PINE DALE MINE

ANNUAL ENVIRONMENTAL MANAGEMENT REPORT 2013

Prepared by:

Enhance Place Pty Ltd

March 2014

TITLE

Name of Mine:	Pine Dale Mine
Titles/Mining Leases:	ML1569, ML1578, ML1664
Project Approval Number:	10_0041
MOP Commencement Date	24 February 2011
MOP Completion Date	Under Review
AEMR Commencement Date:	1 January 2013
AEMR Completion Date:	31 December 2013
Name of Leaseholder:	Enhance Place Pty Limited
Reporting Officer:	Mr Graham Goodwin
Title:	Manager of Mining Engineering

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EXECUTIVE SUMMARY

Energy Australia (EA) owns Enhance Place Pty Ltd (Enhance Place) which operates the Pine Dale Mine near Lithgow in the Western Coalfields of New South Wales. Project Approval 10_0041 for the Yarraboldy Extension at Pine Dale Mine was granted by the Minister for Planning and Infrastructure on 20 February 2011 for the extraction of up to 800,000 tonnes of Run of Mine coal from the project. Mining operations are approved on the site until 31st December 2014.

The Pine Dale Mine Annual Environmental Management Report has been prepared pursuant to Schedule 5, Condition 3 of the Project Approval 10_0041 and in accordance with the Department of Trade and Investment - Division of Resources and Energy Guidelines to the Mining, Rehabilitation and Environmental Management Process (EDG03).

The focus on these key environmental aspects and the commitment to improving its environmental management resulted in Pine Dale Mine achieving an acceptable standard of environmental performance during the reporting period as evidenced by the following:

- Air quality monitoring results recorded during the reporting period for depositional dust and fine particulate matter (PM_{10}) were well below the Environmental Protection Authority assessment criteria in Blackmans Flat and other privately owned properties adjacent to the Mining Leases;
- There were no noise exceedances from mining activities at privately owned properties recorded during the reporting period;
- Blasting impacts were managed within the assessment criteria limits for overpressure and ground vibration with no exceedences recorded during the reporting period; and
- There were no surface water discharge events during the reporting period and monitoring was conducted in accordance with EPL 4911 and the approved Water Management Plan.

Rehabilitation areas are generally stable in Areas B and C and it has previously been identified that Area A required additional maintenance works to improve rehabilitation efforts which have been undertaken during the 2013 reporting period. In accordance with Project Approval 10_0041, Flora assessments will be undertaken in areas A, B, C and 8 to assist in identifying additional management strategies required to ensure rehabilitated land is progressing towards meeting its target levels.

1 INTRODUCTION AND GENERAL OBJECTIVES

EnergyAustralia (EA) owns Enhance Place Pty Ltd (Enhance Place) which operates the Pine Dale Mine near Lithgow in the Western Coalfields of New South Wales. EA acquired the Pine Dale Mine in June 2012.

Pine Dale Mine is located at Blackmans Flat, 16km north of Lithgow on the Castlereagh Highway. The site is approximately 3km by road from the Mt. Piper Power Station (MPPS) and immediately across the Highway from the Springvale Joint Venture Coal Preparation & Handling Facility.

This Annual Environmental Management Report (AEMR) refers to the environment and community performance of the Pine Dale Mine from 1 January 2013 to 31 December 2013 (Reporting period). This report has been prepared in accordance with the Department of Trade and Investment - Division of Resources and Energy (DRE) Guidelines to the Mining, Rehabilitation and Environmental Management Process (EDG03). This AEMR has been prepared pursuant to Schedule 5, Condition 3 of Project Approval (PA) 10_0041 granted by the Department of Planning and Infrastructure (DP&I) under section 75J of the *Environmental Planning & Assessment Act 1979* (EP&A Act) on the 20 February 2011.

The Yarraboldy Extension provides approval for the extraction of up to 800,000 tonnes (t) of Run of Mine (ROM) coal over the life of the project at a maximum rate of 350,000 tonnes per annum (tpa), see **Plan 1**. Up to 350,000 tpa of coal from the site may be transported to the MPPS via a Private Haul Road (Coal Link Road) only, and up to 100,000 tpa to any other customer via public road as required. Coal deliveries from the Yarraboldy Extension to the MPPS commenced in February 2012.

This AEMR is distributed to the following stakeholders:

- DP&I;
- DRE;
- Environment Protection Authority (EPA);
- NSW Office of Environment and Heritage (OEH);
- NSW Office of Water (NOW);
- Forest Corporation NSW;
- Sydney Catchment Authority (SCA); and
- Lithgow City Council (LCC).

1.1 Consents, Leases and Licences

Pine Dale Mine operates in accordance with relevant licenses and approvals which are summarised in **Table 1**.

Table 1
Status of Consents, Leases and Licences

Permit Type	Permit Number	Relevant Dates	Description
Project Approval	PA 10_0041	Granted 20 February 2012 Expires 31 December 2014	Granted by Minister of DP&I, Section 75J of the EP&A Act. A modification to PA 10_0041 was granted in April 2012.
Referral Decision	2011/6016	Date of decision 20 October 2011	Determined the Yarraboldy Extension is not a controlled action, as defined under the *EPBC Act*, if undertaken in a particular manner.
Environmental Protection Licence	EPL 4911	Annual Review Date 9 July	EPL held by Enhance Place Pty Ltd
Mining Lease	ML1578 (Act 1992)	Granted 15 March 2006	ML 1578 incorporates 69.4ha of land within the boundary of the Pine Dale Mine site.
Mining Lease	ML 1569 (Act 1992)	Granted 4 July 2007	ML1569 incorporates 161 ha
Mining Lease	ML1664 (Act 1992)	Granted 10 January 2012	ML 1664 incorporates 4.1 Hectares of land within the boundary of the Pine Dale Mine site.
Bore Licence	10BL165933	Granted 22 December 2005	Issued by the Department of Natural Resources (DNR) under Part 5 of the Water Act 1912 for the use of six piezometers for monitoring groundwater levels and quality.
Bore Licence	10BL604181	Dated 23 November 2010	This licence was issued by DECCW – NOW under Part 5 of the *Water Act 1912* for interception and use of up to 200ML of groundwater per year.
Flood Control Works Licence	10CW801601	Dated 23 December 2005	Issued by the DNR under Part 8 of the *Water Act 1912* for the construction of noise/flood bunding along the boundaries of Mining Areas A, B and C.

1.2 Actions Required from Previous AEMR Review

A letter of acceptance for the 2012 AEMR was received from DRE on the 20 August 2013. One action with respect to Pine Dale was noted by DRE following their review of the 2012 AEMR. This action and where it has been addressed in the AEMR are included in

Table 2.

Table 2
Actions Required from Previous AEMR Review

Item	Action Required (2011 AEMR)	AEMR Section
1	Pine Dale Coal Mine – Area A – Provide a MOP amendment consisting of revised rehabilitation strategy to address the unsuccessful rehabilitation status of this area. The MOP amendment shall be provided to, and be to the satisfaction of, the DRE within 3 months of the date of this letter.	**Section 5.5**

1.3 Mine Contacts

The Contact details for Pine Dale Mine are listed in **Table 3**.

Table 3
Mine Contacts

Contact Person	Position	Telephone	Facsimile
Mr Graham Goodwin	Manager of Mining Engineering	(02) 6355 7893	(02) 6355 7894
Mr John Delicato	Operations Manager	0402 822 887	-

2 SUMMARY OF OPERATIONS

2.1 Exploration

There was no exploration drilling activities carried out at the Pine Dale Mine during the reporting period.

2.2 Land Preparation

Land preparation, which occurs directly in advance of open cut mining, involves the clearing of generally remnant vegetation, stripping and removal of topsoil, subsoil and clay, and the removal of overburden by trucks. The waste rock is loaded by an excavator into the haul trucks where it is transported to previously mined areas waiting to be backfilled.

During the reporting period approximately 5 ha of the Yarraboldy Extension was cleared and mined. This involved the clearing and stripping of vegetation, topsoil, subsoil, clay and overburden. Mining and land clearing activities during the reporting period are discussed in more detail in **Section 2.4**.

2.3 Construction

There was no construction work undertaken at the Pine Dale Mine during the reporting period.

2.4 Mining

Pine Dale Mine uses an excavator and fleet of trucks for the extraction of coal from multiple seams and the removal of overburden. Mining continued north of the Private Haul Road in the western section of the Yarraboldy Extension area and progressed to the west for the remainder of the reporting period (see **Plan 5**).

The overburden and interburden waste rock is removed using a combination of rip, push and blasting methods. Blasted and ripped waste rock is loaded by an excavator into the haul trucks where it is transported to previously mined areas waiting to be backfilled.

During the reporting period 291,166 t of ROM coal was extracted at Pine Dale Mine which is within the approved 350,000 tpa of ROM coal permissible under PA 10_0041. The production and waste volumes during the reporting period are summarised in **Table 4**.

Pine Dale Mine continues to utilise the Minex mining software package to assist in improving production and overburden estimates. It is anticipated all recoverable open cut coal reserves within the approved mining area will be exhausted by the 2nd quarter of 2014.

Table 4
Production and Waste Summary

	Cumulative Production		
	Start of Reporting Period	**End of Reporting Period**	**End of Next Reporting Period (estimated)**
Topsoil Stripped	28,862 m^3	30,862 m^3	30,862 m^3
Topsoil used/spread	24,126 m^3	25,026 m^3	25,026 m^3
Waste Rock	11,391,620 m^3	13,212,742 m^3	13,330,000 m^3
Ore	n/a	n/a	n/a
Processing Waste	n/a	n/a	n/a
Product	1,198,993 t	1,490,159 t	1,550,000 t

2.5 Coal Processing

During the reporting period, 291,166 t of ROM coal was extracted from the Pine Dale Mine and exported directly to the MPPS. No ROM coal was delivered to other customers. A summary of the production figures, mining activity for 2013 and the forecast production expectations for 2014 are summarised in **Table 4**. It should be noted that there is no Coal Preparation Plant at the Pine Dale Mine and as such no processing waste is produced. All ROM coal extracted from the open cut is transported by haul trucks to the onsite coal crushing plant where it is sized and screened into product coal with a top size ≤50 mm (see **Plan 6**). The screened coal is either temporarily stockpiled or transported, in covered road trucks, directly to the MPPS via the Coal>Link Road.

COAL TRANSPORTING

Product coal is delivered to the MPPS by covered road trucks via the Coal>Link Road. In accordance with PA 10_0014, coal transport activities occur between the hours of 7:00am to 8:00pm, Monday to Saturday, and at no time on Sundays or public holidays. Pursuant to Schedule 3, Condition 35 of PA 10_0041, no product coal was transported to the MPPS via the Castlereagh Highway during the reporting period.

2.6 Waste Management

Overburden and interburden is placed in waste dumps until shaping of the final land formation is required. No overburden or interburden was removed from site during the reporting period.

Hydrocarbons from equipment maintenance undertaken on the site were collected in drums and removed from site by the Mining Contractor. All hydrocarbon products are securely stored within a bund to prevent any land or water contamination. There were no areas of land contamination identified during the reporting period.

All general wastes originating from the office, amenities, ablutions and first-aid facilities, together with routine maintenance consumables from the servicing of mobile equipment (e.g. air filters) are disposed of in closed garbage bins located adjacent to the amenities building. The bins are collected weekly by licensed waste contractors

(SITA Lithgow) and the contents disposed of at Council's Waste Depot. All recyclables are placed in separate bins for collection and recycling.

2.7 Product Stockpiles

The capacity of the ROM stockpile is 20,000 t whilst the capacity of the product stockpile is limited to 5,000 t. The ROM stockpile or product stockpile was not enlarged during the reporting period outside of the capacity approved under PA 10_0041.

2.8 Water Management

On a regional scale, the Pine Dale Mine lies within the Neubeck's Creek catchment which is a sub-catchment of the Upper Cox's River catchment, which in turn is part of the Warragamba Catchment, administered by the Sydney Catchment Authority

The runoff from the surrounding area reports to the Cox's River via Neubeck's Creek (a perennial tributary) which runs into Blue Lake, a former open cut mining void. Neubeck's Creek is understood to flow intermittently (noting that many of its tributaries are temporary), with flows influenced by water discharges from other upstream industrial land uses in addition to the existing Pine Dale Mine.

The water management system at Pine Dale Mine has been designed as a closed loop system, with all clean water diverted around the mining site. The water management system is designed not to discharge any water from the site into Neubeck's Creek unless required to under an emergency. Drainage of surface water within the current mining area is generally to the south and southeast following the natural topography toward the receiving waters of Neubeck's Creek (see **Plan 4**). The runoff from the north is captured in temporary sumps and used as dust suppression when required.

STORED WATER

There are no permanent water storage structures at the Pine Dale Mine. Clean water diversion structures are utilised at the site in conjunction with temporary sediment ponds (see **Plan 4).** Temporary sediment ponds are constructed downslope of disturbed areas to ensure the capture of 'dirty' water and treatment prior to discharge into the underground workings.

GROUND WATER

There was no measurable groundwater intercepted during the reporting period. More details and results of groundwater monitoring are discussed in **Section 3.5**.

SURFACE WATER

During the reporting period, all surface water monitoring at the Pine Dale Mine was undertaken in accordance with EPL 4911. **Table 5** details the locations, frequency and sampling methods for surface water monitoring. The parameters analysed were consistent with the requirements of EPL 4911, namely pH, EC, oil and grease, turbidity, total suspended solids, filterable iron and sulphate. More details and results of groundwater monitoring are discussed in **Section 3.4**.

The water management system (groundwater, floodplain and surface water) is described in sections in Sections 11.4 and 11.5 of the currently approved MOP. Potable Water for use in the offices and amenities is sourced from town water mains supply.

Table 5
Surface Water Monitoring Locations and Frequency

Monitoring Location	Type of Monitoring Point	Frequency	Sampling Method
Point 2	Baseline and discharge monitoring	*Quarterly during discharge*	Grab sample for oil & grease, TSS, turbidity, filtered iron and sulphate concentrations. Probe for pH and electrical conductivity measurements.
		Daily during discharge for pH, EC and turbidity	
Point 3	Baseline and discharge monitoring	*Quarterly during discharge*	
		Daily during discharge for pH, EC and Turbidity	
LDP 13	Discharge monitoring (to surface water)	*Quarterly during discharge*	
		Daily during discharge for pH and EC	
Point 14	Baseline and discharge monitoring	*Daily during discharge for pH, EC and Turbidity*	

Licensed discharge points (LDP) four and five have been removed from EPL 4911 during the reporting period by the EPA.

2.9 Hazardous Materials Management

Hazardous materials stored on site are limited to bulk storage of diesel fuel and small quantities of miscellaneous chemicals for vehicle maintenance (i.e. oils and lubricants). The diesel storage capacity at the Pine Dale Mine is 30,000L and is stored in a tank located within a bunded steel container with lockable doors. It is located together with the associated bowser in the fuel bay within the maintenance area. Diesel fuel is delivered to site by a mobile diesel tanker as required. There are no bulk oils stored on site. Oils are brought onto site as required by the Mining Contractor. Waste oil and oil drums are removed from site by the Mining Contractor for disposal. Material Safety Data Sheets (MSDS) accompany the materials on site and are kept in a folder with the Hazardous Materials Register, located in the main office.

2.10 Other Infrastructure Management

There is no other infrastructure outside that described above at the Pine Dale Mine.

3 ENVIRONMENTAL MANAGEMENT

The Pine Dale Mine regards sound environmental performance and community liaison as integral components of its operations. Pine Dale Mine seeks to:

- Minimise the impact of its operations on the environment through effective environmental management;
- Communicate with the community, consider its concerns and expectations and move to a solution;
- Ensure that employees and contractors recognise they are accountable for their actions;
- Comply with applicable environmental laws and other obligations;
- Use effective environmental management controls to comply with all environmental laws and minimise adverse environmental impacts;
- Provide awareness training for employees;
- Monitor, audit, and review performance;
- Communicate with key stakeholders including shareholders, the community and government;
- Promote active employee participation to continuously improve environmental management and performance;
- Reduce and reuse waste where practicable; and
- Undertake appropriate decommissioning and rehabilitation.

Environmental Monitoring

The monitoring program in the MOP provides a reference for all the environmental monitoring procedures and timing for monitoring to be undertaken during the construction and operation of the Pine Dale Mine. More detailed information can be found in the following monitoring sections of the MOP:

- Noise Monitoring Program
- Air Quality Monitoring Program
- Groundwater Monitoring Program
- Surface Water Monitoring Program

Locations of monitoring sites are shown in **Plan 1A** in **Appendix B**.

Risk Assessment

In order to identify areas where mining and mining related activities have the potential to place the natural environment at risk, the risk matrix shown in **Table 6** has been developed for the Pine Dale Mine. The identification and assessment of environmental risks at the mine has allowed appropriate management plans and procedures to be developed to minimise the potential risk to the environment.

Table 6
Environmental and Rehabilitation Risk Matrix

	Issue	Land preparation, vegetation and topsoil stripping.	All construction activities including earth moving.	Mine development and mining, surface and underground.	Use/maintenance of roads, tracks and equipment.	Waste rock emplacement management.	Mineral processing facilities and infrastructure.	Ore/product stockpiling and handling.	Water management including term event contingencies.	Hazardous materials and fuel, handling/spills management.	Sewerage.	Rubbish disposal.	Rehabilitation activities.	Rehabilitated land and remaining features.
Air Quality	Air pollution – dust/other	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	
Water	Erosion / sediment minimisation	✓	✓		✓		✓	✓					✓	
	Surface water pollution[1]	✓	✓		✓		✓	✓		✓	✓	✓	✓	
	Ground water pollution			✓					✓					
Soil	Contaminated or polluted land	✓	✓	✓	✓								✓	
Flora	Threatened flora protection	✓	✓											
Fauna	Threatened fauna protection	✓	✓											
Flora	Weed control and management	✓	✓		✓								✓	✓
Noise	Operational noise	✓	✓	✓	✓		✓	✓					✓	
	Vibration / air blast				✓									
Visual Amenity	Visual amenity, stray light[2]	✓	✓	✓	✓		✓	✓				✓	✓	
Heritage	Aboriginal heritage[3]													
	Natural heritage conservation[4]													
Fire Mgt	Spontaneous combustion			✓				✓						
	Bushfire	✓			✓								✓	
	Mine subsidence													
Soil and Water	Hydrocarbon contamination						✓			✓				
	Methane drainage / venting													
Public Safety	Public safety[5]	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	

1 - Off site pollution only.
2 - Construction and production activities will occur between 7:00am and 6:00pm and hence stray light is not likely to affect visual amenity. Transport and maintenance activities are permitted at later times each day.
3 - No items of Aboriginal heritage significance have been identified within the site.
4 - The site is highly disturbed and does not contain items / areas of natural heritage significance.
5 - All activities carry some form of risk to public safety; however, there will be no public access to areas where these activities are undertaken.

Environmental Management

Environmental management is reflected in operating procedures outlined in the MOP. Also included in the MOP are specific management plans for:

- Blast Management
- Flora and Fauna Management
- Bushfire Management
- Soil and Erosion Management
- Complaints Management

3.1 Meteorological Monitoring

In accordance with Schedule 3, Condition 22 of PA 10_0041, Pine Dale Mine operates a meteorological monitoring station. A summary of monthly meteorological monitoring results are presented in the following sections and detailed in **Appendix B**.

RAINFALL

Pine Dale Mine received 576.8mm of rainfall and experienced 109 rainfall days during the 2013 reporting period. Rainfall during this reporting period was observed to be lower than rainfall recorded in 2012 (776.4mm and 149 rainfall days). The monthly rainfall data for 2013 is summarised in **Table 7.**

TEMPERATURE

Temperature is monitored at two heights (2 metres and 10 metres respectively) to account for temperature inversions. The maximum temperature recorded during the reporting period was 38.5°C at 2m during January. The lowest temperature occurred in July, with a recording of -7.0°C at 2m. A summary of monthly temperatures for 2013 is included in **Table 7**.

WIND SPEED, DIRECTION & SIGMA THETA

Recordings of wind parameters are monitored from the stations' 10 metre mast. Predominant wind directions at the site in 2013 were observed to be from a south easterly or west south-westerly direction and were shown to fluctuate on a seasonal basis. The maximum wind speed measured at the site was 21.05m/s in October 2013.

Additional sensors were installed at the station in May 2013 to bring the monitoring into line with the requirements of EPL 4911, which included the addition of sigma theta. The annual windrose from the Pine Dale mine meteorological station is shown in **Figure 1**.

RELATIVE HUMIDITY

An additional sensor to record relative humidity was also installed in May 2013. A summary of monthly humidity variations for 2013 is included in **Table 7**.

Table 7
Pine Dale Mine Meteorological Station Summary 2013

Month	Rainfall (mm)	Cumulative Rainfall (mm)	No of Rain Days/ Month	Air Temp. @ 2m (°C)			Relative Humidity (%)		
				Mean	Min	Max	Mean	Min	Max
January	94.4	94.4	11	21.4	8.0	38.7	N/A	N/A	N/A
February	121.4	215.8	11	18.0	4.3	35.3	N/A	N/A	N/A
March	41.0	256.8	9	16.3	4.5	28.1	N/A	N/A	N/A
April	27.4	284.2	14	11.8	-1.4	26.4	N/A	N/A	N/A
May*	22.6	306.8	10	8.5	-4.1	22.4	*86.6*	*19.4*	*100.0*
June	79.0	385.8	18	6.7	-3.2	17.1	88.4	29.6	100.0
July	18.4	404.2	10	5.7	-7.0	17.2	81.4	20.1	100.0
August	18.2	422.4	10	7.2	-4.9	21.3	69.6	22.8	99.4
September	44.4	466.6	6	11.2	-2.6	25.0	65.2	16.4	99.0
October	15.0	481.6	7	13.3	-2.4	30.5	54.3	10.4	98.3
November	59.2	541.0	10	15.0	-0.3	31.2	63.4	7.4	98.1
December	35.6	576.6	4	16.5	0.0	33.5	52.1	6.3	95.5
TOTAL	**576.6**	**-**	**109**	**-**	**-**	**-**	**-**	**-**	**-**
Minimum	**15.0**	**-**	**4**	**5.7**	**-7.0**	**17.1**	**52.1**	**6.3**	**95.5**
Maximum	**121.4**	**-**	**18**	**21.4**	**8.0**	**38.7**	**88.4**	**29.6**	**100.0**

N/A – not applicable as the sensor had not yet been installed.
Please note that values in *italics* indicate that a full month's data was not available; additional sensors were installed on the 22nd May 2013 to allow for the monitoring of sigma theta and relative humidity.

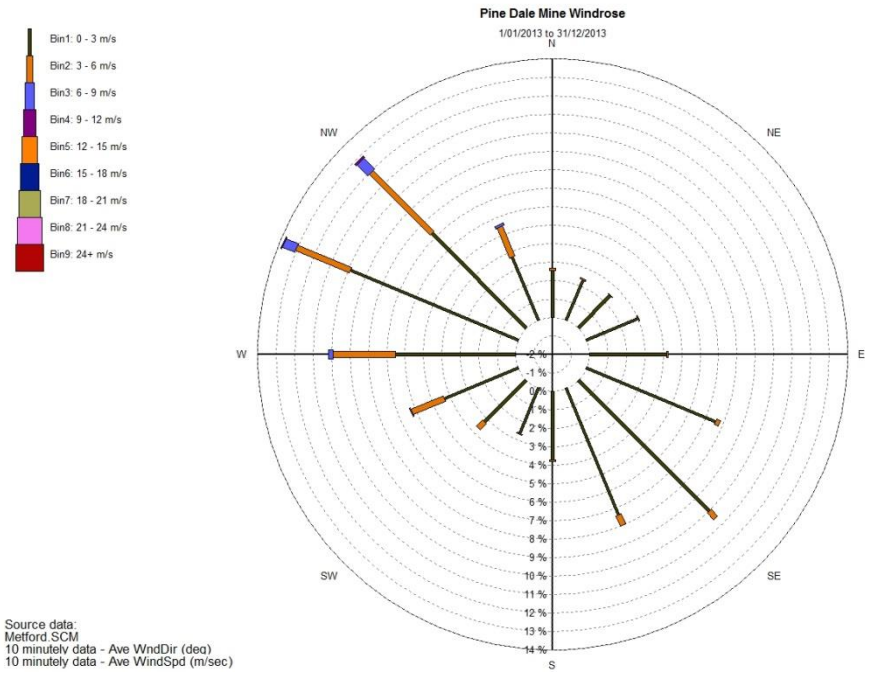


Figure 1: Pine Dale Mine 2013 Annual Windrose

3.2 Air Quality

Air quality management is a priority at the Pine Dale Mine. Onsite dust suppression is performed using a 50,000L tanker from water accumulated in the in-pit sumps and from the abandoned Wallerawang Colliery underground workings. The tanker will typically make four trips on dry days targeting the active haul roads, and only if necessary on wet days.

Air quality is monitored at seven locations including nine depositional dust gauges (DDG) and one high volume air sampler (HVAS) site which monitors total suspended particulates and particulates less than 10µm (**Plan 1A**). Monitoring is performed by independent consultants and a summary report of air quality data collected throughout the reporting period is available in **Appendix B**.

DEPOSTIONAL DUST

Depositional Dust results for the period January – December 2013 show an annual average insoluble solids range of 0.4 g/m² per month to 1.6 g/m² per month for all dust gauges. These results fall well below the nominated assessment criteria of an annual average of 4.0 g/m² per month, as stipulated in EPL 4911.

HIGH VOLUME AIR SAMPLES

Annual average PM_{10} and TSP monitoring results are summarised in **Table 9** and presented in **Appendix B**. All PM_{10} results recorded 24-hour average concentrations below the 50µg/m³ Impact Assessment Criteria (IAC) for 2013 with one exception. The exception occurred on the 18th October 2013 with a concentration of 85µg/m^3 recorded, however reports of local bushfires are noted on this day and preceding days relating to the "State Mine Fire". The second highest PM_{10} result recorded was 30µg/m³ on 5th November 2013 which is 3µg/m³ less than the peak result for 2012. The annual average PM_{10} result recorded in 2013 was 13µg/m³ which is well below the long term 30µg/m³ IAC. The 2013 period's annual average TSP result recorded was 26µg/m³ which is well below the 90µg/m³ limit.

The long term average annual PM_{10} and TSP levels are all within the nominated assessment criteria. Results also demonstrate consistent PM_{10} and TSP levels were recorded at the site throughout the 2012 to 2013 monitoring period (see **Table 9**). A slight increase in both PM_{10} and TSP levels between 2012 and 2013 is most likely attributed to the commencement of mining in 2012, whilst the increase in particulate concentrations between 2012 and 2013 may be attributable to considerably lower rainfall received at the site during the 2013 monitoring period.

Table 8
Depositional Dust Monitoring Results

Date	Total Insoluble Solids (g/m².month)									
	Gauge Location									
	D1	D2	D3	D4	D5	D6	PCB1	PCB2	PCB3	PCB7
Jan-13	0.9	0.6	1.0	0.4	0.4	0.5	1.2	1.5	0.4	0.4
Feb-13	1.4	0.9	1.0	1.5	0.7	1.1	0.5	0.6	1.6	0.6
Mar-13	0.5	0.8	0.4	0.4	0.5	0.6	0.6	1.3	0.4	0.5
Apr-13	0.8	0.7	0.7	0.6	0.4	0.3	0.6	0.4	0.5	0.4
May-13	0.9	0.7	1.2	0.7	0.6	0.4	0.6	0.4	0.1	0.5
Jun-13	0.3	0.5	0.4	0.2	0.4	1.0	0.4	0.2	0.2	0.2
Jul-13	1.0	0.9	1.1	0.4	0.2	3.6	0.4	0.2	0.2	0.3
Aug-13	0.4	0.2	0.6	0.2	0.3	2.1	0.8	0.3	0.4	0.2
Sep-13	1.1	0.7	1.1	0.5	0.5	0.5	0.6	0.5	0.5	0.4
Oct-13	0.9	0.8	0.9	0.6	EB	0.5	1.3	0.4	0.2	0.4
Nov-13	1.3	0.7	1.0	0.6	1.1	0.7	1.0	0.8	0.7	0.4
Dec-13	9.5	1.2	1.7	1.3	1.2	ND	1.4	1.1	2.0	0.7
Annual Averages										
2012	0.9	0.6	1.0	0.5	0.7	0.8	4.9	1.1	0.7	1.7
2013	1.6	0.7	0.9	0.6	0.6	1.0	1.7	0.9	0.8	0.9
OEH Licence Limit Annual Average	**4.0**									

Notes: EB – Sample contaminated by bird droppings; sample rejected.
ND – No Data due to broken funnel found during field sampling.

Table 9
PM_{10} and TSP Summary

	Particulate Matter <10µm (µg/m³)	TSP (µg/m³)
Maximum 24h Average result 2011	35	n/a
Maximum 24h Average result 2012	33	n/a
Maximum 24h Average result 2013	85*	n/a
EPL 4911 PM_{10} 24h Limit	50	Not Required
Annual Average 2011	11	20
Annual Average 2012	11	25
Annual Average 2013	13	26
EPL 4911 Particulate Annual Average	30	90

* result was influenced by external sources (bushfires) that are outside of the control of the project.

The existing air quality monitoring program and dust management practices will continue to be implemented during 2014 whilst normal mining operations are occurring. All air quality monitoring units will be regularly calibrated and audited to ensure compliance with the appropriate Australian Standard in 2014.

3.3 Erosion and Sediment Control

The erosion and sediment controls for Pine Dale Mine have been implemented to safeguard against soil loss and minimise potential water quality impacts. Erosion control structures have been installed around the site with the principle aim of containing sediment at its source. All runoff from disturbed areas is contained in temporary pollution control ponds within the open cut itself and surrounding hardstand areas.

Exposed areas which have been disturbed by the operation are controlled though the use of windrows constructed by subsoil and/or clay material. Once vegetation has been cleared and topsoil removed, subsoil and clay material is pushed against the interface between the disturbed and undisturbed area(s). Dozers are used to build a windrow where the potential for erosion impacts exist and are also managed through the use of temporary measures such as silt fencing to avoid sedimentation impacts on downstream waterways until the area has been rehabilitated. Additionally, temporary sediment ponds are constructed downslope of disturbed areas to ensure the capture of 'dirty' water and treatment prior to discharge into the underground workings. The management measures for the control of erosion described above is also put in place to increase batter and bench stability prior to establishment of permanent rehabilitation measures, where practical.

Erosion control structures at Pine Dale Mine are inspected on a regular basis, particularly after significant rainfall events and repaired where necessary. Erosion and sediment control works which were undertaken during the reporting period included:

- The maintenance of haul roads on a regular basis with a grader to limit the build-up of fine sediment and material, which limits the amount of sediment that enters onsite dams;
- The installation of windrows and silt fencing to prevent potential surface water impacts and sediment entering Neubeck's Creek;
- The removal of sediment from roadside drains and low spots both within the pit and on the crusher pad when required;
- The regular removal of topsoil and clay from each area to be mined so as to limit the amount of material which has the potential to enter sediment dams through surface runoff.

The effectiveness of the erosion and sediment control structures at Pine Dale Mine was demonstrated by their performance against a number of high rainfall events throughout the preceding reporting period. Similar structures were maintained during the reporting period to control water flows.

3.4 Surface Water

Surface water quality at Pine Dale Mine is managed in accordance with the approved Water Management Plan. A summary of the results are provided here with a detailed copy of the annual monitoring report included in **Appendix B**. In accordance with EPL 4911 the following four points at Pine Dale Mine are required to be monitored:

- Ambient Water Monitoring **Point 2** – Upstream of Delta Electricity flow gauge;
- Ambient Water Monitoring **Point 3** – 100m from discontinued discharge point;
- Discharge and Monitoring **Point 13** – Neubeck's Creek below final settling dam; and
- Ambient Water Monitoring **Point 14** – Cox's River downstream of Blue Lake.

A further seven locations are monitored in accordance with the site Water Management Plan:

- S1 – Lamberts Gully Downstream, Neubeck's Creek;
- S2 – Neubeck's Creek at the bridge (site office)
- S3 – Neubeck's Creek, 100m from discontinued discharge point;
- S4 – Cox's River upstream of Blue Lake
- S5 – Blue Lake upstream of Neubeck's Creek confluence;
- S6 – Neubeck's Creek downstream of discharge point
- S7 – Cox's River downstream of Neubeck's Creek confluence
- The Bong – water dam for dust suppression

The locations of the monitoring points are indicated on the Site Plan in **Appendix B**.

Summary of Monitoring Results

Surface water samples collected for EPL compliance during the January – December 2013 period show water quality analysis results are generally compliant with the Concentration Limits specified by the Water Management Plan and EPL 4911.

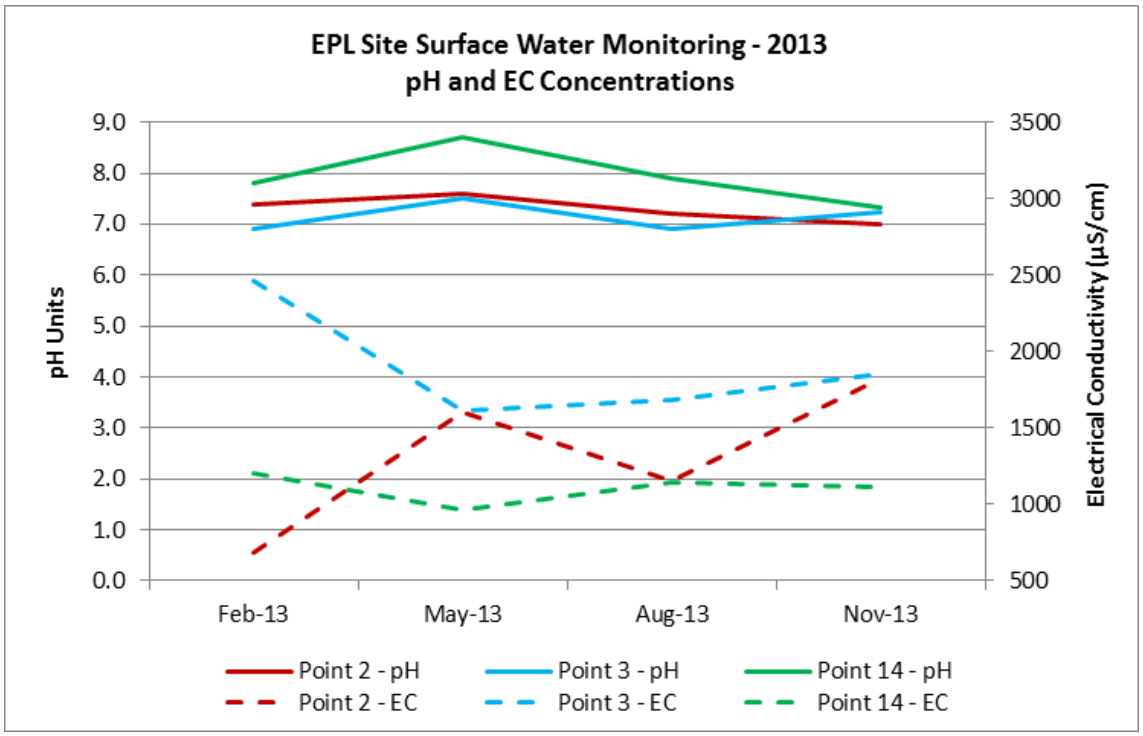
Monitoring Points 2 and 3 are background surface water monitoring points on Neubeck's Creek and are required to be sampled on a quarterly basis and daily during discharge events. Monitoring Point 14 is a background surface water monitoring point located on the Cox's River which assesses the water quality downstream of the Pine Dale Mine. There are no EPL Limits for monitoring Points 2, 3 and 14.

There were no controlled surface water discharge events during the reporting period. As such no samples were collected from licensed discharge monitoring Points 13 during the 2013 reporting period. As there was no discharge from licensed discharge point 13 during the reporting period, EPL 4911 limits were not exceeded. All monitoring performed was undertaken in accordance with EPL 4911.

During the monitoring period, EC was shown to fluctuate at the three EPL monitoring sites, whilst pH was observed to be reasonably consistent.

Surface water monitoring results for Environmental Protection Licence compliance for the 2013 period are provided in full in **Appendix B**. Results are presented graphically in **Figure 2**.

