazard from off-site migration of mine materials.

Ultimately natural forces will be responsible for transporting some materials and soils both off the mine site and within the mine site. However any potential asbestos hazard coupled with the transport of materials will be dependent on five main factors. This includes whether asbestos present in the material, how much asbestos is present in the material, in what form is the asbestos, the capacity to generate airborne fibres and for people to breathe in these fibres.

The first and second factors (the presence or not of asbestos in material and how much asbestos is present) are both of obvious importance. The third factor, the form of the asbestos in the materials, is extremely important for any hazard assessment. The simple underlying principle being within some limits, the smaller the asbestos fibres present the greater the asbestos hazard.

If the asbestos is present as a natural band, encased in rock, with little chance of releasing asbestos fibres, the hazard is negligible. In contrast, asbestos will pose the greatest hazard to humans when present in the form of small fibres or loose bundle of asbestos.

The asbestos hazard to humans occurs via the respiratory route, the breathing in of asbestos fibres. Asbestos can be present in a material but not in a respirable form. Accordingly the hazard posed by mine site materials and soils will be dependent on the ability of the material to release respirable asbestos fibres and for people to breathe in these fibres.

The definition of respirable asbestos fibres is those fibres less than 3µm in width, and greater than 5µm in length and with a width length to width ratio of greater than 3:1 (*AS 4964-2004*). The presence or absence of respirable asbestos fibres is determined during laboratory analysis, using Trace Asbestos Analysis, if Trace Asbestos is reported it indicates the presence of respirable asbestos fibres (*AS 4964-2004*).

If respirable asbestos fibres are present in a sample, by nature of their size the fibres will likely be found in the finest particle size fraction. With regards to laboratory analysis, generally the smallest particle size fractions separated by sieving methods are particles of less than 2mm in size. Accordingly the procedure of Trace Analysis can be conducted on this soil fraction to determine if respirable asbestos fibres are present.

Therefore materials that pose the highest potential hazard to exposed humans will be materials with relatively high asbestos content and with the asbestos fibres present in the respirable size range.

The aim of the current study was to investigate the asbestos related hazards associated with the Woodsreef Asbestos Mine site and the different functional areas present on or near the site.

1.1 Objectives

To identify, characterise and rank sources of asbestos on site, on the basis of their potential to result in off-site migration of asbestos and potential exposure of the public to elevated levels of asbestos fibres.

The identification of appropriate risk management options to minimise the potential for the identified sources to result in off-site migration of asbestos.

1.2 Scope

The scope of the report included the following:

Hazard assessment of the whole mine site to identify, characterise and rank sources of asbestos on site, on the basis of their potential to result in off-site migration of asbestos and exposure of the public to elevated levels of asbestos fibres.

Identification of appropriate risk management options, if any, to minimise the potential for these sources to result in off-site migration of asbestos.

The Woodsreef whole mine site is taken to be defined as the mine area set out in the New South Wales Government Gazette No.11, 18 November 2011.

Conduct site walk over inspection of accessible areas of the mine site and surrounds. However safety concerns due to the hazardous nature of the mine site restricted access to some areas of the site.

Collection and analysis of bulk materials from representative areas of the following:

- Waste/Overburden
- Tailings
- Road Cuttings
- Siltation Systems sediments
- Mill Building vicinity
- Proposed containment cell vicinity
- Additional areas likely to have potential for off-site migration of asbestos containing materials.

2 METHODOLOGY

2.1 Reference Documents

The following documents were reviewed as part of the Hazard Assessment:

- *Geotechnical Assessment and Containment Cell Design for Woodsreef Mine Remediation Project.* Parsons Brinckerhoff, September 2011
- *Geotechnical Assessment for Capping Layer - Woodsreef Mine Remediation Project.* Parsons Brinckerhoff, April 2012
- New South Wales Government Gazette No.11, 18 November 2011
- *Project Close Out Report Former Woodsreef Asbestos Mine – Asbestos Removal and Remediation Works.* AECOM 15 December 2009
- *Woodsreef Derelict Asbestos Mine – Sediment Movement Assessment*. NSW Department of Primary Industries Soil Conservation Service 23 July 2013
- *Woodsreef Mine, Hazard and Risk Assessment- Barraba, New South Wales.* Dames & Moore, Ref: 29139-070, 1 October 1997

2.2 Site Inspection & Sampling

A walk over inspection of the mine site was conducted on 12 to 14 March 2013. Observations were made on the site conditions, including crusting and evidence of ground surface migration noted.

Safety concerns due to the hazardous nature of the mine site, in particular waste / overburden, tailings stockpiles, restricted access to some areas of the site.

Samples of bulk materials (5L volume approx.) were collected at forty six locations, representative of the broad areas within the mine site. These included: Waste/Overburden Road Cuttings, Tailings, Siltation Systems Sediments, Mill Building Vicinity Proposed Containment Cell Vicinity, and Additional Areas likely to have potential for off-site migration of asbestos containing materials

Sample locations for the Additional Areas were chosen during the walk over inspection. Factors taken into account when choosing sample locations included proximity to mine areas, visual or previously documented evidence of localised off site migration of materials with potential to contain asbestos and evidence of potential public access to the areas.

Table 3 Mine Site Areas Samples and Sample Numbers

Areas	Number of Samples
Waste / Overburden	4
Road Cuttings	6
Tailings	8
Siltation Systems Sediments	4
Mill Building Vicinity	10
Proposed Containment Cell Vicinity	4

Table 4 List of Additional Areas Sampled

Additional Areas Sampled (Areas Deemed To Have Potential for or Affected by Off-Site Migration of Asbestos)	Comments
Ironbark Creek, adjacent to pumping station	Pumping Station
Ironbark Creek, adjacent to tyre mount, floodplain	Near Pumping Station
Ironbark Creek, east flood plain, midway	
Ironbark Creek, start of walking track NE	Picnic / Camping Area
North of mine central waypoint, north side of Bundarra – Barraba Road	
Entrance to mine, east of building	
South end tailings, east road culvert, adjacent to private land	
Flora Trail adjacent to pit 1, west	
West of waste dump near pumping station	
North west of overburden	

The spread of sample sites across the mine site and surrounds has been set out in **Appendix A (GPS Co-ordinates) & Appendix G (Site Map)**.

Bulk samples of approximately 5L volume were collected at each sampling location. At most locations samples were taken from the surface to a depth of approximately 5cm. The exceptions were samples taken in the Tailings, where the depth of sampling was dependent on the nature of the crust depth to the underlying material. In most cases Tailings samples were typically collected to a depth of approximately 100mm to 150mm.

2.3 Bulk Materials Asbestos Analysis

Asbestos analysis of samples was conducted as per Australia Standard AS 4964-2004 *Method for the Qualitative Identification of Asbestos in Bulk Samples* and SLR Procedure AIP-01.03 *Asbestos ID in Bulk Samples by Polarised Light Microscopy (PLM) and Dispersion Staining*.

Samples were sieved into three soil particle fractions:

- Fraction greater than 9.5mm in size;
- Fraction smaller than 9.5mm and greater than 2mm in size;
- Fraction less than 2mm in size.

Asbestos content of each fraction was estimated on a volume to volume basis.

2.4 Hazard Assessment Ranking

The hazard associated with the potential of asbestos exposure to the general public outside the mine boundary will be dependent on the transport of asbestos containing materials off the mine site. This will also include the potential for asbestos fibres to become airborne, the airborne fibre concentration generated and dilution and the duration of the fibres remain airborne.

The major factors influencing the likelihood of this occurring are firstly the ability of mine site materials and soils to resist these forces of erosion from natural processes such as rain and wind and secondly the presence of asbestos, the concentration and form or fibre sizes of the asbestos. Once materials have started to be transported by natural processes on the mine site, then the direction of transport becomes important in determining if the material will move off the mine site.

In the current study, to help delineate degrees of hazard associated with the each sample, a nominal Hazard Assessment Score was developed. The scale was based on factors considered to contribute to the potential of asbestos to be transported off the mine site. These factors were, the potential to resist erosion as indicated by the surface crust stability, evidence of previous transport of materials, including the proximity to the public, probable routes of water borne transport, the presence of asbestos and the presence of respirable size asbestos fibres (as indicated by the presence of Trace Asbestos).

The aim of the Hazard Assessment Score was to rank sites based on the potential to release asbestos fibres through off-site migration of asbestos and potential exposure of the public to elevated levels of asbestos fibres.

The Hazard Assessment Score for the asbestos was created by adding combined scores from two components determined by SLR. These were the Site Hazard Assessment Algorithm and the Laboratory Analysis Hazard Assessment Algorithm.

The Hazard Assessment Score ranges, colour codes and general characteristics for each classification are set out below in **Table 5**. The Site Hazard Assessment Algorithm and the Laboratory Analysis Hazard Assessment Algorithm are defined in *Section 2.4.1* and *2.4.2* respectively.

An explanation of the rationale behind the Asbestos Hazard Assessment, the Site Asbestos Hazard Assessment and the Laboratory Analysis Hazard Assessment Algorithm can be found in **Appendix C**.

Table 5 Hazard Assessment Score

Score	Asbestos Hazard Assessment Score	Characteristics
16	**Very High**	Susceptible to erosion Migration pathway off site Trace asbestos present
10 - 15	**High**	May be susceptible to erosion Migration pathway mostly off-site Trace asbestos likely to be present
6 - 10	**Medium**	May be susceptible to erosion Migration pathway mostly on-site Trace asbestos may or may not be present
5 or less	**Low**	May be susceptible to erosion but mostly resistant to erosion Migration pathway on-site Trace asbestos unlikely be present OR No asbestos detected

2.4.1 Site Hazard Assessment Algorithm

The first component, the Site Hazard Assessment Algorithm, was determined using information on the *in situ* conditions of the asbestos at each sampling site, including crusting, evidence of water borne migration and the probable water borne migration path.

The probable water borne migration path was determined from the Existing Catchments Drawings from the *Woodsreef Derelict Asbestos Mine - Drainage Assessment*. NSW Department of Primary Industries Soil Conservation Service 23 July 2013 (refer to **Appendix B**) and site observations.

The Site Hazard Assessment Algorithm definitions and calculation have been set out in **Table 6**.

An explanation of the rationale behind the Site Hazard Assessment Algorithm, can be found in **Appendix C**.

Table 6 Site Hazard Assessment Algorithm

	Sample variable	Scale	Definition
A	**Crusting**	1	**Hard Crust** – Supports human weight easily without breaking, integrity of crust resistant to damage by natural processes such as rain and wind. Damage possible through erosion processes undermining crust.
		2	**Medium Crust** – Compared to "Soft Crust" more difficult to break or deform under foot, integrity of crust less likely to be easily damaged by natural processes such as rain and wind. Damage possible through erosion processes undermining crust.
		3	**Soft Crust**– Easily breaks or deforms under foot, evidence of crust crumbling present, integrity of crust likely to be easily damaged by natural processes such as rain and wind, or crust absent
B	**Evidence of material migration**	1	No visible evidence of migration
		2	Visible evidence of migration
C	**Migration Path**	1	On site
		2	Off site
Score		**(A + B) x C**	**= 2 to 10**

2.4.2 Laboratory Analysis Hazard Assessment Algorithm

The second component, the Laboratory Analysis Hazard Assessment Algorithm was determined from laboratory analysis for asbestos. The samples were characterised for hazard assessment taking into account presence of asbestos, estimated asbestos concentrations in the sub 2mm fraction and the presence or absence of Trace Asbestos. These factors were chosen due to their importance in human exposure to asbestos.

The Laboratory Analysis Hazard Assessment Algorithm definitions and calculation have been set out in **Table 7**.

An explanation of the rationale behind the Laboratory Analysis Hazard Assessment Algorithm, can be found in **Appendix C**.

Table 7 Laboratory Analysis Hazard Assessment Algorithm

Sample variable		Scale	Definition
D	**Asbestos Content in Soil Fractions**	0	Asbestos not detected in sample
		1	Asbestos not observed in <2mm size fraction but observed in larger fractions <9.5mm to > 2mm, or > 9.5mm size classes
		2	Asbestos observed in <2mm size fraction. Estimated concentration less than 1% (volume/volume)
		3	Asbestos observed in <2mm size fraction. Estimated concentration greater than 1% (volume/volume)
E	**Trace Asbestos**	1	Absent
		2	Present
Total		**D x E**	**= 0 to 6**

2.4.3 Asbestos Hazard Assessment Score

To provide an overall hazard ranking for the sampling locations, the rank score for *in situ* conditions, (Site Hazard Assessment Algorithm) and the rank score for laboratory analysis (Laboratory Analysis Hazard Assessment Algorithm), were added together to calculate the Asbestos Hazard Assessment Score.

The addition of the two rank scores provides the Asbestos Hazard Assessment Score ranging from 5 to 16 for each sampling location.

Asbestos Hazard Assessment Score = ((A + B) x C) + (D x E)

Where

A= Crusting

B = Evidence of Material Migration

C = Migration Path

D = Asbestos Content in Soil Fractions

E = Trace Asbestos

If asbestos is not detected in a sample, the sampling location was given a "Low" Asbestos Hazard Assessment Score, regardless of other factors at the location.

The characteristics of ranking scores have been set out in **Table 8**.

Table 8 Hazard Assessment Score

Score	Asbestos Hazard Assessment Score	Characteristics
16	**Very High**	Susceptible to erosion Migration pathway off-site Trace asbestos present
10 - 15	**High**	May be susceptible to erosion Migration pathway mostly off-site Trace asbestos likely to be present
6 - 10	**Medium**	May be susceptible to erosion Migration pathway mostly on-site Trace asbestos may or may not be present
5 or less	**Low**	May be susceptible to erosion but mostly resistant to erosion Migration pathway on-site Trace asbestos unlikely be present OR No asbestos detected

3 RESULTS

3.1 Historic Site Stability

All documents reviewed provide evidence of significant and ongoing erosion. Dames & Moore (1997) reported that tailings dump erosion and slumping was progressive and ongoing with visible cracking and subsidence around the top of embankments and channel erosion on steeper slopes. This description continued to be valid in 2013.

Control of the ongoing erosion across the mine site appears unlikely in the foreseeable future. *The Woodsreef Derelict Asbestos Mine – Sediment Movement Assessment* report (2013) stated that "Erosion control is the lowest priority due to the large area to be addressed and the cost to immediately provide stability."

3.2 Site Walk Over Inspection

Evidence of current erosion and migration of materials within the mine site and off the mine site were readily apparent in many areas of the mine. It appeared that migration of materials is likely to be intermittent in nature and linked to significant events such as heavy rain or the localised catastrophic collapse of sections of the material such as occurs when water causes erosion to undermine areas leading to collapse of previously stable crusts or materials.

A summary of the site walk over inspection observation at representative sampling points, including details of crusting conditions, evidence of migration, and a hazard rating is given in Section 3.4 and **Appendix D**.

3.3 Asbestos Analysis of Bulk Materials

A summary of the asbestos analysis (fraction < 2mm) of bulk samples collected at representative locations, including estimated asbestos concentrations, and a hazard rating is given in Section 3.4 and **Appendix D**.

Information on larger particle size fractions (> 9.5mm, <9.5mm to >2mm) is set out in **Appendix E**.

The laboratory certificates for the analyses are presented in **Appendix F**.

