LIDDELL

GLENCORE

2017 Annual Review

Status: Final
Version: 1
Effective: 28/3/2018

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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	December 2017
MOP/RMP end date	December 2020
Annual Review start date	January 1st 2017
Annual Review end date	December 31st 2017

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 2017 to 31st December 2017 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	28 March 2018

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	Yes
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	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 February 2017. 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 one occasions during the reporting period, monitoring results were submitted outside the 7day timeframe. The monitoring results include the water quality parameter Biological Oxygen Demand which takes 5 days to determine.	Section 11

* 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

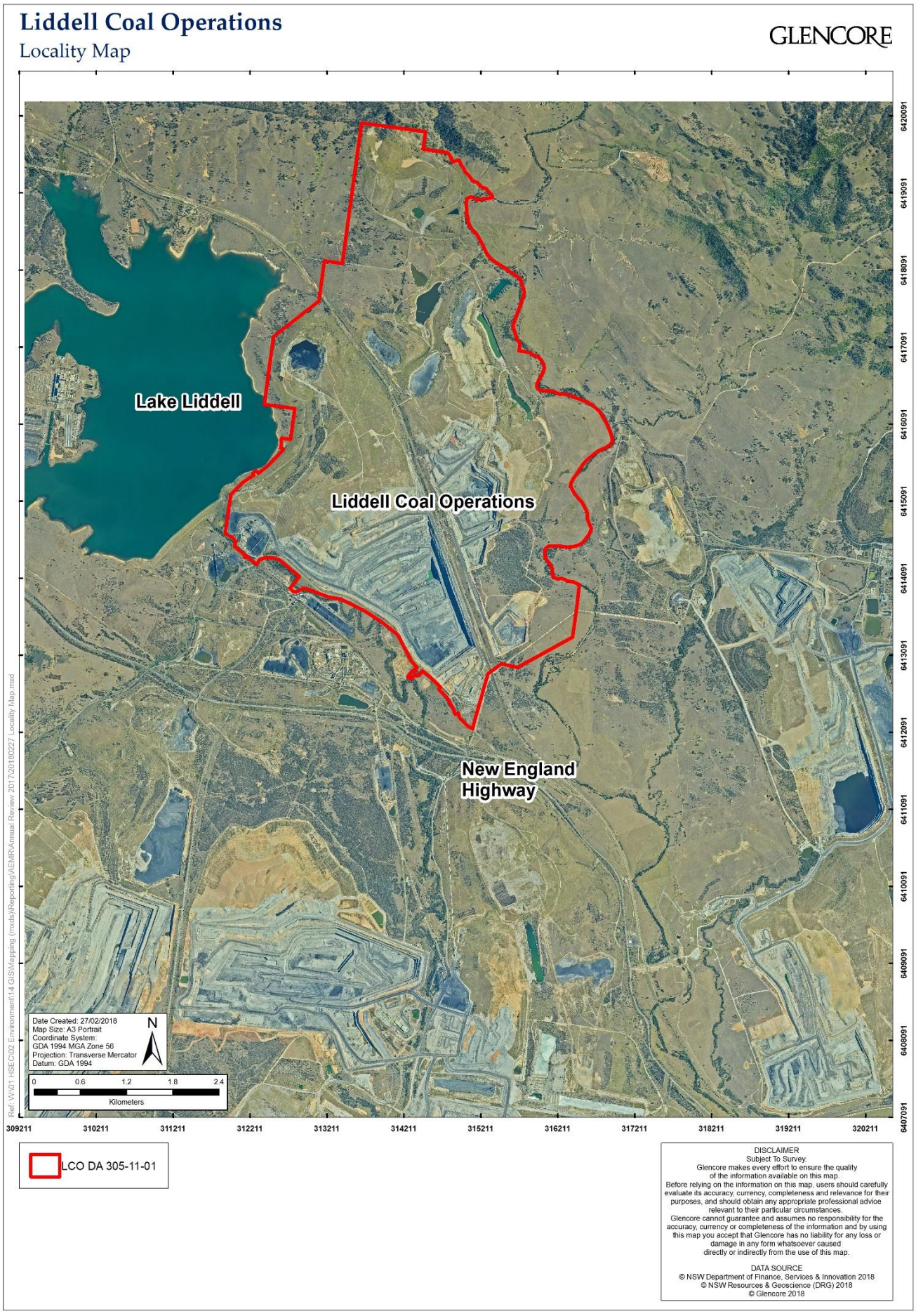

Figure 1 Locality map

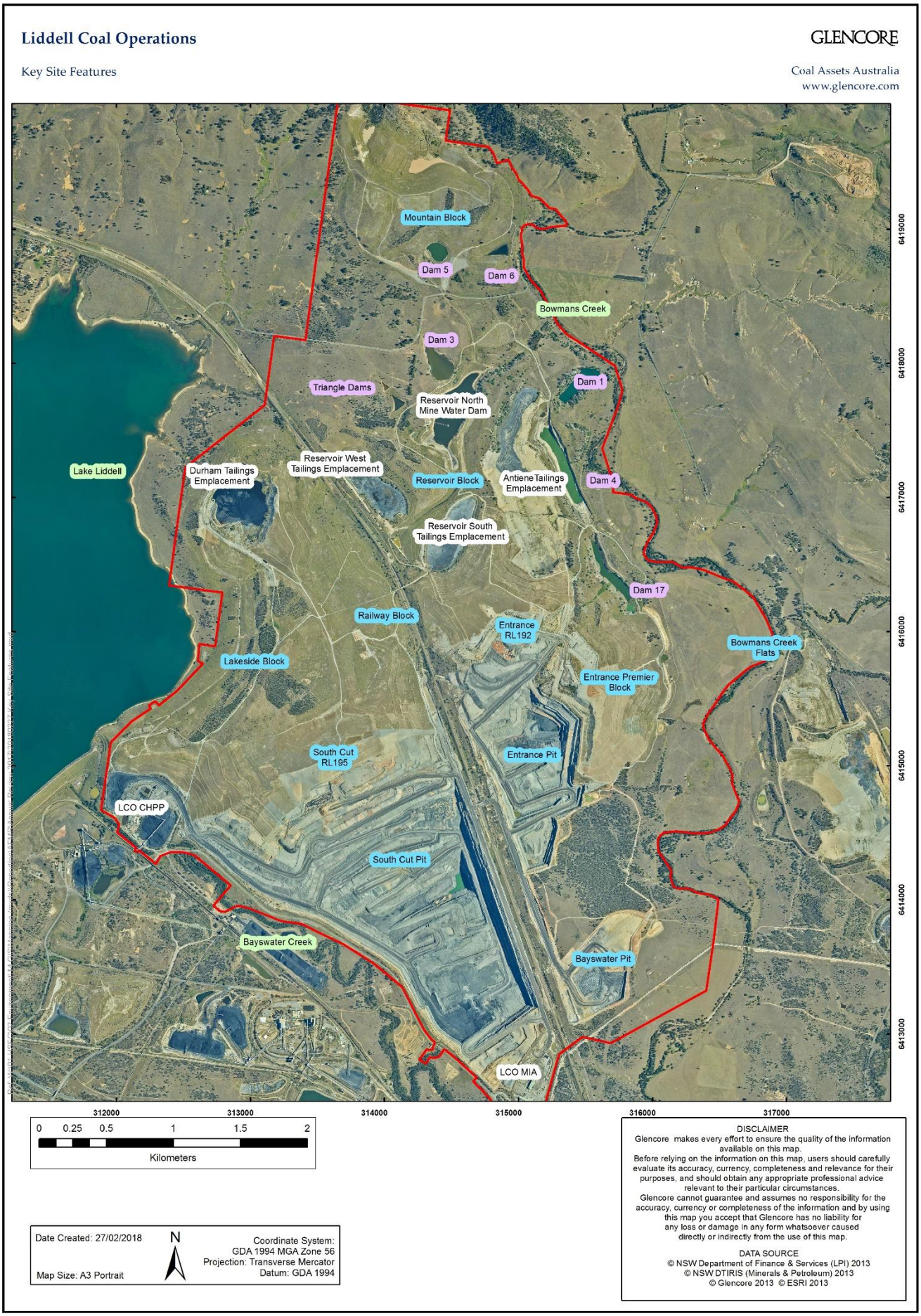

Figure 2 Aerial photograph of LCO – key site features

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.