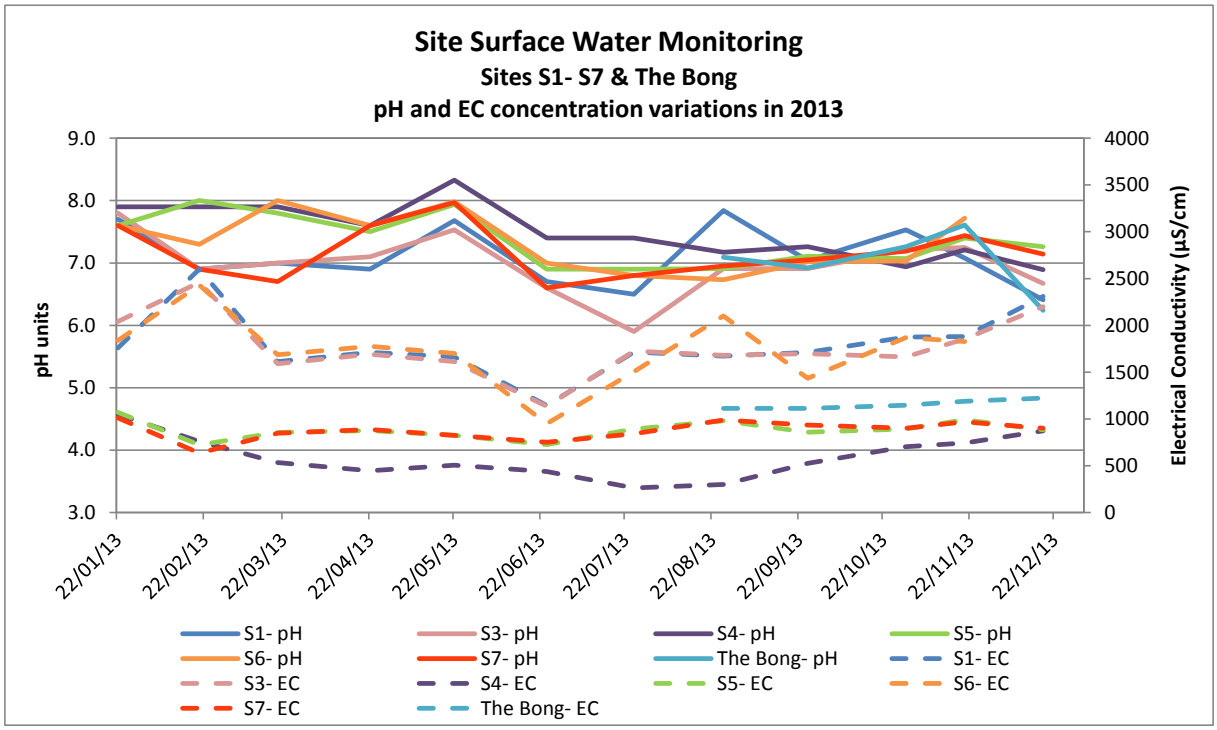
Figure 2
EPL Surface Water Results Summary



Additional site surface water samples associated with the Water Management Plan collected during the January – December 2013 period are generally shown to be consistent over the duration of the monitoring period. The pH results recorded at all monitoring sites is shown to be stable throughout the sampling period, however, the pH recorded at monitoring sites S1, S3 and The Bong were shown to fluctuate marginally between the fortnightly sampling events. During the monitoring period, EC was observed to be reasonably consistent across all surface water sites, whilst the water level of Neubeck's Creek at monitoring location S2 was also observed to be consistent throughout the duration of the monitoring period.

Additional site surface water monitoring results for Water Management Plan compliance for the 2013 period are provided in full in **Appendix B**. Results are presented graphically in **Figure 3**.

Figure 3
Additional Site Surface Water Results Summary



3.5 Ground Water

Groundwater data is collected by independent consultants and analysed at a NATA registered laboratory. Groundwater monitoring for the Pine Dale Mine is undertaken in accordance with the approved Groundwater Monitoring Program. Sampling is conducted at a total of eight locations within the mine site; a further seven locations surrounding the Yarraboldy Extension area; and two locations at the former Enhance Place Mine Site.

Groundwater monitoring is not a requirement of EPL 4911. A copy of the monitored results is provided in full in **Appendix B**.

It should be noted the sampling regime was altered after 1 August 2013 with the cessation of baseline monitoring (bores P6 and Old Shaft) as this had been undertaken for a period greater than two years. The number of groundwater sampling locations was also reduced to bring the sampling program into line with the current Water Management Plan (July 2011).

No samples were collected from the site groundwater bores P4 and PDH8 during the 2013 period. Bore P4 was found to be dry during the monitoring period, whilst bore PDH8 was removed as it was located within the active mining area.

GROUNDWATER CRITERIA AND TRIGGER LEVELS

The site specific Trigger Values developed for the Pine Dale Mine, as stipulated in the sites' *Water Management Plan* in accordance with Schedule 3, Condition 27(c) of the Project Approval (PA 10_0041) are currently under review, therefore the Trigger Level values presented in the previous version of the sites' *Groundwater Monitoring Program* (Dec 2005) have been adopted for the purpose of compliance assessment in this report.

As groundwater monitoring was not undertaken until the commencement of construction and mining operations, a true baseline level is not available. In the absence of baseline values, average values have been calculated based on results from monitoring undertaken during the period October 2005 to December 2006. A subsequent round of baseline monitoring has been undertaken during the period January 2011 to July 2013, from which updated trigger levels are currently being developed.

The Water Management Plan details the protocol for the investigation, notification, and mitigation of any identified exceedences of the impacts on groundwater levels. The Water Management Plan also provides the groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts. It should be noted that the adopted trigger level values are detailed in **Appendix B**.

GROUNDWATER WATER QUALITY

Groundwater samples collected from the on-site groundwater bores during the January – December 2013 period generally show water quality results which are consistent throughout the monitoring period. Water quality within the site bores was shown to be compliant with the trigger levels for key water monitoring parameters pH and EC, as nominated in the *Groundwater Monitoring Program*. Trigger levels for filtered iron were shown to be compliant at all bores except Bore P7 during the 2013 monitoring period. A single elevated filtered iron concentration (4.18mg/L) was recorded at site Bore P7 during November 2013.

Although the concentration of samples collected from this bore during February, April, June and August 2013 exhibit filtered iron results which were less than laboratory detection limits, Bore P7 has historically exhibited fluctuating filtered iron concentrations ranging from less than laboratory detection (<0.05mg/L) to a maximum of 5.14mg/L, observed in April 2010.

All site bores exhibited standing water levels which were consistent throughout the 2013 monitoring period. Trigger levels for water depth were not exceeded at any time at the on-site groundwater bores during the 2013 monitoring period. Results of site groundwater bore are presented graphically in **Figures 4** and **5**.

Figure 4 Site Groundwater Bores Result Summary

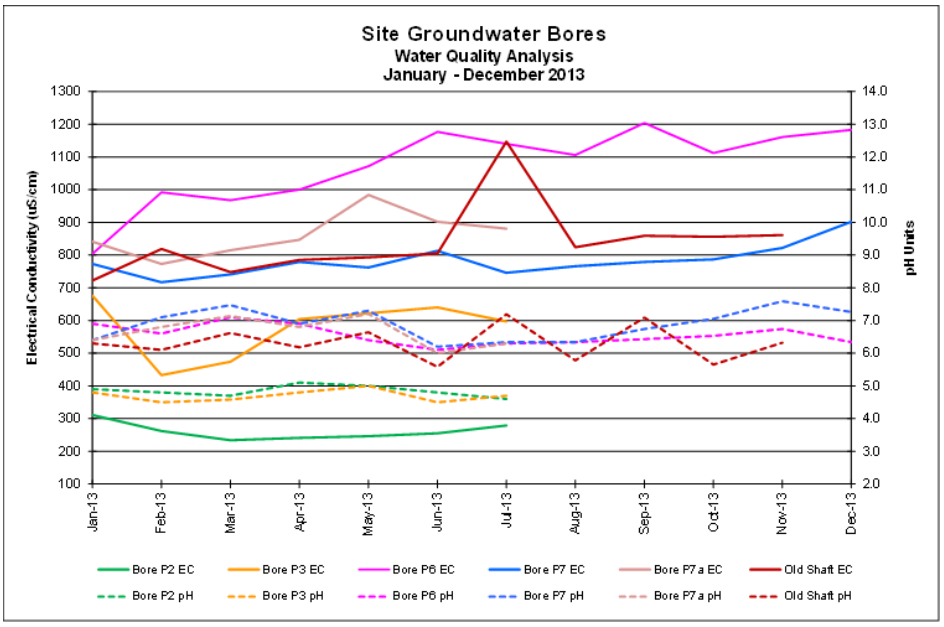
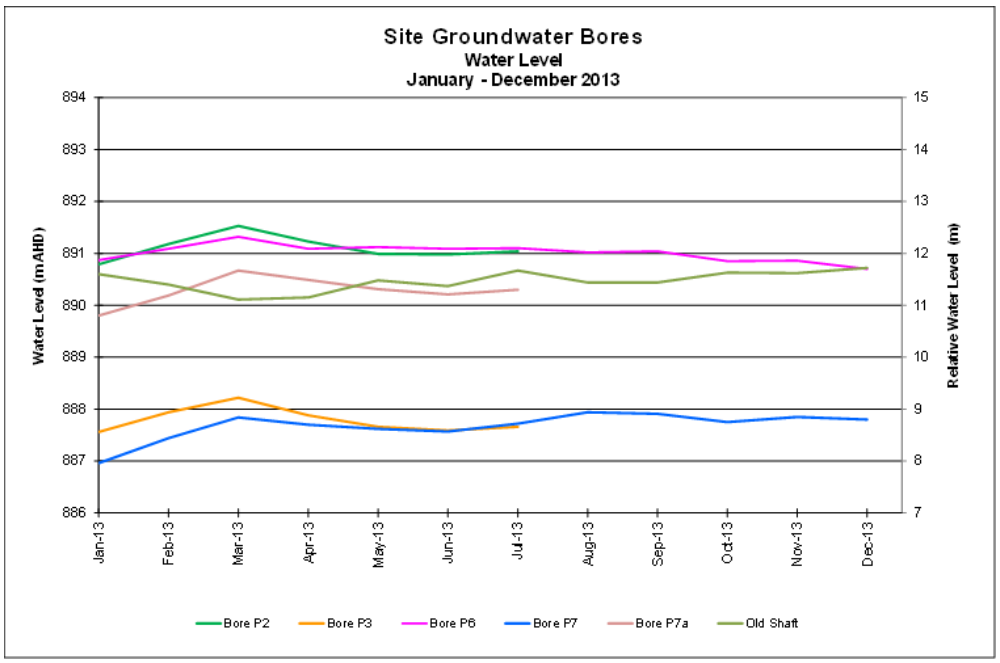


Figure 5 Site Groundwater Bores Water Level Summary



The results of monitoring water quality within the off-site groundwater bores are generally shown to be consistent throughout the 2013 monitoring period. Groundwater samples collected from the off-site bores were shown to be compliant with the trigger levels for the key water monitoring parameters pH, EC and filtered iron. All off-site bores exhibited consistently stable standing water levels throughout the 2013 monitoring period. Results for off-site groundwater bores are presented graphically in **Figures 6** and **7**.

Figure 6 Off-Site Groundwater Bores Result Summary

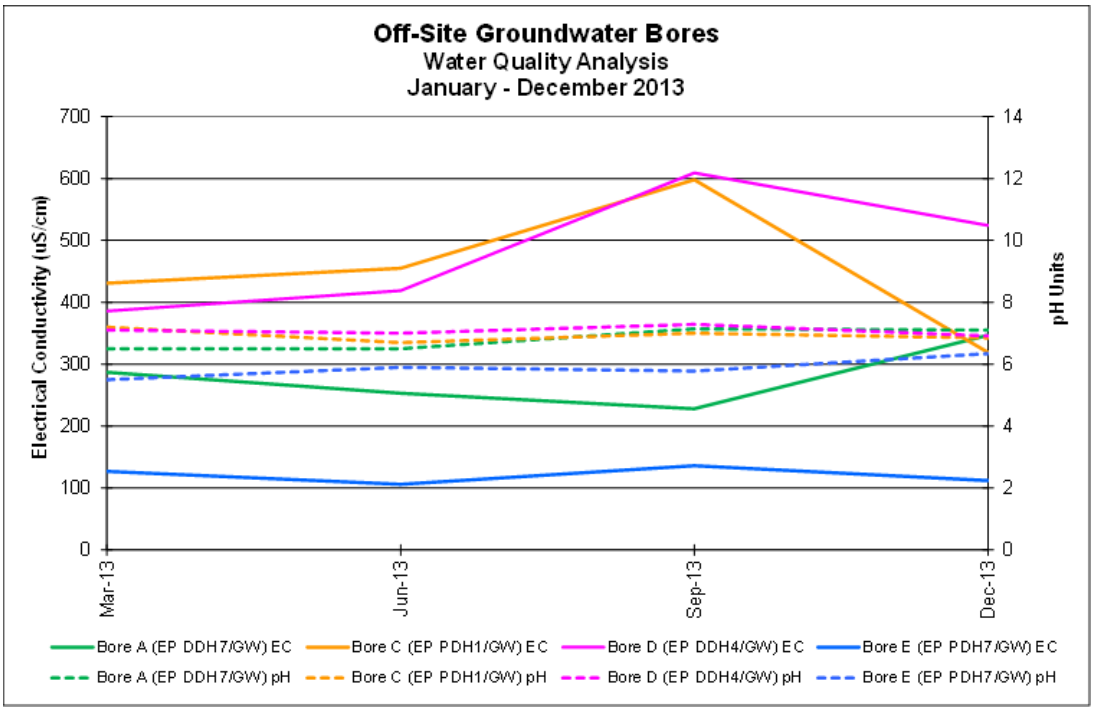
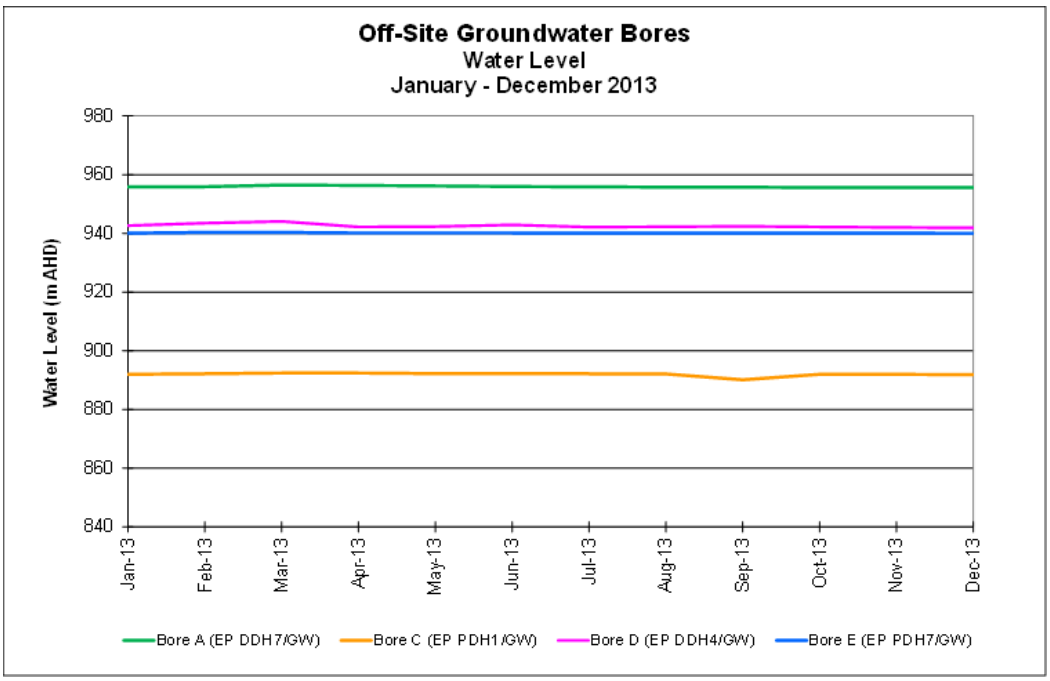
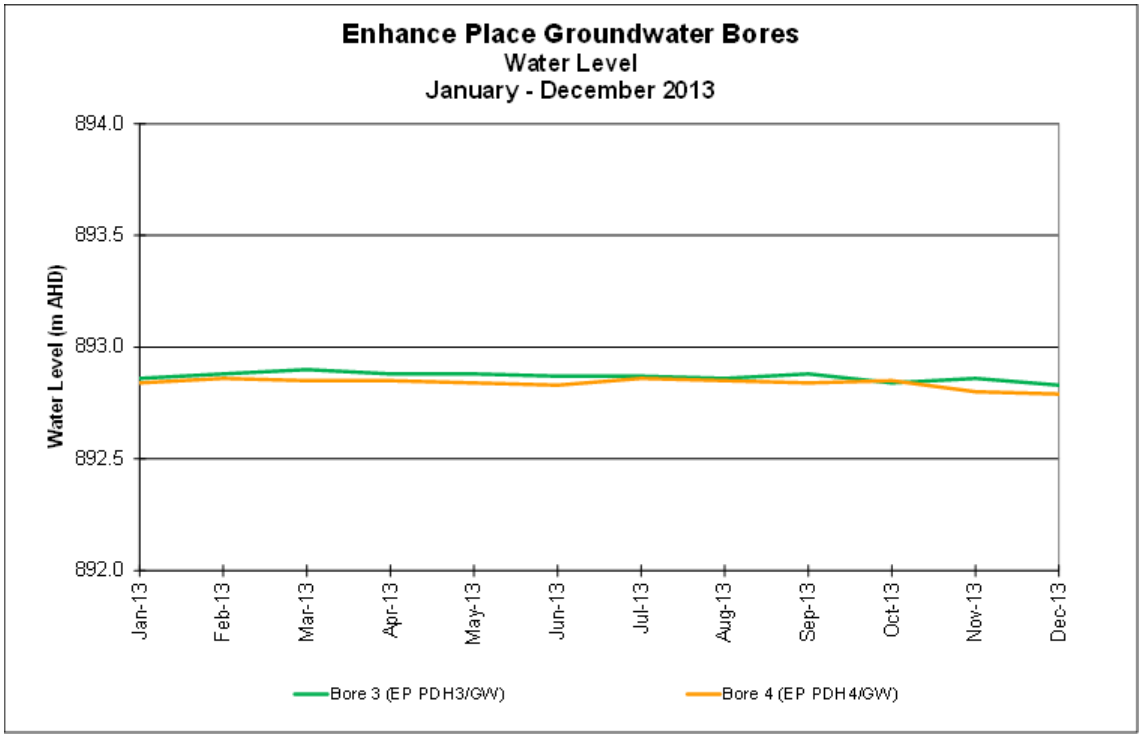


Figure 7 Off-Site Groundwater Bores Water Level Summary



The two monitoring bores located at the former Enhance Place mine exhibited standing water levels which showed very little variation throughout the 2013 monitoring period. These bores do not have any water level triggers nominated in the Water Management Plan. Results for the Enhance Place groundwater bores are presented graphically in **Figure 8**.

Figure 8 Enhance Place Groundwater Bores Water Level Summary



A detailed summary of all groundwater results can be found in **Appendix B**.

3.6 Contaminated Polluted Land

There was no land identified as being contaminated or polluted during the reporting period.

3.7 Threatened Flora

Measures for the management and mitigation of flora impacts at Pine Dale Mine and in the surrounding area are provided in the Flora and Fauna Management Plan. The Flora and Fauna Management Plan include a number of procedures and strategies aimed at ensuring that the impacts from mining activities are minimised.

A summary of the Flora and Fauna Management Plan is included in Section 11.7 of the MOP and outlines operating procedures to minimise impacts on flora and fauna.

3.8 Threatened Fauna

A summary of the Flora and Fauna Management Plan is included as an Appendix in Section 11.7 of the MOP and outlines operating procedures to minimise impacts on flora and fauna. No sightings of threatened fauna were made within the active mining site during the reporting period.

In 2009, the Purple Copper Butterfly, *Paralucia spinifera* (Purple Copper Butterfly) was listed as a Threatened species under the *Threatened Species Conservation Act 1995* and the *Environmental Protection and Biodiversity Conservation Act 1999* (see **Plate 1**). Habitat for the Purple Copper Butterfly is provided by the native Blackthorn (*Bursaria spinosa subsp. Lasiophylla*) ("*Bursaria*"), found throughout the local area.

The Purple Copper Butterfly has been identified adjacent to the eastern boundary of the Pine Dale Mine within an area of Bursaria.

To minimise potential direct and indirect impacts of dust and vibration from the Pine Dale Mine on the Purple Copper Butterfly, the following mitigation measures have been implemented:

a) maintenance of fencing and earth bunds around known PCB habitat;

b) mining activity did not occur within 200 of the main habitat area between September 2012 through end February 2013, and September 2013 though end February 2014 when the flying season of the adult and larvae stages of the PCB were apparent as determined by an independent ecologist; and

c) implementation of management and mitigation measures in accordance with relevant licences and approvals.

A Purple Copper Butterfly Monitoring Program has been implemented to monitor potential indirect impacts on the known populations of the butterfly. The monitoring is conducted to coincide with the adult and larvae stages of the PCB which is generally relative to the warmer months of September through February.

Plate 1
A Purple Copper Butterfly

	
Purple Copper Butterfly larvae Location: Pine Dale Mine PCB habitat area Date: 4 November 2013	Adult Purple Copper Butterfly Location: Pine Dale Mine PCB habitat area Date: 9 September 2013

Data collection of the butterfly larvae has been undertaken since October 2011 and the monitoring of the adult Purple Copper Butterfly since November 2012 with input from independent ecologists.

The objectives of the monitoring program are as follows:

- Identify the potential sources of indirect impacts upon the Purple Copper Butterfly and its larvae and relevant impact management measures that will be implemented at the mine;
- Monitor the potential impacts of the mining operations upon the Purple Copper Butterfly and its larvae; and
- Establish a management protocol for the review of monitoring results including contingency measures to be implemented in the event that monitoring indicates adverse indirect impacts from the mining operations.

The monitoring program will be undertaken while mining and rehabilitation works are being carried out. It is proposed, however, that the monitoring program will be reviewed on an annual basis and, if required, updated to reflect any changes to management or monitoring practices.

The monitoring program was not altered in 2013 as there was insufficient data obtained to justify changing the management or monitoring practices. The monitoring program will be reviewed again upon completion of the current monitoring cycle.

The monitoring program was developed in partnership with the University of Sydney, with a peer review being undertaken by the Australian Museum. Independent ecologists assist with the implementation of the program and the Australian Museum maintaining a peer review role to verify any findings on site.

3.9 Weeds

Weed control activities at Pine Dale Mine are undertaken in accordance with the Flora and Fauna Management Plan, which provides a range of measures to prevent and/or minimise the occurrence and dispersal of weeds. Weed inspections were undertaken on a regular basis with a large portion of weed problems on the mine's property being sprayed or chipped during the reporting period. Approximately 10 ha were actively spot sprayed during the reporting period throughout the Pine Dale Mine and rehabilitated areas.

Weed control methods generally target three noxious weeds which can occur within the Pine Dale Mine and Yarraboldy Extension area, namely:

- Blackberry (*Rubus fruticosus aggregate species*);
- Briar Rose (*Rosa rubiginosa*); and
- St John's Wort (*Hypericum perforatum*).

The control of weeds will be undertaken on an ongoing basis as required to ensure noxious species are managed accordingly.

3.10 Blasting

Blasting commenced at the Pine Dale Mine in 2008 and continued throughout the reporting period of 2013. During the reporting period a total of 34 blast events were initiated at Pine Dale Mine. The blasting results for the 2013 period compared to the blast monitoring criteria are summarised in **Table 10**. The results for each blast event during the reporting period are presented in full in **Appendix B**.

Table 10
Blast Monitoring Criteria and 2013 Results

Air blast overpressure dB(Lin. Peak)	Allowable exceedance*	Results 2013
115	5%	0.0%
120	0%	0.0%
Ground vibration (mm/s)		
5	5%	0.0%
10	0%	0.0%

* Percentage of the total number of blasts over a period of 12 months

All air blast overpressure and ground vibration results for 2013 remained well within the relevant criteria of <115dB (Lin. Peak) and <5 mm/s at all monitoring sites. All blasts occurred between the hours of 10:00am and 3:00pm (Monday to Friday), with no more than one blast per day during the reporting period as required under PA 10_0041. All blasts on site are carried out by Downer EDI Mining – Blasting Services Pty Ltd.

3.11 Operational Noise

Mining related noise impacts at Pine Dale Mine are managed in accordance with PA 10_0041, EPL 4911 and the approved Noise Monitoring Program. Noise emissions from Pine Dale Mine operations were monitored on a quarterly basis at six locations surrounding the site during the reporting period (see **Plan 1A**). These locations included:

- NM1 – the Green residence, Blackman's flat;
- NM2 – the Cherry residence, Blackman's flat;
- NM3 – Castlereagh Highway, east of Blackman's flat;
- NM4 – the Rensen residence, north of View Street, Blackman's flat;
- NM5 – the Fraser residence, Lidsdale; and
- NM6 – the Turek residence, Wolgan Road, Lidsdale.

The operational noise assessment criteria is 42 dB $L_{Aeq\ (15\ minute)}$ at three of the six monitoring locations (NM1 to NM3); and a noise assessment criteria of 35dB $L_{Aeq\ (15\ minute)}$ at the remaining three monitoring locations (NM4 toNM6). Attended quarterly noise monitoring was undertaken during the reporting period which assessed noise impacts from Pine Dale Mine against relevant criteria detailed within PA 10_0041 and EPL 4911.

Pine Dale Mine complied with the daytime $L_{Aeq\ (15\ minute)}$ noise criteria at all locations during the monitoring period. It should be noted that elevated readings were recorded at location NM1 on one occasion during the reporting period; at NM2 on two occasions and NM6 on two occasions. The recorded noise levels, however, were within the 2dB allowable threshold as described under the NSW Industrial Noise Policy (Environmental Protection Authority, 2000), and therefore were compliant with the PA 10_0041.

An elevated noise reading was recorded at NM4 during Q1. It should be noted that this property is owned by another mining company and is no longer privately owned.

Similar elevated readings were recorded at locations NM4 and NM5 on one occasion each during the reporting period, however, these levels are not regarded as exceedances because the source to receiver winds speed at 10 metre height measured at the meteorological station were greater than 3m/s and therefore the noise limits do not apply. Results for each noise survey during the reporting period are presented in full in **Appendix B**.

3.12 Visual, Stray Light

There were no adverse impacts associated with stray light or visual disturbance identified during the reporting period. There were no complaints received during the reporting period regarding visual and stray light impacts.

3.13 Aboriginal Heritage

There were no artefacts of Aboriginal Cultural Heritage found at the Pine Dale Mine during the reporting period.

3.14 Natural Heritage

No items or areas of natural heritage significance were recorded or are considered to occur within the approved disturbance area at Pine Dale Mine.

3.15 Spontaneous Combustion

There were no incidences of spontaneous combustion in coal stockpiles or overburden material during the reporting period. The Lithgow Seam is known to have a low propensity for spontaneous combustion. The Lithgow Seam can experience some heating if left exposed for extended periods in poorly formed stockpiles. Experience in the Western Coalfields shows that the Lithgow Seam coal, when correctly stockpiled, can be exposed for up to 12 months without spontaneous combustion occurring. To minimise the potential for spontaneous combustion ROM coal and Product coal is not stockpile for long periods. The extraction, processing and stockpiling of coal will continue to be managed to ensure spontaneous combustion is avoided.

3.16 Mine Subsidence

There were no issues regarding mine subsidence during the reporting period.

3.17 Hydrocarbon Contamination

There were no reported incidents of hydrocarbon contamination at Pine Dale Mine over the reporting period. Refer to **Section 2.9** for details on hydrocarbon storage.

3.18 Bushfire

Bush fire control strategies for Pine Dale Mine are managed in accordance with the approved Bush Fire Management Plan. These strategies are employed for preventing the occurrence and spread of any fire events that may impact on the site or in surrounding lands (i.e. Ben Bullen State Forest). As such, measures are taken at Pine Dale Mine to prevent the occurrence and spread of fire through proper maintenance of machinery and equipment, and the maintenance of access roads. There were no bush fire events at or in close proximity to Pine Dale Mine during the reporting period.

3.19 Methane Drainage/Ventilation

The underground workings at this site were closed in 1986 and decommissioned over the period from 1987 to 1990. Methane levels are considered to be negligible at the Pine Dale Mine. There are two remaining entries to the underground workings, being the 1A mine entry and the Punch Mine Entry. These are used as surface water storage facilities as per the approved Water Management Plan.

3.20 Public Safety

No issues of public safety occurred during the reporting period. The site is regularly monitored by mine personnel. The entire perimeter of the Pine Dale Mine property is fenced, with “No Trespassing” signs displayed at various intervals. “Do Not Enter” and “Danger” signs are also displayed along the fence of the private sealed haul road. There has been a continuation of the elimination of trespassing, as continual fencing monitoring, upgrades and repairs have continued to occur during the reporting period.

3.21 Other Issues and Risks

There are no other known issues or identified hazards at the operating Pine Dale Mine.

4 COMMUNITY RELATIONS

4.1 Environmental Complaints

All stakeholder and community complaints regarding Pine Dale Mine are documented, with appropriate actions taken as soon as possible to determine the likely cause of the complaint and all possible corrective actions to resolve the problem and prevent its recurrence. Complaints are recorded and retained at the site office.

During the reporting period, a total of 13 complaints were recorded from 3 complainants. The complaints received during the reporting period related to blasting, air quality and noise impacts (see **Table 11**).

Blasting related noise was the most common complaint received during the reporting period making up 69% of the total number of complaints, followed by noise (23%) and air quality (8%).

Table 11
Community Complaints

Complaint Type	Complaints Received 2013
Noise	3
Air Quality (Dust)	1
Blasting	9
Traffic	0
Water	0
Other	0
Total	**13**

4.2 Community Liaison

COMMUNITY CONSULTATIVE COMMITTEE

The Pine Dale Mine CCC commenced in January 2012 and comprises representatives from the local community, LCC and Pine Dale Mine. The Committee meets on a biannual basis to discuss matters relating to the Pine Dale mine. The CCC meeting minutes are made publicly available via the Company's Website www.enhanceplace.com.au.

During 2013, two Community Consultative Committee (CCC) meetings were held on the 31 January 2013 and 27 June 2013. A site tour was conducted for members at the 27 June meeting.

WEBSITE INFORMATION

A website has been established to keep the broader community up to date with recent activities at the Pine Dale Mine in accordance with Schedule 5, Condition 10 of the PA 10_0041. Copies of the following documents are made publicly available on the Enhance Place Website:

- EPL 4911;
- The Environmental Impact Statement;

- Project Approval 10_0041;
- Environmental Management Plans for the Pine Dale Mine;
- CCC minutes;
- Community complaints; and
- Blasting information.

SOCIAL/ ECONOMIC CONTRIBUTIONS

Pine Dale Mine has contributed to the economy of the district and State by providing direct employment, indirect employment and through the purchase of services and materials from regional suppliers. Coal supplies to MPPS provide competitively priced energy for the NSW electricity market which ultimately flows through to provide economic benefit to electiricity consumers.

5 REHABILITATION

5.1 Buildings

There were no buildings removed or constructed during the reporting period.

5.2 Rehabilitation of Disturbed Land

Where practicable, areas mined are progressively backfilled on a continual basis to form a profile similar to the pre-mining landscape. The rehabilitation area is made up of a series of parcels of land which are at various stages of being progressively rehabilitated back to a self-sustainable native ecosystem (acceptable post-mining land use and capability). The principal re-vegetation technique currently employed is direct seeding using native tree and shrub species for woodland communities and pasture species for areas intended for agricultural activities. The proposed final landform aims to emulate the pre-mining environment and to enhance local and regional ecological linkages across the site and surrounding areas. A summary of the disturbed and rehabilitated areas at the Pine Dale Mine can be seen in **Table 12**.

Rehabilitation Area A

Seeding of Area A (8 ha) commenced in 2008, with 1500 trees planted. In 2010 an additional 400 trees were planted with the assistance of the Gundungurra Tribal Aboriginal Council.

Flora monitoring is undertaken in Area A to assess species diversity, plant density and ground cover within the rehabilitated area. It is planned to assess the rehabilitated area against comparable local grassland and woodland communities to establish baseline rehabilitation targets.

After seeking expert advice, further rehabilitation of Area A was undertaken in October 2013 in the form of direct seeding and application of an organic mulch layer and lime. Drought conditions in quarter four 2013 have limited the outcomes of this work. The final land formation and ground cover post these works are illustrated in **Plate 2** to **Plate 5.**

Plate 2
Area A Rehabilitation Looking North East during mulching process

Plate 3
Area A Rehabilitation Looking North

Plate 4

Area A Rehabilitation showing mulch application

Plate 5

Area A Rehabilitation showing mulch application and drought affected growth

Rehabilitation Area B and C

Rehabilitation Areas B and C covers an area of approximately 25 ha and has been rehabilitated. The final landform and water management structures have been completed and the areas seeded for pasture in accordance with Planning Approval 10_0041 and the requirements of the landowner.

Areas B and C had lime applied in October 2013 to control soil pH and provide improved soil conditions to promote pasture growth. Below average rainfall, particularly in quarter four 2013 has inhibited growth and the response of the lime application.

Flora monitoring of Areas B and C will continue to be undertaken to ensure the rehabilitated areas are progressing towards the agreed target levels.

Rehabilitation Area 8

Seeding of area 8 (10 ha) commenced in 2008, with a pasture mixture known as 'Cox's River Mix'. The vegetation communities prior to mining include a mixture of cleared land, pasture, pines and eucalyptus. No additional works were undertaken during the reporting period.

Table 12
Rehabilitation Summary

	Area Affected/Rehabilitated (ha)		
	To date	**Last report**	**Next Report (estimated)**
A: MINE LEASE AREA			
A1 Mine Lease Area	98.1		
B: DISTURBED AREAS			
B1 Infrastructure Area	21.0	18.6	21.0
B2 Active Mining Area	4.6	2.6	4.6
B3 Waste emplacements	15.2	14.2	15.2
B4 Tailings emplacements	N/A	N/A	N/A
B5 Shaped Waste Placement	5.3	2.3	5.3
ALL DISTURBED AREAS	46.1	37.7	46.1
C: REHABILITATION PROGRESS			
C1 Total Rehabilitated Area (except for maintenance)	32	32	32
D: REHABILITATION ON SLOPES			
D1 10 to 18 degrees	0	0	0
D2 Greater than 18 degrees	0	0	0
E: SURFACE OF REHABILITATED LAND			
E1 Pasture and grasses	24.5	24.5	24.5
E2 Native forest/ecosystems	7.5	7.5	7.5
E3 Plantations and crops	0	0	0
E4 Other (include non-vegetative outcomes)	0	0	0

During 2013 additional maintenance activities were conducted on rehabilitated lands in the form of erosion control, fertilizing and weed mitigation (see **Table 13**).

Table 13
Maintenance Activities on Rehabilitated Land

	Area Treated (ha)		
	Report Period	**Next Period**	**Comment/control strategies/treatment detail**
Additional erosion control works	1	1	Ongoing maintenance of sedimentation fencing was conducted in and around the rehabilitated areas.
Recovering	0	0	No further topsoil or subsoil sealing was required during the reporting period.
Soil treatment	32	0	Adding mulch, lime and fertilizer was applied over the previously rehabilitated "Area A". Lime was spread over areas B and C.
Treatment/Management	0	0	No grazing cropping or slashing was conducted during the reporting period.
Re-seeding/Replanting	10	0	Area A was re-seeded with a pasture and tree seed mix.
Adversely affected by weeds	10	10	Weed spraying was conducted in Area A.
Feral animal control	0	0	No feral animal control was required during the reporting period.

5.3 Other Infrastructure

There was no rehabilitation of other infrastructure during the reporting period.

5.4 Rehabilitation Trials and Research

Research and monitoring on the Purple Copper Butterfly and its habitat is currently being undertaken under the direction and advice of the Australian Museum. More details are available in **Section 3.8**. There were no further rehabilitation trials or research undertaken during the reporting period.

5.5 Further Development of the Final Rehabilitation Plan

The final landform and rehabilitation plan is outlined in the MOP. Approval of the MOP was granted in February 2011 and the final landform and rehabilitation plan has remained unchanged. A revision of the currently approved MOP is being undertaken in accordance with new guidelines issued by DRE in September 2013. This review is being undertaken in consultation with DRE and other relevant stakeholders.

6 ACTIVITIES PROPOSED IN THE NEXT AEMR PERIOD

MINING

It is anticipated that coal resources within the Yarraboldy Extension will be exhausted by the second quarter of 2014. Approximately 60,000 t of product coal will be extracted in 2014 and approximately 120,000 m³ of waste rock will be moved. Mining activities will be undertaken consistent with the approved MOP. Following exhaustion of reserves, activities thereafter will be undertaken consistent with an approved Care and Maintenance Plan until such time that Project Approval is granted to continue mining operations. A draft Care and Maintenance Plan has been submitted with the Department of Trade & Investment - Division of Resources & Energy.

