LIDDELL

GLENCORE

2016 Annual Review

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Table 1 Title Block

Name of operation	Liddell Coal Operations Pty Ltd
Name of operator	Liddell Coal Operations
Development consent / project approval #	DA-305-11-01
Name of holder of development consent / project approval	Liddell Coal Operations
Mining lease #	ML1597, CCL708, ML1552, ML1313
Name of holder of mining lease	Liddell Tenements Pty Ltd
Water licence #	Refer to **Table 6**
Name of holder of water licence	Refer to **Table 6**
MOP/RMP start date	March 2015
MOP/RMP end date	March 2022
Annual Review start date	January 1st 2016
Annual Review end date	December 31st 2016

I, David Foster, certify that this audit report is a true and accurate record of the compliance status of Liddell Coal Operations Pty Ltd for the period 1st January 2016 to 31st December 2016 and that I am authorised to make this statement on behalf of Liddell Coal Operations Pty Ltd.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty
2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	David Foster
Title of authorised reporting officer	Operations Manager
Signature of authorised reporting officer	
Date	31 March 2017

1 Statement of Compliance

During the reporting period, LCO operated as per the approvals listed in **Section 3**. The following **Table 2** and **Table 3** provide a summary of LCO's compliance with key operational approvals.

Table 2 Statement of compliance

Statement of Compliance	
Approval	Were all conditions of approval complied with?
DA 305-11-01	No
ML #1597	Yes
ML #1313	Yes
CCL #708	Yes
ML #1552	Yes
EPL 2094	No
EPBC 2013/6908	Yes
MOP 2015-2022	Yes
Aboriginal Heritage Impact Permit (AHIP No. 0000623)	Yes
OSSM 3916/2008 (Onsite Sewage Management System)	No

During the reporting period LCO had a number of non-compliances listed below in **Table 3**.

Table 3 Non-compliances

Non Compliances					
Approval	Condition Reference	Condition Description	Compliance status*	Comment	Section of AR for detailed response
EPL 2094	O1.1	Activities must be carried out in a competent manner	Non-compliant	Approximately 5kL of mine affected water discharged to a contained and localised section of Bayswater Creek (inside Liddell Coal Operations EPL and Mining Lease Boundaries) whilst undertaking works on a pipeline on 1st April 2016. The creek was not flowing at the time and the discharge water was recovered via pumping to the mine water system; The event did not cause material harm to the environment.	Section 11
EPL 2094	M4.1	Weather Monitoring – Continuous monitoring of metrological conditions	Non-compliant	Site weather monitoring station not functional due to firmware issues and electrical interference from storm activity resulting in failure to continuously monitor specified in M4.1. This occurred a number of times during the reporting period. Works have been completed to rectify the issues.	Section 11
OSSM 3916/2008	Condition 3	SSC Onsite Sewage Management System Approval	Non-compliant	Monitoring results are required to be submitted to the SSC within 7days of monitoring. On two occasions during the reporting period, monitoring results were submitted outside the 7day timeframe; once by 5 days in	Section 11

				January and once by 3 days in March. The monitoring results include the water quality parameter Biological Oxygen Demand which takes 5 days to determine.	
DA305-11-01	Schedule 3 Condition 4	The applicant shall ensure blasting impacts do not exceed the criteria specified	Non-compliant	On the 15 February 2016, a blast was fired and the resultant peak ground vibration of 28.48mm/s exceeded the criteria of 25mm/s at Newdell Sub Station. Investigation and remedial actions were completed.	Section 6.2
DA305-11-01	Schedule 3 Condition 5	The applicant shall ensure blasting impacts do not exceed performance indicators in the Blast Management Plan	Non-compliant	On the 24 January 2016, a blast was fired and the resultant peak ground vibration of 21.04mm/s exceeded the criteria of 20mm/s at Chain of Ponds Inn. Investigation and remedial actions were completed.	Section 6.2

* Compliance status as per the *Compliance status key Table 3* of the NSW Government Annual Review Guideline reproduced below as **Table 4.**

Table 4 Compliance Status Key

Risk level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2 Introduction

Liddell Coal, located in the Upper Hunter Valley, is operated by Liddell Coal Operations Pty Limited (LCO) under the conditions of development consent DA 305-11-01. This Annual Review AR has been prepared by LCO in accordance with the *Annual Review Guidelines* (NSW Government, 2015) and Schedule 5, Condition 3 of the DA 305-11-01.

LCO is an established open-cut mine located at Ravensworth, approximately 25 kilometres north-west of Singleton in the Upper Hunter Valley of New South Wales. LCO is operated and managed by Liddell Coal Operations Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore), on behalf of a joint venture between Glencore (67.5%) and Mitsui Matsushima Australia (32.5%).

Mining operations at Liddell Coal have been continuous since the 1950s. Operations prior to the 1950s were intermittent, with underground operations commencing in 1923 and open cut operations in 1946. Current open cut operations access the coal reserves previously not mined by the underground operations. The current open cut mining operation has been in operation since 1990.

A locality map and aerial photograph of the operation is shown in **Figure 1** and **Figure 2** respectively.

During the reporting period mining operations were undertaken using the excavator and truck /shovel method of operation. LCO has consent to extract no more than eight million tonnes of run-of-mine (ROM) coal per annum. Product coal, both semi-soft and thermal, is transported to Newcastle Port by rail via the Hunter Valley Rail Loop and Main Northern Railway Line, for sale to the export market.

The contact details for the personnel directly responsible for the environmental management of the LCO are shown in **Table 5**.

Table 5 Mine contacts

Name	Position	Company	Contact Numbers
David Foster	Operations Manager	Liddell Coal Operations	(02) 6570 9919 (M) 0459 168 589
Daniel Brogan	Mining Manager	Liddell Coal Operations	(02) 6570 9937 (M) 0429 456 969
Ben de Somer	Environment and Community Manager	Liddell Coal Operations	(02) 6570 9947 (M) 0427 936 734

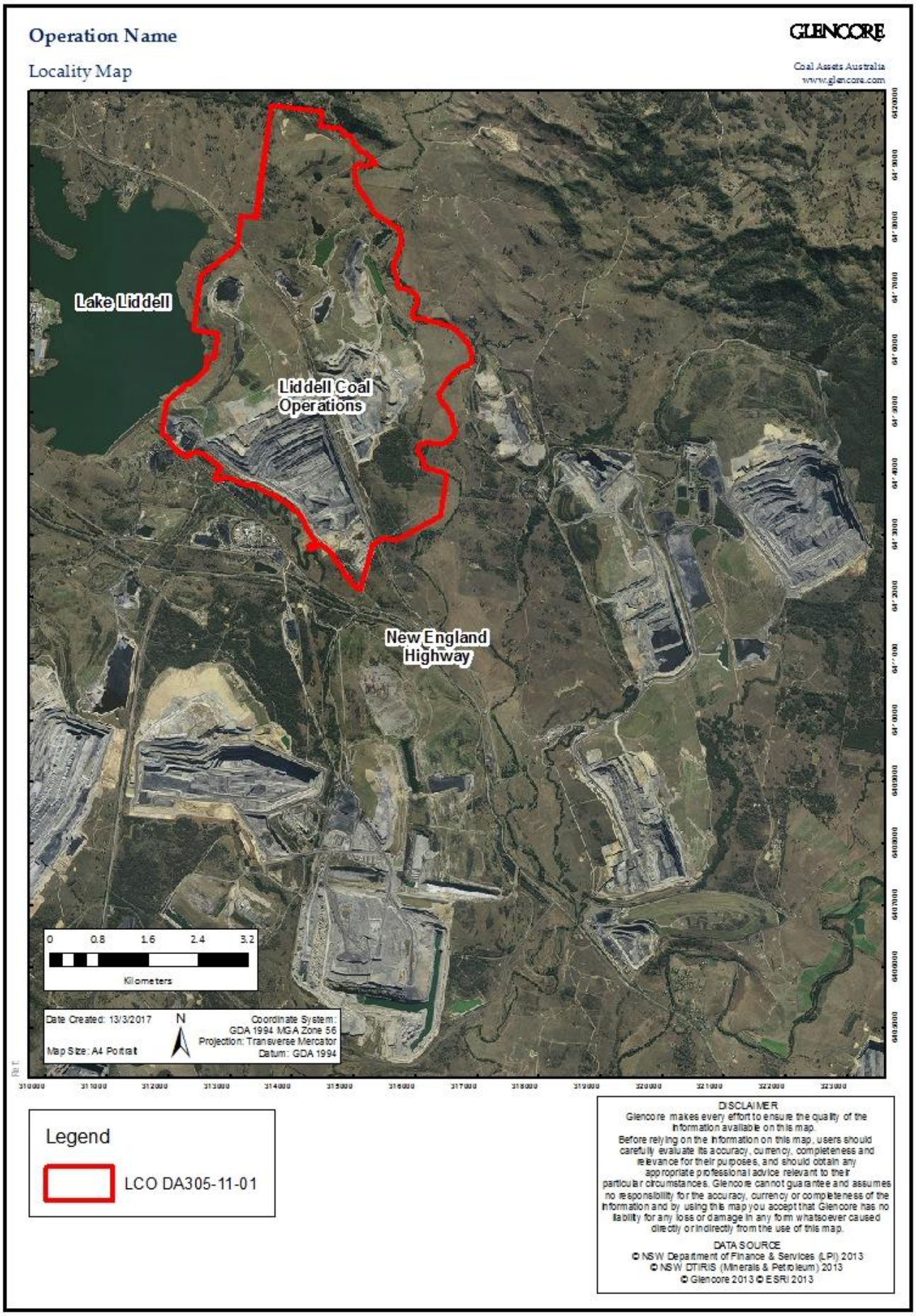


Figure 1 Locality map

Figure 2 Aerial photograph of LCO – key site features

3 Approvals

A number of consents, leases, licences and other approvals regulate mining operations at LCO. The status of development consents, licenses and relevant approvals are listed in **Table 6.**

LCO operates primarily under one consolidated mining lease, ML 1597, as shown in **Figure 3**.

Compliance with the EPL is reported annually to the Environment Protection Authority (EPA) in the EPL Annual Return. LCO's compliance with the EPL is also discussed in **Section 1** of this report.

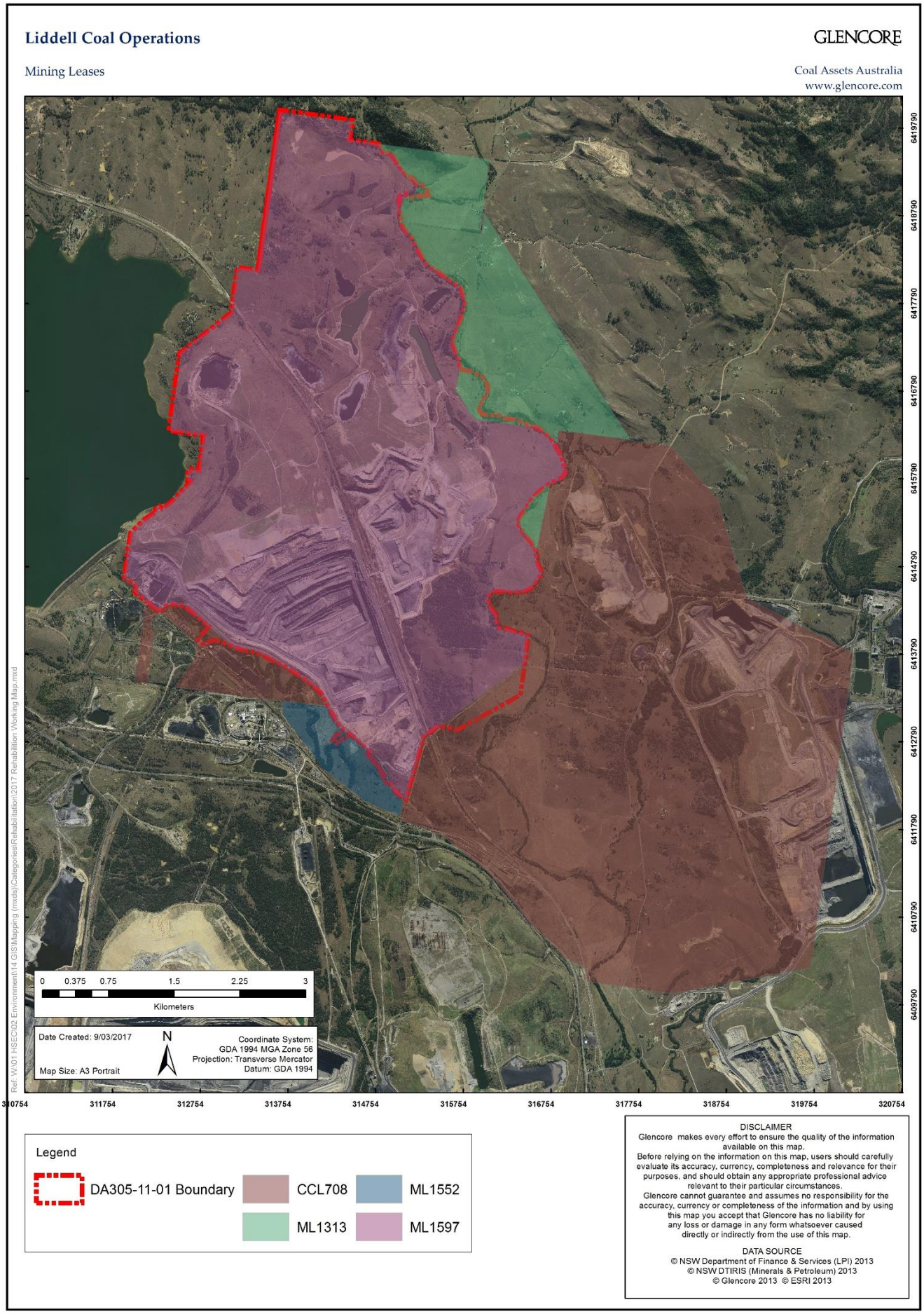


Figure 3 LCO mining leases

Table 6 List of consents, leases, licences and other approvals

Development Approvals			
Approval Number	**Authority**	**Description**	**Expiry Date**
DA 305-11-01	- Department of Planning and Environment	- Continued operation of the Liddell Colliery	31 December 2023
DA 305-11-01 Modification 2	- Department of Planning and Environment	- Increase in the maximum total ROM coal production rate from 4.5 to 8 Mtpa tonnes per annum; - increase in the mining footprint within the approved South and Barrier Pits by a total of 47 hectares; - construction and operation of a new preparation section of the Coal Handling and Preparation Plant and minor upgrades to the ROM receival and product coal facility; - establishment of a new supplementary coal stockpile; - receival and delivery of up to 1.5 Mtpa of coal to and from Cumnock No. 1 Colliery; - increase in the maximum transportation rate of reclaimed tailings from 0.3 to 0.5 Mtpa to Macquarie Generation; - realignment of an already approved access road and services corridor relocation of part of the Old New England Highway; - relocation and construction of the open cut mining offices, workshops and associated infrastructure to the south eastern portion of the Liddell development consent area; - construction of a bridge over the Main Northern Railway to provide for more efficient movement of coal and overburden between open cut pits; and - modifications to the footprint and size of the already approved Dam 13B.	31 December 2023
DA 305-11-01 MOD 3	- Department of Planning and Environment	- Alterations to the approved intersection layout for the Old New England Highway/mine access road intersection; - minor realignment of the development consent boundary to accommodate the road works; - reuse of treated effluent from the office/workshop complex; and - corrections to numbering in the development consent.	31 December 2023
DA 305-11-01 MOD 4	- Department of Planning and Environment	- Additions to the Mining Infrastructure Area including: - two additional high machinery workshop bays; - additional relocatable admin & workshop offices; - fuel farm extension; - storage shed and compound.	31 December 2023

DA 305-11-01 MOD 5	- Department of Planning and Environment	- Extension of the South and Entrance Pits to the south east and, upon completion of mining in these pits, the mining of coal resources under the Mine Infrastructure Area (MIA) during which time the MIA will be relocated to temporary facilities. The extension will enable the recovery of an additional approximate 38 million tonnes (Mt) of Run of Mine (ROM) coal. - The extension of open cut mining activities will lead to an associated extension of the life of mine at LCO from 2023 to 2028. - A tailings emplacement area will be constructed within the final void of the South Pit to dispose of the additional tailings associated with the extension of open cut mining activities. - Minor additional infrastructure including: - Construction and commissioning of a transfer point and conveyor connected to the existing Mt Owen/Glendell/Macquarie Generation conveyor is proposed, enabling LCO to send coal to Ravensworth, and receive coal and crushed gravel from Mt Owen, via the existing conveyor system. The new conveyor will deliver/take material to/from a new 50,000 tonne stockpile; and - Infrastructure and ancillary surface disturbance to support the new mining areas will be required, including but not limited to, power lines, water management infrastructure and haul roads.	31 December 2028
DA 305-11-01 MOD 6	- Department of Planning and Environment	- Constructing approximately 11 kilometres of tailings pipeline connecting both the Ravensworth Complex and Liddell Colliery Coal Handling and Preparation Plants to the West Pit Void Ravensworth East. - Constructing a flocculent plant near the West Pit Void at Ravensworth East. - Staged emplacement of tailings generated from Ravensworth and Liddell within the Ravensworth East West Pit Void. - Interim utilisation of the Narama Void as a central water storage facility for the Greater Ravensworth Area.	31 December 2028
EPBC 2013/6908	- Department of Environment	- Approval for controlled action under the EPBC Act 1999 to expand the existing Liddell open cut coal mine operations in the Hunter Valley region in New South Wales, located approximately 25km north-west of Singleton under the following Controlling Provisions: • Listed threatened species and communities (sections 18 & 18A) • Listed migratory species (sections 20 and 20A) • Water resources/trigger (sections 24D and 24 E)	31 December 2044

Mining Leases, Environmental Protection Licence & Mining Operations Plan		
Mining Leases		
Title	**Authority**	**Expiry Date**
Mining Lease 1597	DTI Division of Resources and Energy	5 November 2028
Consolidated Coal Lease No. 708	DTI Division of Resources and Energy	30 December 2023
Mining Lease No. 1313	DTI Division of Resources and Energy	13 October 2023
Cumnock Sublease Mining lease No. 1552	DTI Division of Resources and Energy	10 March 2025
Environmental Protection Licence		
Licence	**Description**	**Expiry Date**
EPL 2094	Environmental Protection Licence (File number 27051)	30 June (Anniversary Date) September 2016
Mining Operation Plan		
Name	**Commencement Date**	**Expiry Date**
Liddell Colliery Mining Operations Plan 2008 – 2015 (MOP)	24 March 2015	24 March 2022

Surface Water Extraction Licences						
Locality	**Licence No.**	**Holder**	**Use**	**Water Source/ Management Zone/ Type**	**Annual Allocation (ML)**	**Annual Usage (ML)**
Bowmans Creek	WAL 18320	Enex Foydell Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	50	Nil
Bowmans Creek	WAL18304	Enex Foydell Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	32	Nil
Bayswater Creek	WAL 18306	Mitsushima Australia Pty Ltd Enex Liddell Pty Ltd Gabume Pty Ltd	Industrial (coal mining)	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	100	Nil

Hunter River via Macquarie Generation	WAL7815	Liddell Tenements Pty Ltd	Industrial	Hunter Regulated River Water Source/ Zone 1B Regulated River	20	Nil
Swamp Creek	20SL042837	LCO Pty Ltd	Monitoring		N/A - Diversion works	Nil

Groundwater Licences						
Locality	**Licence No.**	**Holder**	**Lot/DP**	**Purpose**	**Annual Extraction Allocation (ML)**	**Annual Extraction 2016 (ML)**
Haz 6	20BL168066	Liddell Tenements Pty Ltd	81/607296	Monitoring	N/A	N/A
Dur 3	20BL168065	Liddell Tenements Pty Ltd	31/837350	Monitoring	N/A	N/A
LC1	20BL168064	Liddell Tenements Pty Ltd	353/867083	Monitoring	N/A	N/A
Durham 1	20BL168063	Liddell Tenements Pty	33/862516	Industrial	6000	Nil
8 South 3 & 4	20BL168062	Liddell Tenements Pty Ltd	32/870789	Industrial	6000 (Combined with 20BL172588)	Nil
Durham 2 & 4	20BL168061	Liddell Tenements Pty Ltd	3/237654	Industrial (2 bores)	1000	Nil
Haz 1&2	WAL39760	Liddell Tenements Pty Ltd	81/607296	Industrial (2 bores)	5500	Nil
ALV1, ALV2, ALV3, ALV4, ALV7, ALV8	20BL168053	LCO Pty Ltd	43/654013 201/848078 4/255403 81/607296 6/255403	Test bore/Monitoring	N/A	N/A
Bowmans Creek Alluvial	WAL18302	Liddell Southern Tenements Pty Ltd	32/545601	Irrigation	5	Nil
	20BL017861	Enex Foydell Limited	6/1077004	Irrigation	5	Nil
M49	20BL172293	Liddell Southern Tenements Pty Ltd	32/545601	Dewatering	2500 (Combined with 20BL168209)	298.5

Mt Owen 1	20BL168209	Mt Owen Pty Ltd	353/867083	Stock, domestic, farming and test	2500 (Combined with 20BL172293)	Nil
Mt Owen 2	20BL169544	Mt Owen Pty Ltd	353/867083	Dewatering	2500	Nil
Middle Liddell	20BL172588	LCO Pty Ltd	1/237766	Dewatering	6000 (Combined with 20BL168062)	863

Aboriginal Heritage Permits			
Licence	**Site**	**Salvage Date**	**Expiry Date**
#2348 (dated 7 August 2007)	Chain of Ponds Site Area (LID 28, 29, 30, 31, 32)	21, 22, 23 November 2006	3 October 2016
S87 #2883 S90 #2896	Bayswater Creek	March/April 2008	18 February 2010 18 March 2010
S90 Permit #c0000623	DA 305-11-01 Modification 5 development consent area	January/February 2015	03/12/2024

Radiation Management Licence				
Type	**Licence Number**	**Purpose**	**Licence Holder**	**Expiry Date**
Radiation Management Licence	5061082	Sell, possess, store or give away regulated material (including radiation apparatus, radioactive substances or items containing radioactive substances) for one year	Liddell Coal Operations Pty Limited	12/9/2017

Effluent Treatment Permits					
Licence/Permit Reference	**Regulatory Authority**	**Purpose**	**Licence Holder**	**Approval Date**	**Expiry Date**
WTA 2006-002	Muswellbrook Shire Council	Permit to Operate Aerated Wastewater Treatment System	Liddell Coal Operations Pty Limited	1/6/2014	21/4/2019
OSSM 3916/2008	Singleton Shire Council	Permit to Operate Aerated Wastewater Treatment System	Liddell Coal Operations Pty Limited	1/7/2015	30/6/2017

4 Operations Summary

During 2016, operational activities were conducted generally in accordance with the approved Mining Operations Plan (MOP). During the reporting period there were a number of construction projects undertaken in accordance with the approved MOP and DA305-11-01. This included:

- Modification of DA305-11-01approved in February 2016 providing for the construction of tailings pipelines between Mt Owen, Liddell and Ravensworth Operations. These pipelines allow for improvements in tailings storage management at all three operations as detailed in **Section 6.9.**
- Commencement of capping operations of the southern portion of the Antiene Tailings Dam in accordance with the Antiene Tailings Dam Capping Strategy submitted to DRE in December 2014; detailed in **Section 6.9.**
- As the operation progressed further south, the main mine water storage Raw Water Transfer Void was decommissioned and replaced with Reservoir North Void. As outlined in the EA; to facilitate offsite discharge of water under the Hunter River Salinity Trading Scheme the Licenced Discharge Point 6 was relocated further upstream Bayswater creek to a site adjacent the CHPP.
- Commissioning of water pipeline between Mt Owen, Liddell and Ravensworth Operations for water sharing capabilities.
- Continued building monitoring and implementation of stabilisation measures at the Chain of Ponds Inn in order to progress the vibration trigger limits in consultation with DPE; detailed in **Section 6.6.**
- Continued to undertake geotechnical monitoring and progress the remediation plan for the Mountain Block area in order to commence remediation earthworks during the next reporting period; detailed in **Section 8.6.**
- Installation of upstream and downstream stream flow gauging stations on Bowmans Creek in accordance with the Water Management Plan to inform the detection of potential loss impacts to the alluvial aquifer.
- Permanent fencing installation around the known Sensitive Archaeological Landscape adjacent Bowmans Creek.
- Commencement of implementation of Indirect Offset commitments as well as Biodiversity Offset Area regeneration activities detailed in **Section 8.4**
- Installation of boundary air quality monitoring units to inform reactive dust management onsite as detailed in **Section 6.3.**

Mining operations

The open cut mining sequence at LCO includes:

- Land preparation including vegetation removal and pre-stripping topsoil;
- Removal of overburden;
- Coal extraction, predominantly using excavators and tucks;
- Coal processing and transport.

Mining will continue in accordance with the MOP targeting coal from the Lemington, Pikes Gully, Arties, Liddell, Barrett and Hebden seams. These seams range from 0.7 metres (m) to 9.5 m in thickness, and include semi-soft and thermal coal types. Mining will generally utilise hydraulic excavators and trucks which are suitable for working in the South Pit and Entrance Pit to recover coal from multiple seams.

No mining was undertaken using dragline or highwall extraction methods during 2016.

Key production statistics are summarised in **Table 7** below. During the reporting period there was no non-compliance with the sites approved production limits.

Other Operations

Coal is transported from the open cut areas by truck to a ROM stockpile with an approximate capacity of 200,000 tonnes for storage prior to processing in the CHPP.

The CHPP produces both semi soft coking coal and thermal coal. The CHPP operates 24 hours a day, seven days a week, with the exception of downtime due to maintenance (generally 10 to 12 hours each fortnight). The CHPP has a processing capacity of 8 Mtpa.

As per **Table 7** below, the total ROM coal processed at Liddell's CHPP during the 2016 reporting period was 5,940,742 tonnes. The total product coal produced was 3,887,724 tonnes with 1,708,950 tonnes of coarse 354,068 tonnes of fine rejects generated.

If required, in accordance with Schedule 3, condition 32 (a) of the current DA 305-11-01, transport of ROM coal to Ravensworth Central Coal Processing Facility would be restricted to internal mine haul roads, Pikes Gully Road and Liddell Station Road.

In accordance with Schedule 2 Condition 6 b) and 6 c) during 2016 no ROM coal produced at Mt Owen was processed in the Liddell CHPP, nor was any ROM coal transported to Ravensworth Central Coal Processing Facility.

During the reporting period, 3,887,724 tonnes of product coal including export thermal coal and export semi soft coal were railed to the Port of Newcastle by trains along the Main Northern Railway Line.

In accordance with Schedule 3, condition 33 (a) and (b) of DA 305-11-01, LCO monitored coal haulage movements as part of standard operations. Daily train haulage movements are presented in **Appendix A**. There were no sales of tailings during the reporting period and no truck movements for the transportation of tailings along the New England Highway as per condition 32(a).

Table 8 includes key performance indicator targets and actuals during the reporting period.

Table 7 Production summary

Production Summary				
Material	**Approved limit**	**2015 actual**	**2016 forecast**	**2016 actual**
Waste Rock / Overburden (bcm)	N/A	35,017,483	37,751,371	36,390,745
ROM Coal / Ore (t)	8,000,000	6,192,227	6,101,630	5,940,742
Coarse reject (t)	N/A	1,465,665	1,547,263	1,708,950
Fine reject (Tailings) (t)	N/A	639,755	402,851	354,068
Saleable product (t)	N/A	4,086,807	4,151,516	3,877,724

Table 8 Other operational statistics

Key Performance Indicators		
Economic Indicators	**Target**	**Actual**
Employees	292	276
Environmental Indicators		
Land area rehabilitated during reporting period (ha)	42	42
Potable water consumed (ML)	Nil	3.9
Average annual deposited dust range (private residence) (g/m^2/month)	4	1.99
Total Suspended Particulate (annual average) exceedances	Nil	Nil
PM_{10} dust exceedances (annual average) due to LCO activities	Nil	Nil
Number of blasts exceeding criteria	Nil	2
Social Indicators		
Complaints	2	1

Major activities proposed in the next reporting period

All activities proposed in the next Annual Review period will be consistent with the approved LCO MOP.

Forecast major changes to the operation during the next reporting period include:

- implement amendment to the Liddell 2015-2022 Mining Operations Plan once approval as submitted in early 2017;
- commencement of clearance and mining in Bayswater Pit as well as an additional water fill point;
- construction of additional carpark areas around the Mine Infrastructure Area to reduce risk of blasting operations impacting mobile equipment;
- continued implementation of Biodiversity Offset commitments;
- commencement of slope stabilisation and rehabilitation measures at Mountain Block;
- construction of visual screening along the Old New England Highway as mining progresses southwards.
- construction of tailings pipeline to Mt Owen Complex West Pit; and
- continued capping of the Antiene Tailings dam.

5 Actions Required at Previous Annual Review

NSW Department of Industry - Resources & Energy (DRE) and conducted a site inspection on the 1 June 2016 following a review of the previous (2015) Annual Review. Correspondence was received from DRE on the 23 August 2016 regarding the 2015 Annual Review and inspection. The NSW Department of Planning & Environment (DPE) completed as desktop review of compliance via the 2015 AR and provided comment on the 2 June 2016. While general compliance was observed during the site inspection, the actions in **Table 9** Actions required at previous Annual Review below were identified as requiring attention.

Table 9 Actions required at previous Annual Review

Action Number	Issue/Observation	Action	Action Achieved
DRE Comments			
1	Annual Review Feedback	The Department requests that results of monitoring undertaken against the rehabilitation completion criteria, as presented in the Mining Operations Plan, is reported and includes trends towards completion criteria in future Annual	Results summarised in **Section 7**, performance against all of the completion criteria is tabled in **Appendix G**
2	Annual Review Feedback	Provide a rehabilitation summary of rehab area, as provided in previous AEMR's, this information can be attached as an appendix to the Annual Review	Provided in **Appendix H**
3	Rehabilitation	The Department encourages grazing to be undertaken within pasture areas to manage these rehabilitation areas.	Management of pasture rehabilitation is outlined in **Section 7.**
4	Proposed Tailings Dam South Pit	The proposed tailings dam on the South Pit dump will trigger a MOP amendment	MOP Amendment not yet triggered.
DPE Comment			
1	Annual Review Feedback	Please provide the Mt Owen ROM Figures to meet condition 6 (b) in Schedule 2 of the approval.	Provided in **Section 4**.

6 Environmental Performance

6.1 Noise

The approved Noise Monitoring Program outlines the noise monitoring required to be undertaken by LCO to ensure compliance with statutory requirements at LCO. The program addresses the requirements contained in DA 305-11-01.

Monthly attended noise monitoring is undertaken at representative locations surrounding LCO, refer to **Figure 4**. LCO has a real time, directional noise monitoring unit that is programmed to send an SMS to key operational personnel when a trigger noise level is reached. Alarm conditions are currently measured and calculated with respect to low frequency noise levels, that being the noise frequency consistent with continuous open cut mining noise and seeks to target continuous noise output from the mining operation and exclude extraneous noise sources. Trigger levels are set below and at relevant criterion at the nearby sensitive receivers as identified in the DA 305-11-01.

Noise criteria for LCO are prescribed in Schedule 3, Condition 1 of DA 305-11-01. LCO are required to ensure that noise generated by the development does not exceed the noise impact criteria in **Table 10**.

Table 10 Development consent noise impact assessment criteria dB (A)

Assigned Residential Location Number	Daytime $L_{Aeq\ (15\ minute)}$	Evening L_{Aeq} (15min)	Night $L_{Aeq\ (15min)}$	Night $L_{A\ (1\ min)}$
1, 5, 6, 7, 8, 9, 10, 11, 12, 14	35	35	35	45
2	35	35	36	45
3	36	35	37	45
4	36	35	36	45
All other privately owned land	35	35	35	45

Noise Compliance monitoring is undertaken as per Appendix 6 of DA-305-11-01. The noise emission limits identified in **Table 10** apply under all meteorological conditions, which are measured from the LCO met station, except the following:

- During periods of rain or hail;
- Average wind speed at microphone height exceeds 5m/s;
- Wind speeds greater than 3m/s measured at 10m above ground level; or
- Temperature inversion conditions greater than 3˚C/100m, or alternatively stability class F & G.

Noise Monitoring Results

Attended compliance noise monitoring during the reporting period was undertaken on a monthly basis by a specialist noise consultant (Global Acoustics) at two representative neighbouring residential locations along Hebden Road (see **Figure 4**). $L_{Aeq(15\ minute)}$ measurements against compliance criteria are detailed in the **Table 11**.

Results of attended noise monitoring during the reporting period show that LCO complied with the noise limits applicable at all monitoring locations.

Table 11 Noise monitoring results

Location	Date	Wind Speed (m/s)	LCO $L_{Aeq\ (15min)}$ dB	LCO $L_{Aeq\ (1min)}$ dB	Exceedance
	January				
1317 Hebden Road	12/1	5.0	29	34	Nil
1246 Hebden Road	12/1	4.9	32	35	Nil
	February				
1317 Hebden Road	18/2	3.1	NM	NM	Nil
1246 Hebden Road	18/2	3.5	NM	NM	Nil
	March				
1317 Hebden Road	17/3	3.0	NM	NM	Nil
1246 Hebden Road	17/3	2.3	<20	<25	Nil
	April				
1317 Hebden Road	21/4	1.2	NM	NM	Nil
1246 Hebden Road	21/4	0.8	NM	NM	Nil
	May				
1317 Hebden Road	25/5	3.4	IA	IA	NA
1246 Hebden Road	25/5	3.0	NM	NM	Nil
	June				
1317 Hebden Road	27/6	5.2	34	41	NA
1246 Hebden Road	27/6	5.2	35	44	NA
	July				
1317 Hebden Road	28/7	5.1	NM	30	Nil
1246 Hebden Road	28/7	4.1	NM	NM	Nil
	August				
1317 Hebden Road	18/8	1.6	<30	<30	Nil
1246 Hebden Road	18/8	2.0	<30	<30	Nil
	September				
1317 Hebden Road	25/9	1.7	<30	<30	Nil
1246 Hebden Road	25/9	1.6	<30	<30	Nil
	October				
1317 Hebden Road	18/10	3.4	IA	IA	NA
1246 Hebden Road	18/10	3.5	IA	IA	NA
	November				
1317 Hebden Road	07/11	1.2	IA	IA	Nil
1246 Hebden Road	07/11	2.3	<20	<20	Nil
	December				
1317 Hebden Road	12/12	0.9	IA	IA	Nil
1246 Hebden Road	12/12	1.1	IA	IA	Nil

Notes:

1. Atmospheric data is from LCO weather station;

2. These are results for LCO in the absence of all other noise sources;

3. NM denotes audible but not measurable, IA denotes inaudible;

4. NA in exceedance column means atmospheric conditions outside conditions specified in development consent and so criterion is not applicable

Comparison to EA Predictions

The Liddell Coal EA (2015) proposes that modifications to the development consent would not produce an exceedance of the LCO operational specific noise criteria (35 dB(A)) at any surrounding privately owned residence during the reporting period. All noise monitoring events during 2016 were in accordance with these predictions.

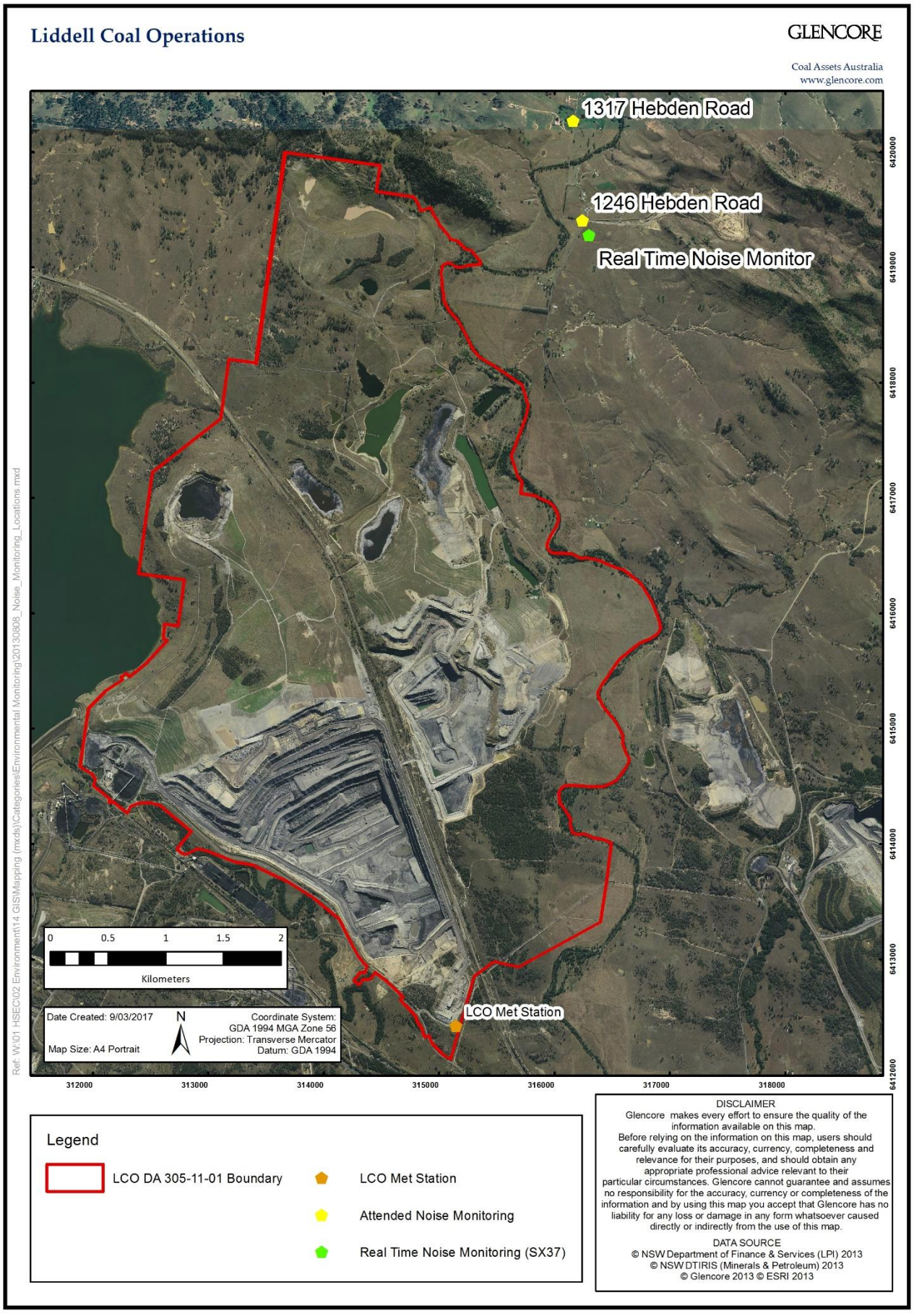


Figure 4 Noise monitoring locations

6.2 Blasting

Blasting criteria for LCO are prescribed in Schedule 3 of DA 305-11-01. The consent condition covers criteria for overpressure, ground vibration and vibration limits at designated structures. **Table 12** below sets out the blasting impact assessment criteria for the reporting year as per DA-305-11-01.

Table 12 Blasting impact assessment criteria as per DA-305-11-01

Location	Airblast overpressure level (dB(Lin Peak)	Ground vibration (mm/s)	Allowable exceedance
Residence on privately owned land (Scrivens/Burlings)	115	5	5% of the total number of blasts over a 12 month period
	120	10	0%
Newdell zone substation	-	20 (interim)	10% of the total number of blasts over a 12 month period
	-	25 (interim)	0%
Other public infrastructure	-	50	0%

Schedule 3, Condition 9 of the DA stipulates that blasting activities can only be undertaken at LCO between 9 am and 5 pm Monday to Saturday, inclusive. No blasting is allowed to be undertaken on Sundays, public holidays, or at any other time without the written approval of the Secretary.

In accordance with Schedule 3, Condition 10 of the DA, LCO can carry out a maximum of 3 blasts per day and 8 blasts per week (average over a calendar year) on the site. However this condition does not apply to blasts that generate ground vibration of 0.5mm/s or less at any residence on privately owned land, blast misfires or blasts required to ensure the safety of the mine, its workers or the general public.

LCO operates a combined 24 hour blasting information and community complaints hotline (1800 037 317).

Chain of Ponds Inn Blast Management Strategy

Additional to the blasting impact criteria specifically identified in the DA, the Chain of Ponds Inn is a heritage and sensitive structure located on the Old New England Highway adjacent the operation. In line with the Schedule 3 Condition 5 of the DA, LCO developed a Blast Management Strategy for the Inn with specific blasting impact limits. A staged increase in the vibration level and air blast exposure at the Chain of Ponds Inn, combined with continual monitoring of vibration and air blast levels and corresponding structural behaviour, will enable an adaptive management approach to blasting in the vicinity of the Inn. Limits for blast overpressure and ground vibration at the Chain of Ponds Inn (COPI) varied throughout the reporting period, as LCO progressed trigger levels in accordance with the approved Blast Management Strategy. Management of the Chain of Ponds Inn is discussed further in **Section 6.6** whilst this section only examines compliance with applicable limits during the reporting period.

Newdell Zone Substation Blast Management Strategy

Development Approval conditions also required LCO to develop a Blast Management Strategy for the Newdell Zone Substation. In accordance with DA305-11-01 (as modified), the primary objective of this Strategy is to ensure that blasting at LCO has a negligible impact on the structural integrity and does not accelerate the deterioration of electrical equipment efficiency (directly caused by blasting activities and exclusive of normal operational deterioration) of the Newdell Zone substation, compared to the existing condition and structural integrity of the substation at the date that consent was granted to DA305-11-01 MOD 5 (December 2014).

Similar to the Chain of Ponds Inn discussed above, a staged increase in the vibration level at the Newdell Zone Substation, combined with continual monitoring of vibration levels and corresponding structural behaviour, will enable an adaptive management approach to blasting in the vicinity of the substation. The strategy involves at-source management measures (blast design control), particularly within a distance of 350 metres to the substation, combined with an inspection and blast review regime to effectively manage blasting in the vicinity of the substation.

During the reporting year, LCO worked with Ausgrid (infrastructure owner), Terrock Consulting Engineers and Swinburne University to complete a detailed structural analysis of the Substation to identify the blast vibration threshold for significant structural components. This information was then used to develop a series of mitigation measures for vulnerable components. Practical completion of the installation/commissioning of the blast vibration mitigation works were achieved on the 1st December 2017. A blast monitoring system for various components is also in the process of being installed by Ausgrid and it is envisaged that the staged increase in blast vibration and transition to alternate vibration limits will occur during 2017.

Blast Monitoring Results

Blast monitoring locations are presented in **Figure 5** and monitoring results for the reporting period are provided in **Appendix F**.

Blast monitoring was undertaken at two privately owned residences, the Chain of Ponds Inn and Newdell Substation throughout the reporting period. There were 163 blasts fired throughout the reporting period.

There were no non-compliances with DA305-11-01 Schedule 3 Condition 9 or 10 (pertaining to days of blasting and frequency) during the reporting period. All blasts were conducted within the hours of 09:00 and 17:00 and on Monday to Saturday No blasts were undertaken on Public Holidays. The blast monitoring system recorded 100% blast data at all sites.

There were no levels above the ground vibration limit of 5mm/s or the overpressure limit of 115dB (L) recorded at privately owned residences.

There were no reportable blast fume incidents recorded during the reporting period.

There was one blast related complaint received Via the EPA on the 10 October 2016 for an event that occurred on the 6 October 2016. An anonymous person phoned the EPA to complain about fume and dust witnessed from a blast fired at 3.30pm on 6 October. There were issues encountered earlier in the week during loading (product runaway) which identified increased blast fume risk. Loading was halted and risk assessment developed to mitigate impacts. The NSW DPE was notified of potential fume risk prior to firing and the controls put in place. The fume generated from the blast was rated as Level 2, and passed over mine owned land, avoiding impact to surrounding residents as planned. LCO related this information to the EPA and supplied further information as requested, including photos. No further action has been required to date.

LCO exceeded the Newdell Zone Substation vibration limit of 20mm/s on one occasion during the reporting period, equating to LCO achieving compliance with 99.5% of the events for this item of Infrastructure. The exceedance occurred on the 15th February 2016 where the PPV (Peak Particle Vibration) level at the Substation recorded 28.48mm/s. The incident was notified to NSW Department of Planning & Environment (DPE) and the infrastructure owner Ausgrid. The Substation remained in service and operational during and after the blast. An investigation report was commenced with Ausgrid also completing detailed inspection and analysis of the Substation infrastructure. No immediate damage was found by Ausgrid, nor has there been any indicator of long term degradation to infrastructure/equipment. The investigation report was submitted to the DPE on the 26 February 2016, identifying a number of recommendations for the blast design process that have since been implemented during the course of the year.

Approved blasting impact limits at Chain of Ponds Inn were exceeded on one occasion during the reporting period. The exceedance occurred on 24 February 2016 when the PPV (Peak Particle Vibration) level at the Inn measured 21.04mm/s, 1.04mm/s above the approved limit at the time. The incident was reported to DPE and Coal & Allied (infrastructure owner). An investigation report was lodged with the DPE on the 11 March 2016. The building response to blast vibration was being monitored at the time in line with the approved strategy, and this indicated no adverse impact to the Inn complex as a result of the blast. This was further confirmed by visual inspection. It was also found that the geophone measuring blast vibration was slightly loose in the ground and likely contributed to the elevated or erroneous result. The investigation also found that there were some errors made in the execution of the blast design on the ground that also cannot be ruled out as to having contributed to the exceedance. Repair of the ground coupling was completed and further training for Drill & Blast Crews completed as per recommendations of the investigation report.

A summary of blasting performance against DA305-11-01 during the reporting period is presented in **Table 13**.

Table 13 Blasting performance summary

Site	Approval Criteria airblast overpressure level (dB(Lin Peak)	Approval Criteria ground vibration (mm/s)	Performance during the reporting period	Key management implications	Proposed management actions
Burlings/ Scrivens	115	5	Compliant for 100% of blasts	NA	None required
Newdell zone substation	-	20 (allowable exceedance 10% of the total number of blasts over a 12 month period)	Compliant (0.5% of blasts exceeded 20mm/s)	Further consultation and liaison required with infrastructure owners to determine an appropriate mitigation measures to be applied in order	Continue liaising with infrastructure owners in order to determine an appropriate ground vibration level increase during the next reporting period
		25 (no allowable exceedance)	Compliant	As above	As above
Other Public Infrastructure	-	50	Compliant	NA	None required
Chain of Ponds Inn	146 (January – March)	-	Compliant for 100% of blasts	NA	None required
	149 (March-July)		Compliant for 100% of blasts	NA	None required
	150 (July-December)		Compliant for 100% of blasts	NA	None required
	-	20 (January – March)	1 exceedance on February 24	Continue to monitor and undertake stabilisation works in accordance with approved Blast Management Strategy – COPI	Continue to progress trigger limits in accordance with approved Blast Management Strategy – COPI. Action completed during reporting
		30 (March-December)	Compliant for 100% of blasts	As above	As above
		40 (July-December)	Compliant for 100% of blasts	As above	As above

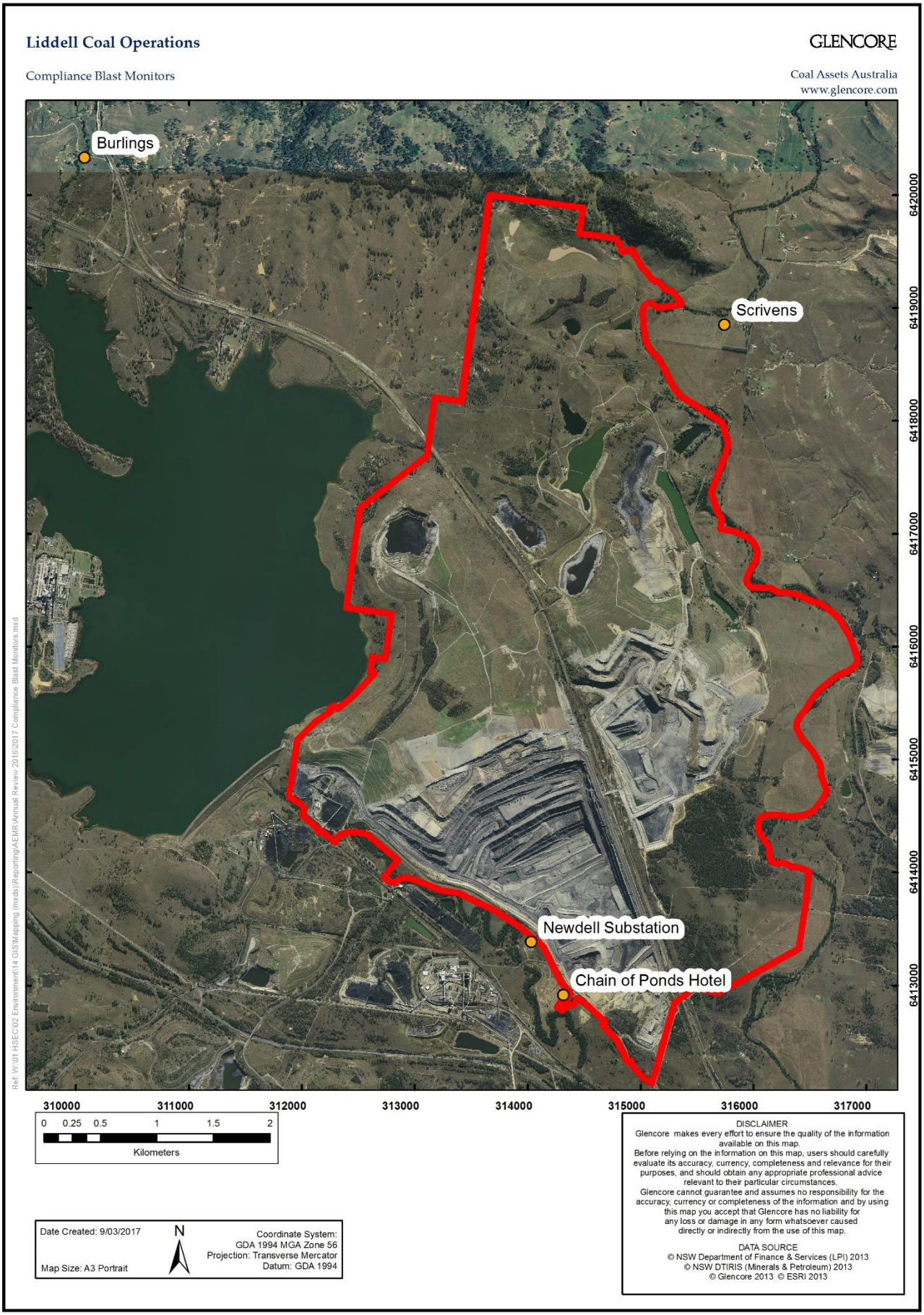


Figure 5 Blast monitoring locations

6.3 Air quality

Air quality monitoring is undertaken in accordance with the Liddell Coal Air Quality Management Monitoring Program (AQMMP). In addition, the LCO Dust Management TARP and LCO Spontaneous Combustion Management Plan are used for the ongoing management of air quality.

The AQMMP was developed in accordance with Schedule 3 Condition 19 of DA-305-11-01. In accordance with this condition, the AQMMP includes a combination of deposited dust gauges and high volume air samplers (HVAS) to monitor any dust emissions, and an air quality monitoring protocol for evaluation of compliance with the air quality impact assessment. The AQMMP was reviewed and updated during 2016 in accordance with DA-305-11-01.

During the reporting period, LCO has updated the compliance monitoring within the AQMMP, finalising the use of depositional dust monitors on mine owned land and substituting these for the use of relocatable continuous boundary monitors detailed below. Additionally, once AQMMP modifications are approved by DPE, existing continuous PM10 Tapered Element Oscillating Monitors (TEOMs) located on privately owned land will become compliance monitoring locations; providing for continuous compliance monitoring at offsite locations. Hence, the compliance air quality monitoring includes Depositional Dust Gauges, paired High Volume Air Samplers (PM10 and TSP), continuous TEOMs on privately owned residences with potential to be impacted and continuous boundary monitoring. The LCO air quality monitoring network is shown in **Figure 6**.

As per the AQMMP and the Dust Management TARP, the control measures undertaken to minimise potential impact on air quality at LCO include:

- regular dust inspections are carried out and excavation and tipping activities may be ceased or modified if excessive dust is observed;
- real time dust monitoring is undertaken to assist with the management of dust on-site;
- disturbance of the minimum area necessary for construction and prompt rehabilitation of construction areas;
- watering of roads and trafficked areas to minimise the generation of dust; permanent roads are constructed from hard non-friable material and have defined marker posts to prevent vehicle deviations;
- long term topsoil stockpiles are vegetated to reduce dust generation;
- overburden emplacements are shaped to 10 degrees or less and seeded;
- dust suppression sprays situated on the ROM dump hopper and transfer conveyor points are actuated to reduce potential dust generation; and
- all equipment is maintained in good working order to reduce emissions.

In line with the AQMMP and condition 19, schedule 3, LCO installed three relocatable supplementary boundary PM10 air quality monitors. The units were installed to:
- Determine LCO's contribution to local dust levels, based on their upwind and downwind positioning relative to the location of LCO mining activity; and
- Supplement the reactive operational dust management at LCO.

The relocatable boundary monitoring is a solar/battery powered trailer mounted equipment using an EBAM air quality monitor. The unit connects to a live monitoring system and will provide for early response to measured air quality impacts. As per the AQMMP, three units were used to throughout the reporting period to provide for the instrument conditioning and acclimatisation, a fourth unit was installed in Q3 2016. During Q4 2016, LCO completed a review of the performance of the units to determine suitability for commencement of LCO contribution analysis and the specifics regarding their role in effective dust management. During Q1 2017, the units will be integrated into the existing air quality monitoring network to inform dust management performance.

Air Quality Criteria

The following details the air quality compliance impact criteria applicable during the reporting period.

Schedule 3, Condition 16 of DA 305-11-01 requires that LCO manage their operations so as to satisfy the relevant air quality criteria for deposited dust and dust concentration emitted to privately owned land not owned by LCO.

Deposited dust levels refer to the quantity of dust particles that settle out from the air as measured in grams per square meter per month (g/m2/month) at a particular location. The LCO Air Quality Impact Assessment Criteria for deposited dust is summarised in **Table 14**.