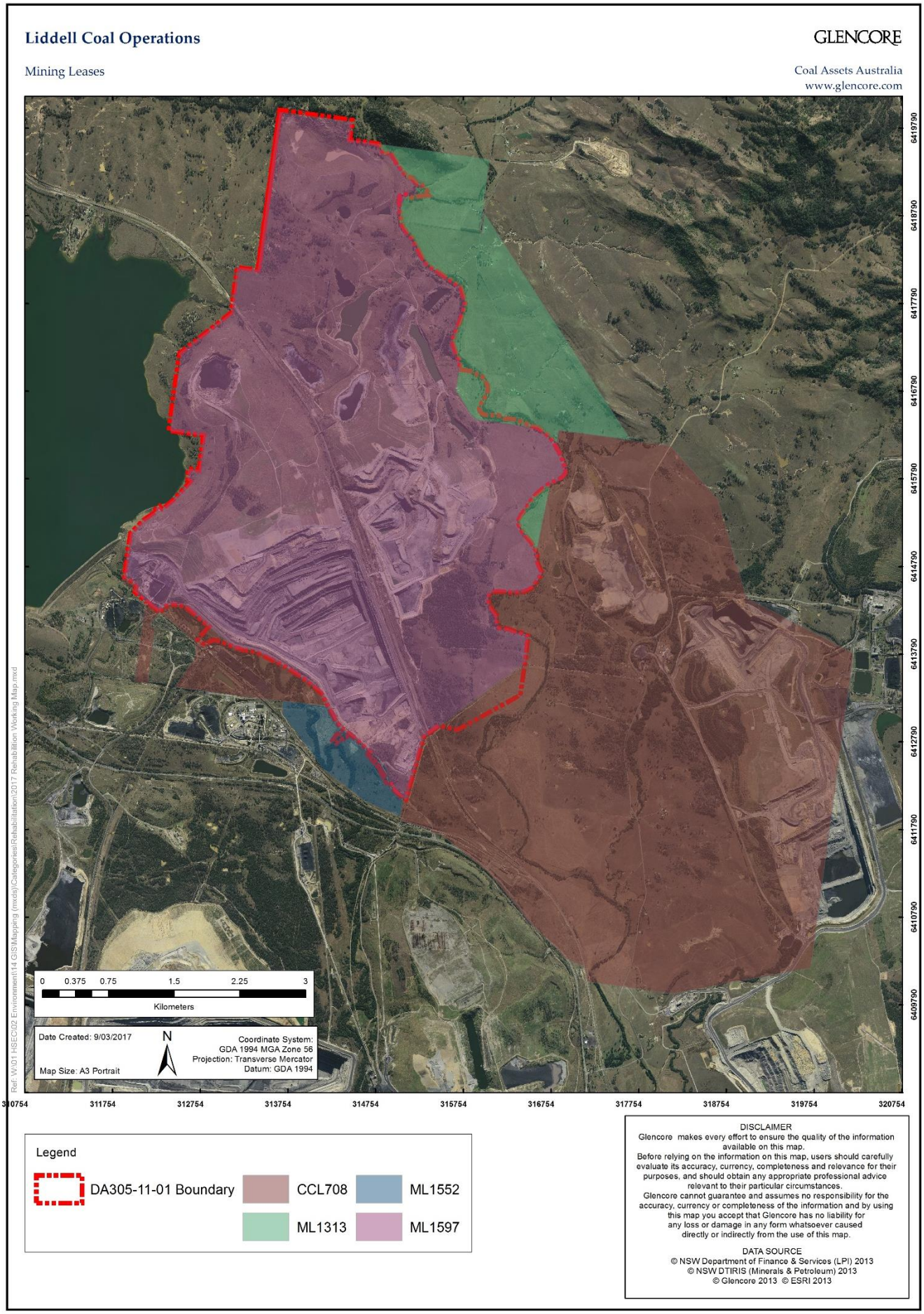

Figure 3 LCO mining leases

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)
Mining Operation Plan		
Name	**Commencement Date**	**Expiry Date**
Liddell Colliery Mining Operations Plan 2017 – 2020 (MOP)	1 December 2017	1 December 2020

Surface Water Extraction Licences						
Locality	**Licence No.**	**Holder**	**Use**	**Water Source/ Management Zone/ Type**	**Annual Allocation (ML)**	**Annual Usage (ML)**
Bowmans Creek	WAL18320	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
Bowmans Creek	WAL18318	Novacoal Australia Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	55	Nil

Bayswater Creek	WAL18306	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 AGL 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 2017 (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	WAL41499 (previously 20BL168063)	Liddell Tenements Pty Ltd	33/862516	Industrial	6000	Nil
8 South 3 & 4	WAL41498 (previously 20BL168062)	Liddell Tenements Pty Ltd	32/870789	Industrial	6000 (Combined with 20BL172588)	Nil
Durham 2 & 4	WAL41497 (previously 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	395
ALV1, ALV2, ALV3, ALV4, ALV7, ALV8, ALV9	20BL168053	LCO Pty Ltd	43/654013 201/848078 4/255403 81/607296 6/255403 32/545601	Test bore/Monitoring	N/A	N/A
Bowmans Creek Alluvial	WAL18302	Liddell Southern Tenements Pty Ltd	32/545601	Irrigation	5	Nil
	20WA210940 (prev. 20BL017861)	Enex Foydell Limited	6/1077004	Irrigation	5	Nil

M49	WAL41493 (previously 20BL172293)	Liddell Southern Tenements Pty Ltd	32/545601	Dewatering	2500 (Combined with 20BL168209)	1295
Mt Owen 1	WAL41493 (previously 20BL168209)	Mt Owen Pty Ltd	353/867083	Stock, domestic, farming and test purposes	2500 (Combined with 20BL172293)	Nil
Mt Owen 2	20BL169544	Mt Owen Pty Ltd	353/867083	Dewatering	2500	Nil
Middle Liddell	WAL41498 (previously 20BL172588)	LCO Pty Ltd	1/237766	Dewatering	6000 (Combined with 20BL168062)6	898

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	12/9/2018

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	1/7/2017	30/6/2018

4 Operations Summary

During 2017, 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:

- Commencement of mining within the Bayswater Pit.
- 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 (WMP) to inform the detection of potential loss impacts to the alluvial aquifer.
- Installation of a monitoring bore (ALV9) in the Bowman's Creek alluvium, in accordance with the WMP to provide for the detection and measurement of predicted drawdown impacts.
- Continuing implementation of Indirect Offset commitments as well as Biodiversity Offset Area regeneration activities detailed in **Section 8.4**

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 2017.

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 2017 reporting period was 4,259,086 tonnes. The total product coal produced was 2,911,634 tonnes with 1,262,040tonnes of coarse and 5135,810tonnes of fine rejects generated.

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 in accordance with Schedule 2 Condition 6 b) and 6 c) during 2017

During the reporting period, 2,911,634 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**	**2016 actual**	**2017 forecast**	**2017 actual**
Waste Rock / Overburden (bcm)	N/A	36,390,745	38,781,446	31,144,732
ROM Coal / Ore (t)	8,000,000	5,940,742	6,201,379	4,259,086
Coarse reject (t)	N/A	1,708,950	1,636,197	1,262,040
Fine reject (Tailings) (t)	N/A	354,068	464,399	135,810
Saleable product (t)	N/A	3,877,724	4,054,953	2,911,634

Table 8 Other operational statistics

Key Performance Indicators		
Economic Indicators	**Target**	**Actual**
Employees	292	288
Environmental Indicators		
Land area rehabilitated during reporting period (ha)	30	37
Potable water consumed (ML)	Nil	4.61
Average annual deposited dust range (private residence) (g/m^2/month)	4	1.96
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	0
Social Indicators		
Complaints	2	0

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 and DA305-11-01 Mod 6.

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

- continued clearing and mining in Bayswater Pit as well as rehabilitation activities in accordance with the 2018-2020 MOP;
- continued implementation of Biodiversity Offset commitments;
- commencement of slope stabilisation and rehabilitation measures at Mountain Block as detailed in the 2018-2020 MOP once amended in 2018 (see Section 8.7 for detail); and
- construction of tailings pipeline to Mt Owen Complex West Pit; andcontinued capping of the Antiene Tailings dam.