REHABILITATION

Rehabilitation activities will be undertaken during the 2014 period on areas that will not be directly impacted by a future mining operation at the Pine Dale Mine. All maintenance activities required on the rehabilitation areas will continue throughout 2014 (sediment fences, fertilizing, re-seeding, weed control etc).

FUTURE MINING DEVELOPMENT

In order to maintain supply of commercial coal to MPPS, Enhance Place intends to lodge an application with the Department of Planning and Infrastructure to extend the existing mining operations. Engagement with regulators and other key stakeholders will be undertaken throughout 2014.

APPENDIX A

SITE PLANS 2013

NOTES:

CRAVEN, ELLISTON & HAYES (LITHGOW) PTY.LTD.
CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
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DATE	31-12-13
AMENDED	
SURVEYOR	AERIAL PHOTO/TE/TH
DRAWN	K.L.F./D.M.
CHECKED	

PINEDALE MINE
AEMR PLAN
END DECEMBER 2013

SCALE - 1 : 4000 (A1 Sheet)

100 80 60 40 20 0 100 200 300 400

DWG No

PINE-AEMR13

Plan 1

Y:\Jobs 531 to 1000\613\Reports\61309 EIS 2013\CAD\ 613EA.dwg 4.4 Ownership-04.03.2014-4:26 PM

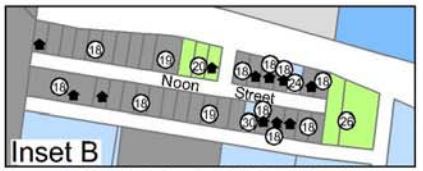
REFERENCE
- Approved Yarraboldy (Stage 1) Extension
- Cadastral Boundary
- Crown Road
- Residence
- (1) Landowner Reference (See Table)
- Energy Australia / Enhance Place Land
- Mining-related Land
- Crown / Government Land
- Ben Bullen State Forest (Forestry Corporation of NSW)
- Privately Owned Land

SCALE 1:25 000 (A4)

250 0 250 500 750 1000 1250 m

Land Ownership Source: Department of Lands - LPI Online Search
Base Map Source: Craven Elliston & Hayes Pty Ltd

Ref	Landowner	Ref	Landowner
1	Crown Land	15	State Land Services
1b	Ben Bullen State Forest (Forestry Corporation of NSW)	16	GC Springvale Pty Limited & Samsung Development (Aust) Pty Limited
2	Centennial Fassifern Pty Limited	17	Centennial Springvale Pty Limited & Samsung Development (Aust) Pty Limited
3	G. & A. Jenkins	18	Centennial Springvale Pty Limited & Springvale SK Kores Pty Limited
4	A. Fraser	19	Ivanhoe Coal Pty Limited
6	R. & H. Taylor	20	W. Doherty
7	K. May	24	The Council of the Shire of Blaxland
8	N. & J. Watson	26	The Trustees of the Catholic Church
9	Enhance Place Pty Ltd	30	The Council of the City of Lithgow
10	P. & E. Barnes	34	Delta Electricity
11	C. Jonkers & J. Favell	38	D.J & J.W Hunt
12	M S & L J Morris	39	Lidsdale Holdings Pty Ltd
13	J. Cope	40	T.L Elms
14	J. Cherry		



INSET A SCALE (A4)

0 100 200 300 400 500 m

Plan 2

LAND OWNERSHIP

BEN BULLEN STATE FOREST

No. 434

No. 1 EXTENSION

Pinedale Leases		
Portion	Coal Lease	Plan
ML81	ML1578	M27054
ML82	ML1569	M27055
ML119	ML1664	M27204
ML340	ML1637	M27161

Enhance Place Leases		
Portion	Coal Lease	Plan
ML35	ML1422	M26857
ML79	ML1458	M26893R
ML80	ML1520	M26982R

ML1637
(Extends to Lidsdale Siding - See Plan M27161)

NOTES:

N

MGA Zone 56

CRAVEN, ELLISTON & HAYES (LITHGOW) PTY.LTD.
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DATE	19.12.2013
AMENDED	
SURVEYOR	T.E.
DRAWN	D.M.
CHECKED	

ENHANCE PLACE PTY LIMITED
LEASES
PINEDALE OPENCUT MINE & ENHANCE OPENCUT MINE

SCALE - 1:12500 (A3)

DWG No

Plan 3

Plan 4

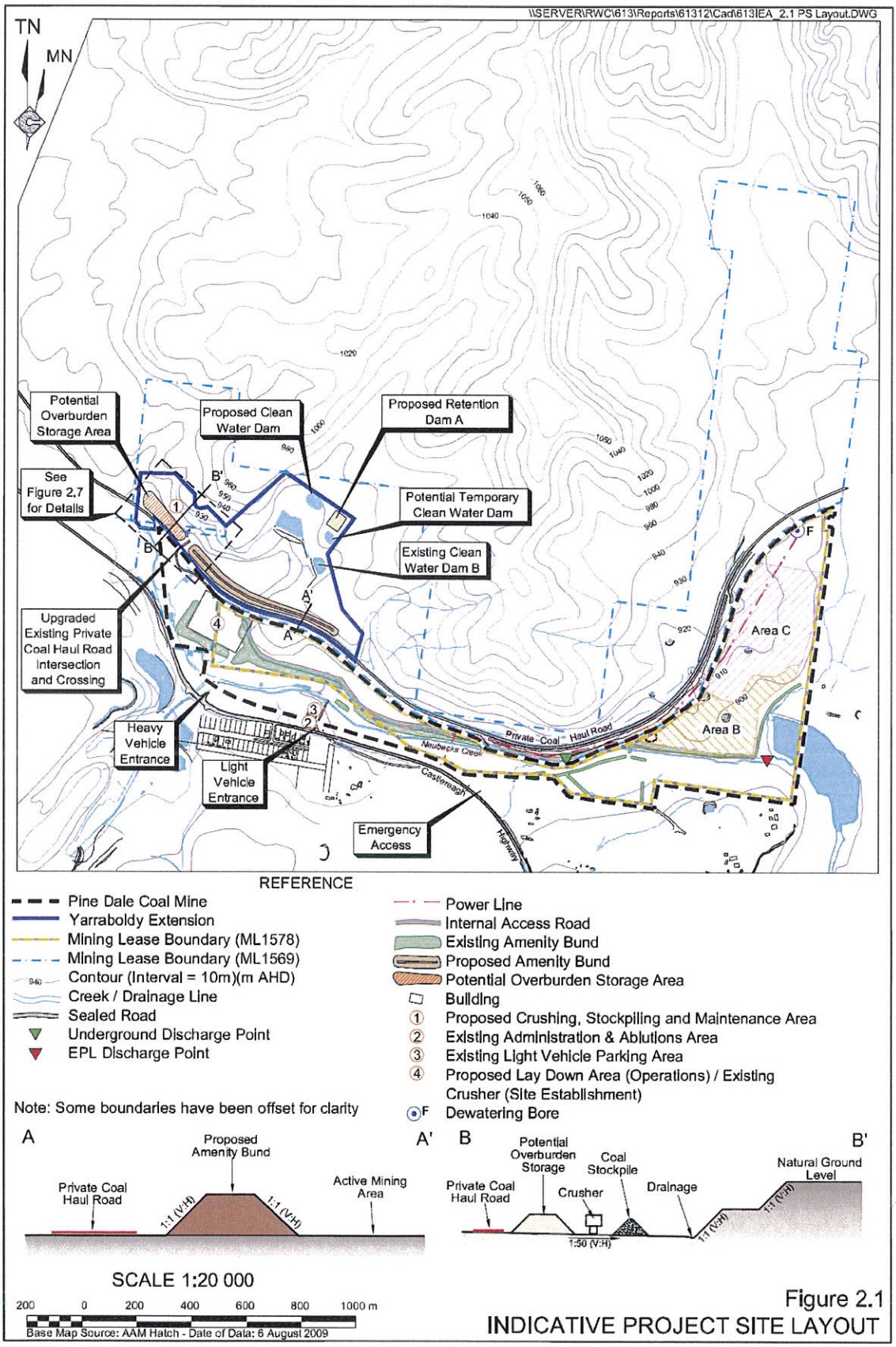
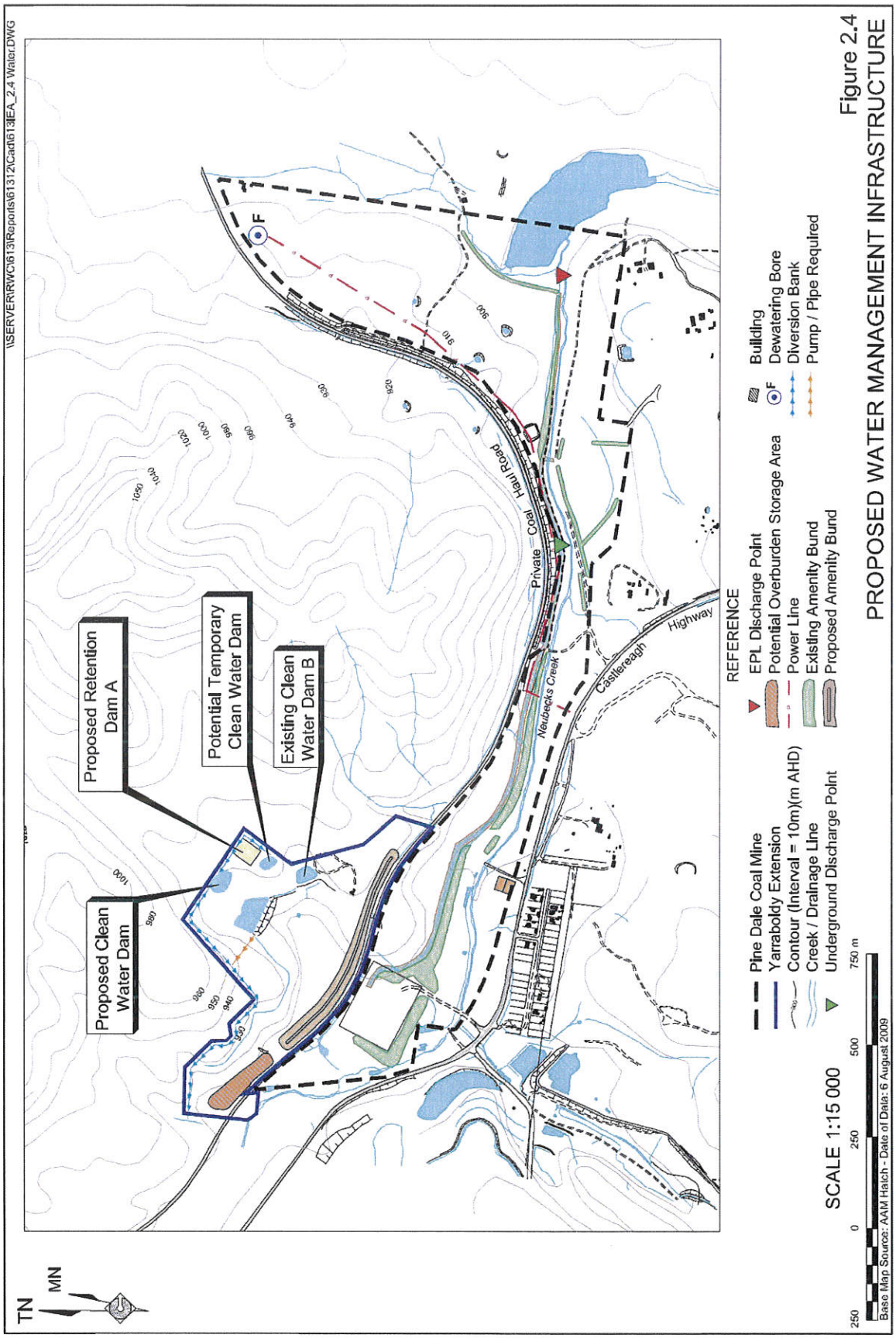


Figure 2.1
INDICATIVE PROJECT SITE LAYOUT

Plan 5


\\SERVER\RWC\613\Reports\61312\Cad\613EA_2.4 Water.DWG
Proposed Retention Dam A
Potential Temporary Clean Water Dam
Existing Clean Water Dam B
Proposed Clean Water Dam
Haul Road
Private Coal
Neubecks Creek
Castlereagh Highway
TN
MN
REFERENCE
Pine Dale Coal Mine
Yarraboldy Extension
Contour (Interval = 10m)(m AHD)
Creek / Drainage Line
Underground Discharge Point
EPL Discharge Point
Potential Overburden Storage Area
Power Line
Existing Amenity Bund
Proposed Amenity Bund
Building
Dewatering Bore
Diversion Bank
Pump / Pipe Required
SCALE 1:15 000
0
250
500
750 m
250
Base Map Source: AAM Hatch - Date of Data: 6 August 2009
Figure 2.4
PROPOSED WATER MANAGEMENT INFRASTRUCTURE

Plan 6

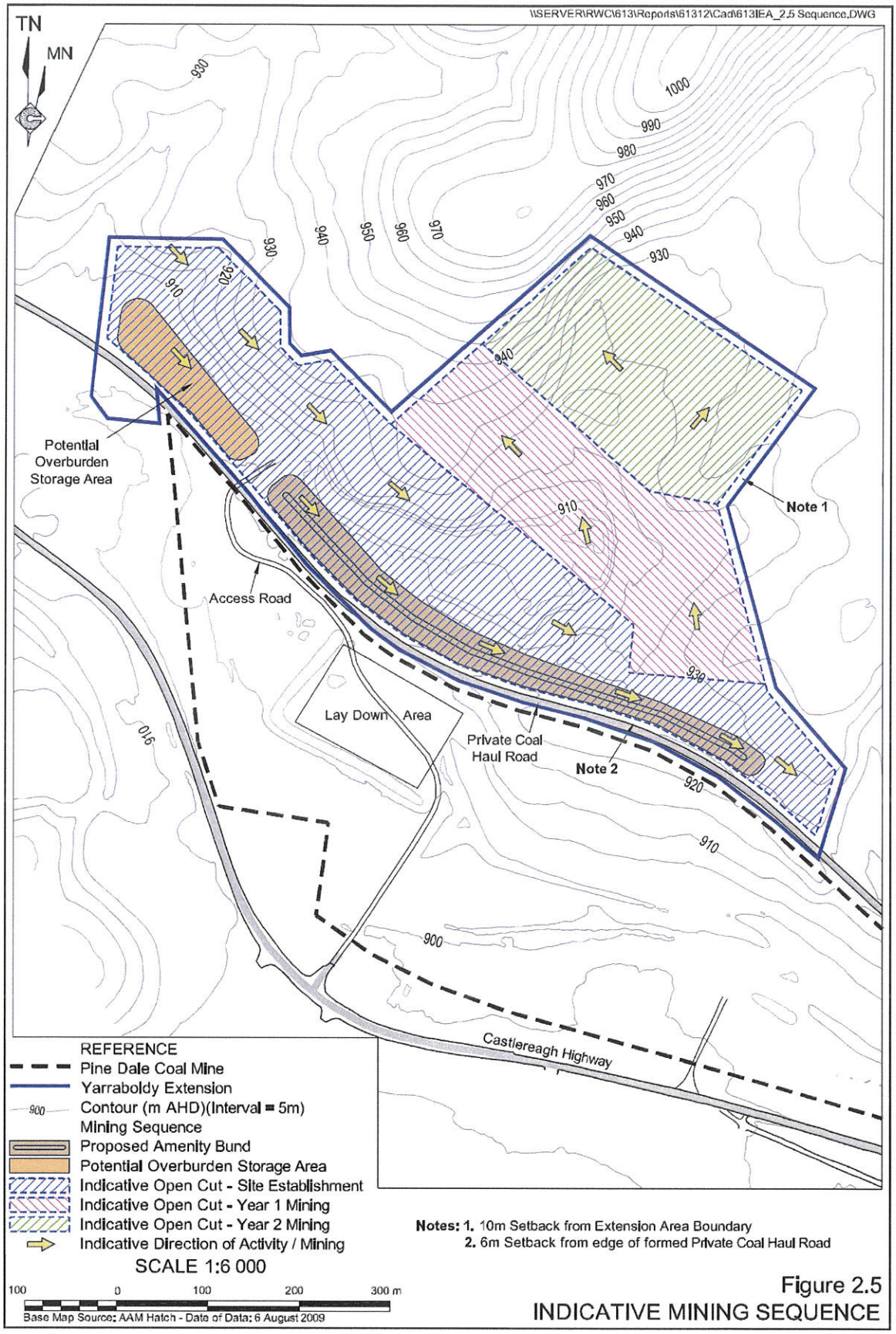


Figure 2.5
INDICATIVE MINING SEQUENCE

Plan 7

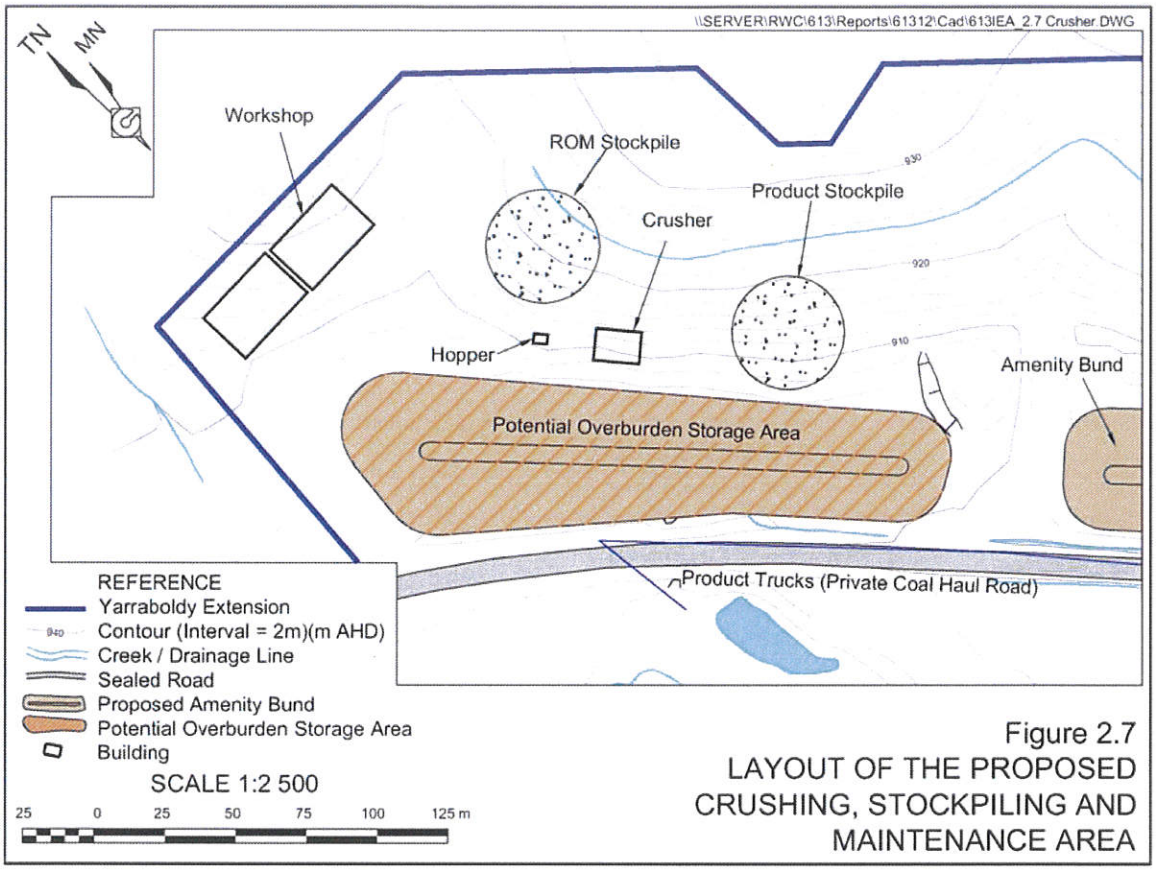


Figure 2.7
LAYOUT OF THE PROPOSED CRUSHING, STOCKPILING AND MAINTENANCE AREA

Plan 8

R.W. CORKERY & CO. PTY. LIMITED
TN
MN
Castlereagh Highway
Private Coal Haul Road
REFERENCE
Pine Dale Coal Mine
Yarraboldy Extension
Existing Contour (m AHD)(Interval = 5m)
Final Landform Contour (Interval = 5m)
Existing Drainage Line
Proposed Drainage Line
Revegetation
Pasture
Native Woodland
SCALE 1:12 000
200 0 200 400 600 m
Base Map Source: AAM Hatch - Date of Data: 6 August 2009
INDICATIVE FINAL LANDFORM AND REVEGETATION
Figure 2.8
\\SERVER\RWC\613\Reports\613\2\Cad\613EA_2.8 Final Landform.DWG

APPENDIX B

ENVIRONMENTAL MONITORING SUMMARY REPORT

AEMR SUMMARY REPORT COMPILED FOR PINE DALE MINE

Environmental Performance Monitoring
January – December 2013

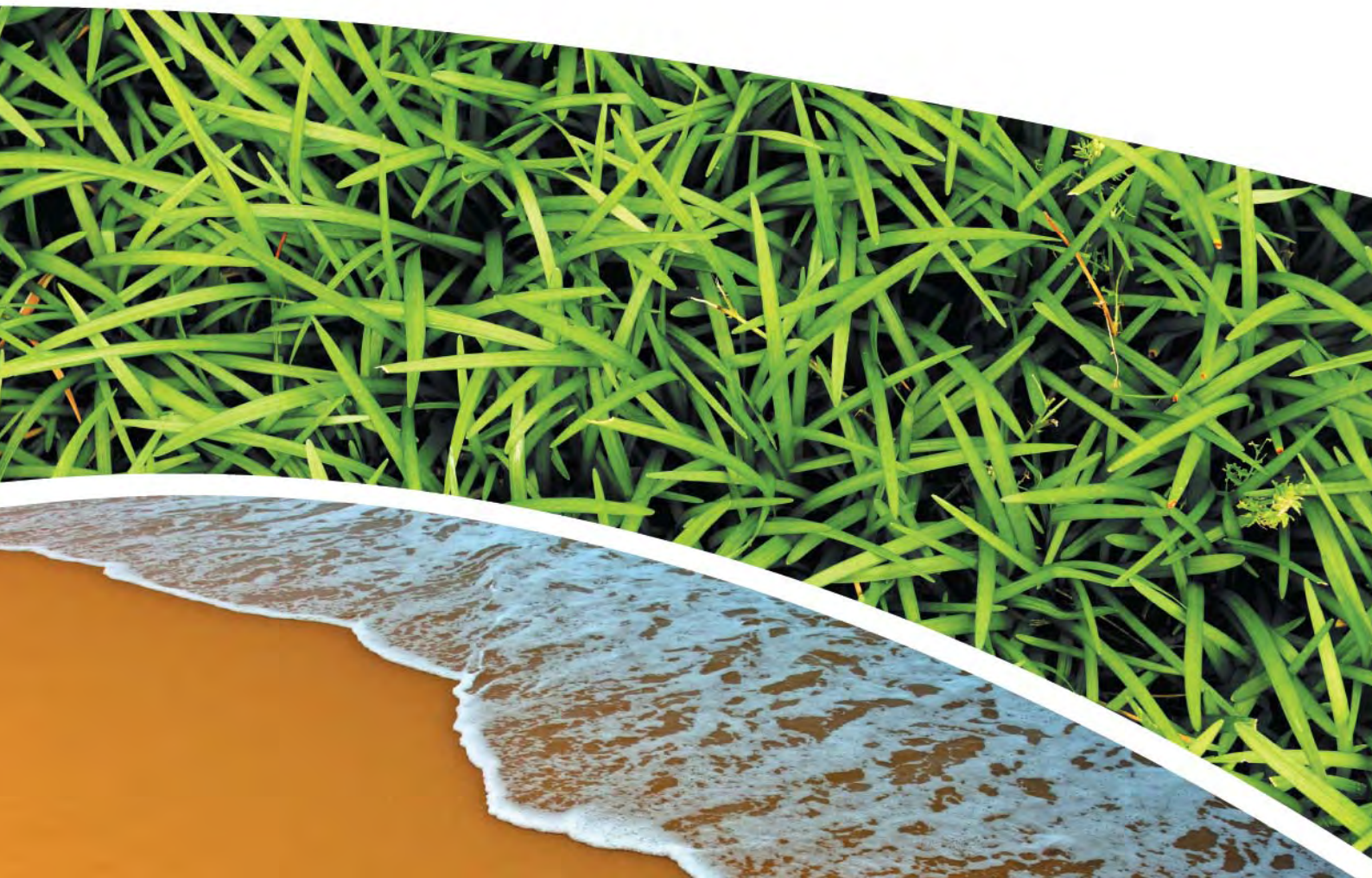
Pine Dale Mine

RCA Australia

RCA ref 6880-840/0

24 February 2014

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL



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				Name	**Signature**	**Date**
/0	Final	Karen Tripp	Geoff Mason	Karen Tripp		25.01.14

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Rev No	**Copies**	**Format**	**Issued to**	**Date**
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/0	1	Bound report	Pine Dale Mine – Mr Graham Goodwin	25.01.14
/0	1	Bound report	RCA – job archive	25.01.14
/0	1	Electronic report	RCA – job archive	25.01.14

RCA-LE ref 6880-840/0

24 February 2014

Pine Dale Mine
PO Box 202
WALLERAWANG NSW 2845

Attention: Mr Graham Goodwin

AEMR SUMMARY REPORT
COMPILED FOR PINE DALE MINE
DETAILING ENVIRONMENTAL PERFORMANCE MONITORING
JANUARY – DECEMBER 2013

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APPENDIX

APPENDIX 1

ENVIRONMENTAL MONITORING LOCATIONS

STREAM HEALTH & CHANNNEL STABILITY MONITORING LOCATIONS

APPENDIX 2

STREAM HEALTH & CHANNEL STABILITY FIELDSHEETS

1 INTRODUCTION

The following report provides a summary of monthly environmental monitoring data for Pine Dale Mine for the year 2013. Summary data is comprised of High Volume Air Samples (TSP & PM_{10}), Depositional Dust, Surface Water, Groundwater monitoring, Noise monitoring and Blast monitoring.

This report satisfies the requirements to monitor environmental parameters as presented in the Pine Dale Mine Environmental Protection Licence (EPL 4911) and Project Approval (PA 10_0041). Monitoring is undertaken in accordance with the site's *Water Management Plan*; *Baseline Water Monitoring Plan*; *Air Quality and Greenhouse Gas Management Plan*; *Purple Copper Butterfly Monitoring Programme*; the *Noise Management Plan*; and the *Blast Management Plan*.

A compliance assessment of each environmental monitoring parameter is made in accordance with the relevant assessment criteria outlined in Project Approval (PA 10_0041), the site Management Plans and Environmental Protection Licence (EPL 4911).

At the request of Pine Dale Mine, the results of groundwater quality monitoring have been assessed against the Trigger Levels presented in the Pine Dale Coal Mine *Groundwater Monitoring Program* (Report No. 613/05, Dec 2005). These Trigger Levels have been adopted for use in this report as the Trigger Levels for water quality monitoring presented in the current Pine Dale Mine *Water Management Plan* (Report No. 613/20, July 2011) are under review at present.

2 AIR QUALITY MONITORING

2.1 DEPOSITIONAL DUST AND HVAS PARTICULATE MATTER ASSESSMENT CRITERIA

The Pine Dale Mine Project Approval (PA 10_0041, Schedule 3 Condition 18) and *Air Quality and Greenhouse Gas Management Plan* stipulates that dust emissions generated by the project must not cause additional exceedances of the long term impact assessment criteria listed in **Table 1, 2** and **3** (below).

Table 1 *Depositional Dust: Long Term Assessment Criteria*

Pollutant	Average Period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c]Deposited dust	Annual	[b]2 g/m^2.month	[a]4g/m^2.month

Table 2 *HVAS Particulate Matter: Long Term Assessment Criteria*

Pollutant	Average Period	[d]Criterion
Total suspended particulate (TSP) matter	Annual	[a]90µg/m^3
Particulate matter < 10µm (PM_{10})	Annual	[a]30µg/m^3

Table 3 *HVAS Particulate Matter: Short Term Assessment Criteria*

Pollutant	Average Period	[d]Criterion
Particulate matter < 10µm (PM_{10})	24 hours	[a]50µg/m^3

- *a Total impact ie, incremental increase in concentrations due to the project plus background concentrations due to other sources);*
- *b Incremental impact (i.e. incremental increase in concentrations due to the project on its own);*
- *c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method;*
- *d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agree to by the Director-General in consultation with DECCW.*

2.1 AIR MONITORING RESULTS – DEPOSITIONAL DUST GAUGE DATA SUMMARY

Depositional dust monitoring is undertaken at 10 locations across the Pine Dale Mine site. A total of six (6) depositional dust gauges are monitored in accordance with the Pine Dale Mine *Air Quality and Green House Gas Management Plan* and Environmental Protection Licence (No. 4911). Two of these gauges are located within the township of Blackmans Flat (gauges D1 & D2). A third gauge is located to the east of Blackmans Flat along the Castlereagh Highway (gauge D3). The remaining three gauges (D4, D5 & D6) were installed in November 2006 to coincide with the commencement of mining in Areas B & C. Gauge D4 is located to the north of View St, Blackmans Flat. Two more gauges (D5 & D6) are located to the east of Mining Areas B & C, along Wolgan Road, Lidsdale (refer Drawing 1, **Appendix 1**).

The remaining four (4) depositional dust gauges are monitored in accordance with the Pine Dale Mine *Purple Copper Butterfly Monitoring Program*. These gauges are named PCB1, PCB2, PCB3 and PCB7. Three of the dust gauges are located within the major butterfly population to the east of the current mine workings in the Yarraboldy Extension (PCB1-3), whilst the fourth dust gauge (PCB7) is located to the south west of the major butterfly population area (refer Drawing 1, **Appendix 1**).

Depositional Dust summary results for the period January – December 2013 are shown in **Tables 4** to **13**. Graphical presentations are shown in **Figures 1** and **2**. A discussion of results is presented in **Section 2.3**.

Table 4 *Depositional Dust Data Summary Gauge D1 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	D1	0.9	0.5	0.4
Feb-13	D1	1.4	0.7	0.7
Mar-13	D1	0.5	0.2	0.3
Apr-13	D1	0.8	0.3	0.5
May-13	D1	0.9	0.6	0.3
Jun-13	D1	0.3	0.1	0.2
Jul-13	D1	1.0	0.7	0.3
Aug-13	D1	0.4	0.2	0.2
Sep-13	D1	1.1	0.6	0.5
Oct-13	D1	0.9	0.5	0.4
Nov-13	D1	1.3	0.6	0.7
Dec-13	D1	9.5	1.2	8.3
ANNUAL AVERAGE		***1.6***	***0.5***	***1.1***

Table 5 *Depositional Dust Data Summary Gauge D2 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	D2	0.6	0.2	0.4
Feb-13	D2	0.9	0.4	0.5
Mar-13	D2	0.8	0.4	0.4
Apr-13	D2	0.7	0.3	0.4
May-13	D2	0.7	0.4	0.3
Jun-13	D2	0.5	0.2	0.3
Jul-13	D2	0.9	0.5	0.4
Aug-13	D2	0.2	0.1	0.1
Sep-13	D2	0.7	0.3	0.4
Oct-13	D2	0.8	0.5	0.3
Nov-13	D2	0.7	0.3	0.4
Dec-13	D2	1.2	0.6	0.6
ANNUAL AVERAGE		***0.7***	***0.3***	***0.4***

Table 6 *Depositional Dust Data Summary Gauge D3 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	D3	1.0	0.6	0.4
Feb-13	D3	1.0	0.6	0.4
Mar-13	D3	0.4	0.1	0.3
Apr-13	D3	0.7	0.4	0.3
May-13	D3	1.2	0.8	0.4
Jun-13	D3	0.4	0.2	0.2
Jul-13	D3	1.1	0.7	0.4
Aug-13	D3	0.6	0.3	0.3
Sep-13	D3	1.1	0.6	0.5
Oct-13	D3	0.9	0.6	0.3
Nov-13	D3	1.0	0.6	0.4
Dec-13	D3	1.7	0.9	0.8
ANNUAL AVERAGE		***0.9***	***0.5***	***0.4***

Table 7 *Depositional Dust Data Summary Gauge D4 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	D4	0.4	0.2	0.2
Feb-13	D4	1.5	0.8	0.7
Mar-13	D4	0.4	0.1	0.3
Apr-13	D4	0.6	0.3	0.3
May-13	D4	0.7	0.3	0.4
Jun-13	D4	0.2	0.1	0.1
Jul-13	D4	0.4	0.1	0.3
Aug-13	D4	0.2	0.1	0.1
Sep-13	D4	0.5	0.2	0.3
Oct-13	D4	0.6	0.4	0.2
Nov-13	D4	0.6	0.2	0.4
Dec-13	D4	1.3	0.4	0.9
ANNUAL AVERAGE		***0.6***	***0.3***	***0.4***

Table 8 *Depositional Dust Data Summary Gauge D5 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	D5	0.4	0.2	0.2
Feb-13	D5	0.7	0.4	0.3
Mar-13	D5	0.5	0.2	0.3
Apr-13	D5	0.4	0.2	0.2
May-13	D5	0.6	0.4	0.2
Jun-13	D5	0.4	0.2	0.2
Jul-13	D5	0.2	0.05*	0.2
Aug-13	D5	0.3	0.1	0.2
Sep-13	D5	0.5	0.2	0.3
Oct-13	D5	26.6^{EB}	12.3^{EB}	14.3^{EB}
Nov-13	D5	1.1	0.6	0.5
Dec-13	D5	1.2	0.6	0.6
ANNUAL AVERAGE		***0.6***	***0.3***	***0.3***

EB- indicates excessive bird droppings were present and the sample was rejected due to contamination. Results have been excluded from the annual average result.

* Where results are found to be less than the detection limit, values of half the detection limit are used for reporting purposes.

Table 9 *Depositional Dust Data Summary Gauge D6 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	D6	0.5	0.3	0.2
Feb-13	D6	1.1	0.5	0.6
Mar-13	D6	0.6	0.4	0.2
Apr-13	D6	0.3	0.2	0.1
May-13	D6	0.4	0.2	0.2
Jun-13	D6	1.0	0.4	0.6
Jul-13	D6	3.6	2.1	1.5
Aug-13	D6	2.1	0.6	1.5
Sep-13	D6	0.5	0.3	0.2
Oct-13	D6	0.5	0.3	0.2
Nov-13	D6	0.7	0.4	0.3
Dec-13	D6	ND	ND	ND
ANNUAL AVERAGE		***1.0***	***0.5***	***0.5***

Notes: ND – No Data due to broken (vandalized) funnel found during field sampling.