3.4 Field Observations & Laboratory Analysis

3.4.1 Waste / Overburden

Table 9 Waste / Overburden - Field Observations at Sampling Locations and Hazard Scores

Designated Area	Sample No.	Location	Visual Findings	Crusting (Soft, Medium, Hard)	Visual Assessment of Migration	Migration Path On-site / Off-site	Site Hazard Assessment (0 = low,10= high)
Waste/Overburden	610.10893.00030/13	South of south dump adjacent to road, overburden	Crusting sediment	Soft along road	Yes, heavy slopewash escarpment rain runoff	Off site	5
	610.10893.00030/14	South of south dump, east end of internal road on Waste/Overburden	Soil	Soft in pool areas	Yes, major slopewash splash	On site	10
	610.10893.00030/40	South west of south overburden	Runoff soil	Soft, fibres present	Yes, Runoff from tailings heading towards culvert	Off site	10
	610.10893.00030/41	South central south overburden rock fall	Rock material	Soft, fibres present in fencing	Yes, Runoff from tailings heading towards culvert	Off site	10

Table 10 Waste / Overburden - Laboratory Analysis and Hazard Scores

Designated Area	Sample No.	Whole Sample Description	Asbestos Presence Fraction < 2mm	Asbestos Description Fraction < 2mm	%Asbestos (vol/vol) estimate	Trace Asbestos	Lab Analysis Hazard Assessment (0 = low, 6= high)
Waste / Overburden	610.10893.00030/13	light grey soil, rocks	Chrysotile	bundles	20	Present	6
	610.10893.00030/14	light brown soil, rocks and organic material	Chrysotile	bundles	1	Present	4
	610.10893.00030/40	dark grey soil and rocks	Chrysotile	bundles	<0.1	Absent	2
	610.10893.00030/41	light grey material, crusts and plant debris	Chrysotile	fibrous masses	90	Present	6

3.4.2 Road Cuttings

Table 11 Road Cuttings - Field Observations at Sampling Locations and Hazard Scores

Designated Area	Sample No.	Location	Visual Findings	Crusting (Soft, Medium, Hard)	Visual Assessment of Migration	Migration Path On-site / Off-site	Site Hazard Assessment (0 = low,10= high)
Road cuttings	610.10893.00030/23	North East mine, south side road near manmade mound	Sediment run-off from upstream dump	No crusting, sediment trap"	Yes, river downstream	Off site	10
	610.10893.00030/25	Corner of Mine Road and the Woodsreef Road	Overburden material, soil rock	Soft, no crusting	Yes, water runoff	Off site	10
	610.10893.00030/35	Entrance to tailings, runoff east of road	Road base soil	Medium	Yes, downslope, old roadway east towards road	On site	4
	610.10893.00030/39	East of Mine Road near south end	Soil	Soft, unprocessed rock"	Yes, runoff from tailings	Off site	10
	610.10893.00030/42	West side of Mine Road midway	Rock material	Soft, fibres present in fencing	Yes, Downslope runoff from road tailings	On site	5
	610.10893.00030/46	East side of Mine Road north near intersection	Overburden waste material	Soft, migration in rockfall - water runoff	Yes, pebbles, natural rock	On site	5

Table 12 Road Cuttings - Laboratory Analysis and Hazard Scores

Designated Area	Sample No.	Whole Sample Description	Asbestos Presence Fraction < 2mm	Asbestos Description Fraction < 2mm	%Asbestos (vol/vol) estimate	Trace Asbestos	Lab Analysis Hazard Assessment (0 = low, 6= high)
Road Cuttings	610.10893.00030/23	grey brown soil and rocks	Chrysotile	bundles	1	Absent	2
	610.10893.00030/25	light grey soil and rocks	Chrysotile	bundles	0.5	Present	4
	610.10893.00030/35	light brown/grey material, fibrous masses	Chrysotile	fibrous masses	40%	Present	6
	610.10893.00030/39	light brown/grey material and crusts	Chrysotile	fibrous masses	70	Present	6
	610.10893.00030/42	grey brown soil and rocks	Chrysotile	bundles	<0.1	Present	4
	610.10893.00030/46	rocks, and soil	Chrysotile	bundles	<0.1	Present	4

3.4.3 Siltation Systems Sediments

Table 13 Siltation Systems Sediments - Field Observations at Sampling Locations and Hazard Scores

Designated Area	Sample No.	Location	Visual Findings	Crusting (Soft, Medium, Hard)	Visual Assessment of Migration	Migration Path On site / Off site	Site Hazard Assessment (0 = low,10= high)
Siltation Systems sediments	610.10893.00030/21	Culvert 3, north of west dump	Riverbed (sand/gravel)	No crusting	Yes, composite sample from 20m^2 area	Off site	10
	610.10893.00030/22	Culvert 2 area upstream, east	soil, sediment wash	Soft, collect from culvert	Yes, river downstream	Off site	10
	610.10893.00030/36	Culvert to east of road	Tailings runoff	Soft,	Yes, significant runoff, rills, incisions collecting around rubble	Off site	10
	610.10893.00030/37	Culvert to west of Mine Road	Tailings soil	Medium	Yes, some wash heading downslope north	Off site	8

Table 14 Siltation Systems Sediments - Laboratory Analysis and Hazard Scores

Designated Area	Sample No.	Whole Sample Description	Asbestos Presence Fraction < 2mm	Asbestos Description Fraction < 2mm	%Asbestos (vol/vol estimate)	Trace Asbestos	Lab Analysis Hazard Assessment (0 = low, 6= high)
Siltation Systems sediments	610.10893.00030/21	sandy soil, rocks organic material	Chrysotile	bundles	<0.1	Absent	2
	610.10893.00030/22	sandy soil and rocks	Absent	-	0	Absent	0
	610.10893.00030/36	light grey material, crusts and plant debris	Chrysotile	fibrous masses	40	Present	6
	610.10893.00030/37	grey /blue gravel, grey crusts	Chrysotile	bundles	1	Absent	2

3.4.4 Tailings

Table 15 Tailings - Field Observations at Sampling Locations and Hazard Scores

Designated Area	Sample No.	Location	Visual Findings	Crusting (Soft, Medium, Hard)	Visual Assessment of Migration	Migration Path On site / Off site	Site Hazard Assessment (0= low,10= high)
Tailings	610.10893.00030/26	West side tailings east of Crow Mountain Road, conveyor belt	Soil runoff	Soft, unprocessed rock material also present	Yes, large rocks - unprocessed-rocks	Off site	10
	610.10893.00030/27	Midway along tailings east of Mountain Road	Tailings soil	Soft, hard-pebble/ rock	Yes, side gully to road - north Nangohrah river	Off site	10
	610.10893.00030/28	South end tailing, midway adjacent drainage area	Tailings soil	Soft, crusted surface"	Yes , Downslope from mine - rain	Off site	10
	610.10893.00030/29	East side of tailing basin south between hills	Tailings soil	Soft, hard - rocky surface	Yes, downslope riling	Off site	10
	610.10893.00030/30	East side of tailing, midway basin	Tailings runoff	Soft, with fines	Yes, Gullying along bottom rills to down west side	Off site	10
	610.10893.00030/31	North tailing midway	Tailings soil	Soft	Yes, Major gullies erosion of tailings, large migration, small rocks	On site	5
	610.10893.00030/32	Top of tailings, north of telegraph pole	Tailings soil	Soft, fines - rocks smaller	Yes, large basin and run off containing slopewash from tailing	On site	5
	610.10893.00030/33	Top of tailings, near old building rubble	Friable	Soft, crusting pebbles	Yes, basin with large run off gullies on tailings, some rock fines, major rills	Off site	10

Table 16 Tailings - Laboratory Analysis and Hazard Scores

Designated Area	Sample No.	Whole Sample Description	Asbestos Presence Fraction < 2mm	Asbestos Description Fraction < 2mm	% Asbestos (vol/vol) estimate	Trace Asbestos	Lab Analysis Hazard Assessment (0 = low, 6= high)
Tailings	610.10893.00030/26	light grey material, crusts and rocks	Chrysotile	fibrous masses	95	Present	6
	610.10893.00030/27	light grey material, crusts and rocks	Chrysotile	fibrous masses	2	Present	6
	610.10893.00030/28	light grey material, crusts and rocks	Chrysotile	bundles	<0.1	Present	4
	610.10893.00030/29	light grey material, crusts	Chrysotile	bundles	80	Present	6
	610.10893.00030/30	light grey material, crusts	Chrysotile	bundles	70	Present	6
	610.10893.00030/31	light grey soil and rocks	Chrysotile	bundles	25	Present	6
	610.10893.00030/32	grey brown soil and rocks	Chrysotile	bundles	10	Present	6
	610.10893.00030/33	light grey material, crusts and plant debris	Chrysotile	fibrous masses	<0.1	Present	4

3.4.5 Mill Building Vicinity

Table 17 Mill Building Vicinity - Field Observations at Sampling Locations and Hazard Scores

Designated Area	Sample No.	Location	Visual Findings	Crusting (Soft, Medium, Hard)	Visual Assessment of Migration	Migration Path On site / Off site	Site Hazard Assessment (0 = low,10= high)
Mill Building Vicinity	610.10893.00030/5	NE adjacent road to silos	Soil Detritus	Soft	Yes, contained	On site	10
	610.10893.00030/6	NE of silo, adjacent to Northern Pit	Soil Detritus	None - rock	Yes, contained	On site	10
	610.10893.00030/7	NW of silo adjacent to Centre Pit	Soil	Hard pebble surface	Yes, accumulated to north of slab	On site	6
	610.10893.00030/8	Silos, south of stockpile	Soil	Hard	Yes, rain - scroar tracks across area	On site	6
	610.10893.00030/9	West of main building, adjacent to old water tank	Stockpile debris	Pebble crusting, soft	Yes - Rain scorers tracks throughout rocky surface	Off site	3
	610.10893.00030/10	Emplacement area, SE	Soil	Hard, pebbly	Yes, slight - very little movement	Off site	3
	610.10893.00030/11	Stockpile south of building	Soil	Unprocessed-rock	Yes, evidence of rain wash/ splash on piles	Off site	3
	610.10893.00030/12	Stockpile south of building run-off	Rock soil matrix	Soft	Yes, slight evidence of rainwash	Off site	5

Table 17 Mill Building Vicinity - Field Observations at Sampling Locations and Hazard Scores (continued)

Designated Area	Sample No.	Location	Visual Findings	Crusting (Soft, Medium, Hard)	Visual Assessment of Migration	Migration Path On site / Off site	Site Hazard Assessment (0 = low,10= high)
	610.10893.00030/15	Stockpile south of building, west of culvert 1	Soil	Fibro cement fragments unprocessed rock	Yes, major crusting soft-runoff from SP	Off site	5
	610.10893.00030/16	Waste from conveyor belt dump east of building	Soil	Hard at crusting base	Yes, slopewash splash	Off site	3

Table 18 Mill Building Vicinity - Laboratory Analysis and Hazard Scores

Designated Area	Sample No.	Whole Sample Description	Asbestos Presence Fraction < 2mm	Asbestos Description Fraction < 2mm	% Asbestos (vol/vol) estimate	Trace Asbestos	Lab Analysis Hazard Assessment (0 = low, 6= high)
Mill Building Vicinity	610.10893.00030/5	dark brown soil	Chrysotile	bundles	<0.1	Absent	2
	610.10893.00030/6	light brown soil, rocks and organic material	Chrysotile	bundles	<0.1	Absent	2
	610.10893.00030/7	light brown soil, rocks and organic material	Chrysotile	bundles	<0.1	Absent	2
	610.10893.00030/8	light grey soil, rocks and organic material	Chrysotile	bundles	70	Present	6
	610.10893.00030/9	light brown soil, rocks and organic material	Chrysotile	bundles	<0.1	Absent	2
	610.10893.00030/10	orange brown soil and rocks	Chrysotile	bundles	<0.1	Absent	2
	610.10893.00030/11	grey brown soil and rocks	Chrysotile	bundles	20	Present	6

Table 18 Mill Building Vicinity - Laboratory Analysis and Hazard Scores (continued)

Designated Area	Sample No.	Whole Sample Description	Asbestos Presence Fraction < 2mm	Asbestos Description Fraction < 2mm	% Asbestos (vol/vol) estimate	Trace Asbestos	Lab Analysis Hazard Assessment (0 = low, 6= high)
Mill Building Vicinity (cont)	610.10893.00030/12	light brown/grey material, some layers and crusts	Chrysotile	fibrous masses	95	Present	6
	610.10893.00030/15	light brown soil, rocks	Chrysotile	bundles	90	Present	6
	610.10893.00030/16	light grey soil, rocks	Chrysotile	bundles	90	Present	6

3.4.6 Proposed Containment Cell Vicinity

Table 19 Proposed Containment Cell Vicinity - Field Observations at Sampling Locations and Hazard Scores

Designated Area	Sample No.	Location	Visual Findings	Crusting (Soft, Medium, Hard)	Visual Assessment of Migration	Migration Path On site / Off site	Site Hazard Assessment (0 = low,10= high)
Proposed Containment Cell Vicinity	610.10893.00030/1	Inside Building north west	Soil Detritus	Medium	Yes, contained in building	On site	8
	610.10893.00030/2	Inside Building north east	"Detritus	Medium	Yes, contained in building	On site	8
	610.10893.00030/3	Inside Building Central	Soil Debris"	Medium	Yes, contained in building	On site	8
	610.10893.00030/4	On concrete slab, east of building	Detritus, Debris	Soft	Yes, contained	Off site	5

Table 20 Proposed Containment Cell Vicinity - Laboratory Analysis and Hazard Scores

Designated Area	Sample No.	Whole Sample Description	Asbestos Presence Fraction < 2mm	Asbestos Description Fraction < 2mm	% Asbestos (vol/vol) estimate	Trace Asbestos	Lab Analysis Hazard Assessment (0 = low, 6= high)
Proposed Containment Cell	610.10893.00030/1	light brown/grey material, fibrous masses	Chrysotile	fibrous masses	70%	Present	6
	610.10893.00030/2	light brown/grey material, fibrous masses	Chrysotile	fibrous masses	50%	Present	6
	610.10893.00030/3	light brown/grey material, fibrous masses	Chrysotile	fibrous masses	40%	Present	6
	610.10893.00030/4	light brown/grey material, fibrous masses	Chrysotile	fibrous masses	25%	Present	6

3.4.7 Additional Areas

Table 21 Additional Areas - Field Observations at Sampling Locations and Hazard Scores

Additional Areas	Sample No.	Visual Findings	Crusting (Soft, Medium, Hard)	Visual Assessment of Migration	Migration Path On site / Off site	Site Hazard Assessment (0 = low,10= high)
Ironbark Creek, adjacent to pumping station	610.10893.00030/17	Fines	"Hard, pebble rock	Yes, pooling at sediment lake	Off site	3
Ironbark Creek, adjacent to tyre mount, floodplain	610.10893.00030/18	Run-off of overburden soil	Medium"	Yes, little evidence no rain wash	Off site	8
Ironbark Creek, east flood plain, midway	610.10893.00030/19	Soil	Medium - some crusting	Yes, slopewash splash	Off site	8
Ironbark Creek, start of walking track north east	610.10893.00030/20	Riverbed sand/sediments	No crusting	Yes, slopewash from over burden	Off site	10
North of mine central waypoint, north side of Bundarra – Barraba Road	610.10893.00030/24	Runoff soil	Soft	Yes, major erosion of west dump	Off site	10
Entrance to mine, east of building	610.10893.00030/34	Friable tailings	Soft	Yes, gullies, rills, lots of runoff, incision	On site	5
South end tailings, east road culvert, adjacent to private land	610.10893.00030/38	Tailings soil	Soft, visible fibres	Yes, runoff from tailings	Off site	10
Flora Trail adjacent to pit 1, west	610.10893.00030/43	Soil	Soft	Yes, large boulders, hard rocky roads mostly crust	On site	5
West of waste dump near pumping station	610.10893.00030/44	Soil	Soft	Yes, large boulders, hard rocky roads mostly crust	Off site	10
North west of overburden	610.10893.00030/45	Overburden waste material	Soft, pebbles fines	Yes, pebbles, natural rock	On site	5

Table 22 Additional Areas - Laboratory Analysis and Hazard Scores

Designated Area	Sample No.	Whole Sample Description	Asbestos Presence Fraction < 2mm	Asbestos Description Fraction < 2mm	% Asbestos (vol/vol) estimate	Trace Asbestos	Lab Analysis Hazard Assessment (0 = low, 6= high)
Ironbark Creek, adjacent to pumping station	610.10893.00030/17	light grey soil, rocks and organic material	Chrysotile	bundles	<0.1	Absent	2
Ironbark Creek, adjacent to tyre mount, floodplain	610.10893.00030/18	light brown soil, rocks and organic material	Chrysotile	bundles	80	Present	6
Ironbark Creek, east flood plain, midway	610.10893.00030/19	sandy soil, rocks organic material	absent	absent	0	Absent	0
Ironbark Creek, start of walking track north east	610.10893.00030/20	sand and rocks	absent	absent	0	Absent	0
North of mine central waypoint, north side of Bundarra – Barraba Road	610.10893.00030/24	grey brown soil and rocks	Chrysotile	bundles	2	Present	6

Table 22 Additional Areas - Laboratory Analysis and Hazard Scores (Continued)

Designated Area	Sample No.	Whole Sample Description	Asbestos Presence Fraction < 2mm	Asbestos Description Fraction <2mm	% Asbestos (vol/vol) estimate	Trace Asbestos	Lab Analysis Hazard Assessment (0 = low, 6= high)
Entrance to mine, east of building	610.10893.00030/34	grey brown soil and rocks	Chrysotile	bundles	<0.1	Absent	2
South end tailings, east road culvert, adjacent to private land	610.10893.00030/38	light brown soil and crusts	Chrysotile	fibrous masses	5	Present	6
Flora Trail adjacent to pit 1, west	610.10893.00030/43	light brown/grey material, some layers and crusts	Chrysotile	fibrous masses	40	Present	6
West of waste dump near pumping station	610.10893.00030/44	rocks, gravel and leaves	Chrysotile	natural asbestos (i.e unprocessed)	<0.1	Present	4
North west of overburden	610.10893.00030/45	grey brown soil and rocks	Chrysotile	bundles	<0.1	Present	4

4 HAZARD ASSESSMENT

The combined Hazard Assessment Score for each area has been set out below in **Table 23** and **Table 23**.