Table 14 Long term impact assessment criteria for deposited dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2g/m^2/month	4g/m^2/month

Dust concentration refers to airborne dust and is measured in micrograms per cubic meter (µg/m^3). Dust concentration is measured as total suspended particulate matter (TSP) and particulate matter of less than 10 microns in diameter (PM_{10}). TSP relates to all suspended particles, which are usually in size range of zero to 50 micrometres (µm). TSP measurements include PM10 particles. TSP is compared to long term (annual average) goals and PM10 is compared to both long term (annual average) and short term (24 hour maximum) goals. Particle sizes larger than 50 µm are measured as deposited dust. The LCO Air Quality Impact Assessment Criteria for dust concentration (particulate matter) is summarised in **Table 15.**

Table 15 Impact assessment criteria for particulate matter

Pollutant	Standard/Goal	Averaging Period
Total Suspended Particulate Matter (TSP)	90 µg/m^3 (Long-term goal)	Annual
Particulate Matter <10µg (PM_{10})	50 µg/m^3 (Short-term goal)	24 hour maximum
	30 µg/ m^3 (Long-term goal)	Annual

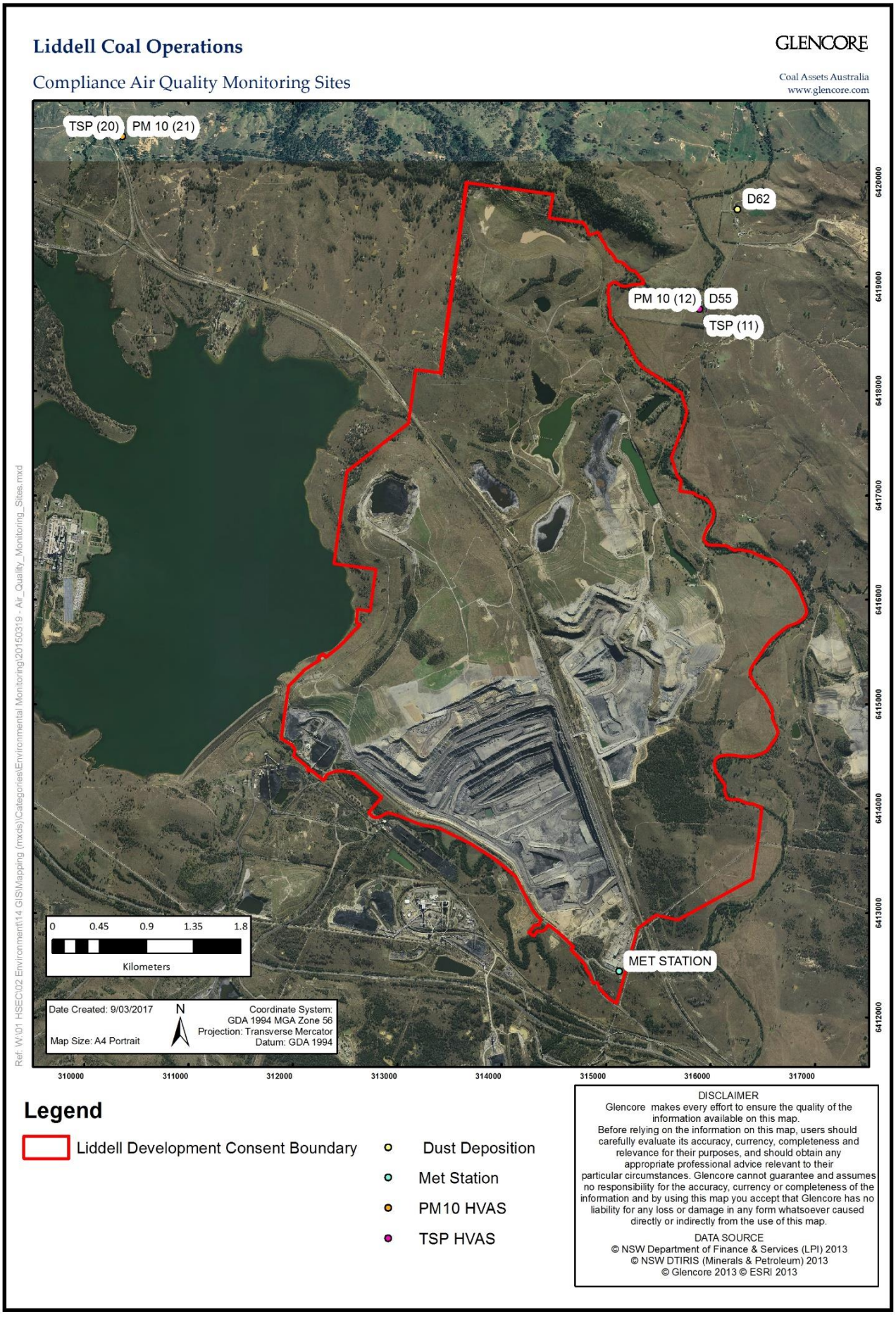


Figure 6 Air quality monitoring sites

Deposited Dust

The location of LCO's compliance depositional dust gauges are shown on **Figure 6.** In accordance with the EPL and Air Quality Management and Monitoring Program, monitoring results are collected from all deposited dust gauges on a monthly basis. Deposited dust monitoring results are provided in **Appendix C**. Two dust gauges maintained by LCO are representative of private residences (D55, and D62). During the reporting period both monitoring sites met the annual average criteria.

Gauges can become contaminated with organic material such as bird droppings, insects, vegetation or algae growth and the contamination of gauges is determined on the basis of field observations and laboratory analysis. D55 had high levels of contamination during May. May's contaminated results were not included when calculating the annual average results.

A summary of LCO's dust deposition gauge performance with compliance criteria is presented in **Table 16**.

Table 16 Annual average depositional dust comparison

Monitoring location	Approval Criteria (g/m2)	Performance during the reporting period (g/m2)	Key management implications	Proposed management actions
D55	4	Compliant (2.06)	NA	None required
D62	4	Compliant (2.05)	NA	None required

Deposited Dust - Comparison to EA Predictions

The Liddell Coal Modification to Development Consent Environmental Assessment (EA) (Pacific Environment Limited, 2013) makes predictions that the modifications alone or cumulatively will not result in exceedances of the relevant deposited dust criteria at any private residence in the surrounding area. This is an annual average criterion.

All annual averages at dust gauges representative of private residences were below the maximum annual average deposited dust level of 4 g/m2/month, as the modelling predicted.

High Volume Air Sampling - TSP

LCO operates two compliance High Volume Air Samplers (HVAS) which sample Total Suspended Particulates (TSP), as shown in **Figure 6**. In accordance with the Air Quality Monitoring Program and EPL requirements, TSP is measured by the samplers every six days. TSP monitoring results are presented in **Figure 7** and **Figure 8** and provided in **Appendix C**.

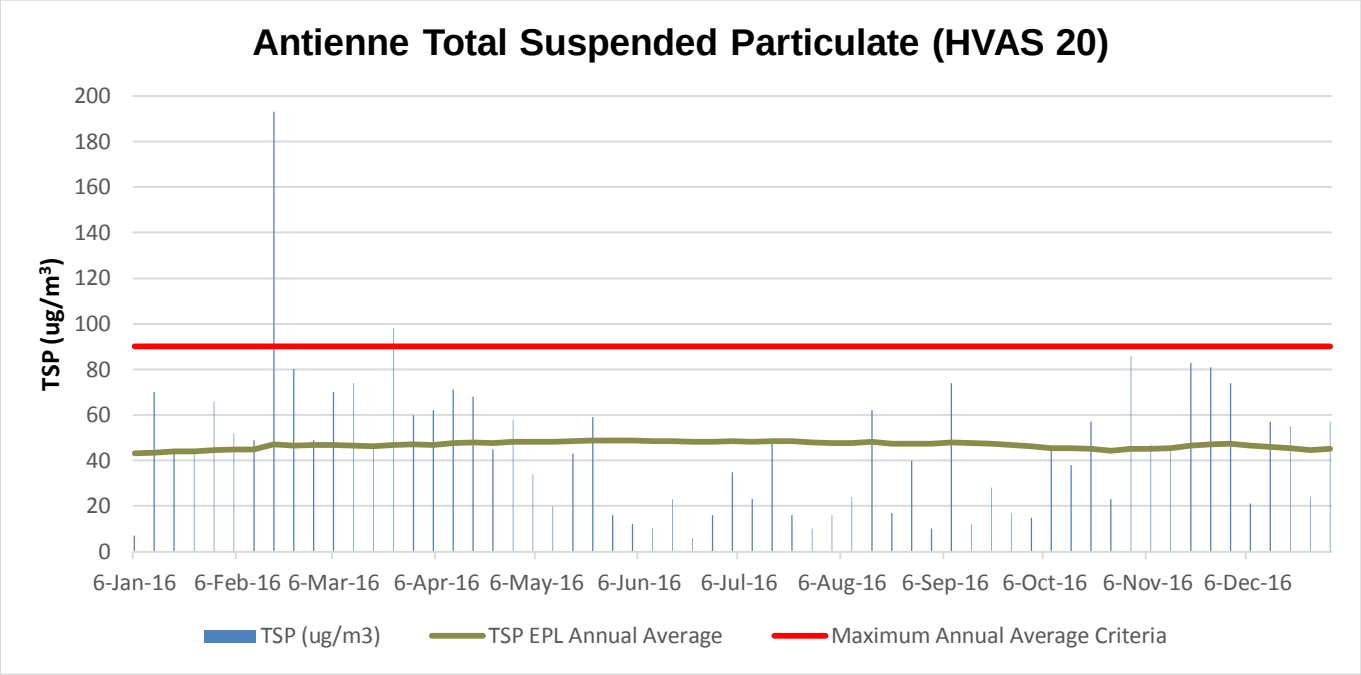


Figure 7 Antiene HVAS TSP Annual Results

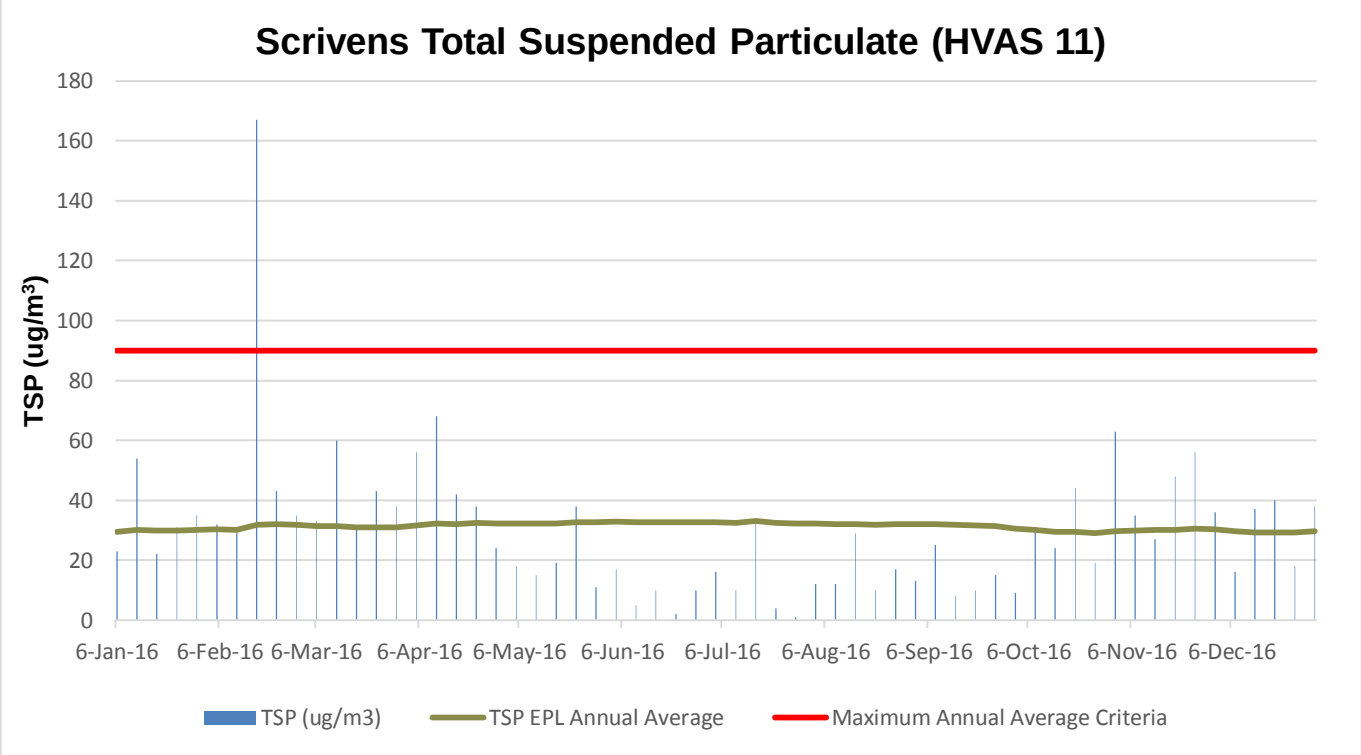


Figure 8 Scrivens HVAS TSP Annual Results

During the reporting period LCO complied with the TSP annual average goal (90µg/m3) at the Scrivens property (HVAS 11) and Antiene (HVAS 20). The Scrivens property is privately owned land. The annual average TSP at HVAS 11 was 31µg/m3 with a maximum concentration of 167µg/m3 (recorded on 17th February 2016). The annual average TSP at HVAS 20 was 47µg/m3 with a maximum concentration of 193µg/m3 (recorded on 17th February 2016). The elevated results occurring on the 17 February as the result of weed/grass management activities occurring at both locations and not reflective of either regional conditions or mining activities; these did not exceed a compliance limit.

High Volume Air Sampling – PM10

LCO operates two compliance HVAS which sample fine particulates with an aerodynamic diameter of less than 10 microns (PM10), as shown in **Figure 6**. In accordance with the Air Quality Management and Monitoring Program and EPL requirements, PM10 is measured by the samplers every six days.

PM10 monitoring results are presented in **Figure 9** and **Figure 10,** detailed results provided in **Appendix C**. These results are compared against daily meteorological data (wind speed and direction) to determine whether dust levels are attributable to Liddell Coal Operations.

During the reporting period, LCO complied with the PM10 long term (annual average) criterion (30µg/m3) and short term criterion (50µg/m3) at Scrivens and Antiene. The annual average PM10 at HVAS 12 was 12ug/m3 with a maximum concentration of 28ug/m3 (recorded on 11 April 2016). The annual average PM10 at HVAS 21 18µg/m3 with a maximum concentration of 39µg/m3 (recorded on 17 February 2016). There were no exceedances of the impact assessment criteria during the reporting period.

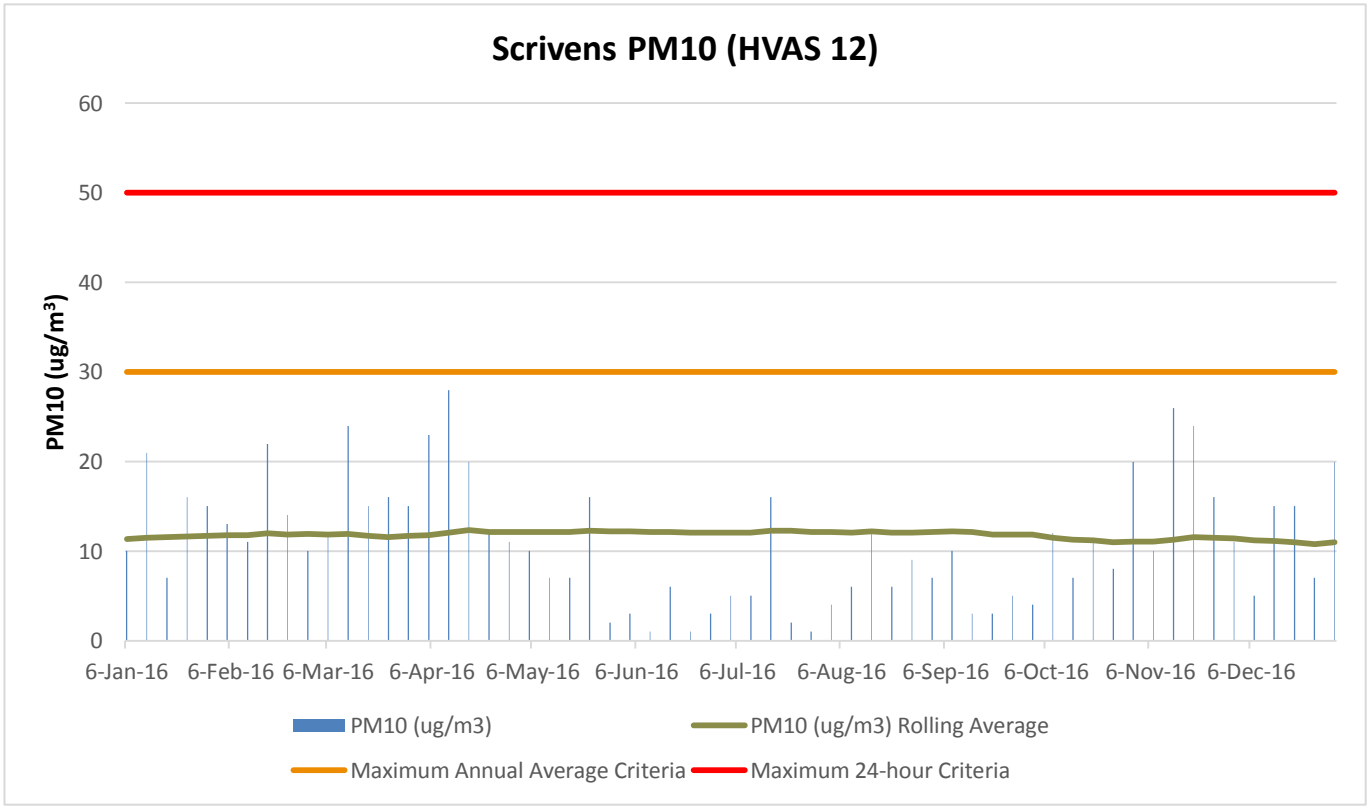


Figure 9 Scrivens HVAS PM10 Annual Results

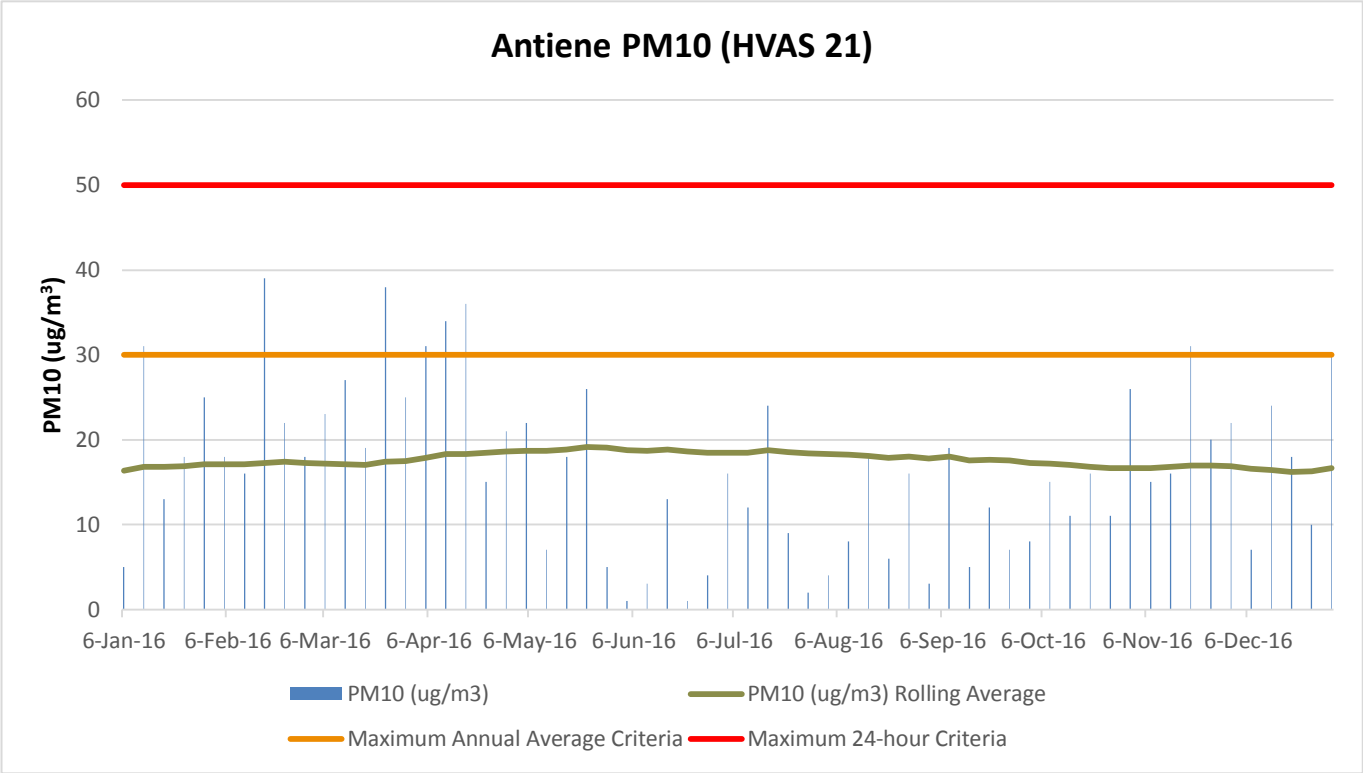


Figure 10 Antiene HVAS PM10 Annual Results

High Volume Air Samplers - Comparison to EA Predictions

The Liddell Coal EA (2013) did not predict any exceedances of the annual average PM_{10}, criteria at any of the nearest receptors. When considering LCO and other sources (including mining and other non-mining sources), none of the nearby privately owned residences are predicted to experience annual average PM10 levels above the relevant criterion, as per **Table 15**, on an annual basis.

Continuous Monitoring – PM10

LCO operate four continuous Tapered Element Oscillating Microbalance (TEOM) measuring 10µm Particulate Matter dust levels around the site. Air quality and meteorological monitoring data are evaluated against monitor-specific PM10 and meteorological triggers on a real-time basis with dust and weather alarms automatically triggered by LCO's data acquisition system. The alarms are sent to key operational personnel and are used as an auxiliary management tool in controlling dust emissions at Liddell.

During 2016, there were no exceedances at private residences (SX38 D1 & D2 being Antiene and Scrivens). LCO did however record one occasions at an offsite location on mine owned land where 24 hour average PM_{10} results measured above 50µg/m^3 and where LCO was upstream of alarming monitor. It should be noted that this location is used as a management monitor to assist in the monitoring of LCO dust emissions. . The results and actions taken are reproduced in **Table 17** below. Upstream and downstream monitors are determined based on wind direction at the time of the event.

Table 17 24 Hour average PM_{10} exceedances and actions

Event Date	Upstream (ug/m^3)	Downstream (ug/m^3)	Action Taken
8 November	20.7 (SX38D2)	50.9 (SX13)	Contribution during the 24hrs was less than 50ug/m^3. During shift, LCO responded to adverse conditions hot seating watercarts and modifying the operation to minimize dust emissions.

Pollution Reduction Programs

During 2016, no new Pollution Reduction Programs were completed however LCO did continue the Haul Road Dust Monitoring program as established from a 2013 PRP for Particulate Matter Control Best Practice – Wheel Generated Dust. This monitoring program includes determining the haul road dust control

efficiency achieved across the operation on four occasions throughout the year. Real-time concentrations of PM10 were measured using a DustTrak real time analyser attached to a 4WD vehicle. The mobile dust sampling method has been approved by the US EPA for use in a similar pollution reduction programs and the sampler is equivalent to that used in the ACARP project on wheel generated dust monitoring. Emissions were monitored from controlled haul roads (loading circuits), with baseline data collected at an uncontrolled test site; the dust monitored coming off the haul road surface was compared to the uncontrolled section to determine the control efficiency. All monitoring is completed in line with the original PRP methodology including the metrological conditions leading up to and during the monitoring event, silt sampling and scope of monitoring. As per the AQMMP, LCO aims to achieve greater than 80% control efficiency at all times.

The four monitoring events are planned to be spread out quarterly over the year however rainfall events did impact the timing of monitoring especially the Q3 event. During each monitoring event LCO achieved the target 80% control efficiency with results as follows:

- Q1 February – 90%
- Q2 May – 96%
- Q3 October – 97%
- Q4 November – 87%

6.4 Visual and Stray Light

Visual impact management is undertaken in accordance with the practices outlined in the Liddell Coal MOP (LCO, 2015) and the LCO Lighting Management Procedure. In accordance with these documents, visual impacts are managed through:

- prompt rehabilitation;
- prioritisation of rehabilitation, focusing effort on areas that are most visually prominent from off-site private residences and public transport routes; and
- directing of light away from residences.

During the reporting period, flood lighting in mining areas was located to minimise direct light emitted to Hebden Road, Antiene Road, the New England Highway, the Main Northern Railway, or towards any dwellings. During 2016, there were no lighting complaints received.

6.5 Aboriginal Cultural Heritage

Aboriginal Heritage Impact Permit (AHIP) C0000623 (AHIMS Permit ID 3765) was issued by OEH on 3rd December 2014 for the salvage of all sites within the impact footprint of Development Modification 5.

The LCO Aboriginal Cultural Heritage Management Plan underwent review by RAPs during 2016 and was subsequently finalised and submitted to DPE for review and approval. On the 31st March 2016 the LCO ACHMP was approved by DPE.

In early 2016, LCO completed construction of the Sensitive Aboriginal Landscape (SAL) (LID-BC-SAL) stock proof fencing and was completed. The fencing follows the boundary of the identified SAL as per the LCO ACHMP to protect the SAL by preventing vehicular and stock access.

Also during 2016, LCO finalised a Care Agreement with Wanaruah Local Aboriginal Lands Council for artefacts salvaged under AHIP 2348. This agreement (C0002281) provides for the in perpetuity care and control of 370 stone artefacts.

No Salvage Programs were completed in 2016.

The annual inspection and meeting was held with RAPs on 25th August 2016. The following actions were to be undertaken by LCO as discussed during the inspection:

- straw bales and/or coconut logs to be placed at HAZ2 OS1 for scour protection;
- SAL fence line clean up;

- Discussion and determination of action regarding potential artefact sighted just outside of SAL fencing adjacent to LID 3.

Since the annual inspection, LCO has installed straw bales at HAZ2 OS1 to assist in protecting the area from the scour. Additionally wire and post cut offs were removed from the SAL fence line as requested. During the inspection, a stakeholder identified a potential artefact below the new fence line and raised the concern for the potential of artefacts still present within the operational areas. The entire area west of the fence that demarcates the Impact Footprint of LCO was subjected to a Salvage program under AHIP C0000623 and completed in 2015. While not ideal, it is commonly accepted that no archaeological salvage is 'complete' – there is virtually no way to retrieve every stone artefact from a site area prior to destruction, hence the need for an AHIP or Approval instrument authorising harm such that a Proponent cannot be prosecuted. The salvage was conducted in accordance with the approval and with the appropriate stakeholder engagement. The portion of LID 3 which has been salvaged (outside the SAL) is accepted as destroyed within AHIMS.

Figure 11 identifies the Aboriginal Heritage sites within the Development Consent boundary. During 2017, LCO will complete an Archaeological Due Diligence assessment of biodiversity offset areas to provide for the protection of cultural heritage within these areas.

For further information relating to Aboriginal heritage management at Liddell, please refer to the LCO ACHMP which can be accessed from the Liddell Coal Website www.liddellcoal.com.au.

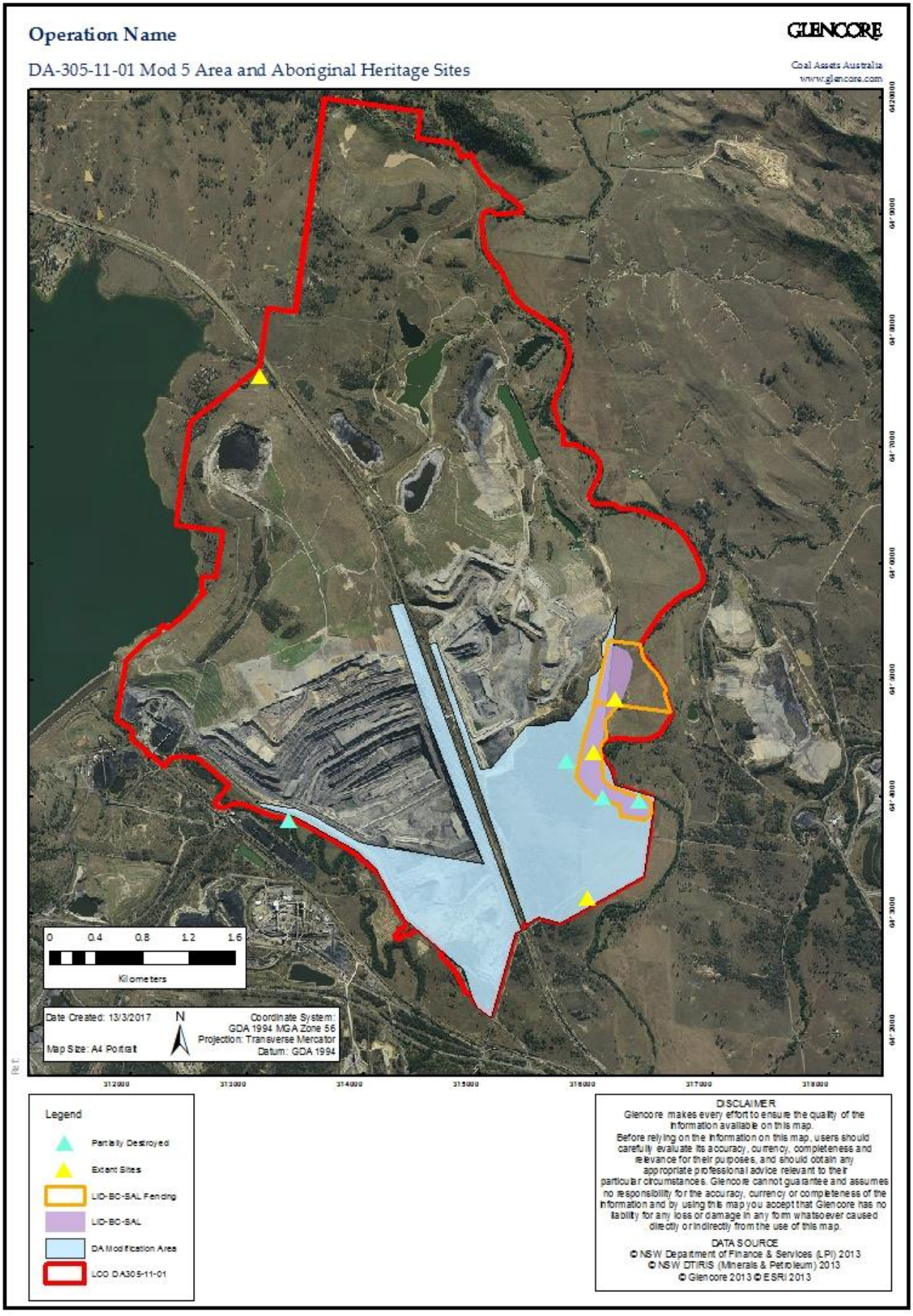


Figure 11 Aboriginal archaeological sites within Development Consent boundary

6.6 Heritage

The Environmental Assessment (EA) prepared for the development consent modification (DA305-11-01 Modification 5) found that mining in the vicinity of the Inn could proceed without any major risk of damage, provided that blast design control is implemented and a number of defects in the structures within the Inn complex are rectified prior to the commencement of the close range blasting program.

As required by Condition 15A of DA-305-11-01 (as modified) the Chain of Ponds Inn Blast Management Strategy (COPI Strategy) has been developed by LCO to document the management of potential blast related impacts on the Chain of Ponds Inn. This strategy was approved by the DPE on the 11th May 2015 in consultation with NSW Heritage Council and Coal & Allied (owner).

In accordance with DA305-11-01, the primary objective of this Strategy is to ensure that blasting at LCO does not cause loss of heritage value, and/or have a negligible impact on the structural integrity of the external fabric of the Inn, compared to the existing condition and structural integrity of the Inn at the date that consent was granted to DA305-11-01 MOD 5 (December 2014).

The COPI Strategy describes a process whereby the staged increase in the vibration level and air blast exposure (trigger levels) at the Chain of Ponds Inn, combined with continual monitoring of vibration and air blast levels and corresponding structural behaviour, will enable an adaptive management approach to blasting in the vicinity of the Inn. The strategy involves both at-receptor mitigation measures (structural stabilisation measures at the Chain of Ponds Inn) and at-source management measures (blast design control), particularly within a distance of 350 metres to the Inn, combined with an inspection and blast review regime to effectively manage blasting in the vicinity of the Inn.

Management Actions During 2016

As per the requirements of the management strategy, the following actions were completed during 2016:

In addition to the repairs/restoration carried out by the buildings' owners, Coal & Allied, and the propping installed in the cellar and some fireplace lintels, as noted in the 2015 report, timber framing was installed to prevent major damage to chimneys.

Each of the three remaining chimneys was stabilised as shown in **Figure 12** and **Figure 13** below. In the case of the stone chimneys on the main building, timber yokes were installed below the roofing and attached to the roof framing as well as framing up the chimneys themselves; the brick chimney on the main building annex was supported entirely from without as the roof structure was too damaged by termites to allow entry below the roofing.

Figure 12 Main chimney frame (plus framing below roof) Accelerometer locations	***Figure 13 Annex chimney stabilisation framing***

The lightweight framing is intended to prevent damaging movements, but is not stiff enough to affect vibration recording from those parts of the structure. Completion of this mitigation work allowed progression to the second ground vibration trigger level of 20-30mm/s and overpressure of 149dB from the 1st April 2016 in accordance with the provisions of the approved blast management strategy.

Further progression of blast triggers of 30-40mm/s vibration and overpressure 150dB was notified on 29 June 2016. This was supported by monitoring results and independent review of works to date by

representatives from Swinburne University and that no vulnerable walls or other structures had been identified as requiring further support by the monitoring undertaken.

Analysis of Blast Monitoring

The structures were monitored with accelerometers on 13 occasions during the year, from 10/2/2016 to 27/1/2017. For each of these events, vibrations were measured at the building locations previously chosen and the acceleration measurements were analysed and compared with the geophone velocity measurements from the site geophone. For both the geophone and the accelerometers, the analysis yield acceleration, velocity and displacement results, together with frequency analyses for all.

Displacement of a building element is the best indication that damage may be caused, as this relates directly to the strain in the building fabric. In a report prepared by Bill Jordan & Associates dated 16 March 2016, the acceptable displacements were tabulated for each of the monitored locations. The most vulnerable locations were shown to be the chimneys and the large unsupported two-storey side wall(s) of the kitchen block (Building B). Extracting these two locations from the table quoted shows:

Table 18 Calculated maximum displacement factors for vulnerable structures

Location	Max. displacement tolerance (mm)	Velocity amplification factor @ 95% confidence level	Predicted PPV (mm/s)	Comments
Ad (top of southern chimney, laterally)	12	11.4	32	Chimney top
Bc (centre of northern kitchen block wall)	3	2.3	34	Centre of wall

For each location, data from the whole year's monitoring was assembled in a continuous record and analysed to show the relationship between PPV, frequency and displacement. Plots for the two locations are shown in **Figure 14** and **Figure 15**.

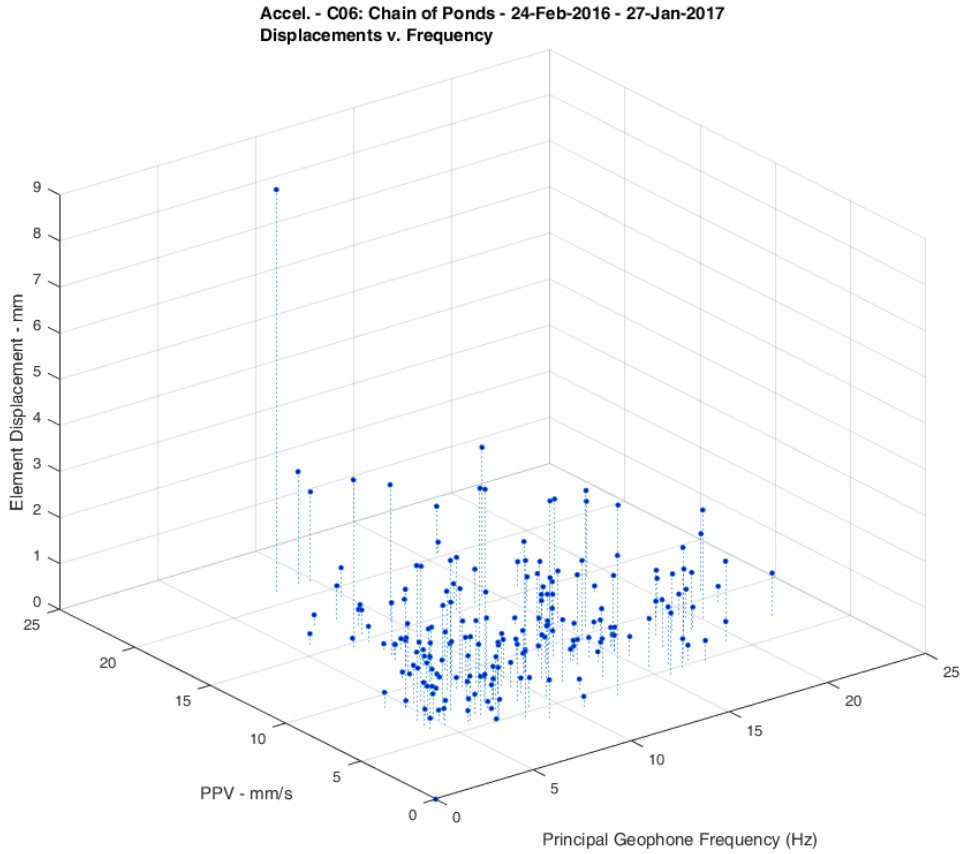


Figure 14 Plot showing results over the year for position Ad. The tolerance is 11.4 mm and only one result possibly anomalous, approaches this value.

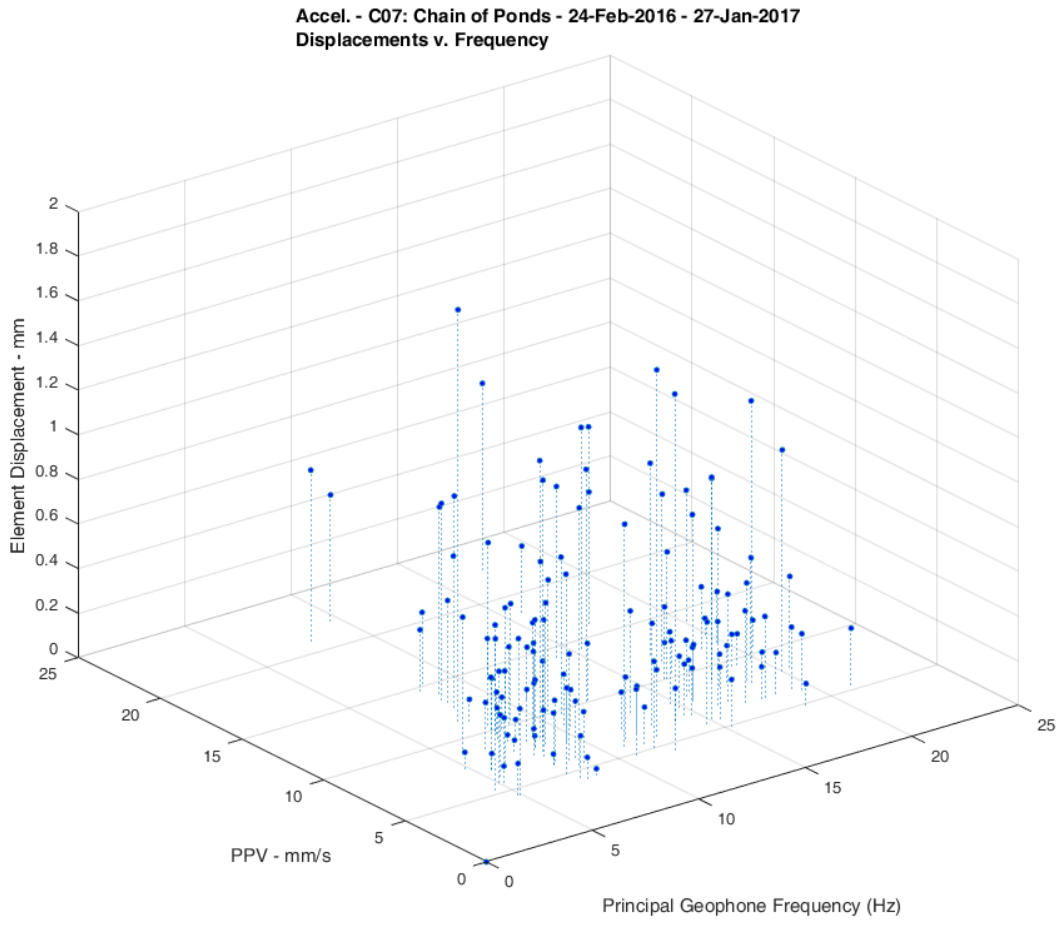


Figure 15 Plot showing results over the year for position Ca. The tolerance is 3 mm and all values are less than 50% of this and less than 30% where frequencies were in the desired range.

The single large deflection of the chimney at a low frequency can be associated with poor coupling between the chimney and the accelerometer which was mounted on the timber framing, not the stonework. Steps are being taken to ensure that the accelerometer measures the chimney movement, not that of the timber framing. It will be noted that there was not a large value at position Ca in **Figure 15**.

Peer review of analysis Procedure

In April 2016 I spent a day with Professor Emad Gad and Dr Hing-Ho Tsang at Swinburne University of Technology in Melbourne: Professor Gad and Dr Tsang are acknowledged experts in the analysis of induced structural vibrations.

Professor Gad has reported:

"In addition to the comprehensive discussions we had during our meeting, we also reviewed your report dated 16 March 2016 regarding the results of blast vibration monitoring and the procedure adopted for predicting the response of the former Chain of Ponds (CoP) Buildings.

We note that the three buildings of the former CoP have been instrumented at 12 different locations to measure the horizontal vibration response of walls and the chimney. The selected instrumentation and locations of measurements are appropriate and provide necessary information for the structural assessment.

The assessment procedure and the results presented in Table 1 of your report are technically sound. The use of amplification factor for velocity response is reasonable given that PPV has been the standard parameter in the field of blast vibration assessment. It is well noted that 95% confidence level of the velocity amplification factor has been adopted. Further, we fully support the conclusions and recommendations you have outlined in your report in relation to future monitoring.

Trends and compliance issues

Except for the single anomalous reading explained above, effects on the buildings have been well under movement tolerances and are likely to remain so with PPV increases up to the limits proposed in the Management Plan and beyond.

Blast vibrations are still not reliably predictable, different factors influence the actual vibration levels for each blast and the predictions will continue to vary from the recordings of the event. A conservative margin is built into both the prediction models and the building behaviour models and it will be appropriate to continue with this conservatism in the future.

A three-monthly dilapidation update inspection has been carried out, the last being on 14 March 2017: no damage attributable to ground vibrations or air blast has been noted to date.

Future Work

Continuing monitoring of the buildings' behaviour, particularly as PPVs rise, will be necessary to ensure that no trends emerge which have not been obvious at lower magnitudes.

6.7 Exploration

No exploration activities were completed during 2016.

6.8 Spontaneous Combustion

Fine coal along the ribs of exposed pillars in old underground workings associated with the Liddell coal seam have been historically linked to spontaneous combustion at LCO. To manage spontaneous combustion the mine plan aims to keep the underground workings full of water to limit coal exposure to oxygen for as long as possible. Once exposed, the mine design then incorporates benches for sealing off the high wall, which minimises the ingress of oxygen. Where areas of spontaneous combustion are exposed, the affected material is removed where possible, dumped low in spoil areas and covered with at least 20 m of inert material. If removal is not feasible, care is taken to minimise potential dust generation, and the coal is processed in the CHPP as soon as practicable to minimise ROM stockpile time. Spontaneous combustion of stockpiled product coal at LCO is rare due to the moisture introduced during the washing process and the regular transfer of coal to the Port of Newcastle for export. In the event that stockpiles start to generate heat due to delays in transportation, coal in the stockpiles is spread out and soaked with water to allow the heat to dissipate. Measures to control spontaneous combustion are documented in the LCO Spontaneous Combustion Management Plan, which is reviewed and updated regularly.

Historically, underground workings in the Liddell seam were de-watered a number of months prior to mining. This allowed the coal to be exposed to oxygen, facilitating spontaneous combustion. The mining process was revised and implemented during 2013, 2014 and sees a just-in-time methodology, where by an increased pumping network has enabled the workings to be de-watered just prior to excavation. By eliminating the coal's exposure to the atmosphere and propensity to combust, rather than relying on an engineering treatment once exposed, a significant reduction in the environmental hazard has been realised.

Since revising the management practices, the methodology has proven successful with a considerable reduction of spontaneous combustion. Whilst there have been occurrences of spontaneous combustion within working areas, the extent and duration of these affected areas has reduced. LCO did not have any management issues relating to spontaneous combustion resulting in either odour or air quality complaints during the reporting period.

LCO remains committed to developing and improving environmental management strategies. If the adopted spontaneous combustion strategy exhibits unsatisfactory performance, then the methodology will be reassessed and an effective strategy implemented to achieve acceptable outcomes.

6.9 Tailings and Rejects Management

The processing of ROM coal in the CHPP produces both tailings and coarse rejects. This section details the tailings and rejects management strategy employed by LCO.

Tailings and reject management strategy, operation and disposal

Tailings and reject production is dependent on a number of factors including the source coal seam, seam section, in-pit mining conditions, out of seam dilution, stockpile weathering prior to washing, and weather conditions during and prior to mining. The amount of tailings produced from the LCO CHPP is in the order of approximately 9.8% of ROM coal processed.

Coarse rejects generated from the LCO CHPP are in the order of 24% of ROM coal processed, and consist of carbonaceous shale, mudstone and claystone, with minor coarser rocks such as siltstone and sandstone. Coarse rejects will be co-dispersed throughout the overburden dumps in varying levels during dump construction with a final placement to be a minimum of 5m below the final landform. Capping of coarse reject is undertaken using inert overburden to minimise the risk of spontaneous combustion. Carbonaceous shale in the coarse rejects has a very low spontaneous combustion potential.

Under DA305-11-01, up to 0.5 Mtpa of tailings reclaimed from LCO can be sold to Macquarie Generation, with the actual annual rate depending on the moisture content of tailings in situ, and the energy content after mining, recovery, drying and screening. The tailings are to be transported in haul trucks via Pikes Gully Road underpass and a merging lane to the New England Highway to the nearby power station at a rate of no more than 114 truck movements per day (i.e.57 loaded trucks), 5 days per week. No transportation of tailings to Macquarie Generation occurred during 2016.

LCO has approval to dispose of tailings in the Antiene, Reservoir West, Reservoir South and the Railway fines (now referred to as the Durham Tailings) emplacement areas. Deposition into the Reservoir South Tailings Dam was completed in 2014. Deposition into the Reservoir West Tailings Dam was completed in December 2013; both reservoir tailings dams are in a settling/drying stage.

The Antiene tailings dam has reached capacity and use of this void as an active tailings emplacement area ceased in August 2009. A strategy for the capping of Antiene Tailings Dam was submitted to the DRE in December 2014. As per the capping strategy submitted to DRE, LCO commenced capping of the Southern portion of Antiene Tailings Dam during 2016 and will continue into 2017. At this stage approximately 23ha of the 33ha dam have had an initial capping layer of 1.5m created.

The Durham Tailings Dam is the only active tailings dam at Liddell. The Durham Tailings emplacement is estimated to have capacity for 3.85million m^3 of tailings through to late 2017. Between 2018 and 2020, LCO plan to commence emplacement of tailings in Mount Owen's West Pit void in consideration of the Greater Ravensworth Area Water and Tailings Strategy in accordance with DA305-11-01 Modification 6. This void will enable sufficient tailings disposal capacity in the period when the Durham Tailings Emplacement Area is reaching capacity. LCO will commence tailings emplacement in the South Pit Tailings Dam in 2021.

In order to assist in settlement of the tailings, free standing water is pumped from the surface of the tailings dams when required. A pump is rotated between the three inactive tailings dams and water is syphoned off when it is a suitable depth.

Water in the Durham Tailings Dam is managed through secondary flocculation and decant ponds. Flocculent is mixed with the tailings at the tailings pipe outlet to increase solids density. Water then filters through the decant structures and is then pumped to the mine water storage dams.

Table 19 below shows indicative timeframes for capping and final rehabilitation for each facility.

Table 19 Tailings emplacement and rehabilitation timeframes

	2016	2017	2018	2019	2020	2021	2022	2023
RTEA (Reservoir South and West Tailings Emplacement)				Rehab	Rehab			
Durham Tailings Emplacement	Active	Active					Rehab	Rehab
Antiene Tailings Dam	Rehab	Rehab	Rehab	Rehab				
Mount Owen West Pit		Active	Active	Active	Active			
South Pit Tailings Emplacement						Active	Active	Active

7 Water Management

7.1 Water Management System

Water management is one of the key operational constraints at LCO and is managed through the LCO Water Management Plan. The LCO Water Management Plan (WMP) documents the processes and responsibilities of all aspects of the site water management system. This WMP has been compiled to satisfy the relevant requirements of DA 305-11-01 Mod 5, as well as condition's 12, 13, 14, 15 and 16 of the Australian Government EPBC approval.

The water management system at LCO is integrated, that is, the water from both the open cut operations and former underground operations is managed together, in an integrated system. The integrated water management system at LCO is designed around the following operational objectives:

- To maintain a low risk of uncontrolled discharge occurring from the process water (CHPP) or mine water systems over the mine life.
- To minimise the need to export water and salt to the Hunter River by maximising re-use on-site and by transferring excess water to other nearby mining operations.
- To minimise risks of disruption to mining operations by efficient mine and underground workings dewatering.
- To ensure that effective control over generation of airborne particulates is not interrupted due to lack of water by maintaining a reliable water supply.
- To ensure uninterrupted operation of the CHPP by maintaining a reliable water supply.

LCO is guided in its decisions using a life-of-mine water balance model which will enable the prediction of future water supply security and risks of excess open cut pit water. LCO store water on site to maintain supply security during dry conditions, and maximise the water reuse in the CHPP and for dust suppression.

Inflows which contribute to the LCO water balance include site rainfall runoff, tailings water reclaim, former underground inflows and water sourced from neighbouring operations. Outflows or usage from the LCO water balance include evaporation, water used in the CHPP, for dust suppression, vehicle wash down, to mitigate spontaneous combustion in waste rock emplacements, water exported to neighbouring operations and controlled release of surplus water in accordance with EPL 2094 and the HRSTS.

The water uses at LCO include CHPP uses, tailings export, dust suppression (haul roads and stockpiles), equipment wash down and potable water usage. The water consumption at LCO was generally consistent with previous reporting periods. Note changes in water consumption are a result of many variables including pit progression, groundwater inflow, rainfall, atmospheric conditions, etc.

LCO also participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing it to discharge from a licensed discharge point located on Chain of Ponds Creek. These discharges take place during high flow periods in compliance with HRSTS regulations. During 2016, the Licenced Discharge Point was relocated to a new location adjacent the CHPP product stockpile to allow for the continuation of mining operations in the South Cut area.

During 2016, LCO commissioned a major water pipeline project involving the construction of a pipeline and associated infrastructure which connect Mt Owen, Liddell and Ravensworth (Greater Ravensworth). This infrastructure was installed to assist in the life of mine water holdings of each operation and provide better drought proofing ability as well as strategic use of available mine water storages at each operation reducing the requirement for additional dams/voids.

Annually, LCO conduct a review of the total water flows within the water management system. **Table 20** below is a summary of the water balance results. A summary of the water flows onsite LCO during the reporting period is shown in **Figure 18**.

Table 20 Site water balance

2016 Site Water Balance	
Total Inputs (ML)	3,486
Total Outputs (ML)	4,974
Inputs minus Outputs (ML)	-1,489
Storage at Start (ML)	10,020
Storage at End (ML)	8,932
Change in Storage (ML)	-1,088
Imbalance (ML)	401
Total Inputs + Total Outputs equals total flow through site (ML)	8,460
Imbalance Percentage	4.7%

During 2016, LCO was required to complete a calibration of the site water balance as per commitment 23 of the 2015 WMP. These works were completed during Q1 2016 allowing the benefit of a full year dataset for 2015 to be included. Water balance model calibration was undertaken by comparing model estimates of total water volume stored in all monitored water storages against water volumes estimated from monitoring records for the period 1 November 2011 to 31 December 2015.

A comparison between estimated actual total underground stored water volumes (from monitored water levels and supplied level-volume relationships) and those generated by the calibrated model is shown in **Figure 16**.

