

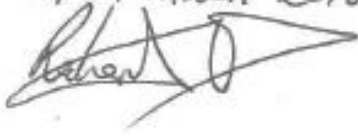



## Northparkes Mines

# Annual Environmental Management Report

January 2014 – December 2014

Name of Mine	Northparkes Mines
Name of Leaseholder and Mine Operator	North Mining Limited
Mining Leases	ML 1247, ML 1367 and 1641
Environment Protection Licence	EPL 4784
Development Consent	PA 11-0600 & DC 06-0026, including Mod 1 and Mod 2
MOP Commencement Date	1 <sup>st</sup> July 2011
MOP Completion Date	30 <sup>th</sup> June 2015
AEMR Commencement Date	1 <sup>st</sup> January 2014
AEMR Completion Date	31 <sup>st</sup> December 2014

Reviewed by	
Title	Robert Cunningham, HSEF Manager
Date	4 <sup>th</sup> MARCH 2015
Signature	
Approved by	
Title	Stefanie Loader, Managing Director
Date	4 <sup>th</sup> March 2015
Signature	

## Year in Review 2014

	2013	2014 (actual)	2015 (forecast)
General			
Government fines	0	0	0
Reportable incidents	9	9	0
Legal compliance	✓	✓	✓
ISO 14001 certification	✓	✓	✓
Mining			
Concentrate production (t)	168,282	169,376	162,856
F/T employment level	310	324	310
Total land clearance (ha)	2.09	2.8	160
Total land rehabilitation (ha)	0.87	0.00	110
Community			
Complaints	8	2	0
Main complaint issue	Dust	Dust/Traffic	–
CCC meetings	2	1	2
Investments (\$)	480,000	457,150	470,000

# Contents page

<b>Introduction</b>	<b>7</b>
1. Introduction	7
1.1 Scope	7
1.1.1 Location, history and process overview	7
1.1.2 Site Layout and Infrastructure	10
1.2 Contents, leases and licences	12
1.2.1 Amendments over the reporting period	12
1.3 Mining Contacts	13
1.4 Actions required from previous AEMR review meeting	13
<b>Operations During The Reporting Period</b>	<b>14</b>
2. Brief Summary on key outcomes/achievements	14
2.1 Exploration and Resource Utilisation	14
2.2 Mining and Development	16
2.3 Ore Processing	18
2.4 Employment Levels	20
<b>Environmental Management and Performance</b>	<b>21</b>
3. Environment and Community Team	21
3.1 Environmental Management System	21
3.2 Reportable Environmental Incidents	21
3.3 Meteorology	23
3.3.1 Monitoring	23
3.3.2 Management	23
3.3.3 Results	23
25	
25	
3.3.4 Actions Proposed for 2015	26
3.4 Air Quality	26
3.4.1 Monitoring	26
3.4.2 Management	28
3.4.3 Results	28
3.4.4 Actions Proposed for 2015	34
3.5 Noise	35
3.5.1 Monitoring	35
3.5.2 Management	37
3.5.3 Results	37
3.5.4 Actions Proposed for 2015	37
3.6 Blasting	38
3.6.1 Monitoring	38
3.6.2 Management	38
3.6.3 Results	38
3.6.4 Actions Proposed for YEAR (following year)	38

3.7	Water	39
3.7.1	Monitoring	39
3.7.2	Management	43
3.7.3	Results	43
3.7.4	New groundwater monitoring bores	45
3.8	Water Balance	47
3.8.1	Actions Proposed for YEAR (following year)	47
4.	Land Management and Rehabilitation	48
4.1	Monitoring	48
4.2	Management	50
4.3	Results	50
4.3.1	Woodland Revegetation Sites	51
4.3.2	Grassland Revegetation Sites	58
4.3.3	Conclusion	62
4.3.4	Estcourt Biodiversity Offset site/Other Projects	62
4.3.5	Conclusion and management recommendations	69
4.3.6	Land Disturbance and Pre-clearing Survey	70
4.3.7	Revegetation and Rehabilitation	70
4.4	Research and Rehabilitation Trials and Use of Analogue Sites	70
4.5	Actions Proposed for 2015	72
5.	Biodiversity and Ecology	73
5.1	Kokoda monitoring surveys	73
5.1.1	Floristic data using plot-based surveys	74
	Floristic data using plot-based surveys	74
5.1.2	LFA using transect-based surveys	74
5.1.3	Targeted bird surveys	75
5.2	Pine donkey orchid populations monitoring surveys	75
5.2.1	Production of the NPM Biodiversity Offset Management Plan (BOMP)	76
6.	Waste and Hazardous Material Management	77
6.1	Monitoring	77
6.2	Management	77
6.3	Results	77
6.4	Actions Proposed for 2015	78
7.	Tailings and Mineral Waste	79
7.1	Management	81
7.1.1	Tailings	81
7.1.2	Waste Rock	81
7.2	Monitoring	81
7.2.1	Tailings	81
7.2.2	Waste Rock	82
7.3	Results	83
7.3.1	Tailings	83
7.3.2	Waste Rock	83
7.4	Actions Proposed for 2014	83
8.	Cultural heritage	84
8.1	Monitoring	84

8.2	Management	86
8.3	Results	86
8.4	Actions Proposed for 2015	86
9.	Community Relations	87
9.1	Community engagement	87
9.2	Contributions and achievements	87
9.3	Complaints	88
9.3.1	Management	88
9.4	RESULTS	88

## List of figures

Figure 1	Regional Proximity	9
Figure 2	Operational Layout	11
Figure 3	Cross section showing the zones of mineralisation in relation to existing and proposed mine infrastructure	14
Figure 4	Exploration collar locations of 2014	15
Figure 5	Block Cave Mining Method	17
Figure 6	Process-flow schematic for NPM Operations	19
Figure 7	Employment levels at NPM	20
Figure 8	Temperature and Evaporation Summary for 2014	24
Figure 9	Windrose for 2014	25
Figure 10	NPM Air Quality Monitoring Locations	27
Figure 11	PM <sub>10</sub> Results for 'Hubberstone'	30
Figure 12	PM <sub>10</sub> Results for 'Milpose'	30
Figure 13	Depositional dust annual averages	33
Figure 14	NPM Noise monitoring locations	36
Figure 15	NPM Surface water monitoring locations	40
Figure 16	NPM Groundwater monitoring locations	41
Figure 17	New groundwater monitoring bores at Rosedale tailings storage facility	46
Figure 18	Locations of rehabilitation and reference monitoring sites	49
Figure 19	Design depths of capping trial plots	71
Figure 20	Existing ore, waste rock dump and stockpile locations	80
Figure 21	Aboriginal cultural heritage sensitivity zones	85

## List of tables

Table 1 Summary of Licences	12
Table 2: Ore Processing Production	18
Table 3 Environmental Incidents in 2014	21
Table 4 Rainfall summary for 2014	24
Table 5 Summary of depositional dust investigations	29
Table 6 Surface water monitoring program	42
Table 7 Groundwater monitoring program	42
Table 8 New groundwater bores	45
Table 9 Reporting period water balance	47
Table 10 Performance of the woodland rehabilitation monitoring sites against 'proposed' Primary Completion Performance Indicators	54
Table 11 Performance of grassland rehabilitation sites against Primary Completion Performance Indicators in 2014	60
Table 12 Performance of the EOA sites against Primary Indicators for woodland ecosystems in 2014	65
Table 13 Stage 4 Capping trail design specifications	72
Table 14 Details of survey sites established in Kokoda Offset Site 2014	73
Table 15 Complaints received in 2014	88

A summary of Northparkes Mines operations, setting and localised weather conditions experienced during the reporting quarter.

## 1. INTRODUCTION

### 1.1 Scope

The Annual Environmental Management Report (AEMR) details the environmental performance of Northparkes Mines (NPM) from 1 January 2014 – 31 December of 2014 and outlines proposed actions for the next reporting period. The AEMR applies to NPM's activities being undertaken on Mining Leases (ML) 1247, 1367, 1641 and Goonumbla Rail Siding.

The AEMR has been prepared in accordance with the NSW Department of Trade & Investment (DTI) "ESG3: Mining Operations Plan (MOP) Guidelines September 2014" and Development Consent (DC 06-0026) Schedule 4, Condition 4 which states:

*"Within 12 months of this approval, and annually thereafter, the Proponent shall submit an AEMR to the Director-General and to all relevant agencies."*

Compliance against conditions stated in the Project Approval (11\_0600) and Development Consent 06-0026, including Modification 1 and Modification 2 (DC 06-0026) (Appendix 1) are required to be reported in the AEMR and are therefore included in this document.

NPM recognise the importance of stakeholders and therefore values the development of positive relationships to aid continual improvement of its environmental management practice. This report is provided to the following stakeholders:

- Department of Trade and Investment (DTI);
- Department of Planning and Infrastructure (DPI);
- Parkes Shire Council (PSC);
- NSW Office of Environment and Heritage (OEH);
- NSW EPA (EPA);
- Peak Hill Local Aboriginal Land Council (PHLALC);
- Wiradjuri Council of Elders (WCE);
- Southern Cross Landholders;
- Local Community Representative;
- Northparkes Community Consultative Committee; and
- General public (available at [www.northparkes.com.au](http://www.northparkes.com.au)).

#### 1.1.1 Location, history and process overview

NPM copper-gold mine is located 27 kilometres north north-west of the town of Parkes in central west New South Wales, Australia (Figure 1). On 1<sup>st</sup> December 2013, Rio Tinto Limited divested its 80% interest in NPM to China Molybdenum Pty Limited (CMOC). The NPM business continues to run under a joint venture arrangement, with the remaining 20% share owned by the Sumitomo Group.

Majority of the NPM employees reside in the Parkes Shire, which has a population of approximately 15,000 residents. Parkes Shire is a diverse municipality centred in the town of Parkes. It is primarily a farming based community with other industries such as transport and mining bringing economic diversity.



NPM is an open cut and underground operation, however the open cut mines have been economically exhausted and operations of these pits ceased in 2010. The two underground ore bodies, E26 and E48 access copper sulphide porphyry ore bodies using the block cave mining method. NPM was the first Australian mine to use block caving as its mining method.

Mining of the E26 orebody occurred in two stages, Lift 1 and Lift 2 with an extension to the north as grades permitted. Production in E26 ended in 2007 with the E48 orebody in full production from 2010.

Ore is transported to surface where it is processed through a semi-autogenous grinding (SAG) circuit and associated floatation process. The copper concentrate slurry is filtered through ceramic discs and loaded into sealed containers where it is transported to Port Kembla from Goonumbla Rail Siding. By products from the ore processing facility is stored in the onsite Tailings Storage Facilities.

A significant exploration and evaluation program for additional ore reserves has resulted in the submission of an extensive Environmental Assessment for a significant capital project to extend mine life from 2025 to 2032, including closure.

In addition to mine and mineral process activities, NPM farm the bulk of its 6,481 ha landholding, including a significant portion of the 3,400 ha within its three existing mining leases. The land is farmed using best practice conservation farming methods developed and adopted to maximise productivity and quality, whilst conserving water and soils.

In July 2014, The Northparkes Mine Extension Project (the Project) was approved with conditions by Department of Planning. Key elements of the Project included:

- Continued underground block cave mining of two existing ore bodies;
- Development of additional underground block cave mine;
- Two new open cur campaigns; and
- Construction of new tailings storage facility (Rosedale TSF).



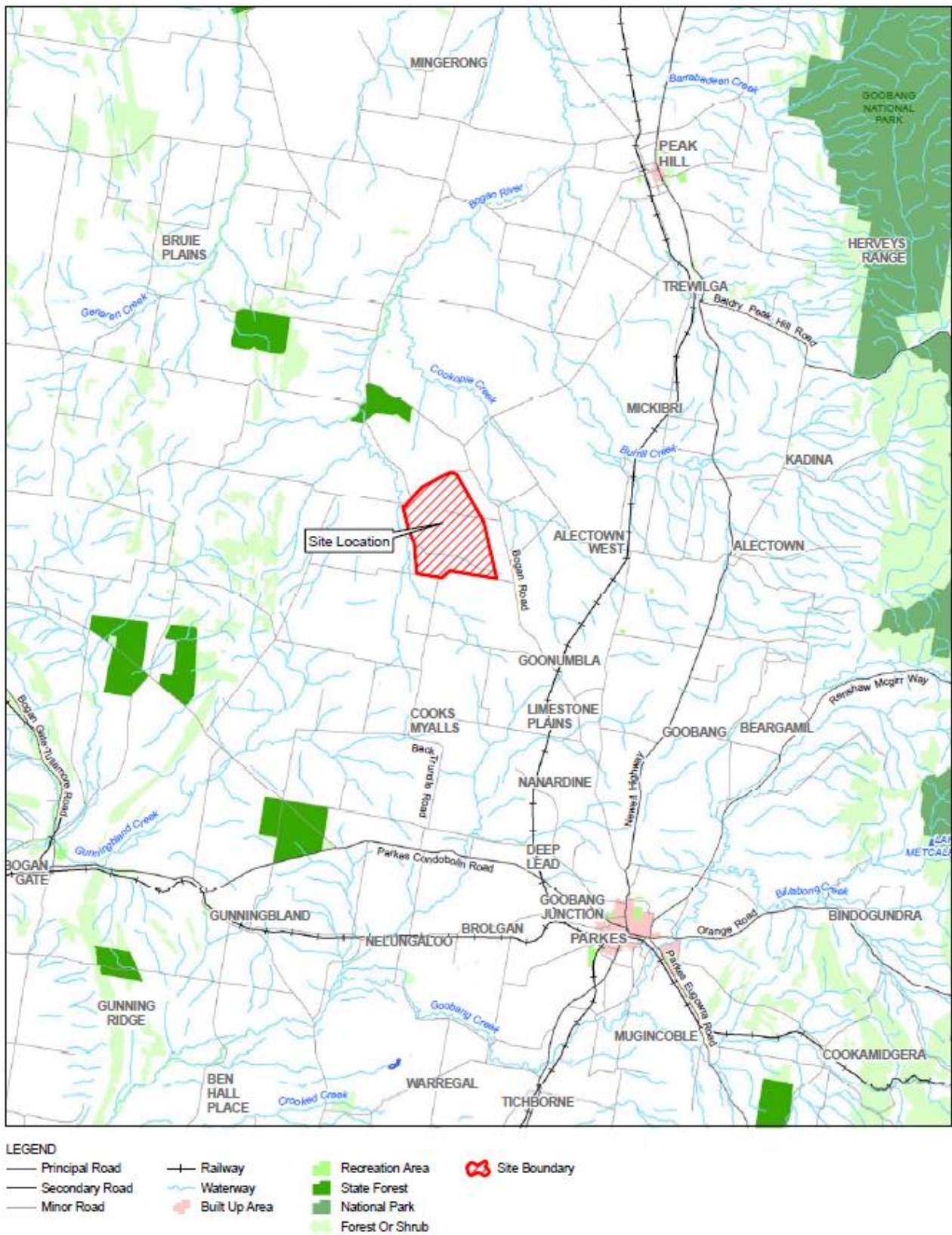


Figure 1 Regional Proximity

### **1.1.2 Site Layout and Infrastructure**

Surface infrastructure and operation layout is shown in Figure 2. Onsite infrastructure includes:

- Two former open cut pits E22 and E27, surrounded by ore stockpiles, waste rock dumps and a sound bund.
- Tailings Storage Facilities (TSFs): TSF1, TSF2 and Estcourt.
- The E26 and E48 underground block cave mine and resultant surface subsidence zone.
- Underground mining fixed plant infrastructure including two crushers, maintenance workshops and materials handling conveyor system.
- Surface mining related infrastructure such as the portal, hoisting shaft, ventilation fans, transfer and overland conveyor, mining offices and contractor laydown areas.
- Marginal ore stockpiles, waste rock dumps and stockpiles of clay and oxide material are located around the surface subsidence zone outside the predicted subsidence limits.
- The processing plant, including surface crusher, crushed ore stockpiles, active grinding mills, froth flotation area, concentrate filtration and storage bays and tailings storage facilities.
- Service infrastructure including administration building and change rooms, core shed, metallurgical laboratory, emergency response shed, warehouse, workshop, electrical infrastructure, surface contractor lay down areas and associated roads.
- Goonumbla rail siding infrastructure including fuel dispensing facilities and portable amenities.
- Farm infrastructure includes bulk storage sheds, workshop and grain silos.



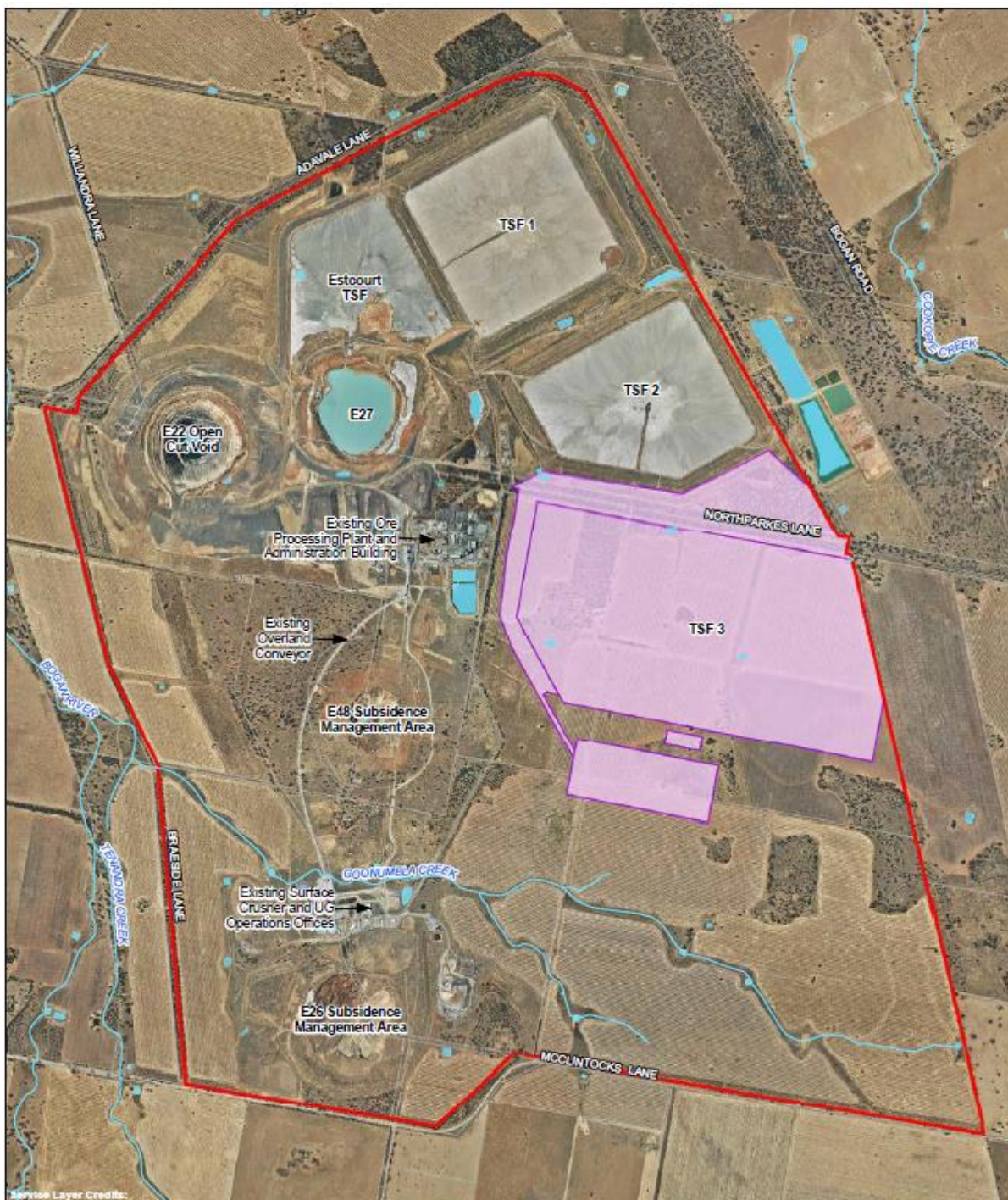


Figure 2 Operational Layout

## 1.2 Contents, leases and licences

NPM has a large number of statutory approvals and associated legal obligations that regulate its mining related activities onsite. The status of NPM main statutory approvals are listed in Table 1.

Leases and licences were transferred as part of the transfer in ownership

**Table 1 Summary of Licences**

Approval	Description	Issue Date
ML 1247	Mining Lease (1629.6 ha)	27/11/1991
ML1367	Mining Lease (826.2 ha)	21/03/1995
ML1641	Mining Lease (24.4 ha)	25/03/2010
EL 5800	Exploration Lease (245 km <sup>2</sup> )	08/01/2001
EL 5801	Exploration Lease (495 km <sup>2</sup> )	08/01/2001
EL 5323	Exploration Lease (218 km <sup>2</sup> )	18/07/1997
PA11_0600	Project Approval	16/07/2014
EPBC 2013/6788	EPBC Approval	13/02/2014
Surrendered DC 06-0026	Development Consent Modification 1 Modification 2	28/02/2007 06/10/2009 28/10/2009
N/A	PSC Approval for Road Train Access on Bogan Road	19/11/1999
EPL 4784	Environmental Protection Licence	30/05/2001
35/02983	Dangerous Goods Notification	-
07-100146-001	Licence to Store (Explosives)	27/07/2009
70WA600026	Joint Water Supply Works	01/07/2004
70AL600028	Water Access Licence 8241	01/07/2004
70AL603187	Water Access Licence 10082	18/10/2005
70BL226550	Bore Licence (Mining, Irrigation, Stock and Domestic)	01/07/2008
70BL230929	Bore Licence (Mining and Irrigation) – Bore 7	10/07/2009
70BL229975	Bore Licence (Domestic and Stock)	26/07/2004
70BL226584	Bore Licence (Mining) – Bore 8	27/05/2008
80BL356559	Bore Licence (Dewatering – Mining) – E26 and E48	18/01/2010
80BL245449	Bore Licence (Dewatering – Mining) – E22	18/01/2010
80BL245450	Bore Licence (Dewatering – Mining) – E27	18/01/2010
DA2009/0057	Development Consent (Forbes Water Pipeline)	19/03/2009
HD 48307	Limestone State Forest Occupation Permit	24/09/2009

### 1.2.1 Amendments over the reporting period

#### 1.1.1.1 Development Consent

No applications or modifications of the existing Development Consent 06-0026 were submitted or granted by, the NSW DPI the current reporting period.

The project approval 11\_0600 was granted on 16 July 2014. In conjunction with this project approval the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 approval for NPM was also granted on the 13 February 2014.

#### 1.1.1.2 Mining Operations Plan

The new MOP for the period 2015 – 2020 has been prepared and submitted to Department of Resources & Energy for approval. The Minister of Planning has determined NPM Mine Extension Application as State Significant Development and classed as Level 1 Mine.

The new MOP is been developed under the new guidelines 'ESG3: Mining Operations Plan (MOP) Guidelines, September 2013', which replaces the previous guidelines 'EDG03 Guidelines to the mining, rehabilitation and environmental management process (January 2006)'.