The Hazard Assessment Scores for individual sampling sites has been set out below in **Figure 4**.

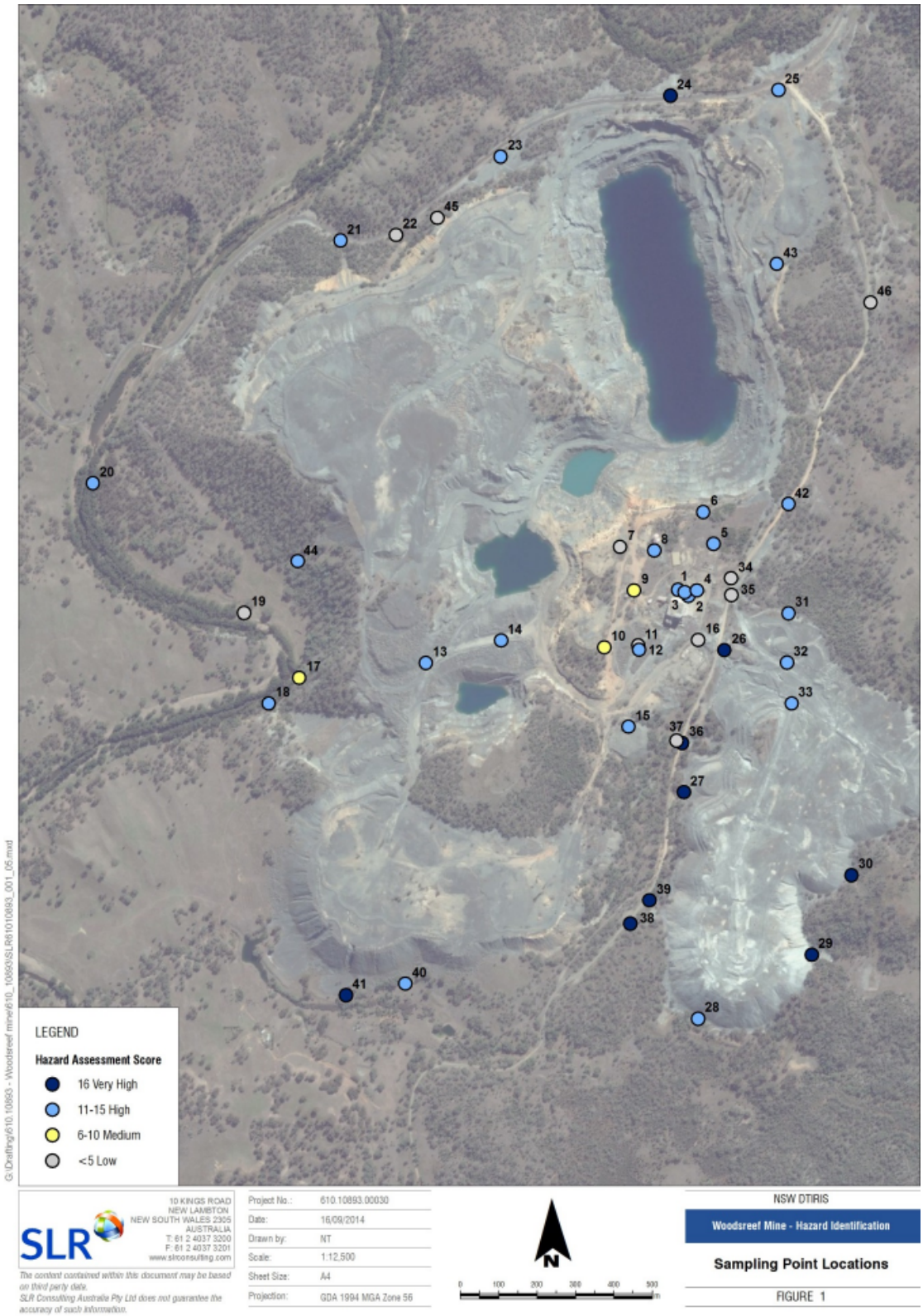
Table 23 Hazard Assessment Combined Scores

Area	Site Hazard Assessment (2 = low, 10 = high)	Lab Analysis Hazard Assessment (0 = low, 6= high)	Overall Asbestos Hazard Assessment Score (2= low, 16= very high)	Potential to release asbestos fibres through off-site migration of asbestos and exposure of the public to elevated levels of asbestos fibres		
Waste / Overburden	5-10	2-6	11-16	**High**	-	**Very High**
Road Cuttings	4-10	2-6	9-16	**Medium**	-	**Very High**
Tailings	5-10	4-6	11-16	**High**	-	**Very High**
Siltation Systems sediments	8-10	0-6	10-16	**Medium**	-	**Very High**
Mill Building vicinity	3-10	2-9	5-12	**Medium**	-	**High**
Containment Cell vicinity	5-8	6	11-14	**High**		

Table 24 Hazard Assessment Combined Scores (Additional Areas)

Area	Site Hazard Assessment (2 = low, 10 = high)	Lab Analysis Hazard Assessment (0 = low, 6= high)	Overall Asbestos Hazard Assessment Score (2= low, 16= very high)	Potential to release asbestos fibres through off-site migration of asbestos and exposure of the public to elevated levels of asbestos fibres
Ironbark Creek, adjacent to pumping station	3	2	5	**Low**
Ironbark Creek, adjacent to tyre mount, floodplain	8	6	14	**High**
Ironbark Creek, east flood plain, midway	8	0	8	**Medium**
Ironbark Creek, start of walking track NE	10	0	10	**Medium**
North of mine central waypoint, north side of Bundarra – Barraba Road	10	6	16	**Very High**
Entrance to mine, east of building	5	2	7	**Medium**
South end tailings, east road culvert, adjacent to private land	10	6	16	**Medium**
Flora Trail adjacent to pit 1, west	5	6	11	**High**
West of waste dump near pumping station	10	4	14	**Very High**
North west of overburden	5	4	9	**Medium**

Figure 4 Hazard Assessment Scores for Individual Sampling Sites.



5 HAZARD ASSESSMENT CONCLUSION

The aim of the current study was to investigate the asbestos related hazards associated with the Woodsreef Asbestos Mine site and the different functional areas present on the site.

The hazard assessment identified that sources of asbestos were present throughout almost all sampling sites. The only exceptions were two sites, Ironbark Creek, start of walking track north east and one sample from Siltation Systems Sediments.

At the majority of locations respirable asbestos fibres were present in the soil. Asbestos fibres in this size range pose a significant hazard to human health if inhaled at elevated concentrations.

The functional areas of the mine site and additional sampling areas have been ranked based on the sources of asbestos on site, on the basis of their potential to result in off-site migration of asbestos and potential exposure of the public to elevated levels of asbestos fibres. The ranking have been set out below in **Table 25 & 26**.

Table 25 Hazard Assessment Score in Designated Areas

Hazard assessment based on potential to release asbestos fibres through off-site migration of asbestos and with the potential to expose the public to elevated levels of asbestos fibres hazardous to health

Designated Area	Overall Hazard Assessment Score		
Waste / Overburden	**High**	To	**Very High**
Road Cuttings	**Medium**	To	**Very High**
Tailings	**High**	To	**Very High**
Siltation Systems sediments	**Medium**	To	**Very High**
Mill Building vicinity	**Medium**	To	**High**
Containment Cell vicinity	**High**	To	**High**

Table 26 Hazard Assessment Score in Additional Areas

Hazard assessment based on potential to release asbestos fibres through off-site migration and exposure to the public to elevated levels of asbestos fibres potentially hazardous to human health

Additional Areas	Overall Hazard Assessment Score
Ironbark Creek, adjacent to pumping station	Low
Ironbark Creek, adjacent to tyre mount, floodplain	High
Ironbark Creek, east flood plain, midway	Medium
Ironbark Creek, start of walking track north east	Medium
North of mine central waypoint, north side of Bundarra – Barraba Road	Very High
Entrance to mine, east of building	Medium
South end tailings, east road culvert, adjacent to private land	Medium
Flora Trail adjacent to pit 1, west	High
West of waste dump near pumping station	Very High
North west of overburden	Medium

6 RISK MITIGATION OPTIONS

6.1 Current Conditions - Risk Mitigation Measures

As the mine site is contaminated with significant volumes of naturally occurring and processed asbestos waste and tailings, many high level or large scale asbestos mitigation controls (such as encapsulating and removal) are not feasible. Furthermore the mine is situated in an area of high asbestos mineralisation and accordingly areas beyond the mine would be expected to contain naturally occurring asbestos (NOA).

A mid-level risk management approach is required in order to implement risk mitigation controls. As there is variability between the different areas within and around the mine (and in some cases within areas themselves) and a number of locations are readily accessible by the public using the Barraba-Bundarra Road, controls need to be tailored in order to provide the best options for members of the public, workers and visitors to the site to control the potential environmental health hazards in and around the mine.

The primary control is to reduce public access to areas where there is an elevated asbestos hazard present and/or minimise off-site migrating of asbestos materials into publicly accessible areas such as locations where run-off is occurring across roads or is entering upstream creeks. As such the primary focus is on the need to maintain current sediment drains and culverts around the mine site, especially those along the Barra-Bundarra Road as well as preventing drainage into water courses that may lead to extensive off site migration into public areas.

A number of effective area specific controls that can provide the most practicable hazard controls to prevent public exposure and can be implemented without significant planning have been identified and their priority are highlighted by boxed text in section in *Section 6.1.1- 6.1.7*

Specific locations of potential notable public risk to areas of elevated asbestos hazard or migration to waterways around the perimeter of the site observed during visits and sampling are also highlighted in the specific controls. In addition they have also been marked as “Priority Area” on the sampling Map in **Appendix G**.

Subject to a review of the air monitoring data contained in the Health Impact Assessments conducted as part of the current Woodsreef Mine Major Rehabilitation Project, a background program of asbestos air monitoring may be considered with the aim to determine the stability of the structure and site with regards to the release of airborne asbestos fibres. For example air monitoring may be considered in the area every 2-3 years in locations where there is evidence of off-site impacts along perimeters with emphasis on the public access interface, this will provide a method to confirm the adequacy of controls and to document airborne asbestos levels and collate monitoring data. Where there are works or evidence of stability in off-site migration and/or reduction in public access to these areas the time periods between monitoring can be increased. Conversely additional air monitoring could be considered following a particular significant event where notable migration of asbestos materials has impacted on publicly accessible areas.

There are also some legislative requirements under the NSW Work Health and Safety Act for managing an asbestos exposure risk present on and around a site. These include:

- Maintain an Asbestos Register to record authorised site visits that details the purpose of the visit, duration, and any other information deemed necessary. Prohibit any unauthorised activity that will generate dust unless a detailed Asbestos Management Plan is in place.
- Ensure all authorised personnel that require a site visit are trained in asbestos risk and exposure including in the correct use of PPE/RPE and decontamination procedures in association with a Site Specific Asbestos Management Plan or Job Safety Analysis (JSA) as required.
- Maintain a register of unauthorised site visits or security breaches that detail the locations, estimated date, duration, and any other information available, insofar as is possible.

6.1.1 Waste / Overburden

This area forms the largest part of the mine site and the hazard assessment indicates a high to very high potential to release asbestos fibres through off site migration

- A detailed review of site security and site access should be undertaken in order to restrict unauthorised access around the waste dump and overburden areas and where corresponding drains interface with the public access (such as Barraba-Bundarra Road) including sediment basins and culverts.

- Consider a further review of the draining assessment on the southern end of the South Dump (near Sampling Points 40-41).
- A routine inspection is carried out by a competent person to ensure the above mentioned points on Barraba-Bundarra Road are maintained. The interval is best determined based on previous access of the site and likely access areas however should be no less than every month.
- A risk management approach shall be used in determining signage and labelling requirements, with the clear intent of informing all on risk of asbestos exposure. Emphasis should continue to be placed on areas of easy access to the waste and overburden area, namely along the Barraba-Bundarra Road and Iron Bark Creek.
- Maintain appropriate asbestos signage. These signs should be maintained at all the potential entrances, trails, fence-lines, property lines, creek beds and points where there is historical or current evidence of unauthorised access. The signs should conform to Australian Standard 1319-1994 *Safety Signs for the Occupational Environment*. The display, positioning and numbers of asbestos hazard warning signs shall be determined by a competent person; however difficulty in removing the signs should also be considered given this issue of unauthorised removal or damage in the past.
- Additional information signs should also be considered in the picnic area, look out areas along the Barraba-Bundarra Road as well as the area along Iron Bark Creek where water sampling is periodically taken by utility companies.

6.1.2 Road Cuttings

The road cuttings sampled in the hazard assessment indicates a medium to very high potential to release asbestos fibres through off site migration. It is also likely that the hazard levels would be highly variable within short distances. Unlike the mine site a number of road cuttings are readily accessible from the Barraba-Bundarra road making public access difficult to prevent.

The closure of Crow Mountain Road will reduce to need to access road cuttings in this section of the mine area (where the samples contained significantly higher concentration of asbestos) however for Barraba-Bundarra Road, fibre release minimisation is the most effective option.

- The feasibility of suitable encapsulation methods along identified edges of the road e.g. laying blue metal, shotcrete or other similar methods to suppress dust release should be considered, especially around the intersection of Crow Mountain (Mine) Road and the current look-out area.
- Consider relocation or extension of the existing fence boundary towards the road to capture as much of this area where possible.
- Rather than managing the hazard uniformly along Barraba-Bundarra Road a further soil sampling investigation could be considered between Crow Mountain Road and Iron Bark Creek Bridge in order to identify and control any specific asbestos hotspots.

- Consider a further review of the draining and soil assessment on the end of the South Dump (near Sampling Point 40-41).
- A routine inspection is carried out by a competent person monthly along the Barraba-Bundarra Road to ensure the above mentioned locations are in suitable condition.

- A risk management approach shall be used in determining signage and labelling requirements, with the clear intent of informing all on risk of asbestos contamination and exposure and ensuring access is restricted insofar as is possible. As a number of the road cuttings are readily accessible from the Barraba-Bundarra Road additional information signage may also be suitable at the current look out area.
- Maintain appropriate asbestos signage. The signs should conform to Australian Standard 1319-1994 *Safety Signs for the Occupational Environment*. The display, positioning and numbers of asbestos hazard warning signs or labelling shall be determined by a competent person; however difficulty in removing the signs should also be considered.

6.1.3 Tailings

The tailing (waste overburden) area forms the second largest part of the mine site and the hazard assessment indicates a high to very high potential to release asbestos fibres through off site migration.

- Off Site-Drainage System Maintenance. A detailed review of site security and site access should be undertaken in order to restrict unauthorised access especially where the drainage and sediment basins and culverts interface crosses access paths (including the closed Crow Mountain Road).
- Consider a further review of soil and drainage around the immediate vicinity of the Tailings near Sampling Point 28.
- Ensure site access is restricted and unauthorised access prevented. A risk management approach shall be used in determining signage requirements, with the clear intent of informing all on risk of asbestos exposure.
- Maintain appropriate asbestos signage. These signs should be placed at all the main entrances and should conform to Australian Standard 1319-1994 *Safety Signs for the Occupational Environment*. The display, positioning and numbers of asbestos hazard warning signs shall be determined by a competent person.
- As the location is furthest away from the general public, routine inspection should be carried out by a competent person every 3 months or as required to ensure the above mentioned controls are maintained.