5 Actions Required at Previous Annual Review

NSW Department of Planning & Environment - Resources & Geosciences (DRG) conducted a site inspection on the 20 December 2017 following a review of the 2016 Annual Review (AR) and provided written advice on the AR on the 6 February 2018. The NSW Department of Planning & Environment (DPE) completed a desktop review of compliance of the 2016 AR and provided comment on the 26 April 2017. An inspection was then completed by DPE on 20 July 2017. 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
DRG Comments			
1	Annual Review Feedback	The Department requests that the studies and findings of the proposed Mountain Block remediation/closure strategy are included in the Annual Review submitted for the 2017 reporting period.	As per consultation with DRE, LCO is preparing for submission of a revised 2018-2020 MOP with appended revised Mountain Block Remediation Strategy. See **Section 8.7**.
2	Annual Review Feedback	The Department encourages ongoing and proactive weed management.	LCO conduct regular inspections of all areas it manages in accordance with the Biodiversity Management Plan. See **Section 8.3** a summary of activities completed throughout 2017 and key findings from monitoring programs.
DPE Comments			
1	Annual Review Feedback	Assessment of Environmental Performance with Environmental Assessment Prediction – please include an assessment of environmental performance with predictions in the environmental assessment and identify any discrepancies between the predicted and actual impacts for all environmental aspects in accordance with Schedule 5, Conditions 3(e) and 3(h). The 2016 Annual Review only included this assessment for air quality and noise.	Each applicable section of this Annual Review includes a brief summary of the EA predictions and 2017 performance.
2	Annual Review Feedback	Implementation of Environmental Performance Improvements – please include a timetable for environmental performance improvement measures required by Schedule 5, Condition 3(i).	Environmental Improvement Measures are identified in **Section 12**.

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	08/1	2.5	IA	IA	NA
1246 Hebden Road	08/1	1.7	<20	<20	Nil
	February				
1317 Hebden Road	16/2	1.2	NM	NM	NA
1246 Hebden Road	16/2	1.4	NM	NM	Nil
	March				
1317 Hebden Road	09/3	2.0	IA	IA	NA
1246 Hebden Road	09/3	1.5	IA	IA	NA
	April				
1317 Hebden Road	20/4	1.2	IA	IA	Nil
1246 Hebden Road	20/4	0.8	IA	IA	Nil
	May				
1317 Hebden Road	08/5	2.1	<30	<30	NA
1246 Hebden Road	08/5	1.8	NM	NM	NA
	June				
1317 Hebden Road	15/6	0.7	IA	IA	Nil
1246 Hebden Road	15/6	1.1	IA	IA	NA
	July				
1317 Hebden Road	24/7	3.8	IA	IA	NA
1246 Hebden Road	24/7	3.4	IA	IA	NA
	August				
1317 Hebden Road	10/8	5.8	IA	IA	NA
1246 Hebden Road	10/8	4.8	NM	NM	NA
	September				
1317 Hebden Road	11/9	1.2	33	36	NA
1246 Hebden Road	11/9	3.1	30	34	NA
	October				
1317 Hebden Road	03/10	1.9	IA	IA	NA
1246 Hebden Road	03/10	2.3	IA	IA	NA
	November				
1317 Hebden Road	02/11	4.7	<25	<25	NA
1246 Hebden Road	02/11	4.6	<20	<20	NA
	December				
1317 Hebden Road	05/12	1.8	33	43	Nil
1246 Hebden Road	05/12	2.9	<25	31	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 2017 were in accordance with these predictions.

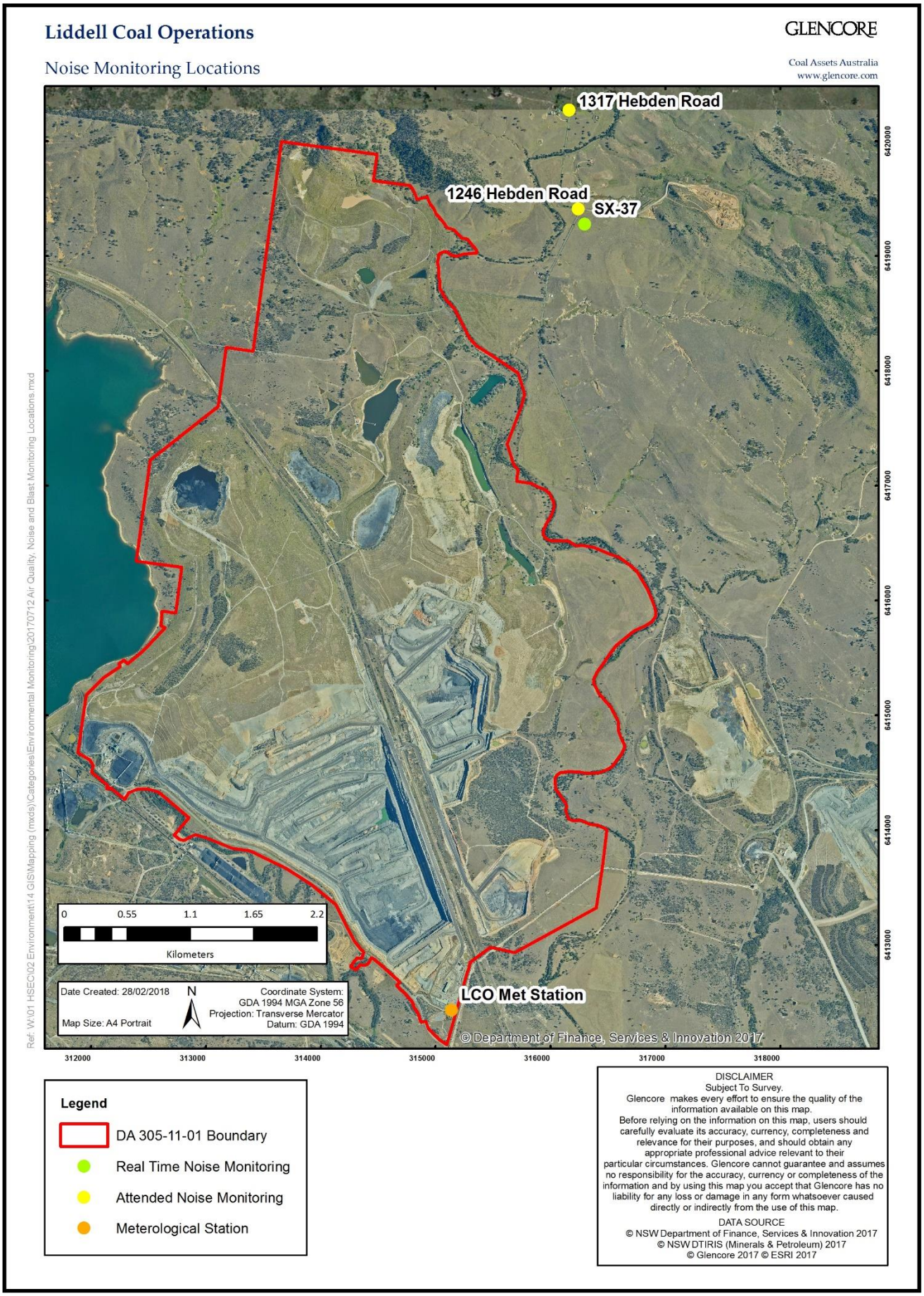

Figure 4 Noise monitoring locations

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 (01/01/2017 – 01/11/2017) 26 (02/11/2017 – current)	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.

To date, Liddell and Ausgrid have executed a number of agreements and Ausgrid have implemented mitigation measures relating to:

- Design and installation of various mitigation measures for substation infrastructure – notice of practical completion received 13 December 2016.
- Collection of baseline data to assess mitigation performance – complete February 2017
- Design and installation of blast vibration monitoring to validate mitigation performance – complete May 2017
- Design and installation of further mitigation measures based on validation program – complete September 2017

In accordance with DA305-11-01 Schedule 3 Condition 4a) and the approved Newdell Zone Substation Blast Management Strategy, LCO reached agreement with Ausgrid to progress an increase of blast vibration limits at the Substation from the 1st November 2017 and subsequently notified the DPE of the increase in limits on the 2 November 2017. The revised blasting limits are such that blasting does not cause:

a) ground vibration or VPPV that is greater than 30mm/s above 12Hz for any individual blast; and
b) ground vibration or VPPV that is greater than 26mm/s below 12Hz for any individual blast.

As per the approved blast management strategy, the proposed increase in limits is incremental and effectiveness of the mitigation measures will be confirmed by the Ausgrid monitoring program prior to increasing limits further. Conversely, monitoring analysis may also demonstrate that the mitigation measures have not been effective and Ausgrid will notify Liddell that vibration limits will need to revert back to specified in DA305-11-01. In either case LCO will continue to advise the Department when vibration limits are varied in accordance with the approved blast management strategy.

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 179 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 was one blast on the 31/8/2017 which recorded an overpressure limit of 115.1 db(L) at the Scrivens blast monitor. This exceedance was within the 5% of allowable blast exceedances over the total number of blasts in 2017.