#### **1.1.1.3 Environmental Protection Licence**

An Annual Return for the reporting period was submitted to EPA by 31<sup>st</sup> July of the current reporting period in accordance with requirements under Environment Protection Licence (EPL) 4784 Condition R1.1.

#### **1.1.1.4 Occupation Permit**

There were no applications submitted to, or granted by, the Forests NSW to modify the existing Limestone National Forest Occupation Permit in the current reporting period.

### **1.3 Mining Contacts**

Contact details for the current Managing Director and Environmental personnel at NPM are:

Stefanie Loader – Managing Director

Phone: 02 6861 3000

Email: [stefanie.loader@northparkes.com](mailto:stefanie.loader@northparkes.com)

Robert Cunningham - Manager - Health, Safety, Environment, and Farms

Phone: 02 6861 3280

Email: [rob.cunningham@northparkes.com](mailto:rob.cunningham@northparkes.com)

### **1.4 Actions required from previous AEMR review meeting**

No actions were raised from the last AEMR Review meeting.

# Operations During The Reporting Period

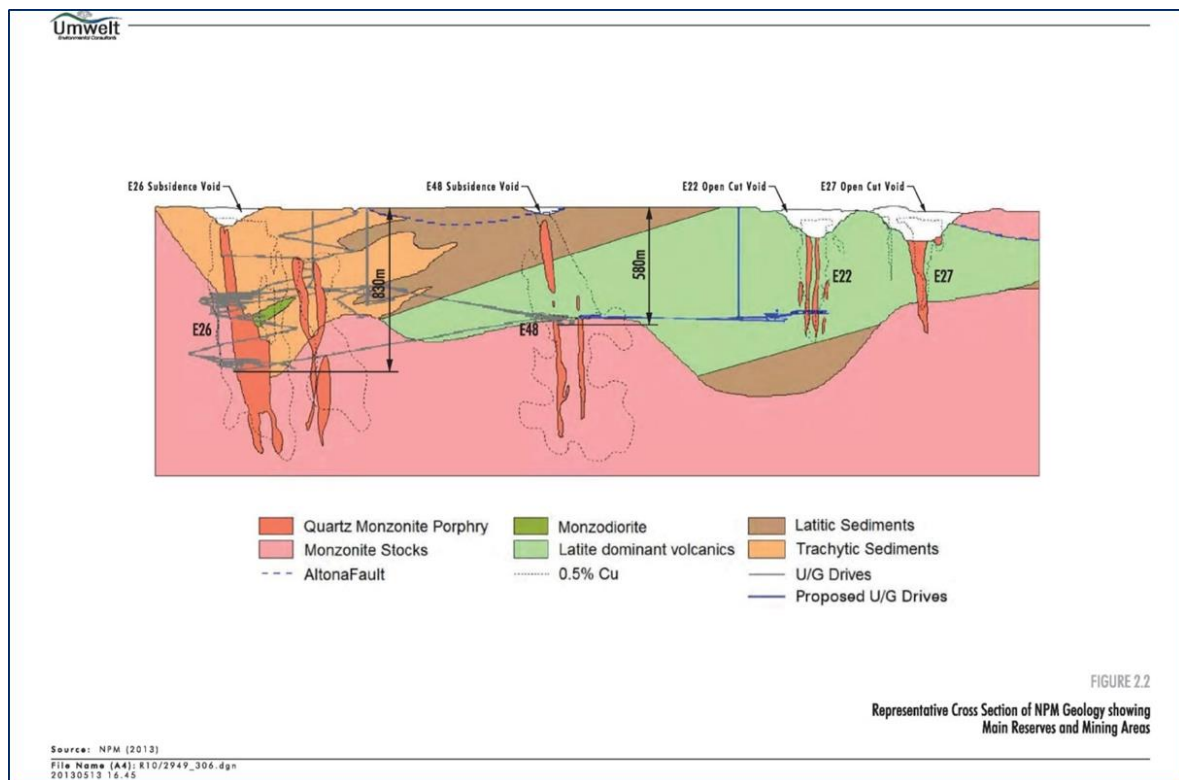
## 2. BRIEF SUMMARY ON KEY OUTCOMES/ACHIEVEMENTS

Reporting period summary:

- 6.11 million tonnes of ore milled
- 169,376 tonnes of copper concentrate produced

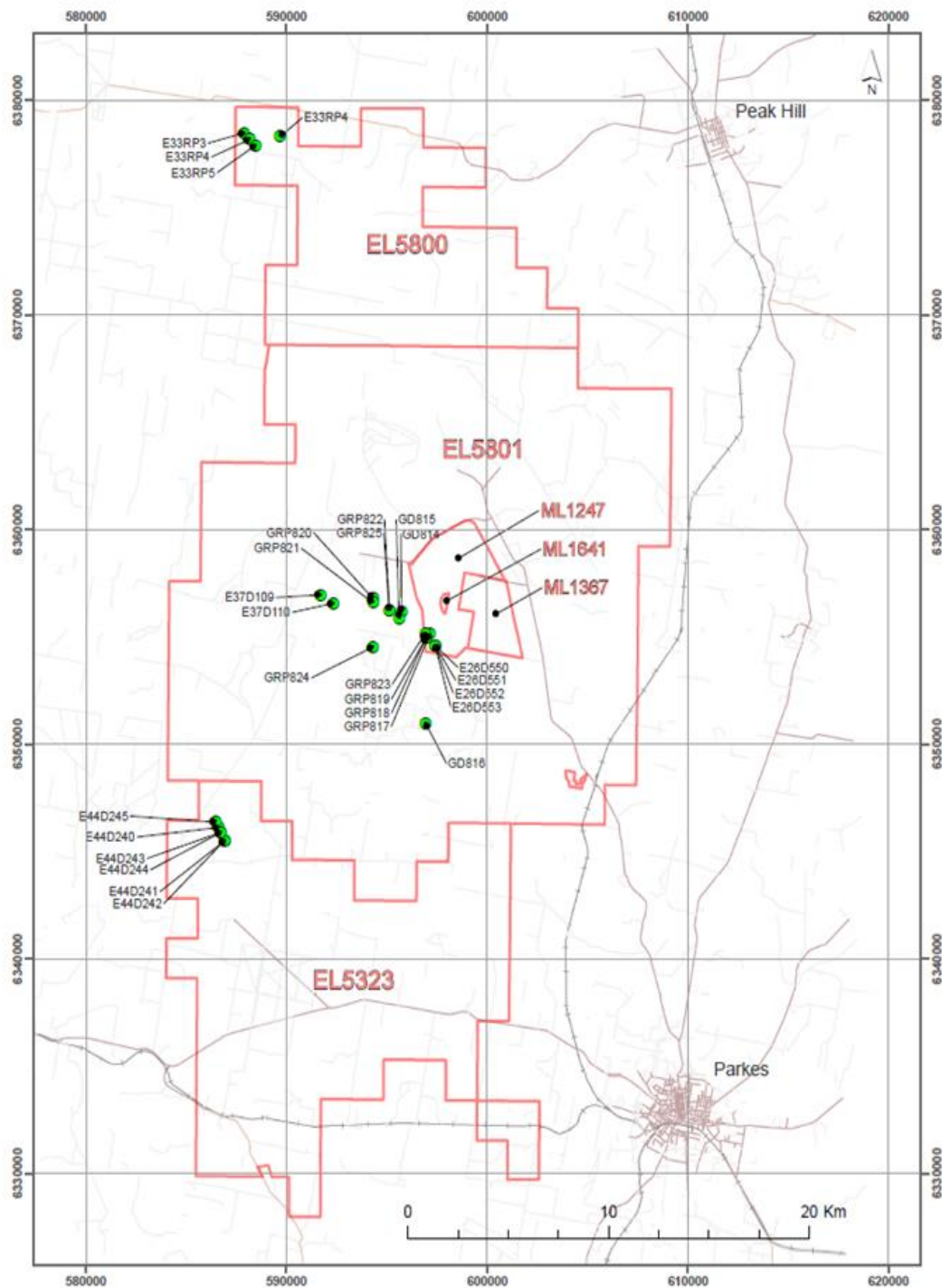
### 2.1 Exploration and Resource Utilisation

Exploration and evaluation programs continued in the current reporting period, on both the mining and exploration leases. Mining lease evaluation under the E48 Extension Program was completed. Drilling North and South of the E48 Lift 1 orebody coincided with the construction of additional access drives, expanding the operation footprint. Preconditioning works were undertaken using these holes, and cave monitoring will continue for the life of the E48 mine.



**Figure 3 Cross section showing the zones of mineralisation in relation to existing and proposed mine infrastructure**





**Figure 4 Exploration collar locations of 2014**

Exploration activities during the period included reverse circulation (RC) and diamond drilling programs. A total of 11,069 m of surface drilling was completed during the reporting period. NPM is committed to identifying and evaluating new ore bodies with the intention extending the NPM mine life.

Exploration and evaluation activities will continue in the next reporting period. Focus is aimed at supporting feasibility studies of the GRP314 and E26 Lift 1 North deposits. A site wide geophysical inversion project, as well as the current RC and diamond drilling programs will continue on both mining leases and exploration licences.

## 2.2 Mining and Development

### **Open cut**

Active open cut mining ceased in 2010. There were no open cut mining activities in the current reporting period.

### **Underground Operations**

Underground mining activities are currently undertaken in ore body E48 using block caving methods. A schematic of the underground mining section is seen in Figure 5.

In our Underground mine, automation of our loaders remained a crucial element to the success of Northparkes. In a world first, our E48 block cave reached 100% automation, making it our primary method of extracting ore from underground. This makes the E48 production level the most automated mining environment in the world.

The Underground team also added three new extraction drives to the E48 block cave. These drives expand the existing production level by 30%, broadening resources within the cave and extending the cave's life of the mine by a further two years and 12.6Mt.



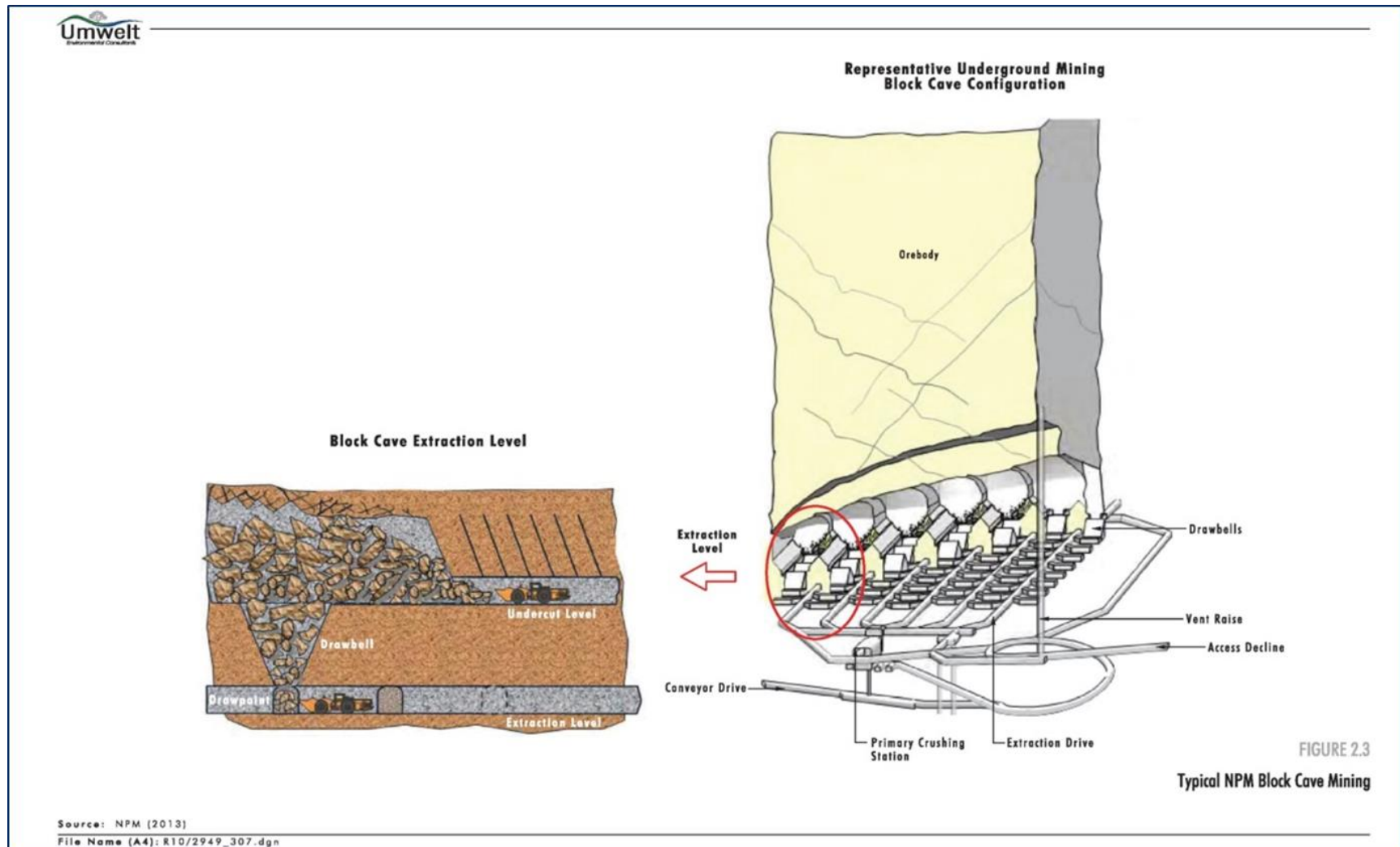


Figure 5 Block Cave Mining Method



## 2.3 Ore Processing

A total of 6.11 Mt of sulphide ore was processed in 2014 from E48 underground ore body. Copper-gold concentrate production totalled 169,376 tonnes. The NPM concentrate is high quality with low impurities and is generally sought after to blend with lower grade concentrates.

- Ore processing as shown in the Figure 6 includes a number of defined stages including grinding, floatation and thickening.
- The grinding circuit is comprised of two separate modules (Mod 1 and Mod 2), each incorporating a Semi Autogenous Grinding (SAG) mill, oversize crushing technology, two stages of ball milling and froth floatation.
- The floatation process floats a sulphide concentrate to recover copper and gold bearing minerals. From the floatation, the concentrate is then processed through the concentrate thickener then onto the storage shed.
- The tailings component is pumped from the floatation stage to a tails thickener then out to the TSF.

**Table 2: Ore Processing Production**

Year	Ore Milled (Mt)	Production Copper Concentrate (t)	Gold (oz)
2010	5.25	116,056	65,279
2011	5.52	146,625	76,004
2012	5.65	155,838	71,799
2013	6.01	168,282	67,162
2014 (actual)	6.11	169,376	60,080
2015 (forecast)	6.34	162,856	52,051

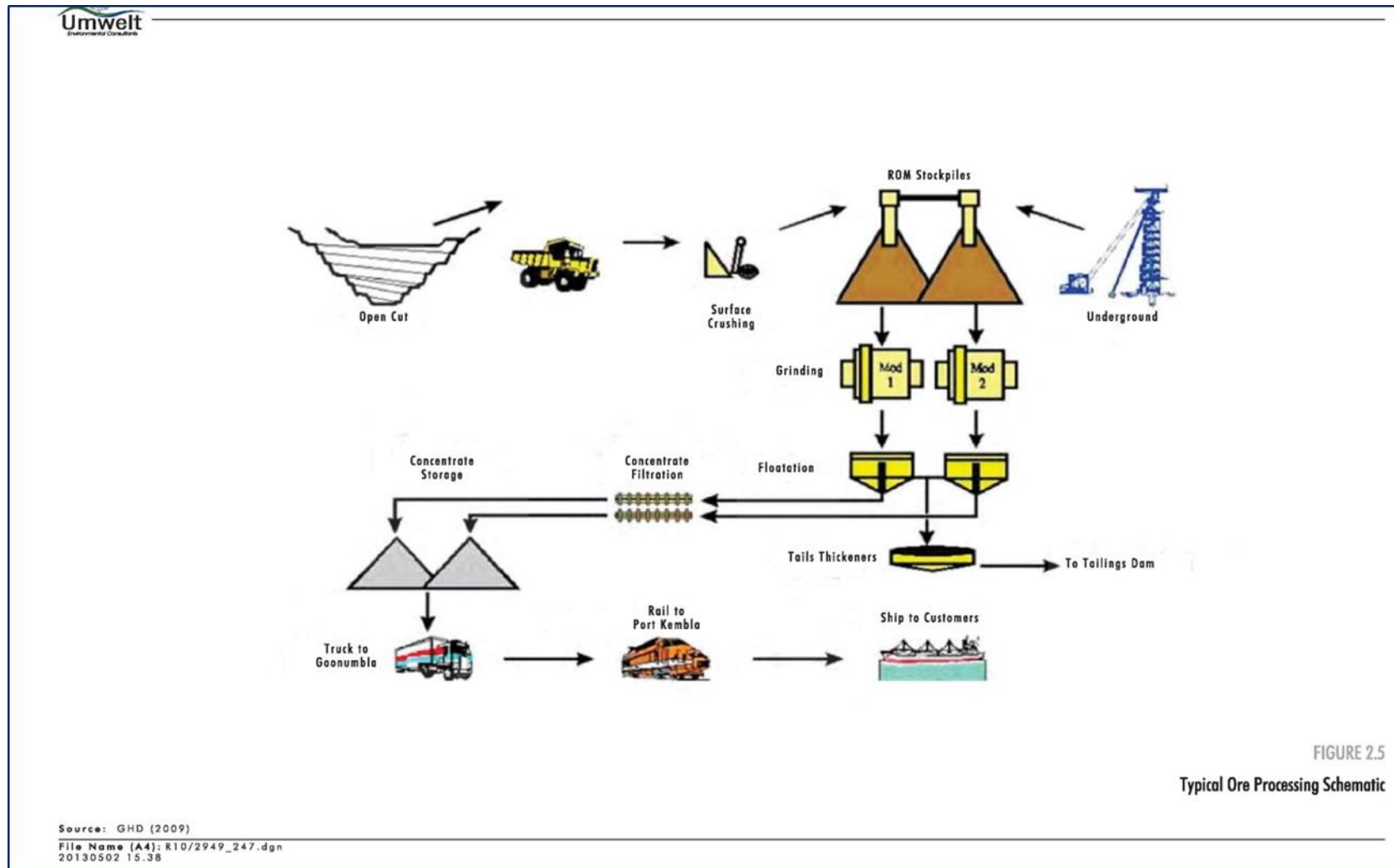


FIGURE 2.5  
Typical Ore Processing Schematic

Figure 6 Process-flow schematic for NPM Operations

## 2.4 Employment Levels

Full time permanent employees increased to 324 in the current reporting period from 310 in the previous reporting period (Figure 7). This increase reflects the business obtaining its optimum employment level to achieve maximum operational efficiency. NPM continues to employ a large number of contractors, to supplement the permanent workforce.

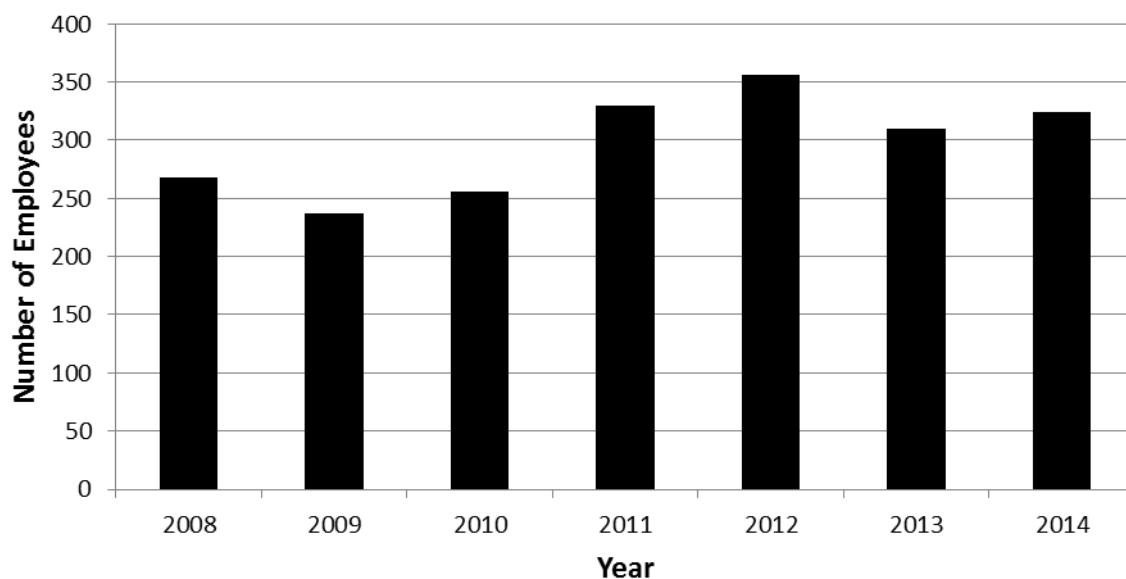


Figure 7 Employment levels at NPM



## Environmental Management and Performance

### 3. ENVIRONMENT AND COMMUNITY TEAM

NPM has an HSE Policy committed to pollution prevention and continual improvement of environmental management activities. To support the intent of this policy, environmental management is undertaken by the onsite Environmental team, which is a part of the NPM Health, Safety, Environmental and Farms (HSEF) department.

The HSEF policy (Appendix 2) is a part of the developed and implemented Health, Safety, Environment and Quality Management System (HSEQ MS) based on the NPM HSEQ MS Standard. This is certified to ISO14001 and audited on an annual basis.

Team members of the Environment team include the following roles:

- Manager – Health, Safety, Environment and Farm (HSEF);
- Superintendent – Environment & Farm;
- Senior Environment Advisor;
- Environment & Health Advisor;
- Environment Advisor; and
- Environment Trainee.

#### 3.1 Environmental Management System

NPM develop, implement and maintain an ISO 14001 certified HSEQ MS. The HSEQ MS encourages a rigorous and consistent approach to managing and improving its environmental performance across all of its mining and related activities.

The HSEQ MS outlines minimum standards to encourage continual improvement in HSEQ performance. The operational management component of the management system is underpinned by NPM's safety, health and environmental performance standards. A periodic Audit against the ISO 14001 standard was conducted in the reporting period. The purpose of the audit is to assess NPM's alignment with the ISO14001 Certification. The audit identified four minor non-conformances, two Observations and one Commendation.

#### 3.2 Reportable Environmental Incidents

During the reporting period, NPM had six reportable environmental incidents. Table 3 provides information on these incidents.

Formal incident notifications summarising the incident details, likely cause/s, actions taken to date and additional proposed measures were submitted to the EPA and other relevant government agencies in accordance with NPM reporting procedures.