6.1.4 Siltation Systems Sediments

The siltation system sediments sampled in the hazard assessment indicates a medium to very high potential to release asbestos fibres through off site migration. Unlike the mine site a number of siltation systems are accessible from the Barraba-Bundarra road making public access difficult to prevent.

- Ensure site access is restricted and unauthorised access prevented. Erecting additional fencing in areas (such as near sampling point 21) in order to limit public access should be considered.
- The closure of Crow Mountain Road will prevent access to siltation and sediments in this section of the mine area however for the Barraba-Bundarra Road fibre release minimisation is the most effective option. The feasibility of laying blue metal or other similar methods to suppress dust release should be considered, especially where there is evidence of occasional run off underneath and/or across the road.
- Consider a further review of the effectiveness of the current drainage system, especially in areas where road run-off is evidence following rain.

- A risk management approach shall be used in determining signage and labelling requirements, with the clear intent of informing all on risk of asbestos contamination and exposure and ensuring access is restricted insofar as is possible.
- Maintain appropriate asbestos signage. The signs should conform to Australian Standard 1319-1994 *Safety Signs for the Occupational Environment*. The display, positioning and numbers of asbestos hazard warning signs or labelling shall be determined by a competent person; however difficulty in removing the signs should also be considered given past issues.
- A routine inspection be carried out by a competent person at least monthly along the Barraba-Bundarra Road to ensure the abovementioned locations are in suitable condition.

6.1.5 Mill Building Vicinity

The mill building vicinity samples in the hazard assessment indicated a medium to high potential to release asbestos fibres.

- Ensure site access remains restricted and unauthorised access prevented.
- A risk management approach shall be used in determining signage requirements, with the clear intent of informing all on risk of asbestos exposure. As the location of the Mill Building is within the mine site any signage review would only need to apply to the entrance gate.
- A routine inspection is carried out by a competent person to ensure the gates are maintained. The interval is best determined based on previous access of the site and likely access areas however this should be no less than once a month.

6.1.6 Proposed Containment Cell Vicinity

At this stage controls similar to the Mill Building Vicinity are appropriate given the proposed containment cell's location.

6.1.7 Additional Areas

Iron Bark Creek

The samples taken in the Iron Bark Creek area (samples 17-20) in the hazard assessment indicates a range of low to high potential to release asbestos fibres following off site migration. This range also indicates that there is significant variability within a close area making targeted mitigation control difficult. Furthermore, many of these locations are accessible from the picnic area off Barraba-Bundarra road making public access difficult to prevent.

- If closure and fencing off of the area is feasible then this approach should be seriously considered as this area has also been known to be impacted by asbestos contamination follow heavy rain or a major event. Where it is not feasible, a risk management approach shall be used in determining signage requirements, with the clear intent of informing all on the risk of asbestos contamination and exposure and ensuring access is minimised insofar as is possible. As Iron Bark Creek is readily accessible from the Barraba-Bundarra Road additional information signage may also be suitable stating recommendations to relocate to alternative camping, fishing and picnic areas.
- A routine inspection is carried out by a competent person at least monthly along the public areas of Iron Bark Creek to ensure the above mentioned locations are in suitable condition.
- The display, positioning and numbers of asbestos hazard warning signs or labelling shall be determined by a competent person; however difficulty in removing the signs should also be considered given this past issues.

North of Mine Central Waypoint, North Side of Bundarra – Barraba Road

The sample taken in this area (sample 24) in the hazard assessment indicates a very high potential to release asbestos fibres. This area has been identified as an site where offsite migration occurs. This location is readily accessible on the side of Barraba-Bundarra road making public access difficult to prevent.

- The feasibility of methods to encapsulate or suppress dust release should be considered along identified edges of the road (such as laying blue metal or concreting).

- Where it is not feasible, a risk management approach shall be used in determining signage requirements, with the clear intent of informing all on the risk of asbestos contamination and exposure and ensuring access is minimised insofar as is possible.

- This location should be managed as recommended in *Section 6.1.2* Road Cuttings.

Entrance to Mine, East of Building

The sample taken in this area (sample 34) in the hazard assessment indicates a medium potential to release asbestos fibres. This area has been identified as an area where offsite migration occurs. This location is located on the closed section of Crow Mountain Road and is not readily accessible to the public.

- Ensure site access is restricted and unauthorised access prevented. Signage requirements will be covered by adjoining areas at this location.
- Maintain an Asbestos Register to record authorised visits to these areas that details the purpose of the visit, duration, and any other information deemed necessary. These may include drainage and sediment control works or utility companies who may need to access the area.
- This location should be managed as recommended in *Section 6.1.2* Road Cuttings

South End Tailings, East Side of Road Culvert, Adjacent to Private Land

The sample taken in this area (sample 38) in the hazard assessment indicates a medium potential to release asbestos fibres. This area has been identified as an area where offsite migration can occur. This location is located on the closed section of Crow Mountain Road and is not readily accessible to the public however it is adjacent to private farm land.

- Ensure site access is restricted and unauthorised access prevented. Signage requirements will be covered by the signage at the nearby closed road barriers.
- Maintain an Asbestos Register to record authorised visits to these areas that details the purpose of the visit, duration, and any other information deemed necessary. These may include drainage and sediment control works or utility companies who may need to access the area.

Flora Trail Adjacent To Pit 1, West

The sample taken in this area (sample 43) in the hazard assessment indicates a high potential to release asbestos fibres. This location is reasonably accessible from the Barraba-Bundarra Road can be accessed to the public.

- Closure of the trail and fencing off of the area should be seriously considered. A study may be an option to determine if the Flora Trail can be relocated to an area away from the mine site. Where it is not feasible, a risk management approach shall be used in determining signage requirements, with the clear intent of informing all on the risk of asbestos contamination and exposure and ensuring access is minimised insofar as is possible.
- Public signage to trial adjacent to the mine site should be removed and the promotion of tourism activities to location adjacent to the mine site should be discouraged.

West of Waste Dump Near Pumping Station

The sample taken in this area (sample 44) in the hazard assessment indicates a very high potential to release asbestos fibres. This area has been identified as an area where offsite migration and run-off occurs. This location can be accessed by off-road vehicles using a track from the Iron Bark Creek picnic area.

- Ensure this section of the area (between the West Tailings Dump and the track leading to the Iron Bark Creek pumping station) is restricted and unauthorised access prevented. A risk management approach shall be used in determining signage and labelling requirements, with the clear intent of informing all on risk of asbestos exposure.
- If viable fencing with gates may be considered in order to limit inadvertent access.
- Formal notification should be provided to contractor or utility companies of the control measures required if in this area.
- Consider installation of suitable sediment traps if feasible to reduce migration of asbestos containing materials into Iron Bark Creek.

- Maintain appropriate asbestos signage. The signs should conform to Australian Standard 1319-1994 *Safety Signs for the Occupational Environment*. The display, positioning and numbers of asbestos hazard warning signs or labelling shall be determined by a competent person; however difficulty in removing the signs should also be considered given past issues.

North West of Overburden

The sample taken in this area (sample 45) in the hazard assessment indicates a medium potential to release asbestos fibres. This area has been identified as an area where offsite migration occurs. This location is located is located near the current fence along Barraba-Bundarra Road and is accessible to the public.

- This location should be managed as recommended in *Section 6.1.2* Road Cuttings.

6.2 Demolition - Risk Mitigation Measures

The removal contractor and the appointed independent Class A Asbestos Assessor should prepare a detailed Technical Scope of Works and an Asbestos Management Plan (AMP) that incorporate suitable Risk Mitigation Measures during Demolition Works.

It is recommended that the Technical Scope of Works, AMP and monitoring program from the principal contractor be reviewed by the Taskforce and to ensure it meets adequate mitigation controls and shows an adequate understating of the unique environmental health hazards present both within and outside the demolition zone.

Limited information on the proposed remediation transportation plan and methodology is available at the stage of this report. It is understood that the road in use is the Barraba-Bundarra Road and the short section of Crow Mountain (Mine) Road to the mine site entrance.

6.2.1 Waste / Overburden

- It is not envisaged that the demolition process will have an impact on the current waste and overburden control measures outlined as per *Section 6.1.1*

6.2.2 Road Cuttings

In addition to the current recommendations as outlined in *Section 6.1.2* it is recommended that:

- At the entrance area and verges around the intersection of the Barraba-Bundarra and Crow Mine Roads, Contrsctors implement dust suppression either as part of the decontamination process or laying blue metal or other similar encapsulation methods to suppress dust release should be considered prevent larger vehicles from creating dust when exiting and entering Crow Mountain (Mine) Road. Alternative methods may also be considered as part of the transport / logistics section of the project management plan for the demolition works.

6.2.3 Tailings

- It is not envisaged that the demolition process will have an impact on the current waste and overburden control measures outlined as per *Section 6.1.3*

6.2.4 Siltation Systems Sediments

In addition to the current recommendations outlined in *Section 6.1.4* it is recommended that:

- The gravel pit and sediment pond on Crow Mountain Road be regularly checked and maintained to ensure suitable integrity and functionality during the demolition phase of the project.

6.2.5 Mill Building Vicinity & Containment Cell Vicinity

A Technical Scope of Works and Asbestos Management Plan for the demolition project needs to be developed by the principal contractor and the independent asbestos assessor / occupational hygienist, with WorkCover NSW oversight. The list below is a guide only as to what documentation should be provided:

- Duration and type of monitoring that is recommended.
- The Occupational Hygienist and Field Technician's name, recent experience and qualification/asbestos assessor licences.
- The proposed monitoring locations around the Mill Building and the Containment Cell. It is recommended that personal monitoring also be undertaken.
- Ensure site access is restricted and unauthorised access prevented. A risk management approach shall be used in determining signage and labelling requirements, with the clear intent of informing all on risk of asbestos exposure.
- Details of asbestos and waste signage should be placed at the main entrance and should conform to Australian Standard 1319-1994 Safety Signs for the Occupational Environment. The display, positioning and numbers of asbestos hazard warning signs or labelling shall be determined by a competent person.
- Details of contractors current licences for asbestos removal relevant to the project and can prove competency.
- Contractor is responsible for notifying, in a timely manner, WorkCover NSW of any works that require such notification
- The Contractor is responsible for obtaining all necessary permits and approvals prior to the commencement of the works.

- Ensure site specific inductions are provided to all workers, including the issues involving naturally occurring asbestos both on the site and near the site, as well as general risks involved with derelict mine sites.
- Obtain Job Safety Analyses or Safe Work Method Statements and Asbestos Removal Plans from Contractors, review and issue an Asbestos Work Permit.
- The Contractor is to provide details on site occupancy restrictions and conditions, including access or egress; work schedules, emergency management requirements – evacuation plans and communication numbers and after hours arrangements. As the site may have limited mobile phone coverage this will also need to be considered.
- Strategies in place to avoid cross contamination, may include:
    - Keeping contaminated equipment/vehicles within the contaminated area
    - Only allowing decontaminated equipment/vehicles entering 'clean' areas of the site boundary.
    - Avoid water runoff onto roads by installing silt fence along perimeters of work zone. In some cases where the runoff is back on to the mine site an alternative method may be suitable.
    - Monitor wash down areas
    - Various clean up techniques to suit differing conditions e.g. wet brushing (physical removal) of invasive material from equipment/vehicles and high pressure water washing.
- Obtain details on storage and disposal of all asbestos waste from the project.
- The Contractor shall install appropriate decontamination facilities, including emergency decontamination facilities (eye washing/showering stations) as determined.
- The Contractor shall set up of decontamination zones for washing down of plant and equipment prior to entering clean areas. Consideration needs to be given to the current contamination on the surfaces in the 'clean' zone.
- Appropriate dust suppression measures, which may include:
    - Treating the soil with a wetting agent before disturbing it;
    - Using dust suppressants or covers on stockpiles;
    - Installing wind barriers;
    - Using sheltered areas;
    - Monitoring metrological conditions and modifying/stopping work where necessary;
    - Regulating the speed of vehicles;
    - Minimising access to contaminated areas, especially by vehicles; and,
    - Implementing a community dust complaint and response system.
- All drains are to be fitted with an appropriate filter medium in order to remove contaminants from water that is proposed leaving the mine site.
- Details of any post-demolition sign-off or evidence of suitable containment, noting that a clearance certificate or validation sampling is of limited use given the location and type of works.

6.2.6 Additional Areas

Iron Bark Creek

It is not envisaged that the demolition process will have an impact on the control measures outlined as in *Section 6.1.7*.

North of Mine Central Waypoint, North Side of Bundarra – Barraba Road

It is not envisaged that the demolition process will have an impact on the control measures outlined as in *Section 6.1.7*.

Entrance to Mine, East of Building

As the entrance to the Mine will become part of the demolition zone the requirements in the Technical Scope of Works and Asbestos Management Plan will apply as per *Section 6.2.5*.

South End Tailings, East Side of Road Culvert, Adjacent to Private Land

It is not envisaged that the demolition process will have an impact on the control measures outlined as in *Section 6.1.7*.

Flora Trail Adjacent To Pit 1, West

In addition to the control measures outlined in *Section 6.1.7* (Flora Trail), if the trail is to be risk managed rather than closed during the non-demolition phase, it is recommended that it be temporarily closed during the demolition phase given the potential for localised dust generation and transport issues surrounding the site.

West of Waste Dump Near Pumping Station

It is not envisaged that the demolition process will have an impact on the control measures outlined as in *Section 6.1.7*.

North West of Overburden

It is not envisaged that the demolition process will have an impact on the control measures outlined as in *Section 6.1.7*.

Location of Sampling Points

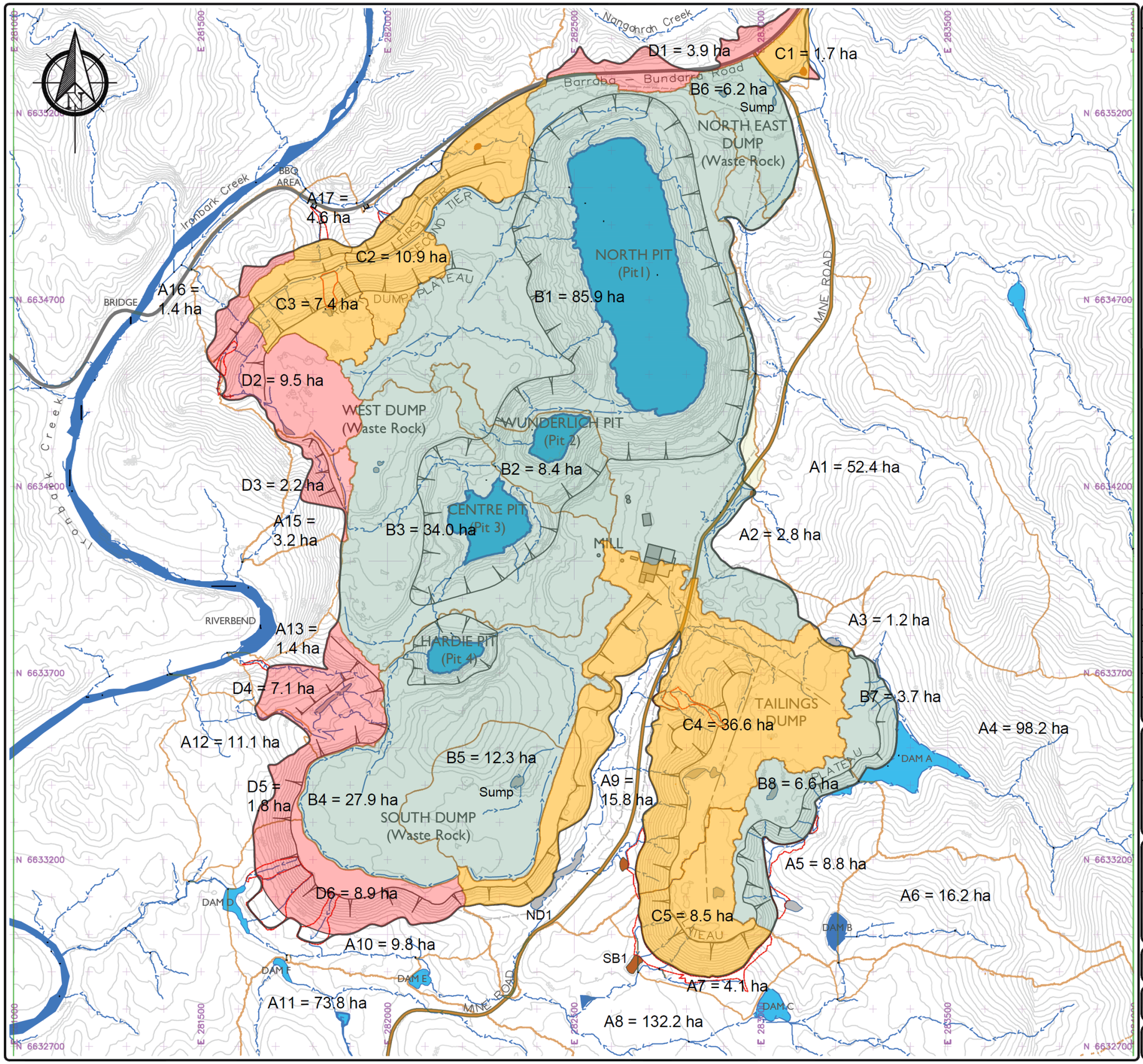
Appendix A contains information on GPS co-ordinates for sample points and map of sampling locations. The locations on the map also indicate the hazard assessment for the area as well as Priority Areas as detailed in *Section 6.1*