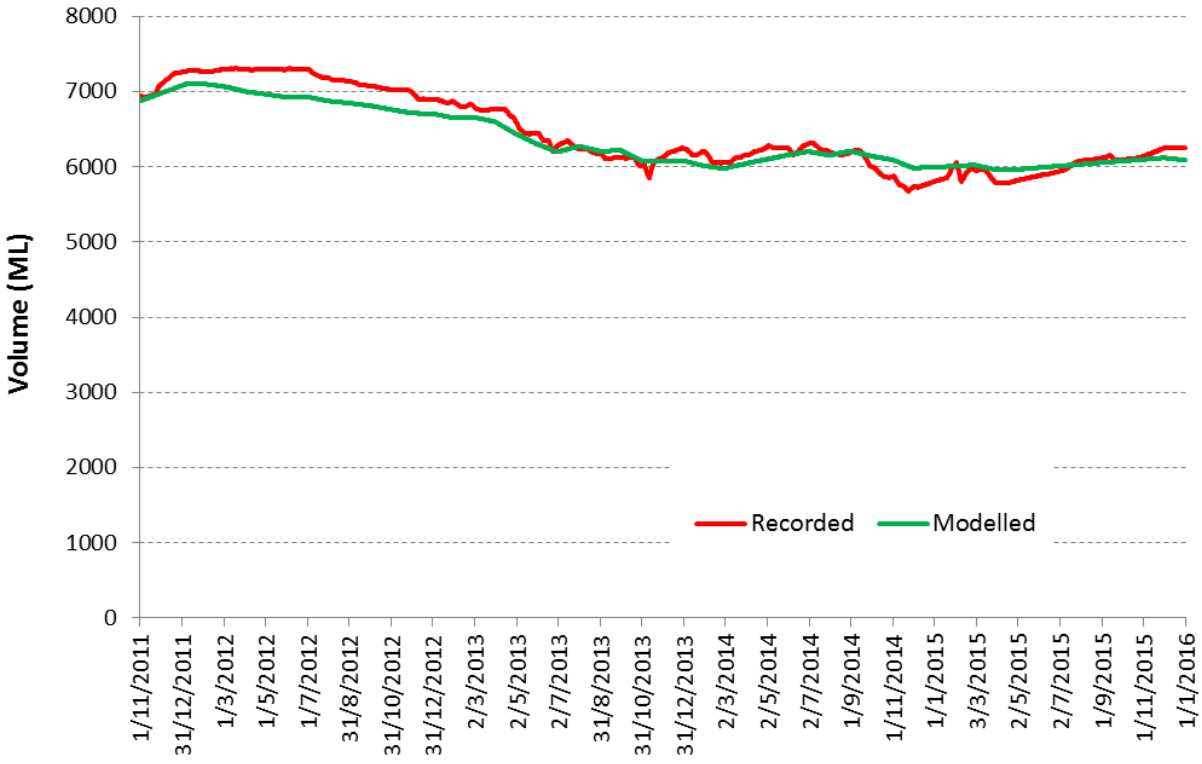


Figure 16 Calibrated model & estimated actual stored water volume – All Underground Storages

A comparison between estimated actual total surface stored water volumes in the four main monitored water storages and those generated by the calibrated model is shown in **Figure 17.**

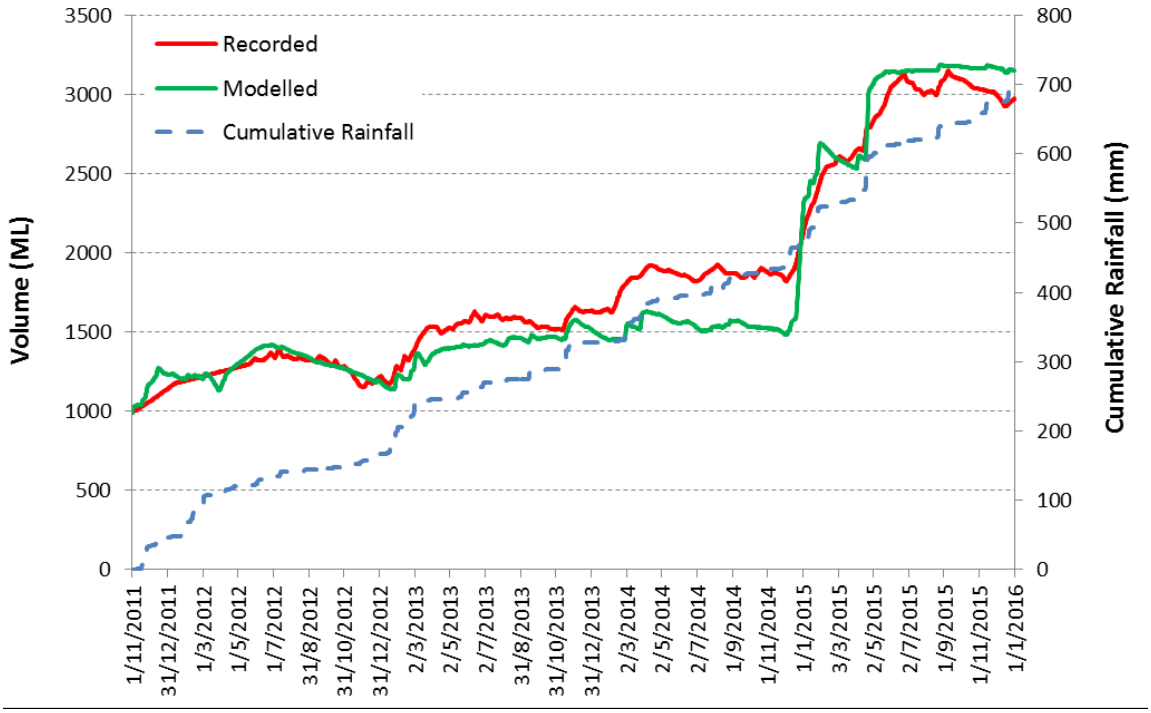


Figure 17 Calibrated model & estimated actual total stored water volume – main surface water storages

The water balance model calibration reported that the calibrated model reproduces observed water management system behaviour well. Modelled groundwater inflows to former underground storages and open cut pits have been adjusted as part of the calibration. Rainfall runoff model parameters have been adjusted in order to better reproduce volumes derived from recorded water levels in the main LCO water storages. The calibration verifies that the model is fit for use as part of the water management system.

The following summary list of recommendations was provided in order to further improve model calibration and the accuracy of model predictions; these will be actioned in 2017 once another 12months of data is collected:

1. The model calibration should be reviewed in one year's time, following the collection of an additional year of data.

2. Predicted future groundwater inflow rates should be reviewed in the light of the rates used in the model calibration.

3. The recorded pumped volumes from Dam 6 to Dam 3 be checked and future model calibration revisions include (if justified) simulation of below ground storage for the Mountain Block dams.

4. Volumes of water pumped from the two open cut pits should be recorded on at least a monthly basis, including the destination of the pumped water.

Mine Dewatering

Bore M49 (20BL172293), Mt Owen bore (20BL169544) and Middle Liddell Bore (MLB; 20BL172588) are utilised to dewater the open cut mine ahead of mining and are stable. Bore M49 is being maintained at -21mAHD. During the reporting period Middle Liddell Bore ranged between -46mAHD and -31mAHD. **Section 7.3** details groundwater monitoring results (water level and water quality) for the reporting period.

Table 21 provides a summary of the water take in 2016 from the groundwater licences held by LCO with an extraction allocation. LCO did not take from any surface water licences during the reporting period.

Table 21 Groundwater take

Water Licence	Entitlement	Passive take	Active pumping	Total
20BL168063	6000	0	0	0
20BL168062	6000 (Combined)	273	590	863
20BL172588				
20BL168060	5500	0	0	0
WAL18302	5	0	0	0
20BL017861	5	0	0	0
20BL172293	2500 (Combined)	204	94.5	298.5
20BL168209				
20BL169544	2500	0	0	0
20BL168061	1000	0	0	0

Framework Representation

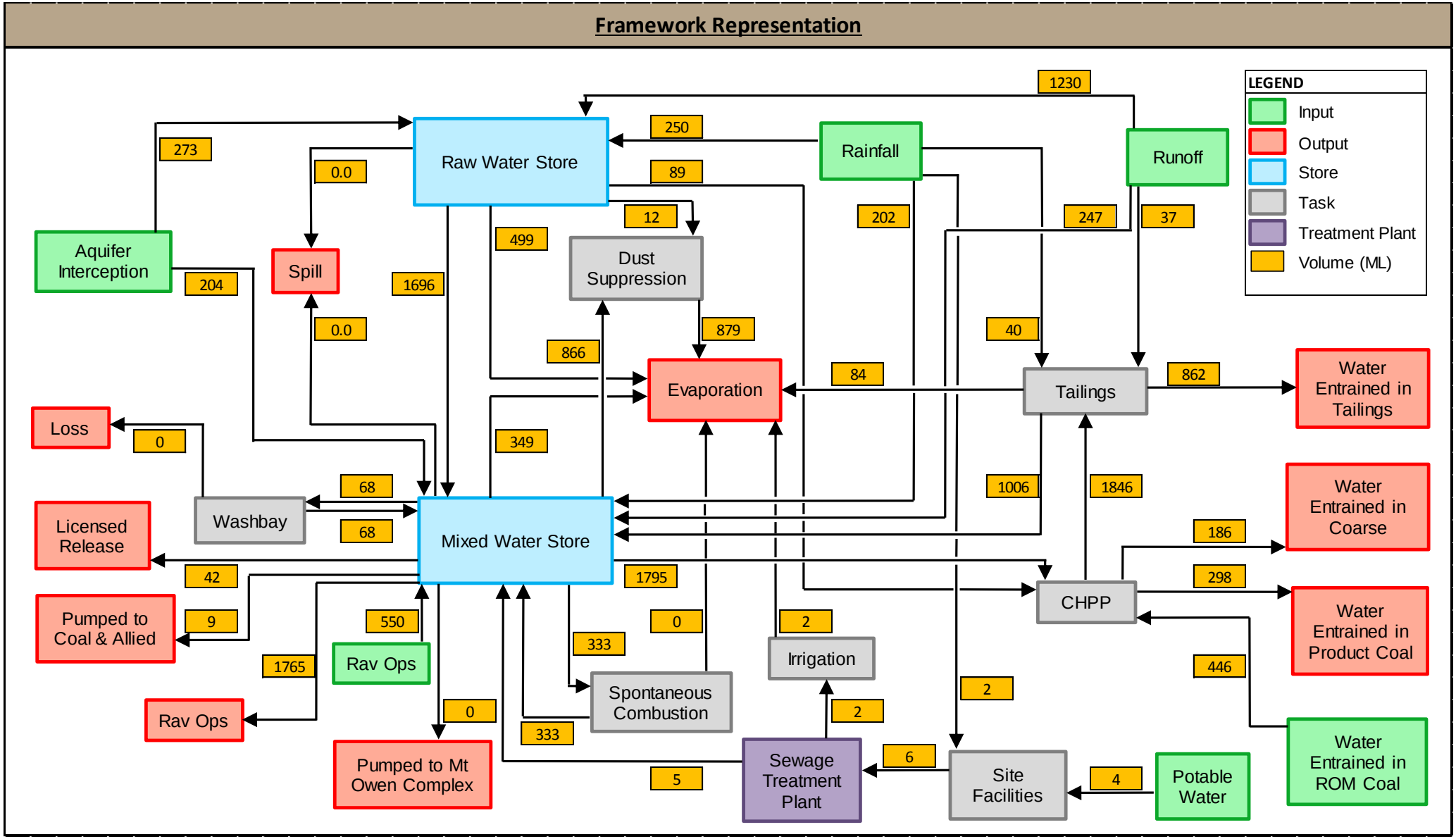


Figure 18 Site water balance

7.2 Surface Water Monitoring

Surface water monitoring is undertaken along the two creek lines adjacent the operation (Bayswater and Bowmans) as well as at onsite water storages. During 2016, LCO undertook the WMP surface water monitoring program that was approved in August 2015. This monitoring program utilises specific surface water quality monitoring trigger limits which provide for the identification of potential adverse impacts.

The trigger limits or impact assessment criteria for both Bayswater and Bowmans Creek has been determined based on a statistical analysis of data collected over a 5 year period. In accordance with ANZECC (2000) guidelines a 90th percentile concentration is appropriate for maintaining water quality. Importantly, impact assessment criteria apply based on the flow conditions of the each creek line and monitoring location; due to the disturbed nature of both catchments this is deemed to be an appropriate statistical criterion to adopt whilst mining operations are ongoing. The creek trigger levels are presented in **Table 22**.

Table 22 WMP trigger values for surface water quality

	pH lower limit[4]	pH upper limit		EC 90th %tile[1]	EC Max[2]	TDS 90th %tile[1]	TDS Max[2]	TSS 90th %tile[1]	TSS Max[2]
		90th %tile[1]	Max[2]						
Bayswater	6.5	8.3	8.5	5130	7300	3230	5180	50[3]	302
Bowmans Creek	6.5	8.3	8.8	2020	4570	1210	3460	50[3]	97

[1] whole creek 90th percentile
[2] maximum recorded value for whole creek
[3] ANZECC criteria for TSS
[4] ANZECC criteria for pH lower limit

Trigger Level when creek is flowing
Trigger Level when no flow in creek

Figure 19 shows the locations of each of the surface water monitoring sites.

Monitoring during the reporting period was completed as per the applicable approved WMP. The following details exceedances, if any, of applicable WMP trigger levels; full monitoring results are shown in **Appendix D**

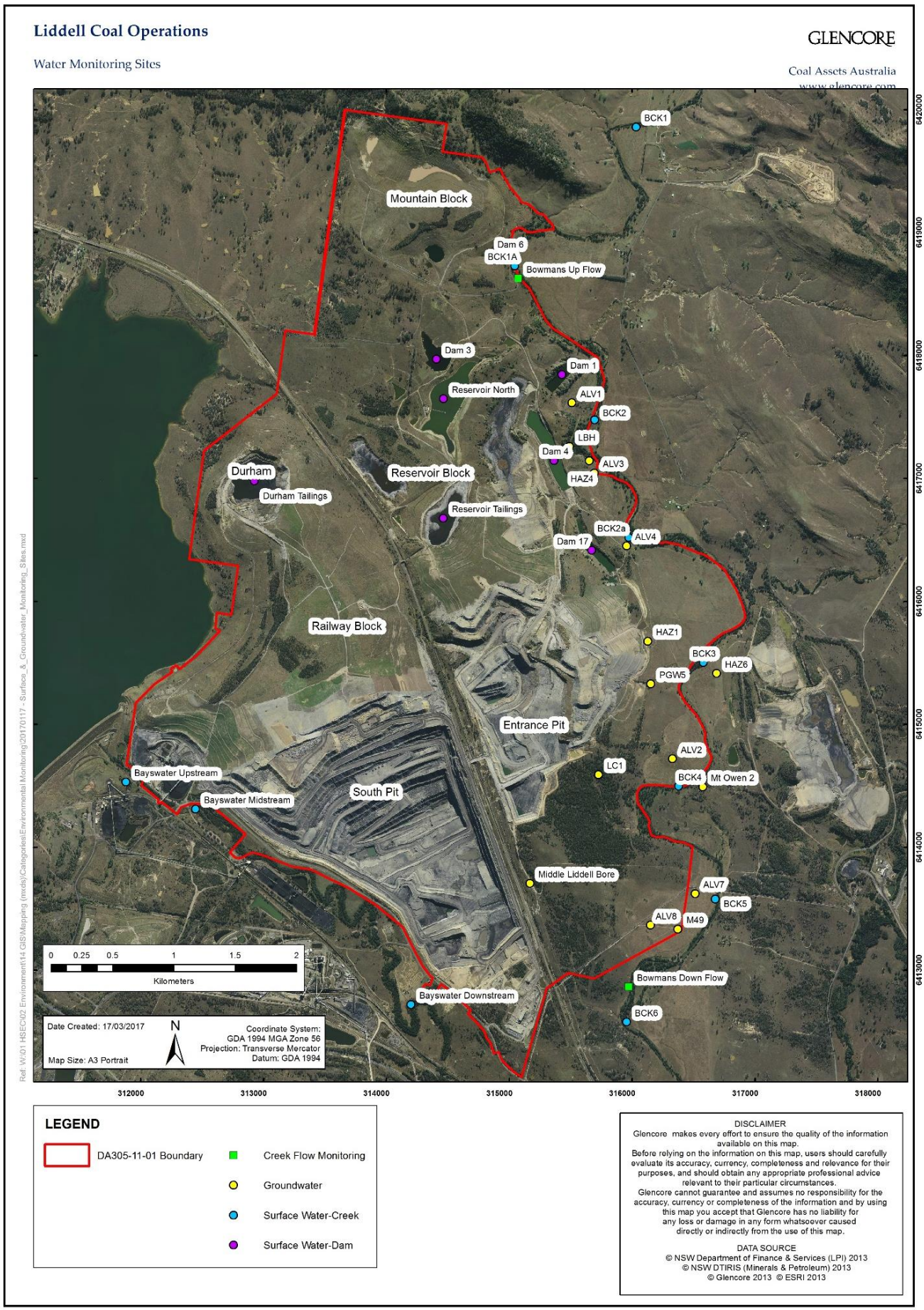


Figure 19 Surface and groundwater monitoring locations

7.2.2 Monitoring Results Review

Bayswater Creek

Monitoring of the three sites within the creek (Upstream, Midstream and Downstream) was completed monthly during the reporting period in accordance with the WMP. Bayswater Creek is a highly modified watercourse and regularly experiences periods of low or no flow. The measured water quality levels were typical of historical results with considerable range due to the infrequent flow and highly modified catchment. There was no exceedance of flow or no flow applicable WMP trigger levels.

Table 23 below summarises the trigger limit exceeded in Bayswater Creek during the reporting period. No water quality observations exceeding the adopted triggers were recorded during 2016.

Table 23 Bayswater creek trigger limit summary

Bayswater Creek – Values Exceeding Trigger Limits												
Month	**Bayswater Creek Upstream**				**Bayswater Creek Midstream**				**Bayswater Creek Downstream**			
	pH	**EC (µS/cm**	**TSS (mg/L)**	**TDS (mg/L)**	**pH**	**EC (µS/cm**	**TSS (mg/L)**	**TDS (mg/L)**	**pH**	**EC (µS/cm)**	**TSS (mg/L)**	**TDS (mg/L)**
Jan									Dry			
Feb									Dry			
Mar									Dry			
Apr									Dry			
May									Dry			
Jun									Dry			
Jul									Dry			
Aug									Dry			
Sep									Dry			
Oct									Dry			
Nov									Dry			
Dec									Dry			

Orange Shading – Denotes an exceedance of the 90%ile trigger limit (applicable when the creek is flowing)

Red Shading – Denotes an exceedance of the Max trigger limit (applicable when the creek is not flowing)

Bowmans Creek

Monitoring of the eight sites within the creek (upstream BCK1, BCK1A, BCK2, BCK2A, BCK3, BCK4 BCK5 and downstream BCK6) was completed monthly during the reporting period in accordance with the WMP.

It should be noted sections of Bowmans Creek are ephemeral in nature and often pool or have very low flow leading to potential stagnant conditions which influences water quality. With this consideration as detailed above, trigger limits are dependent on the flow conditions at time of monitoring.

Table 24 below summarises the trigger limit exceeded in Bowmans Creek during the reporting period.

Table 24 Bowmans creek trigger limit summary

Bowmans Creek – Values Exceeding Trigger Limits																
Month	BCK1 (Upstream)				BCK 1A				BCK2				BCK2A			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan																
Feb																
Mar																
Apr						2040		1330								
May																
Jun																
Jul																
Aug																
Sep			92				101				80				101	
Oct																
Nov																
Dec																
Month	BCK3				BCK4				BCK5				BCK6 (Downstream)			
	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	EC (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan																
Feb																
Mar					8.32				8.36							
Apr																
May																
Jun										2280		1230				
Jul						2380				2360		1330				
Aug																
Sep											102				103	
Oct			58													
Nov																
Dec			61		8.32						78					

Orange Shading – Denotes an exceedance of the 90%ile trigger limit (applicable when the creek is flowing)

Red Shading – Denotes an exceedance of the Max trigger limit (applicable when the creek is not flowing)

The measured pH levels consistently averaged 8.0 throughout the reporting period. There were three isolated exceedances of the flowing WMP 90th%ile pH limits of 8.30; each occurring with slow flow observed at the site. Since they were not maintained exceedances, these are not considered to be an impact related to mining activities.

The measured TDS and EC levels along Bowmans Creek identified four exceedances of flow applicable criteria; once and isolated at upstream location BCK1a, once and isolated at BCK3, twice

consecutively at BCK5. Each of the exceedances applied to the flowing 90th%ile limits however monitored conditions at each event recorded either slow or trickle indicating that no flow trigger levels are nearly applicable. Given there were no sustained exceedances of criteria in accordance with the surface water trigger response plan and considering the isolated nature of these measurements it is unlikely to be representative of any mining impact and no further investigation was required.

During the reporting period, some sites measured TSS levels above the flowing 90th%ile trigger limits however returned to be well below trigger levels at the next monitoring event. During September, elevated results were recorded at upstream and downstream monitoring locations and deemed to be related to considerable rainfall the day before the monitoring event. There were no consecutive exceedances of applicable trigger limits and considering the isolated nature of these measurements it is unlikely to be representative of any mining impact; no further investigation was required.

HRSTS Discharge Monitoring

Any discharges from the Liddell Colliery must be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS). During 2016, there was one discharge events from the site under the HRSTS occurring in September which is summarised below. There was no exceedance of any compliance limits applicable to these discharge events. **Table 25** below summarises the HRSTS discharge events and monitoring results.

Table 25 HRSTS discharge events summary

HRSTS Discharge Monitoring					
Event/Block		**Volume Discharged (ML)**	**Mean EC (µs/cm)**	**Salt Load (Tonnes)**	**Total Allowable discharge (Tonnes)**
Start	**Finish**				
20:20 21/09/2016	19:30 22/09/2016	18.44	6280	54.79	1886
19:30 22/09/2016	14:20 23/09/2016	23.77	6430	65.50	876

7.3 Groundwater Monitoring

LCO is located within an area of the Upper Hunter Valley subject to extensive underground and open cut mining activities since the early 20th century. Current and historical mining operations have extensively altered the physical features and environmental setting of the local area, including the region's surface water and groundwater systems. Mining operations to the west, south and east of LCO, Lake Liddell to the west, and the major geological feature Hunter Thrust to the north, all have major influence on groundwater levels in the region. Due to such operations and features regional groundwater levels largely reflect current and past mining activities, with water levels varying with time and location according to local mining activities.

The LCO Water Management Plan (WMP) documents the processes and responsibilities of all aspects of the site water management system. During December 2015, and in response to a 2015 ITARP investigation, LCO submitted a modified WMP. The modified WMP, which is the current plan, was approved on 21 January 2016.

The WMP groundwater monitoring program adopts site specific trigger levels for impact investigation and assessment. If monitoring results suggest significant and continuous deviation from historical or background trends in water quality, further investigations into potential impacts are conducted. It is highlighted that, due to changes in land-use in the vicinity of LCO through both mining and agriculture, as well as local variability in groundwater conditions, there is limited opportunity for establishment of groundwater reference sites, hence the appropriateness site specific trigger levels based on historical measurements. Currently, investigations into potential impacts are conducted if there are three consecutive exceedances of the nominated triggers.

Table 26 presents the current site specific trigger levels for water level and groundwater quality. Monitoring results observed during the reporting period are summarised in following sections. The groundwater monitoring locations (compliance and management bores) are shown on **Figure 19.**

Table 26 Groundwater quality impact assessment criteria

Groundwater Impact Assessment Criteria							
		Groundwater Elevation (mAHD)		**EC (µS/cm)**			**pH**
		Collar	**10th%ile**	**Ref. Minm**	**80%ile**	**Max**	
Alluvial and Shallow Bedrock Aquifers							
ALV1	Alluvial aquifer (L)	111.19	105.69	104.88	1520	2020	6.5 – 8.5
	Shallow bed rock (S)	111.19	105.97	104.35	1580	1770	
LBH	Alluvial aquifer (L)	110.79	102.21	104.55	1690	3090	
ALV3	Alluvial aquifer (L)	109.51	103.19	102.43	1490	3080	
	Shallow bed rock (S)	109.51	102.88	102.25	2630	4510	
ALV4	Alluvial aquifer (L)	107.70	101.76	94.86	2200	3080	
	Shallow bed rock (S)	107.70	101.03	100.28	5380	6430	
ALV2	Alluvial aquifer (L)	97.88	92.97	91.12	2940	4160	
	Shallow bed rock (S)	97.88	92.96	89.35	2830	3370	
ALV7	Alluvial aquifer (L)	93.77	86.93	86.43	1900	2310	
	Shallow bed rock (S)	93.77	83.26	82.39	2260	2540	
ALV8	Alluvial aquifer (L)	92.02	84.98	83.66	1320	1880	
	Shallow bed rock (S)	92.02	82.18	80.94	2090	2400	
Hard Rock Aquifers (Coal Measures)							
PGW5	Overburden (L)	105.85	93.24	86.22	5050	6060	6.5 – 8.5
	Coal Measure (S)	105.85	94.76	94.48	5770	6820	

7.3.2 Monitoring Results Review

Groundwater quality of Alluvial and Shallow Bedrock Aquifers

Long term groundwater quality monitoring results for the alluvial and shallow bedrock aquifers including the reporting period is shown in **Figure 20** to **Figure 24** and in **Appendix E**; a summary of these results is provided below.

Table 27 Groundwater exceedances for pH in alluvial and shallow bedrock aquifers**Table 27** presents the pH trigger level exceedances. During the reporting period, there were no exceedances of the 6.5 to 8.5 trigger values.

Table 27 Groundwater exceedances for pH in alluvial and shallow bedrock aquifers

Borehole	Month	Limit	Measurement	TARP Trigger type (Monitoring, Investigation, Management)
N/A	N/A	N/A	N/A	N/A

In the period July 2016 to December 2016, for the alluvial piezometers, there is an increasing trend in pH to a pH of 7.5 to 8.0 compared to the period January 2016 to June 2016, where pH was 7.0 to 7.5. A similar trend is observed with respect to the shallow bedrock piezometers.

Historically, there was an increase in pH observed in December 2013 and in December 2014 to a pH of 8.5; as illustrated in **Figure 20** and **Figure 21**. It is considered that the current increase in pH will follow the same trend, decreasing within a 6 month period. Investigation at the time concluded that the increase in pH was not mining-related and likely due to climatic variance. The monitoring program will continue to be implemented to observe any change in groundwater pH.

During the reporting period, a number of consecutive exceedances of the 80%ile trigger limits occurred; investigations were undertaken and are outlined below.

Table 30 below summarises the EC measurements of the groundwater with comparison to the applicable trigger levels. Trigger Action Response Plan (TARP) investigations undertaken in accordance with the WMP are summarised below. Long term monitoring results are shown in **Figure 23** and **Figure 24.**

Table 28 Groundwater exceedances for EC in alluvial and shallow bedrock aquifers

Site	ALV1L	ALV1S	LBH	ALV3L	ALV3S	ALV4L	ALV4S	ALV2L	ALV2S	ALV7L	ALV7S	ALV8L	ALV8S
80th%ile	**1520**	**1580**	**1690**	**1490**	**2630**	**2200**	**5380**	**2940**	**2830**	**1900**	**2260**	**1320**	**2090**
Maximum	**2020**	**1770**	**3090**	**3080**	**4510**	**3080**	**6430**	**4160**	**3370**	**2310**	**2540**	**1880**	**2400**
Jan													
Feb					2950				2860	1940			
Mar					2780								
Apr					2860								
May					2960								
Jun					2980								
Jul					3000								
Aug					2160								
Sep													
Oct					2830								
Nov					2880								
Dec					2720								

Orange Shading – Denotes an exceedance of the 80%ile investigation limit

Red Shading – Denotes an exceedance of the 100%ile maximum investigation limit

ALV3S Investigation – May 2016

During the reporting period, there was an exceedance of the 80th percentile trigger level value at piezometer ALV3S in May 2016, defined as three (3) consecutive exceedances of the adopted 80th percentile trigger value. An investigation was undertaken by an external hydrogeologist.

The investigation is summarised as follows:

- Above average rainfall was received between November 2015 and January 2016 which led to a temporary increase in groundwater elevation at site ALV3S.
- It was interpreted that this constituted a groundwater recharge event that then led to enhanced water-rock interaction / mobilisation of salts within the shallow bedrock.
- Depending on the magnitude of rainfall received over a discrete period, a groundwater recharge event may lead to a decrease in groundwater salinity (due to dilution) or an increase in groundwater salinity (due to enhanced water-rock interaction and/or re-saturation and mobilisation of salt within intermittently saturated portions of the aquifer).
- It was concluded that minor transient exceedance of EC at ALV3S and elsewhere will not have an adverse impact on the environment and it was considered that there was no potential harm due to the exceedance, as it was a naturally occurring response of the aquifer and not mining-related.

ALV3S Follow-Up Investigation – December 2016

A follow-up investigation was undertaken in February 2017, in accordance with the recommendations from the May 2016 investigation that the exceedance in ALV3S be reviewed at the end of 2016.

The investigation is summarised as follows:

- Groundwater elevation data at site ALV3 did not indicate an adverse change with respect to alluvium or shallow bedrock during 2016. The minor vertically downward hydraulic gradient between the alluvium and bedrock also remained consistent with historical observation.
- Groundwater quality at site ALV3S continued to remain high throughout the rest of 2016. Groundwater quality at ALV3S exhibits more variability than other shallow bedrock piezometers. It was interpreted that this is due to, in part, to the very minor vertically downward hydraulic gradient at this site. With a minor vertical hydraulic gradient, the potential for groundwater flow from the alluvium into the shallow bedrock is low. With limited vertical groundwater flow, it would be expected that groundwater quality in the bedrock (a lower permeability unit compared to the alluvium) would be different to groundwater quality in the alluvium, as is observed. It would also be expected that there would be higher variability in quality due to reduced 'flushing'.
- It was concluded that groundwater quality (as salinity) at ALV3S continues to reflect natural variation due to climatic factors and do not show a mining-related impact. It was also concluded that there continues to be no potential for harm to the environment due to currently elevated groundwater salinity, as it remains within the historical range.

It is noted that recommendations were also provided in the follow-up investigation of ALV3S that an internal review step be added to the TARP, whereby climatic factors are reviewed prior to the requirement to engage an external hydrogeologist.

Review of monitoring data (EC) with respect to alluvial piezometers indicates a generally stable trend through 2016. Review of monitoring data (EC) with respect to the shallow bedrock piezometers also indicates a generally stable trend through 2016, including with respect to ALV3S.

Groundwater quality of Hard Rock Aquifer (Coal Measures)

Long term groundwater quality monitoring results for the hard rock aquifers including the reporting period is shown in **Figure 22 , Figure 25** and in **Appendix E**; a summary of these results is provided below.

Table 29 presents the groundwater pH and EC exceedances in the Hard Rock Aquifer (Coal Measures). Monitoring piezometer PGW5L is installed into the overburden and piezometers PGW5S is installed into the Pikes Gully coal seam.

Monitoring of piezometers at site PGW5 is used to inform LCO on groundwater pressurisation of the strata between the Bowmans Creek shallow bedrock and lower overburden and underground workings

Table 29 Groundwater exceedances for EC and pH in hard rock aquifers

Site	PGW5L	PGW5S	PGW5L	PGW5S
80th%ile	**5050**	**5770**	**6.5 – 8.5**	
Maximum	**6060**	**6820**		
Jan				
Feb	5060	5790		
Mar				
Apr				
May				
Jun				
Jul				
Aug				
Sep				
Oct	5090	5840		
Nov	5260	6010		
Dec	5060			

Orange Shading – Denotes an exceedance of the 80%ile investigation limit

Red Shading – Denotes an exceedance of the 100%ile maximum investigation limit

PGW5L Investigation – December 2016

During 2016, there was an exceedance of the 80th percentile trigger value at PGW5L in December 2016, defined as three (3) consecutive exceedances of the adopted 80th percentile trigger value. An investigation was undertaken in February 2017 by an external hydrogeologist.

The investigation is summarised as follows:

- The vertical hydraulic gradient at site PGW5 fluctuates between upward and downward flow direction, due to naturally occurring processes. Accordingly, groundwater quality in PGW5L and PGW5S is quite similar and does not vary over a significant range.
- There is has been no mine-related activity in the vicinity of site PGW5. The closest open-cut workings (Entrance Pit) is located approximately 950m to the west and there is no immediately adjacent water store.
- Review of groundwater elevation in the underlying underground workings, as indicated by Haz1, is 68.5mAHD as at 16 January 2017 and has been steady for many years. By comparison, the groundwater elevation at site PGW5 is ~96mAHD. There is no indication that a change in hydraulic connection to the underground has occurred.
- It was concluded that the exceedance at PGW5L was due to natural variability and, similarly, recent elevated levels in PGW5S also reflect natural variability. Assessment indicated no potential harm to the environment due to continuing exceedance of the site specific trigger value.

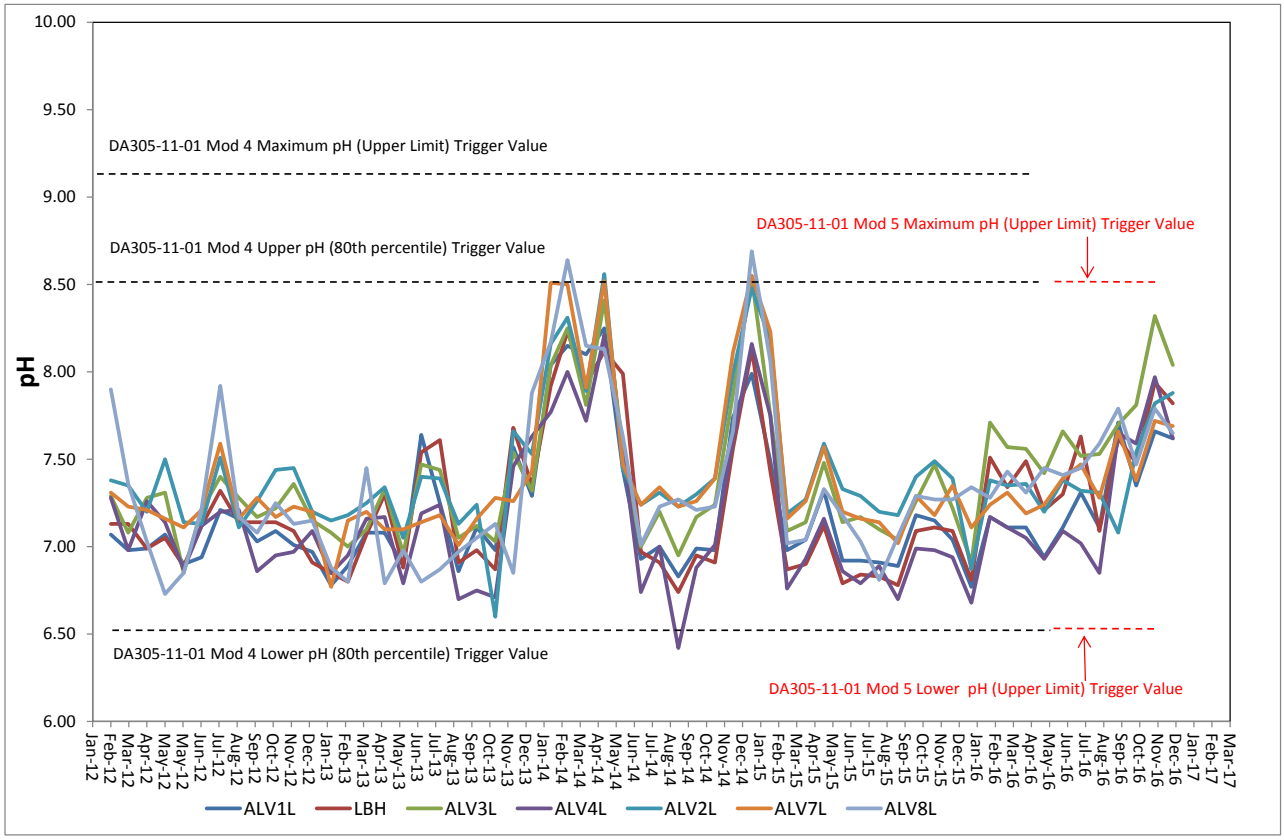


Figure 20 Groundwater pH data in alluvial bores – 2012 to 2016

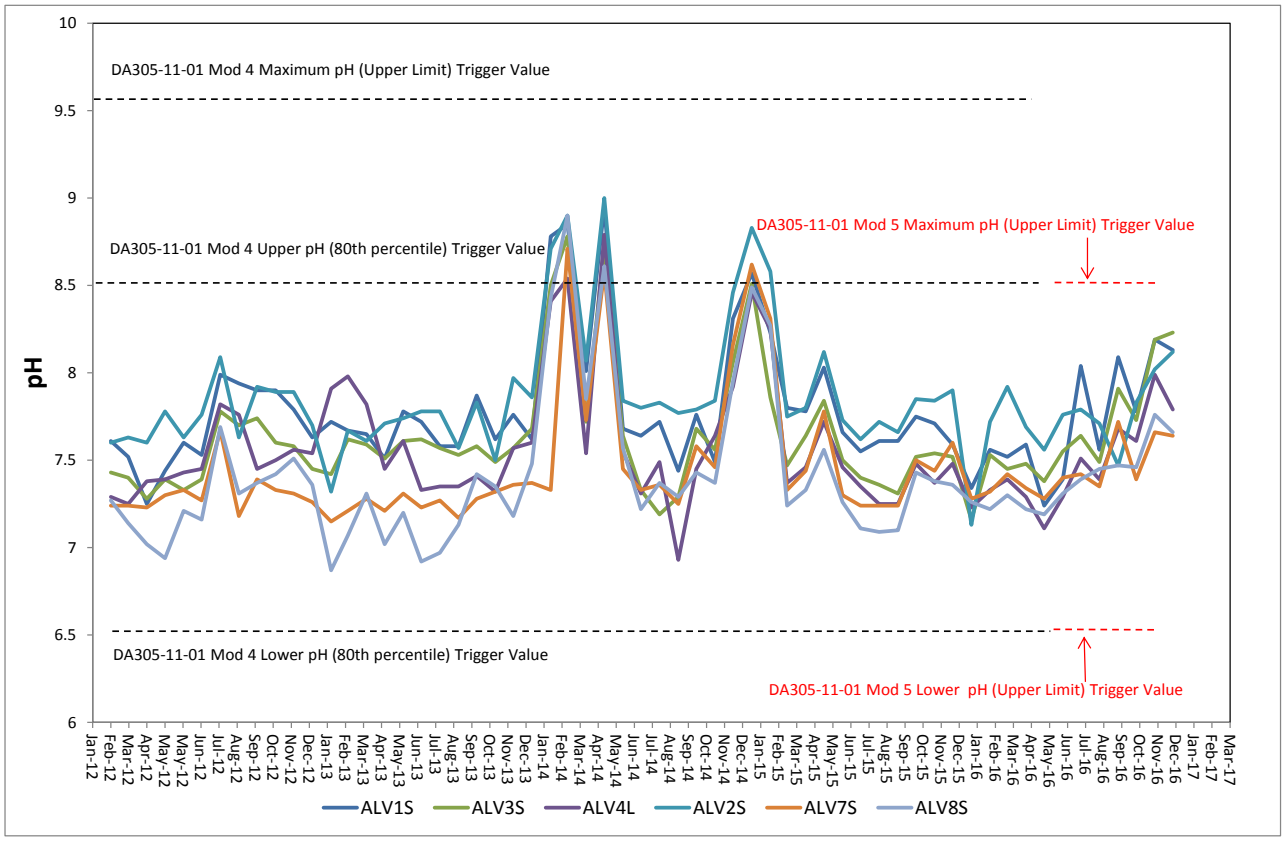


Figure 21 Groundwater pH data in shallow bedrock (overburden) bores – 2012 to 2016

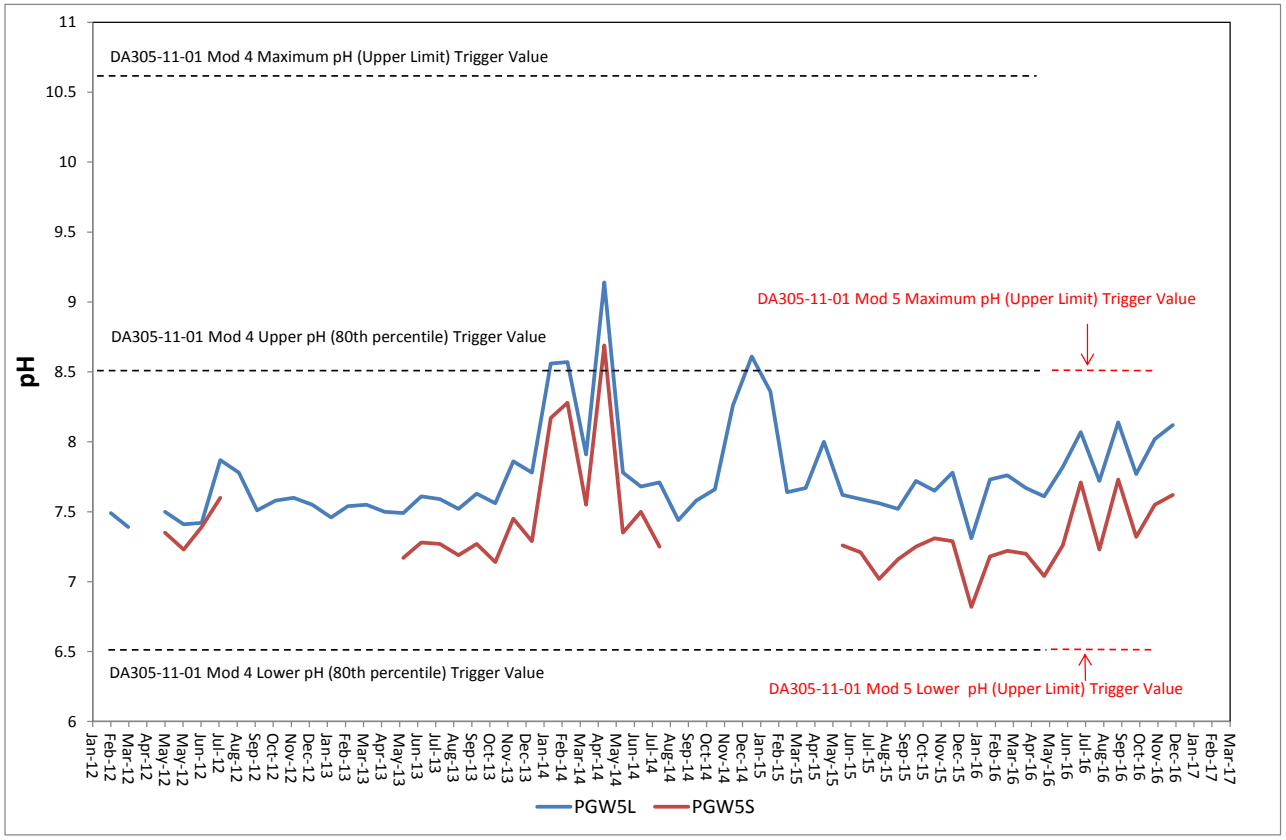


Figure 22 Groundwater pH data in hard rock (overburden & coal measure) piezometers – 2012 to 2016

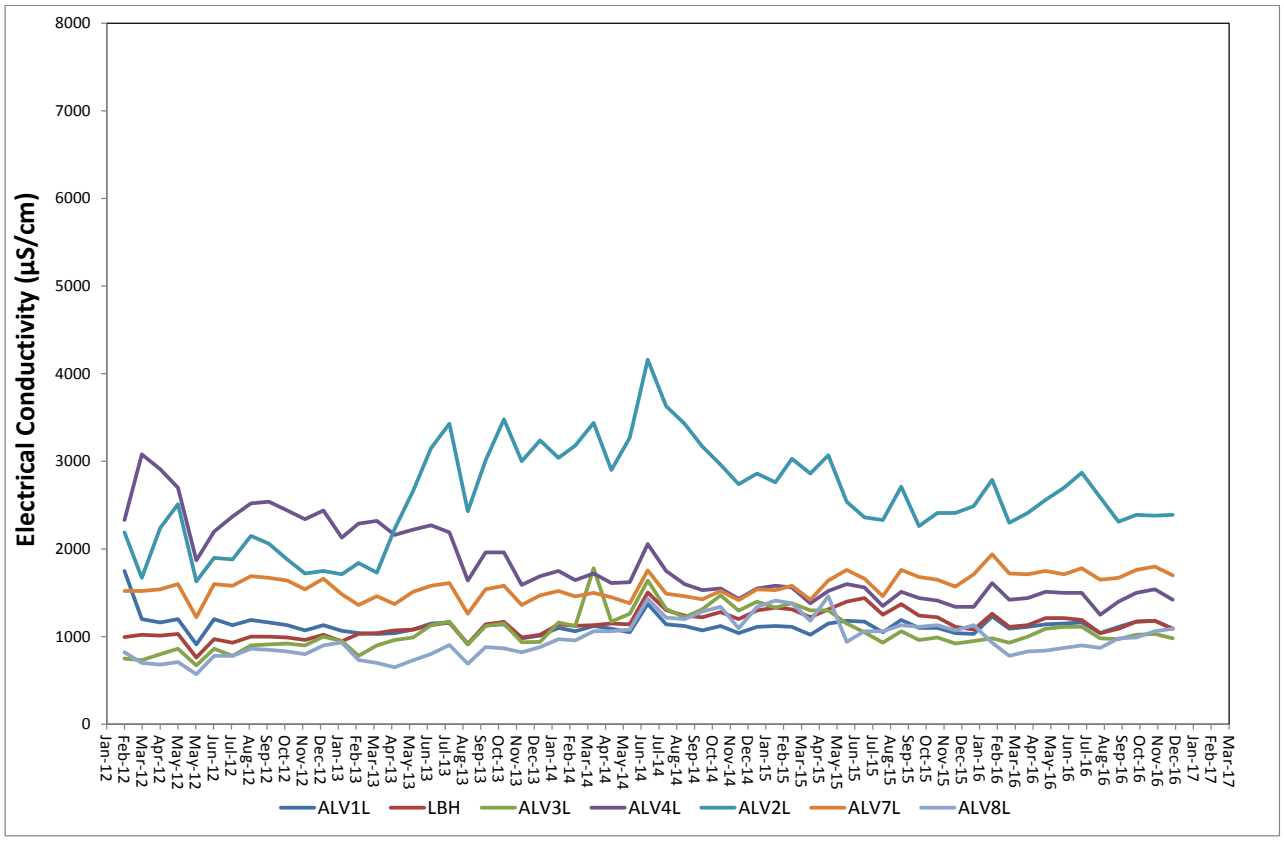


Figure 23 Groundwater Salinity (EC) in alluvial bores – 2012 to 2016

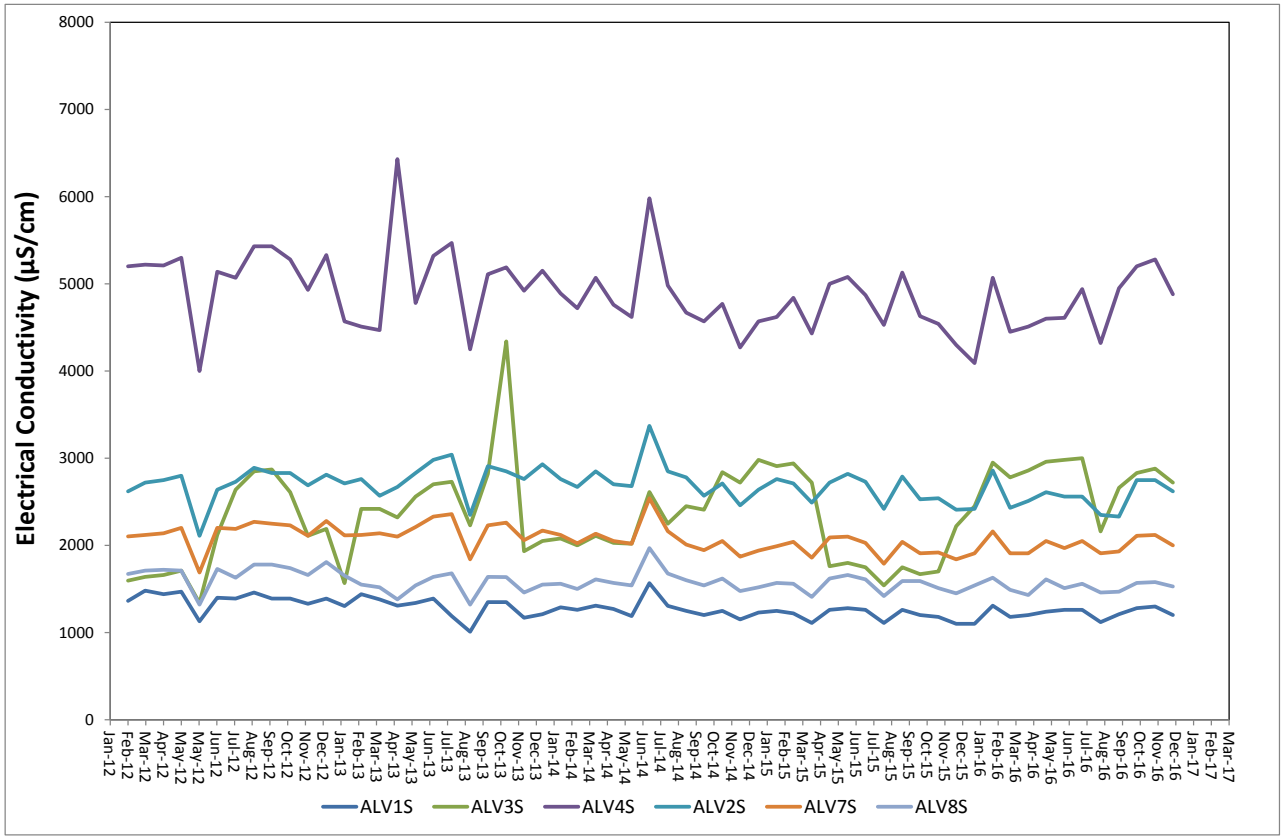


Figure 24 Groundwater Salinity (EC) in shallow bedrock (overburden) bores – 2012 to 2016

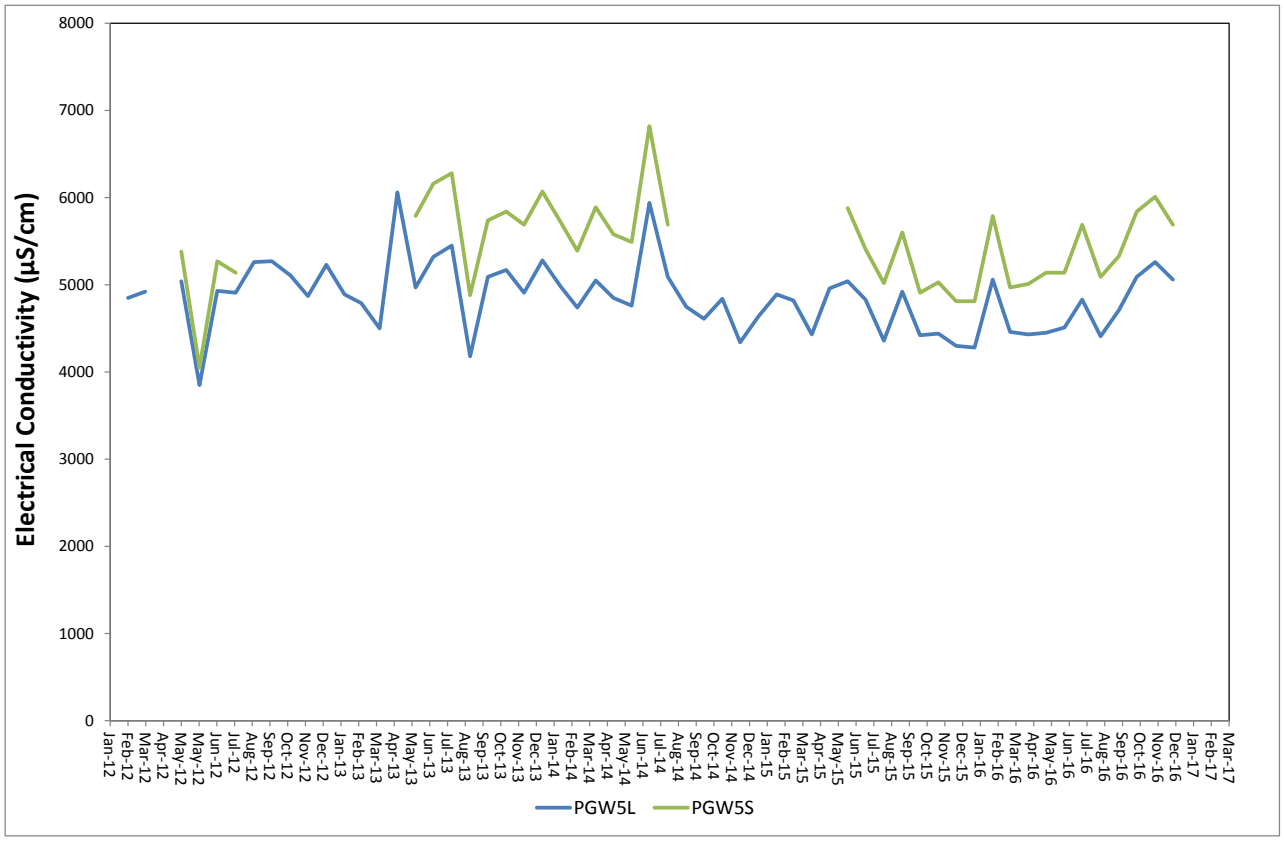


Figure 25 Groundwater Salinity (EC) hard rock (coal measures) bores – 2012 to 2016

Groundwater Levels of Alluvial and Shallow Bedrock Aquifers

LCO monitor the groundwater level of the Bowmans Creek Alluvial and Shallow Bedrock Aquifers to identify any potential impacts from mining such as depressurisation. Hydrographs for piezometers targeting the alluvium and shallow bedrock are displayed in **Figure 26** and **Figure 27** respectively.

The residual mass curve for rainfall is also presented in **Figure 26** and **Figure 27**. The residual mass curve for rainfall calculates the difference between observed rainfall and the average amount of rainfall for that time of the year (defined monthly). This was developed from the SILO dataset (Station No. 061208 at Ravensworth). The SILO dataset consists patched (infilled and interpolated) climatic data throughout Australia. Patching climatic data is necessary to fill in any missing observations days, for example.

Groundwater elevations within the water table aquifer decrease with distance downstream. Generally speaking, this is because the elevation of the water table within a near surface aquifer (for example, the water table aquifer at LCO), is a subdued reflection of surface topography. I.e. in the same way that a surface water course flows from high topographic elevation to low topographic elevation. The steepness of the hydraulic gradient (slope of groundwater elevation with distance down-gradient) reflects other factors including the permeability of aquifer material, differences in propensity for recharge as well as groundwater/surface water interaction.

The sympathetic response in water levels observed in the paired bores indicate similar processes are driving the recharge for both the alluvial aquifer and shallow bedrock aquifer. The different absolute levels for the paired bores reflect the different hydraulic connectivity between the alluvium and shallow bedrock. Water level relationships show a shift from slight upward pressures (gaining stream) upstream (ALV1), through to equal pressures adjacent to LCO (ALV3, ALV4, ALV2) to slight downward pressures (losing stream) to the south (ALV7, ALV8). Rainfall (recharge) appears to be the dominant driver for groundwater level variability for the Bowmans Creek alluvium.