**Table 3 Environmental Incidents in 2014**

Incident No.	Date	Details
--------------	------	---------

NA	23 January 2014	<p>PM<sub>10</sub> 24 hour average result (98.1 ug/m<sup>3</sup>) for "Milpose" monitoring location exceeded the 24 hour performance criteria (50 ug/m<sup>3</sup>) set out in Development Consent 06-0026. The result did not cause an exceedence of the annual average limit. An investigation was undertaken immediately to determine the likely cause of the exceedence.</p> <p>The investigation concluded that the prevailing wind direction was primary from the North East. Field notes indicate the presence of sheep activity in the nearby paddock. The monitoring cycle occurred on the 12<sup>th</sup> day without rain; rainfall occurred subsequent to this monitoring result, and under similar field observations (sheep in nearby paddock) PM<sub>10</sub> concentrations were considerably lower</p>
NA	4 February 2014	<p>PM<sub>10</sub> 24 hour average result (51.7 ug/m<sup>3</sup>) for "Milpose" monitoring location exceeded the 24 hour performance criteria (50 ug/m<sup>3</sup>) set out in Development Consent 06-0026. The result did not cause an exceedence of the annual average limit. An investigation was undertaken immediately to determine the likely cause of the exceedence.</p> <p>The investigation concluded that the prevailing wind direction was from North East. Field notes indicate dry conditions with sheep movement in the yard. A review of the monitoring data indicates that the elevated results were localised to the Milpose location.</p>
NA	20 October 2014	<p>PM<sub>10</sub> 24 hour average result (63.8 ug/m<sup>3</sup>) for "Milpose" monitoring location exceeded the 24 hour performance criteria (50 ug/m<sup>3</sup>) set out in Development Consent 06-0026 and Project Approval (11_0600). The result did not cause an exceedence of the annual average limit. An investigation was undertaken immediately to determine the likely cause of the exceedence.</p> <p>The investigation concluded that the prevailing wind direction was from South, towards the Mine Lease from the monitor location. A review of the monitoring data indicates that the elevated result was localised to the Milpose farm. Other PM<sub>10</sub> monitoring events in the month of May had a lower recorded value and Depositional Dust results recorded lower values toward the Mine Lease boundary whilst high results were localised to the Milpose location.</p>
NA	13 November 2014	<p>PM<sub>10</sub> 24 hour average result (55.8 ug/m<sup>3</sup>) for "Milpose" monitoring location exceeded the 24 hour performance criteria (50 ug/m<sup>3</sup>) set out in Development Consent 06-0026 and Project Approval (11_0600). The result did not cause an exceedence of the annual average limit. An investigation was undertaken immediately to determine the likely cause of the exceedence.</p> <p>The investigation concluded that the prevailing wind direction was primarily from the South, towards the Mine Lease from the monitor location. A review of the monitoring data indicates that the elevated result was localised conditions in the vicinity of the sampler.</p>
NA	13 December 2014	<p>PM<sub>10</sub> 24 hour average result (68.1 ug/m<sup>3</sup>) for "Milpose" monitoring location exceeded the 24 hour performance criteria (50 ug/m<sup>3</sup>) set out in Development Consent 06-0026 and Project Approval (11_0600). The result did not cause an exceedence of the annual average limit. An investigation was undertaken immediately to determine the likely cause of the exceedence.</p> <p>The investigation concluded that the prevailing wind direction was primarily from the North West, towards the Mine Lease away from the monitor location. A review of the monitoring data indicates that the elevated result was localised sheep shearing activities in the vicinity of the sampler.</p>
74003816	02 October 2014	<p>NPM reported a tailings spill incident to EPA on 02 October 2014 thorough EPA Pollution Hotline. The tailings line on the western line at concentrate truck access gate spilt which resulted in 5m<sup>3</sup> of tailings spill, causing the spillage pond to overflow into access road drain. The flange section of the pipe gave away which resulted in the tailings spilt.</p>

		Officers from EPA (Dubbo) completed a site inspection of the spill incident on 9 <sup>th</sup> October and collected soil samples. EPA issued a Notice to Clean-up (1525411) on 13 October 2014. A final investigation report was submitted on 7 November 2014, which includes all monitoring analysis undertaken by NPM to clean-up the spill.
--	--	---

### 3.3 Meteorology

Reporting period summary

Annual rainfall was 92% of the long term annual average

Six major rainfall events triggering flow.

#### 3.3.1 Monitoring

NPM operate a meteorological monitoring station located within ML 1367 that complies with AS 2923. The weather station records 10 minute and 24-hour average wind speed, wind direction, air temperature, relative humidity, solar radiation and rainfall.

#### 3.3.2 Management

A meteorological monitoring station is maintained to provide real time and periodic meteorological data for operational purposes. The interpretation of meteorological data assists in daily operational planning and management and to provide an historical record.

Weather data is accessible to employees via the NPM intranet and is used in internal and external environmental reporting.

#### 3.3.3 Results

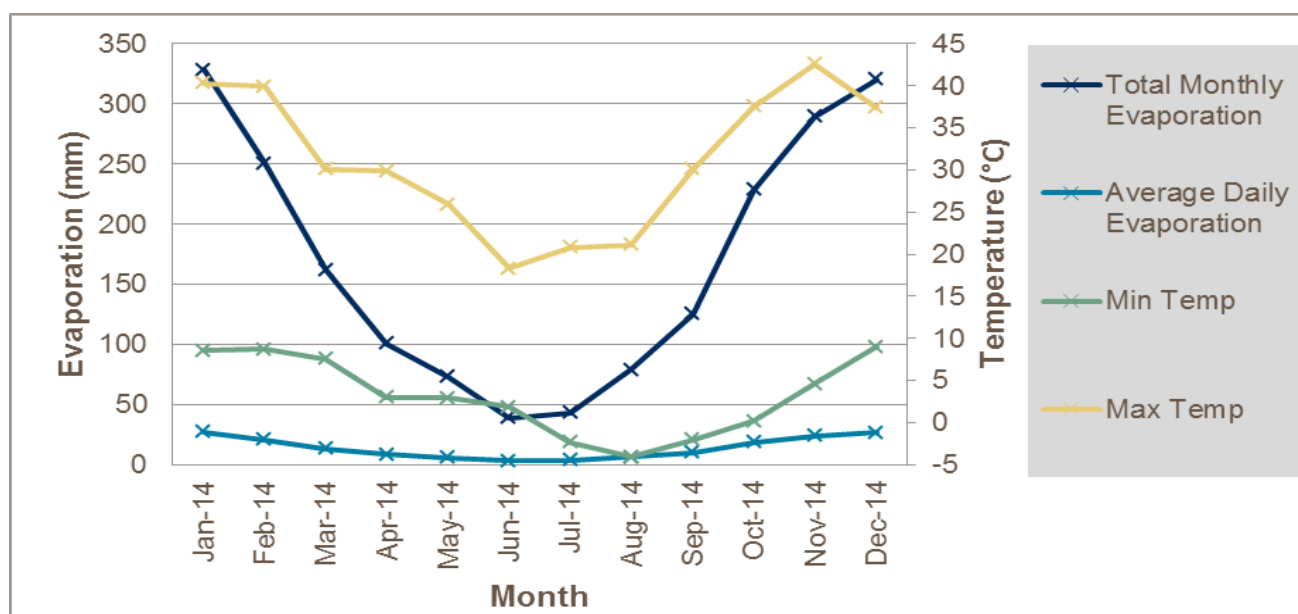
A total rainfall of 540.0 mm was recorded at the weather station during the reporting period. This is a 116.5 mm increase from the previous reporting period though still below the long-term average for the region. Table 4 outlines rainfall figures in comparison with the long-term average.

Temperature and evaporation for the reporting period are shown in Table 4. Daily temperature, wind and rainfall data is provided in Appendix 3 for the reporting period. Evaporation followed expected seasonal trends observed in previous climatic conditions for the region. The monthly maximum temperatures were significantly warmer, recorded at a mean of +1.26°C above the average. These figures are consistent with the national average which experienced the third warmest year on record.

**North-east and south-east winds were the dominant winds throughout the reporting period. This is similar to previous reporting periods and is consistent with long term trends. Annual and quarterly wind roses have been produced to identify the predominant wind directions observed throughout the reporting period.**

**Table 4 Rainfall summary for 2014**

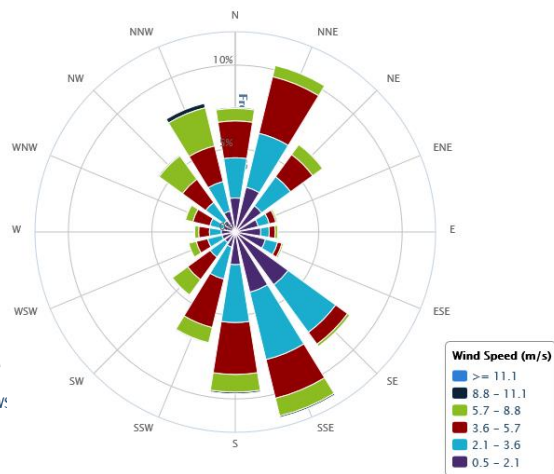
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Monthly Total (mm)	51.0	52.0	155.0	20.5	41.5	63.5	23.5	20.0	16.0	11.5	13.0	72.5
Long Term Average (mm)	57.6	49.1	47.4	41.4	47.2	49.5	49.1	49.2	41.8	52.4	49.5	53.0
YTD Actual (mm)	51.0	103.0	258.0	278.5	320	383.5	407.0	427.0	443.0	454.5	467.5	540
Wet days	3	7	10	6	7	12	10	4	5	4	3	11
Maximum Temp (Deg C)	40.3	39.9	30.1	29.9	25.9	18.3	20.8	21.1	30.1	37.6	42.6	37.4
Minimum Temp (Deg C)	8.6	8.7	7.6	3.0	2.9	1.9	-2.3	-4.1	-2.0	0.2	4.6	9.0



**Figure 8 Temperature and Evaporation Summary for 2014**

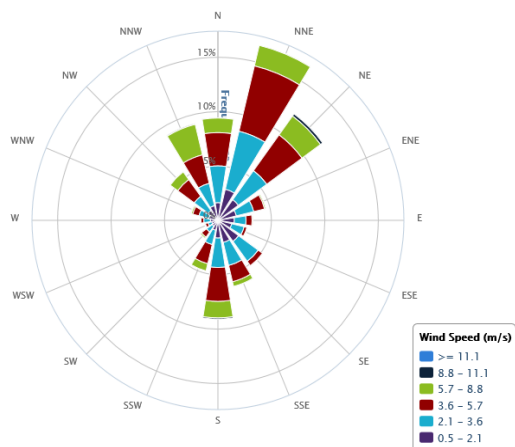


Summary Windrose – NPAWS001  
1/1/2014 – 31/12/2014

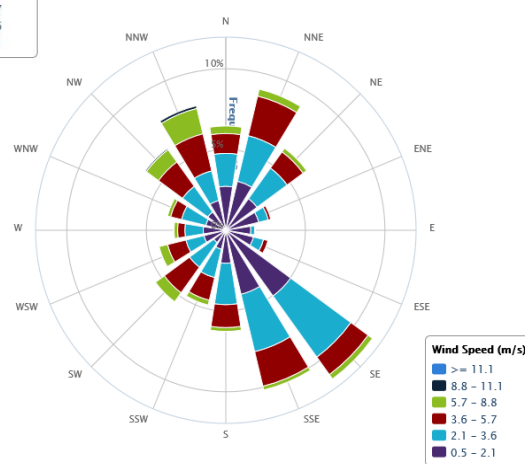


## 2014 Summary Windrose

Summary Windrose – NPAWS001  
1/1/2014 – 31/3/2014

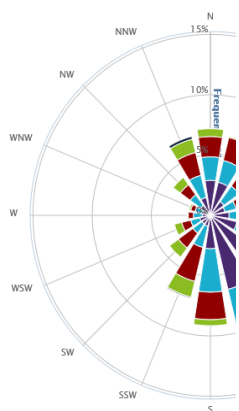


Summary Windrose – NPAWS001  
1/4/2014 – 30/6/2014

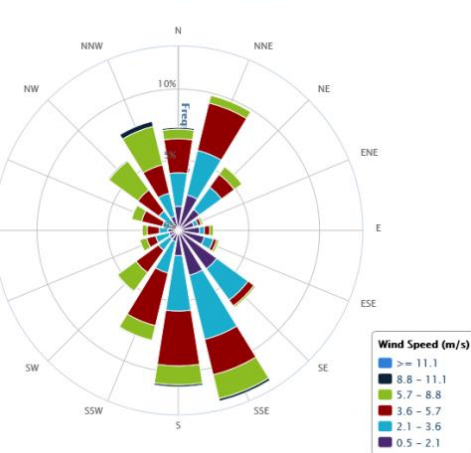


## 2014 Q2 Summary

Summary Windrose – NPAWS001  
1/7/2014 – 30/9/2014



Summary Windrose – NPAWS001  
1/10/2014 – 31/12/2014



## 2014 Q3 Summary

## 2014 Q4 Summary

Figure 9 Windrose for 2014

### **3.3.4 Actions Proposed for 2015**

- Continued calibration of the weather station

## **3.4 Air Quality**

Reporting period summary

- Nil exceedances of the annual average limits
- All required monitoring conducted during period
- Straw bales on the surface of TSF1 proven effective breakdown of wind activity and reduce dust exceedances / complaints.
- One community complaint relating to dust

### **3.4.1 Monitoring**

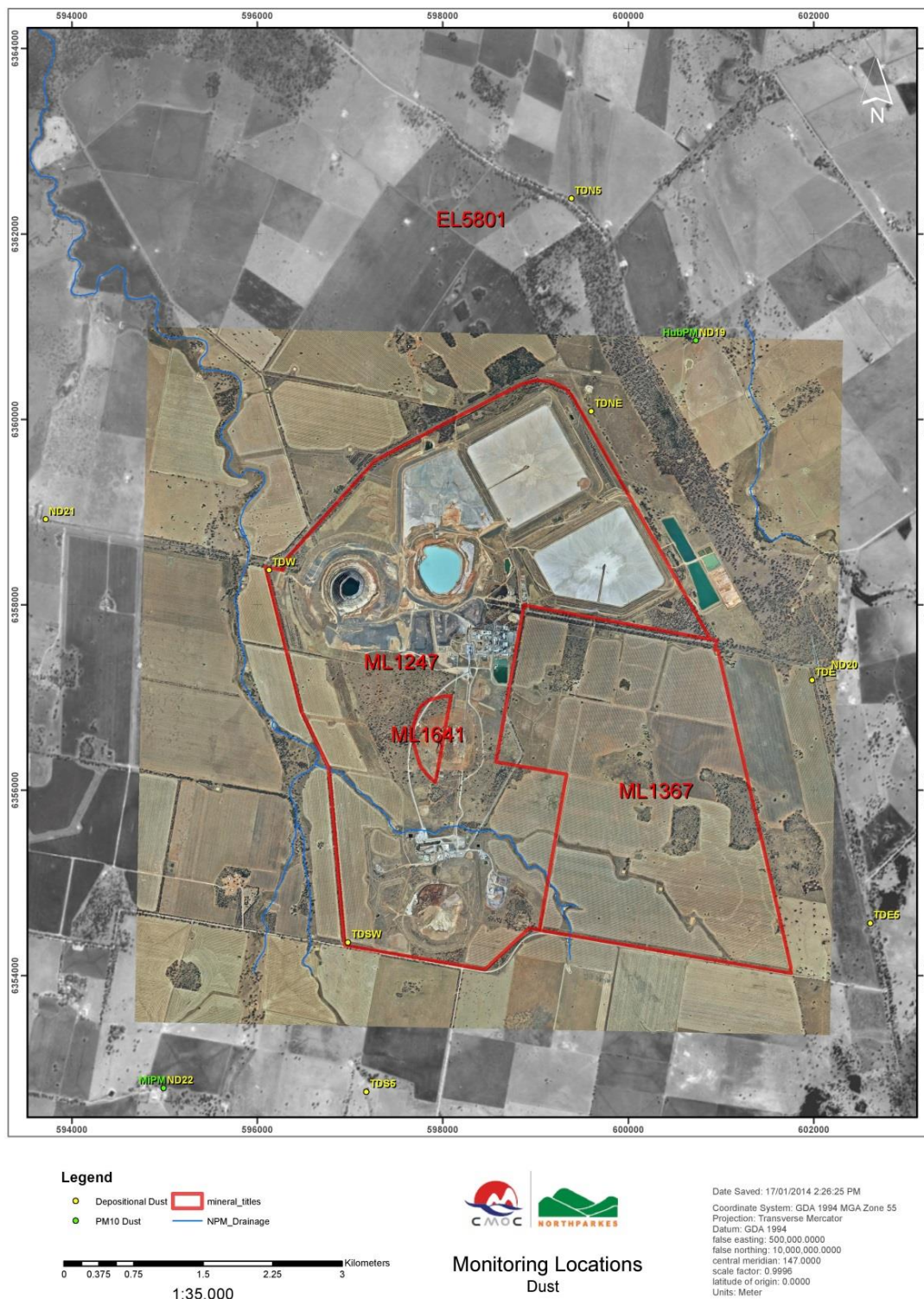
NPM has implemented an air quality monitoring program to periodically sample at key locations on and adjacent to the Mine Lease. The program is designed to assess the effectiveness of dust control measures and ensure compliance with PA11\_0600, DC 06-0026 and EPL 4784 conditions as well as internal standards and procedures.

The monitoring program consists of PM<sub>10</sub> high volume air samplers (HVAS) and depositional dust gauges. These 11 monitoring points are strategically located around the mine lease and neighbouring properties (Figure 10).

Fine dust particles measured as PM<sub>10</sub> are monitored using high volume air samplers (HVAS). Each station is fitted with a size selective inlet that operates for 24 hours every six days in accordance with AS 3580.9.6. These samplers monitor dust particles that, similar to dust deposition, can also be sourced from a range of mining and non-mining activities. PM<sub>10</sub> monitoring is undertaken at the local residences of 'Hubberstone' and 'Milpose', with the addition of 'Hillview' in December 2014.

Depositional dust gauges record the total of deposited dust for a month long period. Depositional dust gauges are a useful measure of broad scale changes to the local air quality but may be influenced by a number of sources including mining, agriculture, ambient dust, fires and vehicle emissions. Sample collection may also be affected by non-mining organic contamination (e.g. bird droppings, sticks and insects). For this reason depositional dust gauges are a less accurate sampling method from a particular activity.

Depositional dust samples are analysed for insoluble solids, ash residue and combustible matter so that the impact of sample contamination can be assessed.



**Figure 10 NPM Air Quality Monitoring Locations**

### 3.4.2 Management

NPM has an Air Quality Management Plan which provides a framework to assess, monitor and manage potential dust impact as a result of its activities. Operational and design controls to manage air quality include:

- Environmental training and awareness to employees and contractors;
- Sealing high traffic roads, where possible;
- Copper concentrate product transported in sealed containers;
- Road sweeper used on sealed trafficable areas;
- Use of water carts and water sprays on unsealed roads;
- Minimising clearing activities and undertaking progressive;
- Use of conveyor systems as opposed to haul trucks in the material handling system;
- Control mechanisms on crushing and conveying infrastructure, including complete or partial enclosure, dust extraction filters and mist sprays;
- Operation of the tailings storage facilities to minimise dust and capped as early as practicable;
- Dust controls on surface reverse circulation drill rigs; and
- Monthly air quality monitoring.

### 3.4.3 Results

All dust samples are collected by trained staff and analysed by NATA certified laboratories. This work is carried out in accordance with relevant statutory and industry code standards. Monitoring equipment is maintained in accordance with manufacturer's specifications.

All dust results are made publically available on the NPM website through the Quarterly Reports, as per PA11\_0600 and DC 06-0026.

#### **PM<sub>10</sub>**

PM<sub>10</sub> monitoring results for the reporting period are displayed in Figure 11 and Figure 12. The criteria for exceedances (as nominated in PA11\_0600 and DC 06-0026), for both 'Hubberstone', 'Milpose' and 'Hillview', are >30 µg/m<sup>3</sup> for the annual average and >50 µg/m<sup>3</sup> for a 24 hour monitoring period.

Monitoring results for the 'Hubberstone' location show an exceedance for the 24-hour limit in the month of February and November. Monitoring results for the 'Milpose' location show an exceedance for the 24 hour limit in the month of January, February, October, November and December. There was no exceedance of the annual average for either 'Hubberstone' or 'Milpose' in the reporting period. The PM<sub>10</sub> monitoring at Hillview started in December 2014 with the new Project Approval (11\_0600) requirement.

All the exceedences of the PA11\_0600 and DC 06-0026 nominated criteria were investigated, and in the majority of cases it was found that the result was due to localised activities (e.g. shearing of sheep, farming activities, harvesting and vehicle movement). These results were considered anomalies and therefore not included in the calculation of the reporting period's annual average.

Overall, results suggest dust levels generally increase throughout the spring period and at a time when farming activities are the most active.

### Depositional Dust

The indicative annual averages (IAAs), calculated from the monthly dust deposition results, are displayed in Figure 13 from 2010 to the current reporting period, for each site of the monitoring sites.

During the reporting period, the calculated IAA dust deposition level was below the regulatory limit of 4g/m<sup>2</sup>/month IAA. However, at a number of locations, individual results greater than the internal trigger value were received and investigated, but did not result in any exceedances of the IAA in PA11\_0600 and DC 06-0026.

A high proportion of anomalous results were found to be due to external contaminants, such as bird droppings, bugs, organic matter, and dust from local farming activities. In cases where values above the trigger value were found not to be a result of NPM's activities, these results were deemed an outlier and excluded from the IAA calculation. Table 5 summarises the results of these investigations during the reporting period.