Table 10 *Depositional Dust Data Summary Gauge PCB1 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	PCB1	2.7	1.5	1.2
Feb-13	PCB1	1	0.5	0.5
Mar-13	PCB1	0.9	0.3	0.6
Apr-13	PCB1	1.3	0.7	0.6
May-13	PCB1	1.3	0.7	0.6
Jun-13	PCB1	0.8	0.4	0.4
Jul-13	PCB1	0.8	0.4	0.4
Aug-13	PCB1	1.9	1.1	0.8
Sep-13	PCB1	1.4	0.8	0.6
Oct-13	PCB1	3.3	2	1.3
Nov-13	PCB1	2.1	1.1	1
Dec-13	PCB1	2.6	1.2	1.4
ANNUAL AVERAGE		***1.7***	***0.9***	***0.8***

Table 11 *Depositional Dust Data Summary Gauge PCB2 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	PCB2	2.3	0.8	1.5
Feb-13	PCB2	0.8	0.2	0.6
Mar-13	PCB2	1.4	0.1	1.3
Apr-13	PCB2	0.5	0.1	0.4
May-13	PCB2	0.6	0.2	0.4
Jun-13	PCB2	0.3	0.1	0.2
Jul-13	PCB2	0.4	0.2	0.2
Aug-13	PCB2	0.5	0.2	0.3
Sep-13	PCB2	0.7	0.2	0.5
Oct-13	PCB2	0.6	0.2	0.4
Nov-13	PCB2	1.2	0.4	0.8
Dec-13	PCB2	1.6	0.5	1.1
ANNUAL AVERAGE		***0.9***	***0.3***	***0.6***

Table 12 *Depositional Dust Data Summary Gauge PCB3 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	PCB3	0.5	0.1	0.4
Feb-13	PCB3	1.9	0.3	1.6
Mar-13	PCB3	0.5	0.1	0.4
Apr-13	PCB3	0.7	0.2	0.5
May-13	PCB3	0.1	<0.1	0.1
Jun-13	PCB3	0.3	0.1	0.2
Jul-13	PCB3	0.5	0.3	0.2
Aug-13	PCB3	0.6	0.2	0.4
Sep-13	PCB3	0.8	0.3	0.5
Oct-13	PCB3	0.4	0.2	0.2
Nov-13	PCB3	1.0	0.3	0.7
Dec-13	PCB3	2.7	0.7	2.0
ANNUAL AVERAGE		***0.8***	***0.3***	***0.6***

Table 13 *Depositional Dust Data Summary Gauge PCB7 Jan – Dec 2013*

Month	Gauge No.	Insoluble Solids (g/m^2.month)	Ash Residue (g/m^2.month)	Combustible Matter (g/m^2.month)
Jan-13	PCB7	0.9	0.5	0.4
Feb-13	PCB7	1.3	0.7	0.6
Mar-13	PCB7	0.7	0.2	0.5
Apr-13	PCB7	0.9	0.5	0.4
May-13	PCB7	1.1	0.6	0.5
Jun-13	PCB7	0.4	0.2	0.2
Jul-13	PCB7	0.7	0.4	0.3
Aug-13	PCB7	0.5	0.3	0.2
Sep-13	PCB7	0.8	0.4	0.4
Oct-13	PCB7	0.9	0.5	0.4
Nov-13	PCB7	1.1	0.7	0.4
Dec-13	PCB7	1.4	0.7	0.7
ANNUAL AVERAGE		***0.9***	***0.5***	***0.4***

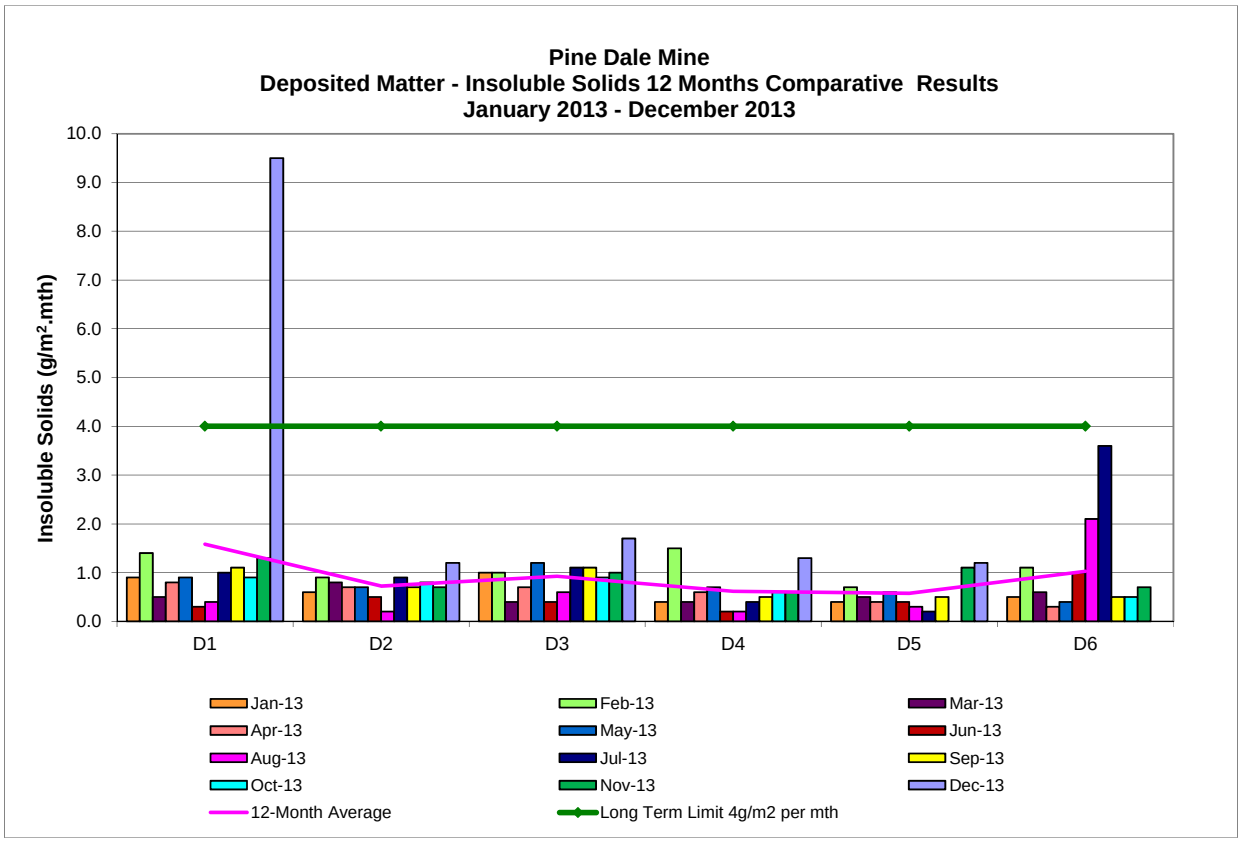


Figure 1 *Depositional Dust Results - Gauges D1 to D6*

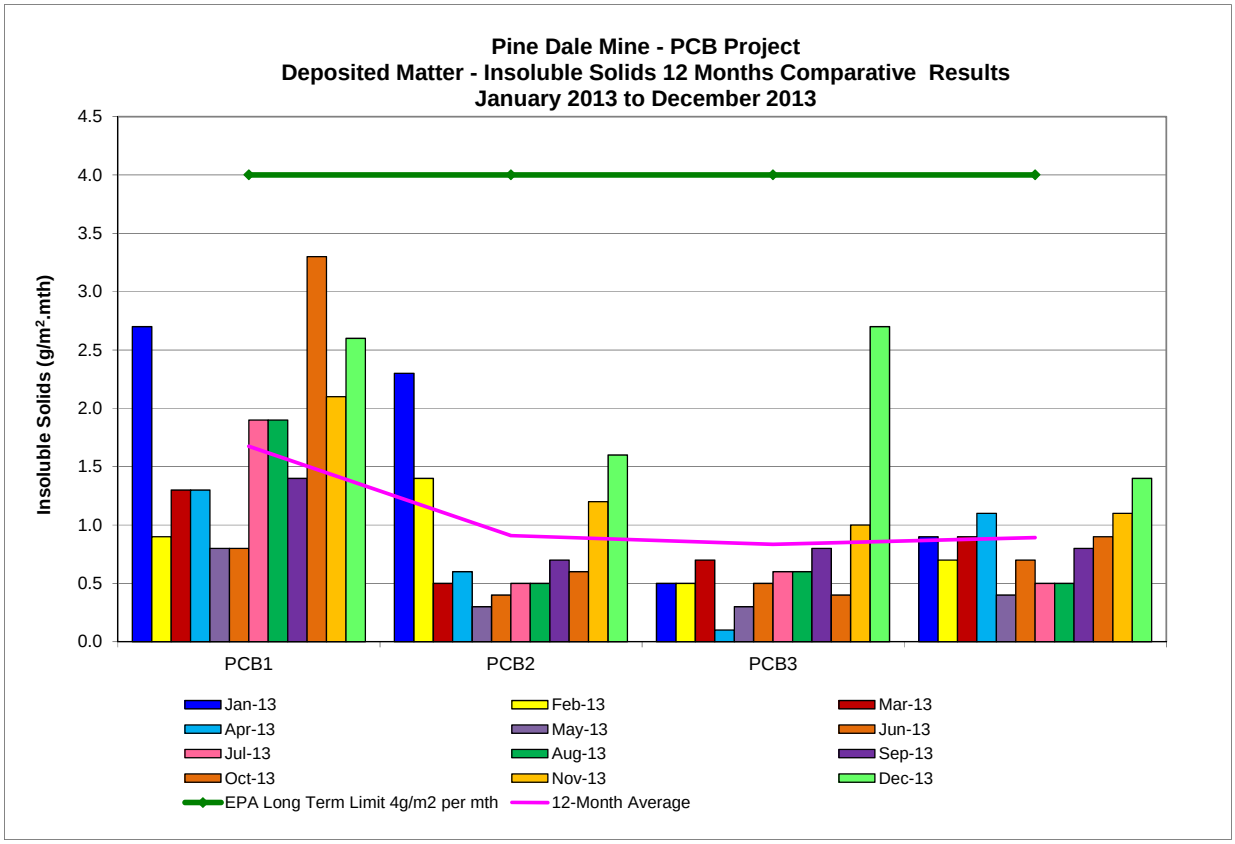


Figure 2 *Depositional Dust Results – Gauges PCB1-3 & PCB7*

2.2 AIR MONITORING RESULTS – HVAS PARTICULATE MATTER DATA SUMMARY

Pine Dale Coal Mine monitors Total Particulate Matter <10µm (PM_{10}) and Total Suspended Particulate matter (TSP) at one location in accordance with the Pine Dale Mine *Air Quality and Green House Gas Management Plan* and Environmental Protection Licence (No. 4911). The HVAS TSP and PM_{10} units are both located adjacent to the mine office at Blackmans Flat (refer Drawing 1, **Appendix 1**).

HVAS Particulate Matter summary results for the period January – December 2013 are shown in **Table 14**. Graphical presentations are shown in **Figure 3**.

Table 14 *HVAS Particulate Matter Summary Jan – Dec 2013*

Run Date	HVAS TSP (µg/m^3)	HVAS PM_{10} (µg/m^3)	Run Date	HVAS TSP (µg/m^3)	HVAS PM_{10} (µg/m^3)
3-Jan-13	26	9	8-Jul-13	2	12
9-Jan-13	30	25	14-Jul-13	15	7
15-Jan-13	44	13	20-Jul-13	11	3
21-Jan-13	41	11	26-Jul-13	17	9
27-Jan-13	12	9	1-Aug-13	29	5
2-Feb-13	10	8	7-Aug-13	50	ND
8-Feb-13	30	18	13-Aug-13	29	4
14-Feb-13	13	6	19-Aug-13	18	4
20-Feb-13	17	17	25-Aug-13	41	9
26-Feb-13	18	11	31-Aug-13	57	12
4-Mar-13	21	12	06-Sep-13	26	24
10-Mar-13	11	8	12-Sep-13	32	9
16-Mar-13	34	17	18-Sep-13	105	10
22-Mar-13	44	15	24-Sep-13	24	11
28-Mar-13	22	15	30-Sep-13	21	19
3-Apr-13	13	8	6-Oct-13	47	8
9-Apr-13	13	4	12-Oct-13	12	20
15-Apr-13	45	30	18-Oct-13	13	85
21-Apr-13	22	5	24-Oct-13	25	7
27-Apr-13	35	18	30-Oct-13	30	11
3-May-13	46	14	5-Nov-13	18	30
9-May-13	60	18	11-Nov-13	37	2
15-May-13	13	11	17-Nov-13	20	10
21-May-13	14	7	23-Nov-13	52	10
27-May-13	20	10	29-Nov-13	46	8
2-Jun-13	9	3	05-Dec-13	16	6
8-Jun-13	10	5	11-Dec-13	2	14
14-Jun-13	3	1	17-Dec-13	15	9
20-Jun-13	25	13	23-Dec-13	11	22
26-Jun-13	6	4	29-Dec-13	17	24
2-Jul-13	16	10			
			Annual Average	***26.2***	***12.7***

ND: No data, invalid sample (section of filter missing)

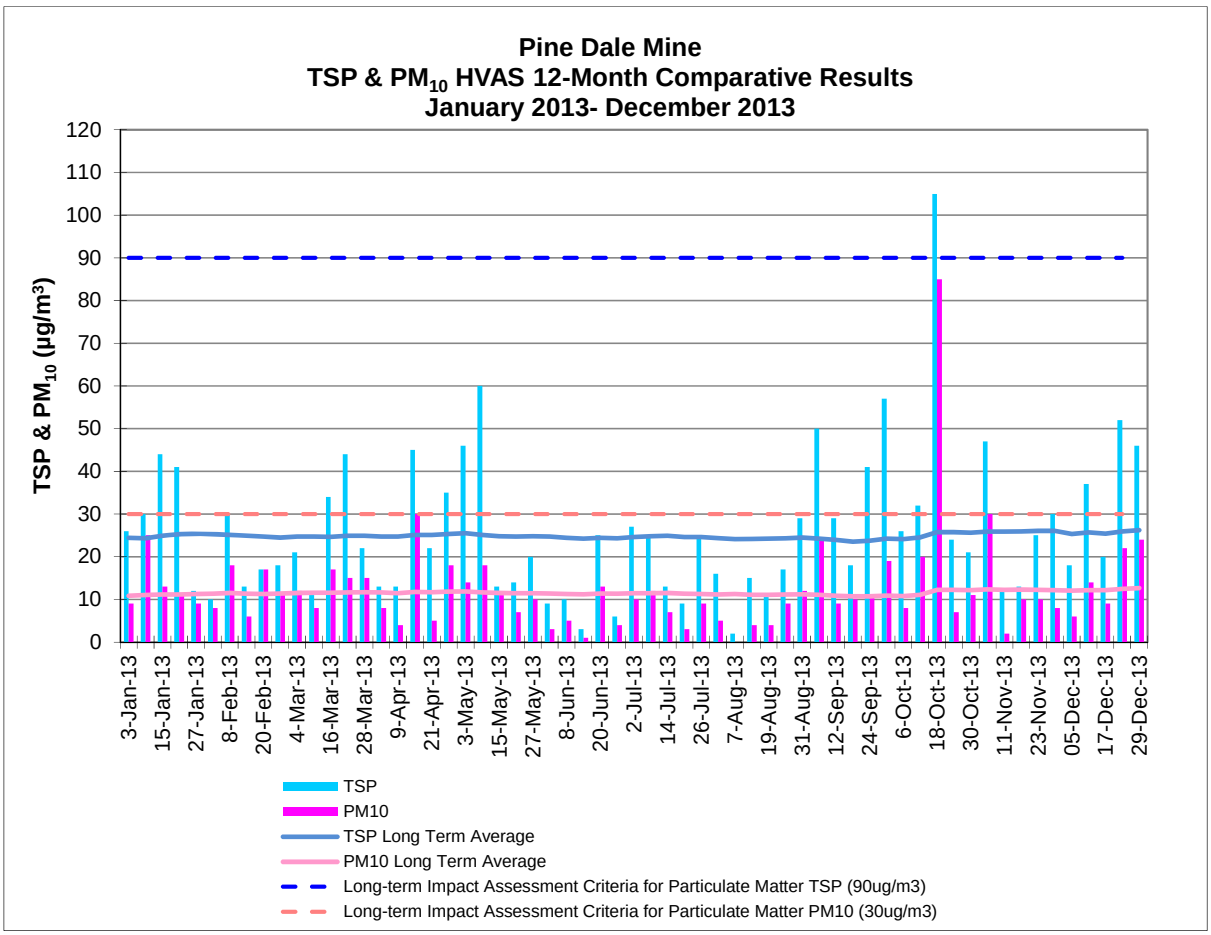


Figure 3 *HVAS TSP & PM_{10} Particulate Matter Summary Jan- Dec 2013*

2.3 REVIEW & INTERPRETATION OF AIR MONITORING RESULTS

2.3.1 DEPOSITIONAL DUST RESULTS

Depositional Dust results for the period January – December 2013 show an average insoluble solids range of 0.6 g/m^2 per month to 1.6 g/m^2 per month for dust gauges D1 to D6. These results fall well below the nominated annual average assessment criteria of 4.0g/m^2 per month, as stipulated in the *Air Quality Monitoring Program*.

During the 2013 monitoring period, there was one instance where a dust gauge (D1 December 2013) showed results which were greater than the maximum increase of 2g/m2 per month deposited matter, as stipulated in the site's Air Quality Monitoring Program. However, the field sheets recorded during the December 2013 period noted insects (Christmas beetles) were present in the sample. The increase of 8.2g/m2 month observed between the November and December 2013 sampling periods is likely to be attributed to the contamination of the gauge by insects, which is supported by the ash to insoluble solids ratio which indicated that only 13% of the sample consisted of non-organic material; implying contamination. In October 2013 D5 was deemed excessively contaminated from bird droppings following a result of 26.6g/m^2 month and an ash to insoluble solids ratio of 46%. No result was available at D6 for the month of December 2013 due to a broken funnel.

It should be noted that dust gauges PCB1, PCB2, PCB3 and PCB7 do not conform to the locational requirements of AS/NZS 3580.1.1:2007 as they are located in a bushland setting under the canopy of tall trees. The purpose of these gauges, however, is to determine the level of dust present at each location to aid in study of the Purple Copper Butterfly population.

2.3.2 HVAS PARTICULATE MATTER RESULTS

HVAS Total Suspended Particulate (TSP) results for the period January – December 2013 show an average result of 26.2μg/m^3, which is well below the nominated annual average assessment a criterion of 90μg/m^3 for total suspended particulates. During the reporting period there were six run events in which a programming error caused the TSP unit to run for greater than the quality assurance period of twenty four hours ± one hour as stipulated in AS3580.9.3.

Similarly, the HVAS particulate matter results <10μm (PM_{10}) also show results within the required *Air Quality Monitoring Program* assessment criteria. The average PM_{10} result was 12.7μg/m^3, which is below the annual average PM_{10} assessment criteria of 30μg/m^3. There was one elevated recording which occurred on the 18th October 2013 whereby the result recorded was greater than the OEH 24 hour maximum assessment criteria of 50μg/m3. This elevated result of 85μg/m^3 was recorded during a period in which severe local bushfires including the "State Mine Fire" surrounding Lithgow and Bells Line of Road were present. As such, this elevated result is not deemed and exceedance of the assessment criteria as the circumstances leading to the elevated result was not a consequence of the Pine Dale Mine operations.

During the reporting period there were two run events in which a programming error caused the PM_{10} unit to run outside of the quality assurance run period of twenty four hours ± one hour as stipulated in AS3580.9.6. One sample (7th August 2013), was deemed invalid upon inspection of the filter paper at the laboratory as a section of the filter paper (corner) was found to be missing.

3 GROUNDWATER QUALITY MONITORING

3.1 GROUNDWATER ASSESSMENT CRITERIA

The purpose of groundwater monitoring is to ensure that any impact of the mining operations on the local groundwater can be identified. The site specific Trigger Values developed for the Pine Dale Mine, as stipulated in the sites' *Water Management Plan* in accordance with Schedule 3, Condition 27(c) of the Project Approval (PA 10_0041) are currently under review, therefore the Trigger Level values presented in the previous version of the sites' *Groundwater Monitoring Program* (Dec 2005) have been adopted for the purpose of compliance assessment in this report. The adopted Action Threshold values are shown in **Table 15**.

Table 15 *Groundwater Trigger Levels*

Bore	pH	Electrical Conductivity (μS/cm)	Dissolved Iron* (Fe, mg/L)	
			Baseline Average (Oct 05 to Dec 06)	Calculated Trigger Level
P2	<4.0 or >8.5	2000	7.6	11.5
P3			4.7	7.0
P4			12.0	18.0
P6			20.3	30.4
P7			0.82	1.1
P7a			7.3	9.5
EP DDH4/GW			NA	NA
EP DDH7/GW			NA	NA
EP PDH1/GW			NA	NA
EP PDH3/GW			NA	NA
EP PDH4/GW			NA	NA
EP PDH7/GW			NA	NA
EP PDH8/GW			NA	NA
Old ventilation shaft			NA	NA
The Bong			NA	NA

NA – baseline data not available for this monitoring period at these locations.

* >50% increase on baseline concentration; and >30% increase on baseline concentration for Bores P7 & P7a

A summary of the water level trigger values, as presented in the sites' current *Water Management Plan* are presented in **Table 16**.

Table 16 *Trigger Levels for Groundwater Depth Levels*

Site ID	10% of Saturated Aquifer Thickness	Minimum Water Level Reported (m AHD)	Trigger Water Level (m AHD)
P2	0.2	888.1	887.9
P3	0.1	884.9	884.8
P7	1.72	885.1	883.38
EP DDH3/GW Irondale Lidsdale Marrangarroo	 0.1 0.17 0.7	 908.34 892.24 890.75	 908.24 892.07 890.05
EP DDH4/GW	0.5	944.38	943.88
EP DDH5/GW Sandstone Irondale Lidsdale	 0 0.2 0.2	 921.23 911.38 898.24	 921.23 911.18 898.04
EP DDH6/GW Irondale	 0.1	 882	 881.9
EP DDH7/GW	0.9	953.66	952.76
EP PDH7/GW	0.12	939.66	939.54

3.2 GROUNDWATER MONITORING DATA SUMMARY

Groundwater monitoring for the Pine Dale Mine is undertaken in accordance with the *Groundwater Monitoring Program (December 2005),* the *Water Management Plan (July 2011)* and the *Baseline Water Monitoring Program (July 2011).* Sampling is conducted at a total of eight locations within the mine site; a further seven locations surrounding the Yarraboldy Extension area; and two locations at the former Enhance Place Mine Site (refer Drawing 1, **Appendix 1**.). Groundwater monitoring is not a requirement of EPL 4911.

Groundwater summary results for the period January – December 2013 are shown in **Tables 17** to **28**. Graphical presentations of standing water levels are shown in **Figures 4** to **6**.

It should be noted the sampling regime was altered after 1 August 2013 with the cessation of baseline monitoring (bores P6 and Old Shaft). The number of groundwater sampling locations was also reduced to bring the sampling program into line with the current *Water Management Plan (July 2011).*

No samples were collected from the site groundwater bores P4 and PDH8 during the 2013 period. Bore P4 was found to be dry during the monitoring period, whilst bore PDH8 was removed as it was located within the active mining area.

Three of the groundwater bores located off-site have vibrating wire piezometers installed within them, hence, no samples were retrieved from these bores.

Table 17 *Groundwater Monitoring Bore P2 Results Jan - Dec 2013*

Location	Site Bore P2							
Sample Number	01136880019	02136880019	03136880019	04136880019	05136880019	06136880019	07136880019	**Trigger Levels**
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	
Date Sampled	23/01/13	20/02/13	20/03/13	22/04/13	22/05/13	24/06/13	25/07/13	
Time Sampled	8:50	15:42	16:10	17:20	13:20	9:25	17:07	
Standing Water Level (m)	5.54	5.15	4.80	5.10	5.34	5.35	5.29	
Standpipe Height (m)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Relative Standing Water Level (m)	4.59	4.20	3.85	4.15	4.39	4.40	4.34	
Water level AHD (m)	890.79	891.18	891.53	891.23	890.99	890.98	891.04	**887.9**[#]
pH (pH units)	4.9	4.8	4.7	5.1	5.0	4.8	4.6	**<4.5 or >8.5**
Conductivity (µS/cm)	311	262	234	241	246	255	279	**2000**
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	--	--	<1	--	--	--	
Total Alkalinity (mg/L $CaCO_3$)	--	--	--	<1	--	--	--	
Sulphate (mg/L)	--	--	--	82	--	--	--	
Chloride (mg/L)	--	--	--	7	--	--	--	
Calcium (mg/L)	--	--	--	10	--	--	--	
Magnesium (mg/L)	--	--	--	8	--	--	--	
Sodium (mg/L)	--	--	--	14	--	--	--	
Potassium (mg/L)	--	--	--	4	--	--	--	
Filtered Iron (mg/L)	--	0.125	--	1.22	--	1.04	--	**11.5**

--- Indicates no sampling required during particular period.

Standing Water Level is considered outside of the Trigger Level if the AHD water level drops below the nominated trigger level.

Table 18 *Groundwater Monitoring Bore P3 Results Jan - Dec 2013*

Location	Site Bore P3							
Sample Number	01136880020	02136880020	03136880020	04136880020	05136880020	06136880020	07136880020	**Trigger Levels**
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	
Date Sampled	23/01/13	20/02/13	20/03/13	22/04/13	22/05/13	24/06/13	25/07/13	
Time Sampled	8:55	15:37	16:07	17:14	13:10	9:20	17:02	
Standing Water Level (m)	6.10	5.72	5.44	5.78	6.00	6.07	6.00	
Standpipe Height (m)	0.66	0.66	0.66	0.66	0.66	0.66	0.66	
Relative Standing Water Level (m)	5.44	5.06	4.78	5.12	5.34	5.41	5.34	
Water Level AHD (m)	887.56	887.94	888.22	887.88	887.66	887.59	887.66	**884.8#**
pH (pH units)	4.8	4.5	4.6	4.8	5.0	4.5	4.7	**<4.5 or >8.5**
Conductivity (µS/cm)	676	433	474	604	622	640	597	**2000**
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	--	--	<1	--	--	--	
Total Alkalinity (mg/L $CaCO_3$)	--	--	--	<1	--	--	--	
Sulphate (mg/L)	--	--	--	227	--	--	--	
Chloride (mg/L)	--	--	--	11	--	--	--	
Calcium (mg/L)	--	--	--	34	--	--	--	
Magnesium (mg/L)	--	--	--	26	--	--	--	
Sodium (mg/L)	--	--	--	27	--	--	--	
Potassium (mg/L)	--	--	--	8	--	--	--	
Filtered Iron (mg/L)	--	0.79	--	2.83	--	1.72	--	**7.0**

--- Indicates no sampling required during particular period.

Standing Water Level is considered outside of the Trigger Level if the AHD water level drops below the nominated trigger level.

Table 19 *Groundwater Monitoring Bore P6 Results Jan - Dec 2013*

Location	Site Bore P6												
Sample Number	01136880010	02136880010	03136880010	04136880010	05136880010	06136880010	07136880010	08136880017	09136880014	10136880014	11136880016	12136880014	
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Date Sampled	22/01/13	20/02/13	20/03/13	22/04/13	22/05/13	24/06/13	25/07/13	26/08/13	25/09/13	30/10/13	20/11/2013	18/12/13	
Time Sampled	17:05	14:33	15:06	16:00	11:35	16:08	15:45	16:00	14:40	13:55	15:53	14:50	
Standing Water Level (m)	27.03	26.81	26.58	26.81	26.78	26.81	26.80	26.88	26.86	27.05	27.04	27.20	**Trigger Levels**
Standpipe Height	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
Relative Standing Water Level (m)	26.08	25.86	25.63	25.86	25.83	25.86	25.85	25.93	25.91	26.10	26.09	26.25	
Water Level AHD (m)	890.87	891.09	891.32	891.09	891.12	891.09	891.10	891.02	891.04	890.85	890.86	890.70	
Temperature (°C)	17.0	19.3	19.3	15.0	14.0	15.0	14.5	22.0	17.0	17.0	15.5	15.0	
pH	6.9	6.6	7.1	6.9	6.4	6.1	6.3	6.3	6.4	6.5	6.7	6.3	**<4.5 or >8.5**
Conductivity (µS/cm)	804	992	968	1000	1072	1177	1140	1106	1204	1112	1161	1183	**2000**
Turbidity (NTU)	11.3	21.1	23.1	20.0	25.5	65.3	134	45	13	21	21	5	
Dissolved Oxygen (mg/L)	3.4	6.2	5.0	9.7	4.0	3.8	2	8.3	4.8	7.1	5.4	5	
TSS (mg/L)	24	25	29	30	19	45	28	33	26	28	50	16	
Oil & Grease (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Bicarbonate Alkalinity	64	68	51	48	63	42	46	52	38	49	52	44	
Total Alkalinity	64	68	51	48	63	42	46	52	38	49	52	44	
Sulphate	421	461	421	448	484	494	460	486	497	520	493	560	
Chloride	16	14	14	18	13	20	20	15	24	25	30	24	
Calcium	110	96	106	104	113	106	117	106	117	115	117	106	
Magnesium	50	50	46	46	52	50	50	50	54	54	53	51	
Sodium	32	33	30	31	33	32	40	35	35	38	43	40	
Potassium	19	19	19	20	20	19	21	20	20	22	22	21	
Cobalt (dissolved)	0.089	0.079	0.080	0.076	0.091	0.097	0.084	0.08	0.091	0.094	0.082	0.051	
Manganese (dissolved)	2.91	3.30	3.41	3.10	2.88	3.54	3.08	2.96	3.09	3.60	2.98	2.05	
Nickel (dissolved)	0.138	0.129	0.126	0.134	0.135	0.135	0.127	0.130	0.139	0.126	0.125	0.072	
Zinc (dissolved)	0.142	0.250	0.092	0.248	0.103	0.166	0.363	0.406	0.210	0.170	0.270	0.008	
Iron (dissolved)	22.1	16.4	21.6	11.6	24.7	24.2	14.6	20.1	22.4	25.0	19.7	19.2	**30.4**

Table 20 *Groundwater Monitoring Bore P7 Results Jan - Dec 2013*

Location	Site Bore P7												
Sample Number	01136880021	0213688002	03136880021	04136880021	05136880021	06136880021	07136880021	08136880018	09136880015	10136880015	11136880017	12136880015	
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Date Sampled	23/01/13	20/02/13	20/03/13	22/04/13	22/05/13	24/06/13	25/07/13	26/08/13	25/09/13	30/10/13	20/11/13	18/12/13	
Time Sampled	8:25	14:45	15:49	16:15	11:55	8:57	16:35	16:21	15:51	15:05	16:48	16:50	**Trigger Levels**
Standing Water Level (m)	8.44	7.96	7.56	7.70	7.78	7.83	7.68	7.46	7.49	7.65	7.55	7.60	
Standpipe Height (m)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Relative Standing Water Level (m)	7.44	6.96	6.56	6.70	6.78	6.83	6.68	6.46	6.49	6.65	6.55	6.60	
Water Level AHD (m)	886.96	887.44	887.84	887.70	887.62	887.57	887.72	887.94	887.91	887.75	887.85	887.80	**883.4**[#]
Temperature (°C)	15.5	16.3	15.8	15.0	7.3	13.5	15.0	22.5	14.5	15.0	14.0	15.0	
pH (pH units)	6.4	7.1	7.5	6.9	7.3	6.2	6.3	6.3	6.7	7.1	7.6	7.3	**<4.5 or >8.5**
Conductivity (µS/cm)	773	717	741	779	762	813	746	766	779	787	822	902	**2000**
Total Alkalinity (mg/L $CaCO_3$)	--	--	--	197	--	--	--	205	--	--	211	--	
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	--	--	197	--	--	--	205	--	--	211	--	
Chloride (mg/L)	--	--	--	76	--	--	--	77	--	--	76	--	
Sulphate (mg/L)	--	--	--	96	--	--	--	84	--	--	95	--	
Calcium (mg/L)	--	--	--	44	--	--	--	40	--	--	45	--	
Magnesium (mg/L)	--	--	--	49	--	--	--	44	--	--	47	--	
Sodium (mg/L)	--	--	--	44	--	--	--	45	--	--	49	--	
Potassium (mg/L)	--	--	--	9	--	--	--	8	--	--	9	--	
Filtered Iron (mg/L)	--	<0.05	--	<0.05	--	<0.05	--	<0.05	--	--	4.18	--	**1.1**

Indicates results are outside the Trigger Level. --- Indicates no sampling required during particular period.

Standing Water Level is considered outside of the Trigger Level if the AHD water level drops below the nominated trigger level.

Table 21 *Groundwater Monitoring Bore P7a Results Jan - Dec 2013*

Location	Site Bore P7a							
Sample Number	01136880022	02136880022	03136880022	04136880022	05136880022	06136880022	07136880022	
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	
Date Sampled	23/01/13	20/02/13	20/03/13	22/04/13	22/05/13	24/06/13	25/07/13	
Time Sampled	8:30	14:50	15:55	16:20	12:00	9:07	16:42	
Standing Water Level (m)	6.45	6.06	5.58	5.76	5.94	6.04	5.95	
Standpipe Height (m)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Relative Standing Water Level (m)	5.55	5.16	4.68	4.86	5.04	5.14	5.05	
Water Level AHD (m)	889.80	890.19	890.67	890.49	890.31	890.21	890.30	
pH (pH units)	6.4	6.8	7.1	6.8	7.2	6.0	6.3	**<4.5 or >8.5**
Conductivity (µS/cm)	841	773	815	847	984	902	881	**2000**
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	--	--	202	--	--	--	
Total Alkalinity (mg/L $CaCO_3$)	--	--	--	202	--	--	--	
Chloride (mg/L)	--	--	--	47	--	--	--	
Sulphate (mg/L)	--	--	--	136	--	--	--	
Calcium (mg/L)	--	--	--	52	--	--	--	
Magnesium (mg/L)	--	--	--	51	--	--	--	
Sodium (mg/L)	--	--	--	45	--	--	--	
Potassium (mg/L)	--	--	--	12	--	--	--	
Filtered Iron (mg/L)	--	3.74	--	2.14	--	2.05	--	**9.5**

Trigger Levels

--- Indicates no sampling required during particular period.

Table 22 *Groundwater Monitoring Bore Old Shaft Results Jan - Dec 2013*

Location	Site Bore 'Old Shaft'												
Sample Number	1136880011	02136880011	03136880011	04136880011	05136880011	06136880011	7136880011	08136880006	09136880018	10136880018	11136880020	12136880018	
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Date Sampled	22/01/13	20/02/13	20/03/13	22/04/13	22/05/13	24/06/13	25/07/2013	26/08/13	25/09/13	31/10/2013	20/11/13	18/12/2013	
Time Sampled	16:45	13:47	14:46	11:15	11:45	15:35	15:17	15:17	14:20	8:51	15:12	14:14	**Trigger Levels**
Standing Water Level (m)	13.3	13.1	12.81	12.85	13.18	13.07	11.37	13.14	13.14	13.33	13.32	13.42	
Standpipe Height (m)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	
Relative Standing Water Level (m)	11.6	11.4	11.11	11.15	11.48	11.37	11.67	11.44	11.44	11.63	11.62	11.72	
Temperature (°C)	16.5	17.0	17.3	15.8	14.0	10.0	15.0	21.0	16.0	15	16.5	16	
pH (pH units)	7.7	7.1	7.0	6.7	7.2	6.4	6.3	6.6	6.6	7.2	7.1	6.3	**<4.5 or >8.5**
Conductivity (µS/cm)	456	612	581	699	648	680	722	748	793	1147	859	861	**2000**
Turbidity (NTU)	38.1	12.6	18.8	15.8	39.9	27.6	110	38	32	48	18	16	
Dissolved Oxygen (mg/L)	5.4	5.0	8.2	4.7	1.5	3.1	4.3	4.1	--	--	5.79	--	
TSS (mg/L)	18	27	19	9	18	21	79	22	--	--	59	--	
Oil & Grease (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	--	--	<2	--	
Bicarbonate Alkalinity (mg/L $CaCO_3$)	70	68	72	71	78	70	82	64	--	--	53	--	
Total Alkalinity (mg/L $CaCO_3$)	70	68	72	71	78	70	82	64	--	--	53	--	
Chloride (mg/L)	201	198	204	227	207	447	279	300	--	--	364	--	
Sulphate (mg/L)	10	11	9	16	9	12	10	9	--	--	21	--	
Calcium (mg/L)	44	39	58	46	52	102	61	62	--	--	79	--	
Magnesium (mg/L)	20	22	22	23	26	51	28	30	--	--	36	--	
Sodium (mg/L)	16	19	19	20	23	42	26	24	--	--	30	--	
Potassium (mg/L)	10	10	11	12	13	24	13	14	--	--	15	--	
Filtered Cobalt (mg/L)	0.101	0.095	0.094	0.086	0.090	0.107	0.108	0.113	--	--	0.178	--	
Filtered Manganese (mg/L)	4.64	5.760	5.930	5.820	5.560	6.490	6.18	6.000	--	--	6.98	--	
Filtered Nickel (mg/L)	0.114	0.110	0.104	0.107	0.109	0.120	0.129	0.137	--	--	0.174	--	
Filtered Zinc (mg/L)	0.117	0.100	0.110	0.083	0.151	0.095	0.102	0.091	--	--	0.07	--	
Filtered Iron (mg/L)	21.2	22.10	26.60	24.20	26.10	26.70	24.4	22.00	--	--	14.6	--	

--- Indicates no sampling required during particular period.