During 2016, there were no exceedances of the groundwater level trigger values.

Table 30 presents the groundwater level exceedances.

Table 30 Groundwater level trigger exceedances

Borehole	Month	Limit	Measurement	TARP Trigger type (Monitoring, Investigation, Management)
N/A	N/A	N/A	N/A	N/A

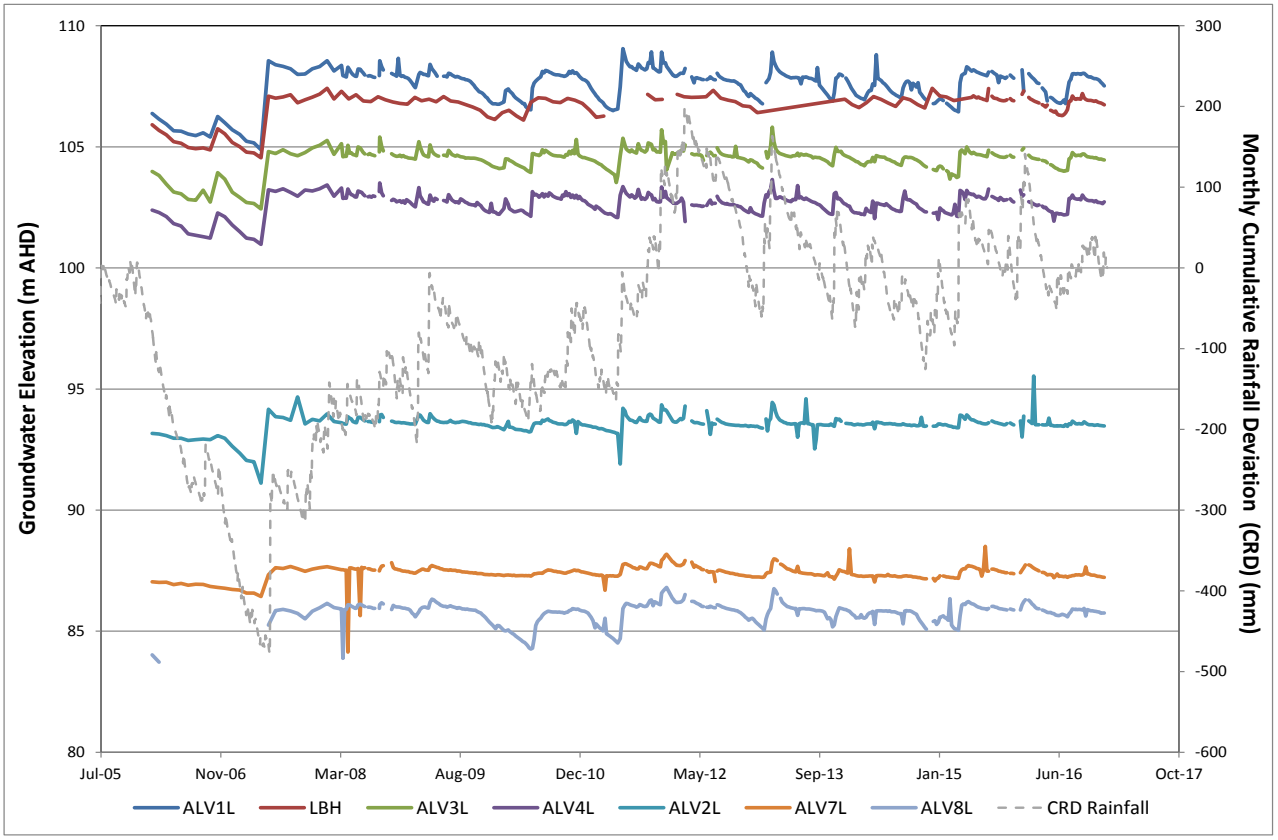


Figure 26 Groundwater level data in alluvial bores – 2006 - 2016

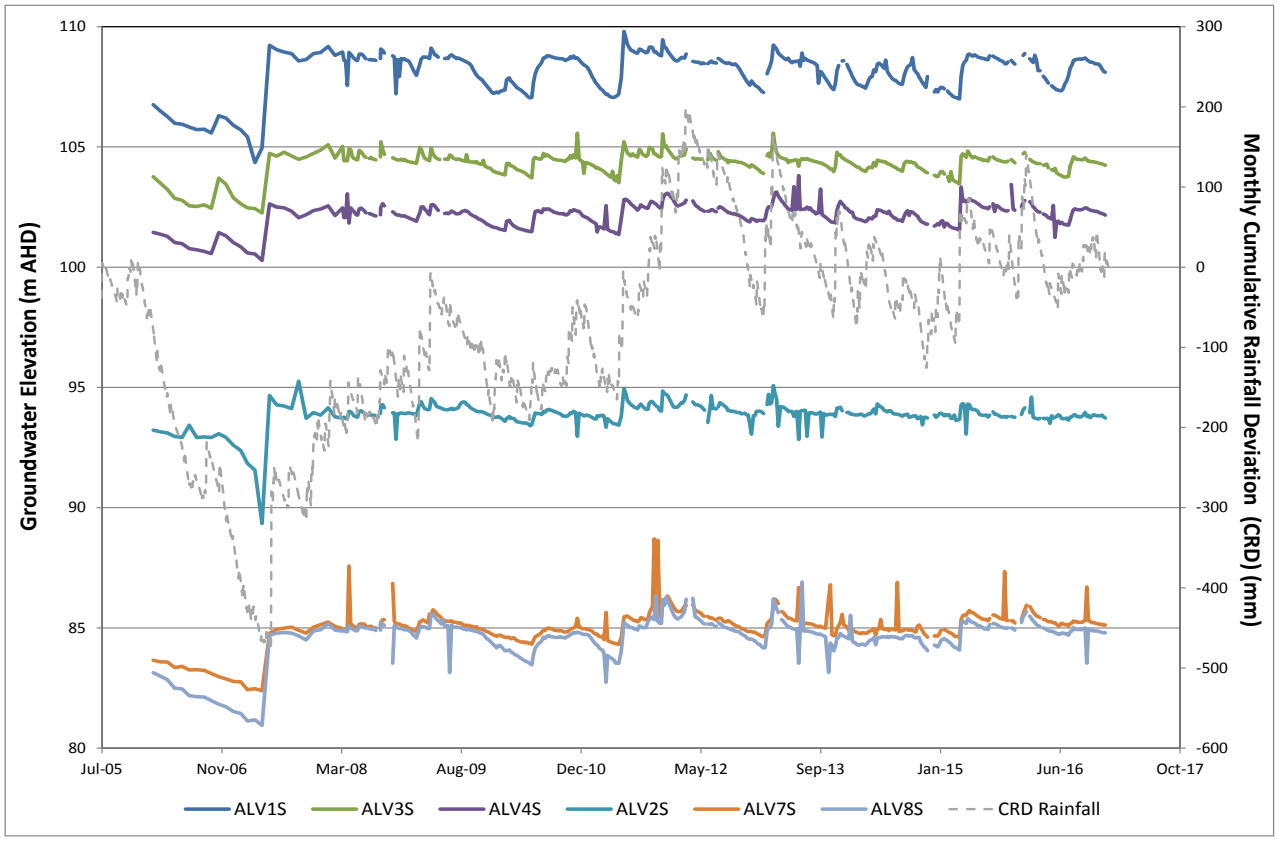


Figure 27 Groundwater level data in shallow bedrock bores – 2006 - 2016

Groundwater Levels of Hard Rock Aquifer (Coal Measures)

LCO monitor a number of hard rock aquifers to provide for the ongoing water management onsite. Hydrographs for piezometers targeting the regional hard rock aquifer associated with the coal measures are shown in **Figure 28**. The groundwater elevations shown vary significantly between the piezometers monitored, reflecting differences in groundwater levels between different stratigraphic layers and as a consequence of recent and historical mining and dewatering operations. There are no investigation groundwater trigger levels for monitoring of these water bodies.

Of note, in general, is the significant difference in groundwater elevation between the alluvial and shallow bedrock piezometers and groundwater elevations maintained in the previous underground workings, as indicated by 8 South (whilst available), M49 and Middle Liddell. Piezometers PGW5L and PGW5S overlie the previous Hazeldene workings. From **Figure 28**, there is no groundwater level response at site PGW5 to changes in groundwater elevation in Hazeldene monitoring locations.

Hydrographs for piezometers LC1 and Mt Owen 2 are also similar, suggesting these bores are hydraulically connected through the former Liddell underground workings. Groundwater levels in the Liddell underground workings are subject to depressurization due to dewatering activities to accommodate current open cut mining operations at LCO. Piezometer LC1 has been dry since July 2010 as a result of these dewatering activities.

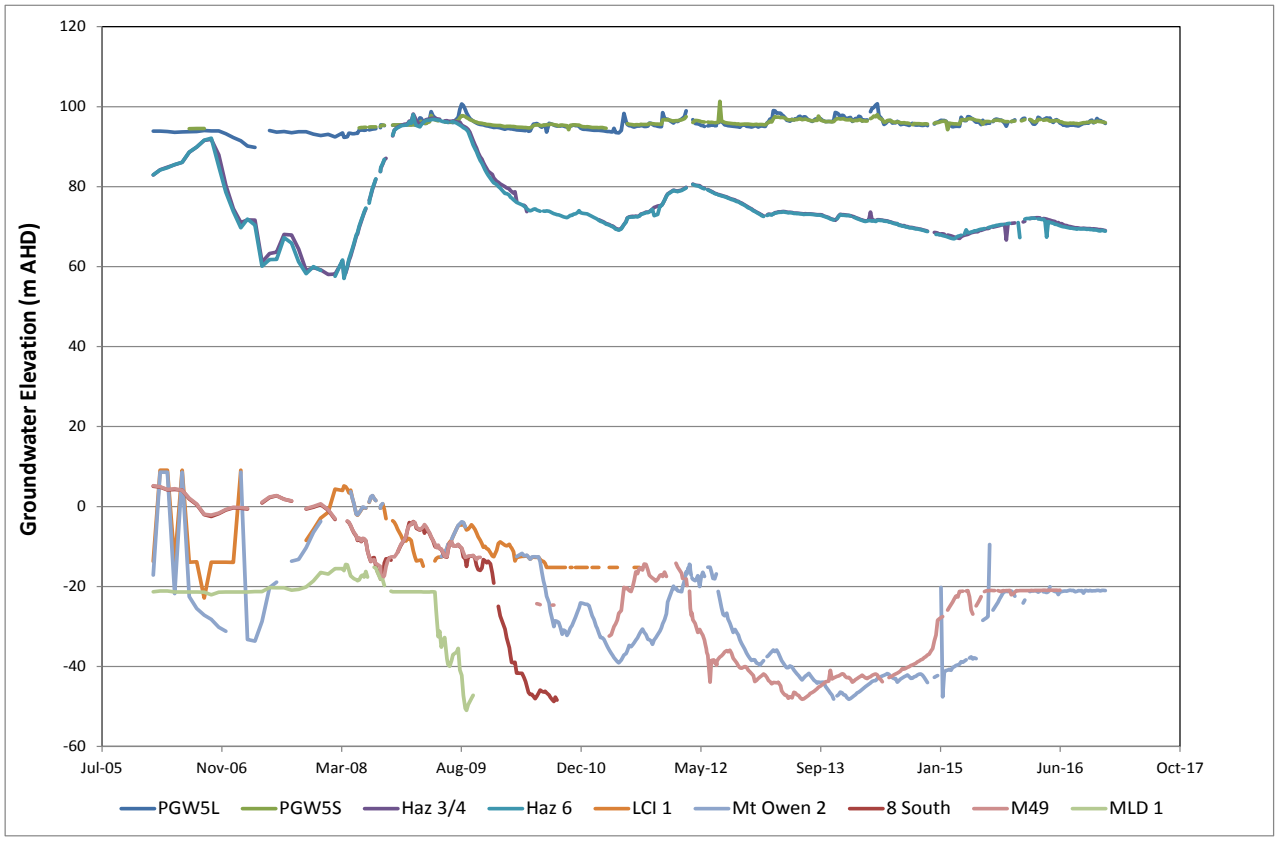


Figure 28 Groundwater level data in hard rock (coal measures) bores – 2006 – 2016

8 Rehabilitation

8.1 Post Rehabilitation

Post mining land use options for LCO were reviewed and assessed for the preparation of the Rehabilitation Strategy included in the MOD 5 EA (Umwelt, 2013). The proposed final landform and final land uses are depicted on Plan 4 of the 2015 Mining Operations Plan (MOP) and are outlined in the sections below. Features of the proposed final landform and final land uses are described below.

The proposed final landform and land use for LCO is shown in **Figure 29** and includes woodland habitat corridors that connect with proposed native vegetation rehabilitation at Ravensworth Operations, Mount Owen Complex and the Ravensworth Operations Hillcrest Offset Area. Additionally, habitat enhancement will be undertaken along Bowmans Creek to enhance habitat specifically for the Spotted-tailed Quoll. Regeneration works associated with Bowmans Creek are documented in the 2015 Biodiversity Management Plan.

The overall objectives of the proposed post-mining land use design are:

- to contribute to effective native corridors through the area which promote fauna movements between Ravensworth Operations, Mt Owen Complex, Lake Liddell and the Ravensworth Operations Hillcrest Offset Area;
- to maintain and provide additional suitable habitat for the spotted-tailed quoll (Dasyurus maculatus maculatus) identified during fauna monitoring programs in 2012, particularly around the Bowmans Creek area;
- to provide opportunities for future agricultural activities such as sustainable grazing;
- to improve the visual amenity of the area; and
- not to preclude other potential post mining land use options should they be determined to be viable and preferable as part of the detailed mine closure planning process that commences at least five years prior to the planned cessation of mining.

8.2 Current Status

Rehabilitation and disturbance status of the operation as at the end of the reporting period is shown in **Figure 30**. The figure shows the extents of mining related disturbance and rehabilitation completed to date (differentiated between grassland and woodland type) and 10m contours. During the reporting period, LCO completed rehabilitation and disturbance activities as detailed in the MOP. **Figure 31**Figure 30 shows the 2016 proposed, actual completed rehabilitation and forecast 2017 rehabilitation.

Table 31 Rehabilitation Status

Rehabilitation Status			
Mine Area Type A	Previous Reporting Period (Actual ha)	This Reporting Period (Actual ha)	Next Reporting Period (Forecast ha)
	2015	2016	2017
A: Total mine footprint	1518	1529	1580
B: Total active disturbance	34	11	51
C: Land being prepared for rehabilitation	729	771	801
D: Land under active rehabilitation	0	0	0
E: Completed rehabilitation	0	0	0

[A] – Area types as defined in the NSW Government Annual Return Guidelines.

No rehabilitation areas onsite have been assessed against the MOP completion criteria for the purpose of formal relinquishment.

Rehabilitation performance with respect to the MOP performance Indictors/Completion Criteria was reviewed as part of the monitoring completed in 2016. Additionally, annual biodiversity monitoring was completed in 2016 as per the Biodiversity Management Plan (BMP). The results of both of these monitoring programs and comparison to performance criteria are presented in **Section 8.3.** Full details of the monitoring programs completed are available on the LCO website.

MOP Rehabilitation Commitments

During 2016, LCO completed rehabilitation generally in accordance with the approved MOP. While LCO total rehabilitation did not meet the 2015 MOP commitments, during 2016 LCO committed to and successfully achieved additional rehabilitation areas and decreased the rehabilitation deficit to zero. **Table 32** shows the hectares put forward in the MOP, actuals as well as the variance. Disturbance during 2016 has remained generally aligned with the MOP with negative variance due to the operation not being as far developed as planned in the MOP. During Q1 2017, LCO has received approval of a MOP amendment to realign the operational progress and the MOP with regards to disturbance and rehabilitation. Within the next reporting period, LCO forecasts to complete 51ha of disturbance and 30ha of rehabilitation.

Table 32 MOP rehabilitation status

	MOP		Full Year Actual		Variance	
	Disturbance (ha)	**Rehabilitation (ha)**	**Disturbance (ha)**	**Rehabilitation (ha)**	**Disturbance (ha)**	**Rehabilitation (ha)**
2015	28.70	61.90	33.66	45.50	4.96	-16.40
2016	29.60	22.7	11.3	42.0	-18.3	19.3
			Total variance		-13.3	2.9

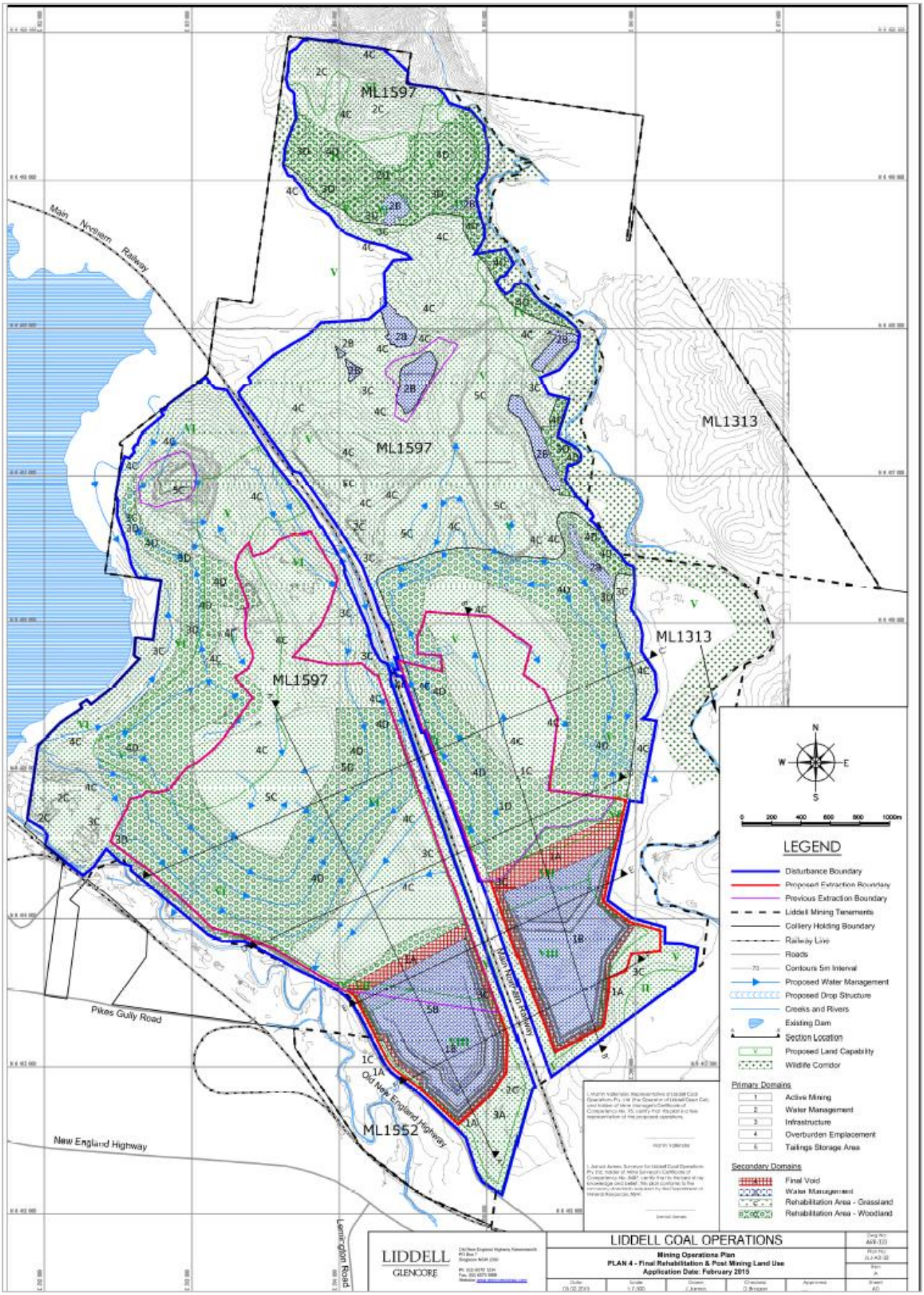


Figure 29 MOP Plan 4 – Current approved final landform

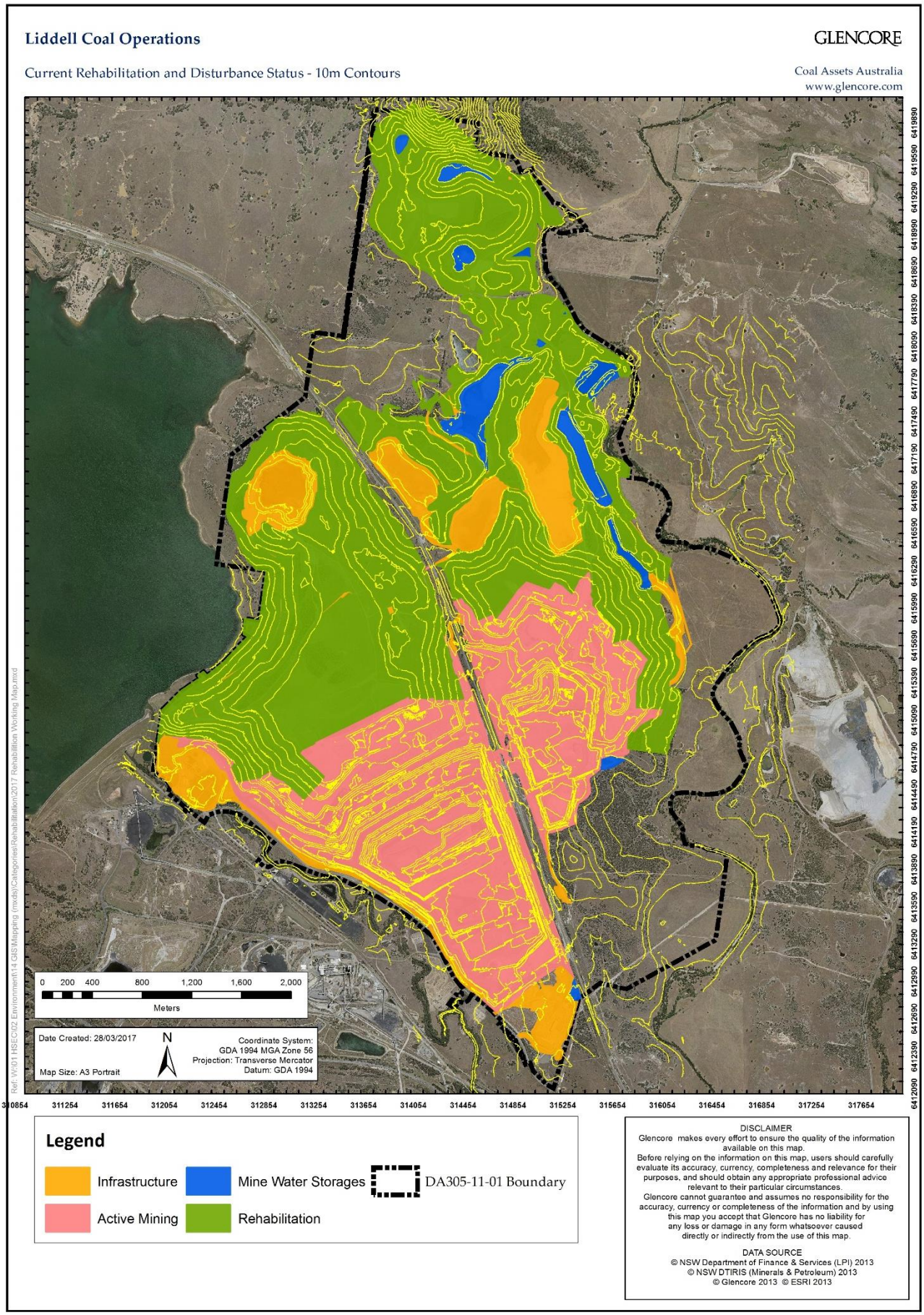


Figure 30 Current rehabilitation and disturbance status

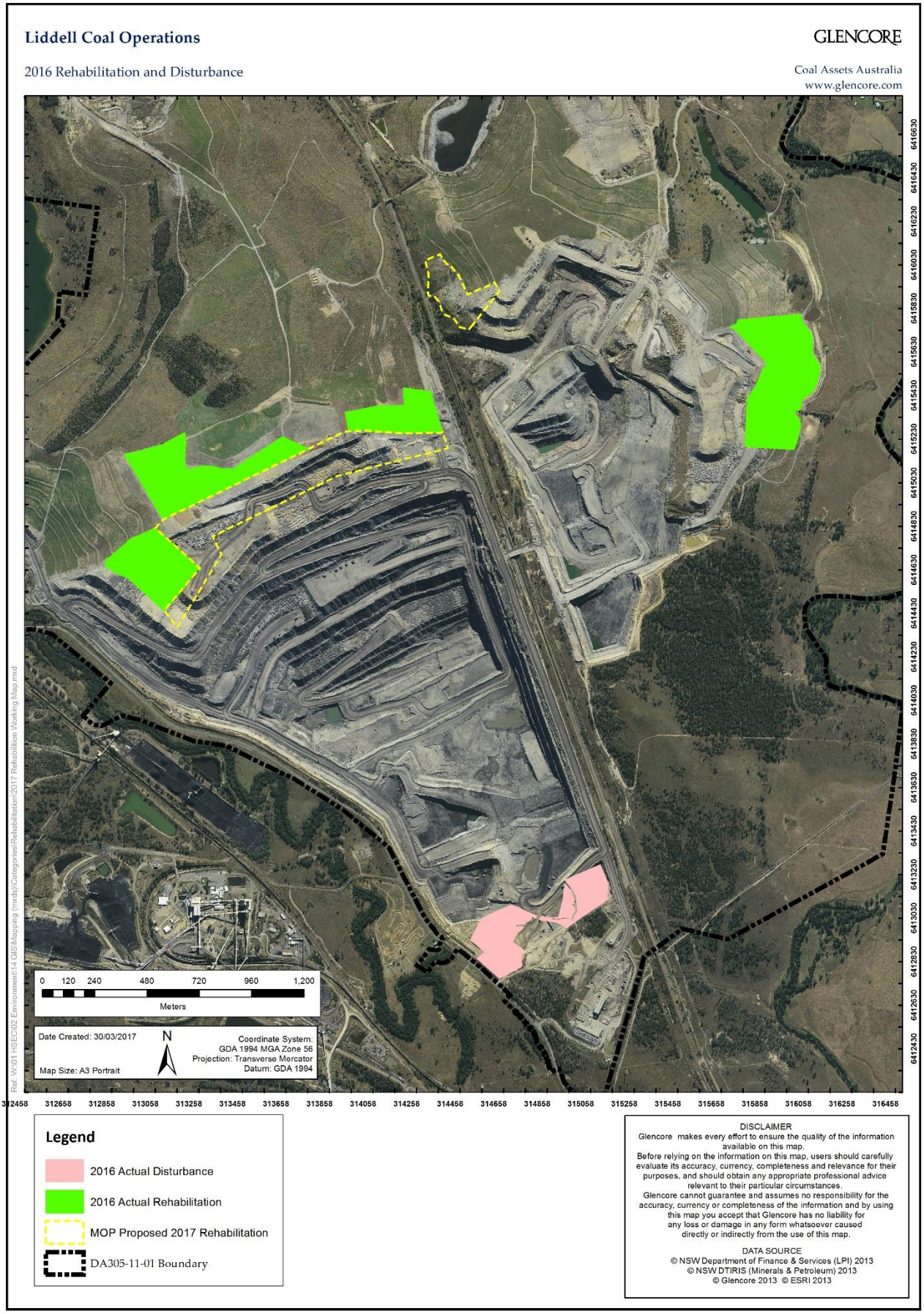


Figure 31 Rehabilitation and disturbance during 2016 and 2017

8.3 Biodiversity Management

During 2016, LCO continued to operate in accordance with the approved MOP and BMP which detail the rehabilitation practices/monitoring and biodiversity practices/monitoring respectively. The detailed rehabilitation and biodiversity monitoring was completed in accordance with the MOP and BMP with the findings summarised below. **Appendix G** includes a summary of the current operational status compared with the MOP completion criteria. **Appendix H** includes a summary of the rehabilitation establishments works completed during 2016.

8.3.1 Biodiversity Monitoring Summary

As part of the approved DA305-11-01 Mod 5, LCO developed a Biodiversity Management Plan (BMP). The objectives of the BMP are to provide direction for the short to long term management and enhancement of the biodiversity values of the BMP Area, as well as to provide a detailed description of the measures to be implemented to achieve this over the next three years (as per the State requirements). LCO's performance tracking towards the objectives is detailed in the section below. The BMP area is defined as all land within the DA305-11-01 consent boundary excluding any biodiversity offset areas and includes rehabilitation areas and remnant vegetation.

In general remnant vegetation sites have maintained broadly consistent vegetation and fauna diversity and abundance since monitoring commenced in 2012. Both provide a range of habitat features that have remained intact and unaltered by mining and mining-related activities. Although not currently impacting on overall condition, introduced species should continue to be managed for continual suppression (with emphasis on noxious species as well as suppressing introduced grasses (particularly at R01)) to ensure that these areas remain in a similar if not improved state. Recent introduced species management works have been undertaken with some success however are not necessarily reflected in plot data as activities have not been directly undertaken within monitoring sites.

Other key findings of the 2016 biodiversity monitoring program were as follows:

- There was a decrease in threatened fauna observed at one monitoring location during 2016 compared to previous years. However, this reduction was not a result of any observable habitat changes. Despite no threatened species being observed, overall fauna diversity was higher in 2016 than any previous monitoring event.
- Stygofauna monitoring indicated a substantial decline to the diversity but the cause of this decline is unknown as no substantial changes over time have been observed to groundwater quality; however these will be subject to ongoing monitoring.
- There has not been a notable increase in the extent of feral species presence.

LCO will continue to implement the BMP commitments and recommendations detailed in the 2016 BMP monitoring report.

As per the BMP, LCO will prepare an Annual Ecological Monitoring Report (AEMR) which will document the monitoring methods and results from the winter monitoring period through to the autumn monitoring period. The intent of this report will be to provide a comparison of the data collected with previous monitoring event and to provide (where necessary) ongoing management recommendations and ameliorative methods to ensure the biodiversity within the BMP area is subject to a positive feedback loop. The full report summarising the method and results of the 2016 Annual Ecological Monitoring Program is available on the LCO website.

Biodiversity Management Performance Indicators

The performance indicators and completion criteria for the short and medium term biodiversity management are identified in the BMP. Completion criteria are objective target levels or values assigned to a variety of indicators (i.e. slope, species diversity, groundcover etc.), which can be measured against to demonstrate progress and ultimate success of rehabilitation. As such, they provide a defined end point, at which point in time rehabilitation can be deemed successful and the lease relinquishment process can proceed.

The performance indicators are for the first three years of the implementation of this BMP are used to assist in demonstrating how management actions are progressing towards achieving completion criteria.

The completion of and performance against each of these indicators/criterion is summarised in **Table 33** below based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 33 BMP performance indicator summary

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
Year 1 2016			
Fencing, Signage and Access Control			
Complete inspection of all fencing of BMP Area to map locations, condition and identify need for new fencing or redundant fencing.	Complete inspection of all fencing of BMP Area to map locations, condition and identify need for new fencing or redundant fencing.	All actions identified from inspection in year 1 have been implemented.	Compliant. Fence line condition mapping completed.
Fencing of relevant parts of BMP area.	Fencing occurs, based on outcomes of inspection.	All biodiversity offset areas and relevant parts of the BMP area (being retained vegetation, rehabilitation and waterways) will have boundary fencing of appropriate design and condition.	Compliant. Commenced identified fencing works.
Any new fencing does not have barbed wire on upper strands and as little barbed wire generally as possible. The bottom strand will be plain wire and elevated to allow faunal passage (while maintaining cattle exclusion).	New fences are installed without barbed wire on upper strands and an elevated plain wire bottom strand.	New fences are constructed with as little barbed wire as possible, with none on upper strands and an elevated plain wire bottom strand.	Compliant. New fencing installed to the appropriate specification.
Removal of redundant fences.	Inspection undertaken to identify redundant fences.	Redundant fences removed.	Compliant. Fence line condition mapping completed.
	Commence removal of redundant fences.		Redundant fence line removal commenced.
Minimum twice yearly inspections of fences to identify condition.	Inspections undertaken nominally in March and September.	All fences in functional condition.	Compliant. Inspections being completed as required.
	Damaged critical fences to be repaired within 1 week (temporary if needed), final repairs and non-critical repairs to be completed in 1 month.		Compliant.

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
Information signage for the spotted-tailed quoll.	Signs will be installed along access tracks in areas of spotted-tailed quoll habitat (such as Bowmans Creek Corridor) to alert drivers to potential activity.	Information signage for the spotted-tailed quoll has been installed and maintained.	Compliant. Signage installed.
Access Track Maintenance			
New access tracks (only constructed where necessary) are subject to due diligence assessments.	Complete due diligence assessments for new access tracks to minimise impact on biodiversity, where possible.	New access tracks are only constructed where necessary, are subject to due diligence inspections	Compliant. New access tracks are installed in accordance with the BMP and subject to preclearance due diligence.
Minimum twice a year BMP Area inspections to identify track conditions.	Inspections undertaken nominally in March and September.	Tracks maintained in good usable condition.	Compliant. Inspections being completed as required.
	Action and repair track damage.		
Rehabilitation of unnecessary access tracks.	Tracks no longer required will be rehabilitated.	Unnecessary access tracks are rehabilitated.	Compliant. No access tracks required to be rehabilitated.
Topsoil Management			
Areas containing weeds that may pose a threat to rehabilitation are sprayed prior to topsoil stripping.	Pre-stripping weed control of topsoil is completed, as needed.	Weed control is completed prior to topsoil stripping (where required) to minimise future potential impact to rehabilitation success.	Compliant. Weeds are managed in line with Weed Action Plan. Preclearance survey identifies any weed infestations requiring further management.
Erosion, Sedimentation and Salinity			
Implement erosion and sediment controls during land clearing.	Actions required by Ground Disturbance Permit are implemented.	Appropriate erosion and sediment control measures required have been identified and implemented. There are no areas of significant erosion, sedimentation within the BMP Area due to land clearing.	Compliant. Erosion and Sediment Controls installed as per standard operating practices.
Creek and Drainage Line Protection			

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
Fencing/protection of LCO controlled side of riparian corridor (as part of Offset Management Plan).	Riparian corridor will be fenced from human and livestock access.	Riparian areas are adequately fenced/protected against damage from uncontrolled human or livestock access.	Compliant. Fencing maintained appropriately and inspected regularly to prevent damage. Monitoring did not identify any adverse impacts due to LCO operations.
Pathogen Management			
If reasonable potential for pathogens is identified in the BMP Area, appropriate pathogen monitoring and management protocols are developed and implemented.	If reasonable potential is identified, pathogens are considered in design and implementation of monitoring works.	Methods to identify potential pathogens are considered in monitoring program design (if reasonable potential of pathogen presence is identified onsite.	Compliant. Monitoring has not identified any requirement for additional pathogen management controls.
	If identified (or potential identified), management actions for specific pathogens are developed and implemented.	Signs of pathogen presence (or potential presence) are immediately reported.	N/A
		If suspected to be onsite, detailed management actions are developed and implemented.	N/A
		There is no onsite infestation of *Phytophthora cinnamomi,* Myrtle rust or Chytridiomycosis.	N/A
Seed Collection			
Where suitable remnant vegetation is available, implementation of seed collection and handling program for use in revegetation/rehabilitation works.	Pre-clearing surveys identify potential seed sources.	Rehabilitation/revegetation works use seeds collected onsite, thus maintaining as much genetic similarity (local provenance) as possible.	Compliant. Preclearance surveys assess the potential for seed collection opportunities. During 2016, no seed resources where identified in preclearance areas. Local provenance seed is used where possible in rehabilitation areas.
	Seeds are collected, stored and handled according to appropriate program.		
	Collected seed resources are used in revegetation/rehabilitation works.		

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
Vegetation Clearing			
Detailed pre-clearing procedure is to be implemented when clearing areas of woody native vegetation (including shrub, groundcover and isolated trees in grasslands).	Pre-clearing process is to be implemented as part of GDP process.	Pre-clearing process has been followed when required.	Compliant. Preclearance process followed and no fauna harmed during clearing activities. Habitat material salvaged and relocated to rehabilitation areas when possible. Appropriate records are maintained.
	Outcomes of pre-clearing process are recorded and recommendations are implemented.	Recommendations from pre-clearing process have been implemented, prior to tree felling if necessary.	
		Outcomes of pre-clearing procedure are recorded and readily accessible.	
Detailed tree felling process is to be implemented when clearing areas of woody native vegetation (including shrub, groundcover and isolated trees in grasslands).	Tree felling process is to be implemented as part of the GDP process.	Tree felling process has been followed when required.	
	Outcomes of tree-felling process are recorded and recommendations are implemented.	Recommendations from tree felling process have been implemented.	
Translocation Works			
Translocation of tiger orchids or other threatened flora species (if encountered during pre-clearing process) to biodiversity offset areas.	Tiger orchids identified during pre-clearing process are salvaged during the tree felling process and are translocated into biodiversity offset areas.	Tiger orchids (or other threatened flora species if encountered) are salvaged from Approved Modification Area and translocated into biodiversity offset areas.	Not translocation activities completed during 2016.
	Any translocated individuals are subject to regular monitoring and maintenance works, if required.	Detailed records are kept on the process, including regular monitoring and maintenance works as required.	
	Reporting of translocation works and monitoring works is maintained.		
Remnant Vegetation and Habitat Management			
Remnant vegetation is to be protected from accidental impact.	Areas to be disturbed will be clearly defined in the field to prevent accidental impact to remnant vegetation.	No areas of remnant vegetation are impacted unnecessarily.	Compliant. No accidental clearing occurred during 2016.

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
Remnant vegetation is protected from disturbance.	Remnant vegetation will be fenced or sign-posted as necessary to protect from disturbance.	Remnant vegetation is protected from disturbance such as accidental clearing, unauthorised access, erosion, weeds and feral animals.	Compliant. Clearing activities appropriately demarcated and managed to ensure no accidental clearing occurred during 2016.
	Annual inspections are completed to assess condition of fences and signs, areas of erosion concern, weeds or feral animals requiring control.		Compliant. Inspections being completed as required. Ecological monitoring of remnant areas completed and no impact from LCO recorded.
	Management works will be conducted, as necessary.		Compliant. Primarily weed management works are occurring in remnant areas.
Annual inspections undertaken by suitably qualified personnel to assess the extent of natural regeneration occurring.	Annual inspection undertaken by suitably qualified personnel to assess extent of natural regeneration occurring.	Areas where natural recruitment is not occurring have been identified and assisted regeneration is occurring if considered appropriate.	Compliant. Annual inspections completed by external professional. Management recommendations to be actioned on a ongoing basis.
	Appropriate action is undertaken if regeneration is deemed as being inadequate.		
Rehabilitation Works			
Criteria for these works are included within the Mining Operations Plan (SLR 2015). This includes detailed criteria for rehabilitation success (survival, succession, vegetation structure and health).			
Weed Control			
Complete weed inspections of BMP area every two months to document diversity and abundance of noxious weed records. This will then inform	Inspections completed every two months, followed by implementation of required control methods, as required.	Weed densities in rehabilitation/regeneration areas are no worse than those in remnant vegetation (analogue) sites.	Compliant. Inspections being completed as required with appropriate weed priorities actioned.

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
ongoing control actions (as needed), including timing, frequency, target species and methods to be used.		There are no significant weed infestations that are identified as a risk to rehabilitation or regeneration areas.	
Weed inspections of remnant and rehabilitation areas	Minimum twice yearly monitoring inspections are undertaken of rehabilitation areas to identify areas of weed infestation.	Regular inspections are undertaken for weed inspections and outcomes documented.	Compliant. Inspections being completed as required with appropriate weed priorities actioned. Annual Weed Action Plan completed and implemented. Annual monitoring undertaken and management recommendations actioned. Observed as being effective during monitoring and inspections.
	Annual inspections are undertaken of remnant vegetation to identify areas of weed infestation		
	Weed management actions of infestations are undertaken in accordance with current or other best practice approaches.		
Feral Animal Control			
Complete feral animal inspections of BMP area every two months to document sighting and abundance records. This will then inform ongoing control actions (as needed), including timing, frequency, target species and methods to be used.	Inspections completed every two months, followed by implementation of required control methods, as required.	BMP area is inspected for feral animal diversity and abundance every two months.	Compliant. Inspections being completed as required with appropriate feral animal priorities actioned.
		Control measures are implemented in response to outcomes of the inspections.	
		Measures are being taken to control feral animals in the BMP area.	
Develop and implement an effective annual pest animal action plan.	Develop and implement pest animal action plan. Stable or downward trend in population size recorded.	Strategies from action plans are implemented and targets are achieved. Stable or downward trend in population size recorded.	Compliant. Pest Action Plan Developed and implemented. Observed as being effective during monitoring and inspections.

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
Particular action is paid to managing foxes, feral cats and feral dogs in order to protect the spotted-tailed quoll population in this area.	Investigation and trials (if appropriate) into fox, feral cat and feral dog control methods posing minimal impact to spotted-tailed quoll population in this area.	Monitoring demonstrates that fox, feral cat and feral dog control methods are being effective in managing target species and not impacting negatively on the spotted-tailed quoll population.	Compliant. Annual dog baiting program completed in conjunction with regional aerial baiting and baiting programs at neighbouring operations. Monitoring and inspection show effective control occurring.
Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register.	Pest animal control register is maintained and up to date.	Compliant. Pest control register in developed and maintained.
Blue-billed Duck Management			
Complete habitat enhancement, maintenance and monitoring works (as required) for the blue-billed duck	Ongoing habitat enhancement and management works within Dam 3 and two Triangle Dams.	Monitoring shows appropriate habitat for the blue-billed duck is maintained is provided in Dam 3 and two Triangle Dams.	Compliant. Monitoring has shown continued improvement in flora establishment. Management actions identified and will be ongoing.
	Monitoring works as required.		
Habitat Enhancement			
Salvage of habitat features (particularly for the spotted-tailed quoll) such as hollow-bearing trees, logs, stumps, large rocks and boulders.	Suitable habitat features identified during the pre-clearing process are salvaged.	Appropriate habitat features have been salvaged.	Compliant. Habitat features suitable for salvage are stockpiled or directly placed into rehabilitation and offset areas. Ongoing habitat augmentation works will continue as per recommendation from monitoring events.
	Salvaged features are either re-instated into areas with low levels of habitat features or stockpiled appropriately for later use.	Salvaged habitat features are re-instated into areas of remnant vegetation lacking in habitat features or into rehabilitated vegetation.	
	Timber or boulder piles will be constructed in riparian areas and areas of regeneration, revegetation and/or rehabilitation (as appropriate) to provide potential quoll denning habitat.	Appropriate spotted-tailed quoll habitat has been salvaged and placed into onsite rehabilitation areas.	
		Habitat features that have been salvaged and are yet to be re-instated are in appropriate storage.	

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
		Appropriate documentation is available of any habitat features salvaged.	
Nest boxes are providing habitat value for native fauna.	Biodiversity offset areas, areas of remnant vegetation and suitably established rehabilitated vegetation (not in disturbance areas) will be supplemented with nest boxes as required.	All nest boxes and monitored and maintained.	Compliant. Nest box installation occurring. Ongoing installation program will continue.
Salvaged–reinstated hollows	Salvaged and re-instated hollows are subject to annual monitoring in conjunction with nest boxes.	All salvaged re-instated hollows are monitored and maintained.	Compliant. Habitat features suitable for salvage are stockpiled or directly placed into rehabilitation and offset areas. Ongoing habitat augmentation works will continue as per recommendation from monitoring events.
Timing of nest box installation	Removed hollows will be replaced (with nest boxes) within six months of each discrete clearing event.	Seasonal breeding opportunities are not lost due to delay in nest box installation.	Partially Compliant. 5 hollow bearing trees and 2 stag trees with sheeting bark cleared during 2016. Hollows and logs removed during clearing works have been placed in offset and rehabilitation areas. Nest boxes have been installed as part of a program however not within the 6month time frame. Additional nest boxes have been installed in early 2017. Ongoing habitat augmentation works will continue.
Salvaging, stockpiling and deployment of habitat features	Suitable habitat features are identified and salvaged as part of the pre-clearing process. These can then be stockpiled until deployment in target areas once rehabilitation/regeneration works are complete.	Suitable habitat features are salvaged, stockpiled and reused to augment habitat complexity (thus value) in rehabilitation/regeneration areas.	Compliant. Salvage and suitable habitat material was stockpiled or directly placed in rehabilitation and offset areas. Ongoing habitat augmentation works will continue.

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
Foraging specific plant resources	Rehabilitation and revegetation plantings undertaken include bulloak (*Allocasuarina luehmannii*), swamp oak (*Casuarina glauca*), broom bitter pea (*Daviesia genistifolia*), sickle wattle (*Acacia falcata*), hickory wattle (*Acacia implexa*) and cooba (*Acacia salicina*)	Rehabilitation areas include plant species that are specific foraging resources.	Compliant. Species planted in rehabilitation are consistent with the species list present in the BMP and include foraging species.
Grazing Management			
Stock rotation	Cattle are grazed within improved pasture areas within mine rehabilitation >3years.	Groundcover percentage is maintained at 70% and greater	Compliant. LCO coordinate a cattle grazing trial and rotate stock between paddocks under supervision of district agronomist to ensure groundcover is >70%.
	Stocked will be managed to allow pasture recovery and maintain pasture availability and sufficient groundcover.		N/A
Shade trees and shelter belts (in areas suitable for future grazing) are planted with suitable endemic species compatible with adjoining vegetation communities.	Any shade trees and shelter belts are planted with suitable endemic species.	Shade trees and shelter belts comprise suitable endemic species compatible with adjoining vegetation communities.	Partially - Compliant. LCO are preparing the scope of works required to commence grazing of suitable pasture rehabilitation which will include significant installation of fencing resources which will utilise existing tree shelter belts. Stock are managed within the areas available.
Bushfire Management			
The current Bushfire Management Plan will be updated according to the approved modification.	The current Bushfire Management Plan will be updated to address the approved modification.	Bushfire risk is managed according to an updated Bushfire Management Plan which allows for appropriate protection of life and property, as well as identified significant ecological features.	Compliant. This plan has been updated.
Bushfire Management Plan will be implemented.	Implementation of requirements of updated Bushfire Management Plan.		Compliant. Requirements from the plan being implemented.
Ecological Monitoring			

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
Undertake floristic, fauna, LFA, waterbird, nest box, stygofauna and instream/riparian monitoring program throughout LCO	Monitoring program completed and reported	Monitoring programs completed and results reported.	Compliant. Monitoring program completed by external professionals. Results reported in this report.
Undertake annual inspections of LCO rehabilitation areas	Annual inspections completed	Annual inspections completed	
Native fauna presence in rehabilitation/regeneration areas	Fauna monitoring completed	Fauna monitoring confirms that native fauna species are recorded within rehabilitation/regeneration areas.	
Collate data on actions implemented and results of inspections and monitoring into the AEMR.	AEMR completed as required annually	AEMR completed as required annually	Compliant.

8.3.2 Rehabilitation Monitoring Summary

Rehabilitation monitoring was completed during 2016 in accordance with the MOP and summarised below. Overall the condition of rehabilitation at LCO is moderate and trending towards the target. Most areas have a good ground coverage which is preventing substantial erosion. In the case of woodland vegetation however, ground coverage is provided by non-target species (particularly Rhodes grass (Chloris gayana)) and vegetation has not been established for lengths of time in which substantial soil organic matter (leaf litter) has had the time to accrue. In terms of pasture areas, height and density are typically good for grazing. However with regards to both pasture and woodland rehabilitation, improvement/maintenance works are continuous with timing sensitive to the age of rehabilitation and time to closure.

Specifically at this stage the pasture rehabilitation typically lacks the legume establishment and diversity desired of a relinquishing pasture area. Given the age of most of the pasture rehabilitation onsite and the requirement of continuous management of pasture, LCO do not consider there to be an issue with the development. At the current stage the pasture rehabilitation is performing as a stable landform supporting the basis of pasture rehabilitation including organic carbon cycling. Domination of Rhodes grass in many areas is acknowledged with sustainable management actions to be completed as LCO progress towards relinquishment. Broadly the pasture rehabilitation strategy including the management of Rhodes grass will be to commence active management of the land including fencing and shade for grazing as well as typical ameliorant and seeding farming practices such as aerial over sowing legume species.

Rehabilitation monitoring has also identified that canopy species on South Cut rehabilitation areas including lemon-scented gum (Corymbia citriodora), (Eucalyptus populnea) and sugar gum (Eucalyptus cladocalyx) have been very successful and should be selectively thinned to encourage other locally endemic species to come through. Replanting of other locally endemic species may also be beneficial. Generally, canopy composition in woodland rehabilitation areas contain species appropriate to target vegetation communities. Due to the time required to develop a functioning target woodland, woodland rehabilitation at LCO is at a range of different stages all of which require some form of ongoing management. Typically, woodland rehabilitation is developing appropriately with no serious arising concerns. Monitoring has identified improvement activities appropriately including construction of additional fauna habitat, weed management, selective thinning of trees and infill planting of target species.

Weed species galenia (Galenia pubescens) and noxious fireweed (Senecio madagascariensis) were typically encountered in most rehabilitation areas and will be subject to control as part of routine weed control works. Previous weed control activities, particularly for galenia have shown some success.

Rehabilitation Management Performance Indicators

As per the MOP, the sites progress towards the MOP performance Indictors/Completion Criteria was reviewed as part of the monitoring completed in 2016. **Table 34** below summarises the MOP completion criteria with applicable TARP trigger levels other than “condition green” as specified in the MOP as well as any completion criteria that require management actions beyond typical. As per the MOP, rehabilitation requires maintenance and continuous adaptive management to improve the performance of each area; adaptive management is guided by monitoring results where appropriate actions are completed as required. **Appendix G** lists all of the completion criteria and comments from the 2016 monitoring.

As requested in the 2015 Annual Review feedback from DRE, a rehabilitation summary of areas established during 2016 is provided in **Appendix H.**

Rehabilitation legacy areas exist within the BMP area, primarily the Mountain Block. This site has been reported and LCO is currently proceeding with Specific Remediation Action Plans (RAP) to rehabilitate. LCO progress with the RAP is outlined below in **Section 8.6**. The following table does not include these two areas as they are reported upon specifically in line with a RAP and have different completion criteria.

Table 34 MOP performance indicator status - exceptions only

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
Landform Establishment Phase						
All Domains						
Post mining landforms will be safe, stable and non-polluting	Rilling	Visual inspections confirm rill erosion is limited to isolated areas of minor rilling up to 200mm deep; as supported by site record form 11.16 - Rehabilitation establishment and methodology record.	MOP	No	3/amber	Isolated areas identified with remediation required
Growth Medium Development Phase						
All Domains						
Enhance the productivity and ecological function of rehabilitation areas by effectively managing risks from bushfire, weeds and feral animals	Weed presence	The density of weeds in rehabilitated areas is no worse than analogue sites. All measurements will be undertaken in accordance with the Department of Agriculture, Fisheries and Forestry (2008) Field Manual for surveying and Mapping Nationally Significant Weeds.	EA Section 7.16.9	No	11/overall amber – red in some areas	Operations ongoing, monitoring results included in annual weed action plan. Weed management contractors engaged throughout the year to control invasive species.
Domain C – Rehabilitation Area – Grassland						
At least 1247 ha of grassland will be established that can be demonstrated to be capable of supporting sustainable grazing.	Species composition	Pasture species to consist of grasses and legumes appropriate to the district and recognised as suitable for beef cattle grazing.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	12, 13 / amber	Operations ongoing, species sown as per approved list.
Domain D – Rehabilitation Area - Woodland						
Vegetation compositions in woodland rehabilitation areas will be comparable with analogue vegetation communities, including areas representative of	Species presence	Revegetation areas contain flora species assemblages characteristic of each strata for the desired native vegetation communities.	EA Section 7.16.9	No	12/amber in some areas	Operations ongoing, no significant issues identified in monitoring. Supplementary planting and similar works planned in 2017.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
Central Hunter Box – Ironbark Woodland, specifically adjacent to rehabilitation areas at Ravensworth Operations and Mount Owen Complex		Rehabilitation monitoring confirms the presence of at least two overstorey and two understorey species at all ages.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	12/amber in some areas	Operations ongoing, no significant issues identified in monitoring. Supplementary planting and similar works planned in 2017.
Ecosystem Sustainability Phase						
All Secondary Domains						
Enhance the productivity and ecological value of rehabilitation areas by effectively managing risks from bushfire, weeds and feral animals	Weed presence	There are no significant weed infestations that are identified as a risk to rehabilitation.	EA Section 7.16.9	No	11/amber	Operations ongoing, monitoring results included in annual weed action plan. Weed management contractors engaged throughout the year to control invasive species.
Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse	Organic carbon	Soil testing indicates soil total organic carbon is no less than 20% of levels in adjacent analogue site after 10 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7/amber	Operations ongoing, no significant issues identified in monitoring, trending towards target
At least 1247 ha of grassland will be established that can be demonstrated to be capable of supporting sustainable grazing by: • Having a pasture species mix representative of the district • Providing a mix of land capability suitable for agriculture (Rural Land Capability Class IV, V and VI); • having a carrying capacity comparable to suitable analogue sites; and Requiring management inputs comparable to suitable analogue sites	Species composition	At least 75% of species surveyed consist of grasses and legumes appropriate to the district and recognised as species suitable for grazing.	EA Section 7.16.9	No	10/condition varies across the site	Operations ongoing, trending towards target. Management of pasture required once appropriate.
	Weed and pest management	Weed and pest management inputs are no more than those of analogue sites.	MOP EA Section	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
Woodland rehabilitation areas will be self-sustaining and require ongoing management inputs that are appropriate for the final land use	Species composition	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities.	MOP EA Section 7.16.9	No	12/varies across areas	Operations ongoing, trending towards target.
	Structure	Rehabilitation monitoring confirms rehabilitated areas provide a range of vegetation structural habitats (e.g. eucalypts, shrubs, ground cover, developing litter layer, etc.) to encourage use by native fauna species.	EA Section 7.16.9	No	14/varies across areas	Operations ongoing, trending towards target.