**Table 5 Summary of depositional dust investigations**

Location	Month	Contamination due to	Excluded from IAA
ND22	February	Organic matter, sheep activity	✓
	March	Organic matter, bugs, bird dropping	✓
TDE	February	Organic matter, bird dropping	✓
	December	Organic matter and insects	✓
TDNE	January	Farm activity, ploughing	✓
	February	Farm activity	✓
	March	Organic matter, bird activity, bugs, insects, spiders	✓
	April	Farm activity	✓
	May	Organic matter	✓
TDN5	April	Farm activity	✓
	May	Farm activity	✓
	June	Stock movement	✓
	July	Farm activity	✓
	August	Organic matter	✓
	September	Farm activity	✓
	December	Road activity/Low vegetation cover	✓
TDS5	January	Increased road activity on unsealed roads outside ML	✓
	March	Bugs, bird urea and organic matter.	✓
	April	Farm activity	✓
	May	Farm activity	✓
	June	Bird activity	✓
	August	Stock movement	✓
	September	Organic matter	✓
	October	Farm activity	✓
	November	Farm activity	✓
ND21	December	Farm activity	✓
TDE5	June	Road activity on unsealed roads outside ML	✓



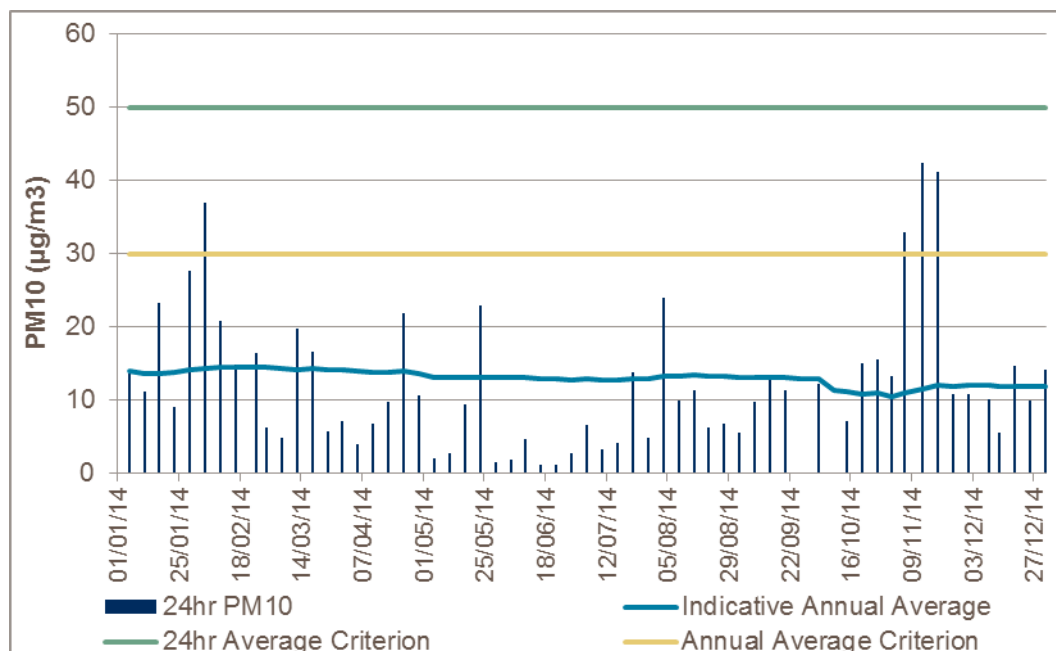


Figure 11 PM<sub>10</sub> Results for 'Hubberstone'

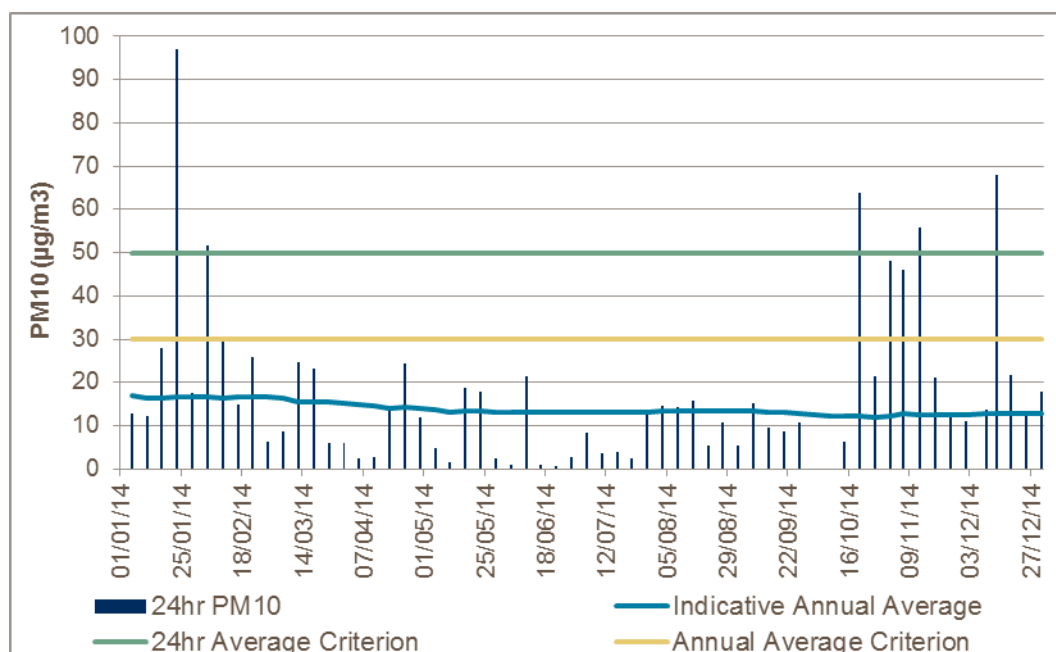
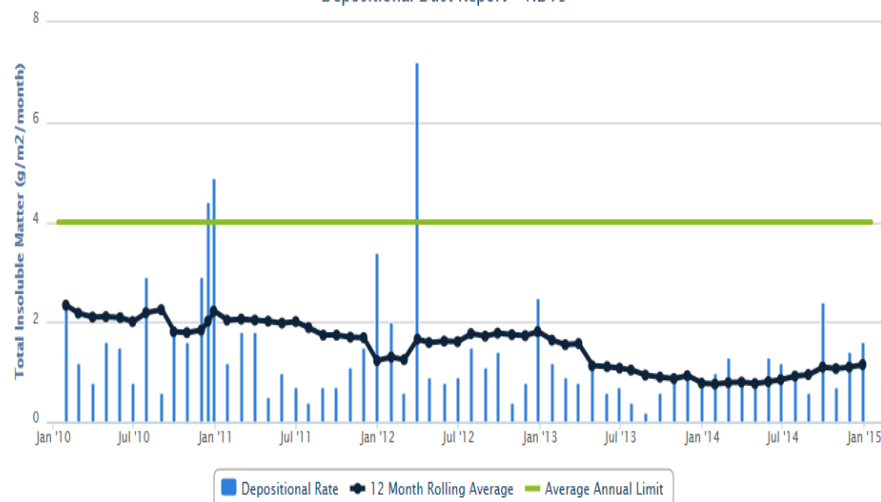


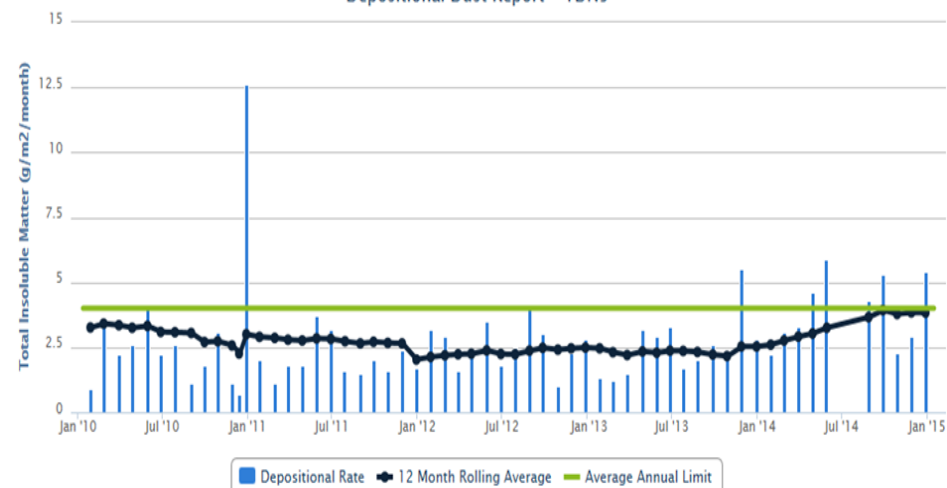
Figure 12 PM<sub>10</sub> Results for 'Milpose'



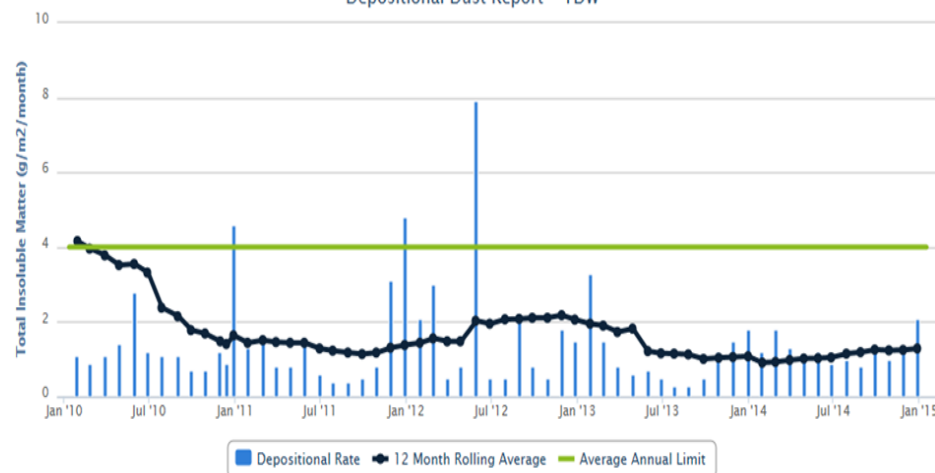
Depositional Dust Report - ND19



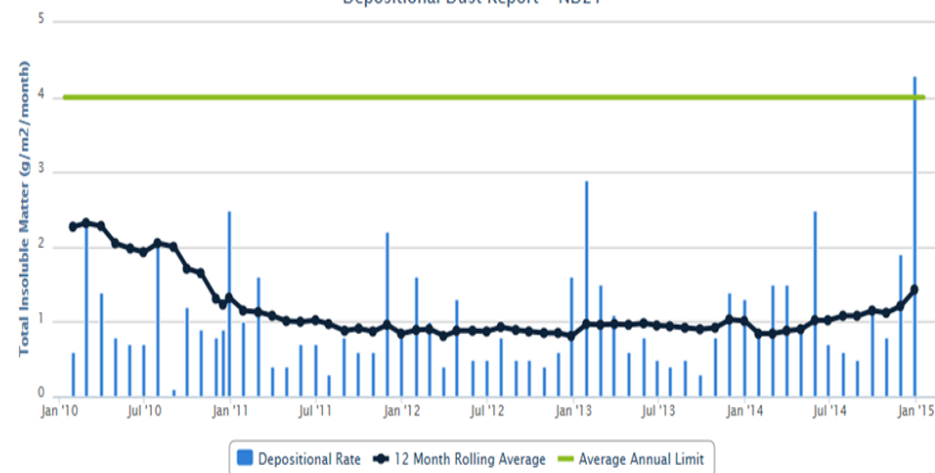
Depositional Dust Report - TDN5



Depositional Dust Report - TDW

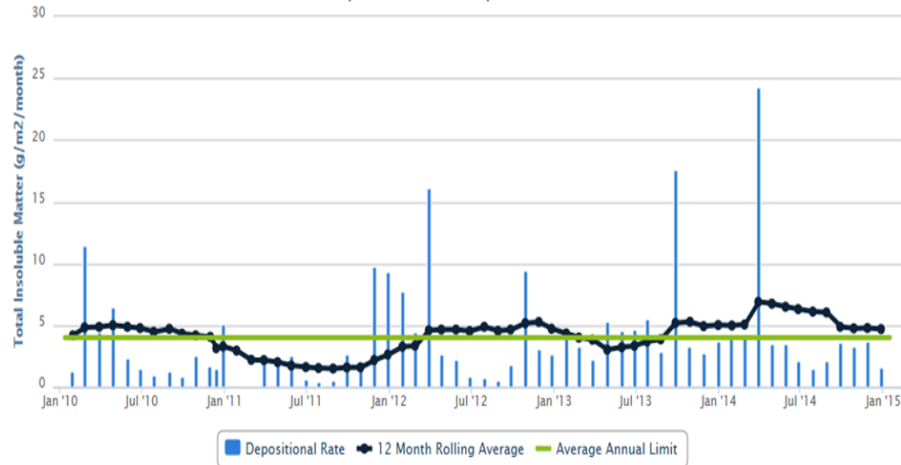


Depositional Dust Report - ND21

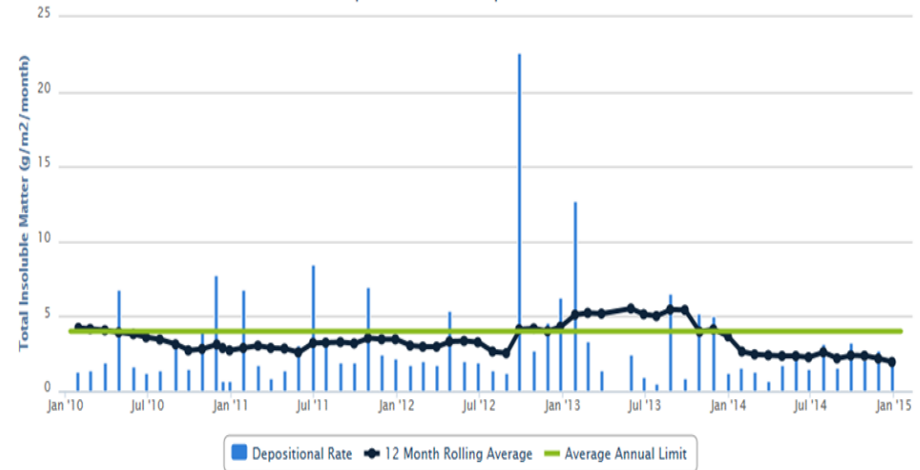




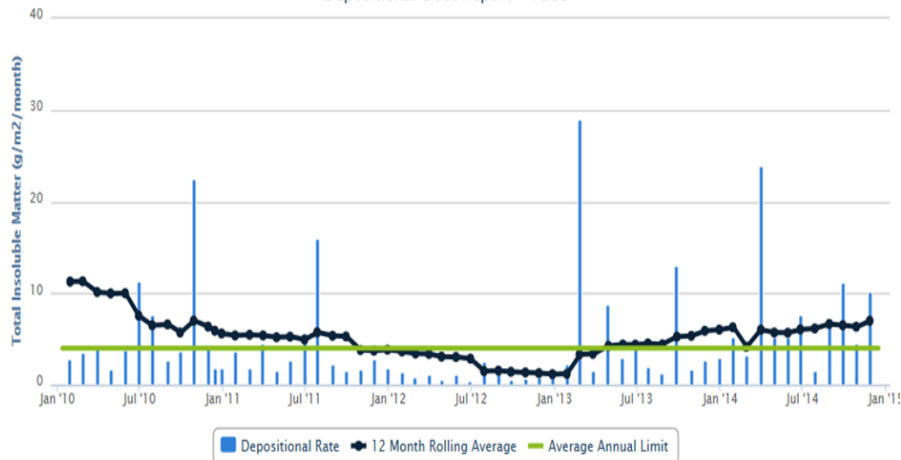
Depositional Dust Report – ND22



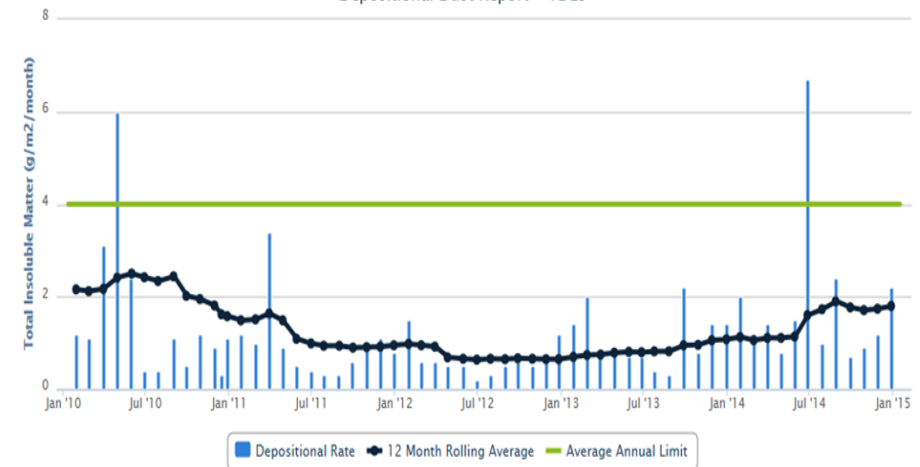
Depositional Dust Report – TDSW



Depositional Dust Report – TDS5



Depositional Dust Report – TDE5





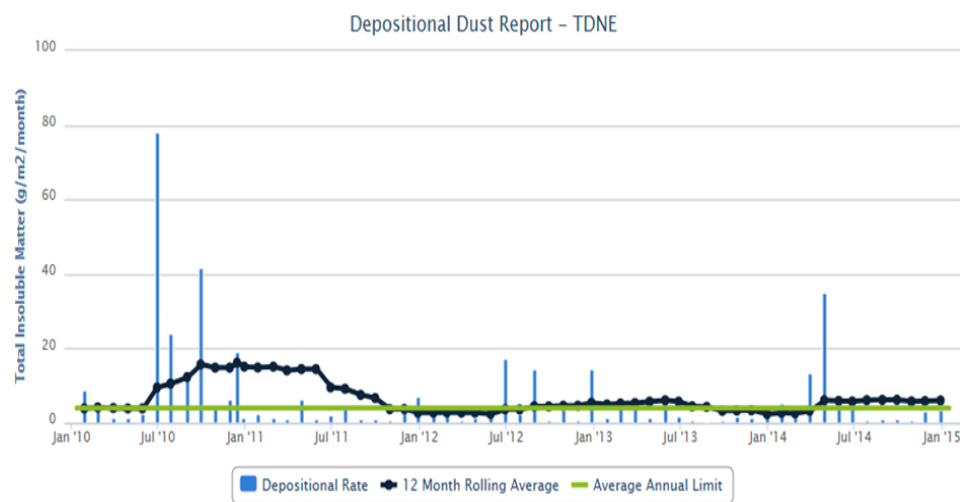
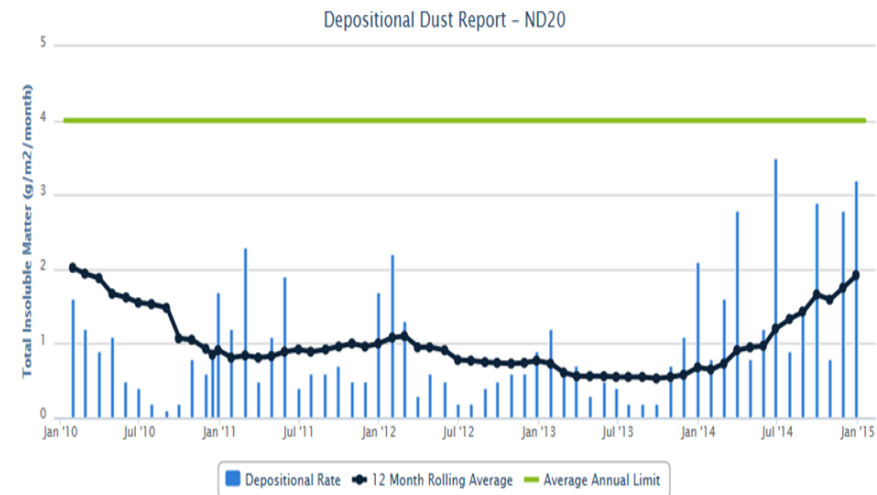
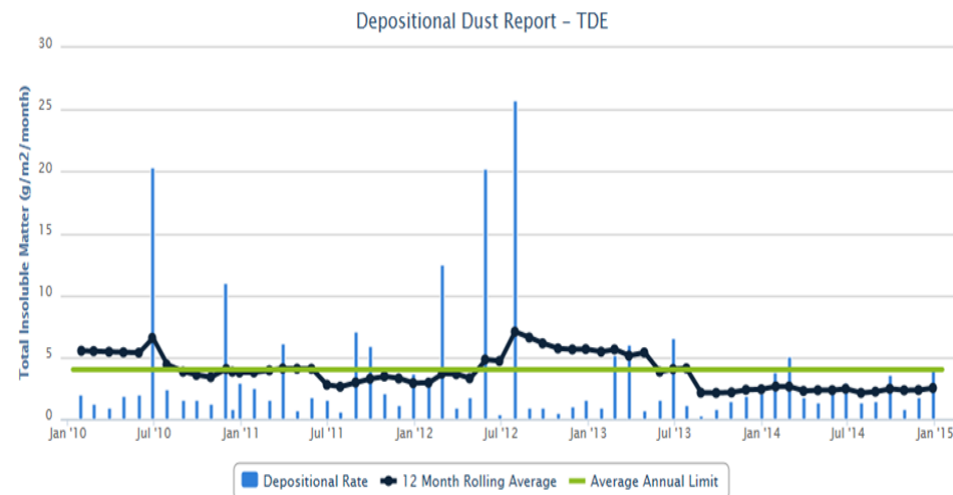


Figure 13 Depositional dust annual averages



#### **3.4.4 Actions Proposed for 2015**

- Introduction of 24hr Real-time PM10 monitors to comply with PA11\_0600
- Analysis of real time data
- Continue rehabilitation trails of TSF1.
- Removal of PM10 monitoring using High Volume Air Samplers which are replaced by real-time PM10 monitors
- Total Suspended Particles (TSP) monitoring at all four locations as required by the Project Approval (11\_0600).

### 3.5 Noise

#### Reporting period summary

- Quarterly noise monitoring completed by external noise specialists
- 'Hillview' location has been added into the NPM Noise Monitoring Program as required by the new Project Approval (11\_0600)
- Real time noise monitors have been installed at 'Hubberstone', 'Milpose' and 'Hillview'.
- No exceedences of regulatory noise criteria

Noise associated with the mining activities has the potential to affect the surrounding community. NPM implement a number of controls to mitigate noise that may be generated from on-site activities.

#### 3.5.1 Monitoring

NPM undertakes a noise monitoring program at three locations on privately owned properties outside the mining leases. The fourth location 'Hillview' has been added into the NPM Noise Monitoring Program as required by the new Project Approval (11\_0600). The program consists of both operator-attended and unattended surveys at the three nearest occupied residences 'Hubberstone', 'Milpose', 'Lone Pine' and 'Hillview' (Figure 14).

Noise measurements are undertaken in accordance with the requirements of new Project Approval (11\_0600), Development Consent (06-0026), AS 1055, and the DECC Industrial Noise Policy, 2000. NPM engage external noise specialists to monitor and analyse the results. All acoustic instrumentation is designed to comply with the requirements of AS 1259.2 and carries current NATA or manufacturer calibration certificates.

Received levels from various noise sources are noted during operator-attended monitoring and particular attention is paid to the extent of the NPM contribution, if any, to measured noise levels. In addition, the operator quantifies and characterises the overall levels of ambient noise. Noise occurring during the surveys is recorded by the operator with an indication of the noise source, noise type, and the time of occurrence. Effect on the mine noise propagation is established by assessing prevailing weather conditions recorded at the NPM weather station, and at the time of the monitoring by the operator. A summary of the weather data is available in Appendix 3.

In addition to the operator-attended monitoring, unattended continuous noise logging is undertaken at the three monitoring locations to determine the overall ambient noise amenity levels of background noise, and any noise generated by mine activity. This is undertaken over a seven day period at which point the loggers are retrieved and the information is assessed. It should be noted that the ambient noise levels obtained from the loggers are not necessarily the contributed noise emissions arising from NPM operations alone. The ambient noise level data quantifies the overall noise level at a given location independent of its source or character. The noise logger calculates the statistical noise indices and does not 'record' the actual noise.



Figure 14 NPM Noise monitoring locations

### **3.5.2 Management**

Controls to manage noise as a result of NPM activities are implemented in all work areas and detailed in the site Noise Management Plan. Such controls include:

- Risk assessment of major works prior to commencement to consider noise management;
- Training and awareness to all employees and contractors;
- Consideration of noise in the purchasing of equipment to relevant noise emission standards;
- Planned and scheduled maintenance programs of mobile and fixed machinery;
- Regular meetings with neighbouring;
- Sounds bunds;
- Scheduling of work during daylight hours and restricted times; and
- A quarterly noise monitoring program undertaken by specialist noise consultants.

In the event that noise related complaints and/or exceedances of noise level criteria occur, these are reported to the NSW Environment Protection Agency and Department of Planning and investigated accordingly. A quarterly summary of the noise monitoring results is made available on the NPM website.