There was one blast incident reported during 2017. On the 31 July 2017, LCO reported a blast to both the EPA and DPE where by dust left LCO and moved over the New England Highway. LCO personnel immediately drove to the affect area and observed that the Highway was clear of the dust plume, however some dust was visible on the opposite side of the Highway in an area of mine rehabilitation. Due to the time duration for the blast dust plume to reach the highway and distance travelled, it is reasonable to assume that the level of dispersion was such that there was little to no impact to traffic using the Highway. There was no visible blast fume generated from the blast and there were no complaints received from the community as a result of this blast. Whilst the event was noted as not having caused or threatened material harm to the environment; LCO provided notification of the incident the same day as the blast in order to provide transparency of operations and inform the EPA and DPE of the event due to it potentially being visible to the community.

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

Comparison to EA Predictions

The Liddell Coal EA (2015) proposes that modifications to the development consent would see continued compliance with vibration and overpressure criteria at the LCO receptors. Furthermore, blasting was proposed to be unlikely to cause significant damage to the Chain of Ponds Inn providing that the blast management strategy developed for the Project is implemented. All blasting during 2017 was within

compliance (minus 1 blast with an overpressure level of 115.1db(L)) and no significant damage has occurred to the Inn.

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 (1 blast exceedance of 115.1db(L))	NA	None required
Newdell zone substation	-	20 (allowable exceedance 10% of the total number of blasts over a 12 month period)	Compliant	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 (01/01/2017 – 01/11/2017 (no allowable exceedance)	Compliant	As above	As above
		26 (02/11/2017 – current (no allowable exceedance)	Compliant	As above	As above
Other Public Infrastructure	-	50	Compliant	NA	None required
Chain of Ponds Inn	150 (July-December)	40	Compliant for 100% of blasts	NA	None required

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 2017 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, existing continuous PM10 Tapered Element Oscillating Monitors (TEOMs) located on privately owned land became compliance monitoring locations; providing for continuous compliance monitoring at representative residential receiver locations. Hence, the compliance air quality monitoring includes Depositional Dust Gauges, paired High Volume Air Samplers (PM10 and TSP), continuous TEOMs representative of 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 operates four relocatable supplementary boundary PM10 air quality monitors. The units are operated 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, four units were 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

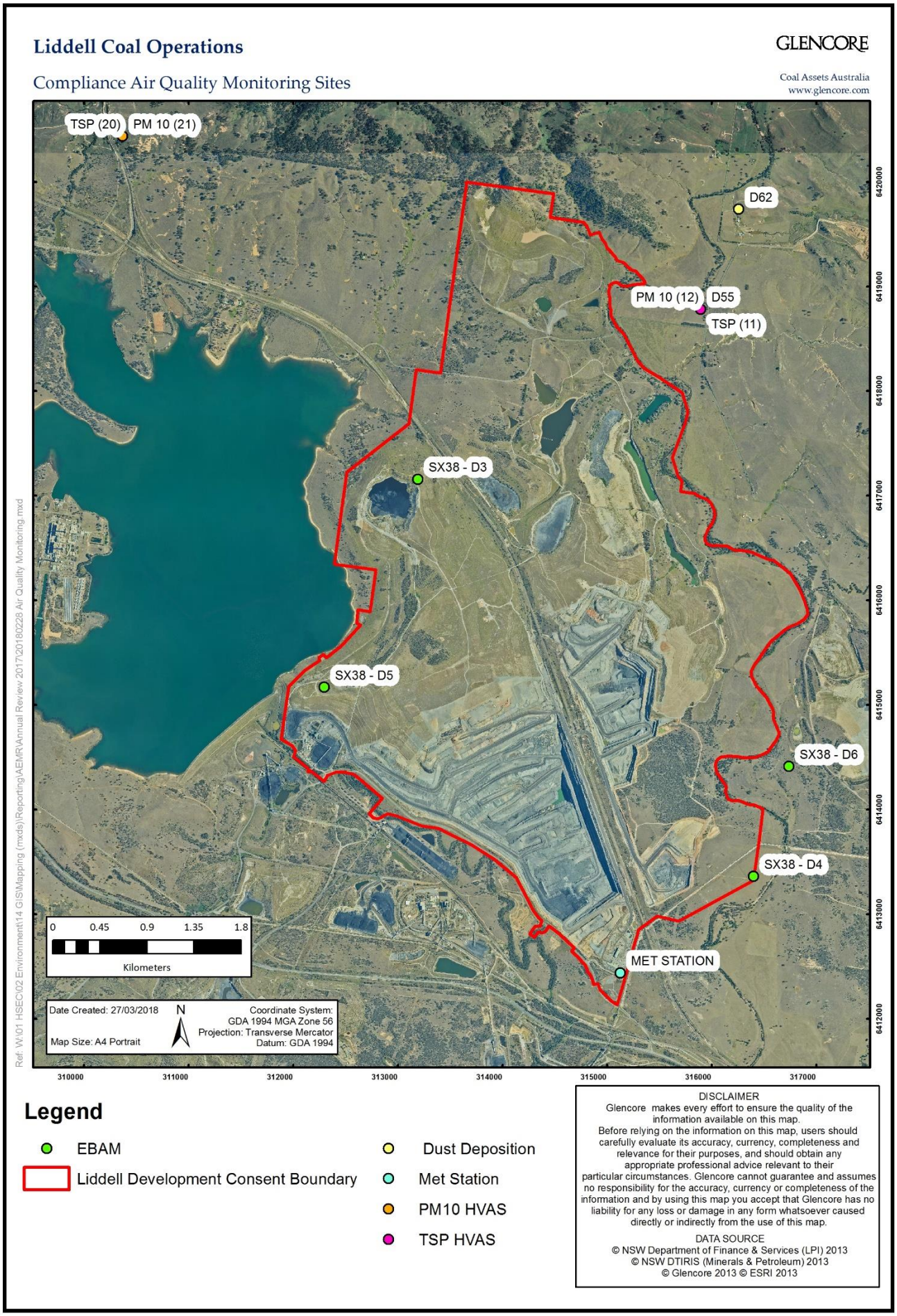

Figure 6 Air quality monitoring sites

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.

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 (2.3)	NA	None required
D62	4	Compliant (2.2)	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**.