8.4 Biodiversity Offset Management

As part of the approved DA305-11-01 Mod 5, LCO developed a Biodiversity Offset Management Plan (BOMP) to guide ongoing management of the LCO biodiversity offset areas to maintain and enhance biodiversity values, particularly those relating to threatened species and threatened ecological communities (TECs) within the LCO biodiversity offset areas. **Figure 32** shows LCO biodiversity offset area comprising of Mountain Block, Bowmans Creek Riparian Corridor and Mitchell Hills South Offset Areas. During 2016, LCO completed an ecological monitoring in accordance with the BOMP as well as commenced various management actions relating to the performance indicators; both of which are detailed below.

Biodiversity Offset Monitoring Summary

In general, the remnant vegetation of Mitchell Hills South is considered to have the highest habitat values of the biodiversity offset sites (with high hollow densities, rock on rock habitats, moderate log presence, abundant shrubs, low introduced species, although poor water resource availability), and Bowmans Creek Riparian Corridor is considered to require the greatest amount of intervention (particularly for introduced groundcover species). Mountain Block continues to have moderate habitat value that could be greatly assisted by undertaking weed control works (particularly of introduced grasses) and increasing the connectivity of the disconnected areas of habitat. Although remnant vegetation at all biodiversity offset sites was generally in good condition and general coverage of weed species was low, all had noxious or invasive species present that were considered to require management to prevent interference with ecological value and subsequent potential for recovery.

Although not specifically identified within monitoring plots, LCO has been undertaking extensive management actions within the Mountain Block and Bowmans Creek Riparian Corridor since the baseline 2015 monitoring. Works have been targeted at areas deemed to be in greatest need of management action (not necessarily within monitoring plots) and therefore will not be reflected within quantitative data.

Key findings of the 2016 biodiversity offset monitoring program were as follows:

- The remnant vegetation of Mitchell Hills South is considered to have the highest habitat values of the biodiversity offset sites.
- Bowmans Creek Riparian Corridor is considered to require the greatest amount of intervention.
- Remnant vegetation at all biodiversity offset sites was generally in good condition and whilst general coverage of weed species was low, all had noxious or invasive species present that require management.
- LCO has been undertaking extensive management actions within the Mountain Block and Bowmans Creek Riparian Corridor since the baseline 2015 monitoring.
- Remnant sites typically provide a greater native species diversity than their regenerating/rehabilitating counterparts. The exception to this is the Bowmans Creek Riparian Corridor remnant site (W07) which has a long history of grazing which is likely to have depleted the seed-bank over time and possibly compacted soil in some areas.
- 2016 monitoring identified much less utilisation of sites by pigs (*Sus scrofa*) and is likely contributed to LCO management actions of this species. There may be a correlation with this reduction and the increased detection of spotted-tailed quolls (*Dasyurus maculata maculatus*) during the 2016 monitoring event compared to 2015. Despite successful baiting program, presence of foxes during the monitoring event has increased and management actions to be considered.
- Areas with higher floristic diversity and more complex vegetation structure generally provided habitat to a greater diversity of fauna species.

Biodiversity Offset Performance Indicators

The BOMP include objectives which are to provide direction for the short to long term management and enhancement of the biodiversity values of the LCO biodiversity offset areas, as well as to provide a description of the measures to be implemented to achieve this over the next three years.

The performance indicators are for the first three years of the implementation of this BMP are used to assist in demonstrating how management actions are progressing towards achieving completion criteria.

The completion of and performance against each of these indicators/criterion is summarised in ***Table 33 BMP performance indicator summary*****Table 35** below based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 35 BOMP performance indicator summary

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
Year 1 2016				
Pathogen Management				
All biodiversity offset areas	If reasonable potential for pathogens is identified in the biodiversity offset areas, appropriate pathogen monitoring and management protocols are developed and implemented.	If reasonable potential is identified, pathogens are considered in design and implementation of monitoring works.	Methods to identify potential pathogens are considered in monitoring program design (if reasonable potential of pathogen presence is identified onsite.	Compliant. Monitoring has not identified any pathogen concerns requiring management.
Cultural Heritage				
Bowman's Creek Riparian Corridor	Detailed rehabilitation planning for the Bowman's Creek Riparian Corridor includes identification of need for cultural heritage assessment.	Include cultural heritage considerations into detailed rehabilitation planning.	Cultural heritage is appropriately considered within rehabilitation works in Bowman's Creek Riparian Corridor.	Compliant. Archaeological due diligence assessment finalized in Q1 2017. Findings will be considered in the detailed works planning. No adverse impacts to cultural heritage occurred during 2016. ACHMP planned to be updated during 2017 to provide for the artefact protection.
All biodiversity offset areas	Develop and implement protocols for identification of potential cultural heritage issues, including how to avoid or mitigate impacts.	Develop and implement protocol.	Protocol developed and implemented.	
Fencing and Signage				
All biodiversity offset areas	Complete inspection of all fencing of biodiversity offset areas to map locations, condition and identify need for new fencing or redundant fencing.	Complete inspection of all fencing of biodiversity offset areas to map locations, condition and identify need for new fencing or redundant fencing.	All actions identified from inspection in year 1 have been implemented.	Compliant. Fence line condition mapping completed and scope of works for fencing works developed and commenced.
All biodiversity offset areas	Install or repair boundary fences restricting unauthorised access to property and controlling livestock movements		All biodiversity offset areas will have boundary fencing of appropriate design and condition.	

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
All biodiversity offset areas	Any new fencing does not have barbed wire on upper strands and as little barbed wire generally as possible. The bottom strand will be plain wire and elevated to allow faunal passage (while maintaining cattle exclusion).		New fences are constructed with as little barbed wire as possible, with none on upper strands and an elevated plain wire bottom strand.	Compliant. New fence lines installed to meet the approved specification.
All biodiversity offset areas	Removal of redundant fences.	Inspection undertaken to identify redundant fences. Commence removal of redundant fences.	Redundant fences removed.	Compliant. Redundant fencing identified and removal works commenced.
All biodiversity offset areas	Inspections of fences every two months to identify condition.	Inspections every two months. Damaged critical fences to be repaired within 1 week (temporary if needed), final repairs and non-critical repairs to be completed in 1 month.	All fences in functional condition.	Compliant. Inspections being completed as required and remediation action when required.
All biodiversity offset areas	Information signage for the spotted-tailed quoll.	Signs will be installed along access tracks in areas of spotted-tailed quoll habitat (such as Bowman's Creek Corridor) to alert drivers to potential activity.	Information signage for the spotted-tailed quoll has been installed and maintained.	Compliant. Information signage installed and maintained in all offset areas.
Grazing Management				
All biodiversity offsets	All stock to be removed from biodiversity offset areas	No stock grazing	Grazing has not occurred in biodiversity offset areas	Compliant. Stock excluded from offset areas.
All biodiversity offsets	Minimum bi-monthly inspections to determine presence of rogue stock and assess condition of fences.	To be completed bi-monthly.	Completion of Stock Inspection Reports	Compliant. Inspections being completed as required and remediation action when required. Monitoring identifying successful exclusion.
All biodiversity offsets	Remove reported rogue stock and repair damaged fences.	Action and remove reported rogue stock and repair damaged fences.	No rouge stock in biodiversity offset areas and fences in functional condition.	
Access Track Maintenance				

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
All biodiversity offset areas	New access tracks (only where necessary) are subject to due diligence assessments.	Complete due diligence assessments for new access tracks to minimise impact on biodiversity, where possible.	New access tracks are only constructed where necessary, and are subject to due diligence inspections	Compliant. No new access tracks installed during 2016.
All biodiversity offset areas	Minimum twice yearly (nominally in March and September) inspections to identify track conditions.	Inspections undertaken nominally in March and September.	Tracks maintained in good usable condition.	Compliant. Inspections being completed as required and remediation action when required.
		Action and repair track damage.		
All biodiversity offset areas	Rehabilitation of unnecessary access tracks.	Tracks no longer required will be rehabilitated.	Unnecessary access tracks are rehabilitated.	N/A. No tracks requiring rehabilitation during 2016.
Pest Management				
Bowmans Creek Riparian Corridor	Complete feral animal inspections of biodiversity offset areas every two months to document sighting and abundance records. This will then inform ongoing control actions (as needed), including timing, frequency, target species and methods to be used.	Inspections completed every two months, followed by implementation of required control methods, as required.	Biodiversity offset areas are inspected for feral animal diversity and abundance every two months.	Compliant. Inspections being completed as required and remediation action when required.
			Control measures are implemented in response to outcomes of the inspections.	
			Measures are being taken to control feral animals in the biodiversity offset areas.	
Mountain Block and Mitchell Hills South	Complete feral animal inspections every four months to document sighting and abundance records. This will then inform ongoing control actions (as needed), including timing, frequency, target species and methods to be used.	Inspections completed every four months, followed by implementation of required control methods, as required.	Biodiversity offset areas are inspected for feral animal diversity and abundance every four months.	
			Control measures are implemented in response to outcomes of the inspections.	
			Measures are being taken to control feral animals in the biodiversity offset areas.	
All biodiversity offset areas	Develop and implement an annual pest animal action plan.	Develop and implement pest animal action plan. Stable or downward trend in population size recorded.	Strategies from action plans are implemented and targets are achieved. Stable or downward trend in population size recorded.	Compliant. Pest action plan developed and implemented. Monitoring showing successful management of pest species.

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
All biodiversity offset areas	Particular action is paid to managing foxes, feral cats and feral dogs in order to protect the spotted-tailed quoll population in this area.	Investigation and trials (if appropriate) into fox, feral cat and feral dog control methods posing minimal impact to spotted-tailed quoll population in this area.	Monitoring demonstrates that fox, feral cat and feral dog control methods are being effective in managing target species and not impacting negatively on the spotted-tailed quoll population.	Compliant. Fox and dog baiting program completed in conjunction with regional aerial baiting and onsite baiting by neighbouring operations. Monitoring of program identified good success rates.
All biodiversity offset areas	Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register.	Pest animal control register is maintained and up to date.	Complaint. Pest control register developed and maintained.
Weed Management				
Bowmans Creek Riparian Corridor	Complete weed inspections of every two months to document diversity and abundance of noxious weed records.	Inspections completed every two months, followed by implementation of required control methods, as required.	Weed densities in rehabilitation/regeneration areas are no worse than those in remnant vegetation (analogue) sites. There are no significant weed infestations that are identified as a risk to rehabilitation or regeneration areas. Regular inspections are undertaken for weed species inspections and outcomes are documented.	Compliant. Inspections being completed as required and remediation action when required. Weeds identified are recorded and included in the Weed Action Plan.
Mountain Block and Mitchell Hills South	Complete weed inspections every four months to document diversity and abundance of noxious weed records.	Inspections completed every four months, followed by implementation of required control methods, as required.	Weed densities in rehabilitation/regeneration areas are no worse than those in remnant vegetation (analogue) sites. There are no significant weed infestations that are identified as a risk to rehabilitation or regeneration areas. Regular inspections are undertaken for weed species inspections and outcomes are documented.	Compliant. Inspections being completed as required and remediation action when required. Weeds identified are recorded and included in the Weed Action Plan.

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
Natural Regeneration				
Mountain Block and Mitchell Hills South	Control of weeds and feral animals in regeneration areas.	Weed and feral animal control works are completed, as required.	Natural regeneration is not impeded by weeds or feral animals.	Compliant. As above, weed and pest management ongoing. Natural regeneration was observed occurring in the 2016 ecological monitoring event.
Mountain Block and Mitchell Hills South	Confirmation of mapping of areas for regeneration, including appropriateness of target community	Completed in first year of monitoring works.	Accurate mapping of regeneration areas.	Compliant. Vegetation mapping of regeneration areas included in the 2016 ecological monitoring works. Management recommendations from the monitoring are actioned during on an ongoing basis.
Mountain Block and Mitchell Hills South	Management of regeneration progress is responsive to monitoring outcomes.	Monitoring of regeneration areas.	Monitoring results are used to inform ongoing regeneration planning, including implementation of assisted regeneration if natural regeneration is not progressing sufficiently.	
Assisted Regeneration				
Mountain Block and Mitchell Hills South	Review need for assisted regeneration where outcomes of natural regeneration is deemed lacking.	Natural regeneration.	Assisted regeneration s implemented after three years if natural regeneration is deemed lacking.	Compliant. Ecological monitoring during 2016 identified natural regeneration occurring in these offset areas and did not identify the requirement to commence active regeneration in these offsets. Management actions to improve the performance of natural regeneration are being completed as an ongoing basis.
Rehabilitation Works				

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Detailed mapping and planning of rehabilitation works required, including earthworks, reshaping, slope stabilisation works, scalping of heavily weeded areas, fencing, erosion control and revegetation.	Detailed planning of all works required.	Rehabilitation works are planned in detail in first year and is being implemented.	Compliant. Planning suitable for the commencement of rehabilitation/active regeneration works has been completed with expert consultation. In line with the positive feedback look, monitoring results and the findings of the Archaeological Due Diligence being completed in Q1 2017, the rehabilitation works strategy is being revised to mitigate and avoid impacts.
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Develop detailed performance criteria for all management zone types.		Criteria developed	N/A. Not required till Year 3.
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Implement rehabilitation/ revegetation program.		Rehabilitation and revegetation plan implemented.	N/A. Not required till Year 2.
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Positive feedback loop from monitoring results.	Feedback from monitoring is incorporated into ongoing review and improvement of plan.	Monitoring outcomes considered in continual review and improvement of plan.	Compliant. Monitoring results are being included in the detailed planning of regeneration works.
Habitat Augmentation				
Bowmans Creek Riparian Corridor	Salvage of habitat features (particularly for the spotted-tailed quoll) such as hollow-bearing trees, logs, stumps, large rocks and boulders.	Suitable habitat features identified during the pre-clearing process are salvaged.	Appropriate habitat features have been salvaged.	Compliant. As identified in the BMP section above, suitable habitat features were salvaged from clearing areas and used to augment the habitat resources in offset areas where the monitoring identified a paucity (primarily Bowman's creek).
		Salvaged features are either re-instated into areas with low levels of habitat features or stockpiled appropriately for later use.	Salvaged habitat features are re-instated into areas of remnant vegetation lacking in habitat features or into rehabilitated vegetation.	

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
		Timber or boulder piles will be constructed in riparian areas and areas of regeneration, revegetation and/or rehabilitation (as appropriate) to provide potential quoll denning habitat.	Appropriate spotted-tailed quoll habitat has been salvaged and placed into onsite rehabilitation areas.	
			Habitat features that have been salvaged and are yet to be re-instated are in appropriate storage.	
			Appropriate documentation is available of any habitat features salvaged.	
	Nest boxes are providing habitat value for native fauna.	Biodiversity offset areas, areas of remnant vegetation and suitably established rehabilitated vegetation (not in disturbance areas) will be supplemented with nest boxes as required.	All nest boxes and monitored and maintained.	Compliant. Ecological monitoring during 2016 identified locations where habitat improvement could be most effective and during 2017 LCO will implement a program to install nest boxes as required.
	Salvaged–reinstated hollows	Salvaged and re-instated hollows are subject to annual monitoring in conjunction with nest boxes.	All salvaged re-instated hollows are monitored and maintained.	
	Timing of nest box installation	Removed hollows will be replaced (with nest boxes) within six months of each discrete clearing event.	Seasonal breeding opportunities are not lost due to delay in nest box installation.	As reported in the BMP performance criteria above.
	Salvaging, stockpiling and deployment of habitat features	Suitable habitat features are identified and salvaged as part of the pre-clearing process. These can then be stockpiled until deployment in target areas once rehabilitation/regeneration works are complete.	Suitable habitat features are salvaged, stockpiled and reused to augment habitat complexity (thus value) in rehabilitation/regeneration areas.	

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
All biodiversity offset areas	Habitat augmentation will occur in Mountain Block and Mitchell Hills South offset areas if monitoring identifies a dearth of key habitat features such as hollows, log piles or boulder piles.	Habitat augmentation, if required.	All biodiversity offset areas have suitable levels of key habitat features, when compared (through monitoring) to remnant vegetation features.	Compliant. Ecological monitoring during 2016 identified locations where habitat improvement could be most effective and during 2017 LCO will implement a program to install nest boxes as required.
Translocation Works				
All biodiversity offset areas	Translocation of tiger orchids or other threatened flora species (if encountered during pre-clearing process) to biodiversity offset areas. Methods to be adopted are detailed within the Biodiversity Management Plan.	Tiger orchids are salvaged and translocated according to the process in the BMP as needed.	Tiger orchids (or other threatened flora species if encountered) are salvaged and translocated into biodiversity offset areas in accordance with the Biodiversity Management Plan.	N/A. No translocation activities required during 2016.
Creek and Drainage Line Protection				
Bowmans Creek Riparian Corridor	Fencing/protection of LCO controlled side of riparian corridor.	Riparian corridor will be fenced from human and livestock access.	Riparian areas are adequately fenced/protected against damage from uncontrolled human or livestock access.	Compliant. As per the fence line inspections, fencing is maintained as required. Ecological monitoring during 2016 did not identify any adverse impacts to the riparian corridor as the result of LCO activities.
Bowman's Creek Riparian Corridor	Rehabilitation works to address stabilisation and erosion issues, as necessary.	Need for stabilisation and erosion control works is assessed as part of detailed rehabilitation planning. Implementation, as needed.	Creek bank is stable and erosion issues are addressed.	Compliant. Creek bank stabilisation issues within the corridor are included in the detailed active rehabilitation planning.
Seed Collection				
All biodiversity offset areas	Where suitable remnant vegetation is available, implementation of seed collection and handling program for use in revegetation/rehabilitation works.	Pre-clearing surveys identify potential seed sources. Seeds are collected, stored and handled according to appropriate program.	Rehabilitation/revegetation works use seeds collected onsite, thus maintaining as much genetic similarity (local provenance) as possible.	As reported in the BMP performance criteria above.

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
		Collected seed resources are used in revegetation/rehabilitation works.		
Erosion, Sedimentation and Salinity				
All biodiversity offset areas	Undertake erosion and sediment inspection and map areas requiring remediation.	Complete inspection and mapping.	Appropriate erosion and sediment control measures required have been identified and implemented.	Compliant. Inspections completed to identify erosion issues completed regularly and remediation works to be completed as part of the ongoing remediation strategy. Areas of significant erosion will require the development of a specific remediation action plan during 2017 following the completion of the Archaeological Due Diligence assessments.
All biodiversity offset areas	Develop remediation plan and implement.		There are no areas of significant erosion or sedimentation.	
All biodiversity offset areas	Monitor completed erosion works and action repairs if required.		Erosion control works are stable and successful.	
Bushfire Management				
All biodiversity offset areas	The current Bushfire Management Plan will be updated according to the approved modification.	The current Bushfire Management Plan will be updated to address the approved modification.	Bushfire risk is managed according to an updated Bushfire Management Plan which allows for appropriate protection of life and property, as well as identified significant ecological features.	Compliant. Bushfire Management Plan updated and implemented appropriately.
	Bushfire Management Plan will be implemented.	Implementation of requirements of updated Bushfire Management Plan.		
Monitoring Program				
All biodiversity offset areas	Undertake floristic, fauna, LFA and nest box monitoring program	Monitoring program completed and reported	Monitoring programs completed and results reported.	Compliant. Ecological monitoring program completed during 2016 in accordance with the BOMP. Results and recommendations are being actioned in 2017 and where
All biodiversity offset areas	Undertake annual inspections of LCO rehabilitation and active regeneration areas	Annual inspections completed	Annual inspections completed	

Relevant Offset Area	Action	Performance Criteria	Completion Criteria	Performance Comment
All biodiversity offset areas	Native fauna presence in rehabilitation/regeneration areas	Fauna monitoring completed	Fauna monitoring confirms that native fauna species are recorded within rehabilitation/regeneration areas.	appropriate included in the detailed regeneration planning.

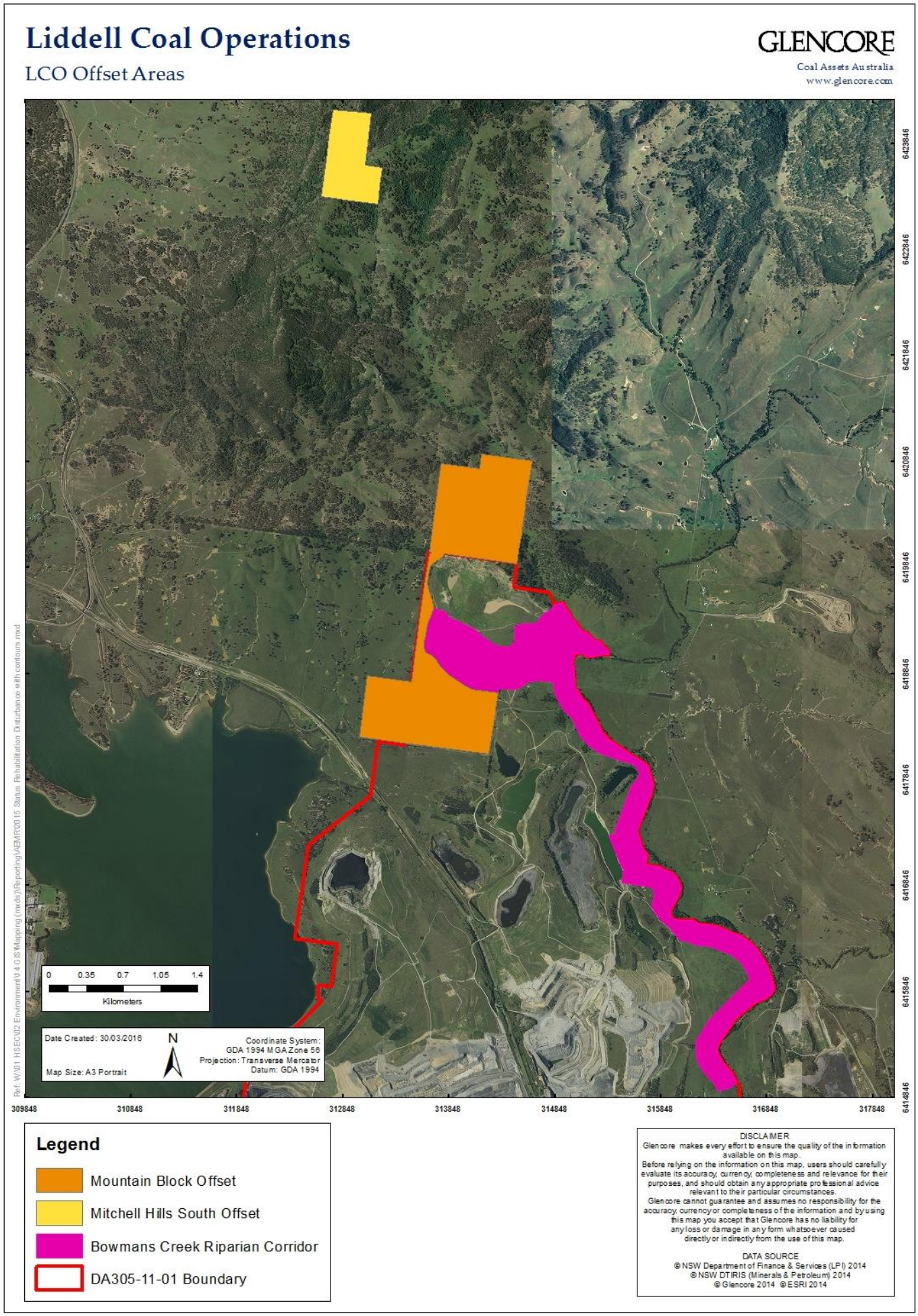


Figure 32 Biodiversity offset areas

8.5 Indirect Offset Management

NSW and Commonwealth approvals for LCO both require the provision of an indirect offset to augment the agreed land-based biodiversity offsets to address the impacts of the project. This indirect offset was agreed to be a financial contribution towards recovery actions for the spotted-tailed quoll (Dasyurus maculatus maculatus) as part of the Final Draft National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus (Long and Nelson 2008); and/or Management actions identified for the spotted-tailed quoll as part of the Office of Environment and Heritage (OEH) Saving Our Species Project Species Action Statement.

An Indirect Offset Management Plan (IOMP) was developed to satisfy related approval conditions in consultation with the NSW Office of Environment & Heritage (OEH), and Federal Dept. Of Environment (DoE). The IOMP received final approval by the DoE on 2nd March 2016. The objective of this IOP is to specify how the $243,000 indirect offset (by way of financial contribution over not more than five years) will be used to support recovery actions for the quoll. From the Glencore perspective, additional objectives for this IOP include:

collection and interpretation of data that is relevant locally (in the Middle Foy Brook area), while also contributing to knowledge of this species from a regional perspective;

collection and interpretation of data which is transferrable and able to inform management actions on other Glencore sites; and sharing of project outputs to relevant agencies to allow incorporation into existing management actions for the quoll.

Following approval of the IOMP, LCO commenced implementation of Project 1: Development of software to allow identification of individual Quolls from remote camera images. This project is being completed in partnership with Invasive Animals Limited (IAL), with a Research Agreement executed on 23rd June 2016 and initial payment of $50,000 completed on 30th June 2016. As agreed, a progress report and mile stone payment of $18,000 was submitted to LCO in December 2016, outlining the methodology being utilised to develop the recognition software. The report noted success in developing the automated recognition system to date and identified the following tasks in 2017 in recognition method refinement; comprehensive testing; and final publication.

8.6 Rehabilitation Research and Trials

Project 1

LCO currently operates a rehabilitation project which aims to establish two ecological communities over a 16 ha area of overburden. Of the 16 ha, 8 ha was seeded with a Central Ironbark, Spotted Gum, Grey Box Forest community seed mix (Area 1). The second 8 ha was seeded with a Central Hunter Grey Box, Ironbark Woodland community seed mix (Area 2). Both areas received the same preparation treatments which included the application of 5 t/ha of Gypsum, 2 t/ha of Cal-S, 2 t/ha of lime and 120 t/ha of the composted soil conditioner Organic Growth Medium (OGM).

Initial monitoring of the rehabilitation areas conducted in 2012 and follow-up monitoring conducted in 2013 found that germination rates of the tree species for both ecological communities were promising. Grass species included in respective seed mixes were evident at both sites, however there appeared to be a lack of shrub species establishing.

Monitoring of the same sites is conducted in annually. Results from the 2016 monitoring showed comparable tree numbers and continual growth for both Area 1 and Area 2. A high percentage of tree species for both seed mixes had established. Some shrub, herb and grass species from both seed mixes were also observed however have been generally unsuccessful.

For Area 1, Canopy vegetation was dominated by spotted gum (Corymbia maculata), as well as grey box (Eucalyptus moluccana) and narrow-leaved ironbark (Eucalyptus crebra). These species are all consistent with the target vegetation community. Fruiting and flowering of all canopy species was occurring, with recruitment of all canopy vegetation observed. Although not directly identified within the plot, forest red gum (Eucalyptus tereticornis) was also present in the wider rehabilitation. Coverage by shrub species was sparse and only two species were identified being falcate acacia (Acacia falcata) and blackthorn (Bursaria spinosa). A total of 13 species were identified at these sites during 2016, of which 6 were introduced and comprised approximately 50 per cent of vegetation present (slightly higher in exposed areas which were dominated by introduced Rhodes grass (Chloris gayana). All native species identified in this site were part of the original seed mix.

For Area 2, Vegetation of this plot was dominated by an open (approximately 4.5 per cent cover) layer of regenerating canopy vegetation between 5 and 8 metres tall. A total of 18 species were identified at these sites during 2016, of which 9 were introduced and comprised approximately 74 per cent of vegetation

present (slightly higher in exposed areas which were dominated by introduced Rhodes grass (*Chloris gayana*)). Canopy vegetation was dominated by narrow-leaved ironbark (*Eucalyptus crebra*) and grey box (*Eucalyptus moluccana*) with a small extent of spotted gum (*Corymbia maculata*). These species are consistent with the target vegetation community. No recruitment of canopy species was observed at the time of survey. The mid storey comprised vegetation 0.5 to 5 metres in height and was dominated by sticky hop bush (Dodonaea viscosa) and weeping myall (Acacia pendula). Groundcover vegetation was dominated by Rhodes grass (Chloris gayana), galenia (Galenia pubescens) and native couch (Cynodon dactylon).

Initial native grass and herb seedings have been generally unsuccessful, with the exception of couch (Cynodon dactylon), Glycine tabacina and speargrass (Austrostipa scabra), all of which were identified in low densities. Ground coverage (despite being at a different location) has remained fundamentally unchanged since 2014.The main difference being that weeping grass (Microlaena stipoides) and Glycine tabacina appear to no longer be present.

Considering the age of both of these areas, it is expected that the groundcover and shrub abundance will transform as the canopy species develop and continue to shade out the invasive Rhodes grass. Weed management activities will continue in these areas and monitoring will continue in 2017. Selective thinning of spotted gum in area 1 as well as supplementary planting in some areas will also occur during 2017.

Project 2

LCO has commenced a new rehabilitation trial during 2016 to further investigate weed load issues arising in recent woodland rehabilitation areas which were the subject of a separate rehabilitation trial.

The initial trial involved changing from the standard woodland rehabilitation ground preparation being sowing into deep ripped overburden and implementing an alternate technique of sowing into a layer of topsoil and Organic Growth Medium (OGM) deep ripped into overburden.

The hypothesis predicted improved strike rates of native species, in particular native grasses which have been identified in previous monitoring events as typically deficient in all woodland rehabilitation areas. The topsoil was to provide the soil structure/medium conducive to plant establishment and the OGM (applied at light rates) to supplement the organic carbon lacking in the soil and overburden. Unfortunately, the 2016 rehabilitation monitoring of native woodland areas in the Entrance Pit confirmed the regular inspection findings; that there was a significant emergence of weed presence occurring. This is likely due to the presence of weed seeds dormant in the topsoil benefiting from the additional organic material load provided by the OGM. LCO are managing the weed presence with increased weed management resource efforts and monitoring within the affected area.

In response to the rehabilitation performance in the Entrance Pit woodland areas, LCO have since revised the ground preparation techniques and commenced a new trial area on the South Cut western batter. This trial involves two 4ha plots comparing woodland development when sown into

a) OGM and overburden ripped surface;

b) topsoil and overburden ripped surface.

The monitoring results have shown initial groundcover strike rate significantly greater in the topsoiled areas with however it will take several months to years to better understand how the woodland species perform in each area and consideration of the rainfall and slope aspect required.

8.7 Mountain Block

As reported in the 2015 Annual Review, LCO extended the geotechnical monitoring investigation program throughout 2016 in an effort to verify ongoing minor slip movement and the drivers for this.

The Geotechnical Investigation report was finalised at the end of September 2016, presenting a number of options to address the two unstable slip areas on the Eastern and Western faces. The two preferred options at this point in time are as follows:

- Dig out each slide zone to bedrock; or
- Construct rock buttress at base of each zone.

These design options are currently being incorporated into the landform design process in order to finalise the preferred design option.

Works planned for 2017 are as follows:

- Undertake 3D landform design including high level material volume analysis incorporating geotechnical recommendations and soil investigation results for three options as follows;

- Re-instating existing contour banks in more robust/sustainable form, including earthworks to ensure the banks have adequate sediment carrying capacity;
- The use of non-linear landforms using Applied Geofluv™ with stable slopes draining to stabilised drainage lines including elements such as rock cladding or founding bedrock;
- Hybrid design incorporating upstream drainage control to shed majority of runoff and stabilising existing contour bank design.

- Assessment of erosion risk;
- Constraints/opportunities analysis and compile risk ranking to focus best technical and environmental outcome;
- Address specific soil erodibility issues;
- Prepare detailed landform design for Regulator consultation and budgeting;
- Address re-vegetation requirements and evaluate overall compliance with closure criteria;
- Select preferred design and issue engineering design drawings for tender;
- Tender review and award contract

Ongoing progress will be reported in the next Annual Review.

9 Stakeholder Engagement

Community Complaints

The management of complaints is undertaken in accordance with EMS, LCO's Stakeholder Engagement Strategy and Schedule 5, Condition 1 of DA 305- 11-01. LCO operates a combined 24 hour community complaints and blasting information hotline (1800 037 317) which is advertised in the community newsletter and on the LCO public website.

One complaint was received during the reporting period via the EPA on the 10 October 2016. The complaint was received by the EPA on the 6 October 2016. An anonymous person phoned the EPA to complain about fume and dust witnessed from a blast fired at 3.30pm on 6 October. LCO related this information to the EPA and supplied further information as requested, including photos. No further action has been required to date. **Section 6.2** details the investigation and conditions surrounding this particular blast.

An annual comparison of the complaints received at LCO is shown in **Figure 33.**

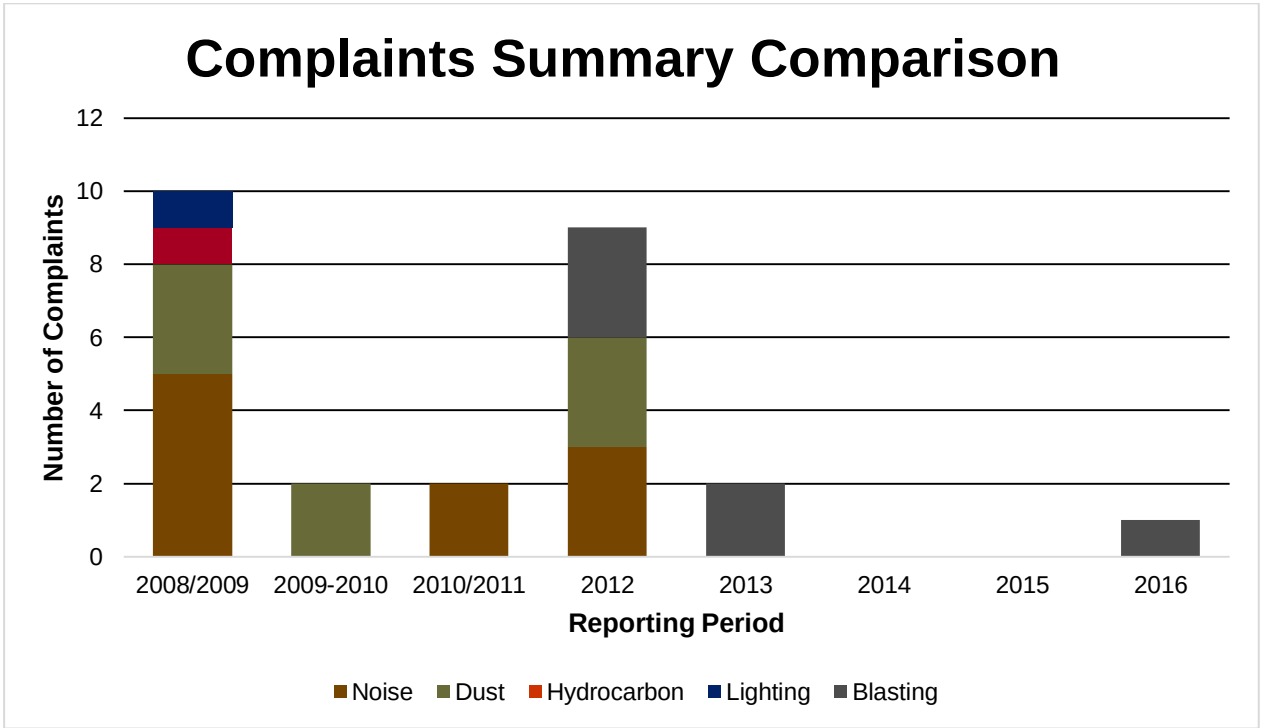


Figure 33 Complaints summary

Stakeholder Engagement

LCO undertakes stakeholder engagement activities in accordance with the Stakeholder Engagement Strategy (the strategy) which includes the Community Engagement, Community Development and Community Investment Plans. The strategy identifies the objectives for consultation and stakeholder engagement, methods of consultation for the various stakeholder groups and priorities for community development.

LCO personnel regularly liaise with the local community in person, over the phone, through newsletters and via email correspondence. A copy of newsletters sent out to the community are available on our public website.

Community Consultative Committee

LCO maintains a CCC in accordance with Schedule 5 Condition 7 of DA 305-11-01.

The LCO CCC provides a forum for local community, local government and mine management to meet and discuss key environmental and community interests and concerns. CCC meetings are held every six months. The CCC met on two occasions during the reporting period including in May 2016 and again in November 2016.

CCC Meeting Minutes are available for download from the LCO website.

Liddell Coal Operations Website

In accordance with Schedule 5, Condition 9 of DA 305-11-01, LCO maintains a website (www.liddellcoal.com.au) to provide access to information on the operation including environmental, community and operational updates.

Community Investment

LCO aims to provide support for local projects relating to the community, health, education and the environment, in the form of cash donations, sponsorship, and in-kind support for a range of community, educational and environmental initiatives.

During the reporting period LCO made donations to the following organisations and charities (in no specific order):

Table 36 Community investment program recipients

Community Investment Projects	
Scone Public School P&C Association Breakfast Club	Multiple Sclerosis Australia Charity Night
Singleton Amateur Theatrical Society	Lake Liddell Recreation Area
Singleton Public School	Mater Hospital
Oxfam Australia	Variety the children's charity
Hunter Valley Mining Charity Rugby League Knockout Competition 2016	Singleton Public Library (Toy Library)
Hunter Prostate Alliance	King Street Public School
Hebden Wild Dog Association	Little Wings flight service for sick kids
Muswellbrook High School	Singleton Fly Fishing Club
Hunter Valley Mining Charity Rugby League Knockout Competition 2016	

10 Independent Audit

An independent environmental audit was undertaken for the Department of Planning & Environment for the period of 1 July 2012 to 31 December 2015 by Hanson Bailey and was completed over the period of 2 – 5 February 2016. The audit assessed compliance against Development Consent DA 305-11-01 (as modified) and also assessed compliance with the conditions of Environmental Protection Licence 2094, key mining authorities and other licence documents.

A list of audit non-compliances, recommendations and actions to address is summarised below in **Table 37.**

Table 37 Independent audit non-compliances and recommendations

Condition Reference	Description	Risk Level	Action taken
DA 305-11-01			
Non-Compliances			
Schedule 3, Condition 23 (ci)	Complete the calibration of the Site Water Balance as soon as possible in 2016 (also included as a commitment in Section 7.5 of the WMP).	Administrative	Water balance calibration completed and report sent to DPI Water and DPE
Recommendations			
Schedule 3, Condition 34	Continue to support the development of plantings on the Old New England Highway bund to ensure that an adequate visual screen is established.	Low	Additional trees planted to replace failed ones. Trees continue to be watered where necessary and monitored.
Schedule 3, Condition 37	Commission a visual impact specialist to review the performance of the measures to enhance the natural appearance of the RL 195 emplacement area to ensure integration with surrounding natural landforms.	Low	Visual assessment complete and provided to DPE for review and determination
Schedule 3, Condition 37	Attempt to obtain greater clarification from DP&E and DRE as to their expectations regarding landform integration.	Low	As above
Mining Operations Plan			
MOP Section 3.4.3	Amend Section 3.4.3 of the MOP at the next variation to describe the use of OGM top-dressed overburden in some rehabilitation areas.	Administrative	Addressed in MOP amendment submitted and approved Feb 2017
MOP Section 3.4.3	Amend MOP Section 3.4.3 to ensure the commitment “LCO propose to re-spread 100mm of topsoil on all rehabilitation”, is subject to the LCO Soil Distribution Plan.	Administrative	Addressed in MOP amendment submitted and approved Feb 2017
MOP Section 3.4.3	Amend Section 3.4.3 of the MOP at the next variation to describe the current process used by LCO to source local native seed for use in site rehabilitation.	Administrative	Addressed in MOP amendment submitted and approved Feb 2017
MOP Section 7.3.4	Amend MOP Section 7.3.4 at the next variation to provide clarity regarding the source of seed used in LCO rehabilitation.	Administrative	Addressed in MOP amendment submitted and approved Feb 2017
MOP Section 9.2	Assess the ecological and rehabilitation monitoring results against the relevant rehabilitation completion criteria in future Annual Reviews. If required, monitoring results should trigger a management response as described in the MOP TARP. LCO should ensure that there is a clear decision making pathway between	Low	Included in Section 8.3 of the 2015 and 2016 Annual Review

	monitoring results, completion criteria, the TARP and resulting management measures.		
MOP Appendix F	Continue with investigations under the Mountain Block Remedial Strategy, as outlined in the 2015 MOP, Appendix F.	Medium	See Section 8.6
MOP (general)	In future MOPs or MOP amendments, consider linking rehabilitation commitments with milestones other than calendar years, such as production or disturbance progress, to ensure rehabilitation commitments match operational progress. Rehabilitation commitments would then reflect fluctuations in operational tempo.	Administrative	To be considered in new MOP (2018-2022) to be submitted for approval by 30 November 2017
DA 20/2008 & ST 18/2008 (SC Sewerage Management System Approval)			
Condition 3	Review contractor reporting procedures to confirm monitoring results are provided to SC within 7 days of testing as required under the approval condition.	Administrative	Confirmed monitoring results are provided within 7 days of testing.
20BL172588 Middle Liddell Bore			
Condition 12	The water licence audit was not completed within the five year period required under Condition 12. It is recommended that LCO address this issue with DPI-Water and seek to undertake the required audit as soon as possible in 2016.	Administrative	DPI Water contacted and confirmed they are satisfied that requirements have been addressed in Independent Environmental Audit and previous Annual Reviews. This will continue to apply for future audit intervals.
Other Recommendations			
Biodiversity Management Plan Section 6	Recommend updating Section 6 of the plan at the next revision to include options for weed control in advance of topsoil stripping in addition to just spraying to align with practices being undertaken.	Administrative	Section 6 of the BMP updated and DPE and DOE notified of the changes.
LCO SD PRO 0079	Review remediation actions and responsibility for the bioremediation area to ensure that the site and emplaced materials are adequately maintained.	Low	Bioremediation area management procedure reviewed and DP&E notified of changes.
Aboriginal Cultural Heritage Management	Remove any residual fencing and signage of Aboriginal heritage sites collected during the 2015 archaeological salvage to minimise any future uncertainty in the management of remaining sites.	Administrative	Complete. All remaining fenced sites exist within the LID BC SAL
General Rehabilitation	Review areas of bare patches on the ridges of contour banks in the Railway Block rehabilitation and remediate these areas if required.	Low	Review of bare areas completed and requirement for maintenance identified. These areas were subsequently re-ploughed with ameliorants and reseeded in June 2016.
General Rehabilitation	Reinstate cover on the disturbed face of the topsoil stockpile on the RL 192 overburden emplacement if the dump is not planned for modification during 2016.	Low	Topsoil stockpile is planned for use in 2017 rehabilitation.
General Rehabilitation	Implement a formal review process to assess the immediate and long term success of grazing and slashing trials as a control measure for Rhodes grass dominated pasture, to determine the value of these activities as a long term	Administrative	Ongoing. Rhodes grass domination of the South Cut rehabilitation areas has been identified as requiring strategic control to ensure the development of the pasture

	controls (for biodiversity and woodland corridor areas).		areas to meet MOP completion criteria. During 2017, LCO are budgeting to commence the installation of fencing, shade and watering systems to allow grazing in the South Cut rehabilitation areas.
General Rehabilitation	Based on those areas with specific biodiversity objectives (such as proposed habitat features or woodland corridors) identified in the 2015 MOP, priorities for the slashing and/or grazing control of Rhodes grass should be documented, and a schedule determined to ensure sufficient time and resources are allocated to achieve the required outcomes.	Administrative	Rhodes grass domination of the South Cut rehabilitation areas has been identified as requiring strategic control to ensure the development of the pasture areas to meet Mop completion criteria. During 2017, LCO are budgeting to commence the installation of fencing, shade and watering systems to allow grazing in the South Cut rehabilitation areas. The aim will be to continue to develop the "infrastructure" required to graze the land as per its intended post mining land use. This will also assist to offset the reduction in available cattle grazed areas with the exclusion of areas from the grazing trial paddocks. Implementation and review of the efficiency of cattle grazing control of Rhodes Grass will be detailed with input from local agronomists once the infrastructure is installed and the MOP completion criteria are revised in the pending MOP due 30 November 2017.
General Rehabilitation	Continue to review the performance of the Weed Action Plan to reflect corrective actions for high risk locations and the weed species present on site.	Low	Performance is reviewed through annual monitoring events and inspections completed every 2 months. Weed Action Plan has been developed for 2017.

The next independent audit is to be undertaken and completed in 2019.

11 Incidents and non-compliances during the reporting period

During the reporting period LCO had a number of incidents and non-compliances during the reporting period and are outlined below in **Table 38.**

Table 38 Non-compliance summary

Approval	Condition Reference	Condition Description	Description	Action taken
DA 305-11-01	Schedule 3, Condition 4	The Applicant shall ensure that blasts on site do not exceed the criteria	Ground vibration criteria from blast fired on 15/02 was recorded as 28.48mm/s, compliance limit is 25mm/s at Newdell zone substation.	Review and analysis of future blast data to examine other parameters that may influence K factor.

				Comparison of shots to examine any further correlations. Review opportunities to implement 'seed-hole' program to better understand vibration movement for each overburden sequence.
DA 305-11-01	Schedule 3, Condition 4	The Applicant shall ensure that blasts on site do not exceed the criteria	Current maximum vibration criteria from blast fired on 24/02 exceeded at Chain of Ponds Inn registering 21.04mm/s peak particle velocity (PPV), compliance limit was 20mm/s at time of the blast.	Investigation shown that vibration level measured was erroneously elevated by the resonance of a loose coupling block between the earth and the geophone. Geophone coupling repaired and inspected weekly until improved ground coupling is investigated and implemented.
EPL 2094	O1.1	Activities must be carried out in a competent manner	Water released (~5kL) from LCO to Ravensworth pipeline whilst under works. The water was largely contained in a containment controls including sump along access road however some released into a localised section of Bayswater Creek.	Water was pumped out of the localised section of the creek with samples taken both upstream and downstream. LCO developed additional Works Permit and revised Pipeline Management Procedure.
EPL 2094	M4.1	Weather Monitoring – Continuous monitoring of metrological conditions	Site weather monitoring station not functional due to firmware issues and electrical interference from storm activity resulting in failure to continuously monitor all parameters specified in M4.1. This occurred on the 22/1/2016 to 2/2/2016, the 20/3/2016, 29/9/2016 to 4/10/2016, 1/12/2016 to 7/12/2016 and 25/12/2016 to 31/12/2016.	Fault checked the sensor with no issues found. Configured alarm logic to notify when erroneous data is being reported, reconfigured when alarm logic failed to identify a fault. Sensor has been replaced in Q1 2017.
OSSM 3916/2008	Condition 3	SSC Onsite Sewage Management System Approval	Monitoring results are required to be submitted to the SSC within 7days of monitoring. On two occasions during the reporting period, monitoring results were submitted outside the 7day timeframe; once by 5 days in January and once by 3 days in March.	The monitoring results include the water quality parameter Biological Oxygen Demand which takes 5 days to determine. Fastest possible sample analysis and reporting occurring. Continued diligence and results reported typically same day as being received.

* Compliance status as per the *Compliance status key Table 3* of the NSW Government Annual Review Guideline

12 Activities to be completed in the next reporting period

All activities proposed in the next Annual Review period will be consistent with the approved LCO MOP, approvals and specific management plans. The following summarises a number of key activities to be completed in the next reporting period.

- No Independent Environmental Audit in accordance with DA-305-11-01 will be required during the reporting period.

- LCO's mining operations will continue to progress in a southerly direction in both mining areas. This will require the construction of additional carpark areas around the Mine Infrastructure Area to reduce risk of blasting operations impacting mobile equipment as well as the installation of visual screening along the Old New England Highway. Additionally, it will require the commencement of clearance and mining in the Bayswater Pit (South Entrance Pit) and the construction of an additional water fill point and associated infrastructure.

- LCO will submit a new Mining Operations Plan 2018-2022 in Q4 2017.

- **Section 6.2** discusses the blasting performance and specific management actions required at the Newdell Sub Station. A blast monitoring system for various components is in the process of being installed by Ausgrid and it is envisaged that the staged increase in blast vibration and transition to alternate vibration limits will occur during 2017.

- **Section 6.6** discusses the Chain of Ponds Inn and the implementation of stabilisation measures in accordance with the COPI Strategy. LCO will continue to implement these stabilisation measures and monitoring regime as required during 2017 in order to progress the vibration trigger limits in consultation with DPE.

- **Section 6.4** raised the requirement for a revised Air Quality Monitoring and Management Plan to be submitted for approval during 2017 to reflect the movement towards real time boundary air quality compliance monitoring.

- As outlined in **Section 6.9**, LCO will continue capping of the Antiene Tailings Dam in accordance with the Antiene Tailings Dam Capping Strategy submitted to DRE in December 2014.

- **Section 6.9** discussed the decreasing tailings capacity, LCO aim to commence planning and construction of the tailings pipeline to Mt Owen Complex (West Pit) as approved by DA305-11-01 Mod 6 to provide for improved LOM tailings emplacement.

- **Section 7.1** identified that a Site Water Balance calibration study will be required to be completed as part of the continuous feedback and improvement system detailed in the Water Management Plan.

- **Section 8.3** identifies the rehabilitation biodiversity and offset monitoring results/performance which will continue to drive management actions. LCO will continue maintenance works, weed and pest control actions and implement the BOMP through the commencement of active regeneration works in Bowman's Creek Riparian Corridor in particular. There will be a focus on the installation/construction of habitat material and connectivity across rehabilitation and offset areas.

- **Section 8.3** outlined the current status of rehabilitation areas, monitoring results and management actions to complete during 2017. LCO will implement the BMP and MOP management commitments including but not limited to:

    - Augment the habitat resource (nest boxes, log piles, hollows, etc.) to encourage fauna diversity;
    - Conduct maintenance (weed control, erosion repairs, tree thinning, etc.) works as required;
    - Complete supplementary planting to improve species diversity;
    - Continue rehabilitation trial areas;
    - Continue to develop and implement grazing strategy throughout South Cut pasture rehabilitation to control Rhodes grass. This will involve the establishment of shade (trees, shelter belts, etc.), water and fencing resources.

- **Section 8.4** outlined the current status of Offset areas, monitoring results and management actions to complete during 2017. LCO will implement the BOMP management commitments including but not limited to:

    - Refine and implement the Offset Remediation Strategy using results from monitoring results, rehabilitation trials and in consultation with appropriate experts;
    - Conduct weed and pest control works, supplementary planting, augment habitat resources, etc. as required;
    - Develop site specific remediation action plans for eroded areas of the Mountain Block Offset Area;
    - Continue fence line improvement works
    - Submit Voluntary Conservation Agreement as a log term security mechanism for the offsets.

- As part of the ongoing Offset implementation Works summarised in **Section 8.4**, the findings of due diligence investigations will require the updating of the Aboriginal and Cultural Heritage Management Plan.

- **Section 8.5** details the progress of the Indirect Offset Management program. During 2017, LCO will work to progress the automated recognition system through recognition method refinement; comprehensive testing; and final publication.

- As per **Section 8.7**, LCO will continue development of remediation plans for the Mountain Block legacy area and submit these for review. Once a final landform design for the area has been approved, LCO will move to tender the works.