### **3.5.3 Results**

A total of 144 attended noise surveys were undertaken during the reporting period, of which 132 (i.e. 90%) were during favourable meteorological conditions stipulated into Development Consent conditions. The surveys that were taken during unfavourable meteorological conditions were excluded from assessment. The reasons for this included the wind speed exceeding 3 m/s and rain.

Unattended noise monitoring was conducted at all four sites for quarter 1, quarter 2 and quarter 3 and quarter 4 for a period of seven days respectively. This data was used to assess background ambient noise levels and do not have an applicable exceedance criteria. In quarter 2, unattended noise monitoring data was not recorded at Hubberstone. No readings were recorded due to technical issues with the data logger.

Monitoring results during the reporting period were in compliance with the limits specified in the new Project Approval (11\_0600) and Development Consent (06-0026), with the exception of Hubberstone in Quarter 2. The noise reading exceeded the limits due to machinery/pump noise coming from the mining lease. The exceedance was reported to the EPA as non-compliance. In quarter 4, attended noise monitoring was not undertaken at Milpose location for the evening time as a result of lightning and thunder. Complete results for unattended and attended monitoring data are available in Appendix 4.

During the life of the project the noise monitoring results have generally been in compliance with the limits specified in the new Project Approval (11\_0600) and Development Consent (06-0026).

### **3.5.4 Actions Proposed for 2015**

- Real time monitoring of noise data from all four locations.
- Removal of unattended noise monitoring from noise schedule due to the installation of real-time noise monitors

### **3.6 Blasting**

The objective of blasting is to ensure that optimal fragmentation of mine overburden or ore. Blasting has the potential to impact the surrounding community through vibration in the air (overpressure) and earth (ground vibration). The firing of blasts has the potential to generate dust and fumes. In 2014 there were nil exceedences of blast limits

#### **3.6.1 Monitoring**

NPM does not currently undertake surface blasting activities. Therefore monitoring for vibration and airblast overpressure at the privately owned residence, "Hubberstone" has ceased. Monitoring undertaken during Open Cut activities as stipulated in the Development Consent (06-0026) until the cessation of Open Cut mining in October 2010.

#### **3.6.2 Management**

NPM does not currently undertake surface blasting activities. Therefore, all associated management activities are no longer applicable. If in future surface mining activities resume, management and monitoring practices will be re-established.

#### **3.6.3 Results**

There were no surface blasts in 2014 and there were no community concerns relating to blasting in 2014.

#### **3.6.4 Actions Proposed for YEAR (following year)**

- Program will be reviewed if operational changes occur.



- Reporting period summary
- Total freshwater consumed was 1808 ML
- No significant changes to water quality or levels
- Site water infrastructure upgrades are underway.

NPM source water from numerous locations including imported water from various licences (refer Table 1). Water recycled from our on-site ore processing facility and tailings dam reclamation system and water collected through on-site infrastructure.

Effective water management is crucial to the long term success of NPM operations as it is essential in the processing of ore through our concentrator to produce copper concentrate.

NPM is located in a semi-arid water stressed environment and as such maintains a strong focus on water management to:

- Ensure a long term reliable water supply to site;
- Minimise impacts to natural water flows and biotic systems;
- Maximise water efficiency to reduce reliance on fresh water usage; and
- Maintain water quality.

NPM is a zero discharge site and therefore impact to the nearby permanent surface waters is minimal.

### 3.7.1 Monitoring

#### Surface and Groundwater

Water monitoring occurs at 69 surface water and 39 groundwater sampling sites. The surface water monitoring program consists of water quality sampling of various surface water courses and drainage system locations on and off the Mine Lease. The groundwater monitoring program involves the monitoring of water levels and quality at various locations up gradient and down gradient from the site. The location of sampling sites is provided in Figure 15 and Figure 16.

Water monitoring occurs on a quarterly basis and ad hoc after significant rainfall events. Water monitoring requirements in regards to the analytical suite monitored and frequencies is displayed in Table 6 and Table 7.

All water monitoring and sample collection, storage and transportation is undertaken in accordance with NPM procedures which are aligned with AS/NZS 5667 – Water Quality - Sampling. Analysis of surface water and groundwater was carried out in accordance with Office of Environment and Heritage (OEH) approved methods by a NATA accredited laboratory.

Ground and surface water impact assessment criteria is not established under NPM EPL 4784, based upon the fact that Northparkes is a zero discharge site. NPM assess water quality sample results against background water quality and communicate results on quarterly basis via the NPM website.

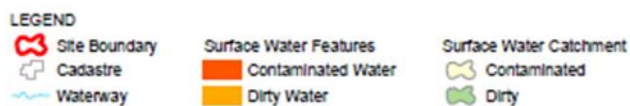


Figure 15 NPM Surface water monitoring locations



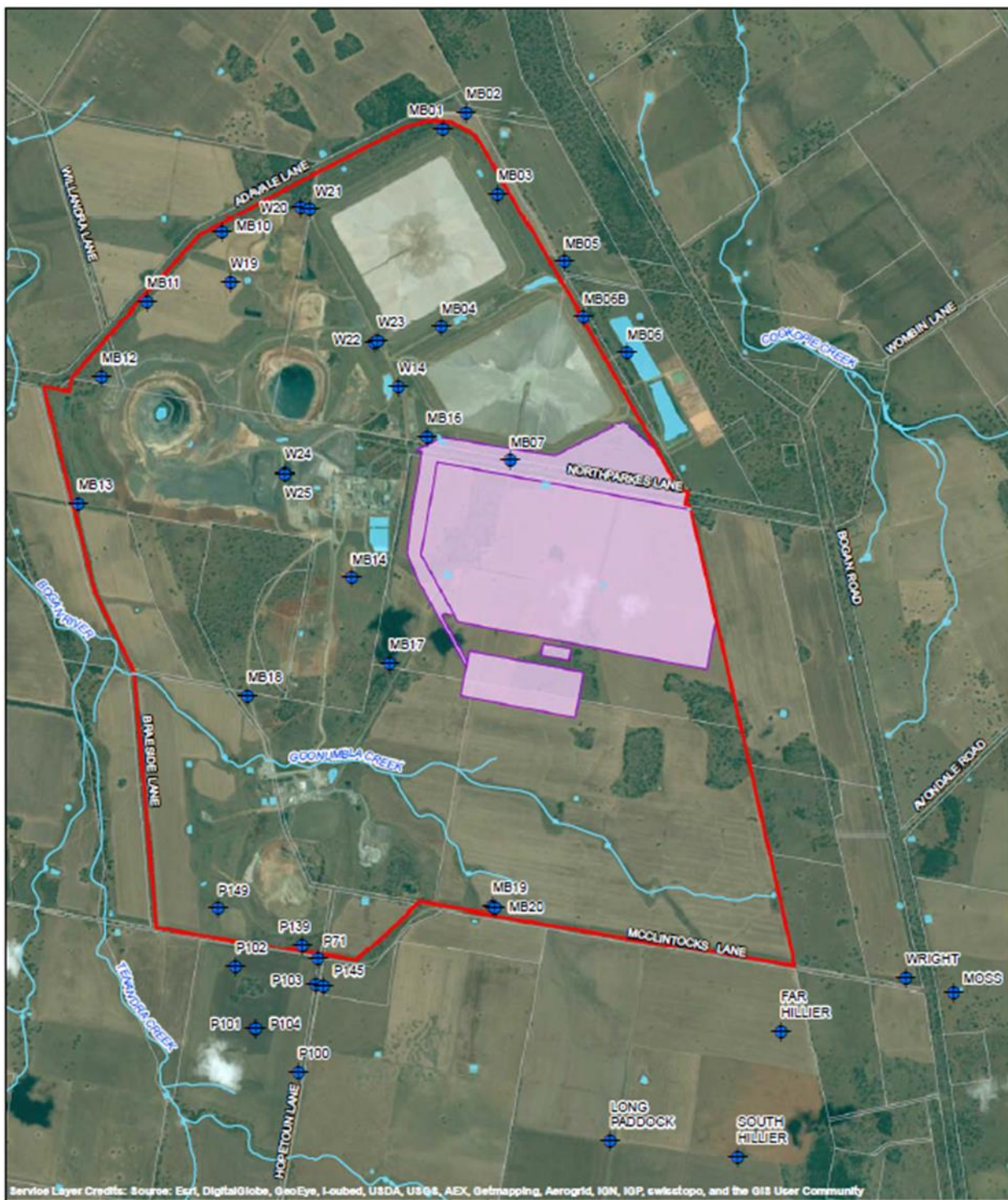


Figure 16 NPM Groundwater monitoring locations

**Table 6 Surface water monitoring program**

Monitoring Locations	Frequency	Analytical Suite
Watercourses	Annually and during rainfall events that results in flow	pH, EC, TSS, TDS, Cu, Na, K, Ca, Mg, Cl, SO <sub>4</sub> , HCO <sub>3</sub> , CO <sub>3</sub>
Farm Dams	Bi-annually	pH, EC, TSS, Cu
	Annually	pH, EC, TSS, TDS, Cu, NA, K, Ca, Mg, Cl, SO <sub>4</sub> , HCO <sub>3</sub> , CO <sub>3</sub>
Sediment Ponds	Quarterly and during rainfall events that results in flow	pH, EC, TSS, Cu
	Annually	pH, EC, TSS, TDS, Cu, NA, K, Ca, Mg, Cl, SO <sub>4</sub> , HCO <sub>3</sub> , CO <sub>3</sub>
Retention Ponds	Quarterly and during rainfall events that results in flow	pH, EC, TSS, Cu
	Annually	pH, EC, TSS, TDS, Cu, NA, K, Ca, Mg, Cl, SO <sub>4</sub> , HCO <sub>3</sub> , CO <sub>3</sub>
Process Water System (including process water dams, TSF's, return water dams, surge dams, retention ponds, grease traps)	Annually	pH, EC, TSS, TDS, Na, K, Ca, Mg, Cl, SO <sub>4</sub> , HCO <sub>3</sub> , CO <sub>3</sub> , Al, As, Ba, Be, Cd, Co, Cu, Cr, Mo, Mn, Ni, Pb, Se, Th, U, Zn,

**Table 7 Groundwater monitoring program**

Monitoring Locations	Frequency	Analytical Suite
TSF Bores	Quarterly	Levels, pH, EC, Cu
	Annually	pH, EC, TDS, Na, K, Ca, Mg, Cl, SO <sub>4</sub> , HCO <sub>3</sub> , CO <sub>3</sub> , Al, As, Ba, Be, Cd, Co, Cu, Cr, Mo, Ni, Pb, Se, Th, U, Zn
Opencut Bores	Quarterly	Levels, pH, EC, Cu
	Annually	pH, EC, TDS, Na, K, Ca, Mg, Cl, SO <sub>4</sub> , HCO <sub>3</sub> , CO <sub>3</sub> , Al, As, Ba, Be, Cd, Co, Cu, Cr, Mo, Ni, Pb, Se, Th, U, Zn
Underground Bores	Quarterly	Levels, pH, EC, Cu
	Annually	pH, EC, TDS, Na, K, Ca, Mg, Cl, SO <sub>4</sub> , HCO <sub>3</sub> , CO <sub>3</sub> , Al, As, Ba, Be, Cd, Co, Cu, Cr, Mo, Ni, Pb, Se, Th, U, Zn
Regional Bores	Quarterly	Levels, pH, EC, Cu
	Annually	pH, EC, TDS, Na, K, Ca, Mg, Cl, SO <sub>4</sub> , HCO <sub>3</sub> , CO <sub>3</sub> , Al, As, Ba, Be, Cd, Co, Cu, Cr, Mo, Ni, Pb, Se, Th, U, Zn

All water monitoring and sample collection, storage and transportation is undertaken in accordance with NPM procedures which are aligned with AS/NZS 5667 – Water Quality - Sampling. Analysis of surface water and groundwater was carried out in accordance with Office of Environment and Heritage (OEH) approved methods by a NATA accredited laboratory.

NPM source water from numerous locations including imported water from various licences (refer Table 1). Water recycled from our on-site ore processing facility and tailings dam reclamation system and water collected through on-site infrastructure.

Effective water management is crucial to the long term success of NPM operations as it is essential in the processing of ore through the concentrator to produce copper concentrate.

NPM is located in a semi-arid water stressed environment and as such maintains a strong focus on water management to:

- Ensure a long term reliable water supply to site;
- Minimise impacts to natural water flows and biotic systems;
- Maximise water efficiency to reduce reliance on fresh water usage; and
- Maintain water quality.

The NPM water management system aims to efficiently and economically collect, store and re-use water onsite to minimise external water supply inputs and supplement supply during periods of high consumption. Water management activities and strategic actions are coordinated, managed and documented through an onsite Water Committee with interdepartmental representation.

NPM have developed new water quality trigger criteria specific to the nature of the operation and the local environment as the water quality criteria as per DC 06-0026.

### **3.7.3 Results**

The overall water quality of surface water and ground water remained consistent within long term average. There were fluctuations observed in the surface water quality which is largely attributable to the less sediments due to low rainfall during the reporting period. The groundwater levels remained similar to the previous reporting period and within long term averages.

#### **Surface Water**

Surface water quality was generally within the range of the long term average for the majority of monitoring locations. The pH concentration at all sediment ponds has seen a gradual decrease over the reporting period. The pH concentrations are between 6 to 7.5.

No samples were collected at SP16, RP4, RP7, RP24, RP27, RP29 and FD12 for the reporting period as it was dry or <10% volume throughout the year. At monitoring locations RP2, RP12, RP21 and RP30 only one sampling event occurred over the reporting period, due to the locations being dry during the remainder of the year.

Copper levels were at or below the long term averages for all monitoring locations. There were fluctuations observed in EC and pH for farm dams, retention ponds and sediment ponds, this was largely due to lack of sediments in the ponds and a result of decreased rainfall and lower water volumes. The monitoring data for all farm dams are available in Appendix 6.

In quarter 2, the copper concentrations in SP10 continue to fluctuate, however are within the range of the long term average, whilst SP15 concentrations continue to drop to less than 0.1 mg/L. Similarly for FD11, the copper concentrations in FD11 have increased and have dropped in the following quarters to be in line with long term averages.

The copper concentrations at SP5 in Quarter 4, have increased from 0.005mg/L to 0.3 mg/L from the last monitoring period but in line with long term averages.



RP1, RP3, and RP26 reported high Cu concentrations higher than the long term average in the previous reporting period; however results from the current reporting period indicate that this has returned to be in-line with the long term average. Complete results for all retention ponds monitoring are available in Appendix 8. The pH concentrations remained in-line with long term averages over the reporting period.

The monitoring data for all sediment ponds and process water system are available in Appendix 7 and Appendix 9.

One rainfall event resulted in watercourse sampling and the results are in line with historical data and representative of freshwater quality characteristics. There was an increase in pH concentrations in this reporting period compared to previous reporting period and is mainly due to high sediment load. The complete monitoring results are available in Appendix 8.

### **Groundwater**

Groundwater levels remained constant at all monitoring bores during the reporting period and are in line with long term averages.

During the reporting period, the regional bore Moss, which is located on the 'Moss' property, was being actively pumped by the land owner and was unavailable for sampling. All other regional bores were sampled and the monitoring data are available in Appendix 11.

The groundwater pH values remained consistent with long term averages with the exception of P100 bore which showed a decrease in pH. An investigation revealed that the pH at P100 is decreasing gradually over the years. The current decrease in pH is inline with the linear average of the last three years of monitoring data.

The groundwater pH values were consistent for all the TSF bores with the exception of MB1, which has declined over the years. The EC and Copper were in line with long term averages with the exception of MB5 with increased copper concentration in quarter 2, but declined in Q3 and Q4 to be in line with average concentrations. Groundwater levels around the perimeter of the tailings storage facilities (TSF) remain steady, with the exception of P71 which recorded an increase in copper from 0.004 mg/L to 0.115 mg/L.

In the reporting period no samples were collected at MB7, MB 11, MB12 and MB16 as the bores were dry and MB8 which is capped as the bore is in the new Estcourt tailings facility. No samples were collected from the South Hillers as the bore is blocked. Due to wind mill not working, no water has been pumping into the tank where the sample is usually collected.

Only two samples were collected from P101 bore due to high sediment load in the bore.

The monitoring results for all bores located in the open cut and underground area are available in Appendix 11 and Appendix 14. The Copper concentrations for all monitoring bores remained in line with the long term average, except W14 which showed varied concentrations over the monitoring period and returned to be in-line with long term averages. The EC and pH remained in-line within long term averages over the monitoring period.

Due to the construction of the Estcourt Tailings Dam W15, W16 and W17 were not measured and have been destroyed. During the reporting period three groundwater sampling locations were dry.

The ground water levels for all the monitoring bores are steady and inline with long term average. There were no variances in the standing water levels over the reporting period. Regional groundwater pH is variable between the bores, with quality being a variable of bore depth and underlying geology.

### 3.7.4 New groundwater monitoring bores

As required by the new Step Change Mine Extension Project Approval (11-0600), NPM has installed seven new groundwater monitoring bores around the proposed new tailings storage facility as shown in Figure 17. Table 8 below shows details of the new monitoring bores.

**Table 8 New groundwater bores**

Monitoring bores	GPS Co-ordinates	
	Easting	Northing
W26	0598996	6358037
W27	0598997	6358028
W28	0600517	6358214
W29	0600517	6358226
W30	0601038	6357724
W31	0600393	6355938
W32	0600394	6355947

### Water Courses and rainfall events

Water quality in natural watercourses was subject to normal variations in range of the long term average for the majority of monitoring locations. There were five rainfall events during the current reporting period that resulted in flow of nearby watercourses and required sampling. Rainfall event sampling indicated no adverse effects from NPM operations on watercourse quality during the reporting period. The monitoring data for water courses sampled during rain events are available in Appendix 6. Rainfall during the reporting period was below the long term average.





Figure 17 New groundwater monitoring bores at Rosedale tailings storage facility



### 3.8 Water Balance

NPM have developed and implemented a water model to capture water inputs, outputs and throughputs at the operation. The GoldSim model was updated in 2014 from consultants to incorporate the requirements from the new Project Approval (11\_0600).

Results of the model are incorporated in internal management decisions and are communicated internally to the management team on a six monthly basis.

In reviewing the mine water balance for the reporting period (Table 9) the following is of note:

- There were six major rainfall events that resulted in flows during the reporting period resulting in above average rainfall. A year total of 540 mm rainfall was recorded onsite.
- The volume of freshwater obtained from Parkes Shire Council (PSC) decreased (1998.25 ML in 2013 to 1808 ML in 2014) due to increased water availability on-site. All water imported to site was from groundwater licence allocations. No allocations of NPM river water were received from PSC in the reporting period, as seen in Table 9.
- Total water use during the reporting period was comparable to the previous reporting period with a decrease of approximately 17% from 6378 ML in 2013 to 5348 ML in 2014. Water used per tonne of ore milled was higher due to more water being used to increase recovery.
- Recycled water use increased during this reporting period by 13% (3109 ML in 2013 and 3540 ML in 2014). This is due to an increase in pumping of stored water in E27 into the PWS.
- Water entrained in product increased from the previous reporting period.
- Evaporation and seepage values were taken from Goldsim. The change from the previous reporting period is largely due to the change in assumptions for evaporation as a result of E27 inpit storage.

**Table 9 Reporting period water balance**

Water Balance	Total (ML)
Total Water Input	1808
Recycled	3540
Change in storage	-277
Dewatering water discharged without use	0
Process effluent	0
Non process water	1847
Entrained in product, by-products or process wastes	14.6
Sent to 3 <sup>rd</sup> party	0
Make Up Water Requirement	0
Water Use	6378
Water Return	0
Evaporation, Seepage and Other	360.43
Total Water Output	5348

#### 3.8.1 Actions Proposed for YEAR (following year)

- Water infrastructure upgrades for the site water storage system to build capacity.
- New water storage infrastructure for Rosedale Tailings Storage Facility.
- Review and update drought and flood management plan for the site.

## 4. LAND MANAGEMENT AND REHABILITATION

NPM own and manage approximately 10,488 hectares of land within and surrounding the mine leases. This area supports a range of land uses including mining, exploration, crop production and habitat re-establishment.

Rehabilitation activities at NPM incorporate the entire landholding and not just the area covered by the mining leases. The aim of this is to enhance the regional landscape and native habitat values.

### 4.1 Monitoring

Land Management aspects are monitored on a continuous basis through inspections conducted by the Farm Manager and members of the Environment team. These aspects include vegetation clearing activities, top soil management and invasive weed and animal pest mitigation.

During the reporting period, NPM engaged external consultants to undertake its annual rehabilitation monitoring program. This program is guided by clearly defined, repeatable and consistent methodologies for monitoring changes in various aspects of ecosystem function, succession and long-term sustainability.

The adopted monitoring methodology is a standard and simple procedure that can be easily replicated over any vegetation community or revegetation area. It includes a combination of Landscape Function Analyses and various measurements of ecosystem diversity and habitat values.

Rehabilitation monitoring sites were selected for their proposed final land use, vegetation community type and year of establishment and were considered to be representative of the rehabilitation area as a whole or were similar to and representative of other smaller areas of rehabilitation (Figure 18). In large rehabilitation areas multiple sites were established. The rehabilitation areas consisted of two main vegetation communities including "mixed native woodland" and "native grasslands".

The woodland sites are tree planting areas with the objective to enhance biodiversity and connectivity throughout the agricultural areas. The native grassland sites are located within the active mining lease on areas revegetated after mining disturbance (e.g. TSFs and batters of waste emplacements). In total, six "woodland" and eight "native grassland" monitoring sites were monitored in the reporting period.



**Figure 18** Locations of rehabilitation and reference monitoring sites

## 4.2 Management

Land management is conducted in accordance to the Landscape Management Plan and is inclusive of the Mine Closure Plan, the Rehabilitation Management Plan and the Void Management Plan. Other management plans pertaining to land management include the Aboriginal Heritage Management Plan and the Flora and Fauna Management Plan. The key objectives for NPM are to develop an integrated and strategic approach to land management including:

Reducing Northparkes' footprint and impacts;

- Land preservation and rehabilitation;
- Conservation and improvement of biodiversity;
- Land conservation through sustainable agricultural management;
- Establishment of environmental offsets on the Northparkes properties; and
- Interaction with adjoining land holders and communities to address cross border and regional land use issues.

Agricultural land around the mine site is used primarily for crop farming in combination with native vegetation. The native vegetation areas serve as biodiversity offsets for the mining operations and wildlife corridors. Since acquiring its various land holdings, NPM has placed considerable emphasis upon sustainable agricultural practices to minimise off-site impacts including:

- Removal of stock to minimise impacts to soil and vegetation;
- Conservation tillage practices;
- Soil conservation works; and
- Stubble retention.

NPM has maintained large sections of remnant vegetation within its landholding wherever possible. An important component of the rehabilitation strategy is the development and implementation of revegetation plans that link the significant areas of remnant vegetation with wildlife corridors and enhance ecological value.

Revegetation activities are designed for erosion control, aesthetic improvement and ecosystem regeneration. These activities are undertaken on constructed landforms such as waste rock dumps, tailings storage facilities, topsoil stockpiles, and other disturbed areas. Revegetation is also undertaken to create wildlife corridors. NPM has committed to planting 10,000 trees in wildlife corridors on an annual basis.