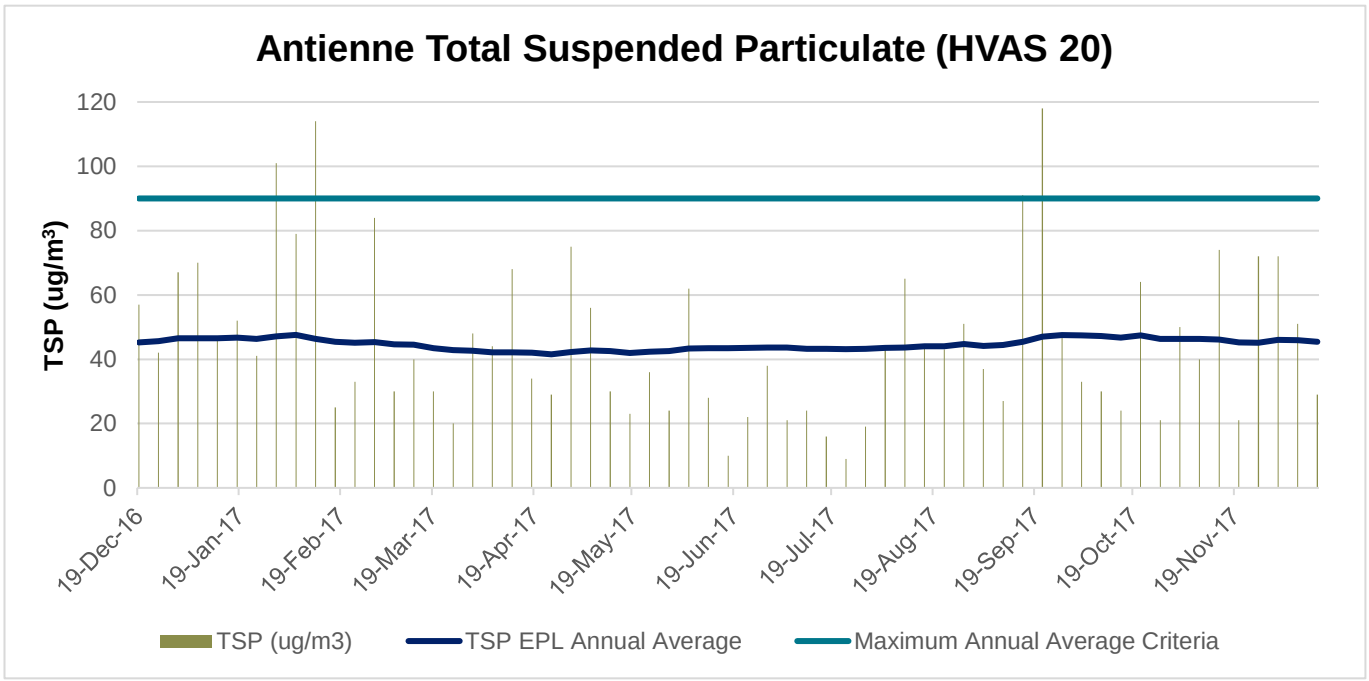

Figure 7 Antiene HVAS TSP Annual Results

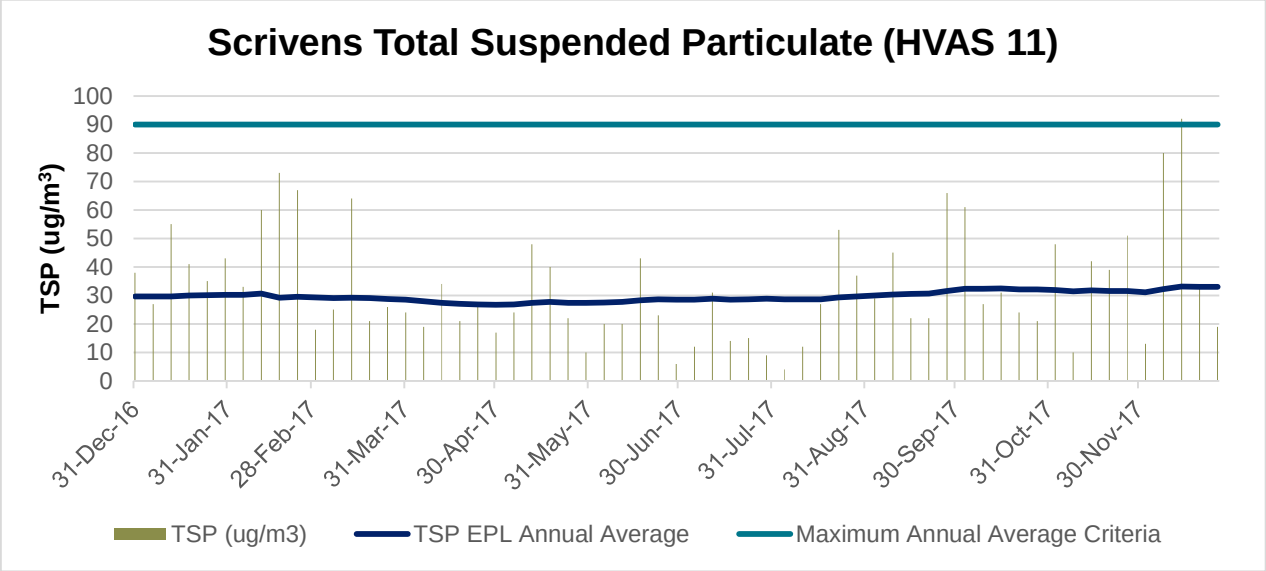

Figure 8 Scrivens HVAS TSP Annual Results

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 annual average TSP at HVAS 11 was 33µg/m3 and 45µg/m3 at HVAS 20.

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 (HVAS 12) and Antiene (HVAS 21). The annual average PM10 at HVAS 12 was 13ug/m3 with a maximum concentration of 36ug/m3 (recorded on 17 February 2017). The annual average PM10 at HVAS 21 was 18µg/m3 with a maximum concentration of 50µg/m3 (recorded on 11 February 2017). There were no exceedances of the impact assessment criteria during the reporting period.

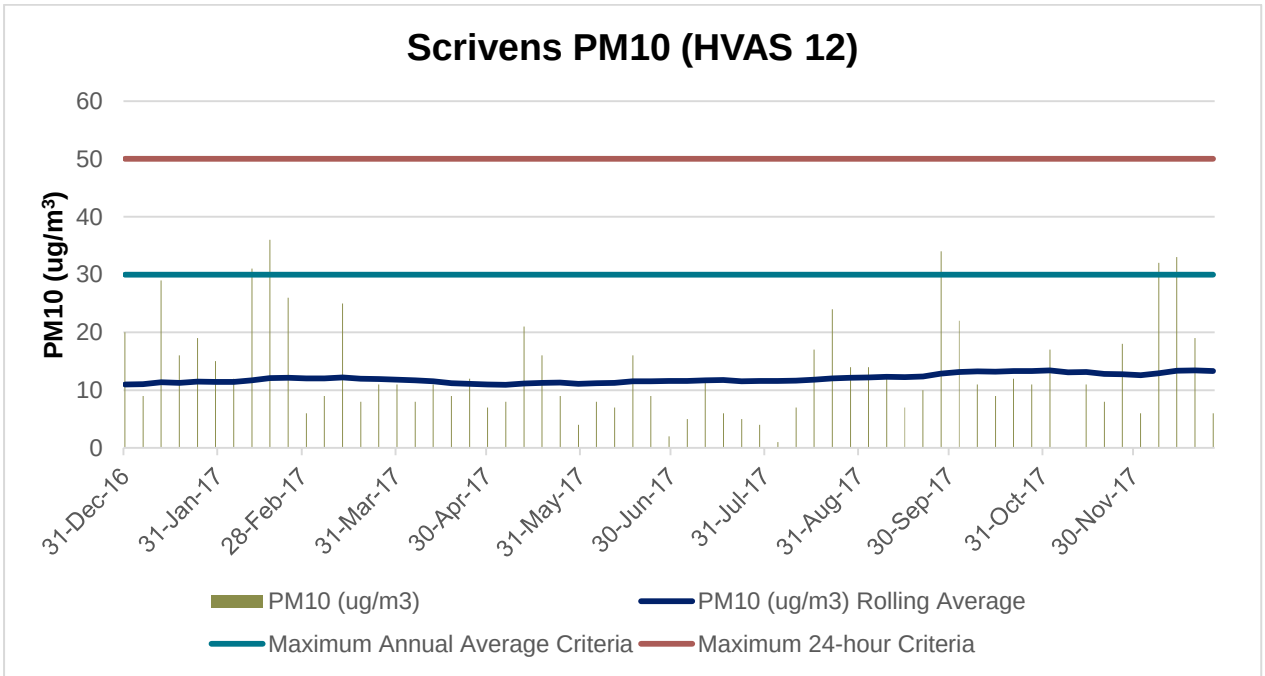

Figure 9 Scrivens HVAS PM10 Annual Results

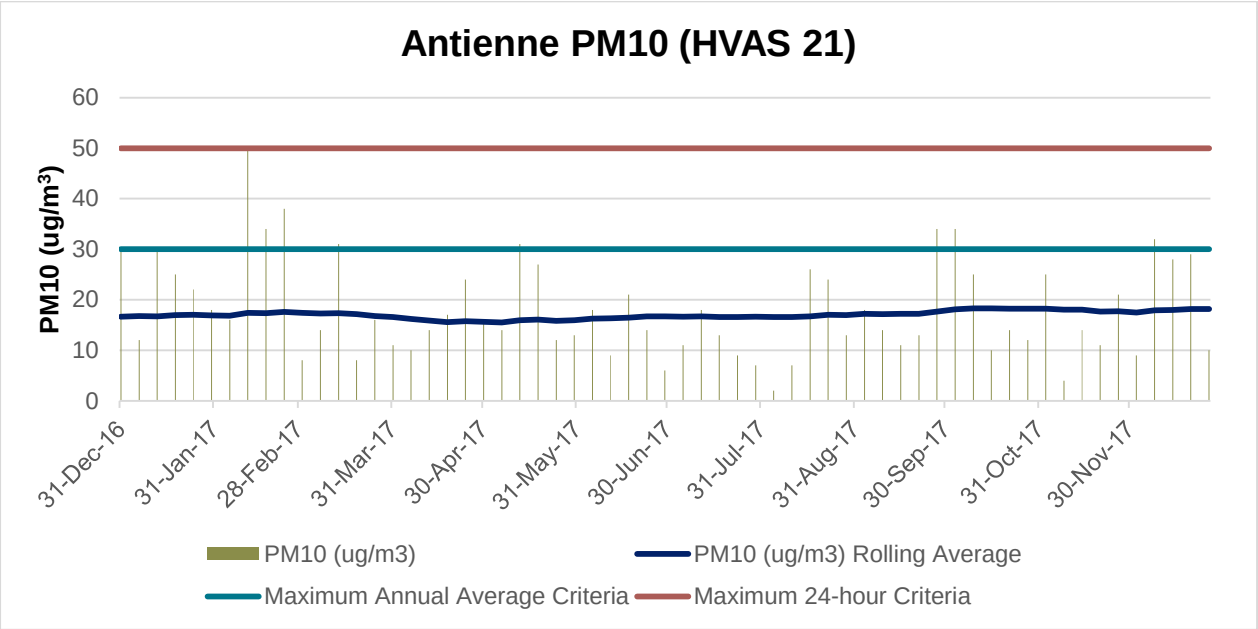

Figure 10 Antiene HVAS PM10 Annual Results

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

During 2017 the Air Quality Management and Monitoring Plan was updated, approved on 13 August adding two Tapered Element Oscillating Microbalance (TEOM) to the LCO compliance monitoring network. LCO operate these two continuous TEOMs 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 the reporting period, LCO complied with the PM10 long term (annual average) criterion (30µg/m_3) and short term criterion (50µg/m_3) at Scrivens (SX38-D1) and Antiene (SX38-D2). The rolling annual average PM10 at SX38-D1 was 13ug/m3 and 18ug/m3 at SX38-D2. PM10 monitoring results are presented in **Figure 11** and **Figure 12.**