13 References

NSW Government (2015) Annual Review Guideline

ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality

AS/NZS 5667.1 (1998) Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples

AS/NZS 5667.6 (1998) Water Quality – Sampling – Guidance on the Sampling of Rivers and Streams

Department of Environmental and Climate Change (DECC) (2007) Approved Methods for Sampling of Air Pollutants in New South Wales

Department of Environment, Climate Change and Water (DECCW) (2004) Approved Methods for Sampling and Analysis of Water Pollutants in New South Wales

Department of Mineral Resources (1999) Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW

Department of Trade & Investment (undated) EDG003 Guidelines to the Mining, Rehabilitation, and Environmental Management Process

Umwelt 2016 Biodiversity Monitoring Report. Prepared for Liddell Coal Operations Pty. Ltd*

Umwelt 2016 Biodiversity Offset Monitoring Report Prepared for Liddell Coal Operations Pty Ltd*

Umwelt 2016 Rehabilitation Monitoring Report Prepared for Liddell Coal Operations Pty Ltd*

Landcom (2004) Managing Urban Stormwater: Soils and Construction Manual

LCO (2015) Liddell Colliery Noise Monitoring Program*

LCO (2015) Spontaneous Combustion Management Plan*

LCO (2016) Air Quality Management and Monitoring Program*

LCO (2015) Land Clearing and Topsoil Stripping Procedure**

LCO (2015) Liddell Dust Management TARP**

LCO (2012) Waste Management Plan**

LCO (2015) Environmental Management Strategy*

LCO (2015) Aboriginal Cultural Heritage Management Plan*

LCO (2016) Water Management Plan*

LCO (2015) Blast Management Strategy – Chain of Ponds Inn*

SLR (2013) Liddell Coal Operations Modification to Development Consent Environmental Assessment*

*LCO document available on public website (www.liddellcoal.com.au)

**LCO document not publicly available

Appendix A - Train Haulage Summary

Train Loading Report

Date: 1/01/2016 to 30/04/2016
Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD164	JIN SHUN	1/1/2016	12:00 a	01:00 a	9,155	60	9,155
LD246	NAVIOS ORBITER	2/1/2016	12:00 a	01:00 a	8,689	60	8,689
LD116	JIN SHUN	2/1/2016	04:01 a	06:20 a	8,558	139	3,694
LD160	JIN SHUN	2/1/2016	07:49 a	10:05 a	9,147	136	4,036
LD364	NAVIOS ORBITER	3/1/2016	12:33 a	02:49 a	9,108	136	4,018
LD108	NAVIOS ORBITER	3/1/2016	03:26 a	05:55 a	8,703	149	3,504
LD246	NAVIOS ORBITER	3/1/2016	02:34 p	04:36 p	8,602	122	4,230
LD204	AMAKUSA ISLAND	4/1/2016	12:00 a	01:00 a	9,263	60	9,263
LD308	AMAKUSA ISLAND		12:00 a	01:00 a	9,168	60	9,168
LD106	BORYEONG	4/1/2016	01:03 a	03:19 a	9,203	136	4,060
LD318	NEW STAGE	7/1/2016	12:00 a	01:00 a	8,724	60	8,724
LD166	CRYSTAL WIND	8/1/2016	12:00 a	01:00 a	8,694	60	8,694
LD318	NEW STAGE		12:00 a	01:00 a	8,613	60	8,613
LD372	NEW STAGE	8/1/2016	03:08 a	05:17 a	9,186	129	4,273
LD264	NEW STAGE	9/1/2016	12:00 a	01:00 a	9,146	60	9,146
LD316	NEW STAGE		12:00 a	01:00 a	9,231	60	9,231
LD118	CRYSTAL WIND	9/1/2016	04:01 a	06:15 a	9,258	134	4,145
LD168	FPMC B 103	10/1/2016	10:29 a	12:47 p	8,645	138	3,759
LD224	FPMC B 103	10/1/2016	01:13 p	03:28 p	9,193	135	4,086
LD318	ISHIZUCHI	10/1/2016	09:05 p	01:09 a	9,145	244	2,249
LD188	K. PHOENIX	11/1/2016	12:00 a	01:00 a	9,193	60	9,193
LD364	FPMC B 103	11/1/2016	01:37 a	03:57 a	9,234	140	3,958
LD178	PACIFIC OAK	12/1/2016	12:00 a	01:00 a	9,226	60	9,226
LD352	PACIFIC OAK		12:00 a	01:00 a	9,045	60	9,045
LD308	K. PHOENIX	12/1/2016	12:42 a	03:06 a	9,191	144	3,830
LD200	PACIFIC OAK	13/1/2016	12:00 a	01:00 a	8,588	60	8,588
LD268	PACIFIC OAK		12:00 a	01:00 a	9,227	60	9,227
LD104	PACIFIC OAK	13/1/2016	05:14 a	07:29 a	9,167	135	4,074
LD270	PACIFIC OAK	14/1/2016	12:00 a	01:00 a	8,836	60	8,836
LD318	PACIFIC OAK	15/1/2016	09:53 p	12:09 a	8,611	136	3,799
LD388	SUNRISE SERENITY	17/1/2016	02:51 a	05:06 a	9,680	135	4,302
LD124	SUNRISE SERENITY	17/1/2016	05:35 a	07:56 a	9,057	141	3,854
LD230	SUNRISE SERENITY	17/1/2016	03:20 p	05:48 p	9,295	148	3,768
LD244	PACIFIC OAK	19/1/2016	12:00 a	01:00 a	9,311	60	9,311
LD278	DAEBO NEWCASTLE	20/1/2016	12:00 a	01:00 a	9,144	60	9,144
LD188	KUMANO MARU	22/1/2016	12:00 a	01:00 a	9,132	60	9,132
LD276	KUMANO MARU	23/1/2016	12:00 a	01:00 a	9,348	60	9,348
LD320	HL PORT KEMBLA		12:00 a	01:00 a	9,438	60	9,438
LD258	KUMANO MARU	23/1/2016	01:33 a	03:51 a	9,418	138	4,095
LD142	KUMANO MARU	24/1/2016	05:35 a	07:51 a	9,435	136	4,162
LD250	ENERGY PRIMAVERA	27/1/2016	12:00 a	01:00 a	9,209	60	9,209
LD152	ENERGY PRIMAVERA	27/1/2016	07:03 a	09:18 a	9,222	135	4,099
LD172	NEW JOY	30/1/2016	12:00 a	01:00 a	9,383	60	9,383
LD264	NEW JOY		12:00 a	01:00 a	9,371	60	9,371
LD200	YUE DIAN 83	2/2/2016	12:00 a	01:00 a	9,177	60	9,177
LD166	HERMES ISLAND	4/2/2016	07:58 a	10:33 a	9,058	155	3,506
LD362	CENTURY WAVE	7/2/2016	12:46 a	03:04 a	9,049	138	3,934
LD150	CENTURY WAVE	7/2/2016	06:19 a	08:33 a	9,233	134	4,134
LD300	CENTURY WAVE	7/2/2016	07:40 p	11:16 p	9,456	216	2,627
LD288	CORAL RUBY	8/2/2016	07:19 p	09:42 p	9,239	143	3,877
LD388	CORAL RUBY	9/2/2016	03:41 a	05:57 a	8,674	136	3,827
LD356	CHINA STEEL EXCELLE	10/2/2016	12:00 a	01:00 a	8,954	60	8,954
LD318	CHINA STEEL EXCELLE	11/2/2016	02:08 a	04:13 a	9,015	125	4,327
LD218	K. YOUNGHUNG	13/2/2016	12:35 p	02:41 p	8,289	126	3,947
LD288	K. YOUNGHUNG	13/2/2016	05:51 p	08:01 p	8,892	130	4,104
LD124	NSU OBELISK	14/2/2016	04:59 a	07:21 a	9,074	142	3,834
LD206	NSU OBELISK	14/2/2016	11:25 a	01:31 p	8,713	126	4,149
LD270	NSU OBELISK	14/2/2016	05:06 p	07:16 p	8,889	130	4,102
LD216	NSU OBELISK	15/2/2016	12:01 p	02:06 p	8,347	125	4,007
LD308	SHIN SAPPORO MARU	15/2/2016	08:38 p	11:07 p	9,186	149	3,699
LD166	SHIN SAPPORO MARU	16/2/2016	08:22 a	10:43 a	8,605	141	3,662
LD380	SHIN SAPPORO MARU	17/2/2016	02:08 a	04:16 a	8,852	128	4,149
LD146	SHIN SAPPORO MARU	17/2/2016	07:06 a	09:19 a	9,134	133	4,121
LD240	SHIN SAPPORO MARU	17/2/2016	02:54 p	05:17 p	9,186	143	3,854
LD308	SHIN SAPPORO MARU	17/2/2016	09:01 p	11:01 p	8,471	120	4,236
LD224	SHIN SAPPORO MARU	18/2/2016	12:52 p	03:06 p	9,321	134	4,174
LD356	DYNA GLOBE	21/2/2016	12:42 a	03:01 a	9,075	139	3,917
LD200	DYNA GLOBE	21/2/2016	11:21 a	01:31 p	8,490	130	3,919
LD246	DYNA GLOBE	21/2/2016	04:06 p	06:28 p	9,059	142	3,828

Train Loading Report

Date: 1/01/2016 to 30/04/2016

Site: Liddell Coal Marketing Pty Limited

Train No	Vessel Name	Arrival Time	Load Start	Load End Time	Qty	Duration (min	Load Rate (T/Hr)
LD344	NSS GRANDEUR	27/2/2016	12:23 a	02:28 a	9,145	125	4,390
LD208	NSU RESPONSIBILITY	28/2/2016	11:44 a	01:57 p	9,219	133	4,159
LD278	NSU RESPONSIBILITY	28/2/2016	05:28 p	07:35 p	9,104	127	4,301
LD156	NSU RESPONSIBILITY	29/2/2016	08:52 a	10:55 a	8,969	123	4,375
LD282	NSU RESPONSIBILITY	29/2/2016	08:19 p	10:30 p	9,090	131	4,163
LD280	KEY GUARDIAN	2/3/2016	05:44 p	07:54 p	9,509	130	4,389
LD344	KEY GUARDIAN	2/3/2016	11:13 p	01:32 a	9,100	139	3,926
LD274	SANTA GRACIELA	5/3/2016	05:59 p	09:09 p	8,706	190	2,749
LD336	CHINA STEEL INTEGRIT	5/3/2016	10:36 p	12:45 a	9,155	129	4,258
LD356	CHINA STEEL INTEGRIT	6/3/2016	01:12 a	03:36 a	9,007	144	3,753
LD206	CHINA STEEL INTEGRIT	6/3/2016	12:00 p	02:04 p	9,211	124	4,457
LD258	CHINA STEEL INTEGRIT	6/3/2016	03:46 p	05:57 p	9,225	131	4,225
LD386	UNITED ADVENTURE	9/3/2016	02:34 a	04:56 a	9,016	142	3,810
LD202	UNITED ADVENTURE	9/3/2016	12:27 p	02:33 a	8,507	846	603
LD114	UNITED ADVENTURE	10/3/2016	03:58 a	06:08 a	8,570	130	3,955
LD372	WESTERN NARVIK	11/3/2016	02:15 a	04:20 a	9,078	125	4,357
LD142	WESTERN NARVIK	12/3/2016	06:06 a	08:16 a	9,154	130	4,225
LD218	WESTERN NARVIK	12/3/2016	01:17 p	03:32 p	9,198	135	4,088
LD350	WESTERN NARVIK	12/3/2016	10:57 p	01:04 a	8,539	127	4,034
LD276	SHIN-REI	17/3/2016	06:17 p	09:02 p	9,133	165	3,321
LD342	SHIN-REI	18/3/2016	12:58 a	03:02 a	9,137	124	4,421
LD246	SHIN-REI	19/3/2016	03:34 p	06:03 p	9,082	149	3,657
LD184	CORONA LIONS	25/3/2016	10:13 a	12:20 p	9,146	127	4,321
LD374	CORONA LIONS	26/3/2016	02:16 a	04:15 a	8,752	119	4,413
LD142	CORONA LIONS	26/3/2016	06:52 a	09:05 a	8,965	133	4,044
LD288	CORONA LIONS	26/3/2016	06:19 p	08:30 p	8,689	131	3,980
LD218	CORONA LIONS	27/3/2016	01:26 p	03:39 p	9,016	133	4,067
LD148	CORONA LIONS	28/3/2016	06:53 a	08:31 a	9,299	98	5,693
LD204	F. D. ISABELLA	28/3/2016	11:44 a	02:04 p	8,747	140	3,749
LD208	F. D. ISABELLA	29/3/2016	12:04 p	02:32 p	9,159	148	3,713
LD304	F. D. ISABELLA	3/4/2016	12:00 a	01:00 a	9,374	60	9,374
LD286	NEW STAGE	6/4/2016	05:56 p	08:15 p	9,120	139	3,937
LD370	NEW STAGE	7/4/2016	12:00 a	01:00 a	9,474	60	9,474
LD350	NEW STAGE	8/4/2016	12:33 a	02:44 a	9,113	131	4,174
LD348	CEMTEX ORIENT	10/4/2016	10:56 p	01:04 a	9,244	128	4,333
LD118	CEMTEX ORIENT	11/4/2016	04:31 a	06:53 a	9,206	142	3,890
LD146	NSU RESPONSIBILITY	13/4/2016	06:37 a	08:58 a	9,521	141	4,052
LD162	NSU RESPONSIBILITY	15/4/2016	08:42 a	10:48 a	8,627	126	4,108
LD230	NSU RESPONSIBILITY	15/4/2016	02:06 p	04:14 p	9,096	128	4,264
LD338	NSU RESPONSIBILITY	15/4/2016	11:38 p	02:03 a	9,053	145	3,746
LD136	NSU RESPONSIBILITY	16/4/2016	06:21 a	08:49 a	9,051	148	3,669
LD322	CEMTEX PRUDENCE	16/4/2016	08:42 p	10:49 p	8,799	127	4,157
LD132	NSU RESPONSIBILITY	18/4/2016	06:02 a	08:17 a	8,720	135	3,876
LD222	NSU RESPONSIBILITY	18/4/2016	01:35 p	03:51 p	9,261	136	4,095
LD158	NSU RESPONSIBILITY	19/4/2016	07:53 a	11:03 a	9,219	190	2,911
LD130	TTM BRILLIANCE	20/4/2016	05:56 a	08:15 a	8,802	139	3,800
LD158	TTM BRILLIANCE	23/4/2016	08:37 a	10:57 a	9,400	140	4,029

Summary

Number of Trains:	116
Total Nett Weight:	1,049,355.0
Average Nett Weight:	9,046.2
Average Load Rate:	4,308.3
Average Load Duration:	126.0

Total Tonnes Railed

LID10	66,240
LID10.5	35,104
LID11	313,764
LID12	261,246
LID12.5	197,101
LID14	83,678
LID22	7,012
LID8	58,728

COAL RECEIVALS

Report Period 01/05/2016 12:00 am to 31/12/2016 12:00 am

CoalMan Site : Liddell Coal Marketing Pty Ltd

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
Glencore Rail (NSW) Pty Ltd	Saturday 28 May 2016	LD188	Liddell to JFE - Apr'16-Mar'17 1st	Shohaku	28 May 2016					9,437.21						9,437.21
		Summary of Saturday 28 May 2016								9,437.21						9,437.21
	Sunday 29 May 2016	LD196	GCS (XMO) to SJEP Apr 16 - Dec'16 Base	Ishizuchi	29 May 2016			9,243.00								9,243.00
		Summary of Sunday 29 May 2016						9,243.00								9,243.00
	Sunday 18 September 2016	LD304	Liddell to Kyushu EPC - JFY'16	Corona Queen	19 September 2016						9,241.71					9,241.71
		Summary of Sunday 18 September 2016									9,241.71					9,241.71
	Monday 19 September 2016	LD250	Liddell to Ube - JFY16 JEN Oct BM	New Command	19 September 2016			9,111.98								9,111.98
		Summary of Monday 19 September 2016						9,111.98								9,111.98
	Tuesday 20 September 2016	LD208	Liddell to JFE - Apr'16-Mar'17 2nd	Cape Green	20 September 2016			9,087.78								9,087.78
		LD256	Liddell to JFE - Apr'16-Mar'17 2nd	Cape Green	21 September 2016						9,117.78					9,117.78
		Summary of Tuesday 20 September 2016						9,087.78			9,117.78					18,205.56
	Wednesday 21 September 2016	LD268	GCS (XMO) to SJEP-Apr'16 - Dec'16 Mutual op	Ishizuchi	21 September 2016						8,800.62					8,800.62
		Summary of Wednesday 21 September 2016									8,800.62					8,800.62
	Thursday 22 September 2016	LD240	Liddell to Ube - JFY16 JEN Oct BM	New Command	22 September 2016			6,543.98						2,441.79		8,985.77
		Summary of Thursday 22 September 2016						6,543.98						2,441.79		8,985.77
	Summary of Glencore Rail (NSW) Pty Ltd							33,986.74		9,437.21	27,160.11			2,441.79		73,025.85
Pacific National	Sunday 01 May 2016	LD184		Ishizuchi	1 May 2016			9,105.20								9,105.20
		Summary of Sunday 01 May 2016						9,105.20								9,105.20
	Monday 02 May 2016	LD164		China Steel Innovator	2 May 2016								9,082.40			9,082.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD280		China Steel Innovator	3 May 2016								8,737.20			8,737.20
		Summary of Monday 02 May 2016											17,819.60			17,819.60
	Tuesday 03 May 2016	LD186		China Steel Innovator	3 May 2016									6,218.57	2,875.43	9,094.00
		LD320		China Steel Endeavor	4 May 2016									9,167.60		9,167.60
		Summary of Tuesday 03 May 2016												15,386.17	2,875.43	18,261.60
	Wednesday 04 May 2016	LD126		Aomi	4 May 2016			8,676.60								8,676.60
		Summary of Wednesday 04 May 2016						8,676.60								8,676.60
	Saturday 07 May 2016	LD116		Tarumaesan Maru	7 May 2016						9,514.80					9,514.80
		LD182		Luminous Halo	7 May 2016						9,319.00					9,319.00
		LD244		Luminous Halo	8 May 2016							9,201.00				9,201.00
		Summary of Saturday 07 May 2016									18,833.80	9,201.00				28,034.80
	Sunday 08 May 2016	LD148		Tarumaesan Maru	8 May 2016						9,122.20					9,122.20
		Summary of Sunday 08 May 2016									9,122.20					9,122.20
	Thursday 12 May 2016	LD142		Corona Nature	12 May 2016						9,193.40					9,193.40
		LD338		Corona Nature	12 May 2016						8,430.00					8,430.00
		Summary of Thursday 12 May 2016									17,623.40					17,623.40
	Friday 13 May 2016	LD330		Corona Nature	13 May 2016						9,080.00					9,080.00
		Summary of Friday 13 May 2016									9,080.00					9,080.00
	Wednesday 18 May 2016	LD212		New Stage	18 May 2016						8,695.80					8,695.80
		LD338		New Stage	18 May 2016						9,088.80					9,088.80
		Summary of Wednesday 18 May 2016									17,784.60					17,784.60
	Thursday 19 May 2016	LD230		New Stage	19 May 2016					8,965.00						8,965.00
		Summary of Thursday 19 May 2016								8,965.00						8,965.00
	Friday 20 May 2016	LD158		Ohshu Maru	20 May 2016						9,309.00					9,309.00
		LD230		Corona Royal	20 May 2016						9,508.00					9,508.00
		LD320		New Stage	20 May 2016						9,129.40					9,129.40
		Summary of Friday 20 May 2016									27,946.40					27,946.40
	Saturday 21 May 2016	LD230		Corona Royal	21 May 2016						7,963.00					7,963.00
		Summary of Saturday 21 May 2016									7,963.00					7,963.00
	Sunday 22 May 2016	LD192		Corona Royal	22 May 2016						8,661.00					8,661.00
		Summary of Sunday 22 May 2016									8,661.00					8,661.00
	Monday 23 May 2016	LD250	Ulan to GIAG (Mars Power) - May'16	Formosabulk Allstar	24 May 2016					8,620.80						8,620.80
		Summary of Monday 23 May 2016								8,620.80						8,620.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Tuesday 24 May 2016	LD306	Bulga to Kyushu EPC - Oct'15 - Sep'16	Corona Kingdom	25 May 2016						9,252.40					9,252.40
		LD330	Ulan to GIAG (Mars Power) - May'16	Formosabulk Allstar	24 May 2016					9,135.00						9,135.00
		Summary of Tuesday 24 May 2016								9,135.00	9,252.40					18,387.40
	Wednesday 25 May 2016	LD374	Bulga to Kyushu EPC - Oct'15 - Sep'16	Corona Kingdom	25 May 2016						9,269.63					9,269.63
		Summary of Wednesday 25 May 2016									9,269.63					9,269.63
	Thursday 26 May 2016	LD130	Q1 LD to China Steel Corp - JFY16	Star Sirius	26 May 2016		9,202.00									9,202.00
		LD284	Q1 LD to China Steel Corp - JFY16	Star Sirius	27 May 2016									9,169.20		9,169.20
		Summary of Thursday 26 May 2016					9,202.00							9,169.20		18,371.20
	Friday 27 May 2016	LD198	Ulan to Chugoku - June'16	Energia Centaurus	27 May 2016			4,645.66	4,627.34							9,273.00
		Summary of Friday 27 May 2016						4,645.66	4,627.34							9,273.00
	Saturday 28 May 2016	LD140	Q1 LD to China Steel Corp - JFY16	Star Sirius	28 May 2016		4,644.14		4,377.26							9,021.40
		Summary of Saturday 28 May 2016					4,644.14		4,377.26							9,021.40
	Sunday 29 May 2016	LD226	Liddell to JFE - Apr'16-Mar'17 1st	Shohaku	29 May 2016				9,180.00							9,180.00
		LD330	Liddell to JFE - Apr'16-Mar'17 1st	Shohaku	30 May 2016						9,213.00					9,213.00
		LD384	GCS (XMO) to SJEP Apr 16 - Dec'16 Base	Ishizuchi	29 May 2016				9,116.60							9,116.60
		Summary of Sunday 29 May 2016							18,296.60		9,213.00					27,509.60
	Monday 30 May 2016	LD388	Liddell to JFE - Apr'16-Mar'17 1st	Shohaku	30 May 2016			0.00	8,393.00	0.00						8,393.00
		Summary of Monday 30 May 2016						0.00	8,393.00	0.00						8,393.00
	Friday 03 June 2016	LD178	GCS (XMO) to SJEP Apr 16 - Dec'16 Base	Ishizuchi	3 June 2016					5,734.78	2,850.22					8,585.00
		Summary of Friday 03 June 2016								5,734.78	2,850.22					8,585.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Thursday 09 June 2016	LD276	Liddell to NSC JFY16 GC NEWC Jan - Mar	Spring Brave	10 June 2016						9,095.00					9,095.00
		Summary of Thursday 09 June 2016									9,095.00					9,095.00
	Friday 10 June 2016	LD144	Liddell to NSC JFY16 GC NEWC Jan - Mar	Spring Brave	10 June 2016						8,405.00					8,405.00
		LD210	Liddell to NSC JFY16 GC NEWC Jan - Mar	Spring Brave	10 June 2016						8,659.80					8,659.80
		Summary of Friday 10 June 2016									17,064.80					17,064.80
	Saturday 11 June 2016	LD128	Liddell to NSC JFY16 GC NEWC Jan - Mar	Spring Brave	11 June 2016			6,132.51				2,953.09				9,085.60
		LD156	XMC to GIAG (KOSPO) - Jun'16	Bluebell	11 June 2016					8,578.20						8,578.20
		LD296	XMC to GIAG (KOSPO) - Jun'16	Bluebell	12 June 2016					9,219.60						9,219.60
		Summary of Saturday 11 June 2016						6,132.51		17,797.80		2,953.09				26,883.40
	Sunday 12 June 2016	LD120	2nd/4 FP XCM-Itochu (Tohoku EPC) JFY'16 Yr 2 of 3	Hibari	12 June 2016			9,056.20								9,056.20
		Summary of Sunday 12 June 2016						9,056.20								9,056.20
	Monday 13 June 2016	LD112	2nd/4 FP XCM-Itochu (Tohoku EPC) JFY'16 Yr 2 of 3	Hibari	13 June 2016			3,818.86					4,732.74			8,551.60
		LD328	Q1 LD to China Steel Corp - JFY16	Berge Yotei	14 June 2016		8,509.80									8,509.80
		LD352	Q1 LD to China Steel Corp - JFY16	Berge Yotei	13 June 2016		7,775.59	1,200.81								8,976.40
		Summary of Monday 13 June 2016					16,285.39	5,019.67					4,732.74			26,037.80
	Tuesday 14 June 2016	LD172	2nd/4 FP XCM-Itochu (Tohoku EPC) JFY'16 Yr 2 of 3	Hibari	14 June 2016			9,311.00								9,311.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD230	Liddell to Ube - JFY16 July JPU-Teijin	Orange Truth	14 June 2016				9,124.20							9,124.20
		Summary of Tuesday 14 June 2016						9,311.00	9,124.20							18,435.20
	Saturday 18 June 2016	LD256	Liddell to NSC JFY16 Fixed Price	NSU Newstar	18 June 2016					9,394.60						9,394.60
		Summary of Saturday 18 June 2016								9,394.60						9,394.60
	Sunday 19 June 2016	LD190	Liddell to NSC JFY16 Fixed Price	NSU Newstar	19 June 2016			8,624.00								8,624.00
		LD242	Liddell to NSC JFY16 Fixed Price	NSU Newstar	19 June 2016			9,301.20								9,301.20
		LD272	Liddell to NSC JFY16 Fixed Price	NSU Newstar	20 June 2016			4,746.20	3,409.20							8,155.40
		Summary of Sunday 19 June 2016						22,671.40	3,409.20							26,080.60
	Monday 20 June 2016	LD110	Liddell to NSC JFY16 Fixed Price	NSU Newstar	20 June 2016			9,262.00								9,262.00
		LD288	MCM to TPC (98-AU-BA0801) - CY16	Cemtex Orient	21 June 2016							9,282.00				9,282.00
		Summary of Monday 20 June 2016						9,262.00				9,282.00				18,544.00
	Tuesday 21 June 2016	LD126	Liddell to NSC JFY16 Fixed Price	NSU Newstar	21 June 2016	9,157.60										9,157.60
		LD172	Liddell to NSC JFY16 Fixed Price	Cape Vanguard	21 June 2016			8,668.00								8,668.00
		LD346	MCM to TPC (98-AU-BA0801) - CY16	Cemtex Orient	21 June 2016							9,119.20				9,119.20
		Summary of Tuesday 21 June 2016				9,157.60		8,668.00				9,119.20				26,944.80
	Wednesday 22 June 2016	LD112	Liddell to NSC JFY16 Fixed Price	Cape Vanguard	22 June 2016			4,336.49						4,131.91		8,468.40
		Summary of Wednesday 22 June 2016						4,336.49						4,131.91		8,468.40
	Saturday 25 June 2016	LD378	Q2 LDto China Steel Corp - JFY16	China Steel Endeavor	25 June 2016									9,002.60		9,002.60
		Summary of Saturday 25 June 2016												9,002.60		9,002.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Tuesday 28 June 2016	LD202	Liddell to Ube - JFY16 Mits. Paper Apr BM	Global Garnet	28 June 2016										8,930.80	8,930.80
		Summary of Tuesday 28 June 2016													8,930.80	8,930.80
	Wednesday 29 June 2016	LD352	Liddell to Ube - JFY16 Mits. Paper Apr BM	Global Garnet	29 June 2016									8,648.80		8,648.80
		Summary of Wednesday 29 June 2016												8,648.80		8,648.80
	Thursday 30 June 2016	LD212	Liddell to Ube - JFY16 Mits. Paper Apr BM	Global Garnet	30 June 2016									8,702.80		8,702.80
		Summary of Thursday 30 June 2016												8,702.80		8,702.80
	Saturday 02 July 2016	LD174	Liddell to NSC JFY16 Fixed Price	Sen-Oku	2 July 2016			8,712.20								8,712.20
		LD206	Liddell to NSC JFY16 Fixed Price	Sen-Oku	2 July 2016			9,127.40								9,127.40
		LD298	Liddell to NSC JFY16 Fixed Price	Sen-Oku	3 July 2016						8,655.40					8,655.40
		Summary of Saturday 02 July 2016						17,839.60			8,655.40					26,495.00
	Sunday 03 July 2016	LD252	Liddell to NSC JFY16 Fixed Price	Sen-Oku	3 July 2016			9,165.20								9,165.20
		LD330	Liddell to NSC JFY16 Fixed Price	Sen-Oku	4 July 2016						8,710.20					8,710.20
		LD344	Rav North to Pen - Apr '16 - Sep'16	Clipper I-Star	3 July 2016							9,326.40				9,326.40
		Summary of Sunday 03 July 2016						9,165.20			8,710.20	9,326.40				27,201.80
	Monday 04 July 2016	LD138	Liddell to NSC JFY16 GC NEWC Apr - Jun	NSU Responsibility	4 July 2016			9,082.80								9,082.80
		Summary of Monday 04 July 2016						9,082.80								9,082.80
	Tuesday 05 July 2016	LD188	Liddell to NSC JFY16 GC NEWC Apr - Jun	NSU Responsibility	5 July 2016			9,157.80								9,157.80
		LD272	Liddell to NSC JFY16 Fixed Price	Sen-Oku	5 July 2016					4,698.18		4,699.22				9,397.40
		Summary of Tuesday 05 July 2016						9,157.80		4,698.18		4,699.22				18,555.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 06 July 2016	LD260	Liddell to NSC JFY16 GC NEWC Apr - Jun	NSU Responsibility	7 July 2016			9,120.00								9,120.00
		Summary of Wednesday 06 July 2016						9,120.00								9,120.00
	Thursday 07 July 2016	LD304	GCS to Suzhou Kaiyuan Chemical June'16 - 082CN	Tango	8 July 2016							9,443.00				9,443.00
		Summary of Thursday 07 July 2016										9,443.00				9,443.00
	Friday 08 July 2016	LD244	GCS to Suzhou Kaiyuan Chemical June'16 - 082CN	Tango	8 July 2016						931.01	8,290.59				9,221.60
		LD322	GCS (XMO) to SJEP Apr 16 - Dec'16 Base	Ishizuchi	9 July 2016			8,769.20								8,769.20
		Summary of Friday 08 July 2016						8,769.20			931.01	8,290.59				17,990.80
	Saturday 09 July 2016	LD320	GCS (XMO) to SJEP Apr 16 - Dec'16 Base	Ishizuchi	10 July 2016			8,712.20								8,712.20
		Summary of Saturday 09 July 2016						8,712.20								8,712.20
	Sunday 10 July 2016	LD156	Liddell to NSC JFY16 Fixed Price	Cape Frontier	10 July 2016	9,213.00										9,213.00
		Summary of Sunday 10 July 2016				9,213.00										9,213.00
	Monday 11 July 2016	LD272	GCS (XMO) to SJEP Apr 16 - Dec'16 Base	Ishizuchi	12 July 2016						0.00				9,202.20	9,202.20
		LD368	Liddell to NSC JFY16 Fixed Price	Cape Frontier	11 July 2016						8,746.40					8,746.40
		Summary of Monday 11 July 2016									8,746.40				9,202.20	17,948.60
	Tuesday 12 July 2016	LD158	Liddell to Ube - JFY16 Yes April BM	Rin Yo	12 July 2016						5,294.72			3,116.48		8,411.20
		LD338	Liddell to NSC JFY16 Fixed Price	Cape Frontier	12 July 2016					6,826.72	2,424.88					9,251.60
		Summary of Tuesday 12 July 2016								6,826.72	7,719.60			3,116.48		17,662.80
	Wednesday 13 July 2016	LD182	Liddell to Ube - JFY16 Yes April BM	Rin Yo	13 July 2016					9,238.00						9,238.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD244	Liddell to Ube - JFY16 Yes April BM	Rin Yo	13 July 2016			1,212.50			4,567.21			2,706.69		8,486.40
		LD334	Liddell to NSC JFY16 Fixed Price	Cape Frontier	13 July 2016	9,235.40										9,235.40
		Summary of Wednesday 13 July 2016				9,235.40		1,212.50		9,238.00	4,567.21			2,706.69		26,959.80
	Thursday 21 July 2016	LD102	XCS TO BAOSTEEL JUL'16	Jin Qi	21 July 2016									7,727.61	1,376.59	9,104.20
		LD284	Q2 LDto China Steel Corp - JFY16	China Steel Entrepreneur	22 July 2016									9,117.20		9,117.20
		Summary of Thursday 21 July 2016												16,844.81	1,376.59	18,221.40
	Friday 22 July 2016	LD216	Q2 LDto China Steel Corp - JFY16	China Steel Entrepreneur	22 July 2016									9,244.40		9,244.40
		Summary of Friday 22 July 2016												9,244.40		9,244.40
	Monday 25 July 2016	LD128	Bulga to Kansai EPC - Jan'16 - Dec'16	Maizuru Kichijo	25 July 2016						9,120.20					9,120.20
		LD216	Bulga to Kansai EPC - Jan'16 - Dec'16	Maizuru Kichijo	25 July 2016			9,411.20								9,411.20
		Summary of Monday 25 July 2016						9,411.20			9,120.20					18,531.40
	Tuesday 26 July 2016	LD148	Bulga to Kansai EPC - Jan'16 - Dec'16	Maizuru Kichijo	26 July 2016			1,407.81			7,827.19					9,235.00
		LD210	Bulga to Kansai EPC - Jan'16 - Dec'16	Maizuru Kichijo	26 July 2016						9,344.60					9,344.60
		Summary of Tuesday 26 July 2016						1,407.81			17,171.79					18,579.60
	Wednesday 27 July 2016	LD358	Bulga to Kansai EPC - Jan'16 - Dec'16	Maizuru Kichijo	27 July 2016						9,207.00					9,207.00
		Summary of Wednesday 27 July 2016									9,207.00					9,207.00
	Friday 29 July 2016	LD230	Ulan to GIAG Jul-Aug'16	Navios Azimuth	29 July 2016					9,091.40						9,091.40
		LD324	Ulan to GIAG Jul-Aug'16	Navios Azimuth	30 July 2016			9,131.00								9,131.00
		Summary of Friday 29 July 2016						9,131.00		9,091.40						18,222.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Saturday 30 July 2016	LD160	Ulan to GIAG Jul-Aug'16	Navios Azimuth	30 July 2016			9,032.20								9,032.20
		Summary of Saturday 30 July 2016						9,032.20								9,032.20
	Sunday 31 July 2016	LD200	Liddell to NSC JFY16 GC NEWC Apr - Jun	New Stage	31 July 2016	8,766.60										8,766.60
		LD288	Liddell to NSC JFY16 GC NEWC Apr - Jun	New Stage	1 August 2016					9,189.00						9,189.00
		Summary of Sunday 31 July 2016				8,766.60				9,189.00						17,955.60
	Sunday 07 August 2016	LD214	Liddell to NSC JFY16 GC NEWC Apr - Jun	New Stage	7 August 2016			9,128.20								9,128.20
		Summary of Sunday 07 August 2016						9,128.20								9,128.20
	Monday 08 August 2016	LD178	Liddell to NSC JFY16 GC NEWC Apr - Jun	New Stage	8 August 2016	8,375.60										8,375.60
		Summary of Monday 08 August 2016				8,375.60										8,375.60
	Tuesday 09 August 2016	LD154	Liddell to NSC JFY16 GC NEWC Apr - Jun	New Stage	9 August 2016	8,747.00										8,747.00
		LD254	Liddell to NSC JFY16 GC NEWC Apr - Jun	Kashima Maru	9 August 2016	9,048.30										9,048.30
		LD322	Liddell to NSC JFY16 GC NEWC Apr - Jun	Kashima Maru	10 August 2016	7,668.48					1,163.52					8,832.00
		LD326	Liddell to NSC JFY16 GC NEWC Apr - Jun	Kashima Maru	9 August 2016						8,531.20					8,531.20
		Summary of Tuesday 09 August 2016				25,463.78					9,694.72					35,158.50
	Wednesday 10 August 2016	LD108	Q2 LDto China Steel Corp - JFY16	China Steel Exploration	10 August 2016									6,899.19	1,335.21	8,234.40
		LD188	Q2 LDto China Steel Corp - JFY16	China Steel Exploration	10 August 2016										9,093.20	9,093.20
		LD264	Q2 LDto China Steel Corp - JFY16	China Steel Exploration	11 August 2016									8,873.70		8,873.70
		Summary of Wednesday 10 August 2016												15,772.89	10,428.41	26,201.30

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Thursday 11 August 2016	LD154	3rd/4 XCM-Itochu (Tohoku EPC) JFY'16 Yr 2 of 3	Akatsuki	11 August 2016						9,199.80					9,199.80
		Summary of Thursday 11 August 2016									9,199.80					9,199.80
	Friday 12 August 2016	LD144	3rd/4 XCM-Itochu (Tohoku EPC) JFY'16 Yr 2 of 3	Akatsuki	12 August 2016						9,317.60					9,317.60
		LD340	Q2 LDto China Steel Corp - JFY16	China Steel Exploration	12 August 2016									0.00	8,679.60	8,679.60
		Summary of Friday 12 August 2016									9,317.60			0.00	8,679.60	17,997.20
	Saturday 13 August 2016	LD330	3rd/4 XCM-Itochu (Tohoku EPC) JFY'16 Yr 2 of 3	Akatsuki	13 August 2016						8,687.40					8,687.40
		Summary of Saturday 13 August 2016									8,687.40					8,687.40
	Sunday 14 August 2016	LD114	Ulan to Talpower - CY16 (Yr7-8)	Talpower Prosperity I	14 August 2016					8,709.40						8,709.40
		LD216	Ulan to Talpower - CY16 (Yr7-8)	Talpower Prosperity I	14 August 2016	9,098.00										9,098.00
		LD300	Ulan to Talpower - CY16 (Yr7-8)	Talpower Prosperity I	15 August 2016	4,632.30				4,671.90						9,304.20
		Summary of Sunday 14 August 2016				13,730.30				13,381.30						27,111.60
	Monday 15 August 2016	LD146	Liddell to Ube - JFY16 April JPU-UBE own use	Jozen	15 August 2016	8,695.00										8,695.00
		LD302	Liddell to Ube - JFY16 April JPU-UBE own use	Jozen	16 August 2016						4,893.49			3,757.51		8,651.00
		Summary of Monday 15 August 2016				8,695.00					4,893.49			3,757.51		17,346.00
	Tuesday 16 August 2016	LD186	Ulan to GIAG Aug'16 #54731	Marvellous	16 August 2016	7,673.43				1,144.17						8,817.60
		LD270	Ulan to GIAG Jul-Aug'16	Genco Commodus	16 August 2016	4,534.24					4,538.56					9,072.80
		Summary of Tuesday 16 August 2016				12,207.68				1,144.17	4,538.56					17,890.40
	Wednesday 17 August 2016	LD164	Ulan to GIAG Jul-Aug'16	Wisdom Of The Sea 1	17 August 2016						9,188.00					9,188.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD216	Ulan to GIAG Jul-Aug'16	Chancy	17 August 2016	9,067.80										9,067.80
		LD260	Mangoola to GIAG Jul-Aug 2016 NEWC GC	Pan Champion	18 August 2016	9,179.60										9,179.60
		Summary of Wednesday 17 August 2016				18,247.40					9,188.00					27,435.40
	Thursday 18 August 2016	LD144	GCS (XMO) to SJEP Apr 16 - Dec'16 Base	Ishizuchi	18 August 2016						9,197.80					9,197.80
		LD304	GCS (XMO) to SJEP Apr 16 - Dec'16 Base	Ishizuchi	19 August 2016						9,191.80					9,191.80
		LD372	Liddell to Ube - JFY16 JEN GC NEWC swap closing c	Sakura Wave	18 August 2016	5,087.94								3,606.26		8,694.20
		Summary of Thursday 18 August 2016				5,087.94					18,389.60			3,606.26		27,083.80
	Friday 19 August 2016	LD242	Liddell to NSC JFY16 Fixed Price	Cape Harvest	20 August 2016			8,678.00								8,678.00
		Summary of Friday 19 August 2016						8,678.00								8,678.00
	Saturday 20 August 2016	LD114	GCS (XMO) to SJEP Apr 16 - Dec'16 Base	Ishizuchi	20 August 2016						6,935.16	1,766.04				8,701.20
		LD294	Liddell to NSC JFY16 Fixed Price	Cape Harvest	21 August 2016					8,908.00						8,908.00
		Summary of Saturday 20 August 2016								8,908.00	6,935.16	1,766.04				17,609.20
	Sunday 28 August 2016	LD230	Liddell to NSC JFY16 Fixed Price	Azalea Wave	28 August 2016		8,711.20									8,711.20
		LD318	Liddell to NSC JFY16 Fixed Price	Azalea Wave	29 August 2016			8,841.00								8,841.00
		LD344	Liddell to NSC JFY16 Fixed Price	Azalea Wave	28 August 2016					4,483.75	4,825.25					9,309.00
		Summary of Sunday 28 August 2016					8,711.20	8,841.00		4,483.75	4,825.25					26,861.20
	Monday 29 August 2016	LD246	Liddell to NSC JFY16 Fixed Price	Azalea Wave	29 August 2016	2,606.91			6,241.69							8,848.60
		Summary of Monday 29 August 2016				2,606.91			6,241.69							8,848.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Thursday 01 September 2016	LD276	Q3 LD to China Steel Corp - JFY16	Giuseppe Mauro Rizzo	1 September 2016				4,549.90	4,549.90						9,099.80
		Summary of Thursday 01 September 2016							4,549.90	4,549.90						9,099.80
	Sunday 04 September 2016	LD214	Rav North to Pen - Jul'16-Feb'17	SBI Thalia	4 September 2016							9,278.00				9,278.00
		Summary of Sunday 04 September 2016										9,278.00				9,278.00
	Monday 05 September 2016	LD126	Bulga to Tohoku EPC - Oct'15-Sep'16 Base 12.5% Ash	Pacific Kindness	5 September 2016					9,142.30						9,142.30
		Summary of Monday 05 September 2016								9,142.30						9,142.30
	Thursday 08 September 2016	LD138	Liddell to Chugoku - JFY16	Sun Excelsior	8 September 2016				8,654.60							8,654.60
		Summary of Thursday 08 September 2016							8,654.60							8,654.60
	Friday 09 September 2016	LD128	Liddell to Chugoku - JFY16	Sun Excelsior	9 September 2016				8,894.60							8,894.60
		LD304	XCS to Kobe IPP - Apr'16-Mar'17	Energy Triton	10 September 2016		2,296.09	0.00		0.00	6,854.11					9,150.20
		Summary of Friday 09 September 2016					2,296.09	0.00	8,894.60	0.00	6,854.11					18,044.80
	Saturday 10 September 2016	LD158	Liddell to NSC JFY16 Fixed Price	Orange Tiger	10 September 2016					9,278.40						9,278.40
		LD264	Liddell to NSC JFY16 Fixed Price	Orange Tiger	10 September 2016			8,777.60								8,777.60
		Summary of Saturday 10 September 2016						8,777.60		9,278.40						18,056.00
	Sunday 11 September 2016	LD252	Liddell to NSC JFY16 Fixed Price	Orange Tiger	11 September 2016					8,727.80						8,727.80
		Summary of Sunday 11 September 2016								8,727.80						8,727.80
	Monday 12 September 2016	LD148	Liddell to NSC JFY16 Fixed Price	Orange Tiger	12 September 2016					8,516.40						8,516.40
		LD346	Liddell to NSC JFY16 Fixed Price	Orange Tiger	12 September 2016				9,037.00							9,037.00
		Summary of Monday 12 September 2016							9,037.00	8,516.40						17,553.40
	Tuesday 13 September 2016	LD102	XMO to Idemitsu - Jul16 - Dec'16 Suzukawa	Maple Island	13 September 2016						9,232.00					9,232.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD260	Liddell to NSC JFY16 Fixed Price	Orange Tiger	13 September 2016		7,341.25		1,785.55							9,126.80
		Summary of Tuesday 13 September 2016					7,341.25		1,785.55		9,232.00					18,358.80
	Thursday 15 September 2016	LD244	GCS (XMO) to GJEP Apr 16 - Dec'16 Base	Hanabusa	15 September 2016					9,131.20						9,131.20
		LD324	GCS (XMO) to GJEP Apr 16 - Dec'16 Base	Hanabusa	16 September 2016										8,911.40	8,911.40
		Summary of Thursday 15 September 2016								9,131.20					8,911.40	18,042.60
	Friday 16 September 2016	LD174	GCS (XMO) to GJEP Apr 16 - Dec'16 Base	Hanabusa	16 September 2016						8,708.80					8,708.80
		LD266	GCS (XMO) to GJEP Apr 16 - Dec'16 Base	Hanabusa	16 September 2016			4,519.49			4,577.81					9,097.30
		Summary of Friday 16 September 2016						4,519.49			13,286.61					17,806.10
	Saturday 17 September 2016	LD280	Liddell to Kyushu EPC - JFY'16	Corona Queen	17 September 2016						8,474.80					8,474.80
		Summary of Saturday 17 September 2016									8,474.80					8,474.80
	Sunday 18 September 2016	LD358	Liddell to Kyushu EPC - JFY'16	Corona Queen	18 September 2016			9,171.20								9,171.20
		Summary of Sunday 18 September 2016						9,171.20								9,171.20
	Monday 19 September 2016	LD184	Liddell to Kyushu EPC - JFY'16	Corona Queen	19 September 2016					9,088.00						9,088.00
		LD288	Liddell to Ube - JFY16 JEN Oct BM	New Command	20 September 2016						9,210.00					9,210.00
		Summary of Monday 19 September 2016								9,088.00	9,210.00					18,298.00
	Tuesday 20 September 2016	LD156	Liddell to JFE - Apr'16-Mar'17 2nd	Cape Green	20 September 2016			3,432.18	5,559.02							8,991.20
		Summary of Tuesday 20 September 2016						3,432.18	5,559.02							8,991.20
	Wednesday 21 September 2016	LD138	Liddell to JFE - Apr'16-Mar'17 2nd	Cape Green	21 September 2016			1,341.74			7,156.66					8,498.40
		LD348	GCS (XMO) to GJEP-Apr'16 - Dec'16 Mutual op	Ishizuchi	21 September 2016										9,022.40	9,022.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Wednesday 21 September 2016						1,341.74			7,156.66				9,022.40	17,520.80
	Thursday 22 September 2016	LD304	Liddell to Ube - JFY16 JEN Oct BM	New Command	23 September 2016			1,734.91			6,779.49					8,514.40
		Summary of Thursday 22 September 2016						1,734.91			6,779.49					8,514.40
	Friday 23 September 2016	LD226	Liddell to NSC JFY16 Fixed Price	Cape Dover	23 September 2016					8,376.00						8,376.00
		Summary of Friday 23 September 2016								8,376.00						8,376.00
	Saturday 24 September 2016	LD222	Liddell to NSC JFY16 Fixed Price	Cape Dover	24 September 2016			4,770.72				3,712.28				8,483.00
		Summary of Saturday 24 September 2016						4,770.72				3,712.28				8,483.00
	Tuesday 27 September 2016	LD274	Liddell to NSC JFY16 Fixed Price	Cape Dover	27 September 2016			9,004.20								9,004.20
		LD300	Liddell to NSC JFY16 Fixed Price	Cape Dover	28 September 2016			9,065.60								9,065.60
		LD352	Liddell to NSC JFY16 Fixed Price	Cape Dover	27 September 2016					8,683.80						8,683.80
		Summary of Tuesday 27 September 2016						18,069.80		8,683.80						26,753.60
	Wednesday 28 September 2016	LD128	Liddell to NSC JFY16 Fixed Price	Cape Dover	28 September 2016			7,381.88			1,679.22					9,061.10
		Summary of Wednesday 28 September 2016						7,381.88			1,679.22					9,061.10
	Thursday 29 September 2016	LD130	Liddell to NSC JFY16 Fixed Price	NSU Sirius	29 September 2016			8,886.40								8,886.40
		Summary of Thursday 29 September 2016						8,886.40								8,886.40
	Saturday 01 October 2016	LD126	GCS to Hokkaido (Hepburn Thermal Coal) Oct'16-Sep'17	Corona Garland	1 October 2016			9,072.00								9,072.00
		LD216	GCS to Hokkaido (Hepburn Thermal Coal) Oct'16-Sep'17	Corona Garland	1 October 2016			8,870.40								8,870.40
		LD354	Liddell to NSC JFY16 Fixed Price	NSU Sirius	1 October 2016	6,179.83		2,991.77								9,171.60
		Summary of Saturday 01 October 2016				6,179.83		20,934.17								27,114.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Sunday 02 October 2016	LD110	GCS to Hokkaido (Hepburn Thermal Coal) Oct'16-Sep'17	Corona Garland	2 October 2016			9,014.20								9,014.20
		Summary of Sunday 02 October 2016						9,014.20								9,014.20
	Tuesday 04 October 2016	LD254	XCS to Kobe IPP - Apr'16-Mar'17	Shining Bliss	4 October 2016				8,709.80							8,709.80
		Summary of Tuesday 04 October 2016							8,709.80							8,709.80
	Wednesday 05 October 2016	LD272	XCS to Kobe IPP - Apr'16-Mar'17	Shining Bliss	6 October 2016				8,381.00							8,381.00
		Summary of Wednesday 05 October 2016							8,381.00							8,381.00
	Thursday 06 October 2016	LD288	XCS to Kobe IPP - Apr'16-Mar'17	Shining Bliss	7 October 2016						8,622.00					8,622.00
		Summary of Thursday 06 October 2016									8,622.00					8,622.00
	Friday 07 October 2016	LD264	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Onozuru Maru	7 October 2016			8,478.40								8,478.40
		Summary of Friday 07 October 2016						8,478.40								8,478.40
	Saturday 08 October 2016	LD116	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Onozuru Maru	8 October 2016			9,083.80								9,083.80
		LD204	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Onozuru Maru	8 October 2016				8,969.60							8,969.60
		LD282	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Onozuru Maru	9 October 2016										8,515.20	8,515.20
		Summary of Saturday 08 October 2016						9,083.80	8,969.60						8,515.20	26,568.60
	Sunday 09 October 2016	LD134	GCS to Mitsubish Materials Corp JFY'16 Yr 2 of 3	Sagar Jyoti	9 October 2016			8,412.80								8,412.80
		LD216	GCS to Mitsubish Materials Corp JFY'16 Yr 2 of 3	Sagar Jyoti	9 October 2016						9,090.60					9,090.60
		Summary of Sunday 09 October 2016						8,412.80			9,090.60					17,503.40
	Monday 10 October 2016	LD178	XMO-(GIAG) TNB - Oct16	Sea Express	10 October 2016			7,788.16		1,214.04						9,002.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD226	GCS to Hokuriku EPC - Oct'16 - Sep'17 -FP	Relyo	11 October 2016			9,057.00								9,057.00
		LD338	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Onozuru Maru	10 October 2016			9,230.20								9,230.20
		Summary of Monday 10 October 2016						26,075.36		1,214.04						27,289.40
	Friday 14 October 2016	LD222	Liddell to Ube - JFY16 Yes October BM	Energy Sunrise	14 October 2016			9,134.30								9,134.30
		LD380	GCS to Hokuriku EPC - Oct'16 - Sep'17 -FP	Relyo	14 October 2016				3,708.37		5,255.23					8,963.60
		Summary of Friday 14 October 2016						9,134.30	3,708.37		5,255.23					18,097.90
	Saturday 15 October 2016	LD178	Ulan to Talpower - CY16 (Yr7-8)	Bottiglieri Flavio Borriello	15 October 2016					8,948.40						8,948.40
		LD244	Ulan to Talpower - CY16 (Yr7-8)	Bottiglieri Flavio Borriello	15 October 2016						8,991.20					8,991.20
		LD330	Ulan to Talpower - CY16 (Yr7-8)	Bottiglieri Flavio Borriello	16 October 2016					3,658.86	4,814.34					8,473.20
		LD362	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Onozuru Maru	15 October 2016			2,790.08							6,287.92	9,078.00
		Summary of Saturday 15 October 2016						2,790.08		12,607.26	13,805.54				6,287.92	35,490.80
	Sunday 16 October 2016	LD256	GCS to Hokuriku EPC - Oct'16 - Sep'17 -FP	Relyo	16 October 2016			4,007.52			3,990.68					7,998.20
		Summary of Sunday 16 October 2016						4,007.52			3,990.68					7,998.20
	Monday 17 October 2016	LD188	Liddell to Ube - JFY16 Yes October BM	Energy Sunrise	17 October 2016			8,500.00								8,500.00
		LD326	GCS to Ube - Mar-16 - Nihon Kaisui Oct (15kt)	Energy Sunrise	17 October 2016				1,275.89		7,176.51					8,452.40
		Summary of Monday 17 October 2016						8,500.00	1,275.89		7,176.51					16,952.40
	Tuesday 18 October 2016	LD174	Q3 LD to China Steel Corp - JFY16	Evanthia	18 October 2016										9,060.60	9,060.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD226	Liddell to Ube - JFY16 Yes October BM	Energy Sunrise	18 October 2016			8,443.60								8,443.60
		Summary of Tuesday 18 October 2016						8,443.60							9,060.60	17,504.20
	Thursday 20 October 2016	LD252	4th/4 XCM-Itochu (Tohoku EPC) JFY'16 Yr 2 of 3	Ohshu Maru	20 October 2016			8,319.00								8,319.00
		LD286	4th/4 XCM-Itochu (Tohoku EPC) JFY'16 Yr 2 of 3	Ohshu Maru	21 October 2016			8,506.40								8,506.40
		Summary of Thursday 20 October 2016						16,825.40								16,825.40
	Friday 21 October 2016	LD188	XMO to Idemitsu-Mazda (MCM Ujina & Hofu Plant)	Sulkai	21 October 2016				9,062.00							9,062.00
		LD310	Liddell to JFE - Apr'16-Mar'17 2nd	Azul Challenge	22 October 2016				8,946.60							8,946.60
		Summary of Friday 21 October 2016							18,008.60							18,008.60
	Sunday 23 October 2016	LD152	Liddell to JFE - Apr'16-Mar'17 2nd	Azul Challenge	23 October 2016				0.00		8,550.00					8,550.00
		LD222	Liddell to Ube - JFY16 Buyers opt.-Oct BM-Tiejin	Jalgarh	23 October 2016					8,218.40						8,218.40
		LD330	GCS (XMO) to SJEP-Apr'16 - Dec'16 Mutual op	Hanabusa	23 October 2016			8,724.40								8,724.40
		Summary of Sunday 23 October 2016						8,724.40	0.00	8,218.40	8,550.00					25,492.80
	Monday 24 October 2016	LD154	GCS (XMO) to SJEP-Apr'16 - Dec'16 Mutual op	Hanabusa	24 October 2016			8,995.40								8,995.40
		LD308	Liddell to Ube - JFY16 Buyers opt.-Oct BM-Tiejin	Jalgarh	25 October 2016				1,079.06		7,516.34					8,595.40
		Summary of Monday 24 October 2016						8,995.40	1,079.06		7,516.34					17,590.80
	Tuesday 25 October 2016	LD104	Q3 LD to China Steel Corp - JFY16	China Steel Realist	25 October 2016									8,687.40		8,687.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD202	GCS (XMO) to SJEP-Apr'16 - Dec'16 Mutual op	Hanabusa	25 October 2016				8,379.20							8,379.20
		LD276	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Ototachibana	26 October 2016	9,086.40										9,086.40
		Summary of Tuesday 25 October 2016				9,086.40			8,379.20					8,687.40		26,153.00
	Wednesday 26 October 2016	LD144	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Ototachibana	26 October 2016			9,046.80								9,046.80
		LD280	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Ototachibana	27 October 2016	8,678.20										8,678.20
		LD320	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Ototachibana	27 October 2016	3,292.60		4,427.00								7,719.60
		Summary of Wednesday 26 October 2016				11,970.80		13,473.80								25,444.60
	Thursday 27 October 2016	LD150	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Ototachibana	27 October 2016	8,981.70										8,981.70
		LD224	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Ototachibana	27 October 2016	8,459.40										8,459.40
		LD300	Q3 LD to China Steel Corp - JFY16	China Steel Realist	28 October 2016									7,583.23	1,057.57	8,640.80
		Summary of Thursday 27 October 2016				17,441.10								7,583.23	1,057.57	26,081.90
	Friday 28 October 2016	LD190	XMO to Akeml IPP - JFY16	Houyo	28 October 2016		2,346.66		6,759.54							9,106.20
		LD254	XMO to Akeml IPP - JFY16	Houyo	29 October 2016		5,539.20		2,248.14						907.26	8,694.60
		LD368	Liddell to NSC JFY16 GC Newc Jul-Sep'16	Ototachibana	28 October 2016	9,159.60										9,159.60
		Summary of Friday 28 October 2016				9,159.60	7,885.86		9,007.68						907.26	26,960.40
	Saturday 29 October 2016	LD140	XMO to Akeml IPP - JFY16	Houyo	29 October 2016		2,132.19		6,997.61							9,129.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD258	XMO to Idemitsu - JFY16 - Spot 50k Summit Onahama Corporation	Ikan Bilis	29 October 2016						8,645.80					8,645.80
		LD370	XMO to Idemitsu - JFY16 - Spot 50k Summit Onahama Corporation	Ikan Bilis	29 October 2016				9,094.20							9,094.20
		Summary of Saturday 29 October 2016					2,132.19		16,091.81		8,645.80					26,869.80
	Sunday 30 October 2016	LD264	XMO to Chugoku EPC - JFY16 6th, 7th Shipment	Sincere Pisces	30 October 2016										9,086.70	9,086.70
		LD356	XMO to Akemi IPP - JFY16	Houyo	30 October 2016		6,692.74		1,819.26							8,512.00
		Summary of Sunday 30 October 2016					6,692.74		1,819.26						9,086.70	17,598.70
	Monday 31 October 2016	LD142	XMO to Akemi IPP - JFY16	Houyo	31 October 2016		7,807.44	1,207.56								9,015.00
		LD234	XMO to Chugoku EPC - JFY16 6th, 7th Shipment	Sincere Pisces	31 October 2016						8,589.80					8,589.80
		LD360	XMO to Chugoku EPC - JFY16 6th, 7th Shipment	Sincere Pisces	31 October 2016										8,569.00	8,569.00
		Summary of Monday 31 October 2016					7,807.44	1,207.56			8,589.80				8,569.00	26,173.80
	Tuesday 01 November 2016	LD244	GCS to Zhejiang Energy - NOV'16 154CN	Minnehaha	1 November 2016			8,479.00								8,479.00
		Summary of Tuesday 01 November 2016						8,479.00								8,479.00
	Wednesday 02 November 2016	LD294	XMO to Chugoku EPC - JFY16 6th, 7th Shipment	Sincere Pisces	3 November 2016						4,498.91				4,544.49	9,043.40
		Summary of Wednesday 02 November 2016									4,498.91				4,544.49	9,043.40
	Friday 04 November 2016	LD126	Bulga to Kansai EPC - Jan'16 - Dec'16	Maizuru Kichijo	4 November 2016	6,633.06									2,387.74	9,020.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD234	Liddell to NSC JFY16 Fixed Price	NSU Quest	4 November 2016			8,981.00								8,981.00
		LD294	Liddell to NSC JFY16 Fixed Price	NSU Quest	5 November 2016			8,580.80								8,580.80
		LD368	Bulga to Kansai EPC - Jan'16 - Dec'16	Maizuru Kichijo	4 November 2016		3,553.80	5,001.60								8,555.40
		Summary of Friday 04 November 2016				6,633.06	3,553.80	22,563.40							2,387.74	35,138.00
	Saturday 05 November 2016	LD138	Liddell to NSC JFY16 Fixed Price	NSU Quest	5 November 2016									8,697.20		8,697.20
		Summary of Saturday 05 November 2016												8,697.20		8,697.20
	Tuesday 08 November 2016	LD206	Q3 Cumnock to Nisshin - JFY16	Kagara	8 November 2016								9,147.20			9,147.20
		Summary of Tuesday 08 November 2016											9,147.20			9,147.20
	Wednesday 09 November 2016	LD148	GCS to Ube - Ube Boiler Coal - Nov'16	Coral Topaz	9 November 2016			9,031.20								9,031.20
		LD202	GCS to Ube - Ube Boiler Coal - Nov'16	Coral Topaz	9 November 2016										9,079.10	9,079.10
		LD330	GCS to Tohoku - Oct - Dec '16	Shoryu	9 November 2016			3,999.30	0.00		4,945.30					8,944.60
		LD386	GCS to Ube - Ube Boiler Coal - Nov'16	Coral Topaz	9 November 2016						9,066.40					9,066.40
		Summary of Wednesday 09 November 2016						13,030.50	0.00		14,011.70				9,079.10	36,121.30
	Thursday 10 November 2016	LD298	GCS to Tohoku - Oct - Dec '16	Shoryu	11 November 2016			8,840.80								8,840.80
		Summary of Thursday 10 November 2016						8,840.80								8,840.80
	Friday 11 November 2016	LD224	Q3 LD to China Steel Corp - JFY16	Great Animation	11 November 2016								8,535.00			8,535.00
		Summary of Friday 11 November 2016											8,535.00			8,535.00
	Saturday 12 November 2016	LD184	GCS (XMO) to SJEP- Apr'16 - Dec'16 Mutual op	Ishizuchi	12 November 2016			9,106.70								9,106.70
		LD240	Q3 LD to China Steel Corp - JFY16	Great Animation	12 November 2016			7,785.82					1,199.78			8,985.60
		Summary of Saturday 12 November 2016						16,892.52					1,199.78			18,092.30