## 4.3 Results

Rehabilitation monitoring during the reporting year was conducted by a qualified ecologist. The following is a summary of sites monitored for revegetation success against the draft completion criteria. For the purpose of this summary, 20 primary draft criteria have been used, which, in consultation with government regulators, could be used as the agreed closure milestones. The full monitoring results are contained in Appendix 14.

Table 10 and Table 11 indicate the performance of the rehabilitation monitoring sites against a selection of draft Completion Performance Indicators developed for woodland and grassland communities during the monitoring period. The selection of criteria has been presented in order of ecosystem successional processes, beginning with landform establishment (orange) and ending with indicators of ecosystem stability (blue). The range values will be amended annually. No significant issues were raised from site inspections by the Farm Manager or Environment team in the reporting period.



#### 4.3.1 Woodland Revegetation Sites

The prolonged dry conditions have resulted in a reduction of active plant growth which has been compounded by increased levels of macropod activity and this was typically evident across the range of monitoring sites. Despite the dry conditions all woodland rehabilitation sites appear to be establishing well and in the older rehabilitation areas ecological function was very similar to those recorded in the woodland reference sites with the exception of Beechmore which continued to have negligibly lower stability and infiltration capacity, largely due to its topographic position on the lower lying areas of hard setting soil.

The two younger Limestone Forest rehabilitation areas have continued to maintain high patch areas and this was largely due to the high levels of cryptogams and annual plants providing very high stability. Due to increasing litter cover and higher decomposition rates these sites were now more functional than their adjacent Limestone Forest woodland reference site, RWood04, a highly modified woodland situated within the Limestone Forest Biodiversity Offset Area. RWood02, another woodland reference site, was the most ecologically functional site which contained high patch area, a mature tree canopy and well developed grassy ground cover layer, with high levels of decomposing litter and cryptogam cover. Most other sites did not tend to have such high levels of these attributes or if they did they were patchy and also contained bare clay pans but all rehabilitation sites except Beechmore were more functional than RWood04.

In 2013, trees and mature shrubs with a trunk diameter which was 5cm or greater were recorded in all rehabilitation sites for the first time, including the young Limestone Forest Offset sites. The density of trees has since increased across most of the sites providing an indication of good growth and development. The exception included Altona where there was one less individual, as the mature Acacias were starting to decline from the maturing ecosystem.

All rehabilitation sites except LFO-02 had tree and mature shrub densities (>5cm diameter at breast height (dbh)) which were similar to or greater than the reference sites with the lowest densities being recorded in the younger Limestone Forest rehabilitation sites. In most rehabilitation sites the minimum dbh were 5 – 6cm however the maximum dbh was an *E. melliodora* recorded in Estcourt which had a dbh of 36cm. In the woodland rehabilitation areas 20 – 73% of the population were bearing buds, flowers or fruits. In the rehabilitation sites the most common species recorded were *E. microcarpa* (Grey Box), *E. melliodora* (Yellow Box), *E. camaldulensis* (River Red Gum), *E. populnea* (Bimble Box), *E. largiflorens* (Black Box), *Casuarina cristata* (Belah), *Acacia pendula* (Myall) and mature *Acacia deanei* (Deane's Wattle).

Last year many sites had a declining shrub and juvenile tree population with a small number having grown into "trees", however in most cases many smaller individuals had died. Exceptions included significant recruitment which was observed in LFO-02 and RWood04, with both supporting a relatively recent regeneration event. In 2014 there were typically minor changes in the number of individuals recorded in the rehabilitation sites except in LFO-02 where the high density recruitment witnessed last year had failed to become established. While all sites contained an appropriate diversity of shrubs and juvenile trees, two rehabilitation sites LFO-01 and Estcourt 1997, did not contain an appropriate density. This may have implications in meeting longer-term ecological targets and may require replacement planting and/or grazing exclusion to enhance natural regeneration. The most common species in the rehabilitation areas included *Callitris glaucophylla*, *Acacia deanei*, *Acacia leucoclada*, *Acacia spectabilis* and *Dodonaea viscosa* subsp. *cuneata*. In Altona, there was also a small population of *Maireana brevifolia* (Yanga Bush) which had voluntarily colonised the site.

Improved total ground cover which is a combination of leaf litter, annual plants, cryptogams, rocks, logs and live perennial plants (<0.5m in height) was typically recorded in the rehabilitation sites with the exception of Kundibah. This year all rehabilitation sites contained appropriate levels of total ground cover with the exception of Altona which had only 77% cover, despite a small improvement during the last year. The two youngest rehabilitation sites LFO-01 and LFO-02 continued to have the highest level of total ground cover perhaps due to a low level of disturbance by animals and reduced competition levels due to the absence of the competitive mature overstorey.

Annual plants continued to provide significant levels of ground cover within the two young Limestone Forest rehabilitation sites, but in the older more established sites annual plants continued to be much less significant or were not present at all. Last year there was also a significant increase in annual plant cover in RWood04. While the cover provided by live annual plants was much reduced this year they continued to exceed annual cover targets in the LFO-01 and LFO-02. All sites contained at least some vertical structure 0.5 – 2.0m in height and all but the two young Limestone Forest rehabilitation areas contained foliage cover within all of the 2.0m height classes. The older rehabilitation sites had at least some canopy cover which exceeded 6.0m in height and the early development of a mature canopy layer. Rehabilitation sites Estcourt and Beechmore had a mature canopy cover which now provided similar levels of projected foliage cover as the naturally occurring woodland communities.

In 2010 there was a significant increase in total species diversity in all sites due to improved seasonal conditions after a long drought period. Since then there tended to be a decline in diversity up until a further peak in 2013 and this year a consistent decline in diversity was recorded in all reference sites. Similar trends were also apparent in the rehabilitation sites with declining numbers of native and exotic species recorded across all sites. This year all rehabilitation sites except LFO-01 and LFO-02 met native diversity targets, however, all contained too many exotic species. The percentage of cover provided by native plants has continued to decline but in the older rehabilitation area there were an acceptable abundance of exotic plant cover. Sites LFO-01 and LFO-02 continued to have a low percentage of native plant ground covers and were weedier than desired.

The woodland rehabilitation sites were generally comprised of a diversity of different growth forms but when compared to the reference sites notable differences include the higher number of tree species and low diversity of herbs. Shrub species were also absent from LFO-01. Subsequently no site yet contains a comparable composition of species but LFO-02 was close but presently had a low diversity of grasses.

The number of species recorded across the range of woodland rehabilitation sites has ranged between 97 – 151 species since 2009 with 24 – 45% of these being exotic species. This year the native herb *Dichondra repens* (Kidney weed) continued to be common in all sites however (live) *Lolium rigidum* (Wimmera Ryegrass) was recorded in only four sites due to the drier weather conditions. Two species of endemic acacia including *Acacia deanei* (Deane's Wattle) and *A. hakeoides* (Hakea Wattle) and *Eucalyptus populnea* (Bimble Box), that were planted as part of the rehabilitation, were recorded in five of the six sites, while numerous other native tree and shrubs species were also common in the planted sites. All common species were also recorded in at least one of the four reference sites and were typical of the local woodland communities.

The most abundant species in the reference sites were native grasses including various *Austrostipa* species (Speargrasses) and the native perennial herb *Einadia nutans* (Fishweed) was relatively abundant in RWood01. The exotic annual *Medicago polymorpha* (Burr Medic) was also comparatively abundant in RWood02. In Estcourt *Rytidosperma bipartitum* (Wallaby Grass) was the most abundant species while *Einadia nutans* was the most abundant species in Altona. The Limestone Forest rehabilitation sites tended to be dominated by exotics annuals including *Hypochaeris glabra* (Smooth Catsear), *Trifolium glomeratum* (Clustered Clover) and *Avena fatua* (Wild Oats). In Beechmore and Kundibah, no particular species was dominant.



The results of the soil analyses indicate that some sites have strongly acidic soil (LFO-01, Altona), and were low in organic matter and/or have a low Cation Exchange capacity but most other chemical characteristics were within or similar to those recorded in the local woodlands or were within agricultural industry standards. The results of the soil tests also indicated there are moderately – significantly high levels of Manganese, Iron, Copper and Silicon in numerous sites in the rehabilitation sites, however in most cases these are also found to be elevated within the woodland reference sites. Altona, an old gravel quarry site however had excessively high levels of Iron and at these concentrations may have the potential to affect plant establishment and ecosystem development."

#### **Performance of the woodland rehabilitation monitoring sites against "proposed" Primary Completion Performance Indicators**

The table below indicates the performance of the woodland rehabilitation monitoring sites against a selection of proposed Primary Performance Indicators during the 2014 monitoring period. The selection of criteria has been presented in order of rehabilitation phases according to the new ESG3 MOP guidelines *excluding: Phase 1: Decommissioning*.

The ecological targets begin at Phase 2: Landform establishment (orange) and end with indicators in Phase 5: Ecosystem Development (dark blue). The range values of the ecological targets are amended annually.

Rehabilitation sites meeting or exceeding the range values of their representative community type have been identified with a coloured box and have therefore been deemed to meet these primary completion criteria targets this year. Hashed coloured boxes indicate they may be outside of the reference target ranges, but within acceptable agricultural limits.

**Table 10 Performance of the woodland rehabilitation monitoring sites against 'proposed' Primary Completion Performance Indicators**

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	LFO-01	LFO-02	Estcourt 1997	Beechmore 1999	Altona 1999	Kundibah 2001
<i>Performance indicators are quantified by the range of values obtained from replicated reference sites</i>				<b>2014</b>					
Phase 2: Landform establishment and stability	Landform slope, gradient	Slope	< Degrees (18°)	4	1	2	2	3	0
	Active erosion	No. Rills/Gullies	No.	0	0	0	0	0	0
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	pH	pH (5.6 - 7.3)	5.2	5.9	6.2	6.1	5.2	6.2
		Organic Matter	% (>4.5)	2.3	2.3	3.1	3.1	5.3	2.5
		Phosphorous	ppm (50)	53.1	26.9	16.4	18.7	33.1	22.0
Phase 4: Ecosystem & Landuse Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	LFA Stability	%	65.0	65.9	63.1	61.5	64.6	64.9
		LFA Landscape organisation	%	100	84	85	82	85	94

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	LFO-01	LFO-02	Estcourt 1997	Beechmore 1999	Altona 1999	Kundibah 2001
	Vegetation diversity	Diversity of shrubs and juvenile trees	species/area	4	7	4	13	7	7
			% population	100	100	100	100	100	98
		Exotic species richness	<No./area	18	22	4	5	9	11
	Vegetation density	Density of shrubs and juvenile trees	No./area	25	53	12	68	154	52
	Ecosystem composition	Trees	No./area	5	3	6	7	5	10
		Shrubs	No./area	0	4	3	7	9	6
		Herbs	No./area	25	28	17	15	20	17
Phase 5: Ecosystem & Landuse Development	Landscape Function Analysis (LFA): Landform function and ecological performance	LFA Infiltration	%	40.7	43.9	39.8	39.7	50.9	40.9

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	LFO-01	LFO-02	Estcourt 1997	Beechmore 1999	Altona 1999	Kundibah 2001
		LFA Nutrient recycling	%	38.5	41.7	36.9	37.8	47.9	42.2
	Protective ground cover	Perennial plant cover (< 0.5m)	%	1.2	8.7	7	9.3	12.5	12.5
		Total Ground Cover	%	96	96	95.5	83.3	77	81.5
	Native ground cover abundance	Percent ground cover provided by native vegetation <0.5m tall	%	26.5	17.0	93.1	96.4	71.4	87.0
	Ecosystem growth and natural recruitment	shrubs and juvenile trees 0 - 0.5m in height	No./area	2	22	1	31	19	2
		shrubs and juvenile trees 1.5 - 2m in height	No./area	1	5	2	4	33	9
	Ecosystem structure	Foliage cover 0.5 - 2 m	% cover	6.5	6	0	7	8	24

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	LFO-01	LFO-02	Estcourt 1997	Beechmore 1999	Altona 1999	Kundibah 2001
		Foliage cover >6m	% cover	0	0	27	27	5	14
	Tree diversity	Tree diversity	%	100	100	100	100	100	100
	Ecosystem health	Live trees	% population	100	100	100	100	100	100
		Healthy trees	% population	100	80	65	54	60	27
		Flowers/fruit: Trees	% population	57	20	59	54	73	40

#### 4.3.2 Grassland Revegetation Sites

In the grassland rehabilitation sites there has tended to be a decline in perennial plant covers and this year lower stability was recorded in TSF1-01, TSF2-02 and E22-02. The remaining rehabilitation sites appeared to have improved site stability which was often related to increased litter cover and rates of decomposition as well as a reduction in slaking potential. The reduction in slaking however in TSF2-01 and TSF2-02 was due in part to the exposure of a more stable but very hard setting clay which also provided large cracks and increased soil surface roughness. A small bare interpatch had reappeared in E22-02.

While RGrass03, one of the grassland reference sites was the most ecologically functional site, E27-01, a rehabilitated grassland site, was negligibly close. Sites E26-01, E22-01 and TSF1-02 were more functional than RGrass02, but all sites were more functional than RGrass01. RGrass01 had a lower topographic position within the landscape and different soil types and grassland community composition and was quite different to the range of rehabilitation monitoring sites. Sites E22-01, TSF1-01 and TSF2-01 were the least functional rehabilitated grassland communities.

Shrubs have been recorded in low numbers (less than three individuals) in all grassland rehabilitation sites and are typically volunteer species establishing from the soil seed bank. Exceptions included TSF1-02 which contained a relatively high density of *Maireana brevifolia* (Yanga Bush) shrubs and E27-01 which contained some scattered planted tubestock including *Senna artemisioides* which have been regenerating. The density of shrubs in TSF1-02 was demonstrating an increasing trend up until 2012 but since then the dry conditions have reduced population numbers. In E27-01 there was however an increasing number of individuals this year, though some of the smaller individuals may have gone undetected beneath the heavy ground cover layer in previous years.

In most of the grassland rehabilitation sites there tended to be an increase in total ground cover except in sites TSF2-01 and E27-01 all sites met total ground cover targets. In TSF2-01 the decline in ground covers has thought to be implicated with fluctuating concentrations of salts which are leaching through the tailings dam walls in conjunction with dry seasonal conditions. In E27-01, high disturbance by macropods has left large and increasing areas of bare ground especially beneath the mature shady shrubs.

The ground cover in most sites were dominated by a combination of dead leaf litter and annual plants and this year there was an increase in dead leaf litter and subsequent decrease in annual plants, as most annual plants had recently died off in the hot dry conditions, but E22-01 and E26-01 continued to have an abundance of annual plants that exceeded acceptable levels. Rehabilitation sites which contained a comparable perennial plant cover were limited to TSF1-02 and E22-02 this year. Other ground covers and habitat features such as cryptogam, rocks or logs were typically absent or provided very low cover values. Most sites had small amounts of projected foliage cover 0.5 – 2.0m in height due to patches of tall annual and perennial grasses.

All rehabilitation sites had more plant diversity than recorded in 2009 and it appears that total plant diversity is strongly influenced by the fluctuation with seasonal conditions rather than any other single cause. This year the prolonged dry has resulted in a declining diversity in all sites, except RGrass03. In the reference sites there were 38 – 46 different plants and this year no rehabilitation site contained this level of diversity, but all contained an acceptable level of exotic species. There was no consistent trend in the changes in the percentage of endemic plant cover across the rehabilitation areas this year with some sites demonstrating an increase in native cover as the annual plants were mostly dead, while in TSF2-01, E22-01 and E26-01, a reduction in native plant cover was recorded. All rehabilitation sites except TSF2-01 (which was negligibly lower), E22-01 and E26-01 did not have the required abundance of native plant covers.



The rehabilitation sites were dominated by herbs and grasses but most sites were deficient in herbs and except TSF2-01 and E27-01 low in grass diversity. The number of species recorded across the range of grassland rehabilitation sites has ranged between 62 – 91 species since 2009 with 27 – 57% of these being exotic species. Four species were common to all rehabilitation sites and in at least two of the reference sites and these included the exotic annuals *Avena fatua* (Wild Oats), *Lolium rigidum* (Wimmera Ryegrass) and *Medicago polymorpha* (Burr Medic) and the native perennial species *Walwhalleya proluta* (Rigid Panic).

The rehabilitation areas were dominated by a different suite of plants compared to the reference sites with the native grass *Walwhalleya proluta* being the most abundant in rehabilitation areas except E27. Exotic species including *Vicia villosa* (Vetch), *Lolium rigidum* and *Medicago polymorpha* were also relatively abundant despite most of the annuals species being dead at the time of monitoring.

In TSF2-01 the extent of rilling has continued to increase and this year there were five rills with a total cross-sectional of 0.314m<sup>2</sup>, with four of these exceeding the minimum value of concern, while one rill previously recorded in E22-02, had become sufficiently established with vegetation and was considered to be stable.

Numerous rehabilitation sites continued to have slightly too moderately alkaline soils but rehabilitation sites TSF2-01, E22-01 and E27-01 fell within the local target range. The soils were typically non saline with the exception of TSF2-01 which first demonstrated a significant increase in EC in 2011. While a dramatic reduction was recorded last year, it had again become excessively high and with an EC of 1.912 dS/m it can be considered to be 'extremely saline'. The soils also had a significantly high Exchangeable Sodium Percentage (ESP) and highly sodic.

The soils in the rehabilitation sites were often low in organic matter and may have had low Nitrate concentrations. The high ESP in soils in some of the TSF sites however indicates the soils are likely to be sodic and may benefit from an application of gypsum. The results indicate there are numerous elements which occur at elevated levels in the rehabilitation sites, but some such as Manganese, Iron and Copper were also found to be elevated within the grassland reference sites, indicating that various elements occur at naturally higher levels within soils surrounding the Northparkes Mine. There were however excessively high levels of Sulfur in both of the TSFs sites which may have long term implications for plant growth and establishment, especially in TSF2-01.

#### **Performance of the grassland rehabilitation monitoring sites against “proposed” Primary Completion Performance Indicators**

The tables below indicates the performance of the rehabilitation monitoring sites against a selection of proposed Primary Performance Indicators during the 2014 monitoring period. The selection of criteria has been presented in order of rehabilitation phases according to the new ESG3 MOP guidelines excluding Phase 1: Decommissioning. The ecological targets begin at Phase 2: Landform establishment (orange) and end with indicators in Phase 5: Ecosystem Development (dark blue). The range values of the ecological targets are amended annually. Rehabilitation sites meeting or exceeding the range values of their representative community type have been identified with a coloured box and have therefore been deemed to meet these primary completion criteria targets this year. Hashed coloured boxes indicate they may be outside of the reference target ranges, but within acceptable agricultural limits.

Table 11 Performance of grassland rehabilitation sites against Primary Completion Performance Indicators in 2014

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	TSF1-01	TSF1-02	TSF2-01	TSF2-02	E22-01	E22-02	E26-01	E27-01
Performance indicators are quantified by the range of values obtained from replicated reference sites				2014							
Phase 2: Landform establishment and stability	Landform slope, gradient	Slope	< Degrees (<18°)	14	10	11	13	14	12	15	15
	Active erosion	No. Rills/Gullies	No.	0	0	4	0	0	0	0	0
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	pH	pH (5.6 - 7.3)	7.72	7.57	7.02	7.35	6.87	8.26	7.56	7.18
		Organic Matter	% (>4.5)	2.4	1.7	1.1	1.4	2.7	1.5	3.0	2.7
		Phosphorous	ppm (50)	19.4	19.7	15.7	18.0	21.0	17.1	28.9	22.6
Phase 4: Ecosystem & Landuse Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	LFA Stability	%	64.6	73.0	69.5	71.0	69.3	66.8	73.0	73.8
		LFA Landscape organisation	%	100	100	100	100	100	99	100	100
	Vegetation diversity	Exotic species richness	<No./area	15	14	11	14	18	11	18	20
	Ecosystem composition	Herbs	No./area	17	18	7	16	18	19	21	18
Phase 5: Ecosystem & Landuse Development	Landscape Function Analysis (LFA): Landform function and ecological performance	LFA Infiltration	%	41.3	43.6	34.2	40.3	47.7	41.4	48.9	50.1
		LFA Nutrient recycling	%	41.8	45.5	36.5	43.2	46.4	39.8	46.9	49.2
	Protective ground cover	Perennial plant cover (< 0.5m)	%	16.5	24.5	16	16	7	20	1	12.5



		Total Ground Cover	%	97	99	81.5	100	100	100	100	80
	Native ground cover abundance	Percent ground cover provided by native vegetation <0.5m tall	%	59.4	51.9	35.5	43.1	21.1	67.3	33.9	17.5

#### **4.3.3 Conclusion**

Despite the prolonged dry conditions, most woodland rehabilitation sites were stable and establishing well with many attributes similar to the relevant reference sites and in most sites, positive recovery trends were apparent and only require additional development time. Despite the decline in perennial plant cover there has typically been an improvement in other ecological attributes and an increase in total ecological function within most sites. The flush of annual plants occurring during the winter – spring periods has made a significant contribution to the development of the sites by increasing litter cover, with the rates of decomposition also improving and resulting in a reduction in soil hardness and increased soil coherency in some sites. Some sites however may have been subjected to disturbance associated with macropod activity but the effects of these were comparatively minor and mostly confined to sites with a mature tree canopies.

Some sites on the TSFs however have demonstrated a declining soil chemistry and in 2011 the visible effects of seepage through the TSF walls was first encountered, with adverse soil conditions being expressed as large bare patches, rilling and white sulphate crystals on the soil surface. These adverse conditions have also been reflected in the soil analyses and other monitoring data, especially in site TSF2-01.

Many rehabilitated grassland sites lacked the diversity of native ground cover species and while these may improve naturally over time, enhanced diversity and other ecological targets could have been achieved via active rehabilitation methods such as seeding and/or planting when the sites were first established. While some sites contained an abundance of weedy species, these species are part of the successional process and will make a positive contribution in providing protective ground cover and assisting with the development of microbial and nutrient recycling processes and most species are likely to decline in abundance over time. Some species however are now naturalised components of the native grasslands and local agricultural lands and therefore some species are likely to persist in the longer-term and will also be reflected in the reference sites.

The older woodland rehabilitation sites Estcourt, Beechmore, Altona and Kundibah and the grassland rehabilitation sites E26-01 and E27, contain many ecological attributes which are comparable to their reference sites. They have typically demonstrated they are stable and functional communities, despite some minor shortfalls in some years and often these have been in response to local seasonal conditions and disturbance events. The younger Limestone Forest rehabilitation area are also progressing particularly well but LFO-01 and Altona may have a low tree and shrub density, with implications in meeting future completion targets in the absence of successful natural recruitment events

#### **4.3.4 Estcourt Biodiversity Offset site/Other Projects**

The EOA monitoring sites have been demonstrating a declining trend in ecological function between 2011 and 2013 largely due to the prolonged dry conditions and a decline in perennial plant, litter and cryptogam cover which may have been compounded by increased levels of macropod activity. This year this trend has continued to develop in several EOA sites but this trend was also evident within two of the woodland reference sites. Sites which demonstrated an increase in ecological function this year included RWood02 and EOA-04, EAO-05 and EOA-06 with these sites tending to have a marginal improvement in litter cover and higher rates of decomposition, and in EOA-06 there was an increase in perennial plants, litter and cryptogam cover and less resources were being mobilised across the site.