Table A1 GPS Co-Ordinates for Sampling Points, UTM Zone 56J, Datum GDA94

Sample Location	Northing	Easting	Sample Location	Northing	Easting
610.10893.0030/1	282698	6634033	610.10893.0030/24	282678	6635319
610.10893.0030/2	282724	6634017	610.10893.0030/25	282959	6635333
610.10893.0030/3	282715	6634027	610.10893.0030/26	282819	6633875
610.10893.0030/4	282747	6634031	610.10893.0030/27	282713	6633506
610.10893.0030/5	282790	6634152	610.10893.0030/28	282750	6632917
610.10893.0030/6	282764	6634235	610.10893.0030/29	283046	6633083
610.10893.0030/7	282547	6634144	610.10893.0030/30	283150	6633290
610.10893.0030/8	282635	6634135	610.10893.0030/31	282986	6633972
610.10893.0030/9	282583	6634031	610.10893.0030/32	282981	6633843
610.10893.0030/10	282505	6633883	610.10893.0030/33	282994	6633737
610.10893.0030/11	282594	6633888	610.10893.0030/34	282836	6634062
610.10893.0030/12	282596	6633876	610.10893.0030/35	282837	6634019
610.10893.0030/13	282041	6633842	610.10893.0030/36	282708	6633634
610.10893.0030/14	282237	6633901	610.10893.0030/37	282694	6633640
610.10893.0030/15	282569	6633676	610.10893.0030/38	282573	6633164
610.10893.0030/16	282750	6633902	610.10893.0030/39	282623	6633224
610.10893.0030/17	281711	6633803	610.10893.0030/40	281987	6633007
610.10893.0030/18	281631	6633737	610.10893.0030/41	281832	6632978
610.10893.0030/19	281567	6633973	610.10893.0030/42	282986	6634256
610.10893.0030/20	281173	6634310	610.10893.0030/43	282955	6634880
610.10893.0030/21	281819	6634942	610.10893.0030/44	281706	6634107
610.10893.0030/22	281962	6634956	610.10893.0030/45	282070	6635000
610.10893.0030/23	282236	6635160	610.10893.0030/46	283199	6634780

Appendix B Existing Catchment Drawing

Source: *Woodsreef Derelict Asbestos Mine – Sediment Movement Assessment*. NSW Department of Primary Industries Soil Conservation Service 9 April 2013



SCALE CHECK (Milimetres) 0 10 20 30 40 50 60 70 A3

LEGEND

- Mine Footprint
- Security Fencing
- Drainage Lines
- Roads & Tracks
- Contours (5 m from 5m DTM)
- Sediment Basin
- Existing Depressions
- Existing Dams
- Diversion Banks
- Contour Banks
- Channels
- Culvert
- Catchment Boundary
- Sediment Outside Mine Footprint

CATCHMENT KEY

A — Catchment is clean outside of the Mine Footprint

B — Catchment is directed into Mine Pits or Depressions

C — Catchment is directed into Sediment Basins or Traps

D — Catchment is uncontrolled and directed to Waterways or Farm

ISSUE	DESCRIPTION	DATE
1	REVISED FOR REVIEW	20/02/2013
0	DRAFT FOR REVIEW	09:07:12

DESIGNED	APPROVED	DRAWN	CHECKED
CC	—	CC	—

CLIENT

NSW MINERAL RESOURCES

36 Marina Drive
Coffs Harbour
NSW 2450
Ph. 02 6691 9623

Department of Primary Industries
Soil Conservation Service

PROJECT TITLE

WOODSREEF DERELICT ASBESTOS MINE DRAINAGE ASSESSMENT

DRAWING TITLE

Catchments & Drainage

SCALE	DATE
1:10,000	20/02/2013

PROJECT NO.	CAD FILE:
5007950	woodsreef 16.dwg

DRAWING NO.	REVISION	NO. OF SHEETS
5007950_3	1	SHEET 1 OF 1

Appendix C Asbestos Hazard Assessment Score Rationale

As previously stated in the Introduction:

> *The potential for natural processes, such as rain and wind, to transport materials from the mine site to areas outside the mine boundary will be a major factor in determining the likelihood of the general public being exposed to asbestos from the mine. The ability of the mine site materials and soils to resist these forces of erosion will vary over time. The characteristics of the parent material to form a stable crust will reduce the potential for off-site migration caused by both wind and rain. If the materials do start to migrate under the influence of natural forces such as rain and water movement, then the direction of water drainage from the source materials will determine if the materials leave the mine site. Therefore the ability of a surface to form a stable crust and the probable water drainage flows from the area of the mine, are primary factors when determining the likely hazard from off-site migration of mine materials.*
>
> *Ultimately natural forces will be responsible for transporting some materials and soils both off the mine site and within the mine site. However any potential asbestos hazard coupled with the transport of materials will be dependent on five main factors. This includes whether asbestos present in the material, how much asbestos is present in the material, in what form is the asbestos, the capacity to generate airborne fibres and for people to breathe in these fibres.*
>
> *The first and second factors (the presence or not of asbestos in material and how much asbestos is present) are both of obvious importance. The third factor, the form of the asbestos in the materials, is extremely important for any hazard assessment. The simple underlying principle being within some limits, the smaller the asbestos fibres present the greater the asbestos hazard.*
>
> *Asbestos will pose the greatest hazard to humans when present in the form of small fibres or loose bundle of asbestos.*
>
> *The asbestos hazard to humans occurs via the respiratory route, the breathing in of asbestos fibres. Asbestos can be present in a material but not in a respirable form. Accordingly the hazard posed by mine site materials and soils will be dependent on the ability of the material to release respirable asbestos fibres and for people to breathe in these fibres.*

Any attempt at assessing the potential asbestos hazard will need to consider these five factors. Laboratory analysis of samples can be used to determine three of these factors as set out below:

1. The presence of asbestos in a material
2. How much asbestos is present in a material
3. The form of asbestos in the sample

Field observations from the site coupled with laboratory analysis can be used to determine two of these factors as set out below:

4. The capacity of the parent material to generate airborne asbestos

Field observations used to determine if there is the capacity to generate airborne asbestos fibre may include observations of the parent material. Examples of field observations include how stable and resistant to erosion is the parent soil and is there evidence of migration of the parent soil through the actions of wind and water. Such observations can be coupled with Laboratory analysis to determine if the asbestos in a form small enough to become airborne.

5. If airborne asbestos fibres are generated is it in a location where people can breathe in the fibres?

Field observations can be used to determine if airborne asbestos fibres may be generated in an area where people may be exposed. For example is there evidence of the parent material being transported towards public areas off the mine site?

Developing an *Asbestos Hazard Assessment Score* to concisely summarise the potential hazard from asbestos to human health, associated with an abandoned asbestos mine is a unique situation. A semi quantitative approach was adopted, based on available data, field observations, laboratory analysis as well as professional judgement and experience.

The *Asbestos Hazard Assessment Score* was designed as a simple method to rank sites based on the potential to release asbestos fibres through off-site migration into locations where the release may impact on the public. It also provides an indication where the application of controls may be most effective, especially in areas where the public may be in close proximity.

The calculations and factors utilised were developed by SLR, based on available information. The Hazard Assessment Scores and associated calculations were designed to provide indicative advice only based on SLR's professional opinions.

The *Asbestos Hazard Assessment Score* was determined by the addition of the results from other calculations developed to capture information relating to site conditions and asbestos content of the sampling area.

Information on the site conditions were captured using the *Site Hazard Assessment Algorithm*. This took into account factors relevant to the possibility of migration or transport of materials from the sampling site to off mine site locations.

Information on the asbestos content of sampling areas was captured using the *Laboratory Analysis Hazard Assessment Algorithm*. This took into account factors relevant to the asbestos content of the areas sampled and factors relevant to the potential human health hazard from the asbestos fibre size and concentrations.

As asbestos hazard to humans occurs via the respiratory route, the breathing in of asbestos fibres. Asbestos can be present in a material but not in a respirable form. Accordingly the hazard posed by mine site materials and soils will be dependent on the ability of the material to release respirable asbestos fibres.

If respirable asbestos fibres are present in a sample, by nature of their size the fibres will likely be found in the finest particle size fraction. With regards to laboratory analysis, generally the smallest particle size fractions separated by sieving methods are particles of less than 2mm in size. Therefore materials that pose the highest potential hazard to exposed humans will be materials with relatively high asbestos content and with the asbestos fibres present in the respirable size range.

In most cases scores for individual factors were additive in the calculations. However multiplication was used for some factors such as off-site migration and trace analysis where these factors were deemed to have a significant impact on the potential hazard to human health. The overall calculation was:

Asbestos Hazard Assessment Score =	***((A + B) x C) + (D x E)***
Site Hazard Assessment Algorithm	***(A+B) x C***
+	**+**
Laboratory Analysis Hazard Assessment Algorithm	***D x E***

The factors used in the calculation of the Asbestos Hazard Assessment Score and the rationale behind the use of these factors has been set out below in Table C1.

Table C1 Asbestos Hazard Assessment Rank – Factors Used in Calculations and Rationale Behind the Factor Selection.

Factor	Symbol	Rationale
Site Hazard Assessment Algorithm	**(A+B) x C**	
Crusting	A	Ability of the parent material to form a stable crust and the subsequent strength of the crust are major factors in the ability of the material to remain intact and resist the forces of erosion both by wind and rain. A crust that resists erosion will reduce the potential for release of asbestos fibres into the surrounding environment.
Evidence of Material Migration	B	Visual evidence of material migration can be used to indicate if the material has been recently disturbed by erosion processes and the associated potential release of asbestos fibres if present in the material.
Migration Path	C	Migration path can indicate whether materials transported by erosion processes is likely to remain on the mine site or be transported off the mine site to areas closer to or in areas of human activities. As such this Migration Path carries a multiplication factor. Potential airborne migration was excluded from the migration path due to insufficient available data.
Laboratory Analysis Hazard Assessment Algorithm	**D x E**	
Asbestos Content in Soil Fractions	D	Asbestos content in the soil in terms of concentrations and the particle size fractions determine the possible hazard to human health. Smaller asbestos fibres and greater the concentration of available asbestos fibres are major factors in determining potential human health hazard.
Trace Asbestos	E	Trace asbestos reflects the presence of respirable sized asbestos fibres in the material. Respirable sized asbestos fibres are considered the fibres with the highest hazard to human health if inhaled.
Asbestos Hazard Assessment Score	**((A + B) x C) + (D x E)**	

For hazard assessment purposes, each factor was allocated a nominal scale in order to rank the hazard relative to that factor.

The definitions of Factors have been set out below in **Table C2** and **Table C3**.

Table C2 Site Hazard Assessment Algorithm

	Factor	Scale	Definition
A	**Crusting** Crusting was used to indicate the ability of the surface material to resist the forces of erosion and therefore the likelihood of the material migrating from the original source.	1	**Hard Crust** – Supports human weight easily without breaking, integrity of crust resistant to damage by natural processes such as rain and wind. Damage possible through erosion processes undermining crust.
		2	**Medium Crust** – Compared to "Soft Crust" more difficult to break or deform under foot, integrity of crust less likely to be easily damaged by natural processes such as rain and wind. Damage possible through erosion processes undermining crust.
		3	**Soft Crust**– Easily breaks or deforms under foot, evidence of crust crumbling present, integrity of crust likely to be easily damaged by natural processes such as rain and wind, or crust absent
B	**Evidence of material migration** Migration was used to indicate the level of transport of the mine materials	1	No visible evidence of migration or transport of materials
		2	Visible evidence of migration or transport of materials
C	**Migration Path** The material may be travelling to areas off the mine site that may be accessible or the potential to impact on to the general public	1	On site migration to the mine site
		2	Off-site migration to publicly accessible areas
Score		**(A + B) x C**	**= 2 to 10**

Table C3 Laboratory Analysis Hazard Assessment Algorithm

	Factor	Scale	Definition
D	**Asbestos Content in Soil Fractions**	0	Asbestos not detected in sample
		1	Asbestos not observed in <2mm size fraction but observed in larger fractions <9.5mm to > 2mm, or > 9.5mm size classes
		2	Asbestos observed in <2mm size fraction. Estimated concentration less than 1% (volume/volume)
		3	Asbestos observed in <2mm size fraction. Estimated concentration greater than 1% (volume/volume)
E	**Trace Asbestos** Indicates whether respirable size asbestos size fibres are present. These fibres pose the risk to asbestos exposure to human health.	1	Absent
		2	Present
Total		**D x E**	**= 0 to 6**

If asbestos is not detected in a sample, the sampling location was given a "Low" Asbestos Hazard Assessment Score, regardless of other factors at the location.

The definitions of Asbestos Hazard Score rankings have been set out in **Table C4**.