Table 23 *Groundwater Monitoring Bore A (EP DDH77/GW) Results Jan - Dec 2013*

Location	Off-Site Bore A (EP DDH7/GW)												
Sample Number	01136880023	02136880023	03136880023	04136880023	05136880023	06136880023	07136880023	08136880019	09136880019	10136880019	11136880021	12136880019	
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Date Sampled	22/01/2013	20/02/2013	20/03/2013	22/04/2013	22/05/2013	24/06/2013	25/07/2013	26/08/2013	25/09/2013	31/10/2013	20/11/2013	18/12/2013	**Trigger Levels**
Standing Water Level (m)	68.7	68.67	68.08	68.23	68.41	68.6	68.72	68.78	68.84	68.93	68.93	68.99	
Standpipe Height (m)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
Relative Standing Water Level (m)	67.95	67.92	67.33	67.48	67.66	67.85	67.97	68.03	68.09	68.18	68.18	68.24	
Water level AHD (m)	955.85	955.88	956.47	956.32	956.14	955.95	955.83	955.77	955.71	955.62	955.62	955.56	**952.8#**
pH	--	--	6.50	--	--	6.50	--	--	7.14	--	--	7.10	**<4.5 or >8.5**
Conductivity (µS/cm)	--	--	287	--	--	253	--	--	228	--	--	347	**2000**
Temperature (°C)	--	--	19.7	--	--	14.0	--	--	17	--	--	16	
TDS (mg/L)	--	--	165	--	--	134	--	--	141	--	--	201	
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	--	90	--	--	82	--	--	84	--	--	114	
Total Alkalinity (mg/L $CaCO_3$)	--	--	90	--	--	82	--	--	84	--	--	114	
Sulfate (mg/L)	--	--	10	--	--	8	--	--	6	--	--	4	
Chloride (mg/L)	--	--	6	--	--	10	--	--	7	--	--	14	
Calcium (mg/L)	--	--	20	--	--	16	--	--	19	--	--	17	
Magnesium (mg/L)	--	--	8	--	--	7	--	--	8	--	--	6	
Sodium (mg/L)	--	--	6	--	--	6	--	--	6	--	--	7	
Potassium (mg/L)	--	--	14	--	--	14	--	--	15	--	--	22	
Filtered Arsenic (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Cadmium (mg/L)	--	--	0.0002	--	--	0.0015	--	--	0.0007	--	--	<0.0001	
Filtered Chromium (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Copper (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Lead (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Nickel (mg/L)	--	--	0.001	--	--	<0.001	--	--	0.001	--	--	0.004	
Filtered Zinc (mg/L)	--	--	0.026	--	--	0.028	--	--	0.042	--	--	0.011	
Filtered Iron (mg/L)	--	--	<0.05	--	--	<0.05	--	--	<0.05	--	--	8.53	

--- Indicates no sampling required during particular period.

Standing Water Level is considered outside of the Trigger Level if the AHD water level drops below the nominated trigger level.

Table 24 *Groundwater Monitoring Bore C (EP PDH1/GW) Results Jan - Dec 2013*

Location	Off-Site Bore C (EP PDH1/GW)												
Sample Number	01136880025	02136880025	03136880025	04136880025	05136880025	06136880025	07136880025	08136880021	09136880021	10136880021	11136880023	12136880021	
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Date Sampled	23/01/2013	20/02/2013	20/03/2013	22/04/2013	22/05/2013	24/06/2013	26/07/2013	26/08/2013	25/09/2013	31/10/2013	20/11/2013	18/12/2013	**Trigger Levels**
Standing Water Level (m)	76.28	76.05	75.8	75.84	76.01	76.04	76.05	76.11	78.13	76.29	76.25	76.37	
Standpipe Height (m)	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	
Relative Standing Water Level (m)	75.54	75.31	75.06	75.1	75.27	75.3	75.31	75.37	77.39	75.55	75.51	75.63	
Water level AHD (m)	891.96	892.19	892.44	892.4	892.23	892.2	892.19	892.13	890.11	891.95	891.99	891.87	**890.1**[#]
pH	--	--	7.2	--	--	6.7	--	--	7.0	--	--	6.9	**<4.5 or >8.5**
Conductivity (µS/cm)	--	--	431	--	--	455	--	--	598	--	--	319	**2000**
Temperature (°C)	--	--	21.8	--	--	17.5	--	--	19	--	--	19	
TDS (mg/L)	--	--	286	--	--	278	--	--	319	--	--	197	
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	--	154	--	--	154	--	--	165	--	--	137	
Total Alkalinity (mg/L $CaCO_3$)	--	--	154	--	--	154	--	--	165	--	--	137	
Sulfate (mg/L)	--	--	36	--	--	50	--	--	65	--	--	4	
Chloride (mg/L)	--	--	9	--	--	11	--	--	12	--	--	12	
Calcium (mg/L)	--	--	42	--	--	47	--	--	55	--	--	34	
Magnesium (mg/L)	--	--	13	--	--	14	--	--	17	--	--	9	
Sodium (mg/L)	--	--	13	--	--	14	--	--	14	--	--	7	
Potassium (mg/L)	--	--	14	--	--	14	--	--	17	--	--	12	
Filtered Arsenic (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Cadmium (mg/L)	--	--	0.0002	--	--	0.0006	--	--	0.0007	--	--	<0.0001	
Filtered Chromium (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Copper (mg/L)	--	--	<0.001	--	--	<0.001	--	--	0.001	--	--	<0.001	
Filtered Lead (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Nickel (mg/L)	--	--	0.001	--	--	<0.001	--	--	0.002	--	--	0.002	
Filtered Zinc (mg/L)	--	--	0.024	--	--	0.02	--	--	0.033	--	--	0.016	
Filtered Iron (mg/L)	--	--	<0.05	--	--	<0.05	--	--	<0.05	--	--	<0.05	

--- Indicates no sampling required during particular period.

Standing Water Level is considered outside of the Trigger Level if the AHD water level drops below the nominated trigger level.

Table 25 *Groundwater Monitoring Bore D (EP DDH4/GW) Results Jan - Dec 2013*

Location	Off-Site Bore D (EP DDH4/GW)												
Sample Number	01136880026	02136880026	03136880026	04136880026	05136880026	06136880026	07136880026	08136880022	09136880022	10136880022	11136880024	12136880022	
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Date Sampled	23/01/2013	20/02/2013	20/03/2013	22/04/2013	22/05/2013	24/06/2013	26/07/2013	26/08/2013	25/09/2013	31/10/2013	20/11/2013	18/12/2013	
Standing Water Level (m)	36.59	35.75	35.15	37	36.92	36.32	37.06	36.93	36.82	37.03	37.23	37.33	**Trigger Levels**
Standpipe Height (m)	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	
Relative Standing Water Level (m)	35.88	35.04	34.44	36.29	36.21	35.61	36.35	36.22	36.11	36.32	36.52	36.62	
Water level AHD (m)	942.62	943.46	944.06	942.21	942.29	942.89	942.15	942.28	942.39	942.18	941.98	941.88	**943.9#**
pH	--	--	7.1	--	--	7.0	--	--	7.29	--	--	6.91	**<4.5 or >8.5**
Conductivity (µS/cm)	--	--	386	--	--	419	--	--	609	--	--	524	**2000**
Temperature (°C)	--	--	21.0	--	--	13.0	--	--	17.5	--	--	17	
TDS (mg/L)	--	--	302	--	--	308	--	--	310	--	--	345	
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	--	146	--	--	165	--	--	189	--	--	202	
Total Alkalinity (mg/L $CaCO_3$)	--	--	146	--	--	165	--	--	189	--	--	202	
Sulfate (mg/L)	--	--	18	--	--	21	--	--	23	--	--	25	
Chloride (mg/L)	--	--	10	--	--	13	--	--	13	--	--	12	
Calcium (mg/L)	--	--	2	--	--	2	--	--	3	--	--	1	
Magnesium (mg/L)	--	--	<1	--	--	<1	--	--	1	--	--	<1	
Sodium (mg/L)	--	--	78	--	--	92	--	--	101	--	--	103	
Potassium (mg/L)	--	--	6	--	--	5	--	--	6	--	--	6	
Filtered Arsenic (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	0.003	
Filtered Cadmium (mg/L)	--	--	0.0001	--	--	0.0014	--	--	0.0003	--	--	<0.0001	
Filtered Chromium (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Copper (mg/L)	--	--	0.002	--	--	0.003	--	--	0.012	--	--	0.001	
Filtered Lead (mg/L)	--	--	<0.001	--	--	0.004	--	--	<0.001	--	--	<0.001	
Filtered Nickel (mg/L)	--	--	0.002	--	--	0.002	--	--	0.003	--	--	0.006	
Filtered Zinc (mg/L)	--	--	0.019	--	--	0.132	--	--	0.069	--	--	0.062	
Filtered Iron (mg/L)	--	--	0.1	--	--	0.69	--	--	0.06	--	--	2.43	

Indicates results are outside the Trigger Level. --- Indicates no sampling required during particular period.

Standing Water Level is considered outside of the Trigger Level if the AHD water level drops below the nominated trigger level.

Table 26 *Groundwater Monitoring Bore E (EP PDH7/GW) Results Jan - Dec 2013*

Location	Off-Site Bore E (EP PDH7/GW)												
Sample Number	01136880027	02136880027	03136880027	04136880027	05136880027	06136880027	07136880027	08136880023	09136880023	10136880023	11136880025	12136880023	
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Date Sampled	22/01/2013	20/02/2013	20/03/2013	22/04/2013	22/05/2013	24/06/2013	25/07/2013	26/08/2013	25/09/2013	30/10/2013	20/11/2013	18/12/2013	**Trigger Levels**
Standing Water Level (m)	15.58	15.28	15.33	15.47	15.48	15.51	15.54	15.55	15.5	15.57	15.59	15.6	
Standpipe Height (m)	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	
Relative Standing Water Level (m)	14.85	14.55	14.6	14.74	14.75	14.78	14.81	14.82	14.77	14.84	14.86	14.87	
Water level AHD (m)	940.05	940.35	940.3	940.16	940.15	940.12	940.09	940.08	940.13	940.06	940.04	940.03	**939.5**[#]
pH	--	--	5.5	--	--	5.9	--	--	5.8	--	--	6.3	**<4.5 or >8.5**
Conductivity (µS/cm)	--	--	127	--	--	106	--	--	136	--	--	112	**2000**
Temperature (°C)	--	--	19.1	--	--	13.0	--	--	17	--	--	16	
TDS (mg/L)	--	--	150	--	--	60	--	--	13	--	--	260	
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	--	16	--	--	14	--	--	11	--	--	17	
Total Alkalinity (mg/L $CaCO_3$)	--	--	16	--	--	14	--	--	11	--	--	17	
Sulfate (mg/L)	--	--	7	--	--	5	--	--	3	--	--	6	
Chloride (mg/L)	--	--	8	--	--	12	--	--	9	--	--	14	
Calcium (mg/L)	--	--	<1	--	--	<1	--	--	<1	--	--	<1	
Magnesium (mg/L)	--	--	2	--	--	2	--	--	1	--	--	<1	
Sodium (mg/L)	--	--	8	--	--	7	--	--	7	--	--	7	
Potassium (mg/L)	--	--	5	--	--	6	--	--	5	--	--	4	
Filtered Arsenic (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Cadmium (mg/L)	--	--	0.0001	--	--	0.0005	--	--	0.0002	--	--	<0.0001	
Filtered Chromium (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Copper (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Lead (mg/L)	--	--	<0.001	--	--	<0.001	--	--	<0.001	--	--	<0.001	
Filtered Nickel (mg/L)	--	--	0.002	--	--	0.001	--	--	<0.001	--	--	<0.001	
Filtered Zinc (mg/L)	--	--	0.04	--	--	0.08	--	--	0.018	--	--	0.026	
Filtered Iron (mg/L)	--	--	4.13	--	--	5.53	--	--	4.89	--	--	5.21	

--- Indicates no sampling required during particular period.

Standing Water Level is considered outside of the Trigger Level if the AHD water level drops below the nominated trigger level.

Table 27 *Groundwater Monitoring Bore - EP PDH3/GW Results Jan - Dec 2013*

Location	Enhance Place Bore EP PDH3/GW											
Sample Number	01136880029	02136880029	03136880029	04136880029	05136880029	061367880029	07136880029	08136880024	09136880016	10136880016	11136880018	12136880016
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Date Sampled	22/01/2013	21/02/2013	21/03/2013	23/04/2013	23/05/2013	24/06/2013	25/07/2013	26/08/2013	25/09/2013	31/10/2013	20/11/2013	18/12/2013
Standing Water Level (m)	23.86	23.84	23.82	23.84	23.84	23.85	23.85	23.86	23.84	23.88	23.86	23.89
Standpipe Height	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Relative Standing Water Level (m)	23.14	23.12	23.1	23.12	23.12	23.13	23.13	23.14	23.12	23.16	23.14	23.17
Water Level AHD (m)	892.86	892.88	892.9	892.88	892.88	892.87	892.87	892.86	892.88	892.84	892.86	892.83

Table 28 *Groundwater Monitoring Bore - EP PDH4/GW Results Jan - Dec 2013*

Location	Enhance Place Bore EP PDH4/GW											
Sample Number	01136880030	02136880030	03136880030	04136880030	05136880030	06136880030	07136880030	08136880025	09136880017	10136880017	11136880019	12136880017
Sampling Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Date Sampled	22/01/2013	21/02/2013	21/03/2013	23/04/2013	23/05/2013	24/06/2013	25/07/2013	26/08/2013	25/09/2013	31/10/2013	20/11/2013	18/12/2013
Standing Water Level (m)	23.95	22.93	23.94	23.94	23.95	23.96	23.93	23.94	23.95	23.94	23.99	24
Standpipe Height	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Relative Standing Water Level (m)	23.24	23.22	23.23	23.23	23.24	23.25	23.22	23.23	23.24	23.23	23.28	23.29
Water Level AHD (m)	892.84	893.86	892.85	892.85	892.84	892.83	892.86	892.85	892.84	892.85	892.8	892.79

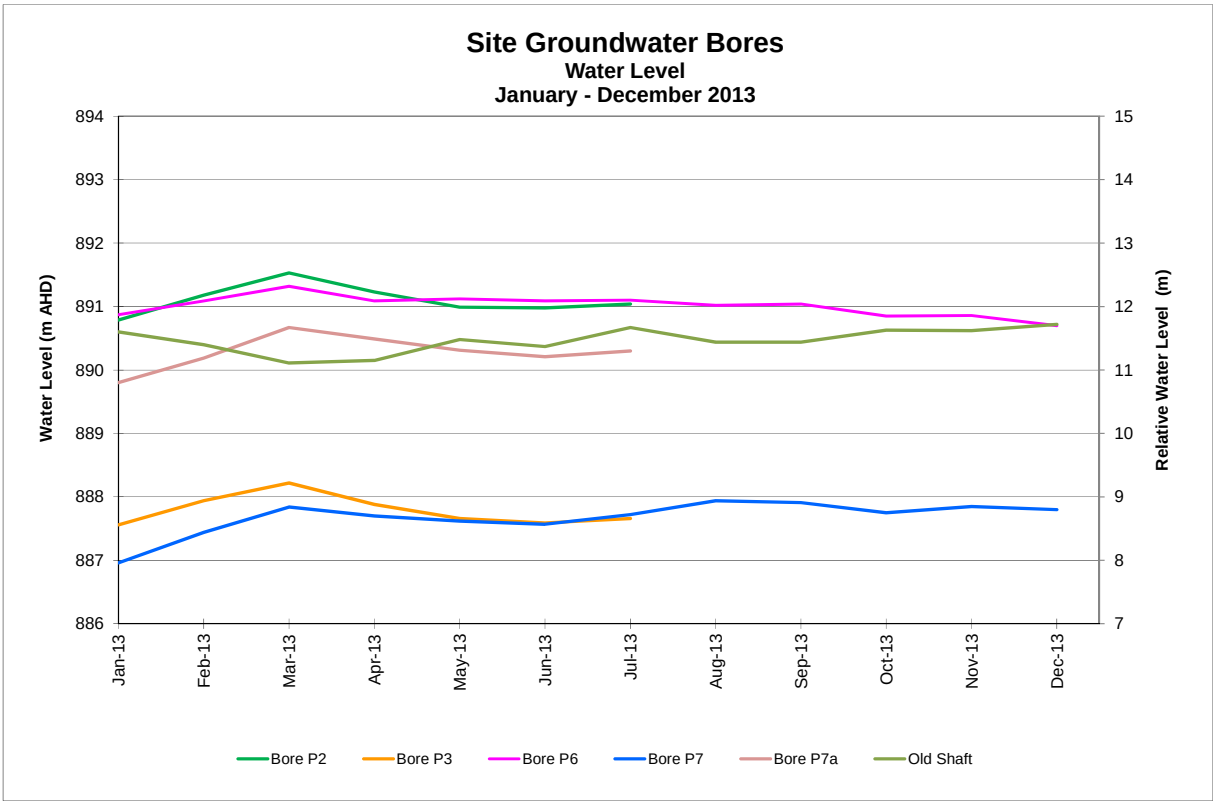


Figure 4 *Site Groundwater Monitoring Bore Depths 2013*

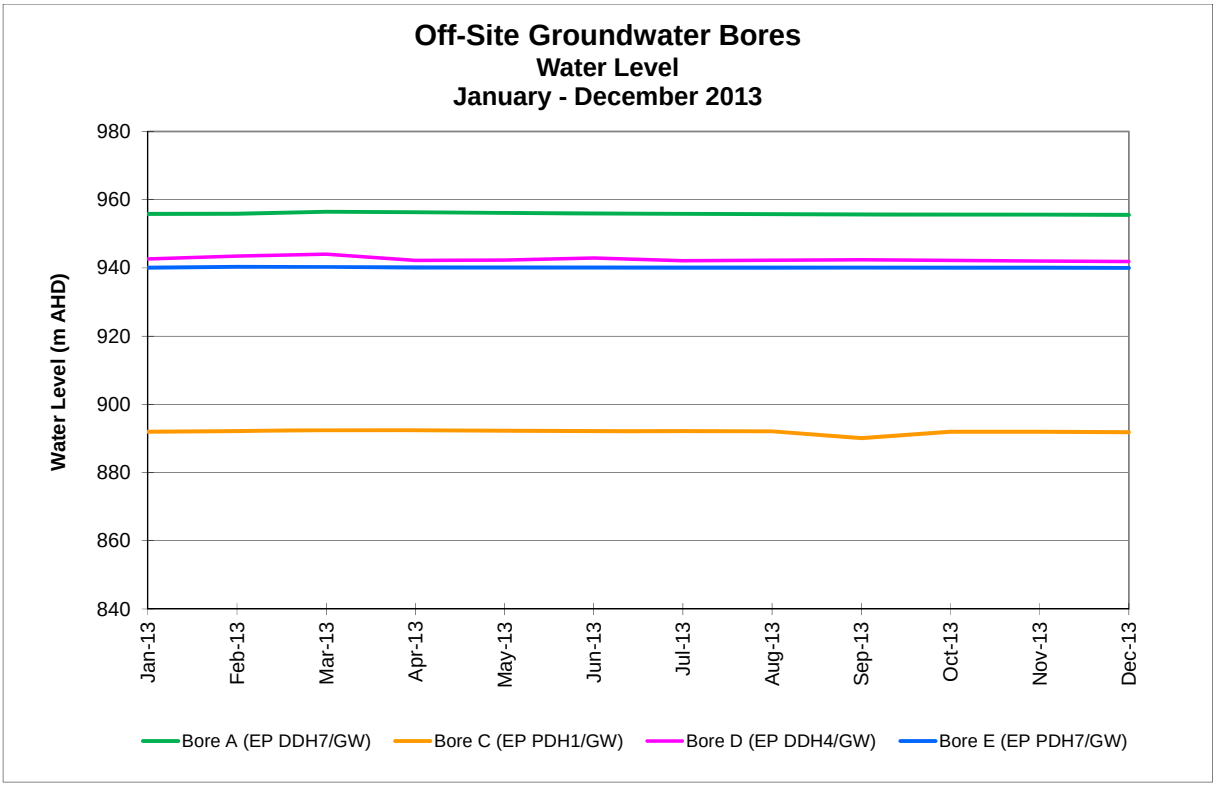


Figure 5 *Off-Site Groundwater Monitoring Bore Depths 2013*

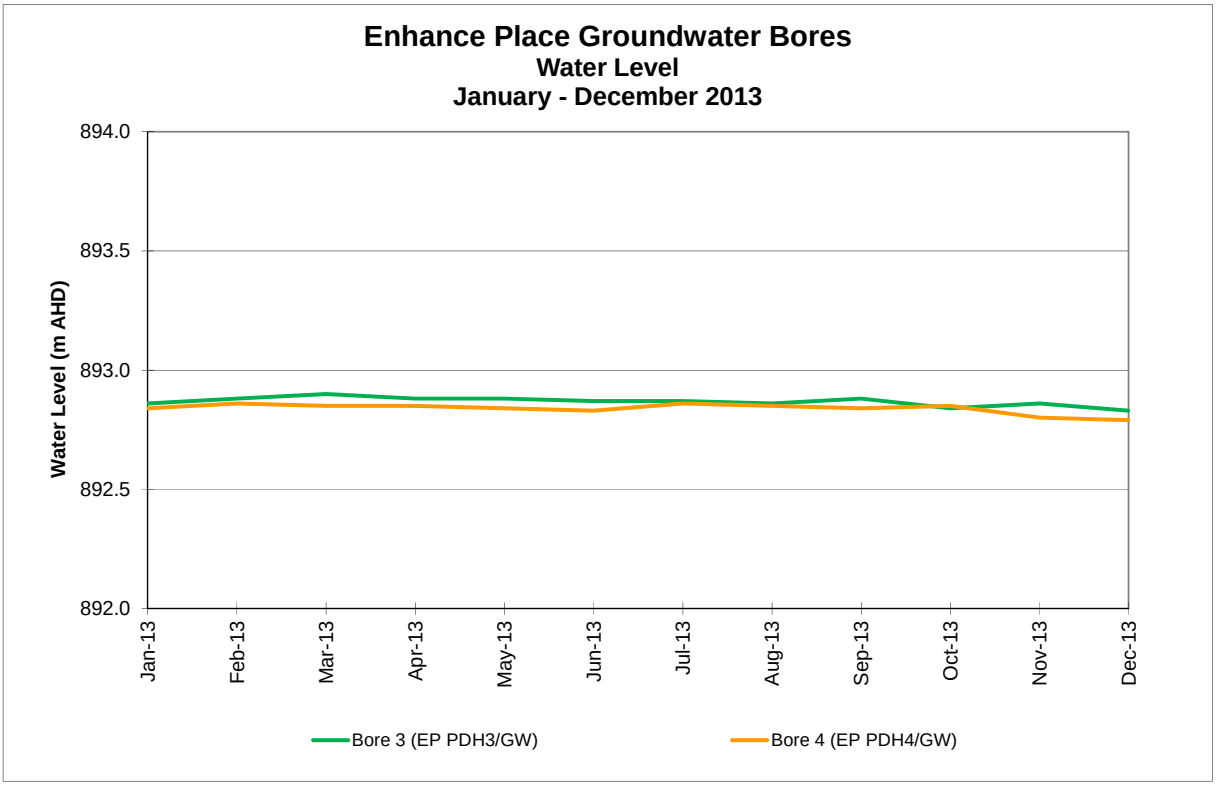


Figure 6 *Enhance Place Groundwater Monitoring Bore Depth 2013*

3.3 REVIEW & INTERPRETATION OF GROUND WATER MONITORING RESULTS

3.3.1 SITE GROUNDWATER BORES

Groundwater samples collected from the on-site groundwater bores during the January – December 2013 period generally show water quality results which are consistent throughout the monitoring period. Water quality within the site bores was shown to be compliant with the trigger levels for key water monitoring parameters pH and EC, as nominated in the *Groundwater Monitoring Program*. Trigger levels for filtered iron were shown to be compliant at all bores except Bore P7 during the 2013 monitoring period. A single elevated filtered iron concentration (4.18mg/L) was recorded at site Bore P7 during November 2013. Although the concentration of samples collected from this bore during February, April, June and August 2013 exhibit filtered iron results which were less than laboratory detection limits, Bore P7 has historically exhibited fluctuating filtered iron concentrations ranging from less than laboratory detection (<0.05mg/L) to a maximum of 5.14mg/L, which was observed in April 2010.

All site bores exhibited standing water levels which were consistent throughout the 2013 monitoring period. Trigger levels for water depth were shown to be compliant at all of the on-site groundwater bores during the 2013 monitoring period with the exception of Bore D, which exhibited water levels which were slightly below the Standing Water Level trigger. Bore D, however, has shown consistent surface water levels throughout the 2013 monitoring period. The decrease in water level observed at Bore D may be attributed to dry conditions and lack of rainfall during the reporting period. This bore should continue to be monitored to record groundwater level trends.

3.3.1 OFF-SITE GROUNDWATER BORES

The results of monitoring water quality within the off-site groundwater bores are generally shown to be consistent throughout the 2013 monitoring period. Groundwater samples collected from the off-site bores were shown to be compliant with the trigger levels for the key water monitoring parameters pH, EC and filtered iron.

All off-site bores exhibited consistently stable standing water levels throughout the 2013 monitoring period. Trigger levels for water depth were shown to be compliant at all bores except Bore D (EP DDH4/GW) during the 2013 monitoring period. The water level measured at Bore D was shown to be outside of the trigger value for standing water level on each sampling occasion during 2013, with the exception of March. This is likely a result of high rainfall received during the month of February.

3.3.1 ENHANCE PLACE GROUNDWATER BORES

The two monitoring bores located at the former Enhance Place mine exhibited standing water levels which showed very little variation throughout the 2013 monitoring period. These bores do not have any water level triggers nominated in the *Water Management Plan*.

4 SURFACE WATER QUALITY MONITORING

4.1 SURFACE WATER ASSESSMENT CRITERIA

The purpose of surface water monitoring is to ensure that any impact of the mining operations on the surface water bodies / streams can be identified, and to show compliance with relevant legislative requirements. The surface water assessment criteria presented in the sites' *Water Management Plan* in accordance with Schedule 3, Condition 27(b) of the Project Approval (PA 10_0041) are currently under review and have therefore not been included in this report. The surface water assessment criteria nominated in Environmental Protection License (EPL 4911) are shown in **Table 29**.

It should be noted that the requirement to monitor the water quality of water discharged to the underground workings at the site was removed from the Environmental Protection License (EPL 4911) on 29 August 2013. The full scope of assessment criteria listed in EPL 4911 has been presented in this report, as the requirement to monitor waters discharged to the underground workings was present for the first half of the 2013 annual monitoring period.

Table 29 *EPL Surface Water Assessment Criteria*

Surface Water Site	pH	Total Suspended Solids (mg/L)	Oil & Grease (mg/L)
EPL 2	NA	NA	NA
EPL 3	NA	NA	NA
EPL 4	6.5 – 8.5	50	10
EPL 5	6.5 – 8.5	50	10
EPL 13	6.5 – 8.5	30	10
EPL 14	NA	NA	NA

NA – no concentration limits defined in EPL 4911.

4.2 SURFACE WATER MONITORING DATA SUMMARY

Surface water monitoring for the Pine Dale Mine is undertaken in accordance with the *Baseline Water Management Plan,* the *Water Management Plan* and Environmental Protection Licence EPL 4911*.* Surface water sampling is undertaken at nine monitoring locations within and surrounding the mine site (refer Drawing 1, **Appendix 1**.).

During the period January to December 2013, monitoring was undertaken on a monthly and quarterly basis for routine samples associated with the *Water Management Plan* and site EPL; whilst fortnightly sampling was conducted at the seven nominated baseline surface water monitoring locations associated with the *Baseline Water Management Plan*. The baseline sampling was discontinued in July 2013, with a reduced sampling regime initiated from August 2013 onwards.

Surface water summary results for the period January – December 2013 are shown in **Tables 30** to **47**. Graphical presentations are shown in **Figures 7** to **9**.

No samples were collected from the EPL Point 4 sampling location (Wallerawang Colliery No. 1A Mine Entry), the EPL Point 5 sampling location (Wallerawang Colliery Coal Punch Mine Entry), nor EPL Point 13 (discharge to concrete lined section of Neubeck's creek) during the 2013 period, as there was no discharge from the mine during the 2013 monitoring period.

The requirement to monitor the water quality of discharges to the underground workings at EPL Point 4 (Wallerawang Colliery No. 1A Mine Entry) and EPL Point 5 (Wallerawang Colliery Coal Punch Mine Entry) was subsequently removed from EPL 4911 on 29 August 2013.

Table 30 *Surface Water Monitoring Location EPL Point 2 Results 2013*

Location	EPL Point 2			
Sample No	02136880046	05136880043	08136880015	11136880014
Sampling Month	Feb	May	Aug	Nov
Date Sampled	20/02/2013	22/05/13	26/08/13	20/11/2013
Time Sampled	14:18	14:50	15:40	11:50
pH (pH units)	7.4	7.6	7.2	7.0
Conductivity (µS/cm)	685	1607	1152	1826
Sulphate (mg/L)	249	725	457	782
Iron filterable (mg/L)	0.12	0.21	<0.05	0.13
TSS (mg/L)	<5	<5	2	4
Turbidity (NTU)	3.2	0.9	0.97	1

Table 31 *Surface Water Monitoring Location EPL Point 3 Results 2013*

Location	EPL Point 3			
Sample No	02136880014	05136880014	08136880010	11136880009
Sampling Month	Feb	May	Aug	Nov
Date Sampled	20/02/2013	22/05/13	26/08/13	20/11/2013
Time Sampled	15:50	13:30	17:00	17:14
pH (pH units)	6.9	7.5	6.9	7.3
Conductivity (µS/cm)	2460	1611	1681	1854
Sulphate (mg/L)	1440	742	758	832
Iron filterable (mg/L)	0.15	1.69	0.98	0.21
TSS (mg/L)	<5	9	12	10
Turbidity (NTU)	2.1	4.8	2.7	<2

Table 32 *Surface Water Monitoring Location EPL Point 14 Results 2013*

Location	EPL Point 14			
Sample No	02136880047	05136880045	08136880016	11136880015
Sampling Month	Feb	May	Aug	Nov
Date Sampled	20/02/2013	22/05/2013	26/08/2013	20/11/2013
Time Sampled	17:16	15:45	13:36	12:07
pH (pH units)	7.8	8.7	7.9	7.3
Conductivity (µS/cm)	1204	960	1141	1114
Sulphate (mg/L)	78	87	86	81
Iron filterable (mg/L)	0.13	<0.05	<0.05	0.07
TSS (mg/L)	<5	<5	5	6
Turbidity (NTU)	3.6	3.2	4.05	<2

Table 33 *Baseline Surface Water Monitoring Location S1 Results 2013*

Location	Baseline Surface Water S1													
Month	January	January	February	February	March	March	April	April	May	May	June	June	July	July
Sample Number	1136880003	1136880012	0213688003	02136880012	03136880003	03136880012	04136880003	04136880012	05136880003	05136880012	06136880003	06136880012	07136880003	07136880012
Date Sampled	7/01/13	22/01/13	4/02/13	20/02/13	4/03/13	20/03/13	2/04/13	22/04/13	6/05/13	22/05/13	11/06/13	24/06/13	8/07/13	25/07/13
Time Sampled	7:30	14:00	7:15	14:16	7:15	14:53	7:22	11:25	7:20	15:00	7:15	13:23	7:20	15:27
Temperature (°C)	16.9	21.0	13.2	22.8	13.6	17.6	10.1	13.0	5.3	7.3	5.3	13.0	2.0	9.0
pH	6.6	7.7	6.5	6.9	6.3	7.0	9.8	6.9	6.4	7.7	6.1	6.7	5.0	6.5
Conductivity (µS/cm)	1017	1760	1387	2600	1336	1612	1967	1710	1279	1662	926	1143	2780	1714
Turbidity (NTU)	5.2	8.1	13.1	1.6	13.8	5.0	2.6	2.0	1.1	1.3	3.2	3.2	3.0	2.0
Dissolved Oxygen (mg/L)	8.6	9.2	8.2	8.6	8.9	9.4	9.2	10.6	11.0	11.4	11.2	11.7	11.4	11.0
TSS (mg/L)	<5	10	6	<5	7	<5	7	<5	<5	<5	5	<5	<5	<5
Oil & Grease (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bicarbonate Alkalinity (mg/L $CaCO_3$)	66	59	36	43	36	45	45	48	60	51	36	33	30	34
Total Alkalinity (mg/L $CaCO_3$)	66	59	36	43	36	45	45	48	60	51	36	33	30	34
Sulfate (mg/L)	419	1020	635	1440	660	770	1060	834	654	743	365	456	1180	699
Chloride (mg/L)	44	104	74	177	76	96	143	101	84	94	50	55	153	92
Calcium (mg/L)	74	157	99	181	87	115	162	113	97	116	58	65	169	114
Magnesium (mg/L)	50	103	72	141	59	82	118	82	80	98	52	58	127	81
Sodium (mg/L)	76	194	148	284	132	168	240	157	111	134	71	80	255	146
Potassium (mg/L)	9	17	15	30	14	18	27	19	14	13	12	9	28	18
Filtered Cobalt (mg/L)	0.005	0.01	0.014	0.042	0.022	0.013	0.022	0.011	0.006	0.007	0.01	0.011	0.044	0.014
Filtered Manganese (mg/L)	1.53	3.27	1.5	3.91	1.82	1.85	2.43	1.7	1.99	1.92	1.13	1.38	3.4	1.33
Filtered Nickel (mg/L)	0.025	0.067	0.11	0.291	0.121	0.097	0.152	0.086	0.04	0.048	0.042	0.037	0.275	0.095
Filtered Zinc (mg/L)	0.012	0.039	0.084	0.242	0.112	0.082	0.135	0.07	0.023	0.029	0.035	0.047	0.264	0.094
Filtered Iron (mg/L)	0.14	0.33	0.35	0.12	0.17	0.34	0.37	0.34	0.36	0.4	0.16	0.22	0.28	0.19

Table 34 *Baseline Surface Water Monitoring Location S2 Results 2013*

Location	Baseline Surface Water S2													
Month	**January**	**January**	**February**	**February**	**March**	**March**	**April**	**April**	**May**	**May**	**June**	**June**	**July**	**July**
Sample Number	1136880004	1136880013	02136880004	02136880013	03136880004	03136880013	04136880004	04136880013	05136880004	05136880013	06136880004	06136880013	07136880004	07136880013
Date Sampled	**7/01/13**	**22/01/13**	**4/02/13**	**20/02/13**	**4/03/13**	**20/03/13**	**2/04/13**	**22/04/13**	**6/05/13**	**22/05/13**	**11/06/13**	**24/06/13**	**8/07/13**	**25/07/13**
Time Sampled	7:22	15:20	7:12	10:45	7:10	12:57	7:18	10:28	7:16	11:21	NR	13:20	7:30	15:38
Depth to Surface from Top Rail of Bridge (m)	3.77	3.78	3.72	3.73	3.7	3.75	3.73	3.74	3.76	3.76	NR	3.75	3.75	3.73

Table 35 *Baseline Surface Water Monitoring Location S3 Results 2013*

Location	Baseline Surface Water S3													
Month	January	January	February	February	March	March	April	April	May	May	June	June	July	July
Sample Number	1136880005	1136880014	02136880005	02136880014	03136880005	03136880014	04136880005	04136880014	05136880005	05136880014	06136880005	06136880014	07136880005	07136880014
Date Sampled	7/01/13	22/01/13	4/02/13	20/02/13	4/03/13	20/03/13	2/04/13	22/04/13	6/05/13	22/05/13	11/06/13	24/06/13	8/07/13	25/07/13
Time Sampled	7:54	15:25	7:30	15:50	7:26	16:20	7:36	11:35	7:35	13:30	7:29	13:40	7:35	17:16
Temperature (°C)	16.2	22.5	13.2	15.0	13.4	17.2	9.7	14.6	4.5	8.0	5.6	13.3	1.7	8.0
pH	7.1	7.8	7.1	6.9	6.7	7.0	6.9	7.1	6.7	7.5	6.7	6.6	6.4	5.9
Conductivity (µS/cm)	1066	2040	1367	2460	1345	1588	2560	1690	1316	1611	960	1134	2870	1724
Turbidity (NTU)	4.2	5.8	12.2	2.1	14.0	3.9	1.9	2.4	5.7	4.9	3.6	4.6	3.0	4.0
Dissolved Oxygen (mg/L)	9.0	9.0	8.7	8.5	9.2	9.5	9.2	10.7	11.3	12.2	11.4	11.9	11.4	11.0
TSS (mg/L)	7	13	7	<5	8	<5	5	<5	10	9	<5	7	7	<5
Oil & Grease (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bicarbonate Alkalinity (mg/L $CaCO_3$)	29	32	31	40	34	41	41	40	46	43	32	21	26	27
Total Alkalinity (mg/L $CaCO_3$)	29	32	31	40	34	41	41	40	46	43	32	21	26	27
Sulfate (mg/L)	470	1170	640	1440	645	792	1110	842	662	742	375	462	1180	700
Chloride (mg/L)	45	116	72	178	76	95	142	100	80	89	50	53	148	90
Calcium (mg/L)	83	172	100	181	86	117	159	116	100	115	58	68	169	114
Magnesium (mg/L)	51	110	70	141	59	82	114	82	80	94	51	56	124	80
Sodium (mg/L)	78	221	143	282	132	168	234	159	109	126	71	76	250	140
Potassium (mg/L)	9	20	14	30	14	18	27	19	13	13	12	9	27	17
Filtered Cobalt (mg/L)	0.016	0.02	0.016	0.039	0.022	0.015	0.022	0.014	0.013	0.015	0.013	0.018	0.05	0.017
Filtered Manganese (mg/L)	2.39	3.52	1.68	3.89	1.9	2.09	2.66	2	2.41	2.6	1.3	2.33	3.91	1.72
Filtered Nickel (mg/L)	0.043	0.107	0.103	0.27	0.122	0.093	0.148	0.097	0.05	0.059	0.042	0.048	0.29	0.094
Filtered Zinc (mg/L)	0.068	0.099	0.088	0.207	0.11	0.083	0.128	0.075	0.058	0.063	0.046	0.079	0.291	0.099
Filtered Iron (mg/L)	1.21	0.34	0.33	0.15	0.21	0.38	0.40	0.48	1.56	1.69	0.37	1.56	0.70	0.77