RWood02, a woodland reference site, was the most ecologically functional site and contained high patch area, a mature tree canopy, scattered shrubs and well developed grassy ground cover layer, with high levels of decomposing litter and cryptogam cover. Most other sites did not tend to have such high levels of these attributes but site EOA-04 was close. Despite the lack of a mature tree canopy and low cover of perennial ground cover plants, sites EOA-03 and EOA-02 were more functional than RWood03, with the dense cover of dead leaf litter in moderate states of decomposition resulting in a less hard and compacted soil surface. The remaining EOA sites were more functional than both RWood01 and RWood04 largely due to the high litter cover which also provided higher levels of function within the sites.

Mature trees (>5cm dbh) were recorded in EOA-04, EOA-05 and EOA-06 however the population density was low in EOA-05. Common species of trees and mature shrubs recorded in the reference sites were *Allocasuarina luehmannii* (Bulloak), *Callitris glaucophylla* (White Cypress Pine), *Eucalyptus albens* (White Box), *E. microcarpa* (Grey Box), *E. populnea* (Bimble Box) and *Acacia hakeoides* (Hakea Wattle). In the EOA sites these were largely limited to *Callitris glaucophylla* and in EOA-06, *E. populnea*. There continued to be natural tree recruitment in all EOA monitoring sites with the vast majority being *Callitris glaucophylla* seedlings probably initiated during the high rainfall activity of the 2011/12 summer. All sites presently had a low density of shrubs and juvenile trees with the lowest density recorded in EOA-04 with 12 seedlings, while the highest density was recorded in EOA-05 with 26.

In the woodland reference sites there were 1- 6 species of shrubs and juvenile trees, but this diversity was not represented in the EOA sites with all sites only having one or two species. While in almost all EOA monitoring sites the seedlings were *Callitris glaucophylla*, eight *Dodonaea viscosa* subsp. *cuneata* (Wedge-leaf Hopbush) persisted in EOA-04 and there were eight *E. populnea* saplings and one *Acacia decora* (Western Golden Wattle) in EOA-06. Numerous other ecological attributes that were not met were largely related to the mature tree population and the structural complexity of the sites due to the lack of a well-developed overstorey.

Total ground cover recorded in the EOA monitoring sites also continued to be high in all sites and while macropod camps had reduced ground cover towards the end of the vegetation transect in EOA-06, total cover on average in this site was 96.5% and continue to exceed the required targets. Total ground cover was derived from various combinations of dead leaf litter, annual and perennial plants and in some sites there were small contribution from cryptogams and logs. This year there tended to be a reduction in annual and perennial plant cover but there were often increased covers of dead leaf litter. Sites EOA-04, EOA-05 and EOA-06 contained some limited canopy cover 4.0 – 6.0 and >6.0m in height due to the presence of mature *Callitris* trees but typically there was limited foliage cover in the lower height categories due to the absence of a shrubby understorey, or larger regenerating saplings.

In 2010 there was a significant increase in total species diversity in all monitoring sites due to improved seasonal conditions after a long drought period. Since then there tended to be a decline in diversity due to prolonged dry conditions up until a small peak in 2013 in numerous sites and this year a consistent decline in diversity was recorded in all woodland sites, including the reference sites. Sites which did not meet total or native diversity targets included the two recovering grasslands sites EOA-01 and EOA-02.

Due to the lower abundance of exotic annual plants sites this year EOA-05 and EOA-06 had an increased endemic ground plant cover. All of the wooded sites EOA-04, EOA-05 and EOA-06 continue to meet endemic plant cover targets while the remaining sites did not and are presently weedier than desired. Site EOA-06 continued to be the only site which contained an appropriate composition of species, with most sites having a low diversity of tree (and shrub) species and there were a low number of herbs and grasses in the derived grassland areas.

This year there were 91 species recorded across the six EOA monitoring sites and of these 33% were exotic species. Six species were common to all EOA monitoring sites this year and these included the native perennial grasses *Austrostipa scabra* subsp. *falcata* (Speargrass), the native tree *Callitris glaucophylla* and *Vittadinia cuneata* var. *hirsuta* (Fuzzweed), a native perennial herb. Three exotic annuals including *Centaurea melitensis* (Maltese Cockspur), *Lolium rigidum* (Wimmera Ryegrass) and *Sonchus oleraceus* (Milk Thistle) were also found in all EOA sites.

Most sites in the EOA were also comprised of various compositions of species with the most abundant species in any one site being native, except in EOA-01 where *Lolium rigidum* was the most abundant species. The EOA sites were also typically dominated by various native grasses including *Walwhalleya proluta* (Rigid Panic, EOA-02), *Rytidosperma erianthum* (Hill Wallaby Grass, EOA-03 and EOA-05), *Austrostipa scabra* subsp. *scabra* (Rough Speargrass, EOA-04) and *Austrostipa scabra* subsp. *falcata* (EOA-06). The natives *Juncus usitatus* (Common Rush, EOA-01), *Xerochrysum bracteatum* (Golden Everlasting, EOA-03) and *Calotis cuneifolia* (Purple Burr Daisy, EOA-06) were also quite abundant. No noxious weeds or threatened species were recorded within the range of monitoring sites.

The soils were typically moderately acidic, non-saline and non sodic. Most sites were also low in organic matter, phosphorous and CEC but not significantly different to that recorded within the local woodland reference sites and a reflection of the low fertility state of the soils in the NPM area. The results tend to indicate that various elements occur at naturally higher levels within soils surrounding the Northparkes Mine, especially manganese, iron and copper and are likely to be a reflection of the long agricultural and/or mining history of the local area.

#### **Performance of the woodland rehabilitation monitoring sites against “proposed” Primary Completion Performance Indicators**

The table below indicates the performance of the woodland rehabilitation monitoring sites against a selection of proposed Primary Completion Performance Indicators during the 2014 monitoring period. The selection of criteria has been presented in order of rehabilitation phases according to the new ESG3 MOP guidelines *excluding Phase 1: Decommissioning*. The ecological targets begin at Phase 2: Landform establishment (orange) and end with indicators in Phase 5: Ecosystem Development (dark blue). The range values of the ecological targets are amended annually. Rehabilitation sites meeting or exceeding the range values of their representative community type have been identified with a coloured box and have therefore been deemed to meet these primary completion criteria targets this year. Hashed coloured boxes indicate they may be outside of the reference target ranges, but within acceptable agricultural limits.



Table 12 Performance of the EOA sites against Primary Indicators for woodland ecosystems in 2014

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Woodland ecosystem range 2014		EOA-01	EOA-02	EOA-03	EOA-04	EOA-05	EOA-06
Performance indicators are quantified by the range of values obtained from replicated reference sites				Lower	Upper	2014					
Phase 2: Landform establishment and stability	Landform slope, gradient	Slope	< Degrees (18°)	0	5	1	1	0	1	1	2
	Active erosion	No. Rills/Gullies	No.	0	0	0	0	0	0	0	0
Phase 3: Growth medium development	Soil chemical, physical properties and amelioration	pH	pH (5.6 - 7.3)	5.8	6.6	6.4	5.9	6.2	5.6	5.7	5.8
		Organic Matter	% (>4.5)	4.1	5.0	3.5	3.4	3.0	3.6	3.8	4.4
		Phosphorous	ppm (50)	18.4	24.3	31.8	34.8	15.4	17.1	16.1	14.8
Phase 4: Ecosystem & Landuse Establishment	Landscape Function Analysis (LFA): Landform stability and organisation	LFA Stability	%	63.0	74.6	72.5	69.5	70.5	73.1	71.5	73.0
		LFA Landscape organisation	%	100	100	100	100	100	100	100	100
	Vegetation diversity	Diversity of shrubs and juvenile trees	species/area	1	6	1	2	1	2	1	2

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Woodland ecosystem range 2014		EOA-01	EOA-02	EOA-03	EOA-04	EOA-05	EOA-06
			% population	100	100	100	100	100	100	100	100
		Exotic species richness	<No./area	11	15	19	12	16	16	14	9
	Vegetation density	Density of shrubs and juvenile trees	No./area	38	129	23	25	16	12	26	11
	Ecosystem composition	Trees	No./area	2	4	1	1	1	1	1	2
		Shrubs	No./area	0	3	0	1	0	1	0	1
		Herbs	No./area	28	35	16	10	27	31	27	28
	Phase 5: Ecosystem & Landuse Development	Landscape Function Analysis (LFA): Landform function and ecological performance	LFA Infiltration	%	39.9	56.0	43.2	48.9	51.3	53.1	45.2
LFA Nutrient recycling			%	36.0	56.4	42.3	45.5	48.7	50.2	42.7	42
Protective ground cover		Perennial plant cover (< 0.5m)	%	5	24	8.5	18	22	30.5	18	28

Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Woodland ecosystem range 2014		EOA-01	EOA-02	EOA-03	EOA-04	EOA-05	EOA-06
		Total Ground Cover	%	82	97	100	100	100	100	100	96.5
	Native ground cover abundance	Percent ground cover provided by native vegetation <0.5m tall	%	61.0	89.5	30.0	50.9	57.7	62.9	75.0	98.4
	Ecosystem growth and natural recruitment	shrubs and juvenile trees 0 - 0.5m in height	No./area	15	83	22	22	13	11	24	3
		shrubs and juvenile trees 1.5 - 2m in height	No./area	0	13	0	0	0	0	0	0
	Ecosystem structure	Foliage cover 0.5 - 2 m	% cover	1	11	0	5	0	1.5	0	0
		Foliage cover >6m	% cover	15	45	0	0	0	14	14	12
	Tree diversity	Tree diversity	%	100	100	0	0	0	100	100	100
	Ecosystem health	Live trees	% population	83	100	0	0	0	62	60	70



Rehabilitation Phase	Aspect or ecosystem component	Performance Indicators	Unit of measurement	Woodland ecosystem range 2014		EOA-01	EOA-02	EOA-03	EOA-04	EOA-05	EOA-06
		Healthy trees	% population	7	35	0	0	0	14	60	30
		Flowers/fruit: Trees	% population	29	90	0	0	0	52	60	50

#### 4.3.5 Conclusion and management recommendations

Despite the prolonged dry conditions, most woodland rehabilitation sites were stable and establishing well with many attributes similar to the woodland reference sites and in most sites, positive recovery trends were apparent and only require additional development time. Despite the decline in perennial plant cover there has typically been an improvement in other ecological attributes and an increase in total ecological function within most sites. The flush of annual plants occurring during the winter – spring periods has made a significant contribution to the development of the sites by increasing litter cover, with the rates of decomposition also improving and resulting in a reduction in soil hardness and increased soil coherency in some sites. This year there was also a significant decline in floristic diversity due to the prolonged dry conditions.

Primary performance criteria which fell short of meeting the target ranges were largely associated with a low density and diversity of tree species and in the more disturbed grassland areas, there was low native species richness and exotic species were dominant. There was also a low density and diversity of shrubs and juvenile trees in most sites. While most EOA sites officially met shrub and juvenile tree diversity targets as compared to the woodland reference sites, juveniles were largely limited to *Callitris glaucophylla* which is technically a sub-dominant tree species which was also recorded in RWood04, a degraded woodland in the Limestone Forest. Most EOA sites therefore lacked and will continue to lack a shrubby mid-storey in the short – medium term unless there is some degree of management intervention. Numerous other ecological attributes that were not met were largely related to the mature tree population and the structural complexity of the sites due to the lack of a well-developed overstorey.

The proposed revegetation activity within the EOA (GHD 2010) aims to increase biodiversity and habitat values within the EOA through tubestock planting within the more cleared grassland areas and encourage natural regeneration and supplementary planting of shrubs within the more open woodland areas as they are currently limited in abundance and distribution. Areas where natural regeneration is evident should be identified and the methods of revegetation, species and planting densities adapted to take into account the natural regeneration such that the final woodland communities are comparable with the surrounding remnant woodlands.

There were little other management issues that have not already been addressed in the Rehabilitation Management Plan (GHD 2010). Regular slashing of the main access tracks is also advised to allow safe and easy access for maintenance and monitoring of the conservation area.



***Eucalyptus populnea* regeneration in the grassy clearing near site EOA-03.**

#### **4.3.6 Land Disturbance and Pre-clearing Survey**

A total of 12.8ha of land was disturbed by mining operations during the reporting period. This approved clearing was associated primarily with clearing around HV power lines.

#### **4.3.7 Revegetation and Rehabilitation**

Rehabilitation works during 2014 have been associated with the rehabilitation of temporary drill pads established as part of Northparkes Mines exploration drilling program. During the reporting period these plantings occurred on the southern boundary of Northparkes agricultural property 'Kundibah', in addition to the northern boundary on the agricultural property 'Orana'.

### **4.4 Research and Rehabilitation Trials and Use of Analogue Sites**

Since 2008, NPM has been working with the CLMR on a series of studies associated with the rehabilitation of TSFs (UQ 2008, UQ 2010a, UQ 2010b and UQ 2014).

The CLMR work has been undertaken in four stages.

- Stage 1 - Review of site environmental data and literature review;
- Stage 2 - Field sampling of geochemical and physical characteristics;
- Stage 3 - Hydrological and geochemical modelling; and
- Stage 4 - Conduct small scale field trials to validate required cover system.

Stages 1 to 3 have been completed and currently stage 4 is in progress. Stage 4 results will be available during this MOP period. This information will be the driver for the TSF capping design requirements.

Based on the results of stages 1-3 the following criteria in regard to cover performance are being investigated:

- Depth of cover (relates to deep drainage, storage of rainfall, salt movement, run off and plant growth; and
- Depth of topsoil (relates to plant growth, run off, precipitation storage).

The trials have been restricted to 100mm of topsoil due to constraints on topsoil volumes. Waste rock has been substituted for plant growth material below the topsoil. The waste rock is benign and suitable for plant growth and water storage.

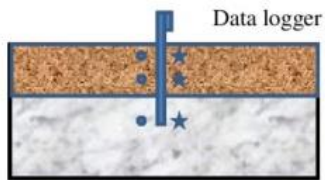
The stage 4 field trials involve setting up four small trial plots 20m X 20m with different levels and layers of cover over the tailings. In each of these trial plots different arrays of suction plates, suction sensors and moisture sensors have been installed. The design depth of each plot is illustrated below in Figure 19.

Plots have been seeded with native summer grasses: red grass (*Bothriochloa macra*), windmill grass (*Chloris truncate*), kangaroo grass (*Themeda triandra*) and warrego grass (*Paspalidium jubiflorum*) at 0.2 g/m<sup>2</sup>; and native saltbush varieties of Yanga bush (*Maireana brevifolia*) at 0.3g/m<sup>2</sup>, creeping saltbush (*Atriplex semibaccatta*) and Ruby saltbush (*Enchyleana tomentosa*), both at 0.4g/m<sup>2</sup>.



### Sensor plan

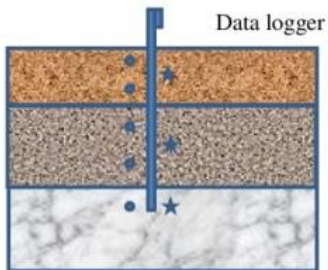
Plot 1 No specific cover



Top soil 2 sensors each

Tailings 1 sensor each

Plot 2 Shallow cover

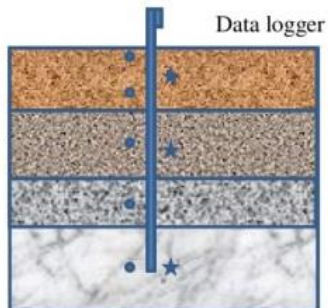


Top soil (2 suction, 1 moisture)

Waste rock (2 suction, 1 moisture)

Tailings (1 suction, 1 moisture)

Plot 3 Shallow cover with capillary break



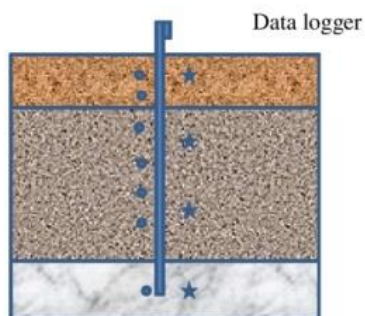
Top soil (2 suction, 1 moisture)

Waste rock (1 suction, 1 moisture)

Capillary break (1 suction, 0 moisture)

Tailings (1 suction, 1 moisture)

Plot 4 Standard cover



Top soil (2 suction, 1 moisture)

Waste rock (4 suction, 2 moisture)

Tailings (1 suction, 1 moisture)

Figure 19 Design depths of capping trail plots

**Table 13 Stage 4 Capping trail design specifications**

Design	Plot 1	Plot 2	T3	T4
	No specific cover	Shallow cover	Shallow cover with capillary break	Standard cover
Topsoil [m]	0.1	0.1	0.1	0.1
Waste rock [m]	--	0.4	0.4	0.9
Capillary break [m]	--	--	0.3	--
Total trial depth [m]	'0.1'	0.5	0.8	1
Water balance parameters to be monitored:				
Suction (# of sensors)	3	5	5	7
Moisture content (# of sensors)	3	3	3	4
Deep drainage with suction plate	1	1	1	1
Geochemical parameters to be monitored				
Seepage quality	✓	✓	✓	✓
Potential salt movement from tailings into cover	✓	✓	✓	✓

#### 4.5 Actions Proposed for 2015

- Soil stripping, stockpiling and rehabilitation works associated with the approved Rosedale tailings dam.
- Continue with monitoring of tailings capping trial research project.

## 5. BIODIVERSITY AND ECOLOGY

### Year summary

The following ecological projects have been undertaken in 2014:

- Kokoda monitoring surveys
- Pine donkey orchid populations monitoring surveys
- Production of the NPM Biodiversity Management Plan (BMP)
- NPM Rehabilitation Management Plan (RMP)

A summary of these projects is outlined below.

### 5.1 Kokoda monitoring surveys

In 2014, a range of baseline ecological field surveys were undertaken across the Kokoda offset site, including:

- Floristic data using plot-based surveys;
- Landscape Function Analysis (LFA) using transect-based surveys ; and
- Targeted bird surveys in winter (mid August) and spring (October).

Field surveys sites established across the Kokoda offset site are summarised in Table 14.

**Table 14 Details of survey sites established in Kokoda Offset Site 2014**

Site ID	Timing	Easting	Northing	Flora Plot	LFA	Bird Survey (Spring)	Bird Survey (Winter)
1	October	636939	6318027	✓	✓	✓	
2	October	636577	6318092	✓	✓		
3	October	636046	6318234	✓	✓	✓	
4	October	636011	6317751	✓	✓		
5	October	635991	6318484	✓	✓	✓	
6	October	637061	6318294	✓	✓	✓	
7	October	636548	6318457	✓	✓	✓	
8	October	636635	6318469	✓	✓		
9	October	636580	6318553	✓	✓		
10	October	637820	6318044	✓	✓	✓	
REM1	October	635679	6316726	✓	✓	✓	
REM2	October	636055	6316810	✓	✓	✓	
REM3	October	636209	6317308	✓	✓	✓	
REM4	October	636114	6318332	✓	✓	✓	
REM5	October	635688	6317753	✓	✓	✓	
REM6	October	635081	6318005	✓	✓	✓	
Winter Bird 1	August	635060	6317310				✓
Winter Bird 2	August	634924	6316846				✓
Winter Bird 3	August	635620	6317687				✓
Winter Bird 4	August	637369	6318129				✓
Winter Bird 5	August	636091	6318258				✓
Winter Bird 6	August	635054	6318042				✓

### 5.1.1 Floristic data using plot-based surveys

#### **Floristic data using plot-based surveys**

A total of sixteen 20 by 20 metre permanent flora sampling sites (plots) were established in the Kokoda Offset Site in 2014. Sites were established to facilitate sampling of the vegetation communities mapped by Umwelt (2013) and were marked for ease of relocating for subsequent monitoring surveys (using a handheld global positioning system (GPS) and star pickets). Photographs were also taken at each site to aid in monitoring changes over time.

During surveys, all vascular plants occurring within each of the permanent floristic plots were recorded and given a score for cover abundance using a six-point modified Braun-Blanquet system (Braun-Blanquet 1927; Poore 1955; Austin *et al.* 2000). In addition to floristic data, information on the vegetation structural formation and biophysical attributes of each site was recorded, including aspect, slope, elevation, landform element and morphology, disturbance history, soil colour, soil texture, estimated soil depth and soil drainage.

Floristic plot-based survey in the Kokoda Offset Site recorded 110 plant taxa; including 33 non-native (weed) species and 77 native species. No threatened flora species were detected in the flora plots during field surveys. The dominant plant family at all sites is Poaceae (grasses), particularly in the DNG sites which have a long history of grazing. The grass species comprise of a mix of both native and non-native species, in the latter case including a number of typical pasture species such as wall fescue (\**Vulpia muralis*). The second most common plant family at all sites is Asteraceae (daisy), which in the DNG sites comprise of mostly weed species such as smooth catsear (\**Hypochaeris glabra*) and dandelion (\**Taraxacum officinale*). A high proportion of species recorded in the Kokoda Offset Site DNG sites are weed (introduced) species. Only three of the recorded weeds are noxious; listed under the Noxious Weeds Act 1993 (NW Act).

### 5.1.2 LFA using transect-based surveys

LFA is a monitoring method for assessing and monitoring landscape restoration or rehabilitation projects. Sixteen baseline LFA monitoring transects were established nearby to each of the permanent quadrats within the Kokoda Offset Site. The LFA surveys were undertaken concurrently with floristic plots and followed standard LFA methods as described by Tongway and Hindley (2004). Each LFA transect is 30 metres in length, and the end point is established downslope of the start point. The start and finish of each LFA transect was permanently marked using star pickets.

Broadly, the LFA results reveal that each of the sites have moderate to high soil stability. This is likely to be correlated with the density of ground cover vegetation currently present and the mostly gently-inclined slopes. Lower results were recorded for infiltration across most sites, of less than 50 per cent. This indicates that there is only moderate infiltration of water and incorporation of organic matter into the soil. The exceptions of Site 1 and REM3 are most likely related to the higher ground cover density of these sites, despite the high proportion of weed species.

The relatively low nutrient cycling values recorded for most sites may be an indication of the small amount of leaf litter and organic matter being incorporated into the soil and cycled into the system. The exceptions include REM 1-4 sites, which occur in the forested remnants, and site 1, which is a denser, taller grassland than some of the more heavily grazed DNG sites. In these sites, the better developed vegetation cover is probably contributing to a higher nutrient cycling. Comparison of these baseline results to future LFA monitoring results will assist in highlighting the influence of different management approaches and the success of regeneration.

### 5.1.3 Targeted bird surveys

Targeted bird surveys were carried out in the Kokoda Offset Site in winter and spring 2014. Bird surveys were conducted at 6 sites in winter and 10 sites in spring. Both surveys comprised searching along slow walking transects over a 30 minute period within a 2 hectare area in the vicinity of each survey site. This activity was repeated on two separate days for each survey site.

Bird species were identified from characteristic calls and by observation using binoculars with up to 10 times magnification. Opportunistic observations were recorded during all other aspects of the field survey.