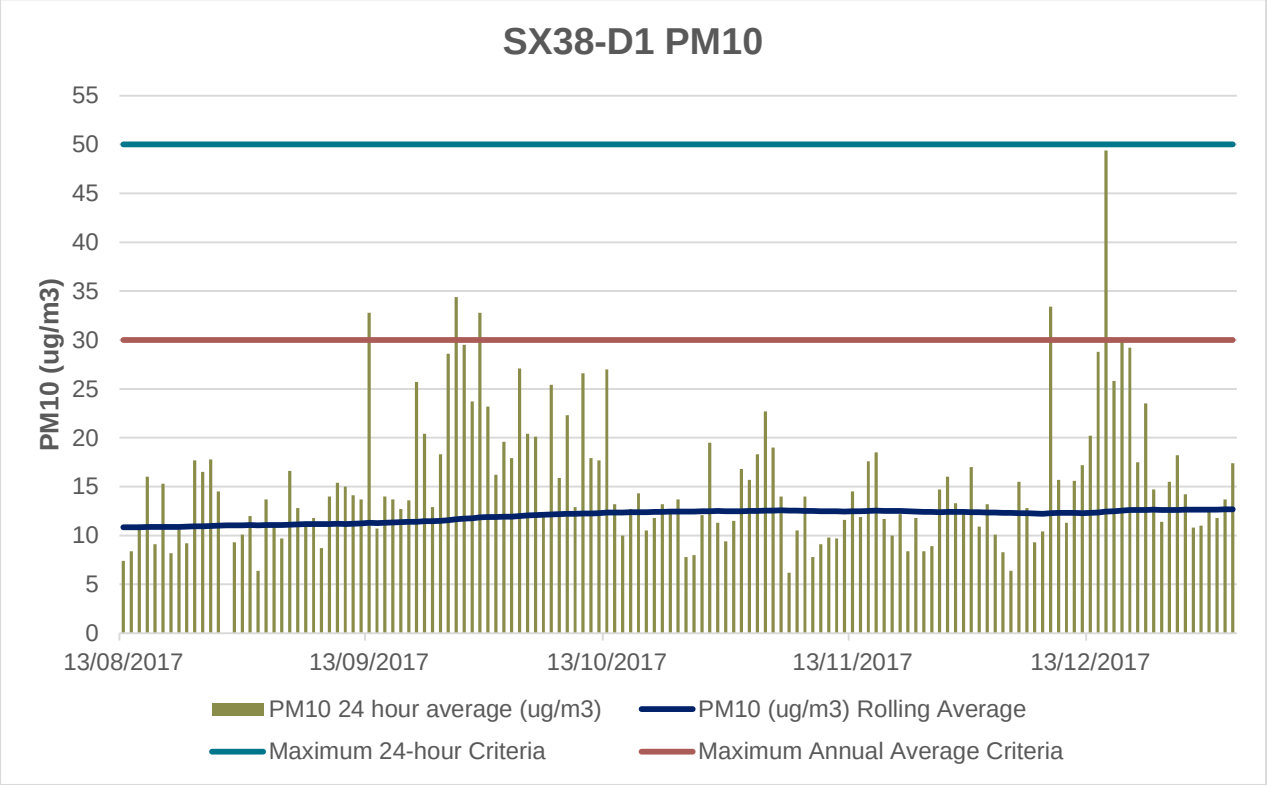

Figure 11 SX38-D1 TEOM PM10 Results

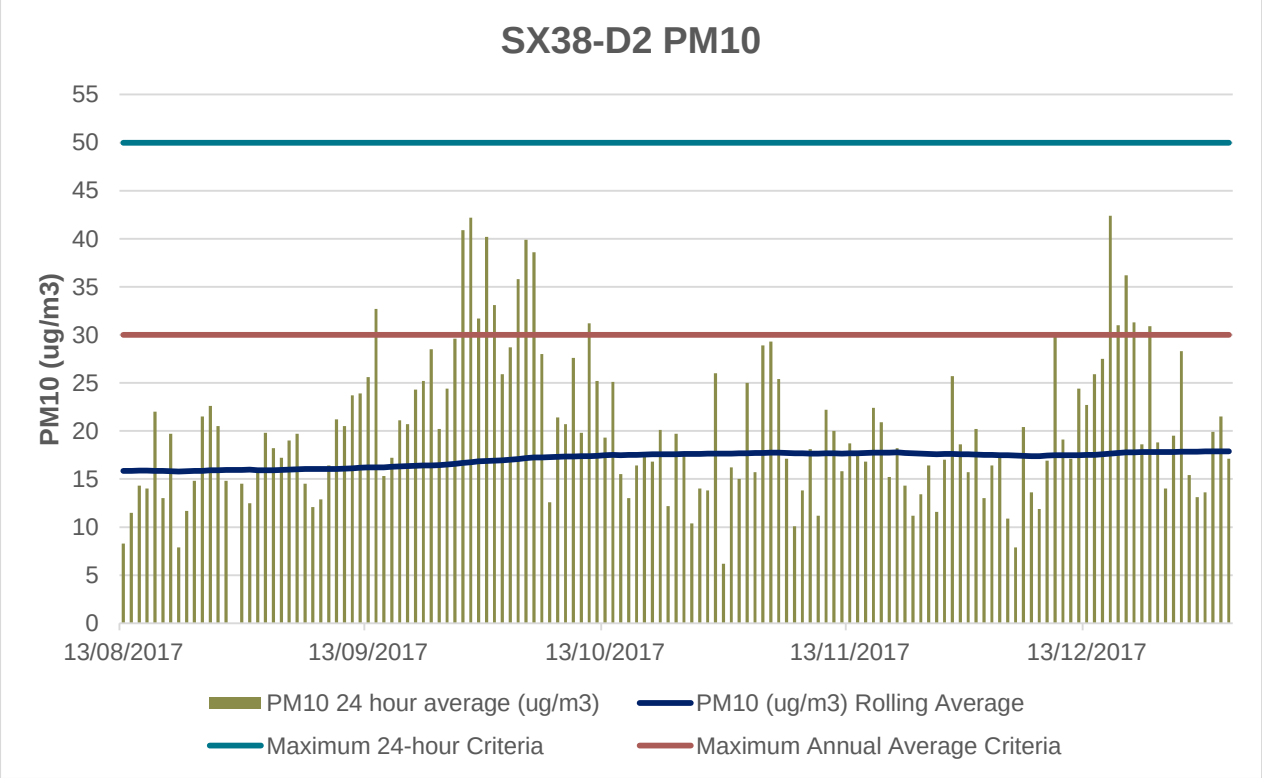

Figure 12 SX38-D2 TEOM PM10 Results

Continuous PM10 Monitoring - Comparison to EA Predictions

The DA 305-11-01 Modification 5 Environmental Assessment (EA) predicted that there was a very minor chance of LCO exceeding the compliance limit of 50 µg/m3 with the probability of this occurring being less than 0.3%. As predicted, LCO did not exceed the criteria at private residences (SX38 D1 and D2) during the reporting period.

Pollution Reduction Programs

During 2017, no new Pollution Reduction Programs were completed however LCO did continue to implment 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.