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Sunday 13 November 2016	LD214	GCS (XMO) to SJEP- Apr'16 - Dec'16 Mutual op	Ishizuchi	13 November 2016			8,980.80								8,980.80
		LD304	XCS to Kobe IPP - Apr'16- Mar'17	Legato II	14 November 2016				8,528.00							8,528.00
		Summary of Sunday 13 November 2016						8,980.80	8,528.00							17,508.80
	Monday 14 November 2016	LD204	Q3 LD to China Steel Corp - JFY16	Great Animation	14 November 2016								5,436.69	3,064.31	0.00	8,501.00
		Summary of Monday 14 November 2016											5,436.69	3,064.31	0.00	8,501.00
	Tuesday 15 November 2016	LD346	GCS (XMO) to SJEP- Apr'16 - Dec'16 Mutual op	Ishizuchi	15 November 2016										8,623.20	8,623.20
		Summary of Tuesday 15 November 2016													8,623.20	8,623.20
	Wednesday 16 November 2016	LD240	GCS to Tohoku - Oct'16 - Sep'17	Yuyo	16 November 2016						4,474.55				4,722.65	9,197.20
		LD338	XCS to Kobe IPP - Apr'16- Mar'17	Legato II	16 November 2016						9,250.80					9,250.80
		Summary of Wednesday 16 November 2016									13,725.35				4,722.65	18,448.00
	Saturday 19 November 2016	LD176	Liddell to Ube - JFY16 JEN Oct BM	Crystal Wind	19 November 2016				4,512.02		4,510.98					9,023.00
		Summary of Saturday 19 November 2016							4,512.02		4,510.98					9,023.00
	Sunday 20 November 2016	LD184	Liddell to Ube - JFY16 JEN Oct BM	Crystal Wind	20 November 2016			1,581.50			1,565.30					3,146.80
		Summary of Sunday 20 November 2016						1,581.50			1,565.30					3,146.80
	Friday 25 November 2016	LD228	Liddell to Ube - JFY16 JEN Oct BM	Crystal Wind	25 November 2016			8,519.40								8,519.40
		LD308	Liddell to Ube - JFY16 JEN Oct BM	Crystal Wind	26 November 2016						8,472.20					8,472.20
		Summary of Friday 25 November 2016						8,519.40			8,472.20					16,991.60
	Saturday 26 November 2016	LD150	Liddell to NSC JFY16 Fixed Price	New Stage	26 November 2016					5,051.34	3,988.06					9,039.40
		LD196	Liddell to NSC JFY16 Fixed Price	New Stage	26 November 2016					3,843.79	5,149.41					8,993.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD260	Liddell to NSC JFY16 Fixed Price	New Stage	27 November 2016	8,449.80										8,449.80
		Summary of Saturday 26 November 2016				8,449.80				8,895.13	9,137.47					26,482.40
	Sunday 27 November 2016	LD192	Liddell to NSC JFY16 Fixed Price	New Stage	27 November 2016										8,461.20	8,461.20
		LD222	Liddell to NSC JFY16 Fixed Price	New Admire	27 November 2016					9,059.80						9,059.80
		Summary of Sunday 27 November 2016								9,059.80					8,461.20	17,521.00
	Monday 28 November 2016	LD104	Liddell to NSC JFY16 Fixed Price	New Admire	28 November 2016			8,740.20								8,740.20
		LD300	Liddell to NSC JFY16 Fixed Price	New Stage	29 November 2016	7,262.22					1,642.68					8,904.90
		Summary of Monday 28 November 2016				7,262.22		8,740.20			1,642.68					17,645.10
	Wednesday 30 November 2016	LD164	Liddell to Kyushu EPC - JFY'16	Corona Queen	30 November 2016			8,964.00								8,964.00
		LD308	Liddell to NSC JFY16 Fixed Price	New Admire	1 December 2016	8,973.20										8,973.20
		LD356	Liddell to NSC JFY16 Fixed Price	New Admire	30 November 2016	2,827.01					6,248.69					9,075.70
		Summary of Wednesday 30 November 2016				11,800.21		8,964.00			6,248.69					27,012.90
	Thursday 01 December 2016	LD172	Liddell to Kyushu EPC - JFY'16	Corona Queen	1 December 2016			5,087.98			3,776.22					8,864.20
		LD284	Liddell to Ube - JFY16 Mits. Paper Oct BM	Ocean Symphony	2 December 2016									8,648.20		8,648.20
		Summary of Thursday 01 December 2016						5,087.98			3,776.22			8,648.20		17,512.40
	Friday 02 December 2016	LD148	Liddell to Ube - JFY16 Mits. Paper Oct BM	Ocean Symphony	2 December 2016			5,400.74						3,504.66		8,905.40
		Summary of Friday 02 December 2016						5,400.74						3,504.66		8,905.40
	Saturday 03 December 2016	LD288	Liddell to Ube - JFY16 Mits. Paper Oct BM	Ocean Symphony	4 December 2016			8,618.40								8,618.40
		LD374	Liddell to Ube - JFY16 Mits. Paper Oct BM	Ocean Symphony	3 December 2016									9,035.60		9,035.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Saturday 03 December 2016						8,618.40						9,035.60		17,654.00
	Sunday 04 December 2016	LD138	Liddell to JFE - Apr'16-Mar'17 3rd	Azul Libero	4 December 2016			8,906.60								8,906.60
		LD188	Liddell to JFE - Apr'16-Mar'17 3rd	Azul Libero	4 December 2016			8,547.40								8,547.40
		LD278	Liddell to Ube - JFY16 Mits. Paper Oct BM	Ocean Symphony	5 December 2016			8,368.40								8,368.40
		Summary of Sunday 04 December 2016						25,822.40								25,822.40
	Monday 05 December 2016	LD282	Liddell to JFE - Apr'16-Mar'17 3rd	Azul Libero	6 December 2016						8,627.40					8,627.40
		LD336	Liddell to Ube - JFY16 Mits. Paper Oct BM	Ocean Symphony	5 December 2016	2,589.12		5,949.48								8,538.60
		Summary of Monday 05 December 2016				2,589.12		5,949.48			8,627.40					17,166.00
	Wednesday 07 December 2016	LD106	Liddell to NSC JFY16 Fixed Price	NSU Responsibility	7 December 2016	9,112.60										9,112.60
		LD276	Liddell to NSC JFY16 Fixed Price	NSU Responsibility	8 December 2016	8,564.60										8,564.60
		Summary of Wednesday 07 December 2016				17,677.20										17,677.20
	Thursday 08 December 2016	LD146	Liddell to NSC JFY16 Fixed Price	NSU Responsibility	8 December 2016						9,046.20					9,046.20
		LD266	Liddell to NSC JFY16 Fixed Price	NSU Responsibility	8 December 2016	2,528.15				6,108.25						8,636.40
		Summary of Thursday 08 December 2016				2,528.15				6,108.25	9,046.20					17,682.60
	Friday 09 December 2016	LD108	Liddell to NSC JFY16 Fixed Price	NSU Responsibility	9 December 2016					8,561.40						8,561.40
		Summary of Friday 09 December 2016								8,561.40						8,561.40
	Saturday 10 December 2016	LD244	GCS to KYUSHU EPC (Spot) Dec'16	Sincere Salute	10 December 2016			9,045.00								9,045.00
		LD318	Liddell to NSC JFY16 Fixed Price	NSU Responsibility	11 December 2016	9,166.00				0.00						9,166.00
		Summary of Saturday 10 December 2016				9,166.00		9,045.00		0.00						18,211.00
	Sunday 11 December 2016	LD124	Liddell to NSC JFY16 Fixed Price	NSU Trust	11 December 2016						8,035.60					8,035.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Sunday 11 December 2016									8,035.60					8,035.60
	Monday 12 December 2016	LD162	GCS to KYUSHU EPC (Spot) Dec'16	Sincere Salute	12 December 2016						5,645.74			3,421.76		9,067.50
		LD344	Liddell to NSC JFY16 Fixed Price	NSU Trust	12 December 2016									9,056.00		9,056.00
		Summary of Monday 12 December 2016									5,645.74			12,477.76		18,123.50
	Tuesday 13 December 2016	LD184	Liddell to NSC JFY16 Fixed Price	CSK Fortune	13 December 2016	8,990.30										8,990.30
		LD260	Liddell to NSC JFY16 Fixed Price	NSU Trust	13 December 2016					9,042.60						9,042.60
		LD322	Liddell to NSC JFY16 Fixed Price	CSK Fortune	14 December 2016			8,090.60								8,090.60
		LD356	Liddell to NSC JFY16 Fixed Price	CSK Fortune	13 December 2016					9,193.20						9,193.20
		Summary of Tuesday 13 December 2016				8,990.30		8,090.60		18,235.80						35,316.70
	Wednesday 14 December 2016	LD108	Hokkaido EPC - Spot	Corona Garland	14 December 2016						9,210.20					9,210.20
		LD224	XCS to Kobe IPP - Apr'16-Mar'17	Ultra Panther	14 December 2016			9,105.00								9,105.00
		LD316	Hokkaido EPC - Spot	Corona Garland	15 December 2016						9,089.40					9,089.40
		Summary of Wednesday 14 December 2016						9,105.00			18,299.60					27,404.60
	Thursday 15 December 2016	LD124	Liddell to NSC JFY16 Fixed Price	CSK Fortune	15 December 2016	0.00				9,147.20						9,147.20
		LD216	Hokkaido EPC - Spot	Corona Garland	15 December 2016									8,592.60		8,592.60
		LD308	Hokkaido EPC - Spot	Corona Garland	16 December 2016						9,165.20					9,165.20
		Summary of Thursday 15 December 2016				0.00				9,147.20	9,165.20			8,592.60		26,905.00
	Friday 16 December 2016	LD152	Far Eastern New Century - Oct'16-Mar-17	Cemtex Thrift	16 December 2016			9,321.80								9,321.80
		LD222	Hokkaido EPC - Spot	Corona Garland	16 December 2016									8,670.60		8,670.60
		LD298	XCS to Kobe IPP - Apr'16-Mar'17	Ultra Panther	17 December 2016			9,114.40								9,114.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD376	Far Eastern New Century - Oct'16-Mar-17	Cemtex Thrift	16 December 2016			8,777.80								8,777.80
		Summary of Friday 16 December 2016						27,214.00						8,670.60		35,884.60
	Sunday 18 December 2016	LD124	XCS to Kobe IPP - Apr'16-Mar'17	Ultra Panther	18 December 2016			8,620.80								8,620.80
		LD192	XCS to Kobe IPP - Apr'16-Mar'17	Ultra Panther	18 December 2016			8,953.80								8,953.80
		LD280	Liddell to Chugoku - JFY16	Saiyo	18 December 2016						8,240.40					8,240.40
		LD322	XCS to Kobe IPP - Apr'16-Mar'17	Ultra Panther	18 December 2016			9,075.20								9,075.20
		Summary of Sunday 18 December 2016						26,649.80			8,240.40					34,890.20
	Monday 19 December 2016	LD298	Liddell to Chugoku - JFY16	Saiyo	20 December 2016			9,080.60								9,080.60
		Summary of Monday 19 December 2016						9,080.60								9,080.60
	Tuesday 20 December 2016	LD146	Liddell to Chugoku - JFY16	Saiyo	20 December 2016						8,590.40					8,590.40
		LD304	Liddell to Chugoku - JFY16	Saiyo	21 December 2016						8,582.20					8,582.20
		Summary of Tuesday 20 December 2016									17,172.60					17,172.60
	Wednesday 21 December 2016	LD190	Liddell to Chugoku - JFY16	Saiyo	21 December 2016				8,942.80							8,942.80
		LD240	Liddell to Ube - JFY16 Oct JPU-Teijin	Bulk Finland	21 December 2016						9,066.80					9,066.80
		LD388	Liddell to Chugoku - JFY16	Saiyo	21 December 2016			9,065.20								9,065.20
		Summary of Wednesday 21 December 2016						9,065.20	8,942.80		9,066.80					27,074.80
	Thursday 22 December 2016	LD160	Liddell to Ube - JFY16 Oct JPU-UBE own use	Coral Topaz	22 December 2016						9,167.00					9,167.00
		LD214	Liddell to Chugoku - JFY16	Saiyo	22 December 2016						8,942.60					8,942.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD306	Liddell to Ube - JFY16 Oct JPU-Teijin	Bulk Finland	22 December 2016				4,138.17				4,165.23			8,303.40
		Summary of Thursday 22 December 2016							4,138.17		18,109.60		4,165.23			26,413.00
	Friday 23 December 2016	LD112	Liddell to Ube - JFY16 Oct JPU-UBE own use	Coral Topaz	23 December 2016				8,265.80							8,265.80
		LD304	Liddell to Ube - JFY16 Oct JPU-Teijin	Bulk Finland	24 December 2016				4,606.69	3,812.51						8,419.20
		Summary of Friday 23 December 2016							12,872.49	3,812.51						16,685.00
	Saturday 24 December 2016	LD178	GCS to Ube (USC Coal) - JFY'16-Mitsubishi Rayon	Bulk Finland	24 December 2016				8,340.00							8,340.00
		LD348	GCS to Ube (USC Coal) - JFY'16-Mitsubishi Rayon	Bulk Finland	24 December 2016				8,489.20							8,489.20
		Summary of Saturday 24 December 2016							16,829.20							16,829.20
	Monday 26 December 2016	LD318	Liddell to Ube - JFY16 Oct JPU-UBE own use	Coral Topaz	27 December 2016			4,247.91			4,181.09					8,429.00
		Summary of Monday 26 December 2016						4,247.91			4,181.09					8,429.00
	Wednesday 28 December 2016	LD254	XCS to Kobe IPP - Dec'16 Spot	Rosco Cypress	28 December 2016			8,402.20								8,402.20
		Summary of Wednesday 28 December 2016						8,402.20								8,402.20
	Thursday 29 December 2016	LD204	XCS to Kobe IPP - Dec'16 Spot	Rosco Cypress	29 December 2016				8,912.80							8,912.80
		Summary of Thursday 29 December 2016							8,912.80							8,912.80
	Friday 30 December 2016	LD364	XCS to Kobe IPP - Dec'16 Spot	Rosco Cypress	30 December 2016				8,007.06		912.14					8,919.20
		Summary of Friday 30 December 2016							8,007.06		912.14					8,919.20
	Summary of Pacific National					259,720.99	76,552.09	726,131.59	251,122.79	287,962.09	662,265.07	77,070.82	51,036.24	189,052.09	140,729.46	2,721,643.23
Summary of Liddell Coal Marketing Pty Ltd						259,720.99	76,552.09	760,118.33	251,122.79	297,399.30	689,425.18	77,070.82	51,036.24	191,493.88	140,729.46	2,794,669.08
Grand Total						259,720.99	76,552.09	760,118.33	251,122.79	297,399.30	689,425.18	77,070.82	51,036.24	191,493.88	140,729.46	2,794,669.08

COAL UNLOADED DELTA

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	Total
Grand Total						

Coal Receivals total	2,794,669.08
Coal Unloaded delta Total:	
Adj Total:	2,794,669.08

mmheath Mon Jan 30 2017 10:42:06 GMT+1100 (AEDT)

Appendix B - Metrological Summary

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
1/01/2016	21.7	20.9	3.9	0.0
2/01/2016	21.5	20.7	4.2	0.0
3/01/2016	20.1	19.4	3.1	5.6
4/01/2016	19.5	18.7	3.9	7.2
5/01/2016	19.4	18.7	4.9	48.4
6/01/2016	18.6	17.9	2.3	37.0
7/01/2016	20.5	19.8	3.2	0.0
8/01/2016	21.1	20.7	2.1	0.0
9/01/2016	22.0	21.3	2.6	0.0
10/01/2016	23.9	23.2	2.4	0.0
11/01/2016	27.7	27.4	2.6	0.0
12/01/2016	30.0	29.7	4.3	0.0
13/01/2016	27.1	26.5	2.6	0.0
14/01/2016	30.2	29.8	4.1	7.2
15/01/2016	16.6	15.8	4.1	49.6
16/01/2016	19.0	18.1	4.1	0.0
17/01/2016	19.5	18.6	3.3	2.4
18/01/2016	21.8	21.2	2.2	0.0
19/01/2016	25.0	24.8	2.0	0.0
20/01/2016	29.0	28.8	3.6	0.0
21/01/2016	30.2	29.9	3.5	8.0
22/01/2016	25.9	25.5	2.1	61.0
23/01/2016	23.2	22.9	0.5	1.0
24/01/2016	23.3	23.1	0.0	0.0
25/01/2016	25.1	25.3	0.1	0.0
26/01/2016	23.7	23.3	0.2	0.0
27/01/2016	22.6	22.4	0.0	0.0
28/01/2016	23.8	23.4	0.0	1.2
29/01/2016	23.8	23.9	0.3	0.0
30/01/2016	25.9	25.6	0.1	0.0
31/01/2016	24.5	25.0	0.5	0.0
1/02/2016	26.7	26.5	3.6	0.4
2/02/2016	22.9	22.4	1.8	4.0
3/02/2016	24.8	24.3	2.4	0.0
4/02/2016	21.7	21.1	5.3	3.6
5/02/2016	20.7	20.0	5.0	2.0
6/02/2016	20.7	20.0	4.2	0.0
7/02/2016	22.1	21.5	3.5	0.0
8/02/2016	22.2	21.7	3.4	0.0
9/02/2016	23.1	22.4	3.8	0.0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
10/02/2016	23.1	22.7	2.2	0.0
11/02/2016	23.3	22.8	3.3	0.0
12/02/2016	24.1	23.4	3.3	0.0
13/02/2016	24.3	23.8	2.2	0.0
14/02/2016	27.6	27.8	2.5	0.0
15/02/2016	26.7	26.2	2.4	0.0
16/02/2016	25.5	25.3	3.2	0.0
17/02/2016	22.5	21.7	3.7	0.0
18/02/2016	22.4	21.7	2.7	0.0
19/02/2016	25.6	25.2	1.9	0.0
20/02/2016	25.4	24.9	3.4	0.0
21/02/2016	25.3	24.5	4.4	0.0
22/02/2016	25.3	24.6	3.0	0.0
23/02/2016	24.7	24.3	2.3	0.0
24/02/2016	26.4	26.2	2.3	0.0
25/02/2016	30.1	30.0	2.9	0.0
26/02/2016	27.1	26.5	4.5	0.0
27/02/2016	23.5	22.8	4.8	0.0
28/02/2016	23.5	22.8	3.7	0.0
29/02/2016	23.0	22.4	3.9	0.0
1/03/2016	23.4	22.8	3.2	0.0
2/03/2016	24.5	24.0	2.3	0.0
3/03/2016	25.5	25.0	2.8	0.0
4/03/2016	24.7	24.0	3.4	0.0
5/03/2016	24.2	23.5	2.7	0.0
6/03/2016	24.1	23.5	3.1	0.0
7/03/2016	26.0	25.4	2.5	0.0
8/03/2016	25.0	24.2	3.5	0.0
9/03/2016	27.1	26.6	2.0	0.0
10/03/2016	26.8	26.6	2.9	0.0
11/03/2016	25.8	25.2	2.7	0.0
12/03/2016	26.6	26.1	2.9	0.0
13/03/2016	25.3	24.6	2.7	0.0
14/03/2016	24.3	23.8	2.5	36.2
15/03/2016	22.8	22.2	3.9	0.2
16/03/2016	21.4	20.7	3.1	2.2
17/03/2016	22.4	21.7	3.0	0.0
18/03/2016	22.8	22.3	4.0	2.2
19/03/2016	19.6	18.9	3.3	0.0
20/03/2016	18.0	17.5	3.4	3.8

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
21/03/2016	19.9	19.2	4.0	0.0
22/03/2016	19.5	18.8	2.5	0.0
23/03/2016	20.1	20.0	1.7	0.0
24/03/2016	21.5	21.4	2.1	0.0
25/03/2016	20.2	20.3	1.4	0.0
26/03/2016	21.5	21.3	2.3	0.0
27/03/2016	22.0	21.5	2.8	0.0
28/03/2016	23.3	22.9	1.7	0.0
29/03/2016	22.4	21.9	2.2	1.4
30/03/2016	22.9	22.3	3.7	4.4
31/03/2016	21.4	20.8	2.9	0.0
1/04/2016	21.1	21.1	1.9	0.0
2/04/2016	24.6	24.3	3.5	0.0
3/04/2016	21.9	21.6	3.8	0.0
4/04/2016	22.2	21.5	2.3	0.0
5/04/2016	23.5	23.0	1.5	0.0
6/04/2016	26.8	26.7	2.7	0.0
7/04/2016	22.3	21.6	4.8	0.0
8/04/2016	19.4	18.8	2.2	0.0
9/04/2016	20.3	19.5	2.0	0.0
10/04/2016	22.1	21.8	2.9	0.0
11/04/2016	20.9	20.7	2.9	0.0
12/04/2016	20.0	19.3	3.7	0.0
13/04/2016	19.4	18.7	3.5	0.0
14/04/2016	19.9	19.1	3.3	0.0
15/04/2016	19.9	19.5	1.7	0.0
16/04/2016	20.7	20.7	2.2	0.0
17/04/2016	19.0	18.5	3.2	0.0
18/04/2016	19.2	18.6	2.4	0.0
19/04/2016	20.0	19.4	2.2	0.0
20/04/2016	20.5	20.0	2.5	0.0
21/04/2016	20.6	20.2	1.2	0.0
22/04/2016	19.9	19.4	2.7	1.4
23/04/2016	17.0	16.4	3.0	2.2
24/04/2016	17.5	16.9	3.8	1.2
25/04/2016	17.2	16.7	2.5	0.0
26/04/2016	18.8	18.3	3.0	0.0
27/04/2016	18.0	17.5	2.3	0.0
28/04/2016	19.5	19.1	1.5	0.0
29/04/2016	20.7	20.8	1.6	0.0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
30/04/2016	18.9	18.7	1.8	4.4
1/05/2016	20.5	19.9	3.9	17.6
2/05/2016	20.5	20.0	2.4	0.2
3/05/2016	20.0	19.4	4.5	0.0
4/05/2016	20.7	20.1	3.3	0.0
5/05/2016	18.8	18.5	2.1	0.0
6/05/2016	18.9	18.7	2.3	0.0
7/05/2016	17.8	18.0	1.3	0.0
8/05/2016	18.5	18.4	1.1	0.0
9/05/2016	21.1	20.6	3.3	3.2
10/05/2016	19.8	19.1	7.7	0.0
11/05/2016	17.0	16.2	6.9	0.0
12/05/2016	17.3	16.5	6.2	0.0
13/05/2016	19.3	18.6	3.7	0.0
14/05/2016	17.6	17.2	2.7	0.0
15/05/2016	18.8	18.1	4.1	0.0
16/05/2016	18.9	18.6	1.8	0.0
17/05/2016	20.0	19.4	3.5	0.0
18/05/2016	18.3	17.8	3.2	0.0
19/05/2016	17.8	17.1	5.0	0.0
20/05/2016	18.2	17.8	3.0	0.0
21/05/2016	16.1	16.0	1.9	0.0
22/05/2016	18.5	18.5	1.6	0.0
23/05/2016	19.3	18.7	4.3	0.0
24/05/2016	15.4	14.6	5.3	0.0
25/05/2016	15.8	15.0	3.7	0.0
26/05/2016	15.5	14.8	5.0	1.8
27/05/2016	15.0	14.2	6.8	0.0
28/05/2016	13.0	12.1	5.6	0.0
29/05/2016	13.4	12.5	5.0	0.0
30/05/2016	10.9	10.5	2.4	0.0
31/05/2016	11.8	11.7	2.0	0.0
1/06/2016	14.5	13.8	2.9	0.0
2/06/2016	14.4	13.8	2.2	0.0
3/06/2016	15.2	14.6	3.0	0.0
4/06/2016	16.2	15.5	3.5	34.6
5/06/2016	15.0	14.3	4.9	17.2
6/06/2016	14.7	13.9	7.7	0.0
7/06/2016	15.0	14.2	7.5	0.0
8/06/2016	16.1	15.3	5.8	0.0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
9/06/2016	16.1	15.5	5.2	4.4
10/06/2016	16.3	15.6	5.3	0.0
11/06/2016	14.1	13.4	4.7	0.0
12/06/2016	12.0	11.7	1.9	0.0
13/06/2016	13.9	13.2	1.5	0.0
14/06/2016	13.4	13.1	2.0	0.0
15/06/2016	13.1	12.9	1.8	0.0
16/06/2016	13.0	12.7	2.2	0.0
17/06/2016	14.7	14.5	1.7	0.0
18/06/2016	16.4	16.1	1.8	1.6
19/06/2016	15.3	14.6	2.6	29.8
20/06/2016	15.4	14.6	7.5	0.4
21/06/2016	14.3	13.5	9.1	0.0
22/06/2016	14.8	14.0	7.2	0.0
23/06/2016	14.2	13.4	4.3	0.0
24/06/2016	13.1	12.3	7.9	3.8
25/06/2016	9.7	8.8	4.4	0.0
26/06/2016	8.8	7.9	2.2	0.0
27/06/2016	9.7	8.7	4.9	1.6
28/06/2016	11.6	10.7	4.3	0.0
29/06/2016	9.8	9.2	2.1	0.0
30/06/2016	10.6	9.8	4.1	0.0
1/07/2016	12.4	11.6	6.0	0.0
2/07/2016	11.9	11.0	3.2	0.0
3/07/2016	10.9	10.1	2.5	0.0
4/07/2016	10.7	10.1	2.7	0.0
5/07/2016	12.0	11.3	3.9	9.4
6/07/2016	11.7	10.8	7.9	0.0
7/07/2016	14.5	13.8	3.2	0.2
8/07/2016	13.5	12.8	1.3	5.8
9/07/2016	13.6	13.0	1.9	0.4
10/07/2016	13.0	12.6	1.7	0.0
11/07/2016	16.4	15.9	4.2	0.0
12/07/2016	17.5	16.8	6.4	0.0
13/07/2016	11.8	10.8	6.9	0.0
14/07/2016	9.8	8.9	3.5	0.0
15/07/2016	9.2	8.9	2.3	0.0
16/07/2016	11.4	10.9	2.6	0.0
17/07/2016	15.1	14.2	2.0	0.0
18/07/2016	17.7	16.9	3.1	0.0

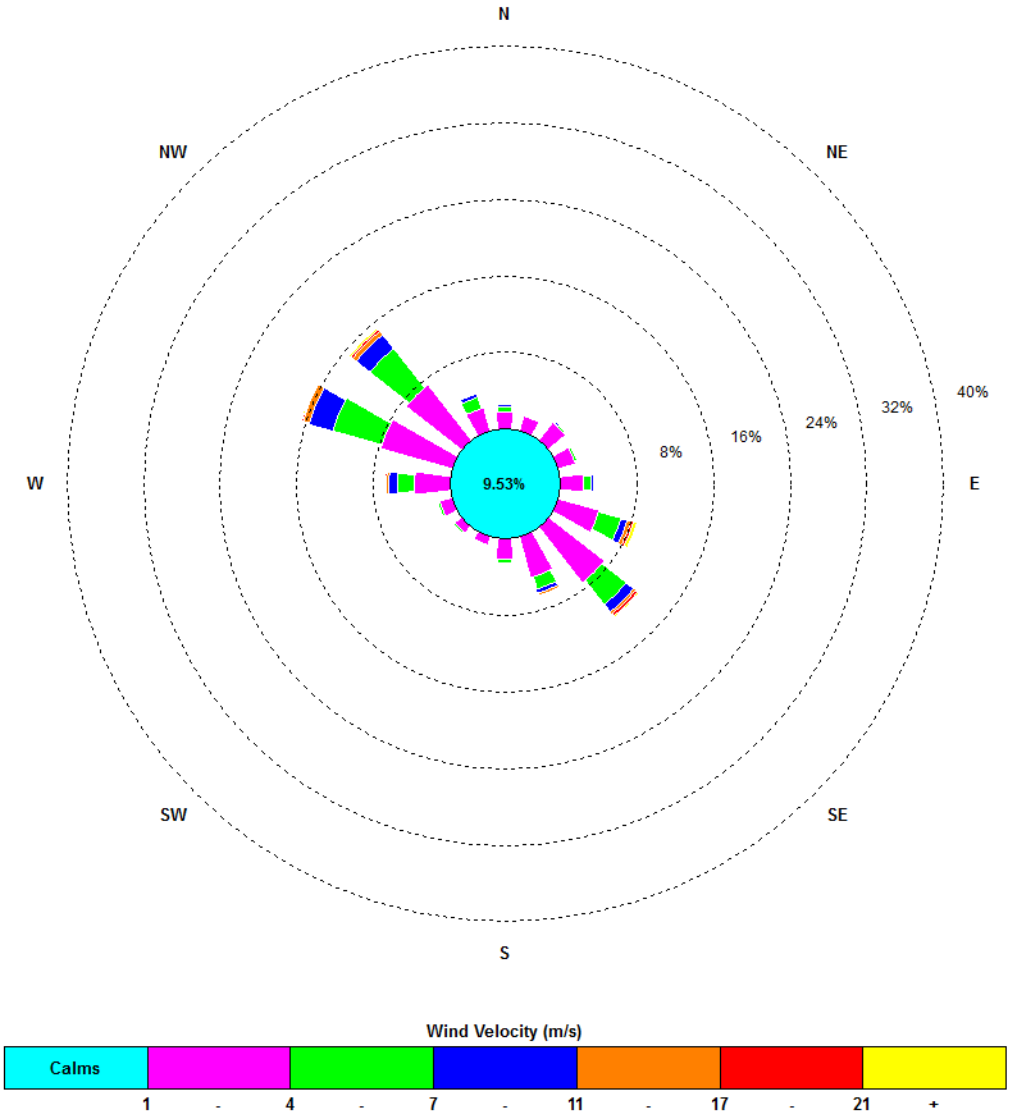
Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
19/07/2016	19.0	18.4	2.4	0.0
20/07/2016	16.5	15.9	1.7	31.8
21/07/2016	15.6	15.1	1.2	0.0
22/07/2016	19.4	18.8	4.8	0.4
23/07/2016	16.6	15.8	8.8	0.0
24/07/2016	10.7	9.9	3.7	0.0
25/07/2016	13.3	12.5	7.0	0.0
26/07/2016	14.3	13.4	6.2	0.0
27/07/2016	14.8	13.9	6.6	0.0
28/07/2016	13.3	12.4	4.4	0.0
29/07/2016	11.4	10.5	4.7	0.0
30/07/2016	11.9	11.3	2.3	0.0
31/07/2016	14.8	14.0	4.0	0.0
1/08/2016	15.4	14.9	2.1	0.0
2/08/2016	13.9	13.1	3.8	3.4
3/08/2016	11.9	11.1	5.0	10.4
4/08/2016	12.1	11.3	3.9	2.0
5/08/2016	12.2	11.4	1.5	0.0
6/08/2016	12.3	11.7	1.7	0.2
7/08/2016	12.5	11.8	1.6	0.0
8/08/2016	12.5	12.2	1.5	0.0
9/08/2016	14.1	13.5	2.5	0.0
10/08/2016	18.6	18.1	3.9	0.0
11/08/2016	15.9	15.2	4.2	2.0
12/08/2016	12.4	11.6	3.3	0.0
13/08/2016	13.9	13.1	3.6	0.0
14/08/2016	13.8	13.2	2.6	0.0
15/08/2016	13.6	13.4	1.6	0.0
16/08/2016	14.9	14.8	2.0	0.0
17/08/2016	16.1	15.4	3.1	0.0
18/08/2016	15.3	15.0	2.3	0.0
19/08/2016	15.7	15.2	3.3	0.0
20/08/2016	14.4	13.5	6.2	0.0
21/08/2016	12.3	11.8	2.8	0.0
22/08/2016	9.7	9.1	1.7	4.8
23/08/2016	13.7	12.9	2.7	0.2
24/08/2016	12.5	11.7	2.0	9.0
25/08/2016	12.5	11.7	2.8	1.2
26/08/2016	11.4	10.6	2.4	0.0
27/08/2016	12.6	11.9	2.5	0.0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
28/08/2016	13.7	13.1	3.3	0.0
29/08/2016	13.5	13.0	1.9	0.0
30/08/2016	16.0	15.8	1.6	0.0
31/08/2016	17.3	16.9	3.2	1.0
1/09/2016	17.9	17.2	2.4	1.2
2/09/2016	15.6	14.8	1.8	20.2
3/09/2016	16.5	15.7	9.5	0.6
4/09/2016	15.4	14.7	4.2	0.0
5/09/2016	14.1	13.7	2.0	0.0
6/09/2016	15.6	15.6	1.8	0.0
7/09/2016	15.9	15.7	2.1	0.0
8/09/2016	17.5	17.1	1.5	0.0
9/09/2016	18.3	18.2	2.1	0.0
10/09/2016	17.0	16.1	5.8	2.6
11/09/2016	16.7	16.0	3.3	0.0
12/09/2016	16.1	15.8	1.8	0.0
13/09/2016	17.2	16.7	1.6	1.6
14/09/2016	18.7	18.0	3.1	11.8
15/09/2016	17.4	16.6	6.8	0.0
16/09/2016	16.2	15.4	4.8	1.8
17/09/2016	16.4	15.8	2.3	0.0
18/09/2016	14.6	13.9	2.5	24.4
19/09/2016	15.5	14.7	7.3	0.0
20/09/2016	14.9	14.3	2.9	0.0
21/09/2016	15.7	15.1	3.0	2.2
22/09/2016	16.5	15.7	6.7	0.0
23/09/2016	17.1	16.5	3.4	0.0
24/09/2016	18.6	18.2	2.1	0.0
25/09/2016	17.6	16.9	3.5	1.4
26/09/2016	16.6	15.8	4.6	0.0
27/09/2016	16.5	15.7	5.4	0.0
28/09/2016	15.0	14.5	2.1	0.0
29/09/2016	12.4	12.7	2.6	11.6
30/09/2016	13.3	13.3	7.5	0.6
1/10/2016	16.6	16.9	5.8	0.0
2/10/2016	17.7	17.9	3.2	0.0
3/10/2016	16.6	17.2	5.1	0.4
4/10/2016	16.9	16.7	8.1	0.0
5/10/2016	17.2	16.4	5.7	0.0
6/10/2016	20.3	19.6	5.3	0.0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
7/10/2016	21.6	21.0	4.1	0.0
8/10/2016	20.8	20.1	4.7	0.0
9/10/2016	18.8	17.9	3.0	0.0
10/10/2016	23.4	22.8	4.7	0.0
11/10/2016	16.4	15.6	4.2	2.0
12/10/2016	15.5	14.7	3.2	0.0
13/10/2016	15.0	14.1	4.0	0.0
14/10/2016	15.0	14.5	2.5	0.0
15/10/2016	17.5	17.1	2.3	0.0
16/10/2016	21.4	20.7	4.4	0.0
17/10/2016	17.9	17.3	5.5	12.2
18/10/2016	17.9	17.1	4.8	0.0
19/10/2016	18.3	17.7	3.3	0.0
20/10/2016	18.0	17.3	3.2	0.0
21/10/2016	20.2	20.0	2.7	1.4
22/10/2016	17.0	16.6	3.9	18.2
23/10/2016	14.6	13.8	2.9	0.0
24/10/2016	15.9	15.4	3.1	0.0
25/10/2016	18.3	17.9	3.1	0.0
26/10/2016	21.9	21.3	3.8	0.0
27/10/2016	22.0	21.4	4.3	0.0
28/10/2016	17.5	16.6	4.0	0.0
29/10/2016	21.0	20.2	2.2	0.0
30/10/2016	21.8	21.3	3.5	4.2
31/10/2016	21.2	20.5	5.2	0.0
1/11/2016	16.6	16.5	1.8	0.0
2/11/2016	19.4	18.8	3.0	0.0
3/11/2016	21.1	20.7	2.7	0.0
4/11/2016	23.0	22.6	3.7	0.0
5/11/2016	22.9	22.2	5.9	0.0
6/11/2016	20.3	19.6	5.1	0.0
7/11/2016	23.0	22.8	3.6	0.0
8/11/2016	25.6	25.3	3.1	12.2
9/11/2016	20.5	19.9	2.5	1.0
10/11/2016	22.6	21.9	3.5	0.0
11/11/2016	22.2	21.4	2.9	0.0
12/11/2016	24.1	23.5	4.1	36.8
13/11/2016	24.8	24.2	5.9	0.0
14/11/2016	18.7	17.8	6.0	6.8
15/11/2016	18.3	17.6	1.7	1.2

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
16/11/2016	19.6	19.0	3.4	0.0
17/11/2016	20.8	20.0	3.1	0.0
18/11/2016	24.8	24.6	2.5	0.0
19/11/2016	24.8	24.2	4.5	0.0
20/11/2016	22.6	21.9	2.8	0.0
21/11/2016	26.3	25.9	2.5	0.0
22/11/2016	27.3	27.2	2.0	0.0
23/11/2016	25.4	25.3	3.3	0.0
24/11/2016	20.3	19.5	3.6	0.0
25/11/2016	20.6	20.2	3.1	0.0
26/11/2016	22.3	21.9	2.3	0.0
27/11/2016	22.9	22.1	3.9	0.0
28/11/2016	25.9	25.3	2.8	0.0
29/11/2016	24.7	24.2	4.3	0.0
30/11/2016	22.1	22.7	3.3	24.6
1/12/2016	23.7	25.4	2.7	0.0
2/12/2016	28.1	27.3	3.4	0.0
3/12/2016	24.9	24.0	5.1	0.0
4/12/2016	25.0	24.4	2.5	0.0
5/12/2016	27.4	26.8	3.0	7.0
6/12/2016	24.7	24.2	2.8	11.6
7/12/2016	22.1	21.3	3.1	5.0
8/12/2016	25.3	25.9	3.3	4.2
9/12/2016	22.8	22.1	5.6	0.0
10/12/2016	21.5	20.8	3.3	0.0
11/12/2016	22.6	22.1	2.7	3.2
12/12/2016	25.7	25.2	2.1	0.2
13/12/2016	30.3	29.9	3.5	0.0
14/12/2016	31.6	31.3	4.8	0.0
15/12/2016	20.2	19.4	4.7	14.6
16/12/2016	20.0	19.2	2.0	26.0
17/12/2016	26.4	26.0	3.6	0.4
18/12/2016	21.1	20.4	5.7	0.0
19/12/2016	21.0	20.1	3.9	0.0
20/12/2016	25.1	24.7	3.7	0.0
21/12/2016	27.3	26.6	5.7	0.0
22/12/2016	22.2	21.3	5.7	0.0
23/12/2016	23.5	22.7	3.2	0.0
24/12/2016	23.2	23.5	2.5	8.4
25/12/2016	23.8	22.8	2.3	0.2

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
26/12/2016	26.4	25.6	2.1	0.0
27/12/2016	27.6	26.7	3.0	0.0
28/12/2016	28.2	27.4	1.9	0.0
29/12/2016	31.8	30.4	3.2	0.0
30/12/2016	31.8	30.8	3.2	0.0
31/12/2016	30.8	30.2	2.9	2.0



Annual Windrose

Appendix C - Air Quality Monitoring Results

Depositional Dust Compliance Monitoring Results					
Month	D55		D62		Criteria
	Insoluble Solids g/m2/month	Annual Average g/m2/month	Insoluble Solids g/m2/month	Annual Average g/m2/month	Annual Average g/m2/month
Jan-16	1.40	1.4	1.8	1.7	4
Feb-16	3.8	1.6	1.9	1.7	4
Mar-16	2.2	1.7	4.2	1.7	4
Apr-16	2.2	1.7	1.5	1.7	4
May-16	4.7c	1.7	3.3	1.8	4
Jun-16	1.4	1.8	1.3	1.8	4
Jul-16	0.1	1.7	1.3	1.9	4
Aug-16	1.4	1.7	1.1	1.9	4
Sep-16	1	1.7	1.2	1.9	4
Oct-16	0.9	1.6	0.8	1.8	4
Nov-16	1.8	1.7	2.1	1.8	4
Dec-16	4.8	1.9	4.3	2.1	4

c – Indicates a contaminated sample, this is often due to bird droppings, insects and similar.

High Volume Air Sampling Compliance Monitoring Results – TSP					
	Scrivens (HVAS 11)		Antiene (HVAS 20)		Criteria
	TSP (ug.m-3)	12month Rolling Average	TSP (ug.m-3)	12month Rolling Average	TSP Annual Average Criterion
06-Jan-16	23	30	7	43	90
12-Jan-16	54	30	70	44	90
18-Jan-16	22	30	45	44	90
24-Jan-16	31	30	44	44	90
30-Jan-16	35	30	66	45	90
05-Feb-16	32	30	52	45	90
11-Feb-16	31	30	49	45	90
17-Feb-16	167	32	193	46	90
23-Feb-16	43	32	80	47	90
29-Feb-16	35	32	49	46	90
06-Mar-16	33	31	70	46	90
12-Mar-16	60	31	74	46	90
18-Mar-16	31	31	45	46	90
24-Mar-16	43	31	98	47	90
30-Mar-16	38	31	60	47	90
05-Apr-16	56	32	62	47	90
11-Apr-16	68	32	71	48	90
17-Apr-16	42	32	68	48	90
23-Apr-16	38	32	45	48	90
29-Apr-16	24	32	58	49	90
05-May-16	18	32	34	49	90
11-May-16	15	32	20	49	90
17-May-16	19	32	43	49	90
23-May-16	38	33	59	49	90
29-May-16	11	33	16	49	90
04-Jun-16	17	33	12	49	90
10-Jun-16	5	33	10	49	90
16-Jun-16	10	33	23	49	90
22-Jun-16	2	33	6	49	90
28-Jun-16	10	33	16	49	90
04-Jul-16	16	33	35	49	90
10-Jul-16	10	33	23	48	90
16-Jul-16	34	33	49	49	90
22-Jul-16	4	32	16	48	90
28-Jul-16	1	32	10	48	90
03-Aug-16	12	32	16	48	90
09-Aug-16	12	32	24	48	90
15-Aug-16	29	32	62	48	90
21-Aug-16	10	32	17	48	90
27-Aug-16	17	32	40	48	90
02-Sep-16	13	32	10	47	90
08-Sep-16	25	32	74	48	90

High Volume Air Sampling Compliance Monitoring Results – TSP					
	Scrivens (HVAS 11)		Antienne (HVAS 20)		Criteria
	TSP (ug.m-3)	12month Rolling Average	TSP (ug.m-3)	12month Rolling Average	TSP Annual Average Criterion
14-Sep-16	8	32	12	48	90
20-Sep-16	10	32	28	47	90
26-Sep-16	15	31	17	47	90
02-Oct-16	9	31	15	46	90
08-Oct-16	30	30	44	45	90
14-Oct-16	24	30	38	45	90
20-Oct-16	44	29	57	45	90
26-Oct-16	19	29	23	44	90
01-Nov-16	63	30	86	45	90
07-Nov-16	35	30	47	45	90
13-Nov-16	27	30	44	46	90
19-Nov-16	48	30	83	46	90
25-Nov-16	56	30	81	47	90
01-Dec-16	36	30	74	47	90
07-Dec-16	16	30	21	46	90
13-Dec-16	37	29	57	45	90
19-Dec-16	40	29	55	45	90
25-Dec-16	18	29	24	45	90
31-Dec-16	38	30	57	46	90

High Volume Air Sampling Compliance Monitoring Results – PM10						
	Scrivens (HVAS 12)		Antiene (HVAS 21)		Criteria	
	PM10 (ug/m3)	12month Rolling Average	PM10 (ug/m3)	12month Rolling Average	PM10 Individual Event Criterion	PM10 Annual Average Criterion
6-Jan-16	10	11	5	16	50	30
12-Jan-16	21	12	31	17	50	30
18-Jan-16	7	12	13	17	50	30
24-Jan-16	16	12	18	17	50	30
30-Jan-16	15	12	25	17	50	30
5-Feb-16	13	12	18	17	50	30
11-Feb-16	11	12	16	17	50	30
17-Feb-16	22	12	39	17	50	30
23-Feb-16	14	12	22	17	50	30
29-Feb-16	10	12	18	17	50	30
6-Mar-16	12	12	23	17	50	30
12-Mar-16	24	12	27	17	50	30
18-Mar-16	15	12	19	17	50	30
24-Mar-16	16	12	38	17	50	30
30-Mar-16	15	12	25	17	50	30
5-Apr-16	23	12	31	18	50	30
11-Apr-16	28	12	34	18	50	30
17-Apr-16	20	12	36	18	50	30
23-Apr-16	12	12	15	18	50	30
29-Apr-16	11	12	21	19	50	30
5-May-16	10	12	22	19	50	30
11-May-16	7	12	7	19	50	30
17-May-16	7	12	18	19	50	30
23-May-16	16	12	26	19	50	30
29-May-16	2	12	5	19	50	30
4-Jun-16	3	12	1	19	50	30
10-Jun-16	1	12	3	19	50	30
16-Jun-16	6	12	13	19	50	30
22-Jun-16	1	12	1	19	50	30
28-Jun-16	3	12	4	18	50	30
4-Jul-16	5	12	16	18	50	30
10-Jul-16	5	12	12	18	50	30
16-Jul-16	16	12	24	19	50	30
22-Jul-16	2	12	9	19	50	30
28-Jul-16	1	12	2	18	50	30
3-Aug-16	4	12	4	18	50	30
9-Aug-16	6	12	8	18	50	30
15-Aug-16	12	12	18	18	50	30
21-Aug-16	6	12	6	18	50	30
27-Aug-16	9	12	16	18	50	30
2-Sep-16	7	12	3	18	50	30
8-Sep-16	10	12	19	18	50	30

High Volume Air Sampling Compliance Monitoring Results – PM10						
Date	Scrivens (HVAS 12)		Antienne (HVAS 21)		Criteria	
	PM10 (ug.m-3)	12month Rolling Average	PM10 (ug.m-3)	12month Rolling Average	PM10 Individual Event Criterion	PM10 Annual Average Criterion
14-Sep-16	3	12	5	18	50	30
20-Sep-16	3	12	31	18	50	30
26-Sep-16	5	12	13	18	50	30
2-Oct-16	4	12	18	17	50	30
8-Oct-16	12	11	25	17	50	30
14-Oct-16	7	11	18	17	50	30
20-Oct-16	11	11	16	17	50	30
26-Oct-16	8	11	39	17	50	30
1-Nov-16	20	11	22	17	50	30
7-Nov-16	10	11	18	17	50	30
13-Nov-16	26	11	23	17	50	30
19-Nov-16	24	11	27	17	50	30
25-Nov-16	16	11	19	17	50	30
1-Dec-16	11	11	38	17	50	30
7-Dec-16	5	11	25	17	50	30
13-Dec-16	15	11	31	16	50	30
19-Dec-16	15	11	34	16	50	30
25-Dec-16	7	11	36	16	50	30
31-Dec-16	20	11	15	17	50	30

Appendix D - Surface Water Monitoring Results

Water Quality - Bowmans Creek																					
Month	BCK1 (Bowmans Creek Upstream)				BCK 1A				BCK2				BCK2A				BCK3				BCK4			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan	7.9	440	6	306	7.9	446	10	308	7.9	453	6	306	8.0	456	10	299	7.9	464	35	317	7.8	463	<5	334
Feb	7.8	697	6	370	8.1	1020	6	615	8.0	927	<5	550	8.1	949	14	540	8.1	955	24	520	8.1	1190	49	694
Mar	8.1	778	6	436	8.2	1850	<5	1100	8.0	1130	<5	632	7.9	1070	<5	617	8.3	1060	43	590	8.3	1580	40	956
Apr	7.8	785	<5	462	8.0	2040	<5	1330	7.7	1090	<5	604	7.7	1303	<5	567	8.0	1090	15	635	8.1	1660	<5	990
May	7.7	796	12	460	7.7	2590	6	1600	7.6	1080	11	584	8.0	1010	12	593	8.0	1090	16	620	8.1	1930	11	1190
Jun	8.0	866	<5	475	8.0	1750	<5	1030	7.8	1100	<5	587	7.8	1060	<5	569	8.1	1210	6	670	8.1	1470	<5	793
Jul	7.9	1060	10	533	8.0	1440	7	771	7.8	1210	10	630	7.8	1140	9	616	8.2	1290	13	662	8.2	2380	10	1210
Aug	8.1	665	6	386	8.1	786	<5	444	8.0	835	<5	464	8.0	846	8	472	8.0	861	7	492	8.1	904	7	518
Sep	7.3	295	92	220	7.8	328	101	272	7.9	309	80	258	7.9	305	101	294	7.9	295	38	279	8.0	777	30	413
Oct	8.0	720	6	384	8.2	944	8	566	8.2	919	7	528	8.2	913	10	496	8.2	883	58	512	8.2	1000	13	559
Nov	7.7	753	6	447	8.0	1210	7	774	7.7	1020	<5	682	8.0	957	<5	648	8.1	912	30	588	8.1	1110	21	694
Dec	7.9	831	8	500	8.1	1560	8	953	7.9	1160	<5	640	7.9	1110	<5	631	8.3	1070	61	603	8.3	1360	41	658

Water Quality – Bowmans and Bayswater Creek																			
Month	BCK5				BCK6 (Bowmans Ck Downstream)				BWKU (Bayswater Ck Upstream)				BWKM (Bayswater Ck Midstream)				BWKD (Bayswater Ck Downstream) 1			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan	8.0	491	11	332	8.0	493	10	333	7.7	1440	<5	850	8.0	2620	<5	1680	Dry			
Feb	8.1	1320	13	780	8.0	1220	5	722	8.0	4420	5	2850	8.2	5250	<5	3420	Dry			
Mar	8.4	1800	10	1080	8.1	1190	<5	698	8.2	4250	7	2760	8.4	5110	5	3390	Dry			
Apr	8.2	1860	8	1130	7.8	1260	<5	730	8.0	3830	6	2500	8.2	4640	40	3030	Dry			
May	8.2	1990	10	1220	7.7	1430	10	902	7.8	3830	13	2440	8.1	4560	91	2960	Dry			
Jun	8.2	2280	<5	1230	7.9	1690	<5	935	7.9	3040	<5	1760	8.2	4100	<5	2200	Dry			
Jul	8.2	2360	8	1330	7.8	1870	12	986	7.9	3670	<5	2260	8.2	4690	<5	2660	Dry			
Aug	8.0	1010	5	526	8.1	1040	8	615	7.9	3780	10	2490	8.2	4310	<5	2860	Dry			
Sep	7.9	329	102	313	7.9	342	103	244	7.8	1260	21	762	8.1	2510	<5	1400	Dry			
Oct	8.3	1170	13	693	8.1	1140	6	686	8.2	3620	6	2380	8.4	4340	<5	2870	Dry			
Nov	8.0	1280	5	808	7.7	1120	<5	694	7.8	2980	20	2070	8.1	3860	7	2140	Dry			
Dec	8.1	1630	78	800	8.1	1280	<5	676	8.2	3620	<5	1980	8.3	4910	<5	2950	Dry			