Table C4 Asbestos Hazard Assessment Score

Score	Asbestos Hazard Assessment Score	Characteristics
16	**Very High**	Susceptible to erosion Migration pathway off site Trace asbestos present
10 - 15	**High**	May be susceptible to erosion Migration pathway mostly off-site Trace asbestos likely to be present
6 - 10	**Medium**	May be susceptible to erosion Migration pathway mostly on-site Trace asbestos may or may not be present
5 or less	**Low**	May be susceptible to erosion but mostly resistant to erosion Migration pathway on-site Trace asbestos unlikely be present Or no asbestos detected

Appendix D Sampling Location Result Summaries and Photographs

Waste / Overburden — Sample No 610.10893.00030/13

Site Observations

Location	South of south dump adjacent to road, overburden
GPS	282041 (Northing), 6633842 (Easting)
Visual Findings	Crusting sediment
Crusting (Soft, Medium, Hard)	Soft along road
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light grey soil, rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	20%
Trace Asbestos	Present
Hazard Assessment	**High**

Waste / Overburden — Sample No 610.10893.00030/14

Site Observations

Location	South of south dump, east end of internal road on Waste/Overburden
GPS	282237 (Northing), 6633901 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Soft along road
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light brown soil, rocks and organic material
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	1%
Trace Asbestos	Present
Hazard Assessment	**High**

Waste / Overburden	**Sample No 610.10893.00030/40**

Site Observations

Location	SW of south overburden
GPS	281987 (Northing), 6633007 (Easting)
Visual Findings	Runoff soil
Crusting (Soft, Medium, Hard)	Soft, fibres present
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	dark grey soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Absent
Hazard Assessment	**High**

Waste / Overburden

Sample No 610.10893.00030/41

Site Observations

Location	South central south overburden rock fall
GPS	281832 (Northing), 6632978 (Easting)
Visual Findings	Rock material
Crusting (Soft, Medium, Hard)	Soft, fibres present in fencing
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light grey material, crusts and plant debris
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	90%
Trace Asbestos	Present
Hazard Assessment	**Very High**

Road cuttings

Sample No 610.10893.00030/23

Site Observations

Location	NE mine, south side road near manmade mound
GPS	282236 (Northing), 6635160 (Easting)
Visual Findings	Chrysotile
Crusting (Soft, Medium, Hard)	No crusting, sediment trap
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	grey brown soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	1%
Trace Asbestos	Absent
Hazard Assessment	**High**

Road cuttings	**Sample No 610.10893.00030/25**

Site Observations

Location	Corner of Mine Road and the Woodsreet Road
GPS	282959 (Northing), 6635333 (Easting)
Visual Findings	Overburden material, soil rock
Crusting (Soft, Medium, Hard)	Soft, no crusting
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light grey soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	0.5%
Trace Asbestos	Present
Hazard Assessment	**High**

Road cuttings	**Sample No 610.10893.00030/35**

Site Observations

Location	Entrance to tailings, runoff east of road
GPS	282837 (Northing), 6634019 (Easting)
Visual Findings	Road base soil
Crusting (Soft, Medium, Hard)	Medium
Migration Path	On site

Laboratory Analysis

Whole Sample Description	light brown/grey material, fibrous masses
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	40%
Trace Asbestos	Present
Hazard Assessment	**Medium**

Road cuttings

Sample No 610.10893.00030/39

Site Observations

Location	East of road near south end
GPS	282623 (Northing), 6633224 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Soft, unprocessed rock
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light brown/grey material and crusts
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	70%
Trace Asbestos	Present
Hazard Assessment	**Very High**

Road cuttings	**Sample No 610.10893.00030/42**

Site Observations

Location	West side of Mine Road midway
GPS	282986 (Northing), 6634256 (Easting)
Visual Findings	Rock material
Crusting (Soft, Medium, Hard)	Soft, fibres present in fencing
Migration Path	On site

Laboratory Analysis

Whole Sample Description	grey brown soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Present
Hazard Assessment	**Medium**

Road cuttings	**Sample No 610.10893.00030/46**

Site Observations

Location	East side of Mine Road north near intersection
GPS	283199 (Northing), 6634780 (Easting)
Visual Findings	Overburden waste material
Crusting (Soft, Medium, Hard)	Soft, migration in rockfall - water runoff
Migration Path	On site

Laboratory Analysis

Whole Sample Description	rocks, and soil
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Present
Hazard Assessment	**Medium**

Siltation systems sediments	**Sample No 610.10893.00030/21**

Site Observations

Location	Culvert 3, north of west dump
GPS	281819 (Northing), 6634942 Easting)
Visual Findings	Riverbed (sand/gravel)
Crusting (Soft, Medium, Hard)	No crusting
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	sandy soil, rocks organic material
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Absent
Hazard Assessment	**High**

Siltation systems sediments	**Sample No 610.10893.00030/22**

Site Observations

Location	Culvert 2 area upstream, east
GPS	281962 (Northing), 6634956 (Easting)
Visual Findings	Soil, sediment wash
Crusting (Soft, Medium, Hard)	Soft, collect from culvert
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	sandy soil and rocks
Asbestos Presence Fraction < 2mm	Absent
Asbestos Description Fraction < 2mm	-
% Asbestos (vol/vol approx.)	0%
Trace Asbestos	Absent
Hazard Assessment	**Medium**

Siltation systems sediments — Sample No 610.10893.00030/36

Site Observations

Location	Culvert to east of road
GPS	282708 (Northing), 6633634 (Easting)
Visual Findings	Tailings runoff
Crusting (Soft, Medium, Hard)	Soft
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light grey material, crusts and plant debris
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	40%
Trace Asbestos	Present
Hazard Assessment	**Very High**

Siltation systems sediments	**Sample No 610.10893.00030/37**

Site Observations

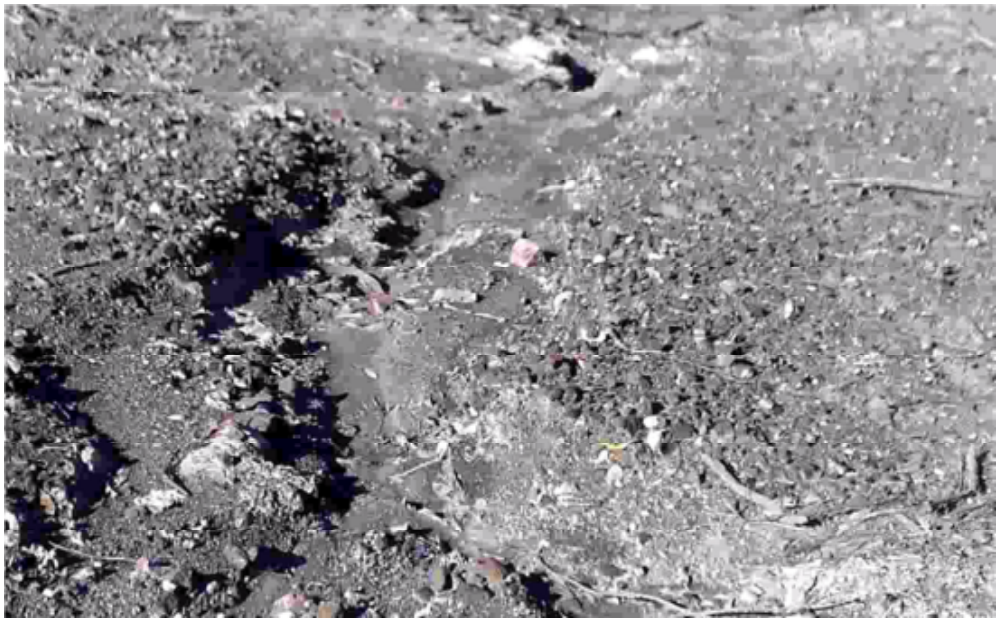
Location	Culvert to west of road
GPS	282694 (Northing), 6633640 (Easting)
Visual Findings	Tailings soil
Crusting (Soft, Medium, Hard)	Medium
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	grey /blue gravel, grey crusts
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	1%
Trace Asbestos	Absent
Hazard Assessment	**Medium**

Tailings	**Sample No 610.10893.00030/26**
Site Observations	
Location	West side tailings east of Crow Mountain Road, conveyor belt
GPS	282819 (Northing), 6633875 (Easting)
Visual Findings	Soil runoff
Crusting (Soft, Medium, Hard)	Soft, unprocessed rock material also present
Migration Path	Off site
Laboratory Analysis	
Whole Sample Description	light grey material, crusts and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	95%
Trace Asbestos	Present
Hazard Assessment	**Very High**

Tailings	**Sample No 610.10893.00030/27**
Site Observations	
Location	Midway along tailings east of Mountain Road
GPS	282713 (Northing), 6633506 (Easting)
Visual Findings	Tailings soil
Crusting (Soft, Medium, Hard)	Soft, hard- pebble/ rock
Migration Path	Off site
Laboratory Analysis	
Whole Sample Description	light grey material, crusts and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	2%
Trace Asbestos	Present
Hazard Assessment	**Very High**



Tailings	**Sample No 610.10893.00030/28**

Site Observations

Location	South end tailing, midway adjacent drainage area
GPS	282750 (Northing), 6632917 (Easting)
Visual Findings	Tailings soil
Crusting (Soft, Medium, Hard)	Soft, crusted surface
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light grey material, crusts and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Present
Hazard Assessment	**High**

Tailings	**Sample No 610.10893.00030/29**

Site Observations

Location	East side of tailing basin south between hills
GPS	283046 (Northing), 6633083 (Easting)
Visual Findings	Tailings soil
Crusting (Soft, Medium, Hard)	Soft, hard - rocky surface
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light grey material, crusts
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	80%
Trace Asbestos	Present
Hazard Assessment	**Very High**

Tailings	**Sample No 610.10893.00030/30**
Site Observations	
Location	East side of tailing, midway basin
GPS	283150 (Northing), 6633290 (Easting)
Visual Findings	Tailings runoff
Crusting (Soft, Medium, Hard)	Soft, with fines
Migration Path	Off site
Laboratory Analysis	
Whole Sample Description	light grey material, crusts
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	70%
Trace Asbestos	Present
Hazard Assessment	**Very High**

Tailings	**Sample No 610.10893.00030/31**
Site Observations	
Location	North tailing midway
GPS	282986 (Northing), 6633972 (Easting)
Visual Findings	Tailings soil
Crusting (Soft, Medium, Hard)	Soft
Migration Path	On site
Laboratory Analysis	
Whole Sample Description	light grey soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	25%
Trace Asbestos	Present
Hazard Assessment	**High**

Tailings	**Sample No 610.10893.00030/32**
Site Observations	
Location	Top of tailings, north of telegraph pole
GPS	282981 (Northing), 6633843 (Easting)
Visual Findings	Chrysotile
Crusting (Soft, Medium, Hard)	Soft, fines - rocks smaller
Migration Path	On site
Laboratory Analysis	
Whole Sample Description	grey brown soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	10%
Trace Asbestos	Present
Hazard Assessment	**High**

Tailings	**Sample No 610.10893.00030/33**
Site Observations	
Location	Top of tailings, near old building rubble
GPS	282994 (Northing), 6633737 (Easting)
Visual Findings	Friable
Crusting (Soft, Medium, Hard)	Soft, crusting pebbles
Migration Path	Off site
Laboratory Analysis	
Whole Sample Description	light grey material, crusts and plant debris
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Present
Hazard Assessment	**High**

Mill Building Vicinity	**Sample No 610.10893.00030/5**

Site Observations

Location	NE adjacent road to silos
GPS	282790 (Northing), 6634152 (Easting)
Visual Findings	Soil Detritus
Crusting (Soft, Medium, Hard)	Soft
Migration Path	On site

Laboratory Analysis

Whole Sample Description	dark brown soil
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Absent
Hazard Assessment	**High**

Mill Building Vicinity	**Sample No 610.10893.00030/6**

Site Observations

Location	NE of silo, adjacent to Northern Pit
GPS	282764 (Northing), 6634235 (Easting)
Visual Findings	Soil Detritus
Crusting (Soft, Medium, Hard)	None - rock
Migration Path	On site

Laboratory Analysis

Whole Sample Description	light brown soil, rocks and organic material
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Absent
Hazard Assessment	**High**

Mill Building Vicinity — Sample No 610.10893.00030/7

Site Observations

Location	NW of silo adjacent to Centre Pit
GPS	282547 (Northing), 6634144 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Hard pebble surface
Migration Path	On site

Laboratory Analysis

Whole Sample Description	light brown soil, rocks and organic material
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Absent
Hazard Assessment	**Medium**

Mill Building Vicinity	**Sample No 610.10893.00030/8**

Site Observations

Location	Silos, south of stockpile
GPS	282635 (Northing), 6634135 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Hard
Migration Path	On site

Laboratory Analysis

Whole Sample Description	light grey soil, rocks and organic material
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	70%
Trace Asbestos	Present
Hazard Assessment	**High**

Mill Building Vicinity	**Sample No 610.10893.00030/9**

Site Observations

Location	West of main building, adjacent to old water tank
GPS	282583 (Northing), 6634031 (Easting)
Visual Findings	Stockpile debris
Crusting (Soft, Medium, Hard)	Pebble crusting, soft
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light brown soil, rocks and organic material
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Absent
Hazard Assessment	**Low**

Mill Building Vicinity	**Sample No 610.10893.00030/10**

Site Observations

Location	Emplacement area, SE
GPS	282505 (Northing), 6633883 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Hard, pebbley
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	orange brown soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Absent
Hazard Assessment	**Low**

Mill Building Vicinity	**Sample No 610.10893.00030/11**

Site Observations

Location	Stockpile south of building
GPS	282594 (Northing), 6633888 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Unprocessed-rock
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	grey brown soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	bundles
% Asbestos (vol/vol approx.)	20%
Trace Asbestos	Present
Hazard Assessment	**Medium**

Mill Building Vicinity	**Sample No 610.10893.00030/12**

Site Observations

Location	Stockpile south of building run-off
GPS	282596 (Northing), 6633876 (Easting)
Visual Findings	Rock soil matrix
Crusting (Soft, Medium, Hard)	Soft
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light brown/grey material, some layers and crusts
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	95%
Trace Asbestos	Present
Hazard Assessment	**High**

Mill Building Vicinity	**Sample No 610.10893.00030/15**

Site Observations

Location	Stockpile south of building, west of culvert 1
GPS	282569 (Northing), 6633676 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Fragments of FCS, unprocessed rock
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light brown soil, rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	90%
Trace Asbestos	Present
Hazard Assessment	**High**

Mill Building Vicinity	**Sample No 610.10893.00030/16**

Site Observations

Location	Waste from conveyor belt dump east of building
GPS	282750 (Northing), 6633902 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Hard at crusting base
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light grey soil, rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	90%
Trace Asbestos	Present
Hazard Assessment	**Medium**

Proposed Containment Cell Vicinity — Sample No 610.10893.00030/1

Site Observations

Location	Inside Building NW
GPS	282698 (Northing), 6634033 (Easting)
Visual Findings	Soil Detritus
Crusting (Soft, Medium, Hard)	Medium
Migration Path	On Site

Laboratory Analysis

Whole Sample Description	light brown/grey material, fibrous masses
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous mass
% Asbestos (vol/vol approx.)	70%
Trace Asbestos	Present
Hazard Assessment	**High**

Proposed Containment Cell Vicinity — Sample No 610.10893.00030/2

Site Observations

Location	Inside Building NE
GPS	282724 (Northing), 6634017 (Easting)
Visual Findings	Detritus
Crusting (Soft, Medium, Hard)	Medium
Migration Path	On site

Laboratory Analysis

Whole Sample Description	light brown/grey material, fibrous masses
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	50%
Trace Asbestos	Present
Hazard Assessment	**High**

Proposed Containment Cell Vicinity	**610.10893.00030/3**

Site Observations

Location	Inside Building NE
GPS	282715 (Northing), 6634027 (Easting)
Visual Findings	Soil Debris
Crusting (Soft, Medium, Hard)	Medium
Migration Path	On site

Laboratory Analysis

Whole Sample Description	light brown/grey material, fibrous masses
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	40%
Trace Asbestos	Present
Hazard Assessment	**High**

Proposed Containment Cell Vicinity	**Sample No 610.10893.00030/4**

Site Observations

Location	On concrete slab, east of building
GPS	282747 (Northing), 6634031 (Easting)
Visual Findings	Detritus, Debris
Crusting (Soft, Medium, Hard)	Soft
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light brown/grey material, fibrous masses
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	25%
Trace Asbestos	Present
Hazard Assessment	**High**

Additional Areas

Table C1 List of Additional Areas Sampled

Additional Areas Sampled (Areas Deemed To Have Potential for or Affected by Off-Site Migration of Asbestos)	Classification
Ironbark Creek, adjacent to pumping station	17 Pumping Station
Ironbark Creek, adjacent to tyre mount, floodplain	18 Pumping Station
Ironbark Creek, east flood plain, midway	19
Ironbark Creek, start of walking track NE	20 Picnic / Camping Area
North of mine central waypoint, north side of Bundarra – Barraba Road	24
Entrance to mine, east of building	34
South end tailings, east road culvert, adjacent to private land	38
Flora Trail adjacent to pit 1, west	43
West of waste dump near pumpingstation	44
North west of overburden	45

Additional Areas - Ironbark Creek, Adjacent to Pumping Station - Sample No 610.10893.00030/17

Site Observations

Location	Ironbark Creek, adjacent to pumping station
GPS	281711 (Northing), 6633803 (Easting)
Visual Findings	Fines
Crusting (Soft, Medium, Hard)	Hard, pebble rock
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light grey soil, rocks and organic material
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Absent
Hazard Assessment	**Low**

Additional Areas - Ironbark Creek, Adjacent to Tyre Mount, Floodplain - Sample No 610.10893.00030/18

Site Observations

Location	Ironbark Creek, adjacent to tyre mount, floodplain
GPS	281631 (Northing), 6633737 (Easting)
Visual Findings	Run-off of overburden soil
Crusting (Soft, Medium, Hard)	Medium
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light brown soil, rocks and organic material
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	80%
Trace Asbestos	Present
Hazard Assessment	**High**

Additional Areas - Ironbark Creek, East Flood Plain, Midway - Sample No 610.10893.00030/19

Site Observations

Location	Ironbark Creek, east flood plain, midway
GPS	281567 (Northing), 6633973 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Medium - some crusting
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	Sandy soil, rocks organic material
Asbestos Presence Fraction < 2mm	Absent
Asbestos Description Fraction < 2mm	Absent
% Asbestos (vol/vol approx.)	0%
Trace Asbestos	Absent
Hazard Assessment	**Medium**

Additional Areas - Ironbark Creek, Start of Walking Track North East- Sample No 610.10893.00030/20