A total of 59 bird species were recorded in the Kokoda Offset Site in 2014, including 44 and 39 in the winter and spring surveys, respectively. Records comprised 24 families, with the largest number of species recorded in the families of Meliphagidae (honeyeaters) with 10 species, Psittacidae (lorikeets and parrots) with six species and Artamidae (butcherbirds, woodswallows, magpie and currawong) with five species.

Within each vegetation community, the remnant forest sites recorded the highest number of species, with Grey Box Grassy Woodland and Dwyer's Red Gum-Grey Box-Mugga Ironbark-Black Cypress Pine Forest recording 39 and 38 bird species, respectively. The DNG sites recorded fewer species, with Grey Box Grassy Woodland DNG and Dwyer's Red Gum-Grey Box-Mugga Ironbark-Black Cypress Pine Forest DNG recording 21 and 27 bird species, respectively.

Additionally, a total of five threatened bird species were recorded within the Kokoda Offset Site during 2014. These included:

- superb parrot (*Polytelis swainsonii*) (EPBC Act: V, TSC Act: V);
- grey-crowned babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) (TSC Act: V);
- little lorikeet (*Glossopsitta pusilla*) (TSC Act: V);
- hooded robin (south-eastern form) (*Melanodryas cucullata*) (TSC Act: V); and
- brown treecreeper (eastern subspecies) (*Climacteris picumnus*) (TSC Act: V).

The grey-crowned babbler (eastern subspecies), brown treecreeper (eastern subspecies) and hooded robin (south-eastern form) are sedentary species; therefore, these records are likely to indicate that populations of each species occurs within the Kokoda Offset Site. However, the superb parrot and little lorikeet are nomadic species and likely to only use the site for foraging during eucalypt flowering.

## 5.2 Pine donkey orchid populations monitoring surveys

Field surveys of the two populations of the pine donkey orchid (*Diuris tricolor*) associated with the Northparkes Mine project area was carried out on 11 and 14 November 2014. Populations were surveyed within the following two *Diuris tricolor* Management Zones:

- E48 Subsidence zone
- Adavale lane

Survey comprised marking the locations of each individual plant encountered along walking transect, using a GPS-generated point. Transects were generally between 5 and 10 metres apart to achieve comprehensive spatial coverage of each population, with the aim of locating every individual orchid visible.

One hundred and ninety-nine individual pine donkey orchids (*Diuris tricolor*) were recorded in the two *Diuris tricolor* Management Zones surveyed in spring 2014. These included:

- 69 individual plants in E48 Subsidence Zone; and
- 130 in Adavale lane



### **5.2.1 Production of the NPM Biodiversity Offset Management Plan (BOMP)**

In 2014, Umwelt was commissioned by NPM to develop a BMP in accordance with the NSW Project Approval (PA11\_0600) and Commonwealth Project Approval (EPBC 2013/6788) requirements issued for the Project. The BMP provides a framework for the implementation of ecological management actions, regeneration strategies, controls and monitoring programs for the Kokoda Offset Site. The BMP broadly focuses on managing woodland for conservation and assisting derived native grassland (DNG) areas to return to woodland form of key targeted vegetation communities.

The NPM BMP was submitted to the Office of Environment and Heritage in August 2014. Following revisions, the NPM BOMP was finalised in November 2014. The BMP will be reviewed in response to any new and relevant data that may arise through the monitoring, legislative change or any other studies completed at the site. This will enable a flexible approach to management commitments, allowing ongoing feedback and refinement of the BMP.

### **Review of the NPM RMP**

In 2014, The NPM Rehabilitation Management Plan (RMP) was reviewed and updated to fulfil the requirements of the NSW State Project Approval (PA11\_0600) for the NPM Step Change Project. The updated NPM RMP was submitted to the relevant state agencies (including the Office of Water, Office of Environment and Heritage, Parkes Shire Council and the Department of Trade and Investment) for approval.

## 6. WASTE AND HAZARDOUS MATERIAL MANAGEMENT

### Year Summary

- 53 % of total waste recycled
- 15.25 % reduction in total waste generated from previous reporting period
- Chemical audit successfully completed.

### 6.1 Monitoring

Onsite non-mineral waste storage facilities are inspected on a regular basis. These inspections target non-mineral waste segregation, general housekeeping, and management of hydrocarbons and chemicals.

NPM undertake inspections at offsite waste disposal facilities receiving non-mineral waste from NPM. Frequency and detail of these inspections are based on the level of risk associated with that waste stream.

NPM also undertake an annual chemical audit on-site which reviews the usage, storage, labelling, quantities, MSDS availability, and approval to be on-site. All chemical approvals are managed on-site via the ChemAlert database.

### 6.2 Management

NPM mining and processing activities generate non-mineral waste such as tyres, waste hydrocarbons, batteries, steel and domestic rubbish. NPM's waste management hierarchy is to eliminate, reduce and recycle where possible and set internal targets to drive this behaviour.

A site wide non-mineral waste management system has been implemented at NPM. The system is managed by waste management specialists and includes the following:

- Provision of suitable waste receptacles;
- Collection and disposal of waste materials;
- Waste tracking and reporting;
- Awareness training; and
- Identification of improvement opportunities.

The system aims to minimise waste generation, and maximise reuse and recycling. This is assisted by a bin colour-coding system to facilitate non-mineral waste segregation at the source of generation. No non-mineral waste was disposed of on-site at NPM during the reporting period.

All non-mineral waste quantities are removed offsite for disposal and are tracked and reported on a monthly basis by NPM's waste service provider.

NPM manages hazardous materials through an internal approval process and the ChemAlert program. All chemicals brought to and used onsite are then registered in a central database. This database contains the Material Safety Data Sheets and can be accessed at any computer terminal to provide guidance on storage, use, and disposal to personnel.

All waste bins onsite (general and recycle) bins are labelled which enables NPM to monitor for waste types and quantity which also provides opportunity to implement waste reduction programs onsite.

### 6.3 Results

Total non-mineral waste generated in the reporting period represents a 15.25% reduction from the previous reporting period. This is largely attributable to a reduction in the production of scrap steel (i.e. used grinding material) generated by NPM's Ore Processing, Underground and the completion of the Tunnel Boring Project. The quantity of general waste produced was more than the recyclable waste and thereby there was a decrease in recycling percentage from the last year.



Minor improvement opportunities were sighted in individual workplaces predominantly associated with the clearness of signage.

#### 6.4 **Actions Proposed for 2015**

- Continue and implement opportunities for waste recycling, re-used and reduction.
- Training and awareness sessions for NPM and NPM contractors.
- Investigate sources and methods for poly recycling.

## 7. TAILINGS AND MINERAL WASTE

### Reporting period summary

- 5.7 million tonnes of tailings deposited
- 94,652 tonnes of waste rock deposited on waste dumps
- Dust suppression trails continued with straw bales placed on top of the TSF1. Straw bales were placed on TSF1 as dust mitigation measure.

NPM currently have three TSF's on-site, TSF1, TSF2 and Estcourt TSF, which incorporated in-pit deposition into a former open cut pit E27. TSF1 is currently at capacity, with approval for an additional wall lift of four meters. Active tails deposition is occurring in TSF2, Estcourt TSF and E27.

NPM also have a number of waste dumps on-site (Figure 20) one of which is currently being utilised primarily to accommodate waste material from on-going underground development.



---

80



## 7.1 Management

### 7.1.1 Tailings

A total of approximately 95 Mt of tailings has been deposited at NPM operations to date. All tailings have been deposited within TSF1, TSF2, E27 pit and Estcourt TSF located approximately 2km from the processing plant. The tailings are sub-aerially deposited into the active TSF and tailings liquid and runoff is contained and directed to the internal central decant tower.

The TSFs have been designed to provide:

- Safe and permanent containment of all tailings solids;
- The recovery of free water for reuse within the processing plant;
- Containment of all water under extreme rainfall conditions;
- Maximised structural strength through the deposited tailings; and
- Containment of all chemical residues.

NPM control measures for the management of tailings during construction and operation are implemented as per the Tailings Operators Manual.

The site tailings strategy is regularly reviewed and the most optimal disposal strategy utilised. The tailings deposition strategy going forward involves alternating deposition between the E27 pit, Estcourt TSF and TSF2. Seepage remediation works were commissioned on TSF2 to realign the seepage drainage channels on the Northern Wall of TSF2.

### 7.1.2 Waste Rock

Geochemical tests of waste rock are conducted for underground activities to determine the nature of the material prior to excavation for disposal onto a surface dump or stockpile. Waste rock and clay across the operations are stored in either stockpiles or dumps as detailed in Figure 20.

Generally underground waste rock has been placed in the E26 Lift 1 Mullock Stockpile. Mineral waste is reused for construction activities. An additional clay dump was constructed to the east of the E26 subsidence zone to store pre-strip material from above the E26 ore body.

Within the constraints of mineral waste management practices these waste dumps and stockpiles may be utilised for construction purposes such as TSF walls, TSF capping, or as road base.

## 7.2 Monitoring

### 7.2.1 Tailings

NPM maintains an extensive monitoring program to manage impacts associated with tailings storage. Anomalies from the monitoring program are recorded and reported internally for action.

Daily inspections monitor:

- Tailings lines and discharge spigots;
- Tailings walls for any breaches, cracks or structural changes;
- Water levels in the retention ponds, TSFs, decant ponds, sediment ponds, and stilling ponds;
- Pump and pipeline integrity from the plant to the TSF;
- Rainfall measurements; and
- Density of tailings stream.

Weekly inspections monitor:

- Water pressures measured at the TSF1 and TSF2 piezometers
- Monthly inspections of the outer surface of the TSF walls monitor:
- Wall stability, cracking and erosion rills; and
- Seepage.



Quarterly water monitoring of the surface and groundwater quality surround the tailings storage facilities.

The mine is currently depositing into the Estcourt TSF and E27 pit. Construction of Estcourt TSF was completed and commissioned during 2012.

All construction work on TSF1 and E27 pit were completed in 2009, with minimal repairs in the current reporting period with the exception of TSF2 where seepage remediation works were undertaken on the Southern Wall.

Erosion of TSF1 and TSF2 drop structures continued to be monitored as part of routine surveillance inspections.

TSF impacts on groundwater and surface water are monitored in accordance with the water monitoring program detailed in Appendix 12.

Mineral waste monitoring includes a monthly composite sample of the tailings slurry. The sample is sent for full sulphide and mineralogical analysis to determine plant efficiencies and chemistry of the tailings.

### **7.2.2 Waste Rock**

NPM undertake testing programs to characterise the nature of rock material considered waste from the mining process. NPM engaged external consultants to undertake the Geo-Chemical assessments on waste rocks and tailings to assess the potential environmental risks posed by waste rocks. The works include characterisation of waste rock and tailings generated during mining, as well as rock located in the area of subsidence associated with the mined out ore body.

The samples were submitted for the following tests

- Paste pH and EC
- Total Sulphur
- Acid Neutralising Capacity (ANC)
- Net Acid Generation (NAG) test
- Multi-Element Chemical Assay

Results indicate that the primary waste rocks from the ore bodies are low in sulphur with high acid-neutralising capacity and a negative net acid-producing capacity.

Solubility analyses and leachate tests showed that potentially toxic elements are not mobile at the natural pH of the waste rock and elevated levels are not expected in leachates or pore water. Using a conservative management approach, waste rock is tested for its acid forming potential even though acid rock drainage does not pose a significant risk for the operations.

Tailings sample indicate low total sulphur content with moderate acid neutralising capacity. All tailings are high content of gold, copper and selenium compared to average crustal abundances.

The Environment team inspects the waste rock dumps on a regular basis for density of vegetative cover, slumping / movement, weed growth, erosion, and drainage lines.

## 7.3 Results

### 7.3.1 Tailings

In the reporting period, 5,703,728 tonnes of tailings were deposited between TSF2 and E27.

### 7.3.2 Waste Rock

A total of 94,652 tonnes of waste rock from underground development was placed on the Lift 1 Mullock Dump during the reporting period. This was primarily from the Brazen, Discovery and Conviction development drives.

The waste movement for this reporting period decreased from the previous reporting period due to the completion of construction activities of the Estcourt TSF.

No significant issues were identified from the inspections of waste rock dumps across site in the current reporting period.

## 7.4 Actions Proposed for 2014

- Monitor the effectiveness of the straw bales applied to TSF1
- Commence the construction of the Rosedale TSF, pending EA approval.

## 8. CULTURAL HERITAGE

### Reporting period summary

Two Aboriginal heritage surveys were undertaken by the Wiradjuri Council of Elders for the Rosedale Project. These surveys were undertaken between the 28<sup>th</sup> July till 5<sup>th</sup> August and the 16<sup>th</sup> October till 24<sup>th</sup> October. Three potential Cultural artefacts were located being

- 1 Chert Flake and
- 2 Silcrete Flakes

The recommendation from the Wiradjuri Council of Elders is for these three artefacts to be relocated to the secure cabinet in the administration building. This has been actioned and the artefacts are stored for safe keeping.

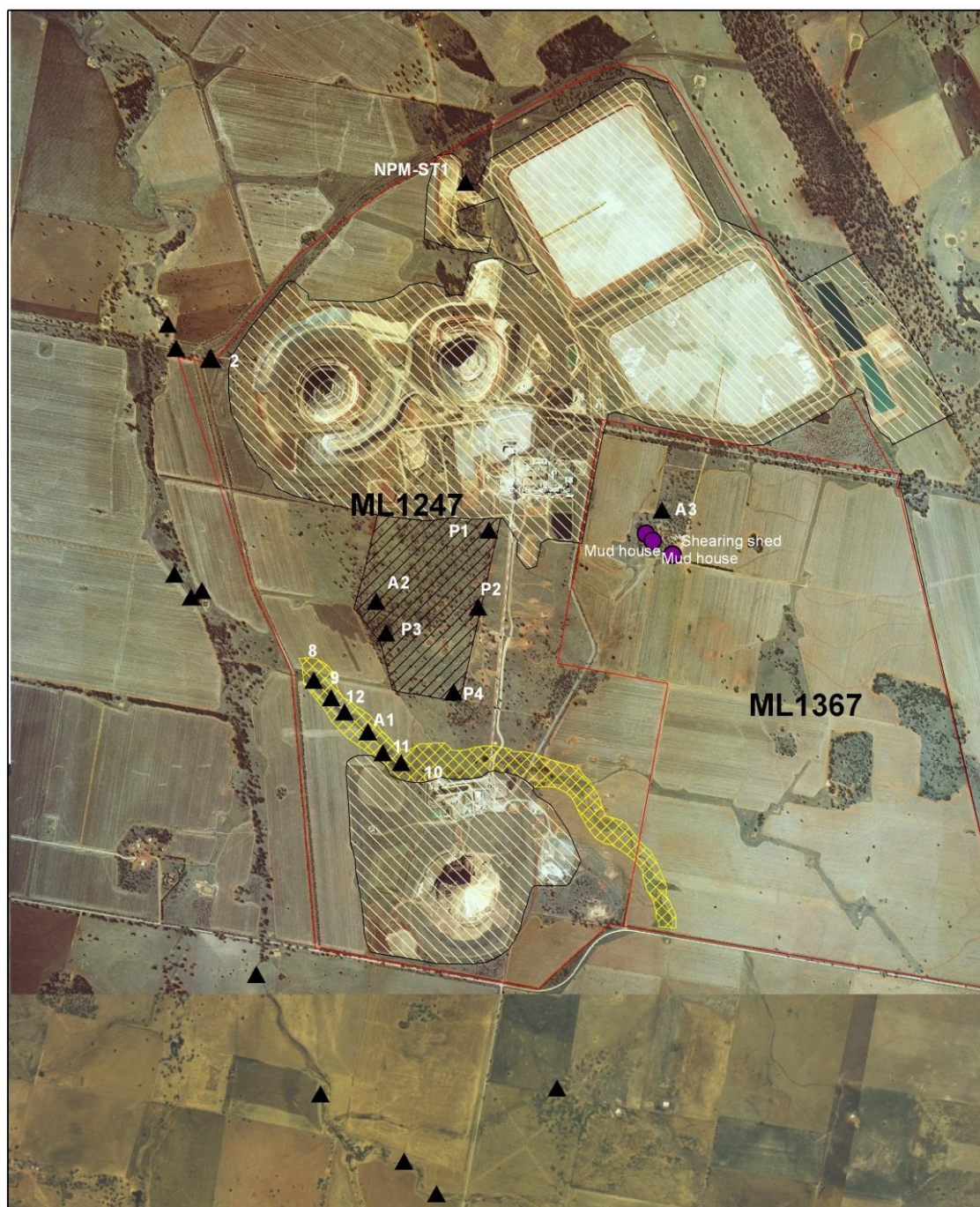
### 8.1 Monitoring

The location of the Aboriginal cultural heritage sensitivity zones are identified in Figure 21.








Monitoring includes:

- Checking the accuracy of information recorded on the land management system;
- Inspection of protected Aboriginal cultural heritage sites to ensure that they have not been damaged (prior to salvage)
- Audit of the site disturbance process and approvals to ensure that all appropriate archaeological assessments have occurred; and
- Review of the training program to ensure relevant staff have received Aboriginal cultural heritage training.





**Legend**

 Mining Lease	 Aboriginal sites	 Zone 1 Medium Sensitivity, Goonumbra Creek	 Zone 3 Very Low Sensitivity, Flats waterless terrain
 Identified European Sites	 Zone 2 Low Sensitivity, Limestone Forest	 Zone 4 Zero Sensitivity, Area disturbed by mining related activities	

0 125 250 500 750 1,000  
Meters  
1:34,000



## Cultural Heritage

Map No.: NPM\_ENV\_004  
Reviewed By: E&C Superintendent  
Revision Date: 30/07/2010  
Version 2

**Figure 21 Aboriginal cultural heritage sensitivity zones**

## 8.2 Management

Northparkes has implemented an Aboriginal Heritage Management Plan (AHMP) that provides the framework for the identification, assessment, monitoring and management of Aboriginal cultural heritage on site.

In accordance with the AHMP, the Wiradjuri Executive committee met on a regular basis throughout the current reporting period, with four meetings held in March, May, August and November. The WEC is a consultation forum to enable review of the current Northparkes Aboriginal heritage management practices and to identify potential improvement opportunities. The WEC reviews all Site Disturbance Permits at their quarterly meetings.

Northparkes utilises a Site Disturbance Permit approval system to manage the protection of heritage sites on the mine lease. This approval process applies to activities planned to be undertaken in previously undisturbed areas or previously rehabilitated areas. The area to be disturbed is compared against the Aboriginal cultural heritage sensitivity zones and determines the requirement for additional survey work or salvage work prior to starting the project.

## 8.3 Results

Works undertaken by the WEC in the reporting period included:

- Review of all site disturbance permits issued by NPM at regular meetings

## 8.4 Actions Proposed for 2015

- Continuation of the quarterly meetings with the Wiradjuri Executive committee
- Continual review of Site Disturbance Permits and opportunity to comment in regard to improvements.



## 9. COMMUNITY RELATIONS

### Reporting period summary

- On-going sponsorship and participation in community based programs in the order of \$457,150.
- Support and participate in community activities
- Two community complaints
- 

Northparkes recognises and respects the importance of positive relations with the surrounding community in which it operates. Its community-related activities are aimed at fostering positive and effective relationships.

### 9.1 Community engagement

Northparkes is committed to engagement with the local community to obtain a greater understanding of community issues and to keep the community updated on activities relating to Northparkes' operations.

The Northparkes Community Consultative committee (CCC) was established in 2006. The CCC provides an open forum to discuss any issues relating to Northparkes and its impact on the local community. The CCC comprises approximately seven community members and three Northparkes personnel. One meeting was held in the reporting period in March and September. In addition to this a subcommittee has been formed to assist Northparkes in making decisions where sponsorship requests are received from the local community, as part of the Northparkes Community Investment Program. No significant issues were raised during the meetings held with the community during the reporting period.

Northparkes is also committed to regular communication with its nearby neighbours. Neighbour meetings are typically held twice a year with Northparkes' closest neighbours to provide a consultation and feedback mechanism in regards to mining activities. Two neighbour meetings were held in the reporting period. No significant issues were raised during the meetings held with Northparkes' neighbours in the reporting period.

The "Source" community newsletter continued to be distributed twice during the reporting period with positive feedback from community members on the content, design and intent of the newsletter. "Source" was delivered to approximately 12,000 residents across the Parkes and Forbes shire council areas and is aimed at communicating Northparkes' activities with both shires.

### 9.2 Contributions and achievements

Northparkes has developed a strong relationship with the local community over the past 20 years, and has supported local community events, committees and schools through donations, Northparkes Community Investment Program and partnership programs. Northparkes continued its financial assistance to local organisations that provide benefits to the community. Approximately \$AU457,150 was invested in various sporting, educational, cultural, environmental, tourist and agricultural programs.

Northparkes continued to be an active member of the local community. A snapshot of the major initiatives in the current reporting period programs included:

- The Northparkes Volunteering Program that encourages our employees to assist community groups by volunteering their time. During the reporting period, 227 employees (73% of workforce) participated in 30 programs within the region including the building of school gardens, revegetation of Memorial Hill and Bush Tucker day;
- A Grants Officer Program in conjunction with Parkes Shire Council;
- A Grants Officer Program in conjunction with Forbes Shire Council;
- An Aboriginal project officer in conjunction with Parkes Shire Council;
- A Sports Grant Program with the Parkes Shire Council
- Five-year partnership with CentaCare – Strong Young Mums;

- Supporting Lachlan Health Services with a Palliative Care partnership;
- Supporting education through the Peer Tutoring Program at Parkes High School and Parkes Life Education Program; and
- A community equipment pool which provides community groups to access to equipment such as marquees, a blow up TV screen, a PA system, eskies etc to use at events free of cost.

## 9.3 Complaints

### 9.3.1 Management

Northparkes has a process for receiving, investigating, responding and reporting complaints received from community members. A 24-hour external telephone line (02 6861 3000 - Option 2) is in place to provide the public with an opportunity to communicate with Northparkes in regard to any community concerns. This contact number is advertised in the local telephone directory, six-monthly in local newspapers and on the Northparkes website ([www.northparkes.com](http://www.northparkes.com)). This website also provides information about all phases of the operation, and has a facility for the community to submit enquiries, concerns or complaints via e-mail direct to the Community and External Relations team.

All complaints received are referred to the Community and External Relations team, and are then responded to in a professional and timely manner. All complaints are recorded and outcomes of investigation findings and corrective actions implemented are communicated to the relevant personnel and reported in the AEMR and the annual Sustainable development report.

During the reporting year Northparkes received one complaint from community members relating to dust generation from TSF2 (Table 15).

In addition, one other complaint relating to visibility of NPM's concentrate truck was made. Northparkes maintained regular correspondence with OEHL in regards to progress and effectiveness of projects to control dust generation on the surface of TSF2.

## 9.4 RESULTS

**Table 15 Complaints received in 2014**

Issue	Date	Details
Dust	13.08.14	A complainant called the Community and External Relations team to register a formal complaint about excess dust from Northparkes TSF2. The source of the problem was located and remediated.
Traffic	02.09.14	A complainant called Northparkes to raise a concern over the visibility of the concentrate truck visibility on Bogan Road. Investigations and communications confirmed NPM operating in full compliance with RTA regulations.