Table 36 *Baseline Surface Water Monitoring Location S4 Results 2013*

Location	Baseline Surface Water S4													
Month	January	January	February	February	March	March	April	April	May	May	June	June	July	July
Sample Number	1136880006	1136880015	02136880006	02136880015	03136880006	03136880015	04136880006	04136880015	05136880006	05136880015	06136880006	06136880015	07136880006	07136880015
Date Sampled	7/01/13	22/01/13	4/02/13	20/02/13	4/03/13	20/03/13	2/04/13	22/04/13	6/05/13	22/04/13	11/06/13	22/04/13	8/07/13	22/04/13
Time Sampled	8:46	8:10	8:25	7:12	8:10	15:36	8:27	16:38	8:15	12:30	7:49	9:05	8:10	16:00
Temperature (°C)	16.7	17.5	11.8	21.3	13.3	16.3	7.8	12.9	5.4	6.5	5.4	8	1.4	11
pH	8.5	7.9	8.1	7.9	7.5	7.9	7.9	7.6	7.8	8.3	6.9	7.4	7.1	7.4
Conductivity (µS/cm)	1073	1046	628	759	331	533	577	445	558	504	918	437.0	326	261
Turbidity (NTU)	8.4	15.6	8.3	8.3	9.2	5.7	5.4	5.7	5.0	3.3	3.8	25.7	5.0	5.0
Dissolved Oxygen (mg/L)	8.5	8.1	8.7	8.4	910.0	10.4	9.4	10.9	10.6	12.1	12.0	11.5	12.0	11.6
TSS (mg/L)	<5	8	<5	<5	10	<5	<5	<5	<5	<5	<5	5	<5	<5
Oil & Grease (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bicarbonate Alkalinity (mg/L $CaCO_3$)	567	497	250	393	113	234	255	188	238	227	173	152	91	80
Total Alkalinity (mg/L $CaCO_3$)	567	497	258	393	113	234	255	188	238	227	173	152	91	80
Sulfate (mg/L)	56	46	44	39	21	25	22	21	28	32	26	27	19	21
Chloride (mg/L)	6	11	35	6	7	7	7	10	8	9	11	14	9	11
Calcium (mg/L)	25	23	20	15	11	15	15	11	11	12	9	8	6	6
Magnesium (mg/L)	15	14	10	11	5	9	9	6	7	7	7	6	4	4
Sodium (mg/L)	229	214	113	146	35	82	90	69	89	93	69	65	45	39
Potassium (mg/L)	29	29	16	22	9	17	19	14	18	17	17	15	10	8
Filtered Cobalt (mg/L)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Filtered Manganese (mg/L)	0.019	0.026	0.026	0.032	0.02	0.035	0.035	0.03	0.017	0.01	0.023	0.012	0.036	0.018
Filtered Nickel (mg/L)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	<0.001	<0.001	0.002	0.001	0.002	<0.001
Filtered Zinc (mg/L)	0.008	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.019	<0.005	<0.005	<0.005
Filtered Iron (mg/L)	0.27	0.61	0.39	0.27	0.23	0.31	0.27	0.29	0.3	0.13	0.19	0.21	0.38	0.21

Table 37 *Baseline Surface Water Monitoring Location S5 Results 2013*

Location	Baseline Surface Water S5													
Month	January	January	February	February	March	March	April	April	May	May	June	June	July	July
Sample Number	1136880007	1136880016	02136880007	02136880016	03136880007	03136880016	04136880007	04136880016	05136880007	05136880016	06136880007	06136880016	07136880007	07136880016
Date Sampled	7/01/13	22/01/13	4/02/13	20/02/13	4/03/13	20/03/13	2/04/13	22/04/13	6/05/13	22/05/13	11/06/13	24/06/13	8/07/13	25/07/13
Time Sampled	8:50	8:15	8:31	15:01	8:15	15:40	8:40	16:35	8:30	12:40	8:25	9:10	8:25	16:15
Temperature (°C)	19.6	21.0	14.8	23.9	13.7	19.2	11.6	14.8	9.3	11.0	8.4	9.0	1.4	9.5
pH	8.2	7.6	7.4	8.0	6.9	7.8	7	7.5	6.63	7.94	6.7	6.9	6.9	6.9
Conductivity (µS/cm)	894	1070	715	721	569	856	924	876	815	824	740	724	630	891
Turbidity (NTU)	6.3	2.9	16.9	5.7	27.3	3.2	8.8	16.4	18	16.6	17.5	23.1	25	16
Dissolved Oxygen (mg/L)	8.4	8.3	8.2	8.6	8.0	9.1	8.1	10.0	8.1	10.4	9.8	10.0	12.4	10.6
TSS (mg/L)	11	<5	7	5	12	<5	<5	<5	9	<5	7	6	9	<5
Oil & Grease (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bicarbonate Alkalinity (mg/L $CaCO_3$)	352	347	149	184	112	118	128	102	108	128	122	116	96	79
Total Alkalinity (mg/L $CaCO_3$)	352	347	149	184	112	118	128	102	108	128	122	116	96	79
Sulfate (mg/L)	128	226	209	180	21	268	312	319	292	261	211	195	190	302
Chloride (mg/L)	11	20	18	22	7	34	40	31	29	22	23	22	25	33
Calcium (mg/L)	33	48	40	31	11	50	58	53	53	50	42	36	36	53
Magnesium (mg/L)	20	29	25	21	5	32	39	34	33	32	28	24	24	34
Sodium (mg/L)	143	175	85	95	35	86	103	79	74	78	68	63	62	77
Potassium (mg/L)	21	23	14	15	9	15	19	16	16	17	16	14	14	14
Filtered Cobalt (mg/L)	0.003	0.005	0.008	0.004	0.012	0.009	0.012	0.025	0.022	0.022	0.017	0.017	0.016	0.017
Filtered Manganese (mg/L)	0.406	0.642	0.747	0.44	0.801	0.831	1.06	1.83	1.46	1.49	1.21	1.07	1.08	1.26
Filtered Nickel (mg/L)	0.02	0.034	0.036	0.023	0.041	0.044	0.054	0.088	0.07	0.072	0.059	0.047	0.052	0.067
Filtered Zinc (mg/L)	0.018	0.023	0.035	0.015	0.054	0.033	0.049	0.113	0.097	0.07	0.051	0.052	0.052	0.071
Filtered Iron (mg/L)	0.26	0.14	0.25	0.27	0.91	0.34	0.24	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	<0.05

Table 38 *Baseline Surface Water Monitoring Location S6 Results 2013*

Location	Baseline Surface Water S6													
Month	January	January	February	February	March	March	April	April	May	May	June	June	July	July
Sample Number	1136880008	1136880017	02136880008	02136880017	03136880008	03136880017	04136880008	04136880017	05136880008	05136880017	06136880008	06136880017	07136880008	07136880017
Date Sampled	7/01/13	22/01/13	4/02/13	20/02/13	4/03/13	20/03/13	2/04/13	22/04/13	6/05/13	22/05/13	11/06/13	24/06/13	8/07/13	25/07/13
Time Sampled	8:15	8:20	7:50	15:07	7:42	15:45	7:55	16:45	7:53	12:50	8:10	9:15	7:54	16:25
Temperature (°C)	17.0	19	12.2	23.1	13.2	18.5	8.1	14.1	5.8	8.0	6.4	7.5	0.5	13.5
pH	7.5	7.6	7.3	7.3	6.9	8	7.2	7.6	6.94	7.98	7.1	7	6.7	6.8
Conductivity (µS/cm)	1217	1837	1273	2430	1315	1684	2.6	1775	1297	1699	4460	948	1972	1506
Turbidity (NTU)	1.7	23.6	10.1	1	12.2	1.3	0.9	1.3	2.08	1.42	8	88.5	2	2
Dissolved Oxygen (mg/L)	8.5	8.6	8.4	9	9.2	9.8	9.4	11.0	10.3	11.8	12.3	11.7	11.8	12.0
TSS (mg/L)	<5	13	<5	<5	6	5	<5	<5	<5	<5	<5	39	<5	<5
Oil & Grease (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bicarbonate Alkalinity (mg/L $CaCO_3$)	48	25	32	36	45	39	41	37	45	43	27	21	27	29
Total Alkalinity (mg/L $CaCO_3$)	48	25	32	36	45	39	41	37	45	43	27	21	27	29
Sulfate (mg/L)	591	1080	575	1410	641	808	1080	945	646	768	374	380	1180	624
Chloride (mg/L)	55	105	63	169	75	100	146	112	78	93	47	43	153	77
Calcium (mg/L)	90	156	91	174	85	121	161	128	96	120	61	57	173	103
Magnesium (mg/L)	52	97	63	137	58	85	114	90	76	100	49	45	128	71
Sodium (mg/L)	108	194	126	271	128	176	235	181	106	140	65	58	259	123
Potassium (mg/L)	12	20	13	29	14	19	27	22	14	14	10	8	28	15
Filtered Cobalt (mg/L)	<0.001	0.013	0.009	0.022	0.019	0.012	0.014	0.009	0.004	0.005	0.011	0.012	0.044	0.013
Filtered Manganese (mg/L)	0.113	2.22	1.15	2.75	1.740	1.510	1.770	1.510	1.160	1.400	1.470	1.560	3.560	1.330
Filtered Nickel (mg/L)	0.007	0.099	0.08	0.194	0.112	0.088	0.118	0.079	0.030	0.042	0.035	0.034	0.280	0.073
Filtered Zinc (mg/L)	<0.005	0.09	0.057	0.09	0.089	0.060	0.082	0.054	0.020	0.028	0.041	0.042	0.272	0.077
Filtered Iron (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.16	<0.05	0.25	<0.05

Table 39 *Baseline Surface Water Monitoring Location S7 Results 2013*

Location	Baseline Surface Water S7													
Month	January	January	February	February	March	March	April	April	May	May	June	June	July	July
Sample Number	1136880009	1136880018	02136880009	02136880018	03136880009	03136880018	04136880009	04136880018	05136880009	05136880018	06136880009	06136880018	07136880009	07136880018
Date Sampled	7/01/13	22/01/13	4/02/13	20/02/13	4/03/13	20/03/13	2/04/13	22/04/13	6/05/13	22/05/13	11/06/13	24/06/13	8/07/13	25/07/13
Time Sampled	9:05	7:55	8:41	15:30	8:30	15:27	8:45	2:24	8:40	13:00	8:40	14:25	8:42	16:50
Temperature (°C)	22	20.5	16.7	16.6	13.7	18.2	12.1	13.7	8.3	9	7.1	9	2.4	7.5
pH	7.7	7.6	6.9	6.9	6.7	6.7	7.1	7.6	6.89	7.97	7	6.6	7.2	6.8
Conductivity (µS/cm)	842	1009	721	635	574	847	918	885	1048	824	726	751	673	840
Turbidity (NTU)	8.2	2.6	10.6	2.6	16.7	3.2	2.2	5	3.44	4.65	8.2	12.5	13	7
Dissolved Oxygen (mg/L)	5.3	5.9	6.0	7.8	5.8	8.7	7.1	9.8	9.8	11.2	9.8	11.7	10.3	11.2
TSS (mg/L)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	7	<5	5	<5
Oil & Grease (mg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bicarbonate Alkalinity (mg/L $CaCO_3$)	324	341	147	185	72	116	140	105	106	122	122	111	96	81
Total Alkalinity (mg/L $CaCO_3$)	324	341	147	185	72	116	140	105	106	122	122	111	96	81
Sulfate (mg/L)	136	198	225	146	167	275	281	312	292	288	215	200	194	276
Chloride (mg/L)	12	18	17	16	24	34	39	31	27	24	24	23	25	30
Calcium (mg/L)	35	43	43	27	33	49	53	54	54	51	40	37	35	49
Magnesium (mg/L)	21	27	26	18	19	32	36	35	33	33	27	25	24	31
Sodium (mg/L)	130	169	87	86	44	86	103	72	75	78	70	63	63	73
Potassium (mg/L)	19	22	14	15	10	14	18	16	17	16	18	14	14	14
Filtered Cobalt (mg/L)	0.001	0.001	0.003	0.001	0.006	0.002	0.001	0.004	0.002	0.002	0.004	0.004	0.005	0.004
Filtered Manganese (mg/L)	0.474	0.45	0.39	0.331	0.602	0.484	0.428	0.712	0.506	0.427	0.520	0.450	0.491	0.495
Filtered Nickel (mg/L)	0.015	0.018	0.028	0.014	0.036	0.026	0.021	0.050	0.032	0.034	0.033	0.030	0.033	0.041
Filtered Zinc (mg/L)	<0.005	0.007	0.02	0.006	0.040	0.016	0.018	0.046	0.033	0.031	0.037	0.029	0.028	0.039
Filtered Iron (mg/L)	0.09	0.1	0.27	0.27	0.62	0.32	0.24	0.14	0.09	0.09	0.17	0.11	0.21	0.25

Table 40 *Site Surface Water Monitoring Location S1 Results 2013*

Location	Site Surface Water S1									
Month	**August**	**August**	**September**	**September**	**October**	**October**	**November**	**November**	**December**	**December**
Sample Number	08136880003	08136880008	09136880003	09136880007	10136880003	10136880007	11136880003	11136880007	12136880003	12136880007
Date Sampled	**12/08/13**	**26/08/13**	**9/09/13**	**25/09/13**	**8/10/13**	**30/10/13**	**4/11/13**	**20/11/13**	**3/12/13**	**18/12/13**
Time Sampled	7:26	15:29	8:21	12:30	8:25	12:10	7:55	11:45	8:35	14:34
Temperature (°C)	8.7	16	17.1	15.5	10.9	15	11.6	17	15.0	20
pH	6.24	7.84	6.22	7.04	6.14	7.53	6.03	7.08	6.44	6.41
Conductivity (µS/cm)	1914	1670	1966	1711	1706	1874	1753	1880	1642	2310
Turbidity (NTU)	2	2	1	3	2	1	2	2	3	7
Dissolved Oxygen (mg/L)	--	10.67	--	--	--	--	--	8.9	--	--
TSS (mg/L)	--	4	--	--	--	--	--	6	--	--
Oil & Grease (mg/L)	--	<2	--	--	--	--	--	<2	--	--
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	37	--	--	--	--	--	49	--	--
Total Alkalinity (mg/L $CaCO_3$)	--	37	--	--	--	--	--	49	--	--
Sulfate (mg/L)	--	728	--	--	--	--	--	820	--	--
Chloride (mg/L)	--	97	--	--	--	--	--	113	--	--
Calcium (mg/L)	--	106	--	--	--	--	--	133	--	--
Magnesium (mg/L)	--	83	--	--	--	--	--	103	--	--
Sodium (mg/L)	--	148	--	--	--	--	--	147	--	--
Potassium (mg/L)	--	15	--	--	--	--	--	14	--	--
Filtered Cobalt (mg/L)	--	0.007	--	--	--	--	--	0.004	--	--
Filtered Manganese (mg/L)	--	0.93	--	--	--	--	--	1.76	--	--
Filtered Nickel (mg/L)	--	0.056	--	--	--	--	--	0.042	--	--
Filtered Zinc (mg/L)	--	0.048	--	--	--	--	--	0.03	--	--
Filtered Iron (mg/L)	--	0.14	--	--	--	--	--	0.23	--	--

--- Indicates no sampling required during particular period.

Table 41 *Site Surface Water Monitoring Location S2 Results 2013*

Location	Site Surface Water S2									
Month	**August**	**August**	**September**	**September**	**October**	**October**	**November**	**November**	**December**	**December**
Sample Number	08136880004	08136880009	09136880004	09136880008	10136880004	10136880008	11136880004	11136880008	12136880004	12136880008
Date Sampled	12/08/13	26/08/13	9/09/13	25/09/13	8/10/13	30/10/13	4/11/13	20/11/13	3/12/13	18/12/13
Time Sampled	7:35	13:55	8:29	12:25	8:43	12:17	8:10	13:46	8:51	12:43
Depth to Surface from Top Rail of Bridge (m)	3.74	3.76	3.75	3.75	3.78	3.75	3.77	3.76	3.77	3.75

Table 42 *Site Surface Water Monitoring Location S3 Results 2013*

Location	Site Surface Water S3									
Month	**August**	**August**	**September**	**September**	**October**	**October**	**November**	**November**	**December**	**December**
Sample Number	08136880005	08136880010	09136880005	09136880009	10136880005	10136880009	11136880005	11136880009	12136880005	12136880009
Date Sampled	12/08/13	26/08/13	9/09/13	25/09/13	8/10/13	30/10/13	4/11/13	20/11/13	3/12/13	18/12/13
Time Sampled	7:38	17:00	8:30	16:14	8:45	12:33	8:14	17:14	8:53	16:18
Temperature (°C)	8.6	16.0	17.2	18.0	11.0	18.5	10.3	22.0	15.0	24.0
pH	6.47	6.91	6.56	6.91	5.98	7.21	5.79	7.25	6.48	6.67
Conductivity (µS/cm)	1838	1681	222	1697	1469	1663	1660	1854	1571	2200
Turbidity (NTU)	2	3	2	3	7	4	3	2	4	2
Dissolved Oxygen (mg/L)	--	10.2	--	--	--	--	--	8.4	--	--
TSS (mg/L)	--	12	--	--	--	--	--	10	--	--
Oil & Grease (mg/L)	--	<2	--	--	--	--	--	<2	--	--
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	28	--	--	--	--	--	34	--	--
Total Alkalinity (mg/L $CaCO_3$)	--	28	--	--	--	--	--	34	--	--
Sulfate (mg/L)	--	752	--	--	--	--	--	832	--	--
Chloride (mg/L)	--	98	--	--	--	--	--	105	--	--
Calcium (mg/L)	--	112	--	--	--	--	--	138	--	--
Magnesium (mg/L)	--	84	--	--	--	--	--	103	--	--
Sodium (mg/L)	--	150	--	--	--	--	--	140	--	--
Potassium (mg/L)	--	16	--	--	--	--	--	14	--	--
Filtered Cobalt (mg/L)	--	0.014	--	--	--	--	--	0.01	--	--
Filtered Manganese (mg/L)	--	1.71	--	--	--	--	--	2.42	--	--
Filtered Nickel (mg/L)	--	0.078	--	--	--	--	--	0.046	--	--
Filtered Zinc (mg/L)	--	0.078	--	--	--	--	--	0.069	--	--
Filtered Iron (mg/L)	--	0.98	--	--	--	--	--	0.21	--	--

-- Indicates no sampling required during particular period.

Table 43 *Site Surface Water Monitoring Location S4 Results 2013*

Location	Site Surface Water S4				
Month	**August**	**September**	**October**	**November**	**December**
Sample Number	08136880011	09136880010	10136880010	11136880010	12136880010
Date Sampled	26/08/13	25/09/13	30/10/13	20/11/13	18/12/13
Time Sampled	16:30	15:30	14:03	16:42	15:55
Temperature (°C)	18	16	16.5	20	22.5
pH	7.20	7.26	6.94	7.21	6.89
Conductivity (µS/cm)	299	526	702	742	872
Turbidity (NTU)	9	9	20	11	14
Dissolved Oxygen (mg/L)	10.7	--	--	8.5	--
TSS (mg/L)	3	--	--	8	--
Oil & Grease (mg/L)	<2	--	--	<2	--
Bicarbonate Alkalinity (mg/L $CaCO_3$)	100	--	--	336	--
Total Alkalinity (mg/L $CaCO_3$)	100	--	--	342	--
Sulfate (mg/L)	27	--	--	24	--
Chloride (mg/L)	9	--	--	8	--
Calcium (mg/L)	7	--	--	17	--
Magnesium (mg/L)	4	--	--	11	--
Sodium (mg/L)	41	--	--	125	--
Potassium (mg/L)	9	--	--	24	--
Filtered Cobalt (mg/L)	<0.001	--	--	<0.001	--
Filtered Manganese (mg/L)	0.018	--	--	0.029	--
Filtered Nickel (mg/L)	<0.001	--	--	0.002	--
Filtered Zinc (mg/L)	0.01	--	--	<0.005	--
Filtered Iron (mg/L)	0.16	--	--	0.4	--

-- Indicates no sampling required during particular period.

Table 44 *Site Surface Water Monitoring Location S5 Results 2013*

Location	Site Surface Water S5				
Month	**August**	**September**	**October**	**November**	**December**
Sample Number	081336880012	09136880011	10136880011	11136880011	12136880011
Date Sampled	26/08/13	25/09/13	30/10/13	20/11/13	18/12/13
Time Sampled	16:35	15:40	14:26	16:45	16:00
Temperature (°C)	20.5	19.5	17.0	21.0	24.0
pH	6.91	7.11	7.07	7.40	7.26
Conductivity (µS/cm)	979	859	891	990	883
Turbidity (NTU)	15	11	3	2	1
Dissolved Oxygen (mg/L)	10.2	--	--	8.3	--
TSS (mg/L)	6	--	--	6	--
Oil & Grease (mg/L)	<2	--	--	<2	--
Bicarbonate Alkalinity (mg/L $CaCO_3$)	74	--	--	128	--
Total Alkalinity (mg/L $CaCO_3$)	74	--	--	128	--
Sulfate (mg/L)	360	--	--	324	--
Chloride (mg/L)	41	--	--	40	--
Calcium (mg/L)	59	--	--	62	--
Magnesium (mg/L)	40	--	--	39	--
Sodium (mg/L)	82	--	--	86	--
Potassium (mg/L)	15	--	--	17	--
Filtered Cobalt (mg/L)	0.02	--	--	0.012	--
Filtered Manganese (mg/L)	1.3	--	--	1.21	--
Filtered Nickel (mg/L)	0.08	--	--	0.064	--
Filtered Zinc (mg/L)	0.079	--	--	0.054	--
Filtered Iron (mg/L)	<0.05	--	--	0.08	--

-- Indicates no sampling required during particular period.

Table 45 *Site Surface Water Monitoring Location S6 Results 2013*

Location	Site Surface Water S6				
Month	**August**	**September**	**October**	**November**	**December**
Sample Number	08136880013	09136880012	10136880012	11136880012	12136880012
Date Sampled	26/08/13	25/09/13	31/10/13	20/11/13	18/12/13
Time Sampled	16:41	15:45	15:02	16:50	15:50
Temperature (°C)	21.0	19.0	18.0	25.5	Dry- no sample
pH	6.73	7.02	7.03	7.72	
Conductivity (µS/cm)	2100	1434	1868	1827	
Turbidity (NTU)	2	2	1	2	
Dissolved Oxygen (mg/L)	10.9	--	--	8.1	--
TSS (mg/L)	3	--	--	5	--
Oil & Grease (mg/L)	<2	--	--	<2	--
Bicarbonate Alkalinity (mg/L $CaCO_3$)	28	--	--	34	--
Total Alkalinity (mg/L $CaCO_3$)	28	--	--	34	--
Sulfate (mg/L)	999	--	--	748	--
Chloride (mg/L)	134	--	--	97	--
Calcium (mg/L)	141	--	--	123	--
Magnesium (mg/L)	102	--	--	91	--
Sodium (mg/L)	211	--	--	126	--
Potassium (mg/L)	21	--	--	13	--
Filtered Cobalt (mg/L)	0.012	--	--	<0.001	--
Filtered Manganese (mg/L)	1.200	--	--	0.143	--
Filtered Nickel (mg/L)	0.096	--	--	0.017	--
Filtered Zinc (mg/L)	0.066	--	--	0.007	--
Filtered Iron (mg/L)	<0.05	--	--	<0.05	--

-- Indicates no sampling required during particular period.

Table 46 *Site Surface Water Monitoring Location S7 Results 2013*

Location	Site Surface Water S7				
Month	**August**	**September**	**October**	**November**	**December**
Sample Number	08136880014	09136880013	10136880013	11136880013	12126880013
Date Sampled	26/08/13	25/09/13	30/10/13	20/11/13	18/12/13
Time Sampled	16:13	16:04	14:47	16:10	15:44
Temperature (°C)	18.5	15.7	18	22	23
pH	6.95	7.05	7.19	7.44	7.14
Conductivity (µS/cm)	987	935	899	969	901
Turbidity (NTU)	5	5	2	2	2
Dissolved Oxygen (mg/L)	12.1			7.9	
TSS (mg/L)	4			2	
Oil & Grease (mg/L)	<2			<2	
Bicarbonate Alkalinity (mg/L $CaCO_3$)	75			128	
Total Alkalinity (mg/L $CaCO_3$)	75			128	
Sulfate (mg/L)	356			316	
Chloride (mg/L)	41			40	
Calcium (mg/L)	59			61	
Magnesium (mg/L)	40			38	
Sodium (mg/L)	81			87	
Potassium (mg/L)	15			17	
Filtered Cobalt (mg/L)	0.003			0.002	
Filtered Manganese (mg/L)	0.424			0.765	
Filtered Nickel (mg/L)	0.04			0.025	
Filtered Zinc (mg/L)	0.039			0.020	
Filtered Iron (mg/L)	0.2			0.14	

-- Indicates no sampling required during particular period.

Table 47 *Site Surface Water Monitoring Location 'The Bong' Results 2013*

Location	Site Surface Water 'The Bong'									
Month	**August**	**August**	**September**	**September**	**October**	**October**	**November**	**November**	**December**	**December**
Sample Number	08136880002	08136880007	08136880002	09136880007	10106880002	10136880006	10106880002	10136880006	11106880002	1113688006
Date Sampled	12/08/2013	26/08/2013	9/09/2013	25/09/2013	8/10/2013	30/10/2013	8/10/2013	30/10/2013	4/11/2013	**20/11/13**
Time Sampled	7:48	15:24	8:50	12:37	8:54	12:00	8:54	12:00	8:26	15:24
Temperature (°C)	10	23	20.9	20	15	19.5	15	19.5	16.2	25.0
pH	6.00	7.09	6.31	6.92	6.01	7.26	6.01	7.26	6.08	7.61
Conductivity (µS/cm)	1091	1111	1091	1112	1156	1147	1156	1147	1166	1188
Turbidity (NTU)	ND[1]	46	57	40	18	18	18	18	41	11
Pump Flow Rate (L/min)	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow	No Flow
Dissolved Oxygen (mg/L)	--	31	--	--	--	--	--	--	--	7
TSS (mg/L)	--	31	--	--	--	--	--	--	--	7
Oil & Grease (mg/L)	--	560	--	--	--	--	--	--	--	588
Bicarbonate Alkalinity (mg/L $CaCO_3$)	--	12	--	--	--	--	--	--	--	14
Total Alkalinity (mg/L $CaCO_3$)	--	114	--	--	--	--	--	--	--	122
Sulfate (mg/L)	--	53	--	--	--	--	--	--	--	54
Chloride (mg/L)	--	37	--	--	--	--	--	--	--	44
Calcium (mg/L)	--	20	--	--	--	--	--	--	--	19
Magnesium (mg/L)	--	<0.001	--	--	--	--	--	--	--	<0.001
Sodium (mg/L)	--	<0.0001	--	--	--	--	--	--	--	<0.0001
Potassium (mg/L)	--	<0.001	--	--	--	--	--	--	--	<0.001
Filtered Cobalt (mg/L)	--	<0.001	--	--	--	--	--	--	--	0.001
Filtered Manganese (mg/L)	--	<0.001	--	--	--	--	--	--	--	<0.001
Filtered Nickel (mg/L)	--	0.259	--	--	--	--	--	--	--	0.217
Filtered Zinc (mg/L)	--	0.222	--	--	--	--	--	--	--	0.176
Filtered Iron (mg/L)	--	6.78	--	--	--	--	--	--	--	<0.05

-- Indicates no sampling required during particular period.

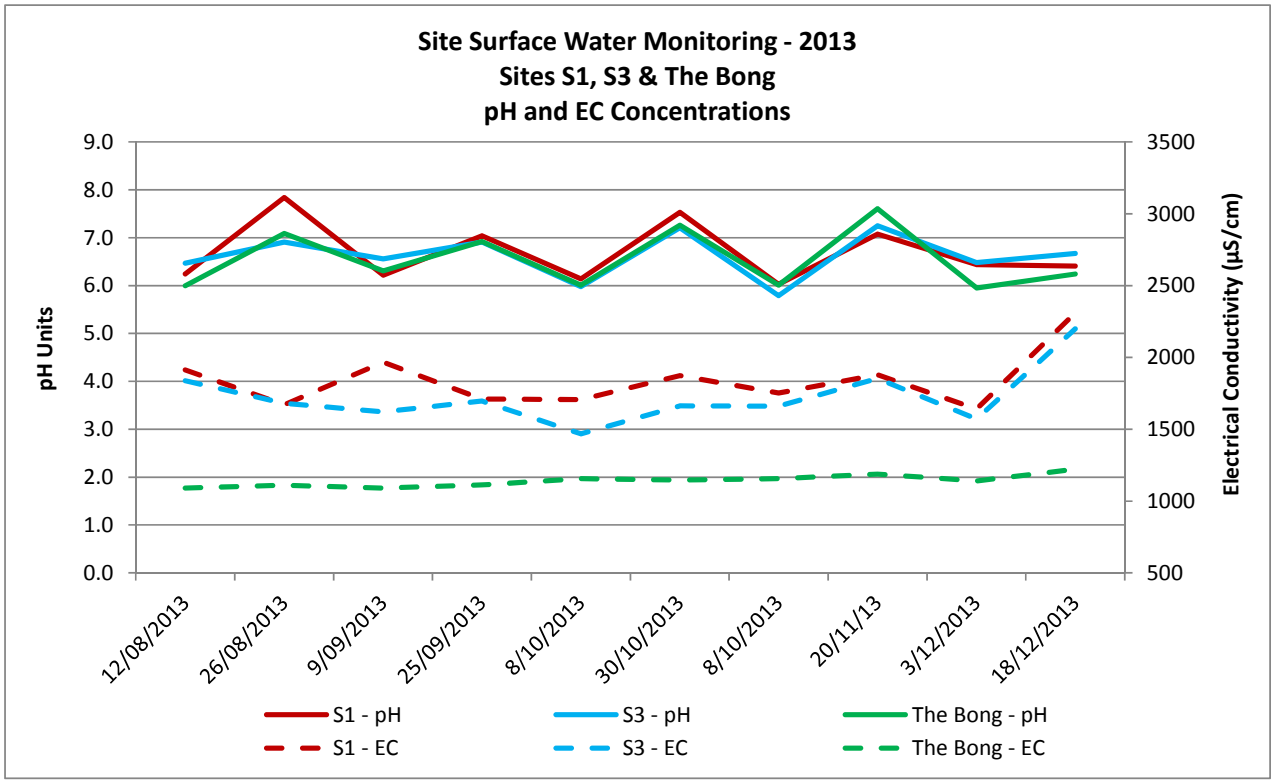


Figure 7 *Site Surface Water S1, S3 & The Bong Monitoring Results 2013*

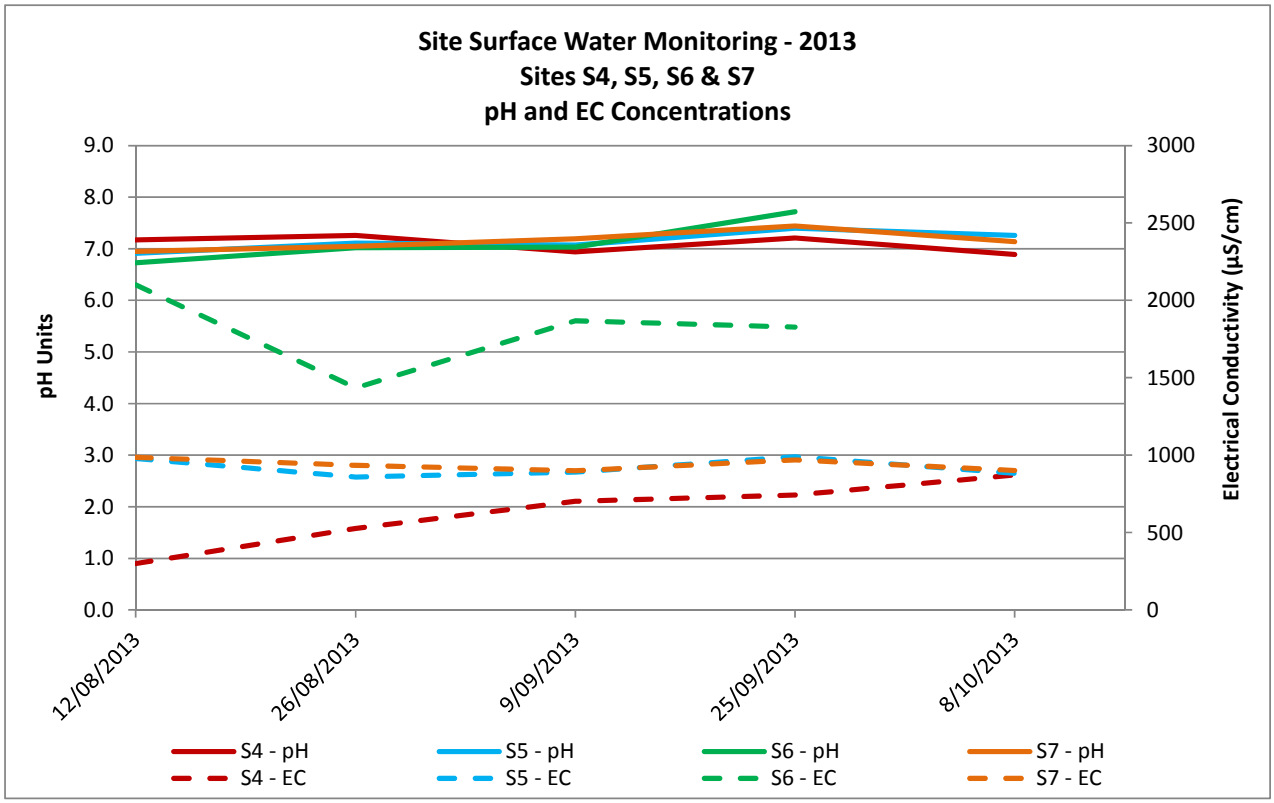


Figure 8 *Site Surface Water S4, S5, S6 & S7 Monitoring Results 2013*

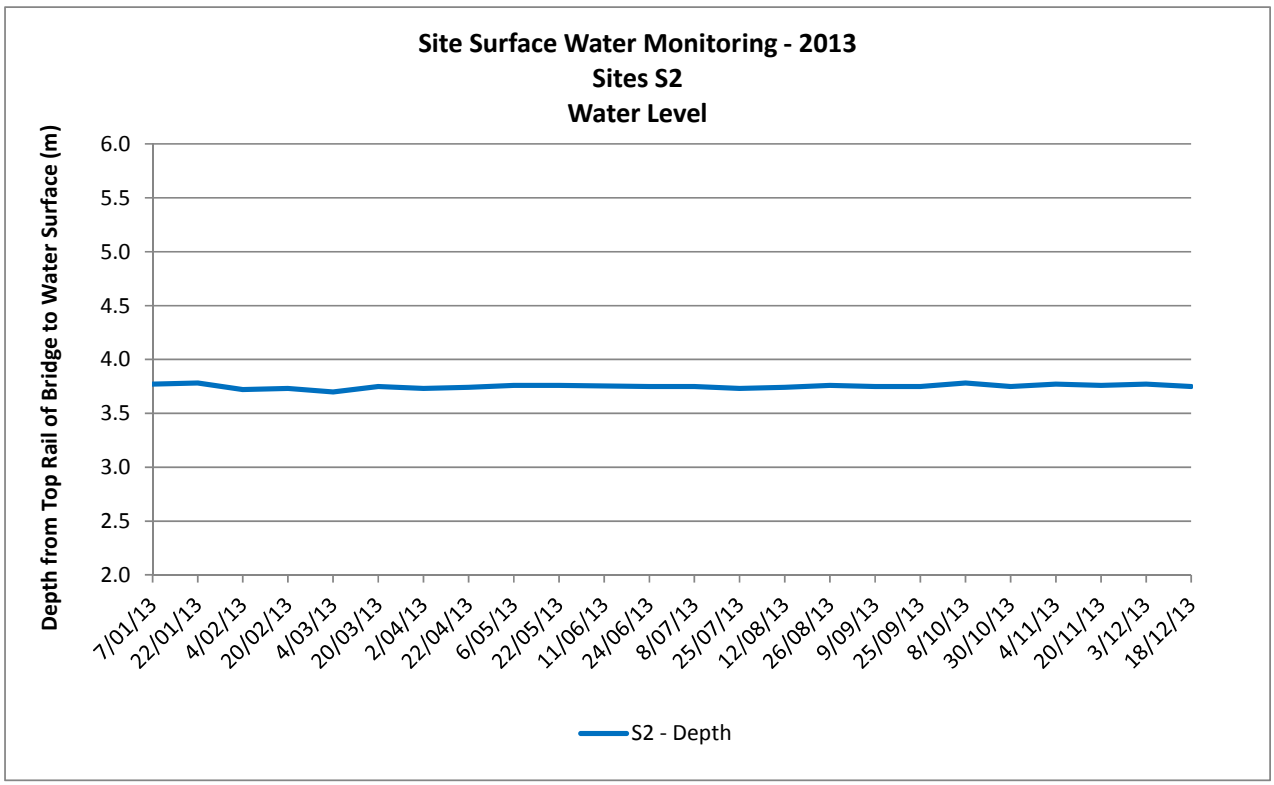


Figure 9 *Site Surface Water S2 - Water Level 2013*

4.3 REVIEW & INTERPRETATION OF SURFACE WATER MONITORING RESULTS

4.3.1 EPL SURFACE WATERS

Surface water samples collected during the January – December 2013 period show water quality analysis results are compliant with the Concentration Limits specified by EPL 4911.