Site Observations

Location	Ironbark Creek, start of walking track NE
GPS	281173 (Northing), 6634310 (Easting)
Visual Findings	Riverbed sand/sediments
Crusting (Soft, Medium, Hard)	No crusting
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	Sand and rocks
Asbestos Presence Fraction < 2mm	Absent
Asbestos Description Fraction < 2mm	Absent
% Asbestos (vol/vol approx.)	0%
Trace Asbestos	Absent
Hazard Assessment	**Medium**

Additional Areas - North of Mine Central Waypoint, North Side of Bundarra – Barraba Road - Sample No 610.10893.00030/24

Site Observations

Location	North of mine central waypoint, north side of Bundarra – Barraba Road
GPS	282678 (Northing), 6635319 (Easting)
Visual Findings	Runoff soil
Crusting (Soft, Medium, Hard)	Soft
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	grey brown soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	2%
Trace Asbestos	Present
Hazard Assessment	**Very High**

Additional Areas - Entrance to Mine, East of Building - Sample No 610.10893.00030/34

Site Observations

Location	Entrance to mine, east of building
GPS	282836 (Northing), 6634062 (Easting)
Visual Findings	Friable tailings
Crusting (Soft, Medium, Hard)	Soft
Migration Path	On site

Laboratory Analysis

Whole Sample Description	grey brown soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Absent
Hazard Assessment	**Medium**

Siltation systems sediments-South End Tailings, East Road Culvert, Adjacent to Private Land- Sample No 610.10893.00030/38

Site Observations

Location	South end tailings, east road culvert, adjacent to private land
GPS	282573 (Northing), 6633164 (Easting)
Visual Findings	Tailings soil
Crusting (Soft, Medium, Hard)	Soft, visible fibres
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	light brown soil and crusts
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	5%
Trace Asbestos	Present
Hazard Assessment	**Very High**

Additional Areas - Flora Trail Adjacent to Pit 1, West - Sample No 610.10893.00030/43

Site Observations

Location	Flora Trail adjacent to pit 1, west
GPS	282955 (Northing), 6634880 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Soft
Migration Path	On site

Laboratory Analysis

Whole Sample Description	light brown/grey material, some layers and crusts
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Fibrous masses
% Asbestos (vol/vol approx.)	40%
Trace Asbestos	Present
Hazard Assessment	**High**

Additional Areas - West of Waste Dump Near Pumping Station - Sample No 610.10893.00030/44

Site Observations

Location	West of waste dump near pumping station
GPS	281706 (Northing), 6634107 (Easting)
Visual Findings	Soil
Crusting (Soft, Medium, Hard)	Soft
Migration Path	Off site

Laboratory Analysis

Whole Sample Description	rocks, gravel and leaves
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Natural asbestos (i.e unprocessed)
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Present
Hazard Assessment	**High**

Additional Areas - North West of Waste / Overburden - Sample No 610.10893.00030/45

Site Observations

Location	North west of waste / overburden
GPS	282070 (Northing), 6635000 (Easting)
Visual Findings	Overburden waste material
Crusting (Soft, Medium, Hard)	Soft, pebbles fines
Migration Path	On site

Laboratory Analysis

Whole Sample Description	grey brown soil and rocks
Asbestos Presence Fraction < 2mm	Chrysotile
Asbestos Description Fraction < 2mm	Bundles
% Asbestos (vol/vol approx.)	<0.1%
Trace Asbestos	Present
Hazard Assessment	**Medium**

Appendix E Laboratory Analysis – Summary Particle Size Fractions > 9.5mm, < 9.5mm to > 2mm and <2mm

Table E1 Waste / Overburden - Laboratory Analysis Summary Size Fractions

Sample No.	Asbestos Presence Fraction > 9.5mm	% Asbestos (vol/vol estimate) Fraction > 9.5mm	Asbestos Presence Fraction <9.5mm > 2mm	% Asbestos (vol/vol estimate) Fraction <9.5mm > 2mm	Asbestos Presence Fraction < 2mm	% Asbestos (vol/vol estimate) Fraction <2mm	Trace Asbestos
610.10893.00030/13	Absent	N/A*	Chrysotile	10	Chrysotile	20	Present
610.10893.00030/14	Absent	N/A*	Chrysotile	5	Chrysotile	1	Present
610.10893.00030/40	Absent	N/A*	Absent	N/A*	Chrysotile	<0.1	Present
610.10893.00030/41	Absent	N/A*	Chrysotile	95	Chrysotile	90	Present

Note * N/A = Not Applicable

Table E2 Road Cuttings - Laboratory Analysis Summary Size Fractions

Sample No.	Asbestos Presence Fraction > 9.5mm	% Asbestos (vol/vol estimate) Fraction > 9.5mm	Asbestos Presence Fraction <9.5mm > 2mm	% Asbestos (vol/vol estimate) Fraction <9.5mm > 2mm	Asbestos Presence Fraction < 2mm	% Asbestos (vol/vol estimate) Fraction <2mm	Trace Asbestos
610.10893.00030/23	Absent	N/A*	Chrysotile	<0.1	Chrysotile	1	Absent
610.10893.00030/25	Absent	N/A*	Chrysotile	<0.1	Chrysotile	0.5	Present
610.10893.00030/35	Absent	N/A*	Absent	N/A*	Chrysotile	40	Present
610.10893.00030/39	Absent	N/A*	Absent	N/A*	Chrysotile	70	Present
610.10893.00030/42	Absent	N/A*	Absent	N/A*	Chrysotile	<0.1	Present
610.10893.00030/46	Absent	N/A*	Absent	N/A*	Chrysotile	<0.1	Present

Note * N/A = Not Applicable

Table E3 Siltation Systems Sediments - Laboratory Analysis Summary Size Fractions

Sample No.	Asbestos Presence Fraction > 9.5mm	% Asbestos (vol/vol estimate) Fraction > 9.5mm	Asbestos Presence Fraction <9.5mm > 2mm	% Asbestos (vol/vol estimate) Fraction <9.5mm > 2mm	Asbestos Presence Fraction < 2mm	% Asbestos (vol/vol estimate) Fraction <2mm	Trace Asbestos
610.10893.00030/21	Absent	N/A*	Absent	N/A*	Chrysotile	<0.1	Absent
610.10893.00030/22	Absent	N/A*	Absent	N/A*	Absent	N/A*	Absent
610.10893.00030/36	Absent	N/A*	Absent	N/A*	Chrysotile	40	Present
610.10893.00030/37	Absent	N/A*	Chrysotile	1	Chrysotile	1	Absent

Note * N/A = Not Applicable

Table E4 Tailings - Laboratory Analysis Summary Size Fractions

Sample No.	Asbestos Presence Fraction > 9.5mm	% Asbestos (vol/vol estimate) Fraction > 9.5mm	Asbestos Presence Fraction <9.5mm > 2mm	% Asbestos (vol/vol estimate) Fraction <9.5mm > 2mm	Asbestos Presence Fraction < 2mm	% Asbestos (vol/vol estimate) Fraction <2mm	Trace Asbestos
610.10893.00030/26	Absent	N/A*	Chrysotile	90	Chrysotile	95	Present
610.10893.00030/27	Absent	N/A*	Chrysotile	2	Chrysotile	2	Present
610.10893.00030/28	Absent	N/A*	Chrysotile	1	Chrysotile	<0.1	Present
610.10893.00030/29	Absent	N/A*	Absent	N/A*	Chrysotile	80	Present
610.10893.00030/30	Absent	N/A*	Chrysotile	<0.1	Chrysotile	70	Present
610.10893.00030/31	Absent	N/A*	Chrysotile	<0.1	Chrysotile	25	Present
610.10893.00030/32	Absent	N/A*	Chrysotile	0.5	Chrysotile	10	Present
610.10893.00030/33	Absent	N/A*	Absent	<0.1	Chrysotile	<0.1	Present

Note * N/A = Not Applicable

Table E5 Mill Building Vicinity - Laboratory Analysis Summary Size Fractions

Sample No.	Asbestos Presence Fraction > 9.5mm	% Asbestos (vol/vol estimate) Fraction > 9.5mm	Asbestos Presence Fraction <9.5mm > 2mm	% Asbestos (vol/vol estimate) Fraction <9.5mm > 2mm	Asbestos Presence Fraction < 2mm	% Asbestos (vol/vol estimate) Fraction <2mm	Trace Asbestos
610.10893.00030/5	Absent	N/A*	Absent	N/A*	Chrysotile	<0.1	Absent
610.10893.00030/6	Absent	N/A*	Chrysotile	<0.1	Chrysotile	<0.1	Absent
610.10893.00030/7	Absent	N/A*	Absent	N/A*	Chrysotile	<0.1	Absent
610.10893.00030/8	Absent	N/A*	Chrysotile	N/A*	Chrysotile	70	Present
610.10893.00030/9	Absent	N/A*	Chrysotile	<0.1	Chrysotile	<0.1	Absent
610.10893.00030/10	Chrysotile	<0.1	Chrysotile	<0.1	Chrysotile	<0.1	Absent
610.10893.00030/11	Chrysotile	<0.1	Chrysotile	20	Chrysotile	20	Present
610.10893.00030/12	Absent	N/A*	Chrysotile	90	Chrysotile	95	Present
610.10893.00030/15	Absent	N/A*	Chrysotile	50	Chrysotile	90	Present
610.10893.00030/16	Absent	N/A*	Chrysotile	50	Chrysotile	90	Present

Note * N/A = Not Applicable

Table E6 Proposed Containment Cell Vicinity - Laboratory Analysis Summary Size Fractions

Sample No.	Asbestos Presence Fraction > 9.5mm	% Asbestos (vol/vol estimate) Fraction > 9.5mm	Asbestos Presence Fraction <9.5mm > 2mm	% Asbestos (vol/vol estimate) Fraction <9.5mm > 2mm	Asbestos Presence Fraction < 2mm	% Asbestos (vol/vol estimate) Fraction <2mm	Trace Asbestos
610.10893.00030/1	Absent	N/A*	Absent	N/A*	Chrysotile	70	Present
610.10893.00030/2	Absent	N/A*	Absent	N/A*	Chrysotile	50	Present
610.10893.00030/3	Absent	N/A*	Absent	N/A*	Chrysotile	40	Present
610.10893.00030/4	Absent	N/A*	Absent	N/A*	Chrysotile	25	Present

Note * N/A = Not Applicable

Table E7 Additional Areas - Laboratory Analysis Summary Size Fractions

Additional Areas	Sample No.	Asbestos Presence Fraction > 9.5mm	% Asbestos (vol/vol estimate) Fraction > 9.5mm	Asbestos Presence Fraction <9.5mm > 2mm	% Asbestos (vol/vol estimate) Fraction <9.5mm > 2mm	Asbestos Presence Fraction < 2mm	% Asbestos (vol/vol estimate) Fraction <2mm	Trace Asbestos
Ironbark Creek, adjacent to pumping station	610.10893.00030/17	Absent	N/A*	Absent	N/A*	Chrysotile	<0.1	Absent
Ironbark Creek, adjacent to tyre mount, floodplain	610.10893.00030/18	Absent	N/A*	Chrysotile	45	Chrysotile	80	Present
Ironbark Creek, east flood plain, midway	610.10893.00030/19	Absent	N/A*	Absent	N/A*	Absent	N/A*	Absent
Ironbark Creek, start of walking track NE	610.10893.00030/20	Absent	N/A*	Absent	N/A*	Absent	N/A*	Absent
North of mine central waypoint, north side of Bundarra – Barraba Road	610.10893.00030/24	Absent	N/A*	Chrysotile	0.5	Chrysotile	2	Present
Entrance to mine, east of building	610.10893.00030/34	Absent	N/A*	Absent	N/A*	Chrysotile	<0.1	Absent
South end tailings, east road culvert, adjacent to private land	610.10893.00030/38	Absent	N/A*	Absent	N/A*	Chrysotile	5	Present
Flora Trail adjacent to pit 1, west	610.10893.00030/43	Absent	N/A*	Chrysotile	<0.1	Chrysotile	40	Present
West of waste dump near pumpingstation	610.10893.00030/44	Absent	N/A*	Absent	N/A*	Chrysotile	<0.1	Present
North west of overburden	610.10893.00030/45	Absent	N/A*	Chrysotile	<0.1	Chrysotile	<0.1	Present

Appendix F Laboratory Analysis –

NATA Reports

SLR Reference No. 1-7 dated 11/02/2014

ASBESTOS ANALYTICAL REPORT
Report No. 610.10893.00030/01/ANA

Client:	NSW Trade and Investment
Client Contact:	Division of Resources & Energy - Mineral Resources
Client Address:	516 High Street, Maitland NSW 2320
Date Analysed:	Monday, 20 May 2013
Report Date:	Tuesday, 11 February 2014
Site Address:	Waste / Overburden, Woodsreef Mine, NSW, 2347
Test Methods:	Sample(s) examined under a Stereo Microscope and selected fibres under a Polarised Light Microscope with dispersion staining techniques, in Accordance with Method AIP.01.03
Laboratory Address:	2 Lincoln Street, Lane Cove NSW 2066 (NATA Accreditation No. 3130)

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

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ABN 29 001 584 612
2 Lincoln Street
Lane Cove NSW 2066
Telephone 61 2 9427 8100 Facsimile 61 2 9427 8200
Email: forhelp@slrconsulting.com
Website: www.slrconsulting.com

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Results:

Sample No	Description	Sample Size	Location	Analysis Results
610.10893.00030/13	Soil and rocks	4800g	South of south dump adjacent to road, overburden	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos Detected
610.10893.00030/14	Soil and rocks	5000g	South of south dump, east end of road, overburden	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos Detected
610.10893.00030/40	Soil and rocks	5800g	SW of south overburden	** Chrysotile Asbestos Detected, Trace Asbestos Not Detected
610.10893.00030/41	Soil and rocks	6100g	South central south overburden rock fall	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos Detected

Note:

- The report(s) and/or information produced by SLR Consulting Australia Pty Ltd should not be reproduced and/or presented/reviewed except in full.
- Even after disintegration of some bulk samples (eg bituminous materials and vinyl tiles/sheeting) detection of fibres may be difficult when using polarized light microscopy and dispersion staining techniques. This may be due to the matrix of the samples (uneven distribution) or fine fibres that are difficult to detect and positively identify.
- Detection Limit - 0.1 g/kg (AS 4964).
- An Independent Analytical Technique is Recommended for Vinyl Samples (i.e. Vinyl Floor Tiles).
- Laboratory is not accredited to perform sampling.
- ** Sub-sampling of sample was undertaken prior to analysis as per SLR Method AIP-01.03.

Approved Identifier: Dr Craig Simpson

Approved Signatory: Dr Craig Simpson

ASBESTOS ANALYTICAL REPORT
Report No. 610.10893.00030/02/ANA

Client:	NSW Trade and Investment
Client Contact:	Division of Resources & Energy - Mineral Resources
Client Address:	516 High Street, Maitland NSW 2320
Date Analysed:	Wednesday, 22 May 2013
Report Date:	Tuesday, 11 February 2014
Site Address:	Road Cuttings, Woodsreef Mine, NSW, 2347
Test Methods:	Sample(s) examined under a Stereo Microscope and selected fibres under a Polarised Light Microscope with dispersion staining techniques, in Accordance with Method AIP.01.03
Laboratory Address:	2 Lincoln Street, Lane Cove NSW 2066 (NATA Accreditation No. 3130)

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

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Results:

Sample No	Description	Sample Size	Location	Analysis Results
610.10893.00030/23	Soil and rocks	6150g	NE mine, south side road near manmade mound	** Chrysotile Asbestos Detected, Trace Asbestos not detected
610.10893.00030/25	Soil	6500g	Corner of Mine Road and the Woodstreet Road	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/35	Soil and tailings	4500g	Entrance to tailings, runoff east of road	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/39	Soil and rock	550g	East of road near south end	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/42	Soil and rock	7100g	West of Mine Road midway	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/46	Soil	7150g	East side of Mine Road north near intersection	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected

Note:

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- Even after disintegration of some bulk samples (eg bituminous materials and vinyl tiles/sheeting) detection of fibres may be difficult when using polarized light microscopy and dispersion staining techniques. This may be due to the matrix of the samples (uneven distribution) or fine fibres that are difficult to detect and positively identify.
- Detection Limit - 0.1 g/kg (AS 4964).
- An Independent Analytical Technique is Recommended for Vinyl Samples (i.e. Vinyl Floor Tiles).
- Laboratory is not accredited to perform sampling.
- ** Sub-sampling of sample was undertaken prior to analysis as per SLR Method AIP-01.03.