During each monitoring event LCO achieved the target 80% control efficiency with results as follows:

- Q1 February – 88%
- Q2 May –83%
- Q3 August – 85%
- Q4 November – 90%

6.4 Visual and Stray Light

Visual impact management is undertaken in accordance with the practices outlined in the Liddell Coal MOP (LCO, 2017) 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 2017, there were no lighting complaints received.

Comparison to EA Predictions

The DA 305-11-01 Modification 5 Environmental Assessment (EA) predicted that the project would have negligible to low visual impact on surrounding receptors due to open cut pits moving in a southerly direction away from the nearest privately owned receptors. As per predictions, no lighting complaints were received by LCO during the reporting period.

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 (ACHMP) was updated and underwent review by LCO RAPs late 2017.The ACHMP is planned to be finalised and submitted to DPE for review and approval in early 2018.

During 2017, LCO completed Archaeological Due Diligence assessment of biodiversity offset areas to provide for the protection of cultural heritage within these areas. New sites were identified during the due diligence process within and outside of the Development Consent boundary. As new sites were identified during this program the extent of the LID-BC-SAL was increased to incorporate the new finds. Furthermore, during this program two additional isolated find SALs were identified being the Bowmans Coalhole Ck SAL

and the Hebden Bowmans Ck SAL. **Figure 13** identifies aboriginal heritage sites within and outside of the LCO DA boundary. No Salvage Programs were completed in 2017.

The annual inspection and meeting was held with RAPs on 22nd November 2017. The following actions were to be undertaken by LCO as discussed during the inspection:

- Organise follow up inspection in early 2018 of the sites identified as a component of the Offset Due Diligence program;
- Additional straw bales with grass seed to be placed at HAZ2 OS1 for scour protection;
- Install a gate near HAZ2 OS1 to allow for better access;
- Organise removal of waste internal fencing near HAZ2 OS1;
- Investigate putting site cards in the appendix of the ACHMP; and
- Place small signs in the field (within the Sensitive Aboriginal Landscape (SAL)) to identify site name.

Since the annual inspection, LCO has installed additional straw bales at HAZ2 OS1 to assist in protecting the area from the scour. LCO have consolidated site cards to be included in the revised ACHMP in early 2018. Site signage has additionally been ordered and is expected to be installed also in early in the next reporting year. All additional actions identified during the inspection will be completed in early 2018.

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.

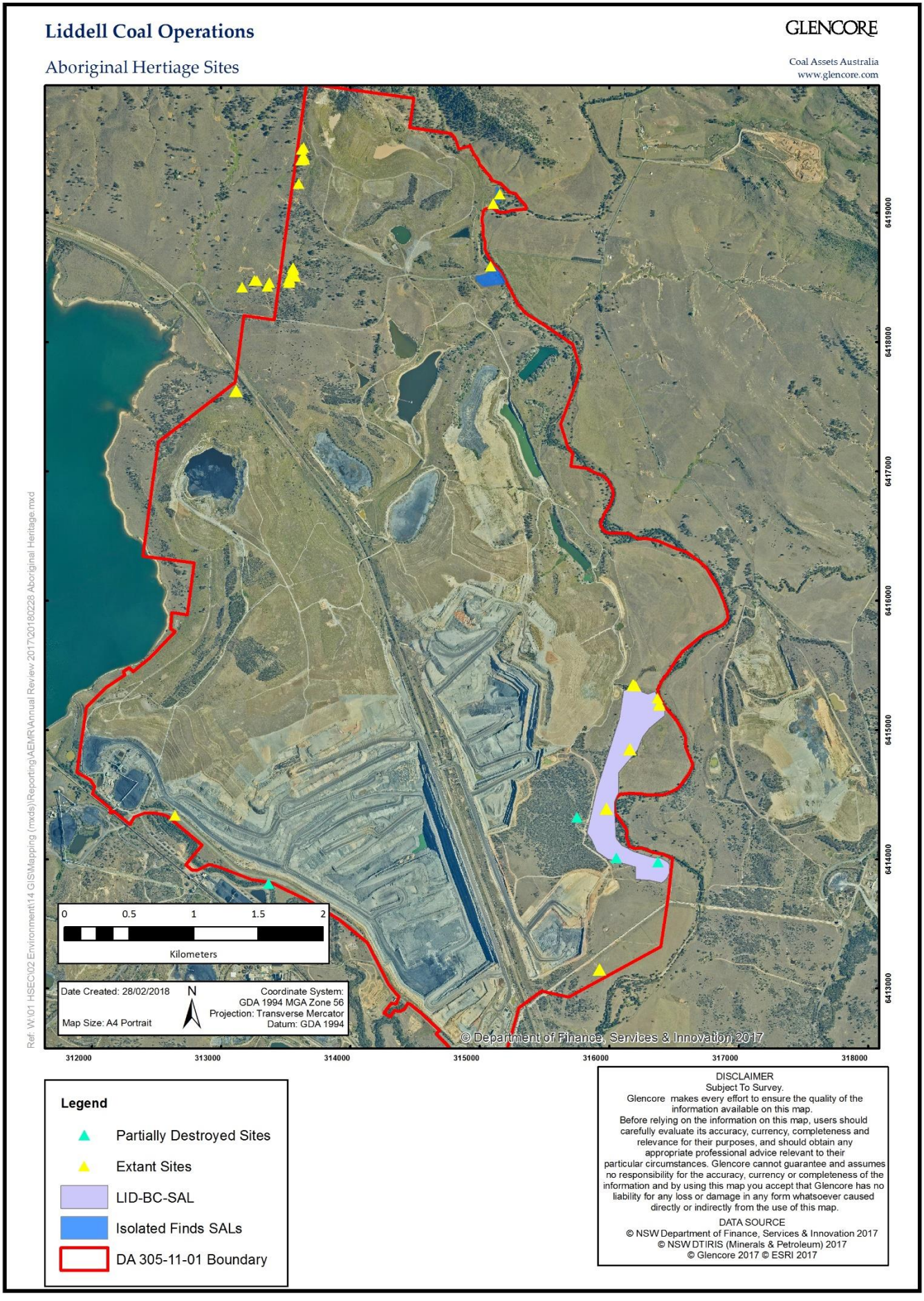

Figure 13 Aboriginal archaeological sites within Development Consent Boundary

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.

During the reporting period, two minor impacts to the Inn Complex have been noted by either building vibration monitoring or visual inspection. Following a blast on the 11 May inspection revealed some fragments of loose plaster from the ground floor archway had dislodged and fallen to the floor. As per the approved management strategy, no structural impacts to the Inn occurred and considered as insignificant damage. Repairs to plaster will be completed when the blasting program affecting the building is completed in approximately 2020.

Following a blast on 9 August inspection revealed that a section of internal wall cladding had come free on the 1st floor of the stable building and was leaning on the chimney structure. This section of wall had existing significant termite damage. Bill Jordan Associates determined that there has been no structural impact to the Inn complex resulting from blasting, nor is it likely that the fallen stud partition had occurred due to the blast.

Management Actions During 2017

As per the requirements of the management strategy, continuous monitoring of blasting as well as structure response monitoring occurred during 2017. No further stabilisation mitigation works were identified as being required. A summary of the building response monitoring is outlined below. Further, ground wave peak particle velocities were kept at the revised level of 40mm/s.

Analysis of Blast Monitoring

The structures were monitored with accelerometers on 15 occasions during the year, from 5/1/2017 to 6/12/2017. For each of these events, vibrations were measured at the building locations specified in the strategy with the acceleration measurements analysed and compared with the in-ground geophone velocity measurements (the site geophone). For both the geophone and the accelerometers, the analysis yield acceleration, velocity and displacement results, together with frequency analyses for all.

Figure 14 shows typical acceleration-velocity-displacement plots for a typical groundwave recording and the corresponding building reaction recording for an accelerometer oriented in the same direction. Groundwave recording in the building-oriented “transverse” direction and the recording at the top of the chimney at position Ad. It can be seen that the maximum deflection at the top of the chimney is less than 2 mm, and amounts to 14% of the tolerance previously established.