During the monitoring period, EC was shown to fluctuate at the three EPL monitoring sites, whilst pH was observed to reasonably consistent.

Monitoring at EPL Point 13 was not undertaken during the 2013 monitoring period as there was no surface water discharge from the site to Neubeck's Creek.

4.3.2 BASELINE SURFACE WATERS

Baseline surface water monitoring has been conducted since January 2011 and was concluded in July 2013. The purpose of baseline water monitoring was to to provide detailed data on surface water flows / levels and quality in creeks and other water bodies that could be affected by the project (including Neubeck's Creek, the Blue Lake and Cox's River). At the cessation of the baseline monitoring period (July 2013) the monitoring was reduced to monthly water level monitoring (at location S2) and quarterly water quality sampling at selected surface water locations on-site. Results of baseline monitoring will be used as a basis to discuss with the Department of Planning & Infrastructure and the Office of Environment and Heritage the need to adjust any water quality trigger levels and to set water flow trigger levels.

4.3.3 SITE SURFACE WATERS

Site surface water samples collected during the January – December 2013 period are generally shown to be consistent over the duration of the monitoring period. The pH results recorded at all monitoring sites is shown to be stable throughout the sampling period, however, the pH recorded at monitoring sites S1, S3 and The Bong were shown to fluctuate marginally between the fortnightly sampling events. This is considered to be attributed to the fact that two different pH meters were used to conduct the sampling alternately each fortnight. This discrepancy has occurred despite the fact that each pH meter is calibrated using quality control standards and reference concentrations before each use.

During the monitoring period, the electrical conductivity concentration was observed to be reasonably steady across all surface water sites. The water level of Neubeck's Creek at monitoring location S2 was also observed to be consistent throughout the duration of the monitoring period.

5 METEOROLOGICAL MONITORING

5.1 METEOROLOGICAL MONITORING REQUIREMENTS

Pine Dale Mine records meteorological data continuously via an on-site meteorological monitoring station in accordance with the requirements of Environmental Protection License No. 4911. The meteorological monitoring requirements of EPL 4911 are presented in **Table 48**.

Table 48 *EPL Meteorological Monitoring Requirements*

Parameter	Units of Measure	Frequency	Averaging Period
Air temperature	°C	Continuous	1 hour
Wind direction	°	Continuous	15 minute
Wind speed	m/s	Continuous	15 minute
Sigma theta	°	Continuous	15 minute
Rainfall	mm	Continuous	15 minute
Relative humidity	%	Continuous	1 hour

5.1 METEOROLOGICAL MONITORING RESULTS

Meteorological monitoring Parameters recorded at the Pine Dale Mine Meteorological Monitoring Station include Wind Speed, Wind Direction, Temperature at 10m height, Temperature at 2m height and Rainfall.

Additional sensors were installed at the site Meteorological Monitoring Station on the 22 May 2013 to allow for the measurement of humidity, solar radiation, sigma theta and evapotranspiration. Details of weather data recorded for the period January to December 2013 are summarised in **Table 49**. The annual windrose for the 2013 period is presented in **Figure 10**.

Table 49 *Meteorological Monitoring Summary Data*

Month	Rainfall (mm)	Cumulative Rainfall (mm)	No of Rain Days/ Month	Air Temp. @ 2m (°C)			Air Temp. @ 10m (°C)			Sigma theta (º)			Relative Humidity (%)			Wind Speed (m/s)			Modal Wind Direction
				Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	
January	94.4	94.4	11	21.4	8.0	38.7	20.7	8.2	36.6	N/A	N/A	N/A	N/A	N/A	N/A	1.71	0.00	13.29	SE
February	121.4	215.8	11	18.0	4.3	35.3	17.2	4.7	32.6	N/A	N/A	N/A	N/A	N/A	N/A	1.53	0.00	12.92	SE
March	41.0	256.8	9	16.3	4.5	28.1	15.8	4.4	26.0	N/A	N/A	N/A	N/A	N/A	N/A	1.65	0.00	14.25	SE
April	27.4	284.2	14	11.8	-1.4	26.4	11.6	-1.3	24.0	N/A	N/A	N/A	N/A	N/A	N/A	1.05	0.00	11.64	NW
May*	22.6	306.8	10	8.5	-4.1	22.4	8.9	-0.9	20.9	*23.5*	*0.0*	*98.9*	*86.6*	*19.4*	*100.0*	1.42	0.00	12.09	WNW
June	79.0	385.8	18	6.7	-3.2	17.1	6.6	-3.0	15.5	25.1	0.0	102.8	88.4	29.6	100.0	1.32	0.00	11.05	SSE
July	18.4	404.2	10	5.7	-7.0	17.2	5.7	-6.8	16.1	21.7	0.0	101.3	81.4	20.1	100.0	1.64	0.00	14.82	NW
August	18.2	422.4	10	7.2	-4.9	21.3	7.2	-4.8	19.5	23.3	0.0	101.3	69.6	22.8	99.4	2.52	0.00	16.15	WNW
September	44.4	466.6	6	11.2	-2.6	25.0	11.0	-2.4	23.9	24.7	0.0	101.7	65.2	16.4	99.0	2.00	0.00	17.09	WNW
October	15.0	481.6	7	13.3	-2.4	30.5	12.9	-2.3	28.9	26.5	0.0	98.2	54.3	10.4	98.3	2.26	0.00	21.05	WNW
November	59.2	541.0	10	15.0	-0.3	31.2	14.6	-0.3	30.0	29.3	0.0	102.4	63.4	7.4	98.1	1.80	0.00	18.21	SE
December	35.6	576.6	4	16.5	0.0	33.5	16.1	0.0	31.6	27.1	0.0	99.5	52.1	6.3	95.5	2.14	0.00	18.52	ESE
TOTAL	**576.6**	**-**	**109**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Minimum	**15.0**	**-**	**4**	**-**	**-7.0**	**-**	**-**	**-6.8**	**-**	**-**	**0.0**	**-**	**-**	**6.3**	**-**	**-**	**0.0**	**-**	**-**
Maximum	**121.4**	**-**	**18**	**-**	**-**	**38.7**	**-**	**-**	**36.6**	**-**	**-**	**102.8**	**-**	**-**	**100.0**	**-**	**-**	**21.05**	**-**

N/A – not applicable as the sensor had not yet been installed.

* Note that values in *italics* indicate that a full month's data was not available; additional sensors were installed on the 22nd May 2013 to allow for the monitoring of sigma theta and relative humidity.

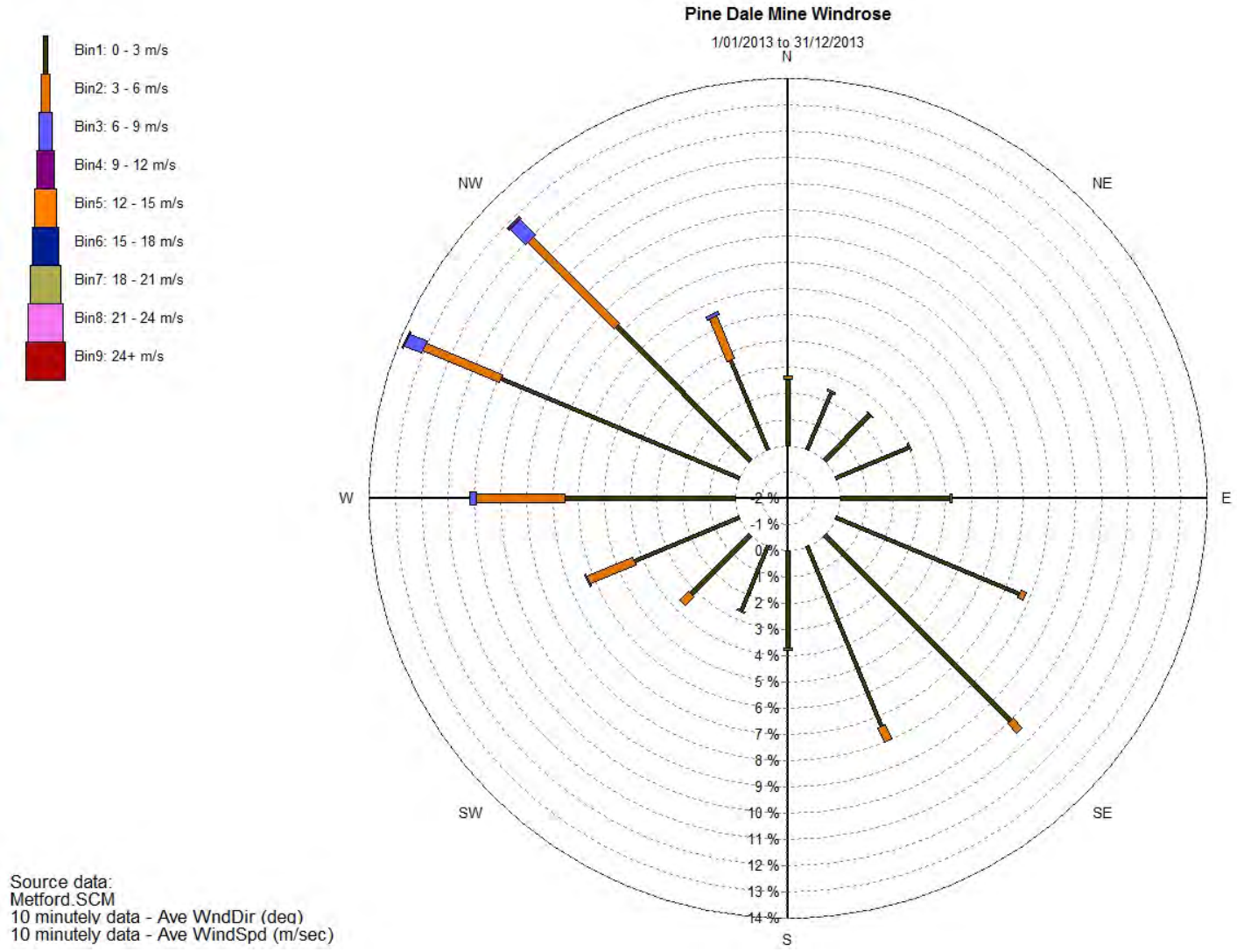


Figure 10 *Pine Dale Mine Windrose Plot - 2013*

5.2 REVIEW OF METEOROLOGICAL MONITORING RESULTS

Pine Dale Mine received 576.8mm of rainfall and experienced 109 rainfall days during the 2013 reporting period. Rainfall during this reporting period was observed to be lower than rainfall recorded in 2012 (776.4mm and 149 rainfall days). The maximum temperature recorded during the reporting period was 38.5°C at 2m and 36.6°C at the 10m sensor, both of which occured during January. The lowest temperature recorded occurred in July, with a recording of -7.0°C at 2m and -6.8°C at 10m. Predominant wind directions at the site during 2013 were observed to be from a south easterly or west north-westerly direction and were shown to fluctuate on a seasonal basis. The maximum wind speed measured at the site was 21.05m/s during October 2013.

6 STREAM HEALTH & CHANNEL STABILITY MONITORING

6.1 STREAM HEALTH & CHANNEL STABILITY MONITORING SUMMARY

Schedule 3 Condition 27(b) of Project Approval PA 10_0041 requires performance criteria and a programme to monitor the stream health, riparian vegetation health and channel stability of creeks and other water bodies that could potentially be affected by the project (Pine Dale Mine). As defined in Schedule 3 Condition 27(b) of the Project Approval, the creeks and other water bodies that could potentially be affected by the project include Neubecks Creek, the Blue Lake and Cox's River.

A Channel Stability and Stream Health Monitoring programme is outlined in Section 4.6.5 of the *Pine Dale Mine Water Management Plan* for the purpose of monitoring channel stability, stream health and vegetation health of Neubecks Creek, ensuring mining operations do not have an adverse effect upon the Neubecks Creek drainage line. In addition to the requirements of the Channel Stability and Stream Health Monitoring programme, the water bodies of Blue Lake and Cox's River have also been included in the monitoring programme, to satisfy the conditions outlined in the Project Approval.

In accordance with the Channel Stability and Stream Health Monitoring programme, a baseline assessment of the Neubecks Creek, Blue Lake and Cox's River was undertaken on 28 August and 31 October 2013 (refer RCA Report 6880-832-1, Oct 2013). Monthly visual assessments and photographic documentation of each site are also undertaken documenting evidence of erosion, newly exposed soils, and vegetation disturbance [refer monitoring fieldsheets presented in **Appendix 2**]. Results of the baseline assessment are presented in **Tables 51** to **55**. The location of Stream Health monitoring sites are presented in Drawing 2, **Appendix 1**].

It is noted that a stream health assessment of the Blue Lake site was not undertaken, as the site does not fit the requirements of the *Ephermeral Stream Assessment* protocol, which is targeted at streams and drainage lines. However, the Blue Lake is still included in monthly erosion and vegetation disturbance observation inspections.

The performance criteria utilized for the stream health assessment of each monitoring point is derived from the CSIRO *Ephemeral Stream Assessment* protocol and is reproduced in **Table 50**.

Table 50 *Classification of Different Drainage Line States (CSIRO)*

Activity Rating (%)	Classification	Discussion of Classification
80 +	Very Stable	Drainage line is very stable and likely to be in original form. It is able to withstand all flow velocities that have previously occurred in this area and only minimal monitoring is required, predominantly after high flow events, to ensure condition does not deteriorate.
70-80	Stable	Drainage line is stable. It is important to assess this zone in relation to the other classifications and define whether this zone is moving from potentially stabilising to a more stable form, or if it is deteriorating from a very stable form. The nature of this relationship will identify the type of monitoring required.
60-69	Potentially Stabilising	Drainage line is potentially stabilising. Ongoing monitoring is required while rehabilitation works are not needed in the immediate future.
50-59	Active	Drainage line is actively eroding and remedial actions are required. It is important to classify if erosion is caused primarily by upstream flows, lateral flows or unstable wall materials so that appropriate rehabilitation can be carried out.
< 50	Very Active	Drainage line is very actively eroding and immediate remedial actions are required. It is important to classify if erosion is caused primarily by upstream flows, lateral flows or unstable wall materials so that appropriate rehabilitation can be carried out.

Table Source: CSIRO Ephemeral Stream Assessment (CSIRO, undated)

Table 51 *Classification of Different Drainage Line State – Site SH1*

Location:		**SH1**	
Assessment Date:		**28/08/2013**	
Activity		**Rating**	**Explanation of Rating**
Vegetation	On Drainage Line Floor	1	Little or no vegetation growing on drainage line floor.
	On Drainage Line Walls	3	Dense perennial plant cover, similar to vegetation on floodplain/riparian zone. Characteristic wetland species composition. No observable plant burial by sediment.
Profile of D/L	Shape and Aspect of Drainage Line Cross Section	3	Potentially stabilising. Side walls become rounded and crusted alluvial fan at foot of side walls. Width>depth.
	Longitudinal Morphology of Drainage Line	2	Flat, continuous, loose sediment with signs of recent/ frequent movement
	Particle Size of Materials on Drainage Line Floor	3	Material on floor is much larger in particle size and/ or denser than material on walls. Surface armouring (e.g. cobbles, competent country rock)
Wall Materials	Nature of Drainage Line Materials	2	Materials that slake and/or disperse are exposed on less than 0.3m of wall height.
Bank Edge	Shape of Stream Bordering Slopes	4	Gently slopes bank/ floodplain, laterally extensive, <5º
	Nature of Lateral Flow Regulation	3	Sparse grassland/ woodland with bare soil bank lip. Moderate flow rate, some highly focused inflow locations.
Final Classification of Drainage Line		Total Score 21/32 = 67%	Drainage line is potentially stabilizing. Ongoing monitoring is required while rehabilitation works are not needed in the immediate future.

Table 52 *Classification of Different Drainage Line State – Site SH2*

Location:		**SH2**	
Assessment Date:		**28/08/2013**	
Activity		**Rating**	**Explanation of Rating**
Vegetation	On Drainage Line Floor	1	Little or no vegetation growing on drainage line floor.
	On Drainage Line Walls	3	Dense perennial plant cover, similar to vegetation on floodplain/ riparian zone. Characteristic wetland species composition. No observable plant burial by sediment.
Profile of D/L	Shape and Aspect of Drainage Line Cross Section	3	Potentially stabilising. Side walls become rounded and crusted alluvial fan at foot of side walls. Width>depth.
	Longitudinal Morphology of Drainage Line	2	Flat, continuous, loose sediment with signs of recent/ frequent movement.
	Particle Size of Materials on Drainage Line Floor	3	Material on floor is much larger in particle size and/ or denser than material on walls. Surface armouring (e.g. cobbles, competent country rock)
Wall Materials	Nature of Drainage Line Materials	3	Materials that slake and/or disperse are exposed on less than 0.3m of wall height.
Bank Edge	Shape of Stream Bordering Slopes	3	Moderately sloped bank, 5-10º
	Nature of Lateral Flow Regulation	4	Dense grassland. Low inflow rate, mostly diffuse.
Final Classification of Drainage Line		Total Score 22/32 = 69%	Drainage line is potentially stabilizing. Ongoing monitoring is required while rehabilitation works are not needed in the immediate future.

Table 53 *Classification of Different Drainage Line State – Site SH3*

Location:		**SH3**	
Assessment Date:		**28/08/2013**	
Activity		**Rating**	**Explanation of Rating**
Vegetation	On Drainage Line Floor	1	Little or no vegetation growing on drainage line floor.
	On Drainage Line Walls	3	Dense perennial plant cover, similar to vegetation on floodplain/ riparian zone. Characteristic wetland species composition. No observable plant burial by sediment.
Profile of D/L	Shape and Aspect of Drainage Line Cross Section	2	Actively eroding. Slight undercutting, near vertical walls, alluvial fans also eroding. Depth=width.
	Longitudinal Morphology of Drainage Line	3	Flat with a cohesive fixe textured “soil like” bed.
	Particle Size of Materials on Drainage Line Floor	1	Material on floor is similar or smaller in particle size and/or denser (more consolidated) than material on walls (e.g. well sorted gravel).
Wall Materials	Nature of Drainage Line Materials	4	Materials that do not slake or disperse are exposed on wall surface.
Bank Edge	Shape of Stream Bordering Slopes	2	Steep bank, 10-30º, permitting moderate to high velocity flows.
	Nature of Lateral Flow Regulation	4	Dense grassland. Low inflow rate, mostly diffuse.
Final Classification of Drainage Line		Total Score 20/32 = 63%	Drainage line is potentially stabilizing. Ongoing monitoring is required while rehabilitation works are not needed in the immediate future.

Table 54 *Classification of Different Drainage Line State – Site SH3A*

Location:		**SH3A**	
Assessment Date:		**31/10/2013**	
Activity		**Rating**	**Explanation of Rating**
Vegetation	On Drainage Line Floor	1	Little or no vegetation growing on drainage line floor.
	On Drainage Line Walls	1	Little or no vegetation growing on drainage line walls.
Profile of D/L	Shape and Aspect of Drainage Line Cross Section	NA	This section of drainage line coated with spray-concrete.
	Longitudinal Morphology of Drainage Line	NA	
	Particle Size of Materials on Drainage Line Floor	NA	
Wall Materials	Nature of Drainage Line Materials	NA	
Bank Edge	Shape of Stream Bordering Slopes	2	Steep bank, 10-30º, permitting moderate to high velocity flows.
	Nature of Lateral Flow Regulation	4	Dense grassland. Low inflow rate, mostly diffuse.
Final Classification of Drainage Line		NA	Drainage line is considered stabile due to spray-concrete lining.

Table 55 *Classification of Different Drainage Line State – Site SH5*

Location:		**SH5**	
Assessment Date:		**30/10/2013**	
Activity		**Rating**	**Explanation of Rating**
Vegetation	On Drainage Line Floor	1	Little or no vegetation growing on drainage line floor.
	On Drainage Line Walls	3	Dense perennial plant cover, similar to vegetation on floodplain/ riparian zone. Characteristic wetland species composition. No observable plant burial by sediment.
Profile of D/L	Shape and Aspect of Drainage Line Cross Section	5	Stable. Gently sloping walls, generally low, “S” shaped bed/bank continuum. Width>>Depth (aspect ratio very low).
	Longitudinal Morphology of Drainage Line	3	Flat with a cohesive fixe textured “soil like” bed.
	Particle Size of Materials on Drainage Line Floor	1	Material on floor is similar or smaller in particle size and/or denser (more consolidated) than material on walls (e.g. well sorted gravel).
Wall Materials	Nature of Drainage Line Materials	4	Materials that do not slake or disperse are exposed on wall surface.
Bank Edge	Shape of Stream Bordering Slopes	3	Moderately sloped bank, 5-10^{o}
	Nature of Lateral Flow Regulation	3	Sparse grassland / woodland with bare soil bank lip. Moderate flow rate, some highly focused inflow locations.
Final Classification of Drainage Line		Total Score 25/32 = 78%	Drainage line is stable. Ongoing monitoring is required to determine if the site is moving from a potentially stabilizing to a more stable form, or if it is deteriorating from a very stable form.

6.2 REVIEW & INTERPRETATION OF STREAM HEALTH MONITORING RESULTS

The Baseline Assessment of channel stability, stream health and vegetation health of the Neubecks Creek monitoring locations (SH1, SH2, SH3 and SH3A) at Pine Dale Mine indicates the drainage line is classified as potentially stabilising. An assessment of the Cox's River monitoring site indicated the drainage line is classified as stable.

The CSIRO Ephermeral Stream Assessment protocol indicates ongoing monitoring of both Neubecks Creek and Cox's River drainage line is required; however, rehabilitation works are not required in the immediate future.

In accordance with the Pine Dale Mine *Water Management Plan*, monitoring of the six Stream Health assessment locations was conducted on a monthly basis from August 2013 onwards. The ongoing monitoring encompasses monthly visual assessments and photographic documentation of each site over time. During monitoring from August 2013 onwards, no evidence of erosion, newly exposed soils, or vegetation disturbance has been sighted.

7 NOISE MONITOIRNG

7.1 NOISE ASSESSMENT CRITERIA

The purpose of noise monitoring is to ensure that any impact of mining operations on the surrounding sensitive receivers can be identified, and to show compliance with relevant legislative requirements. Conditional requirements within Project Approval 10_0041 (Schedule 3, Condition 1) and Environmental Protection License (EPL 4911) are presented in **Table 56**.

Table 56 *Noise Assessment Criteria*

Location		Noise Monitoring Location	Day LAeq (15 min) dBA	Evening LAeq (15 min) dBA
Residences 18, 32 and 33		NM1 - (EPL Ref No.33)	42	39
Residences 20-23, 25 and 27-29		N/A	42	36
Residences 8, 10-12 and14		NM2 - (EPL Ref No.14); NM3 - (EPL Ref No.10)	42	35
Residences 2, 5-7 and 35		NM4 - (EPL Ref No.5); NM6 - (EPL Ref No.2)	35	35
All other residences		NM5 - (EPL Ref No.4)	35	35
During construction and removal of the amenity bund	Residences 8, 10-12, 14, 18, 20-23, 25, 27-29 and 32 - 33	N/A	46	N/A

- *Noise generated by the project should not exceed the above criteria at any residence on privately-owned land or on more than 25% of any privately-owned land.*
- *Day: The period from 7:00am to 6:00pm Monday to Saturday and 8:00am to 6:00pm Sundays and Public Holidays*
- *Evening: The period from 6:00pm to 10:00pm Monday to Sunday*

7.2 NOISE MONITORING DATA SUMMARY

In accordance with the Pine Dale Mine *Noise Management Plan*, Environmental Protection Licence (EPL) No. 4911 and Project Approval (10_0041 Schedule 3-1) conditions attended noise surveys are undertaken on a quarterly basis during the mine's operational period.

Quarterly monitoring was undertaken at the following intervals during the 2013 period:

- Quarter 1 – January to March, monitoring conducted 22 & 23 January 2013
- Quarter 2 – April to June, monitoring conducted 22 & 23 April 2013
- Quarter 3 – July to September, monitoring conducted one week early on 24 & 25 June 2013
- Quarter 4 – October to December, monitoring conducted on 30 & 31 October 2013

The aim of the attended noise survey is to record any impact of operational noise on the surrounding community. Three consecutive 15-minute surveys are conducted at each of the six monitoring locations. Results of attended noise surveys carried out during the 2013 monitoring period are presented in **Tables 57** to **60**. Meteorological conditions recorded during each noise survey are presented in **Table 61**. Noise survey locations are presented in Drawing 1, **Appendix 1**.

Table 57 *Attended Noise Survey – Quarter 1, January 2013*

Survey Date	Survey Start Time	Location	Overall			Pine Dale Mine $L_{Aeq\ 15min}$ Contribution	Pine Dale Mine $L_{Aeq\ 15min}$ Limit	Birds & Insects $L_{Aeq\ 15min}$ Contribution	Traffic & Other $L_{Aeq\ 15min}$ Contribution	Comments, Noise Sources and Level Ranges (Min to Max) dB(A)	
			$L_{Aeq\ 15min}$	$L_{A10\ 15min}$	$L_{A90\ 15min}$						
23/01/13	8:37	NM1	52.2	54.7	45	40.4	42	-	50	Pine Dale Mine Birds & Insects Traffic & Other	39 to 52 Nil 44 to 69
23/01/13	8:52	NM1	51.8	55.7	39.2	40.3	42	-	51.5	Pine Dale Mine Birds & Insects Traffic & Other	34 to 54 Nil 38 to 65
23/01/13	9:07	NM1	52.4	55.8	40.6	41.4	42	31.7	52	Pine Dale Mine Birds & Insects Traffic & Other	34 to 53 41 to 58 37 to 66
23/01/13	7:38	NM2	51.9	54.6	45.6	43.5	42	-	48.3	Pine Dale Mine Birds & Insects Traffic & Other	43 to 65 Nil 44 to 66
23/01/13	7:53	NM2	51.3	51.6	43.9	43.9	42	48.1	46.4	Pine Dale Mine Birds & Insects Traffic & Other	38 to 61 39 to 73 42 to 65
23/01/13	8:08	NM2	50.9	51.3	38.2	41.5	42	47.7	47	Pine Dale Mine Birds & Insects Traffic & Other	33 to 60 38 to 75 38 to 66
22/01/13	13:46	NM3	45.5	47.9	38.4	39.9	42	26	41.9	Pine Dale Mine Birds & Insects Traffic & Other	35 to 63 37 to 46 37 to 65
22/01/13	13:01	NM3	43.5	45.0	37.4	41.6	42	32.4	37.2	Pine Dale Mine Birds & Insects Traffic & Other	35 to 58 37 to 54 36 to 58
22/01/13	14:16	NM3	44	45.2	35.9	36.6	42	33.2	34.9	Pine Dale Mine Birds & Insects Traffic & Other	32 to 57 34 to 57 33 to 66
22/01/13	13:46	NM4	44.4	46.9	37.7	41.0	35	25.4	41.7	Pine Dale Mine Birds & Insects Traffic & Other	35 to 62 37 to 46 37 to 65
22/01/13	14:01	NM4	45.0	46	37.8	44.0	35	32.4	36.3	Pine Dale Mine Birds & Insects Traffic & Other	35 to 71 37 to 54 36 to 58
22/01/13	14:16	NM4	41.9	43.2	34.9	40.4	35	30.9	34.9	Pine Dale Mine Birds & Insects Traffic & Other	32 to 59 34 to 56 33 to 66
22/01/13	12:13	NM5	39.7	40.3	31.2	33.7	35	25.9	37.4	Pine Dale Mine Birds & Insects Traffic & Other	29 to 50 29 to 50 29 to 64
22/01/13	12:28	NM5	38.6	42.1	31.9	31.4	35	14.6	37.1	Pine Dale Mine Birds & Insects Traffic & Other	29 to 50 30 to 41 29 to 52
22/01/13	12:43	NM5	39.9	41.4	31.5	33.6	35	15.4	33.5	Pine Dale Mine Birds & Insects Traffic & Other	29 to 49 32 to 45 30 to 58
22/01/13	11:17	NM6	36.9	38.2	30.7	33.6	35	33.1	27.5	Pine Dale Mine Birds & Insects Traffic & Other	29 to 59 29 to 49 29 to 63
22/01/13	11:32	NM6	37.5	40.4	31.2	36.1	35	30.9	24.8	Pine Dale Mine Birds & Insects Traffic & Other	28 to 51 29 to 44 30 to 51
22/01/13	11:47	NM6	35.6	38.4	31.1	31.1	35	33.4	21.9	Pine Dale Mine Birds & Insects Traffic & Other	29 to 49 29 to 45 29 to 45

Table 58 *Attended Noise Survey – Quarter 2, April 2013*

Survey Date	Survey Start Time	Location	Overall			Pine Dale Mine $L_{Aeq\ 15min}$ Contribution	Pine Dale Mine $L_{Aeq\ 15min}$ Limit	Birds & Insects $L_{Aeq\ 15min}$ Contribution	Traffic & Other $L_{Aeq\ 15min}$ Contribution	Comments, Noise Sources and Level Ranges (Min to Max) dB(A)	
			$L_{Aeq\ 15min}$	$L_{A10\ 15min}$	$L_{A90\ 15min}$						
22/04/13	9:45	NM1	51.2	54.8	43.1	41.7	42	51.2	51.3	Pine Dale Mine Birds & Insects Traffic & Other	40 to 45 43 to 59 40 to 63
22/04/13	10:00	NM1	52	55.4	43.8	42.2	42	47.2	52.2	Pine Dale Mine Birds & Insects Traffic & Other	41 to 44 43 to 52 41 to 64
22/04/13	10:15	NM1	53.1	56.4	43.3	41.8	42	64.3	52.8	Pine Dale Mine Birds & Insects Traffic & Other	40 to 44 56 to 69 41 to 66
22/04/13	10:58	NM2	50.8	53.4	44.1	41.8	42	48.5	50.9	Pine Dale Mine Birds & Insects Traffic & Other	40 to 44 48 to 49 40 to 69
22/04/13	11:13	NM2	49.5	52.6	44.0	42.6	42	-	49.7	Pine Dale Mine Birds & Insects Traffic & Other	41 to 45 Nil 41 to 60
22/04/13	11:28	NM2	50.1	53.3	43.4	41.9	42	-	50.3	Pine Dale Mine Birds & Insects Traffic & Other	39 to 45 Nil 40 to 61
23/04/13	7:17	NM3	59.4	62.3	44.0	39.6	42	52.3	60.1	Pine Dale Mine Birds & Insects Traffic & Other	38 to 44 37 to 63 38 to 78
23/04/13	7:32	NM3	58.0	61.5	41.4	38.7	42	48.7	58.4	Pine Dale Mine Birds & Insects Traffic & Other	35 to 42 37 to 56 38 to 77
23/04/13	7:47	NM3	61.3	63.3	41.1	38.6	42	-	61.5	Pine Dale Mine Birds & Insects Traffic & Other	34 to 44 Nil 36 to 81
23/04/13	9:36	NM4	41.4	42.7	36.2	28.7	35	44.2	40.2	Pine Dale Mine Birds & Insects Traffic & Other	34 to 43 35 to 62 34 to 56
23/04/13	9.51	NM4	44.0	44.6	37.3	28.4	35	45.1	44	Pine Dale Mine Birds & Insects Traffic & Other	35 to 43 36 to 65 35 to 69
23/04/13	10:06	NM4	40.9	43.4	37.4	27.2	35	44.4	40.6	Pine Dale Mine Birds & Insects Traffic & Other	36 to 42 37 to 58 36 to 55
23/04/13	8:29	NM5	40.3	42.8	35.5	25.4	35	41.4	40.1	Pine Dale Mine Birds & Insects Traffic & Other	34 to 43 35 to 54 34 to 62
23/04/13	8:44	NM5	41.2	43.2	36	24.1	35	43.4	40.4	Pine Dale Mine Birds & Insects Traffic & Other	34 to 41 36 to 59 34 to 58
23/04/13	8:59	NM5	40.7	41.6	36.4	27.1	35	40.3	40.9	Pine Dale Mine Birds & Insects Traffic & Other	34 to 42 36 to 48 34 to 63
22/04/13	13:34	NM6	42.3	44.6	38.3	30.7	35	43.4	42.4	Pine Dale Mine Birds & Insects Traffic & Other	36 to 42 37 to 61 37 to 54
22/04/13	13:49	NM6	42.1	44.8	38.6	31.4	35	40.6	42.8	Pine Dale Mine Birds & Insects Traffic & Other	37 to 43 37 to 49 38 to 56
22/04/13	14:04	NM6	42.0	44.3	38.0	31.4	35	42.9	42.4	Pine Dale Mine Birds & Insects Traffic & Other	36 to 42 37 to 53 36 to 57

Table 59 *Attended Noise Survey – Quarter 3, June 2013*

Survey Date	Survey Start Time	Location	Overall			Pine Dale Mine $L_{Aeq\ 15min}$ Contribution	Pine Dale Mine $L_{Aeq\ 15min}$ Limit	Birds & Insects $L_{Aeq\ 15min}$ Contribution	Traffic & Other $L_{Aeq\ 15min}$ Contribution	Comments, Noise Sources and Level Ranges (Min to Max) dB(A)	
			$L_{Aeq\ 15min}$	$L_{A10\ 15min}$	$L_{A90\ 15min}$						
24/06/13	11:26	NM6	40.6	42.8	31.9	NIL	35	30.9	40.1	Pine Dale Mine Birds & Insects Traffic & Other	NIL 29 to 61 30 to 61
24/06/13	11:41	NM6	40.8	44.2	31.7	NIL	35	27.7	40.6	Pine Dale Mine Birds & Insects Traffic & Other	NIL 29 to 45 29 to 55
24/06/13	11:56	NM6	42.1	45.6	31.6	NIL	35	30.6	41.8	Pine Dale Mine Birds & Insects Traffic & Other	NIL 30 to 47 30 to 58
24/06/13	13:15	NM5	38.4	41.4	32.8	NIL	35	33.1	36.8	Pine Dale Mine Birds & Insects Traffic & Other	NIL 31 to 50 31 to 49
24/06/13	13:30	NM5	37.0	39.5	32.6	NIL	35	27.5	36.5	Pine Dale Mine Birds & Insects Traffic & Other	NIL 31 to 47 31 to 50
24/06/13	13:45	NM5	40.7	44	33.5	NIL	35	40.3	30.3	Pine Dale Mine Birds & Insects Traffic & Other	NIL 30 to 55 32 to 48
24/06/13	14:14	NM4	45.5	47.4	34.0	NIL	35	39.9	44.1	Pine Dale Mine Birds & Insects Traffic & Other	NIL 32 to 67 31 to 61
24/06/13	14:29	NM4	39.2	42.1	33.1	18.0	35	34.0	37.6	Pine Dale Mine Birds & Insects Traffic & Other	34 to 43 29 to 59 31 to 53
24/06/13	14:44	NM4	39.1	41.9	34.6	22.3	35	32.3	38.0	Pine Dale Mine Birds & Insects Traffic & Other	35 to 44 31 to 50 31 to 61
24/06/13	15:09	NM3	60.5	64.3	44.5	NIL	42	41.0	60.5	Pine Dale Mine Birds & Insects Traffic & Other	NIL 38 to 58 41 to 78
24/06/13	15:24	NM3	60.1	64.3	41.7	NIL	42	40.3	60.1	Pine Dale Mine Birds & Insects Traffic & Other	NIL 36 to 59 42 to 75
24/06/13	15:39	NM3	58.8	62.4	42.7	NIL	42	38.2	58.7	Pine Dale Mine Birds & Insects Traffic & Other	NIL 37 to 54 41 to 78
24/06/13	16:08	NM2	49.9	53.1	42.7	NIL	42	32.3	49.9	Pine Dale Mine Birds & Insects Traffic & Other	NIL 39 to 47 39 to 60
24/06/13	16:23	NM2	50.7	53.5	43.6	NIL	42	33.1	50.7	Pine Dale Mine Birds & Insects Traffic & Other	NIL 36 to 54 37 to 62
24/06/13	16:38	NM2	50.1	53.2	40.5	NIL	42	36.8	49.8	Pine Dale Mine Birds & Insects Traffic & Other	NIL 37 to 52 39 to 62
25/06/13	09:47	NM1	45.5	48.8	39.5	14.6	42	41.9	43.1	Pine Dale Mine Birds & Insects Traffic & Other	38 to 40 37 to 56 37 to 56
25/06/13	10:02	NM1	45.9	48.9	39.7	NIL	42	31.6	45.8	Pine Dale Mine Birds & Insects Traffic & Other	NIL 38 to 51 37 to 58
25/06/13	10:17	NM1	45.2	47.6	40.2	NIL	42	33.9	44.9	Pine Dale Mine Birds & Insects Traffic & Other	NIL 39 to 53 36 to 58