Approved Identifier: Dr Craig Simpson

Approved Signatory: Dr Craig Simpson

ASBESTOS ANALYTICAL REPORT
Report No. 610.10893.00030/03/ANA

Client:	NSW Trade and Investment
Client Contact:	Division of Resources & Energy - Mineral Resources
Client Address:	516 High Street, Maitland NSW 2320
Date Analysed:	Friday, 24 May 2013
Report Date:	Tuesday, 11 February 2014
Site Address:	Siltation Systems Sediments, Woodsreef Mine, NSW, 2347
Test Methods:	Sample(s) examined under a Stereo Microscope and selected fibres under a Polarised Light Microscope with dispersion staining techniques, in Accordance with Method AIP.01.03
Laboratory Address:	2 Lincoln Street, Lane Cove NSW 2066 (NATA Accreditation No. 3130)

Accredited for compliance with ISO/IEC 17025.
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Results:

Sample No	Description	Sample Size	Location	Analysis Results
610.10893.00030/21	Soil and sediment	5750g	Culvert 3, north of west dump	** Chrysotile Asbestos Detected, Trace Asbestos not detected
610.10893.00030/22	Sediment	7450g	Culvert 2 area upstream, east	** Trace Asbestos not detected
610.10893.00030/36	Soil and tailings	4300g	Culvert to east of road	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/37	Soil and tailings	6150g	Culvert to west of road	** Chrysotile Asbestos Detected, Trace Asbestos not detected

Note:

- The report(s) and/or information produced by SLR Consulting Australia Pty Ltd should not be reproduced and/or presented/reviewed except in full.
- Even after disintegration of some bulk samples (eg bituminous materials and vinyl tiles/sheeting) detection of fibres may be difficult when using polarized light microscopy and dispersion staining techniques. This may be due to the matrix of the samples (uneven distribution) or fine fibres that are difficult to detect and positively identify.
- Detection Limit - 0.1 g/kg (AS 4964).
- An Independent Analytical Technique is Recommended for Vinyl Samples (i.e. Vinyl Floor Tiles).
- Laboratory is not accredited to perform sampling.
- ** Sub-sampling of sample was undertaken prior to analysis as per SLR Method AIP-01.03.

Approved Identifier: Dr Craig Simpson

Approved Signatory: Dr Craig Simpson

ASBESTOS ANALYTICAL REPORT
Report No. 610.10893.00030/04/ANA

Client:	NSW Trade and Investment
Client Contact:	Division of Resources & Energy - Mineral Resources
Client Address:	516 High Street, Maitland NSW 2320
Date Analysed:	Tuesday, 28 May 2013
Report Date:	Tuesday, 11 February 2014
Site Address:	Tailings, Woodsreef Mine, NSW, 2347
Test Methods:	Sample(s) examined under a Stereo Microscope and selected fibres under a Polarised Light Microscope with dispersion staining techniques, in Accordance with Method AIP.01.03
Laboratory Address:	2 Lincoln Street, Lane Cove NSW 2066 (NATA Accreditation No. 3130)

Accredited for compliance with ISO/IEC 17025.
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Results:

Sample No	Description	Sample Size	Location	Analysis Results
610.10893.00030/26	Soil and rocks	5550g	West side tailings east of road, conveyor belt	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/27	Soil and rocks	7150g	Midway along tailings east of road	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/28	Soil and rocks	5250g	South of south dump adjacent to road, overburden	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/29	Soil	4250g	East side of tailing basin south between hills	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/30	Soil and rocks	4300g	East side of tailing, midway basin	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/31	Soil and rocks	5900g	North tailing midway	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/32	Friable tailings	6750g	Top of tailings, north of telegraph pole	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos Detected
610.10893.00030/33	Friable tailings	4550g	Top of tailings, near old building rubble	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos Detected

Note:

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- Even after disintegration of some bulk samples (eg bituminous materials and vinyl tiles/sheeting) detection of fibres may be difficult when using polarized light microscopy and dispersion staining techniques. This may be due to the matrix of the samples (uneven distribution) or fine fibres that are difficult to detect and positively identify.
- Detection Limit - 0.1 g/kg (AS 4964).
- An Independent Analytical Technique is Recommended for Vinyl Samples (i.e. Vinyl Floor Tiles).
- Laboratory is not accredited to perform sampling.
- ** Sub-sampling of sample was undertaken prior to analysis as per SLR Method AIP-01.03.

Approved Identifier: Dr Craig Simpson

Approved Signatory: Dr Craig Simpson

ASBESTOS ANALYTICAL REPORT
Report No. 610.10893.00030/05/ANA

Client:	NSW Trade and Investment
Client Contact:	Division of Resources & Energy - Mineral Resources
Client Address:	516 High Street, Maitland NSW 2320
Date Analysed:	Thursday, 30 May 2013
Report Date:	Tuesday, 11 February 2014
Site Address:	Mill Building Vicinity , Woodsreef Mine, NSW, 2347
Test Methods:	Sample(s) examined under a Stereo Microscope and selected fibres under a Polarised Light Microscope with dispersion staining techniques, in Accordance with Method AIP.01.03
Laboratory Address:	2 Lincoln Street, Lane Cove NSW 2066 (NATA Accreditation No. 3130)

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

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Results:

Sample No	Description	Sample Size	Location	Analysis Results
610.10893.00030/5	Soil and detritus	4600g	NE adjacent road to silos	** Chrysotile Asbestos Detected, Trace Asbestos Not Detected
610.10893.00030/6	Soil and rocks	7150g	NE of silo, adjacent to big pit	** Chrysotile Asbestos Detected, Trace Asbestos not detected
610.10893.00030/7	Soil and rocks	6300g	NW of silo adjacent to second pit	** Chrysotile Asbestos Detected, Trace Asbestos not detected
610.10893.00030/8	Soil and rocks	5500g	Silos, south of stockpile	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/9	Soil and rock	8400g	West of main building, adjacent to old water tank	** Chrysotile Asbestos Detected, Trace Asbestos not detected
610.10893.00030/10	Soil and Rocks	6300g	Emplacement area, SE	** Chrysotile Asbestos Detected, Trace Asbestos not detected
610.10893.00030/11	Soil and rocks	5250g	Stockpile south of building	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/12	Sediment	2700g	Stockpile south of building run-off	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos Detected
610.10893.00030/15	Soil and rock	7100g	Stockpile south of building, west of culvert 1	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/16	Soil	4000g	Waste from conveyor belt dump east of building	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos Detected

Note:

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- Even after disintegration of some bulk samples (eg bituminous materials and vinyl tiles/sheeting) detection of fibres may be difficult when using polarized light microscopy and dispersion staining techniques. This may be due to the matrix of the samples (uneven distribution) or fine fibres that are difficult to detect and positively identify.
- Detection Limit - 0.1 g/kg (AS 4964).
- An Independent Analytical Technique is Recommended for Vinyl Samples (i.e. Vinyl Floor Tiles).
- Laboratory is not accredited to perform sampling.
- ** Sub-sampling of sample was undertaken prior to analysis as per SLR Method AIP-01.03.

Approved Identifier: Dr Craig Simpson

Approved Signatory: Dr Craig Simpson

ASBESTOS ANALYTICAL REPORT
Report No. 610.10893.00030/06/ANA

Client:	NSW Trade and Investment
Client Contact:	Division of Resources & Energy - Mineral Resources
Client Address:	516 High Street, Maitland NSW 2320
Date Analysed:	Friday, 31 May 2013
Report Date:	Tuesday, 11 February 2014
Site Address:	Proposed Containment Cell Vicinity , Woodsreef Mine, NSW, 2347
Test Methods:	Sample(s) examined under a Stereo Microscope and selected fibres under a Polarised Light Microscope with dispersion staining techniques, in Accordance with Method AIP.01.03
Laboratory Address:	2 Lincoln Street, Lane Cove NSW 2066 (NATA Accreditation No. 3130)

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

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Email: forhelp@slrconsulting.com
Website: www.slrconsulting.com

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Results:

Sample No	Description	Sample Size	Location	Analysis Results
610.10893.00030/1	Soil and detritus	2700g	Inside Building NW	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/2	Soil and detritus	2350g	Inside Building NE	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/3	Soil and detritus	3200g	Inside Building Central	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/4	Soil and detritus	4000g	On concrete slab, east of building	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos Detected

Note:

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- Even after disintegration of some bulk samples (eg bituminous materials and vinyl tiles/sheeting) detection of fibres may be difficult when using polarized light microscopy and dispersion staining techniques. This may be due to the matrix of the samples (uneven distribution) or fine fibres that are difficult to detect and positively identify.
- Detection Limit - 0.1 g/kg (AS 4964).
- An Independent Analytical Technique is Recommended for Vinyl Samples (i.e. Vinyl Floor Tiles).
- Laboratory is not accredited to perform sampling.
- ** Sub-sampling of sample was undertaken prior to analysis as per SLR Method AIP-01.03.

Approved Identifier: Dr Craig Simpson

Approved Signatory: Dr Craig Simpson

ASBESTOS ANALYTICAL REPORT
Report No. 610.10893.00030/07/ANA

Client:	NSW Trade and Investment
Client Contact:	Division of Resources & Energy - Mineral Resources
Client Address:	516 High Street, Maitland NSW 2320
Date Analysed:	Tuesday, 4 June 2013
Report Date:	Tuesday, 11 February 2014
Site Address:	Additional Areas, Woodsreef Mine, NSW, 2347
Test Methods:	Sample(s) examined under a Stereo Microscope and selected fibres under a Polarised Light Microscope with dispersion staining techniques, in Accordance with Method AIP.01.03
Laboratory Address:	2 Lincoln Street, Lane Cove NSW 2066 (NATA Accreditation No. 3130)

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports.

Please direct correspondence to
SLR CONSULTING AUSTRALIA PTY LTD
ABN 29 001 584 612
2 Lincoln Street
Lane Cove NSW 2066
Telephone 61 2 9427 8100 Facsimile 61 2 9427 8200
Email: forhelp@slrconsulting.com
Website: www.slrconsulting.com

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Results:

Sample No	Description	Sample Size	Location	Analysis Results
610.10893.00030/17	Soil and rocks	4200g	Adjacent to pumping station, Ironbark creek	** Chrysotile Asbestos Detected, Trace Asbestos not detected
610.10893.00030/18	Soil	2800g	Ironbark creek, adjacent to tire mount, flood plain	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/19	Riverbed sand/ sediment	4550g	Ironbark river east floodplain midway	** Trace Asbestos not detected
610.10893.00030/20	Sand and gravel	5400g	Ironbark river, start of walking track NE	** Trace Asbestos not detected
610.10893.00030/24	Soil and rocks	7150g	North of mine, central waypoint, north side of road	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/34	Soil and road base	7150g	Entrance to mine, east of building	** Chrysotile Asbestos Detected, Trace Asbestos not detected
610.10893.00030/38	Soil and rocks	5050g	South end tailings, east road culvert adjacent to private land	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/43	Soil and rock	6600g	Flora trail adjacent to pit 1, west	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/44	Soil and rocks	6050g	West of west dump near pump station	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected
610.10893.00030/45	Soil and rocks	6900g	North of west overburden	** Chrysotile Asbestos Detected, Trace Chrysotile Asbestos detected

Note:

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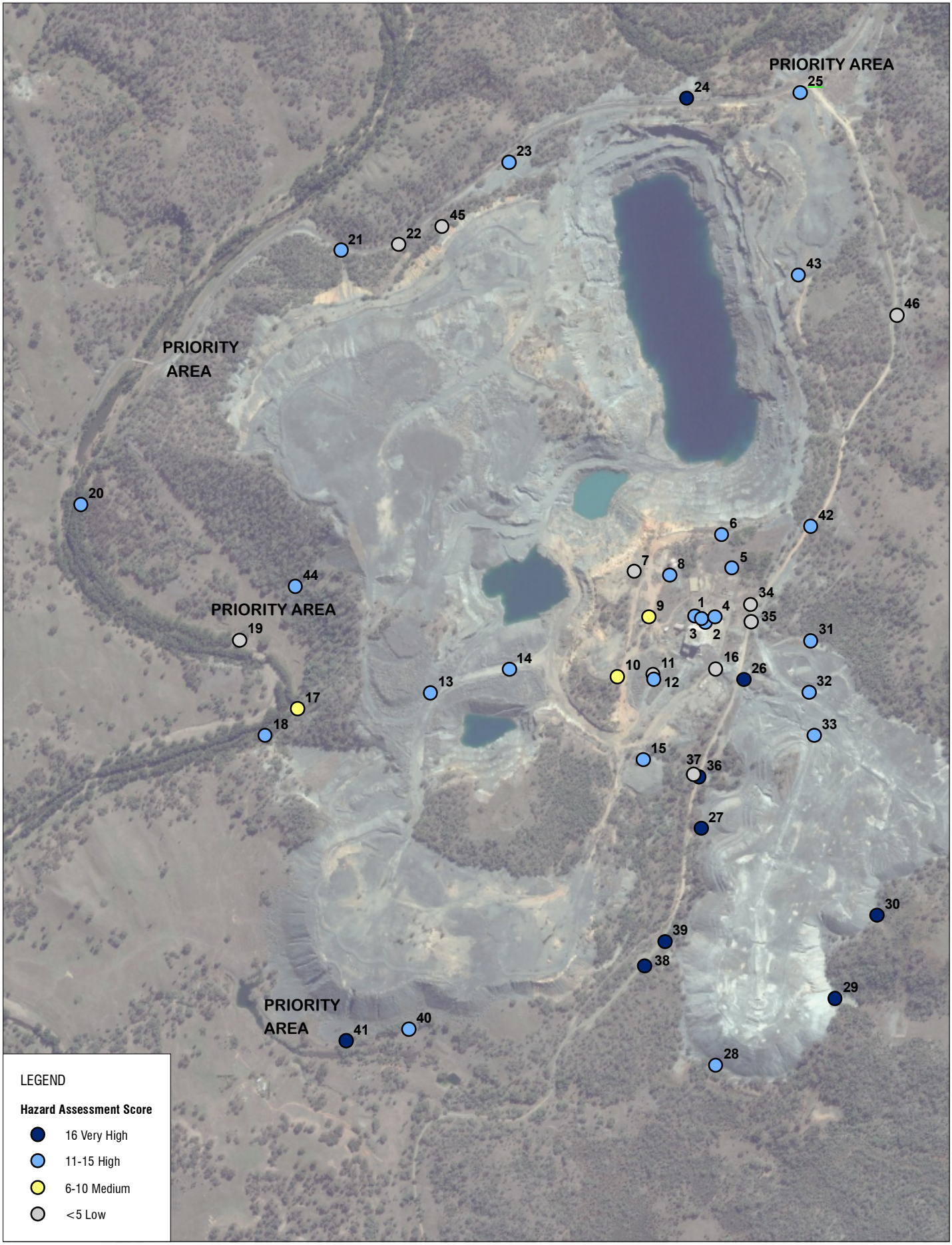
- Detection Limit - 0.1 g/kg (AS 4964).
- An Independent Analytical Technique is Recommended for Vinyl Samples (i.e. Vinyl Floor Tiles).
- Laboratory is not accredited to perform sampling.
- ** Sub-sampling of sample was undertaken prior to analysis as per SLR Method AIP-01.03.

Approved Identifier: Dr Craig Simpson

Approved Signatory: Dr Craig Simpson

Appendix G Sampling Locations indicating Hazard Assessment Score for Individual Sites and Locations of Priority Areas



G:\Drafting\610.10893 - Woodsreef mine\610_10893\SLR610.10893_001_05.mxd

SLR
10 KINGS ROAD
NEW LAMBTON
NEW SOUTH WALES 2305
AUSTRALIA
T: 61 2 4037 3200
F: 61 2 4037 3201
www.slrconsulting.com

Project No.:	610.10893.00030
Date:	16/09/2014
Drawn by:	NT
Scale:	1:12,500
Sheet Size:	A4
Projection:	GDA 1994 MGA Zone 56

NSW DTIRIS

Woodsreef Mine - Hazard Identification

Sampling Point Locations

FIGURE 1