[1] – BWKD site not sampled when dry

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Appendix E - Groundwater Monitoring Results

Water Quality - Groundwater Monthly Monitoring Results																		
Month	ALV1 Large						ALV1 Small						ALV2 Large					
	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	6.77	1.03	2.97	Clear	Nil	Clear	7.34	1.10	2.34	Clear	Nil	Clear	6.87	2.49	4.00	Clear	Nil	Clear
Feb	7.17	1.23	3.28	Clear	Nil	Clear	7.56	1.30	2.64	Clear	Yes	Clear	7.38	2.79	4.24	Clear	Nil	Clear
Mar	7.11	1.09	3.56	Clear	Nil	Clear	7.52	1.18	3.03	Clear	Yes	Clear	7.35	2.30	4.37	Clear	Nil	Clear
Apr	7.11	1.11	3.84	Clear	Nil	Clear	7.59	1.20	3.36	Clear	Nil	Clear	7.36	2.41	4.36	Clear	Nil	Clear
May	6.94	1.14	4.19	Clear	Nil	Clear	7.24	1.24	3.70	Clear	Nil	Clear	7.20	2.56	4.38	Clear	Nil	Clear
Jun	7.11	1.15	4.39	Brown	Nil	Slight	7.39	1.26	3.84	Clear	Nil	Clear	7.38	2.70	4.39	Clear	Nil	Clear
Jul	7.31	1.16	3.91	Orange	Nil	Slight	8.04	1.26	3.23	Clear	Nil	Clear	7.32	2.87	4.42	Clear	Nil	Clear
Aug	7.11	1.04	3.18	Orange	Nil	Slight	7.56	1.12	2.56	Clear	Nil	Clear	7.31	2.59	4.27	Clear	Nil	Clear
Sep	7.71	1.11	3.16	Orange	Nil	Slight	8.09	1.21	2.52	Clear	Nil	Clear	7.08	2.31	4.26	Clear	Nil	Clear
Oct	7.35	1.17	3.32	Orange	Nil	Slight	7.78	1.28	2.68	Clear	Nil	Clear	7.54	2.39	4.34	Clear	Nil	Clear
Nov	7.66	1.18	3.41	Orange	Nil	Slight	8.19	1.30	2.77	Clear	Nil	Clear	7.82	2.38	4.37	Clear	Nil	Clear
Dec	7.62	1.09	3.59	Orange	Nil	Slight	8.13	1.20	3.08	Clear	Nil	Clear	7.88	2.39	4.40	Clear	Nil	Clear

Water Quality - Groundwater Monthly Monitoring Results																		
Month	ALV2 Small						ALV3 Large						ALV3 Small					
	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	7.13	2.42	3.73	Clear	Nil	Clear	6.91	0.95	4.65	Clear	Nil	Clear	7.16	2.45	4.80	Clear	Yes	Slight
Feb	7.72	2.86	3.99	Clear	Nil	Clear	7.71	0.98	4.93	Clear	Nil	Clear	7.53	2.95	5.10	Clear	Yes	Slight
Mar	7.92	2.43	4.11	Brown	Nil	Slight	7.57	0.93	5.03	Clear	Nil	Clear	7.45	2.78	5.21	Clear	Yes	Clear
Apr	7.69	2.51	4.13	Clear	Yes	Clear	7.56	1.00	5.09	Clear	Nil	Clear	7.48	2.86	5.29	Clear	Yes	Clear
May	7.56	2.61	4.05	Clear	Nil	Clear	7.42	1.09	5.28	Clear	Nil	Clear	7.38	2.96	5.50	Clear	Yes	Clear
Jun	7.76	2.56	4.05	Clear	Yes	Clear	7.66	1.11	5.47	Clear	Nil	Clear	7.55	2.98	5.70	Clear	Yes	Slight
Jul	7.79	2.56	4.18	Clear	Nil	Clear	7.52	1.11	5.49	Clear	Nil	Clear	7.64	3.00	5.74	Clear	Yes	Clear
Aug	7.71	2.35	4.05	Clear	Nil	Clear	7.53	0.98	4.84	Clear	Nil	Clear	7.49	2.16	5.01	Clear	Yes	Clear
Sep	7.47	2.33	4.08	Clear	Nil	Clear	7.70	0.97	4.77	Clear	Nil	Clear	7.91	2.66	5.01	Clear	Nil	Clear
Oct	7.83	2.75	4.16	Clear	Nil	Clear	7.81	1.02	4.95	Clear	Nil	Clear	7.73	2.83	5.13	NR	Yes	NR
Nov	8.02	2.75	4.01	Clear	Nil	Clear	8.32	1.03	5.01	Clear	Nil	Clear	8.19	2.88	5.19	Clear	Yes	Clear
Dec	8.12	2.62	4.06	Clear	Nil	Clear	8.04	0.98	5.03	Clear	Nil	Clear	8.23	2.72	5.25	Clear	Yes	Slight

Water Quality - Groundwater Monthly Monitoring Results																		
	ALV4 Large						ALV4 Small						PGW5 Large					
Month	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	6.68	1.34	4.77	Brown	Nil	Slight	7.23	4.09	4.88	Clear	Nil	Clear	7.31	4.28	8.80	Clear	Nil	Clear
Feb	7.17	1.61	5.01	Clear	Nil	Clear	7.33	5.07	5.07	Clear	Nil	Clear	7.73	5.06	9.72	Clear	Nil	Clear
Mar	7.11	1.42	5.13	Clear	Nil	Clear	7.39	4.45	5.41	Clear	Yes	Clear	7.76	4.46	8.48	Clear	Nil	Clear
Apr	7.05	1.44	5.22	Clear	Nil	Clear	7.29	4.51	5.54	Clear	Yes	Clear	7.67	4.43	8.88	Clear	Nil	Clear
May	6.93	1.51	5.38	Clear	Nil	Clear	7.11	4.60	5.74	Clear	Yes	Clear	7.61	4.45	9.74	Clear	Nil	Clear
Jun	7.09	1.50	5.47	Clear	Nil	Clear	7.29	4.61	5.83	Clear	Yes	Clear	7.82	4.51	10.17	Clear	Nil	Clear
Jul	7.02	1.50	5.50	Clear	Nil	Clear	7.51	4.94	5.97	Clear	Yes	Clear	8.07	4.83	10.62	Clear	Nil	Clear
Aug	6.85	1.25	4.83	Orange	Nil	Slight	7.39	4.32	5.28	Clear	Nil	Clear	7.72	4.41	10.58	Clear	Nil	Clear
Sep	7.65	1.40	4.96	Brown	Nil	Slight	7.68	4.95	5.26	Clear	Nil	Clear	8.14	4.71	9.99	Clear	Nil	Clear
Oct	7.59	1.50	4.95	Brown	Nil	Slight	7.61	5.20	5.34	Clear	Yes	Clear	7.77	5.09	9.42	Clear	Nil	Clear
Nov	7.97	1.54	5.00	Orange	Yes	Slight	7.99	5.28	5.43	Clear	Nil	Clear	8.02	5.26	9.47	Clear	Nil	Clear
Dec	7.62	1.42	4.98	Brown	Nil	Turbid	7.79	4.88	5.52	Clear	Nil	Clear	8.12	5.06	9.72	Clear	Nil	Clear

Water Quality - Groundwater Monthly Monitoring Results																		
	PGW5 Small						ALV7 Large						ALV7 Small					
Month	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	6.82	4.81	9.09	Grey	Yes	Slight	7.11	1.71	6.11	Clear	Nil	Clear	7.28	1.91	7.97	Clear	Yes	Clear
Feb	7.18	5.79	9.33	Grey	Yes	Turbid	7.24	1.94	6.07	Clear	Nil	Clear	7.32	2.16	8.01	Clear	Yes	Clear
Mar	7.22	4.97	9.07	Grey	Yes	Slight	7.31	1.72	6.26	Clear	Nil	Slight	7.42	1.91	8.30	Clear	Yes	Clear
Apr	7.20	5.01	9.18	Brown	yes	Slight	7.19	1.71	6.38	Clear	Nil	Clear	7.34	1.91	8.45	Clear	Yes	Clear
May	7.04	5.14	9.48	Grey	Yes	Slight	7.24	1.75	6.46	Clear	Nil	Clear	7.28	2.05	8.54	Clear	Yes	Clear
Jun	7.26	5.14	9.66	Grey	Yes	Slight	7.39	1.71	6.49	Clear	Nil	Clear	7.40	1.97	8.56	Clear	Yes	Clear
Jul	7.71	5.69	10.06	Brown	Nil	Slight	7.47	1.78	6.55	Grey	Nil	Slight	7.42	2.05	8.70	Clear	Nil	Clear
Aug	7.23	5.09	10.04	Brown	Nil	Turbid	7.28	1.65	6.46	Clear	Nil	Clear	7.35	1.91	8.52	Clear	Yes	Clear
Sep	7.73	5.33	9.83	Brown	Nil	Turbid	7.66	1.67	6.45	Clear	Nil	Clear	7.72	1.93	8.51	Clear	Yes	Clear
Oct	7.32	5.84	9.66	Grey	Yes	Turbid	7.38	1.76	6.42	Clear	Nil	Slight	7.39	2.11	8.50	Clear	Nil	Slight
Nov	7.55	6.01	9.57	Grey	Yes	Slight	7.72	1.80	6.50	Clear	Nil	Clear	7.66	2.12	8.65	Clear	Yes	Clear
Dec	7.62	5.69	9.64	Grey	Yes	Turbid	7.69	1.70	6.53	Clear	Nil	Clear	7.64	2.00	8.65	Clear	Yes	Clear

Water Quality - Groundwater Monthly Monitoring Results																		
	ALV8 Large						ALV8 Small						LBH (Coal Measures)					
Month	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	7.34	1.13	5.80	Clear	Nil	Clear	7.26	1.54	6.48	Clear	Nil	Clear	6.81	1.08	3.37	Clear	Yes	Slight
Feb	7.28	0.93	5.84	Clear	Nil	Clear	7.22	1.63	6.66	Clear	Nil	Clear	7.51	1.26	3.69	Clear	Nil	Clear
Mar	7.43	0.78	6.10	Brown	Nil	Slight	7.30	1.49	6.94	Clear	Nil	Clear	7.34	1.11	3.73	Clear	Nil	Clear
Apr	7.31	0.83	6.19	Clear	Nil	Slight	7.22	1.43	7.07	Clear	Nil	Clear	7.49	1.13	3.88	Clear	Nil	Clear
May	7.45	0.84	6.28	Clear	Nil	Clear	7.19	1.61	7.19	Clear	Nil	Clear	7.21	1.21	4.09	Clear	Nil	Clear
Jun	7.41	0.87	6.36	Clear	Nil	Clear	7.31	1.51	7.22	Clear	Nil	Clear	7.30	1.21	4.26	Clear	Nil	Clear
Jul	7.45	0.90	6.43	Clear	Nil	Clear	7.39	1.56	7.33	Clear	Yes	Clear	7.63	1.19	4.03	Clear	Nil	Clear
Aug	7.59	0.87	6.12	Clear	Nil	Clear	7.45	1.46	7.08	Clear	Nil	Clear	7.09	1.04	3.58	Clear	Nil	Clear
Sep	7.79	0.98	6.15	Clear	Nil	Slight	7.47	1.47	7.05	Clear	Nil	Clear	7.62	1.09	3.37	Brown	Nil	Slight
Oct	7.47	0.99	6.18	Clear	Nil	Clear	7.46	1.57	7.11	Clear	Nil	Slight	7.48	1.17	3.66	Clear	Nil	Clear
Nov	7.79	1.06	6.23	Clear	Nil	Clear	7.76	1.58	7.17	Clear	Nil	Clear	7.94	1.18	3.72	Clear	Nil	Clear
Dec	7.65	1.09	6.27	Clear	Nil	Clear	7.66	1.53	7.22	Clear	Yes	Clear	7.82	1.09	3.75	Clear	Nil	Clear

Appendix F - Blast Monitoring Results

Blast Monitoring Results										
			Chain of Ponds Hotel		Burlings		Scrivens		Substation	
Date	Time	Location	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)
12/1/2016	16:08	South Cut	2.00	110.10	0.10	93.60	0.08	96.9	3.91	112.1
14/1/2016	12:52	South Cut	1.30	116.30	0.01	97.30	0.01	90.1	13.67	121.1
19/1/2016	16:06	South Cut	4.39	110.70	0.11	88.80	0.04	93.3	10.91	118.8
20/1/2016	13:36	South Cut	3.76	115.80	0.05	88.80	0.05	86.2	3.7	109
27/1/2016	13:07	Entrance Pit	1.28	106.80	0.10	91.30	0.09	95.3	1.14	102.9
29/1/2016	12:59	South Cut	2.53	121.20	0.02	91.70	0.02	85.9	8.25	120
29/1/2016	13:00	South Cut	3.69	106.60	0.08	102.20	0.06	87.1	5.46	107.5
4/2/2016	12:59	South Cut	1.63	121.30	0.16	102.30	0.01	94.8	6.98	129.9
9/2/2016	16:05	South Cut	0.79	105.20	0.02	96.30	0.04	88.4	0.9	104
10/2/2016	12:52	South Cut	7.24	118.40	0.03	88.30	0.01	79.8	0.95	106.3
11/2/2016	12:58	South Cut	21.04	122.00	0.13	89.40	0.02	81	2.37	115.9
12/2/2016	12:56	South Cut	2.53	115.30	0.05	100.60	0.04	92.9	1.65	110
15/2/2016	12:56	South Cut	2.03	105.40	0.02	88.20	0.04	90.2	3.25	109.6
18/2/2016	12:56	South Cut	7.42	119.20	0.06	97.90	0.01	86.1	28.48	120.4
22/2/2016	12:35	South Cut	3.28	110.50	0.05	90.20	0.03	101.4	5.46	117.1
24/2/2016	13:00	South Cut	10.71	116.90	0.05	81.60	0.02	91.3	4.28	114.9
24/2/2016	16:11	South Cut	2.20	108.30	0.05	90.60	0.02	82.8	14.62	117
25/2/2016	16:08	South Cut	2.02	99.80	0.02	88.30	0.08	93.7	2.04	110.1
1/3/2016	12:56	South Cut	4.46	109.90	0.11	91.30	0.05	94.5	8.86	116
3/3/2016	16:21	South Cut	7.97	110.20	0.10	91.70	0.09	89.9	10.05	110.2
3/3/2016	16:25	South Cut	5.81	112.70	0.02	94.60	0.02	98.9	5.05	115.6
8/3/2016	13:26	South Cut	3.33	111.80	0.04	98.40	0.03	86.9	2.09	109.7
8/3/2016	13:29	South Cut	0.40	104.40	0.02	85.60	0.03	86.8	0.46	104.2

Blast Monitoring Results										
			Chain of Ponds Hotel		Burlings		Scrivens		Substation	
Date	Time	Location	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)
10/3/2016	12:49	South Cut	2.65	101.30	0.04	90.20	0.03	86.7	2.68	105.7
10/3/2016	12:52	South Cut	1.86	106.20	0.02	80.70	0.01	84.7	8.29	112.8
10/3/2016	12:52	South Cut	0.91	102.00	0.01	80.70	0.01	83	8.29	112.8
11/3/2016	13:23	South Cut	2.11	112.70	0.04	93.40	0.02	89.5	1.69	111
11/3/2016	14:16	South Cut	2.53	111.90	0.03	95.90	0.01	86.9	2.79	109.3
14/3/2016	12:48	South Cut	3.72	111.30	0.08	95.00	0.05	91.1	10.25	115.5
15/3/2016	16:04	South Cut	1.57	107.70	0.01	108.30	0.01	80.5	7.43	118
22/3/2016	13:11	South Cut	5.87	120.80	0.01	89.60	0.01	85	2.6	113.1
23/3/2016	13:40	South Cut	2.27	114.00	0.03	91.40	0.02	92	3.36	117.9
23/3/2016	13:41	South Cut	2.27	114.00	0.03	96.10	0.02	92	3.36	117.9
23/3/2016	13:59	South Cut	4.04	121.20	0.05	88.60	0.04	96.9	3.26	116.2
30/3/2016	13:15	South Cut	7.34	123.60	0.02	80.00	0.01	90.8	3.23	113.5
30/3/2016	13:21	South Cut	6.62	119.00	0.02	100.10	0.01	88.1	0.89	109.4
6/4/2016	12:57	South Cut	19.29	142.50	0.02	97.40	0.01	88.9	2.12	123.8
8/4/2016	12:53	South Cut	0.33	103.10	0.02	90.30	0.01	93.9	0.72	110.3
11/4/2016	12:55	South Cut	1.85	105.70	0.02	99.40	0.02	95.4	10.55	115.4
14/4/2016	13:07	South Cut	4.74	107.10	0.14	100.30	0.09	93.8	7.84	109.5
14/4/2016	13:10	South Cut	14.22	121.40	0.03	89.60	0.02	90.8	1.79	119.8
15/4/2016	12:52	South Cut	1.88	108.70	0.02	89.10	0.01	91.2	5.81	113.6
19/4/2016	13:31	South Cut	2.90	121.40	0.03	99.10	0.02	85	5.73	120.5
19/4/2016	13:32	South Cut	1.91	117.00	0.02	94.90	0.01	92.2	1.02	113
21/4/2016	16:14	South Cut	3.91	108.00	0.13	88.80	0.07	95.4	4.4	109.2
21/4/2016	16:17	South Cut	1.40	105.10	0.02	78.40	0.01	84.3	7.53	113.9
22/4/2016	13:28	South Cut	2.41	111.70	0.02	91.20	0.02	90.9	1.97	110.7

Blast Monitoring Results										
			Chain of Ponds Hotel		Burlings		Scrivens		Substation	
Date	Time	Location	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)
27/4/2016	15:42	South Cut	1.95	106.40	0.06	98.60	0.03	87.3	3.19	112.9
29/4/2016	12:58	Entrance Pit	1.28	102.80	0.11	84.80	0.07	94	1.17	103.9
29/4/2016	12:59	South Cut	1.16	100.10	0.02	77.50	0.02	87	1.55	106.4
3/5/2016	13:31	South Cut	2.49	109.20	0.08	100.80	0.06	89.1	5.26	112.6
3/5/2016	13:32	South Cut	8.03	115.90	0.05	102.50	0.04	91.2	6.33	115.8
5/5/2016	12:50	South Cut	4.12	122.10	0.04	88.10	0.04	92.4	2.43	122.9
11/5/2016	12:57	South Cut	1.47	119.70	0.02	112.60	0.02	93.5	3.3	117.2
12/5/2016	13:03	South Cut	4.19	115.00	0.14	103.40	0.09	98.8	9.02	120.1
13/5/2016	13:31	South Cut	2.94	112.50	0.06	90.30	0.03	93.5	9.97	118.4
17/5/2016	16:03	South Cut	6.90	120.80	0.03	81.60	0.02	84.4	3.38	112.7
18/5/2016	13:26	South Cut	1.68	116.90	0.02	95.30	0.02	90.9	2.26	119.5
18/5/2016	13:37	South Cut	3.49	116.90	0.04	97.00	0.03	100.2	2.02	116.9
19/5/2016	13:35	South Cut	8.95	117.70	0.06	97.50	0.05	90.2	13.82	116.8
20/5/2016	13:24	South Cut	3.03	120.30	0.04	92.00	0.04	92.9	1.57	115.9
23/5/2016	10:30	South Cut	1.75	105.30	0.04	94.80	0.05	105.3	1.72	109.7
25/5/2016	12:57	South Cut	1.74	110.90	0.06	96.30	0.04	91.6	2.02	111
25/5/2016	13:00	South Cut	1.67	113.00	0.02	96.40	0.02	89.3	2.37	112
26/5/2016	13:36	South Cut	2.92	114.10	0.02	115.20	0.01	105.2	14.49	115.8
31/5/2016	13:14	South Cut	0.79	114.50	0.01	94.20	0.01	96.2	2.14	116.6
31/5/2016	13:31	South Cut	2.10	103.70	0.06	91.50	0.03	86.4	6.07	110.8
2/6/2016	13:04	South Cut	7.23	120.30	0.02	106.80	0.01	97.6	1.81	116
3/6/2016	12:58	South Cut	1.37	110.90	0.02	106.80	0.01	97.6	1.81	116
7/6/2016	13:19	South Cut	3.59	114.70	0.03	92.10	0.02	94.7	2.4	118.6
8/6/2016	9:19	South Cut	2.49	110.80	0.04	92.10	0.03	99.5	3.03	112.5

Blast Monitoring Results										
			Chain of Ponds Hotel		Burlings		Scrivens		Substation	
Date	Time	Location	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)
8/6/2016	9:23	South Cut	5.66	117.90	0.03	105.50	0.01	94.9	1.59	112.5
10/6/2016	12:54	South Cut	2.44	112.60	0.02	106.50	0.01	94.1	2.23	119.2
14/6/2016	13:03	South Cut	8.03	116.20	0.02	101.70	0.01	90.8	8.85	118.6
14/6/2016	15:28	South Cut	0.70	115.20	0.07	104.80	0.05	100.7	7.27	112.5
15/6/2016	12:46	South Cut	4.91	123.30	0.02	100.20	0.01	96.4	0.68	101.1
16/6/2016	12:51	South Cut	2.14	104.90	0.03	92.20	0.03	89.7	2.32	116.7
17/6/2016	13:48	South Cut	5.81	115.00	0.06	95.30	0.03	92.4	3.85	113.4
17/6/2016	13:53	South Cut	6.05	117.00	0.05	85.80	0.04	87.3	2.34	107.5
22/6/2016	15:56	South Cut	10.65	115.70	0.02	87.60	0.01	91.6	2.78	116.4
23/6/2016	15:41	South Cut	6.91	110.40	0.06	86.00	0.08	93.5	0.74	113
23/6/2016	15:42	South Cut	2.74	114.30	0.03	91.50	0.02	91.9	1.37	109.1
25/6/2016	9:11	South Cut	6.76	130.40	0.04	104.30	0.05	99.9	3.22	112.9
27/6/2016	13:05	South Cut	8.07	125.70	0.04	112.50	0.02	101.7	3.5	116.8
29/6/2016	13:02	South Cut	2.74	111.20	0.04	100.50	0.04	100.9	2.48	114.7
29/6/2016	13:09	South Cut	6.91	118.60	0.03	118.50	0.03	105.7	1.36	111.3
30/6/2016	12:53	South Cut	8.90	127.70	0.01	95.40	0.01	79.8	14.24	117.5
30/6/2016	12:53	South Cut	8.90	127.70	0.06	91.30	0.03	91.9	2.28	114.2
5/7/2016	12:53	South Cut	13.21	125.90	0.02	95.20	0.01	90.2	2.33	114.7
6/7/2016	9:20	South Cut	6.19	119.60	0.09	103.70	0.06	93.6	0.5	99.2
7/7/2016	13:25	South Cut	6.17	118.20	0.05	81.00	0.03	85.9	10.68	117.2
8/7/2016	13:16	South Cut	6.67	78.90	0.05	81.00	0.03	85.9	10.68	117.2
12/7/2016	9:12	South Cut	3.40	110.50	0.01	88.80	0.01	88.6	2.04	117.7
14/7/2016	13:23	South Cut	4.68	123.60	0.07	95.10	0.1	93.4	0.7	108.1
14/7/2016	13:24	South Cut	7.21	125.00	0.05	101.80	0.05	93.7	3.22	112.2

Blast Monitoring Results										
			Chain of Ponds Hotel		Burlings		Scrivens		Substation	
Date	Time	Location	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)
14/7/2016	13:37	South Cut	4.52	115.90	0.04	101.30	0.05	93.4	6.31	121
18/7/2016	12:47	Entrance Pit	1.02	109.20	0.04	97.50	0.02	92.3	3.54	119
19/7/2016	12:53	South Cut	13.20	124.80	0.07	102.90	0.04	97.7	8.24	116
20/7/2016	12:58	South Cut	5.19	114.80	0.06	82.50	0.03	84.6	9.69	116.1
20/7/2016	12:58	South Cut	5.19	114.80	0.05	100.70	0.07	98.6	3.22	115.1
26/7/2016	12:48	Entrance Pit	0.69	106.80	0.13	114.10	0.08	105.7	14.86	121.9
28/7/2016	12:51	South Cut	1.39	113.00	0.02	101.50	0.01	94.3	1.36	107.6
1/8/2016	13:25	South Cut	4.86	113.50	0.07	94.20	0.06	91.2	2.82	109.1
1/8/2016	13:27	Entrance Pit	1.82	104.40	0.09	92.10	0.12	95.8	1.5	102.6
4/8/2016	12:54	South Cut	5.99	120.90	0.04	98.20	0.03	104.7	4.29	117.1
10/8/2016	12:44	South Cut	2.13	121.80	0.03	108.60	0.02	101.8	1.9	120.8
11/8/2016	12:53	South Cut	3.30	107.90	0.10	103.50	0.12	110.9	4.56	110
15/8/2016	12:55	South Cut	19.09	127.50	0.04	89.90	0.03	91.1	2.38	120.1
16/8/2016	12:54	Entrance Pit	1.09	105.50	0.07	86.70	0.07	93.4	0.82	104.9
17/8/2016	12:51	South Cut	2.15	117.20	0.02	87.20	0.01	90.2	2.9	111.8
18/8/2016	12:48	South Cut	2.02	107.70	0.10	83.00	0.06	89.3	3.53	114.2
18/8/2016	15:51	South Cut	0.73	95.90	0.04	78.40	0.04	79.3	1.34	99.3
23/8/2016	12:54	South Cut	22.88	120.60	0.05	90.80	0.02	91.8	2.67	111.3
26/8/2016	12:48	South Cut	5.01	103.30	0.11	80.70	0.09	85.6	10.34	109.6
31/8/2016	13:08	South Cut	2.15	116.10	0.03	96.40	0.01	103.1	5.17	120.2
31/8/2016	13:09	Entrance Pit	1.23	110.00	0.13	109.20	0.08	97.9	1.48	108.2
1/9/2016	13:17	South Cut	3.94	109.40	0.10	84.20	0.06	93.6	4.88	112.8
1/9/2016	13:28	South Cut	2.19	111.60	0.02	83.20	0.02	89.6	1.68	109.8
7/9/2016	13:02	South Cut	4.16	112.10	0.05	95.30	0.04	89.5	5.33	117.1

Blast Monitoring Results										
			Chain of Ponds Hotel		Burlings		Scrivens		Substation	
Date	Time	Location	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)
8/9/2016	12:50	South Cut	2.10	121.90	0.02	85.80	0.01	89.4	1.3	118.9
12/9/2016	12:50	South Cut	2.17	114.50	0.02	80.00	0.01	84.4	0.87	107.2
12/9/2016	12:51	South Cut	2.33	116.30	0.05	91.30	0.04	92.9	2.87	119.1
13/9/2016	12:48	South Cut	3.64	121.90	0.01	83.20	0.01	92.8	3.22	115.5
14/9/2016	13:28	South Cut	1.53	116.00	0.03	102.70	0.02	92.5	0.91	114.1
15/9/2016	16:17	South Cut	14.13	117.91	0.04	110.40	0.02	103.6	2.86	110.2
15/9/2016	16:18	South Cut	0.84	103.03	0.05	107.90	0.04	107.6	1.61	106.3
20/9/2016	13:10	South Cut	3.06	115.20	0.06	96.90	0.07	96.5	6.4	117
21/9/2016	12:53	South Cut	1.87	112.60	0.04	86.50	0.02	95.4	4.34	115.9
22/9/2016	13:24	South Cut	1.21	112.00	0.02	93.90	0.01	98.9	0.92	111.3
6/10/2016	15:33	South Cut	7.39	119.70	0.07	104.90	0.05	96	4.46	118.3
7/10/2016	13:13	South Cut	0.84	108.70	0.04	98.80	0.02	91.8	0.82	109.6
7/10/2016	13:29	South Cut	7.37	117.40	0.06	94.80	0.06	99.2	4.1	114.9
10/10/2016	16:02	South Cut	4.08	115.20	0.02	110.90	0.01	101.7	4.17	113.1
12/10/2016	12:47	Entrance Pit	0.80	104.00	0.10	98.80	0.07	98.9	1.09	104.1
19/10/2016	12:57	South Cut	1.39	121.60	0.04	94.10	0.03	101.6	2.27	125.1
20/10/2016	12:46	South Cut	3.20	119.10	0.10	94.30	0.05	95.6	3.88	121.2
25/10/2016	13:25	South Cut	1.86	118.70	0.03	101.10	0.02	94.6	1.29	120.3
25/10/2016	13:32	South Cut	4.58	113.80	0.04	104.40	0.03	98.9	7.69	115.2
27/10/2016	11:55	South Cut	1.83	103.60	0.06	88.80	0.03	95.4	2.47	106.3
27/10/2016	11:59	South Cut	3.07	104.90	0.11	84.00	0.07	88.4	7.08	111.2
1/11/2016	12:49	Entrance Pit	0.18	101.60	0.03	86.00	0.03	96.2	0.73	122.2
2/11/2016	12:44	South Cut	8.15	118.80	0.05	90.20	0.03	91.4	0.94	107.8
2/11/2016	12:49	Entrance Pit	1.19	105.50	0.06	92.30	0.05	91.8	9.1	118.1

Blast Monitoring Results										
			Chain of Ponds Hotel		Burlings		Scrivens		Substation	
Date	Time	Location	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)	Ground Vibration (mm/s)	Over pressure (dBL)
3/11/2016	15:59	South Cut	4.41	114.90	0.01	91.40	0.01	84.9	0.31	99.5
3/11/2016	16:01	South Cut	2.94	124.50	0.02	90.30	0.01	90.8	0.37	107.4
7/11/2016	13:13	South Cut	4.31	116.70	0.04	100.50	0.02	100.2	1	110.7
10/11/2016	13:08	South Cut	3.90	115.10	0.01	88.60	0.01	103.3	0.16	98.8
10/11/2016	13:13	South Cut	5.90	109.90	0.05	96.90	0.03	88.3	1.06	106.7
15/11/2016	13:11	South Cut	8.56	118.90	0.05	89.70	0.04	99.1	0.88	117.7
21/11/2016	13:15	South Cut	3.08	110.00	0.03	96.20	0.02	85.8	0.77	104.2
23/11/2016	12:48	Entrance Pit	0.49	105.10	0.03	93.90	0.04	94.9	1.69	120.2
24/11/2016	16:05	South Cut	3.35	127.40	0.02	98.80	0.02	89.1	0.44	111.5
28/11/2016	13:00	South Cut	2.11	112.20	0.10	106.50	0.07	92.2	1.58	112.9
1/12/2016	13:00	South Cut	5.63	111.90	0.03	92.20	0.02	92.2	9.23	116.5
5/12/2016	13:50	South Cut	2.88	107.90	0.10	88.20	0.07	96.1	4.39	109.6
6/12/2016	12:06	South Cut	2.88	107.90	0.10	88.20	0.07	96.1	4.39	109.6
13/12/2016	16:10	South Cut	12.05	118.40	0.02	104.20	0.01	82.4	1.24	108.2
13/12/2016	16:11	South Cut	1.56	115.40	0.02	93.90	0.01	98.8	1.29	108.8
14/12/2016	12:47	South Cut	1.24	111.50	0.08	104.80	0.05	93	2.34	112
19/12/2016	12:52	South Cut	7.84	112.80	0.04	104.40	0.03	86.2	13.35	114.6
21/12/2016	13:01	South Cut	1.37	113.20	0.01	107.00	0.01	88.3	0.89	111.6
21/12/2016	13:02	Entrance Pit	0.62	101.90	0.05	98.80	0.04	97.2	0.53	100.7
22/12/2016	12:41	South Cut	0.41	102.60	0.05	95.10	0.03	97.2	0.41	101.9

Appendix G - LCO Rehabilitation MOP Completion Criteria

The below table lists the identified rehabilitation completion criteria as specified in the MOP. Focussing on the reporting period, TARP status have been identified and comments included where appropriate.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
Decommissioning Phase						
Domain 1 – Domain 5						
No decommissioning activities any of the five domains.						
Landform Establishment Phase						
Domain Objective	**Performance Indicator**	**Completion Criteria**	**Justification/ Source**	**Complete (Yes/No)**	**TARP Element(s)/ Status**	**Comment**
All Domains						
Post mining landforms will be safe, stable and non-polluting	Slopes	Survey confirms rehabilitated slopes are generally 10 degrees and less than 18 degrees (unless otherwise approved); as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	EA Section 3.15 & Section 7.16.9	No	1,2/green	Ongoing rehabilitation surveyed confirmed as compliant.
	Surface rock density	Visual inspections confirm surface spoils are (generally) rock free and provide a friable substrate. Large rocks are removed and placed into habitat piles on rehabilitated areas; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	EA Section 3.15	No	n/a	Ongoing rehabilitation surveyed confirmed as compliant.
	Free draining landforms	Landforms are graded to be generally free draining; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	EA Section 7.16.9	No	4/green	Ongoing rehabilitation surveyed confirmed as compliant.
	Stability	Visual inspections confirm rehabilitated landforms exhibit an absence of slumping; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	1/green	Ongoing rehabilitation surveyed confirmed as compliant.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Spontaneous Combustion	Visual monitoring indicates no evidence of spontaneous combustion; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	6/green	Ongoing monitoring confirmed as compliant.
	Dispersive Spoils	Testing confirm dispersive spoils are not present in the surface layer or are appropriately ameliorated; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	7/green	Ongoing monitoring confirmed as compliant.
	ESC	Suitable erosion control measures (e.g. silt fences, mulches etc.) are installed in rehabilitation areas in accordance the Blue Book to minimise soil loss from areas undergoing rehabilitation; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	DECC 2008 EA Section 3.15 & 7.16.9	No	na	Ongoing rehabilitation surveyed confirmed as compliant.
	Gullying	Monitoring demonstrates there are no areas of active gully erosion; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	3/green	Ongoing rehabilitation surveyed confirmed as compliant.
	Rilling	Visual inspections confirm rill erosion is limited to isolated areas of minor rilling up to 200mm deep; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	3/amber	Isolated areas identified with remediation required
Domain 2 – Water Management Area						
Surface water management structures will be designed and constructed in accordance with the Blue Book to minimise erosion and enhance stability	Final landform drainage	Final landform drainage structures including drains, banks, drop structures and dams have been constructed in accordance with Blue Book requirements; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	DECC 2008	No	4	None constructed in 2016

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Geomorphic stability	Drainage structures are assessed to be stable with no evidence of overtopping or significant scouring, loss of freeboard or channel capacity; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	DECC 2008	No	4	Ongoing rehabilitation surveyed confirmed as compliant. None constructed in 2016
Surface water runoff from the final landform will be non-polluting	Discharge water quality	Dirty water is captured and discharged in accordance with the EPL. Analytes measured in accordance with EPL 2094 include; conductivity, pH and TSS.	EPL 2094 Water Management Plan	No	5/green	Water discharge in accordance with EPL
	Runoff water quality	Runoff water quality from rehabilitation areas is within the range of water quality data recorded from analogue sites and does not pose a threat to downstream water quality; as supported by monitoring results undertaken in accordance with LCO SD PLN 0032 - Environmental Monitoring Program. Analytes measured include pH, TSS, TDS and Conductivity.	EA Section 7.16.9	No	5/green	Ongoing monitoring showing compliance.
Domain 4 – Overburden Emplacement						
Overburden emplacements will be shaped with generally informal profiles and maximum heights that complement the local topography	Landform compatibility	Landforms are assessed to be generally compatible with the surrounding landscape, as shown on MOP Plan 4.	EA Section 7.16.9	No	na	Landform not yet at relinquishment stage, constructed to current approved landform design.
	Height	Survey confirms the South Pit emplacement is no higher than RL 195 m.	EA Section 4.11	No	na	Ongoing rehabilitation height surveyed as compliant
	Informal undulations	Elements such as drainage paths, contour drains, ridgelines, and emplacements are shaped into undulating informal profiles in keeping with natural landforms of the surrounding environment and allowing for a greater diversity of plant species over time	EA Section 3.15	No	na	Ongoing rehabilitation constructed to this
Domain 5 – Tailings Storage Area						
Rehabilitated tailings emplacements will be capped and shaped to	Capping	Tailings will be capped with at least 3 m of inert material including select inert overburden, subsoils and topsoils.	Sect 100 Report EA Section 7.16.9	No	16	Initial tailing capping layer of 1.5m has commenced on the

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
produce free draining landforms.						Antiene Tailings Dam in 2016. Ongoing works.
	Ponding	Tailings emplacement areas will be shaped to be free draining and exhibit an absence of ponding.	Sect 100 Report EA Section 7.16.9	No	4	Initial tailing capping layer of 1.5m has commenced on the Antiene Tailings Dam in 2016. Ongoing works.
Domain A – Final Void						
The South Pit and Entrance Pit final voids will be designed and constructed to produce non-spilling permanent water storage bodies.	Water Balance	The water balance confirms the final voids have been designed and constructed to produce an equilibrium water level of approximately 67 m AHD in both voids.	EA Section 7.3.4	No	17/green	Operations ongoing, no final voids constructed
Final voids will be made safe by: Constructing highwalls and battering back lowwalls to be geotechnically stable; and Constructing perimeter fencing and safety bunds to restrict public access	Carbonaceous materials	All coal and carbonaceous material is capped with a minimum of 5 meters of inert overburden.	MOP	No	na	Operations ongoing
	Stability	Highwalls and lowwalls have been assessed by a qualified geotechnical engineer to validate long term stability.	EA Section 7.16.9	No	2/green	Operations ongoing, no final high/low walls constructed
	Safety	Safety features (e.g. safety berm and fence) are installed at the crest of highwalls to restrict public access.	MOP	No	na	Operations ongoing, no final high/low walls constructed
Growth Medium Development Phase						
Domain Objective	**Performance Indicator**	**Completion Criteria**	**Justification/ Source**	**Complete (Yes/No)**	**TARP Element(s)/ Status**	**Comment**
All Domains						
Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are	Soil Depth	Topsoil and/or subsoils are spread uniformly at the depth of 100mm; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	8/green	Ongoing rehabilitation surveyed as compliant

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
appropriate for the final landuse.	Compaction	Soils are ripped to produce a friable surface prior topsoil spreading; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	na	Ongoing rehabilitation surveyed as compliant
	Ameliorants	Ameliorants (such as gypsum, organics and fertilisers) are spread at the recommended rate per hectare; as supported by site record form XCN SD FRM 0596 - Rehabilitation establishment and methodology record form.	MOP	No	7/green	Ongoing rehabilitation surveyed as compliant
	Temporary ESC	Temporary ESCs are installed prior to topsoil re-spreading. Temporary ESCs will be installed in accordance with the Bluebook such as silt fences, catch drains and sediment basins down slope of rehabilitation areas.	DECC 2008	No	3/green	Ongoing rehabilitation surveyed as compliant
Domain D – Rehabilitation Area – Woodland						
Woodland rehabilitation areas will provide habitat augmentation features (such as rock piles and felled logs and woody debris) for target native species including the Spotted Quoll	Habitat features	Rehabilitation monitoring confirms habitat features are incorporated into woodland rehabilitation areas (including rock piles, felled hollow bearing logs and coarse woody debris).	MOP EA Section 3.15	No	14/green	Operations ongoing, habitat augmentation included in rehabilitation
		Habitat features include structure suitable for Spotted-tailed Quoll den making.	EA Section 4.11 and 7.4.6	No	14/green	Operations ongoing, habitat augmentation included in rehabilitation
Growth Medium Development Phase						
Domain Objective	**Performance Indicator**	**Completion Criteria**	**Justification/ Source**	**Complete (Yes/No)**	**TARP Element(s)/ Status**	**Comment**
All Domains						
Enhance the productivity and ecological function of rehabilitation areas by effectively managing risks from bushfire, weeds and feral animals	Weed presence	The density of weeds in rehabilitated areas is no worse than analogue sites. All measurements will be undertaken in accordance with the Department of Agriculture, Fisheries and Forestry (2008) *Field Manual for*	EA Section 7.16.9	No	11/overall amber – red in some areas	Operations ongoing, monitoring results included in annual weed action plan. Weed management contractors engaged

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
		surveying and Mapping Nationally Significant Weeds.				throughout the year to control invasive species.
	Feral animal density	Feral animal pests are controlled in accordance with legislation and the MOP.	EA Section 7.16.9 MOP	No	na	Operations ongoing, monitoring results show no significant issues
	Fuel loads	Fuel loads are assessed and managed as required including, maintaining fire-breaks.	EA Section 7.16.9	No	15	Operations ongoing,
	Access	Firefighting access across rehabilitation areas and water sources (dams) is maintained in accordance with the Bushfire Management Plan.	EA Section 7.16.9	No	15	Operations ongoing
Domain B – Water Management						
Surface water runoff from the final landform will be non-polluting.	Discharge water quality	Water quality testing confirms discharge water quality meets EPL requirements. Analytes measured in accordance with EPL 2094 include; conductivity, pH and TSS.	EPL 2094	No	n/a	Operations ongoing, compliant with EPL
Domain C – Rehabilitation Area – Grassland						
At least 1247 ha of grassland will be established that can be demonstrated to be capable of supporting sustainable grazing.	Hectares	Survey confirms that a minimum of 1247 ha of Grassland has been established.	DA 305-11-01 Schedule 3 Condition 37	No	na	Operations ongoing,
	Soil Quality	Soil testing indicates that soil pH, ESP and EC are trending toward the range of analogue sites after 5 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7/green	Operations ongoing, no issues identified in monitoring
	Species composition	Pasture species to consist of grasses and legumes appropriate to the district and recognised as suitable for beef cattle grazing.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	12, 13 / amber	Operations ongoing, species sown as per approved list. See detailed results in Section 8.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Ground cover	Rehabilitation survey confirms at least 80% vegetative cover over a minimum of 95% of areas treated after one year.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Operations ongoing, no issues identified in monitoring
Domain D – Rehabilitation Area - Woodland						
At least 731 ha of woodland will be established on areas disturbed by mining including the slopes of overburden emplacement areas	Hectares	Survey confirms that a minimum of 731 ha of Woodland have been established.	DA 305-11-01 Schedule 3 Condition 37	No	na	Operations ongoing,
Woodland rehabilitation areas will be self-sustaining and require ongoing management inputs that are appropriate for the final land use	Surface cover	Rehabilitation survey confirms ground cover (vegetation, leaf litter, mulch) greater than 70% by Year 5.	This MOP	No	9	Operations ongoing
	Soil Quality	Soil testing indicates soil characteristics (pH, EC, ESP) vary by no more than 20% from relevant analogue site after 5 years.	LCO Rehabilitation Monitoring Strategy (GSSE) EA Section 7.16.9	No	7/green	Operations ongoing, no significant issues identified in monitoring
Vegetation compositions in woodland rehabilitation areas will be comparable with analogue vegetation communities, including areas representative of Central Hunter Box – Ironbark Woodland, specifically adjacent to rehabilitation areas at Ravensworth Operations and Mount Owen Complex	Vegetation health	More than 75 per cent of trees are healthy and growing as indicated by long term rehabilitation monitoring.	EA Section 7.16.9	No	na	Operations ongoing, no significant issues identified in monitoring
		Rehabilitation monitoring confirms canopy cover is in the range of 10 per cent to 30 per cent.	EA Section 7.16.9	No	na	Operations ongoing, no significant issues identified in monitoring
	Species presence	Revegetation areas contain flora species assemblages characteristic of each strata for the desired native vegetation communities.	EA Section 7.16.9	No	12/amber in some areas	Operations ongoing, no significant issues identified in monitoring. Supplementary planting and similar works planned in 2017.
		Rehabilitation monitoring confirms the presence of at least two overstorey and two understorey species at all ages.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	12/amber in some areas	Operations ongoing, no significant issues identified in monitoring
	Stem density	Minimum total tree/shrub densities for seeded areas to be:	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Operations ongoing, no significant issues identified in monitoring.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
		Year 1 – 1,000 stems/ha Year 5 – 500 stems/ha Year 10 – 400 stems/ha As confirmed by rehabilitation monitoring.				Supplementary planting or tree thinning works planned in 2017.
Ecosystem Sustainability Phase						
All Secondary Domains						
Enhance the productivity and ecological value of rehabilitation areas by effectively managing risks from bushfire, weeds and feral animals	Firefighting resources	Adequate access and water resources for firefighting are retained in the final landform for relinquishment.	EA Section 7.16.9	No	15/green	Operations ongoing
	Weed presence	There are no significant weed infestations that are identified as a risk to rehabilitation.	EA Section 7.16.9	No	11/amber	Operations ongoing, monitoring results included in annual weed action plan.
	Feral animal density	Feral animal pests are controlled in accordance with legislation and do not present a risk to biodiversity.	EA Section 7.16.9	No	na	Operations ongoing
Soils (or soil substitutes) will be reinstated on rehabilitation areas with characteristics that are appropriate for the final landuse	Soil chemistry	Soil testing indicates soil N, P, K and S levels are within 20% of levels of analogue site after 10 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7/amber	Operations ongoing, no significant issues identified in monitoring, trending towards target
	Organic carbon	Soil testing indicates soil total organic carbon is no less than 20% of levels in adjacent analogue site after 10 years.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	7/amber	Operations ongoing, no significant issues identified in monitoring, trending towards target
	Soil profile development	Soil cores demonstrate a developing A and B horizon.	This MOP	No	na	Operations ongoing
Domain A – Water Management Area						
At least 1247 ha of grassland will be established that can be demonstrated to be capable	Species composition	At least 75% of species surveyed consist of grasses and legumes appropriate to the district and recognised as species suitable for grazing.	EA Section 7.16.9	No	10/condition varies across the site	Operations ongoing, trending towards target. Management of pasture required once appropriate.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
of supporting sustainable grazing by: • Having a pasture species mix representative of the district • Providing a mix of land capability suitable for agriculture (Rural Land Capability Class IV, V and VI); • having a carrying capacity comparable to suitable analogue sites; and Requiring management inputs comparable to suitable analogue sites	Natural regeneration	Evidence of second generation pasture plants present during rehabilitation monitoring.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
	Fertiliser and ameliorants	Fertiliser and amelioration are no longer required.	This MOP	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
	Weed and pest management	Weed and pest management inputs are no more than those of analogue sites.	This MOP EA Section	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
	Yields	Pasture production is comparable to similarly managed analogue site yields within 5 years. .	This MOP EA Section 7.16.9	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
	Stock water availability	Water storage and access to water are suitable to support low intensity grazing activities.	This MOP	No	na	Operations ongoing, trending towards target. Management of pasture required once appropriate.
Woodland rehabilitation areas will be self-sustaining and require ongoing management inputs that are appropriate for the final land use	Nutrient recycling	Inspections confirm evidence of nutrient recycling (e.g. presence of fungi).	This MOP	No	na	Operations ongoing, trending towards target.
	Surface cover	Rehabilitation monitoring confirms ground cover (vegetation, leaf litter, mulch) is in the range of analogue sites at Year 10.	This MOP	No	9/green	Operations ongoing, trending towards target.
	Vegetation health	More than 75 per cent of trees are healthy and growing as indicated by long term rehabilitation monitoring.	EA Section 7.16.9	No	na	Operations ongoing, trending towards target.
	Species composition	Revegetation areas contain flora species assemblages characteristic of the desired native vegetation communities.	This MOP EA Section 7.16.9	No	12/varies across areas	Operations ongoing, trending towards target.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Reproduction	Rehabilitation monitoring confirms second generation tree seedlings are present or likely to be (e.g. presence of flowering).	EA Section 7.16.9	No	na	Operations ongoing, trending towards target.
	Structure	Rehabilitation monitoring confirms rehabilitated areas provide a range of vegetation structural habitats (e.g. eucalypts, shrubs, ground cover, developing litter layer, etc.) to encourage use by native fauna species.	EA Section 7.16.9	No	14/varies across areas	Operations ongoing, trending towards target.
	Native fauna presence	Rehabilitation monitoring confirms target native fauna species are recorded utilising rehabilitation areas.	This MOP	No	na	Operations ongoing, trending towards target.
Woodland rehabilitation corridors will connect with remnant vegetation and rehabilitation at adjacent operations including Ravensworth Operations and Mount Owen Complex, to enhance habitat connectivity	Connectivity	Habitat corridors are shown to be successfully established and consistent with desired vegetation community compositions.	This MOP	No	14	Operations ongoing, trending towards target.
		Woodland corridors are assessed to provide contiguous structural habitat.	EA Section 7.16.9	No	14	Operations ongoing, trending towards target.

Appendix H - Rehabilitation Detail

2016 Rehabilitation Detail					
Entrance Premier RL150					
Domain	4	**Re-vegetation Date:**	18 February 2016	**Area:**	6.2ha
Land Use: Woodland **Seed/Plant Mix:** Native woodland and cover crop This area is on the eastern extents of the Entrance Pit overburden emplacement overlooking Bowmans Creek Flats. Landform shaping was completed in Q4 2015 comprising of a 10 degree east facing slope. Surface water drainage includes graded contour drains directing flow into a central rock armoured conveyance channel downslope. This rock structure provides for the drainage of the greater Entrance Premier slope being adjacent and future rehabilitation areas. Surface water is directed into a dam at the base of the rehabilitation area and then maintained within the mine water management system. Surface preparation of the area included ripping to 400mm and along the contour with rocks brought to the surface in this process were selectively left on the surface. Topsoil was applied at 120mm with Organic Growth Medium at 30t/ha as well as gypsum at 7t/ha. Seeding was completed immediately following site preparation with woodland species seed mix modified slightly with considerations of the soil chemistry. Status/Progress: Cover crop established successfully and has kept surface erosion to a minimum. Variability in the strike rate of the woodland species is evident during monitoring in Q4 2016. Significant presence of pasture and weed species has arisen likely as a result of the topsoil seedbank present. The presence of non-target species is not unexpected due to the time required for native species to develop. Various eucalyptus and acacia species sown are developing well and ongoing weed management is being undertaken. It is expected that the area will change significantly as it develops over the first 3years. Improvement works have been identified and will be ongoing through 2017.					
Entrance Premier RL150 South					
Domain	4	**Re-vegetation Date:**	21 September 2016	**Area:**	9.9ha
Land Use: Woodland **Seed/Plant Mix:** Native woodland and cover crop This area is on the eastern extents of the Entrance Pit overburden emplacement overlooking Bowmans Creek Flats. Landform shaping was completed in Q3 2016 comprising of a 10 degree east facing slope. Surface water drainage includes graded contour drains directing flow into a rock armoured conveyance channel in adjacent rehabilitation area. A dam was built at the bottom of this slope providing for surface water control and habitat. Surface preparation of the area included ripping to 400mm and along the contour with rocks brought to the surface in this process were selectively left on the surface. Topsoil was applied at 120mm with Organic Growth Medium at 30t/ha as well as gypsum at 7t/ha. Seeding was completed immediately following site preparation with woodland species seed mix modified slightly with considerations of the soil chemistry. Status/Progress: Cover crop established successfully and has kept surface erosion to a minimum. Variability in the strike rate of the woodland species expected however it has not been seeded long. It is expected that the area will change significantly as it develops over the first 3years. Improvement works have been identified using the performance of adjacent areas and will be ongoing through 2017.					
South Cut Railway Block					
Domain	4	**Re-vegetation Date:**	21 September 2016	**Area:**	5.8ha
Land Use: Woodland **Seed/Plant Mix:** Native woodland and cover crop This area is on the eastern extents of the Entrance Pit overburden emplacement overlooking Bowmans Creek Flats. Landform shaping was completed in Q3 2016 comprising of a 10 degree east facing slope. Surface water drainage includes graded contour drains directing flow south to the active mining areas Surface preparation of the area included ripping to 400mm and along the contour with rocks brought to the surface in this process were selectively left on the surface. Topsoil was applied at 120mm with Organic Growth Medium at 30t/ha as well as gypsum at 7t/ha. Seeding was completed immediately following site preparation with woodland species seed mix modified slightly with considerations of the soil chemistry. Status/Progress: Cover crop established successfully and has kept surface erosion to a minimum. Variability in the strike rate of the woodland species expected however it has not been seeded long. It is expected that the area will change significantly as it develops over the first 3years. Improvement works have been identified using the performance of adjacent areas and will be ongoing through 2017.					

South Cut RL195 Centre					
Domain	4	**Re-vegetation Date:**	29 April 2016	**Area:**	12.4ha
Land Use: Pastoral/grazing **Seed/Plant Mix:** Liddell winter pasture seed mix Landform shaping completed in Q1 2016 comprising flat top of emplacement area justified to the west of the RL195 level. The area was ripped to reduce compaction, rock raked, 80t/ha OGM application and gypsum applied at 10T/ha (50% recycled and 50% natural mined). Chisel ploughed entire surface prior to seeding which was undertaken immediately following site preparation. Liddell winter pasture seed mix applied using locally sourced seed (see Table 24 for details) with Granulock 15 fertilizer applied at 360kg/ha. Status/Progress: Good establishment of cover and diversity in species emerging is evident. Continue monitor and apply maintenance measures as necessary.					
South Cut RL195 West Slope					
Domain	4	**Re-vegetation Date:**	16 December 2016	**Area:**	8.5ha
Land Use: Woodland **Seed/Plant Mix:** Native woodland and cover crop Landform shaping completed in Q3 2016 comprising west facing 10 degree slope of the RL195/RL180 levels. Surface water drainage consisted of the extension of contour drains shedding water to the south into active mining areas. In light of the performance of other recent woodland areas, LCO has begun a trial area comparing the performance of woodland in overburden with OGM and woodland into topsoil on overburden without fertiliser. The aim the trial will be to determine if there is a material benefit in either case and if it successfully reduces the weed load encountered. Surface preparation included ripping to 400mm along the contour, rock raked, 80t/ha OGM application and gypsum applied at 10T/ha (50% recycled and 50% natural mined). Seeding was undertaken immediately following site preparation. Status/Progress: No significant erosion. Improvement works have been identified using the performance of adjacent areas and will be ongoing through 2017.					