Table 60 *Attended Noise Survey – Quarter 4, October 2013*

Survey Date	Survey Start Time	Location	Overall			Pine Dale Mine $L_{Aeq\ 15min}$ Contribution	Pine Dale Mine $L_{Aeq\ 15min}$ Limit	Birds & Insects $L_{Aeq\ 15min}$ Contribution	Traffic & Other $L_{Aeq\ 15min}$ Contribution	Comments, Noise Sources and Level Ranges (Min to Max) dB(A)	
			$L_{Aeq\ 15min}$	$L_{A10\ 15min}$	$L_{A90\ 15min}$						
30/10/13	10:52	NM1	43.1	45.5	36.1	30.0	42	38.1	41.1	Pine Dale Mine Birds & Insects Traffic & Other	35 to 48 33 to 57 34 to 60
30/10/13	11:07	NM1	41.9	44.5	36.7	29.5	42	35.7	40.4	Pine Dale Mine Birds & Insects Traffic & Other	35 to 48 34 to 56 33 to 53
30/10/13	11:22	NM1	43.8	45.8	37.9	32.0	42	37.4	42.3	Pine Dale Mine Birds & Insects Traffic & Other	37 to 48 35 to 58 37 to 61
30/10/13	11:52	NM2	47.3	51.0	36.3	33.3	42	40.9	46	Pine Dale Mine Birds & Insects Traffic & Other	36 to 53 31 to 65 35 to 63
30/10/13	12:07	NM2	48.8	51.9	35.4	38.9	42	40.4	47.5	Pine Dale Mine Birds & Insects Traffic & Other	36 to 55 30 to 58 35 to 69
30/10/13	12:22	NM2	47.6	50.9	35.9	39.8	42	42.1	45.1	Pine Dale Mine Birds & Insects Traffic & Other	37 to 56 31 to 75 36 to 59
30/10/13	13:30	NM3	43.5	47.8	34.3	39.0	42	37.5	39.4	Pine Dale Mine Birds & Insects Traffic & Other	39 to 52 29 to 58 35 to 53
30/10/13	13:45	NM3	43.0	47.1	33.7	33.2	42	38.3	40.4	Pine Dale Mine Birds & Insects Traffic & Other	35 to 50 28 to 62 33 to 52
30/10/13	14:00	NM3	45.2	48.6	37.6	36.1	42	43.0	39.6	Pine Dale Mine Birds & Insects Traffic & Other	40 to 52 32 to 60 35 to 53
30/10/13	14:38	NM4	37.8	38.3	32.4	19.5	35	36.3	32.0	Pine Dale Mine Birds & Insects Traffic & Other	31 to 38 30 to 56 31 to 44
30/10/13	14:53	NM4	37.4	37.5	31.4	19.6	35	36.5	29.8	Pine Dale Mine Birds & Insects Traffic & Other	34 to 42 29 to 62 31 to 44
30/10/13	15:08	NM4	37.3	38.9	30.7	25.1	35	36.0	30.5	Pine Dale Mine Birds & Insects Traffic & Other	32 to 42 28 to 62 29 to 44
31/10/13	10:55	NM5	41.8	39.7	32.6	NIL	35	41.5	29.9	Pine Dale Mine Birds & Insects Traffic & Other	NIL 30 to 67 32 to 45
31/10/13	11:10	NM5	39.1	39.9	32.6	18.5	35	38.8	27.2	Pine Dale Mine Birds & Insects Traffic & Other	34 to 41 31 to 63 33 to 49
31/10/13	11:25	NM5	36.7	39.2	30.7	NIL	35	36.2	27.2	Pine Dale Mine Birds & Insects Traffic & Other	NIL 28 to 54 30 to 45
31/10/13	11:46	NM6	38.3	39.8	31.3	27.2	35	36.7	32.1	Pine Dale Mine Birds & Insects Traffic & Other	30 to 47 29 to 68 31 to 45
31/10/13	12:01	NM6	37.9	40.7	32.1	29.3	35	35.2	33.1	Pine Dale Mine Birds & Insects Traffic & Other	31 to 43 29 to 54 31 to 48
31/10/13	12:16	NM6	38.8	41.7	31.4	33.5	35	36.1	31.9	Pine Dale Mine Birds & Insects Traffic & Other	33 to 50 29 to 58 30 to 45

Table 61 *Meteorological Conditions during Attended Noise Surveys*

Survey Date	Start Time	Location	Cloud	Temp at 10m	Wind Speed at 10m	Wind Direction
23/01/13	8:37	NM1	8 Octa	22°C	1.2 m/s	N
23/01/13	7:38	NM2	7.5 Octa	20°C	1.0 m/s	SSE
22/01/13	13:46	NM3	7.5 Octa	21°C	1.7 m/s	SSW
22/01/13	13:46	NM4	7 Octa	20°C	1.3 m/s	NE
22/01/13	12:13	NM5	5 Octa	23°C	2.1 m/s	WNW
22/01/13	11:17	NM6	2.5 Octa	30°C	3.9 m/s	W
22/04/13	9.45	NM1	6 Octa	16°C	2.6 m/s	NW
22/04/13	10.58	NM2	4 Octa	17°C	3.6 m/s	NW
23/04/13	7.17	NM3	0 Octa	7°C	2.0 m/s	WSW
23/04/13	9:36	NM4	0 Octa	17°C	2.2 m/s	SW
23/04/13	8.29	NM5	0 Octa	12°C	2.5 m/s	SW
22/04/13	13.34	NM6	6 Octa	18°C	3.5 m/s	WNW
25/06/13	9:47	NM1	8 Octa	7.5°C	2.1 m/s	SE
24/06/13	16:08	NM2	8 Octa	6.5°C	1.3 m/s	W
24/06/13	15:09	NM3	8 Octa	6.5°C	1.1 m/s	WSW
24/06/13	14:14	NM4	8 Octa	7°C	1.6 m/s	W
24/06/13	13:15	NM5	8 Octa	7°C	2.0 m/s	WSW
24/06/13	11:26	NM6	8 Octa	7°C	1.2 m/s	WSW
30/10/13	10:52	NM1	1 Octa	17°C	1.4 m/s	SW
30/10/13	11:52	NM2	1 Octa	20°C	2.0 m/s	SE
30/10/13	13:30	NM3	1 Octa	23°C	1.9 m/s	SE
30/10/13	14:38	NM4	1 Octa	24°C	1.4 m/s	SSE
31/10/13	10:55	NM5	1 Octa	18°C	2.1 m/s	W
31/10/13	11:46	NM6	1 Octa	18°C	2.6 m/s	NW

7.3 REVIEW & INTERPRETATION OF OPERATIONAL NOISE MONITORING RESULTS

Attended noise surveys of the Pine Dale mine operations for the 2013 monitoring period were undertaken in January, April, June and October. During each quarterly survey the mine was observed to be operational within the Yarraboldy Extension area. The operations observed were considered to be representative of those undertaken on a normal daily basis.

The source coding method was used during attended noise surveys to record the overall noise levels and define the contributing noise sources at each of the six noise monitoring locations. Noise sources audible during the attended surveys were classified into three source categories, namely, Mine noise (from Pine Dale Mine); Birds & Insects; and Traffic & Other noise sources. Contributions from these sources were determined by analysis of the time coded logger data using the sound level meters proprietary software.

7.3.1 FIRST QUARTER 2013

During the first quarter (January 2013) traffic noise was determined to be a major contributor to the overall acoustic climate at all of the monitoring locations except NM6. Noise monitoring at locations NM1, NM3, and NM5 gave measured levels below the noise assessment criteria.

Noise monitoring at locations NM2 and NM6 recorded noise levels above the noise assessment criteria by 1 dB and 2 dB respectively. The NSW Industrial Noise Policy (Environmental Protection Authority, 2000) stipulates that a non-compliance of noise consent or licence conditions has occurred only if the 'monitored noise level is more than 2dB above the statutory noise limit specified in the consent or licence condition'. Therefore, the measured levels at NM2and NM6 are not considered to be exceedance of the licence condition.

Noise monitoring at location NM4 showed noise levels from mining activity at Pine Dale Mine which were substantially greater than the noise assessment criteria during the survey. The elevated noise levels measured at location NM4 are attributed to the presence of haul trucks and dozers working at the surface in the eastern end of the Yaraboldy extension area. This was a short term activity associated with final shaping associated with the rehabilitation of the eastern Yaraboldy pit area. The particular area of concern was not well protected from NM4 by the noise bund during the shaping works.

7.3.2 SECOND QUARTER 2013

During the second Quarter of 2013 (April 2013) the noise monitoring undertaken at all noise monitoring locations gave noise levels generally below the noise assessment criteria with the exception of two 15 minute samples which gave measured levels of 42.2 dB(A) $L_{eq\ 15min}$ and 42.6 dB(A) $L_{eq\ 15min.}$ at NM2. Both measured results are less than 1 dB above the assessment criteria and are not considered to be an exceedance of the criteria. The slightly elevated results are attributed to intermittent emergence of haul trucks on the upper levels of the mine from behind the noise bund, thus exposing them to the noise monitoring site. The emergence of sound would be largely undetectable by residents because it was for very short periods (approximately 20 seconds) and is masked by general road traffic.

7.3.3 THIRD QUARTER 2013

During the third quarter (June 2013), the $L_{Aeq\ (15\ minute)}$ contribution from the Pine Dale Mine at each noise monitoring location for each of the 45 minute survey sessions were observed to be lower than the noise assessment criteria at all monitoring locations.

7.3.4 FOURTH QUARTER 2013

Similarly, during the fourth quarter (October 2013), the measured $L_{Aeq, 15min}$ noise contribution from the Pine Dale Mine, at all noise monitoring locations, was below the target noise goal for all 15 minute surveys.

7.3.5 OVERALL ASSESSMENT FOR 2013

In general the assessable sound levels from Pine Dale Mine were below the assessment criteria for most periods during the year. The January and April quarters showed some isolated instances of elevated mining noise levels due to the conduct of rehabilitation works on the surface at the eastern end of the Yaraboldy extension. No complaints regarding operational (non blasting related) noise impacts were received during the periods when elevated noise levels were recorded at nearby receivers during January and April 2013. Noise monitoring for June and October Quarters showed compliance with noise assessment criteria at all noise monitoring locations. There has been an overall reduction in the level of mine related noise at residences as mining activity has moved further west and deeper into the pit.

It is a requirement under AS 1055 that the noise surveys also document levels of ambient sound resulting from non mine sound sources. In the surveys conducted for Pine Dale Mine during 2013 traffic and natural sounds, which are represented by the "Overall" LAeq (15 minute) noise levels set out in Table 57 to 60, are usually significantly higher than the sound from Pinedale Mine.

8 BLAST MONITORING

8.1 BLASTING OPERATIONS ASSESSMENT CRITERIA

The purpose of blast monitoring is to ensure that any impact of blasting operations on the surrounding land and nearby sensitive locations can be identified, and to show compliance with relevant legislative requirements. Conditional requirements within Project Approval 10_0041 (Schedule 3, Condition 8) and Environmental Protection License (EPL 4911) are presented in **Table 62**.

Table 62 *Blasting Operations: Compliance Requirements*

Location	*Airblast overpressure (dB(Lin Peak))*	*Ground vibration (mm/s)*	*Allowable exceedance*
Residence on privately-owned land	115	5	5% of the total number of blasts over a period of 12 months
	120	10	0%

8.2 BLASTING OPERATIONS MONITORING DATA SUMMARY

The monitoring of blasts for Pine Dale Mine is undertaken in accordance with the Pine Dale Mine Environmental Protection License (EPL 4911). Throughout the 2013 monitoring period there were a total of 34 blasts conducted at the site. There were zero incidences where multiple blasts were fired on the same day.

Blasting results for the period January 2013 to December 2013 are shown in **Table 63** and **64**. Graphical presentations of the airblast overpressure and ground vibration results are presented in **Figures 10** and **11** respectively.

Where airblast overpressure or ground vibration levels are too low to be detectable at the monitors, no trigger is set off and therefore no result is recorded.

Table 63 *Blast Monitoring Results Jan - Dec 2013*

Date	Park		Noon St.		Summer St.	
	Overpressure (dB)	Vibration (mm/sec)	Overpressure (dB)	Vibration (mm/sec)	Overpressure (dB)	Vibration (mm/sec)
10/01/2013	NT	NT	99.1	0.09	98.4	0.10
17/01/2013	NT	NT	110.9	0.65	108.4	0.67
24/01/2013	NT	NT	111.1	1.95	110.5	1.81
31/01/2013	NT	NT	100.2	0.11	108.0	0.12
21/02/2013	NT	NT	108.0	1.59	108.9	1.57
27/02/2013	NT	NT	NT	NT	NT	NT
14/03/2013	NT	NT	NT	NT	110.4	2.10
28/03/2013	NT	NT	NT	NT	107.2	0.27
5/04/2013	NT	NT	111.6	2.21	107.4	2.17
11/04/2013	NT	NT	105.0	1.94	106.8	2.07
17/04/2013	NT	NT	91.2	0.08	NT	NT
24/04/2013	NT	NT	91.6	0.08	87.2	0.48
2/05/2013	NT	NT	99.1	0.23	NT	NT
9/05/2013	NT	NT	110.2	0.58	106.9	0.56
16/05/2013	NT	NT	102.5	0.24	108.4	0.25
24/05/2013	NT	NT	102.2	0.37	99.9	0.35
6/06/2013	NT	NT	111.9	1.32	113.3	1.22
14/06/2013	NT	NT	78.3	1.74	87.2	1.95
21/06/2013	NT	NT	106.6	1.45	104.5	1.27
3/07/2013	96.9	0.38	99.4	0.41	NT	NT
11/07/2013	NT	NT	110.3	1.79	109.8	1.05
17/07/2013	NT	NT	112.6	1.64	107.1	1.44
26/07/2013	NT	NT	106.0	0.65	103.0	0.53
31/07/2013	NT	NT	99.0	0.42	100.0	0.40
15/08/2013	NT	NT	109.9	1.45	113.3	1.19
16/08/2013	NT	NT	109.5	1.28	109.4	1.37
6/09/2013	NT	NT	100.0	0.40	109.4	1.37
13/09/2013	NT	NT	113.5	0.61	110.5	0.74
25/09/2013	NT	NT	110.5	0.74	112.4	1.99
27/09/2013	NT	NT	109.1	1.00	106.3	1.31
11/10/2013	NT	NT	94.6	0.10	NT	NT
18/10/2013	NT	NT	103.4	0.08	NT	NT
29/11/2013	NT	NT	106.9	0.22	108.2	0.08
12/12/2013	NT	NT	NT	NT	NT	NT

NT - Indicates monitor was not triggered.

Italics- indicate that results are greater than the 95% compliance criteria as specified in the EPL.

Bold italics- indicate that results are greater than the 100% compliance criteria as specified in the EPL.

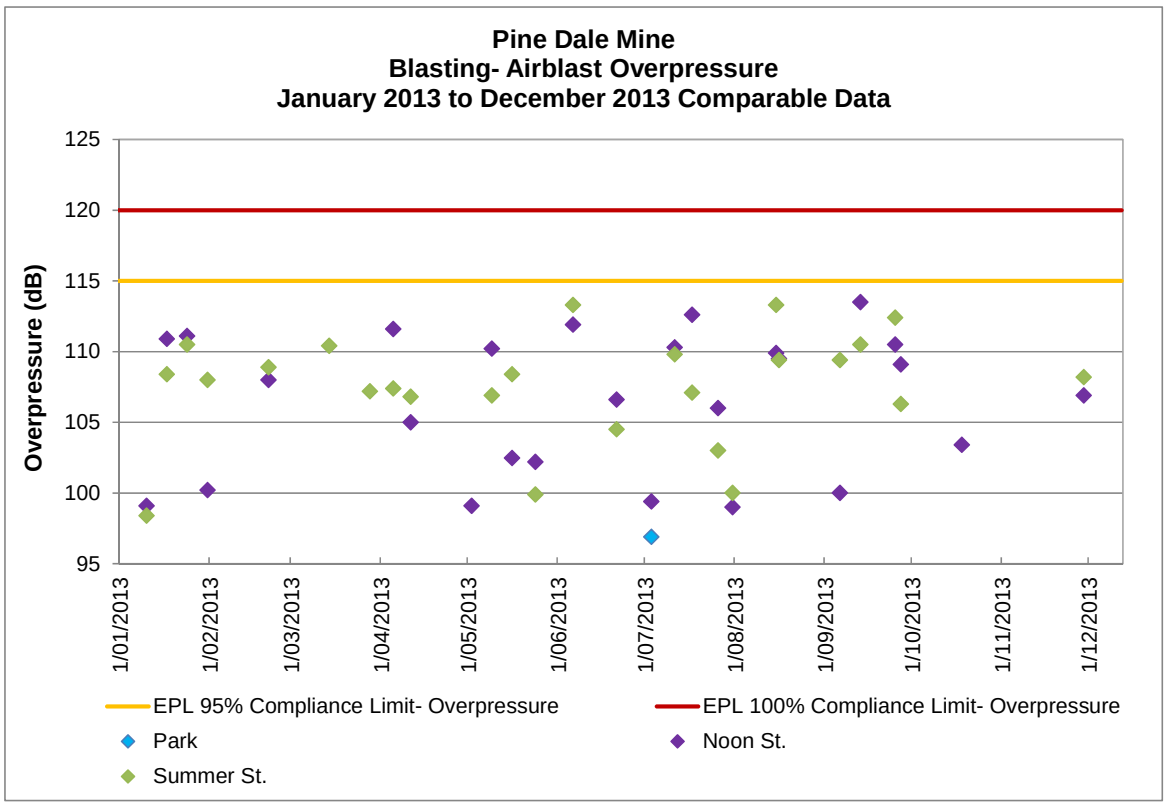


Figure 11 *Blasting Operations: Airblast Overpressure Results Summary*

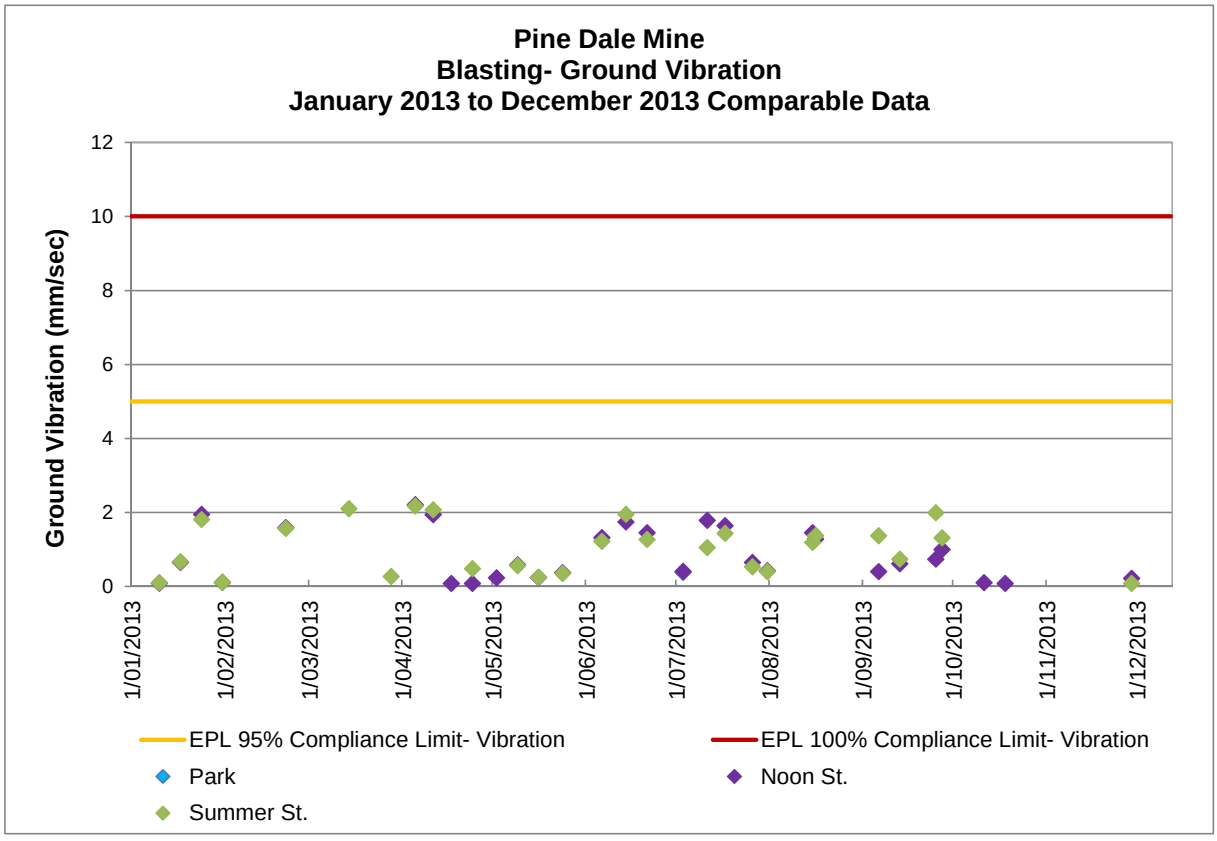


Figure 12 *Blasting Operations: Ground Vibration Results Summary*

Table 64 *Summary of Blasting Results and Compliance Performance*

Jan- Dec 2013 Information	*Park*		*Noon St.*		*Summer St.*	
	Airblast Overpressure (dB)	**Vibration (mm/sec)**	**Airblast Overpressure (dB)**	**Vibration (mm/sec)**	**Airblast Overpressure (dB)**	**Vibration (mm/sec)**
Minimum	96.9	0.38	78.3	0.08	87.2	0.08
Average	96.9	0.38	104.1	0.85	106.0	1.05
Maximum	96.9	0.38	113.5	2.21	113.3	2.17
% blasts > EPL 95% Compliance Criteria	0	0	0	0	0	0
% blasts > EPL 100% Compliance Criteria	0	0	0	0	0	0

8.3 REVIEW & INTERPRETATION OF BLASTING OPERATIONS MONITORING RESULTS

Blast monitoring results obtained during the monitoring period of January – December 2013 show that airblast overpressure results were in compliance with both the 95% and 100% assessment criteria as stipulated in EPL 4911.

As displayed in **Table 64**, full compliance was attained across all monitors during 2013 for vibration levels at both the 100% and 95% velocity levels of 10mm/sec and 5mm/sec, respectively.

Across all of the monitoring locations, airblast overpressure levels were recorded to be below the one hundred per cent, 120dB (Lin Peak), and ninety-five per cent, 115dB (Lin Peak), compliance criteria during the reporting period.

9 LIMITATIONS

This report has been prepared for Pine Dale Mine. The services performed by RCA have been conducted in a manner consistent with that generally exercised by members of its profession and consulting practice.

This report has been prepared for the use of Pine Dale Mine. This report shall only be presented in full and may not be used to support objectives other than those stated in the report without written permission from RCA.

The information in this report is considered accurate at the date of issue. Please contact the undersigned if you have any queries on the above.

Yours sincerely

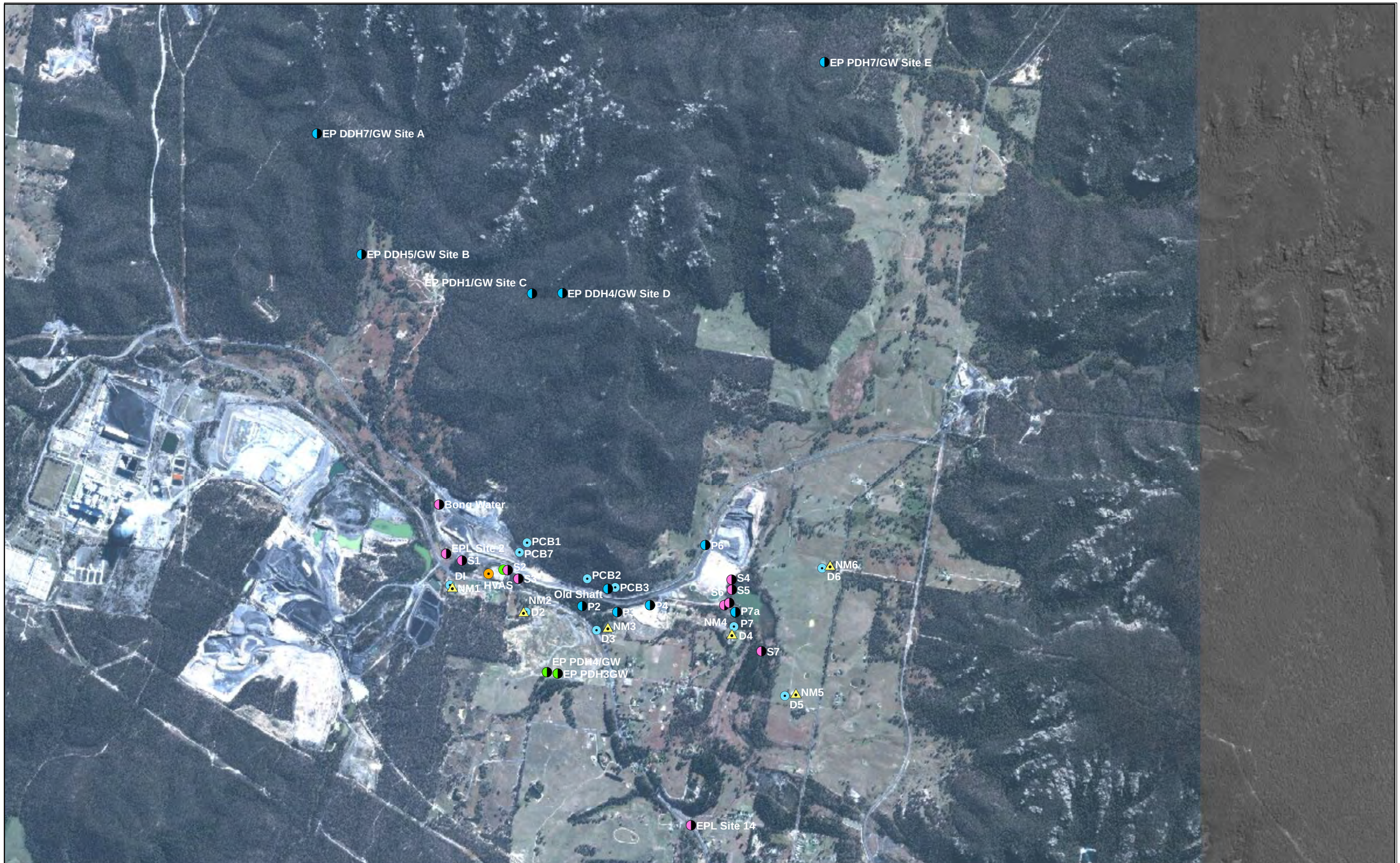
Karen Tripp
Senior Environmental Scientist / Hygienist
Robert Carr and Associates trading as
RCA Laboratories – Environmental

Geoff Mason
General Manager
Robert Carr and Associates trading as
RCA Laboratories – Environmental

Appendix 1

Drawing 1 - Environmental Monitoring Locations

Drawing 2 - Stream Health & Channel Stability Monitoring Locations



Legend

- Noise Monitoring Location
- Depositional Dust Monitoring Location
- Enhance Groundwater Monitoring Location
- Groundwater Monitoring Location
- High Volume Air Sampling Location
- Metorological Monitoring Location
- Surface Water Monitoring Location

500 250 0 500 1,000 1,500

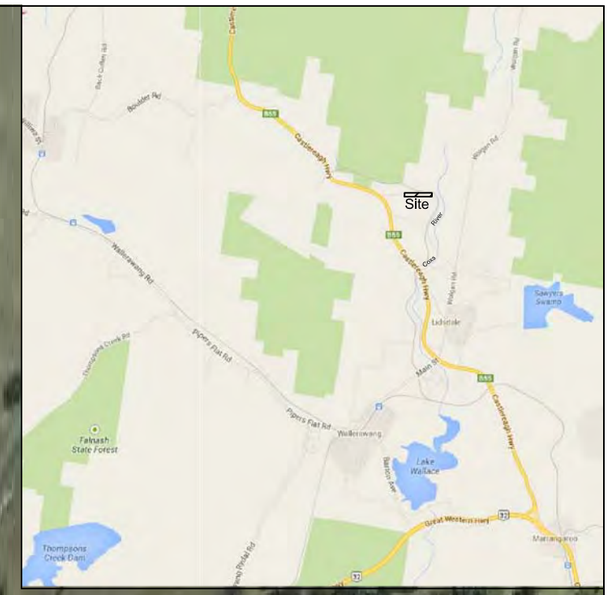
metres

N

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

PINE DALE MINE
ENVIRONMENTAL MONITORING LOCATIONS

CLIENT	Pine Dale Mine			PROJECT No	6880-840/0
DRAWN BY	KT	SCALE	1:30,000 (A3)	DRAWING No	1
APPROVED BY	KT	DATE	5/03/2014	OFFICE	NEWCASTLE



Locality Plan
N.T.S.

Mine Office

SH4

SH2

SH1
Clean Water Diversion

SH3
SH3a
LDP13

Castlereagh Highway

LEGEND
- Monitoring location
- Licence discharge point location
- Clean water diversion location

SH5

0 50 100 150 200 250
metres

View Street

Aerial image taken from Google Earth, 23 May 2006

RCA AUSTRALIA
GEOTECHNICAL • ENVIRONMENTAL

LOCATION PLAN OF CHANNEL STABILITY, STREAM AND VEGETATIVE HEALTH OF NEUBECKS CREEK MONITORING SITES

CLIENT	Pine Dale Mine			RCA Ref	6880-840/0
DRAWN BY	KS	SCALE	1 : 5000 (A3)	DRAWING No 2	REV 0
APPROVED BY	KT	DATE	5/3/2014	OFFICE	NEWCASTLE

CDT-DWG-A3H-001/1

Appendix 2

Stream Health & Channel Stability Field Sheets

Pine Dale Mine

Monthly Stream Health Monitoring

Month: August 2013

Location:	SH1	SH2	SH3
Date:	28/8/13	28/8/13	28/8/13
Time:	10.43	9.45	8.37
Technician:	KT/KS	KT/KS	KT/KS
GPS Location	0227745 6304298	0228058 6304328	0228306 6304293
Visual Inspection Details			
Any evidence of Erosion visible? Y / N	N	N	N
Any newly Exposed Soils visible? Y / N	N	N	N
Any riparian vegetation distrubance visible? Y / N	N	N	N
Photograph looking upstream taken? Y /N	Y	Y	Y
Photograph looking downstrean taken? Y/ N	Y	Y	Y
Photograph looking across stream taken? Y / N	Y	Y	Y
Comments	Cross sections completed 28/8/13 →		→

Pine Dale Mine

Monthly Stream Health Monitoring

Month: September 2013

Location:	SH1	SH2	SH3
Date:	25/9/13	25/9/13	25/9/13
Time:	15.00	15.20	15.30
Technician:	KH/CS	KH/CS	KH/CS
GPS Location	~~022745~~ 022745-6304288	0228058/6304328	0228306/6304293
Visual Inspection Details			
Any evidence of Erosion visible? Y / N	N	N	N
Any newly Exposed Soils visible? Y / N	N	N	N
Any riparian vegetation distrubance visible? Y / N	N	N	N
Photograph looking upstream taken? (Y)/N	Y	Y	Y
Photograph looking downstrean taken? Y/ N	Y	Y	Y
Photograph looking across stream taken? Y / N	Y	Y	Y
Comments			

Pine Dale Mine

Monthly Stream Health Monitoring

Month: October 2013

Site:	SH1	SH2	SH3	SH3A	SH4	SH5
Location:	Downstream of the PDM clean water diversion point	Mid-stream Neubecks Creek	Upstream of the PDM Licenced Discharge Point 13	Downstream of the PDM Licenced Discharge Point 13 (water site S6)	Blue Lake (water site S5)	Cox's River downstream of Blue Lake (water site S7)
Date:	30/10/13	30/10/13	31/10/13	31/10/13	30/10/13	30/10/13
Time:	13.33	15.38	9.08	10.24	14.26	14.47
Technician:	KT	KT	KT	KT	KT	KT
GPS Location	0227745 6304298	0228058 6304328	0228306 6304293	0228410 6304319	0228426 6304416	0228654 6303975
Visual Inspection Details						
Any evidence of Erosion visible? Y / N	N	N	N	N	N	N
Any newly Exposed Soils visible? Y / N	N	N	N	N	N	N
Any riparian vegetation distrubance visible? Y / N	N	N	N	N	N	N
Photograph looking upstream taken? Y /N	Y	Y	Y	Y	Y	Y
Photograph looking downstrean taken? Y/ N	Y	Y	Y	Y	Y	Y
Photograph looking across stream taken? Y / N	Y	Y	Y	Y	Y	Y
Comments						

Pine Dale Mine

Monthly Stream Health Monitoring

Month: NOVEMBER 2013

Site:	SH1	SH2	SH3	SH3A	SH4	SH5
Location:	Downstream of the PDM clean water diversion point	Mid-stream Neubecks Creek	Upstream of the PDM Licenced Discharge Point 13	Upstream of the PDM Licenced Discharge Point 13 (water site S6)	Blue Lake (water site S5)	Cox's River downstream of Blue Lake (water site S7)
Date:	21/11/13	21/11/13	21/11/13	20/11/13	20/11/13	20/11/13
Time:	6.50	6.59	7.10	16.60	16.45	16.16
Technician:	CS/KH	CS/KH	CS/KH	CS/KH	CS/KH	CS/KH
GPS Location	0227745 6304298	0228058 6304328	0228306 6304293	0228410 6304319	0228426 6304416	0228654 6303975
Visual Inspection Details						
Any evidence of Erosion visible? Y / N	N	N	N	N	N	N
Any newly Exposed Soils visible? Y / N	N	N	N	N	N	N
Any riparian vegetation distrubance visible? Y / N	N	N	N	N	N	N
Photograph looking upstream taken? Y /N	Y	Y	Y	Y	Y	Y
Photograph looking downstrean taken? Y/ N	Y	Y	Y	Y	Y	Y
Photograph looking across stream taken? Y / N	Y	Y	Y	Y	Y	Y
Comments						

Pine Dale Mine

Monthly Stream Health Monitoring

Month: December 2013

Site:	SH1	SH2	SH3	SH3A	SH4	SH5
Location:	Downstream of the PDM clean water diversion point	Mid-stream Neubecks Creek	Upstream of the PDM Licenced Discharge Point 13	Downstream of the PDM Licenced Discharge Point 13 (water site S6)	Blue Lake (water site S5)	Cox's River downstream of Blue Lake (water site S7)
Date:	18.12.13	18.12.13	18.12.13	18.12.13	18.12.13	18.12.13
Time:	15.25	15.17	15.32	15.50	16.00	15.44
Technician:	CS|KH	CS|KH	CS|KH	CS|KH	CS|KH	CS|KH
GPS Location	0227745 6304298	0228058 6304328	0228306 6304293	0228410 6304319	0228426 6304416	0228654 6303975
Visual Inspection Details						
Any evidence of Erosion visible? Y / N	N	Y	N	N	N	N
Any newly Exposed Soils visible? Y / N	N	Y	N	N	N	N
Any riparian vegetation distrubance visible? Y / N	N	Y	N	N	N	N
Photograph looking upstream taken? Y /N	Y	Y	Y	Y	Y	Y
Photograph looking downstrean taken? Y/ N	Y	Y	Y	Y	Y	Y
Photograph looking across stream taken? Y / N	Y	Y	Y	Y	Y	Y
Comments		wombat hole to right of star post creek bed dry	creek bed dry black snake see photo			