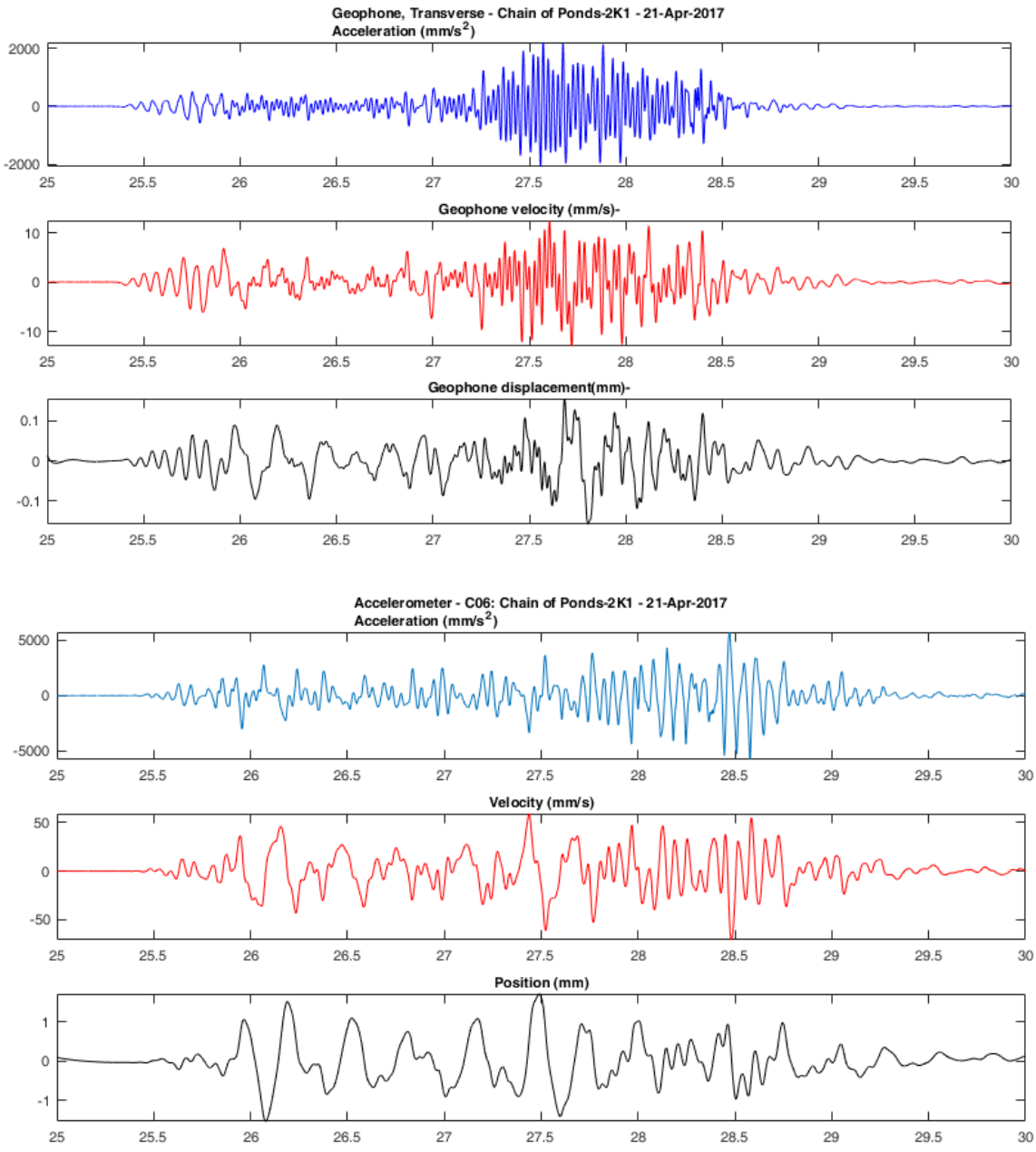

Figure 14 Typical acceleration-velocity-displacement plots for Chain of Ponds

The accelerometer mounting locations chosen to best describe the behaviours of the buildings are shown in **Figure 15.** With the exception of locations Ad and Bc, all are at the tops of the two-storey walls and generally measure the most-damaging in-plane movements. Location Ad is at the top of a chimney and is measuring the movement about its weaker axis; location Bc is at the centre of a two-storey wall which is unsupported by a floor and for which the out-of-plane movement is the most critical.

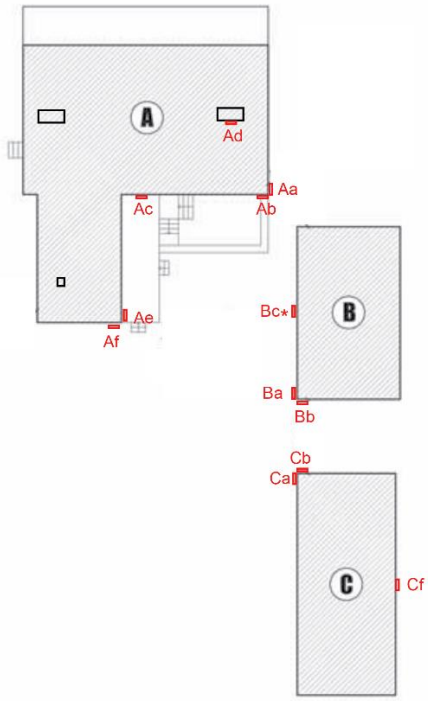

Figure 15 Diagram of accelerometers on COPI

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).

No results recorded in 2017 suggested that any change was required in these criteria.

The maximum displacements recorded during the year at each location are shown in **Table 17**.

Table 17 Maximum displacements recorded in 2017

Location	Max. displacement (mm)	Tolerance	% of tolerance
Aa	0.65	7	9
Ab	0.60	7	9
Ac	0.78	7	11
Ad	4.06	12	34
Ae	0.94	7	13
Af	0.72	7	10
Ba	0.82	5	16
Bb	1.09	5	22
Bc	1.07	3	36
Ca	0.94	5	19
Cb	0.65	5	13
Cf	1.11	5	22

Data relating to the effects of groundwave frequencies continued to be gathered during the year and has been used to refine blast design parameters.

Trends and compliance issues

During 2017, there were no exceedances of the compliance limits at the Chain of Ponds Inn nor was there any significant damage as a result of blasting activities.

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 approach/margin is considered in both the prediction models and the building behaviour models and it will continue to be appropriate to continue this into the future.

Comparison to EA Predictions

The Liddell Coal EA (2015) proposes that modifications to the development consent would be unlikely to cause significant damage to the Chain of Ponds Inn provided that the blast management strategy developed for the Project is implemented. A staged and adaptive management approach has been applied to South Cut blasting and has not resulted in any significant damage to the Inn in 2017.

Future Work

Continuing monitoring of the buildings behaviour as per the strategy will occur to further develop the predictive modelling and provide for the conservation of the structures.

6.7 Exploration

No exploration activities were completed during 2017.

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 submerged with 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 2017.

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 storage facility (TSF) 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 TSF 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 TSF during 2016 and aims recommence in 2018 capping operations on the Northern portion pending confirmation of sufficient surface strength. At this stage approximately 23ha of the 33ha dam have had an initial capping layer of 1.5m created.

The Durham TSF is the only active tailings emplacement at Liddell. The Durham TSF emplacement is estimated to have capacity for 3.85million m^3 of tailings through to early 2019. Between 2019 and 2021, 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 TSF is reaching capacity. LCO plan to 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 18 below shows indicative timeframes for capping and final rehabilitation for each facility.

Table 18 Tailings emplacement and rehabilitation timeframes

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

During 2018, a tailings pipeline will be constructed to transfer tailings to the West Pit Tailings Emplacement Area at Mt Owen Complex as approved by DA 305-11-01 Modification 6. This modification improves the tailings management strategy for Liddell by removing the need for tailings cells being constructed in the South Pit overburden dumps once emplacement is completed in the Durham TSF and the South Pit void becoming available during 2021.

7 Water Management

7.1 Water Management System

Water management is one of the key operational activities 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 (as modified), as well as condition's 12, 13, 14, 15 and 16 of the Australian Government EPBC approval. During 2017, LCO consulted with DoE, DPE and DPI Water to update the WMP. The key updates comprised of revised groundwater triggers and Trigger Action Response Plan (TARP); inclusion of new alluvial monitoring borehole (ALV9) and associated impact assessment criteria as well as contextual details regarding the Mod 6 tailings pipeline integration into the water management system. The changes to impact assessment criteria are detailed in the sections below.

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. LCO also utilises pipeline infrastructure between Mt Owen, Liddell and Ravensworth (Greater Ravensworth) 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 19** 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 19 Site water balance

2017 Site Water Balance	
Total Inputs (ML)	2,426
Total Outputs (ML)	3,837
Inputs minus Outputs (ML)	-1,411
Storage at Start (ML)	8,914
Storage at End (ML)	7,842
Change in Storage (ML)	-1,073
Imbalance (ML)	338
Total Inputs + Total Outputs equals total flow through site (ML)	6,262
Imbalance Percentage	5.4%

During 2017, LCO was required to complete a calibration of the site water balance as per commitment 23 of the WMP. 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 November 2011 to July 2017.

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**.

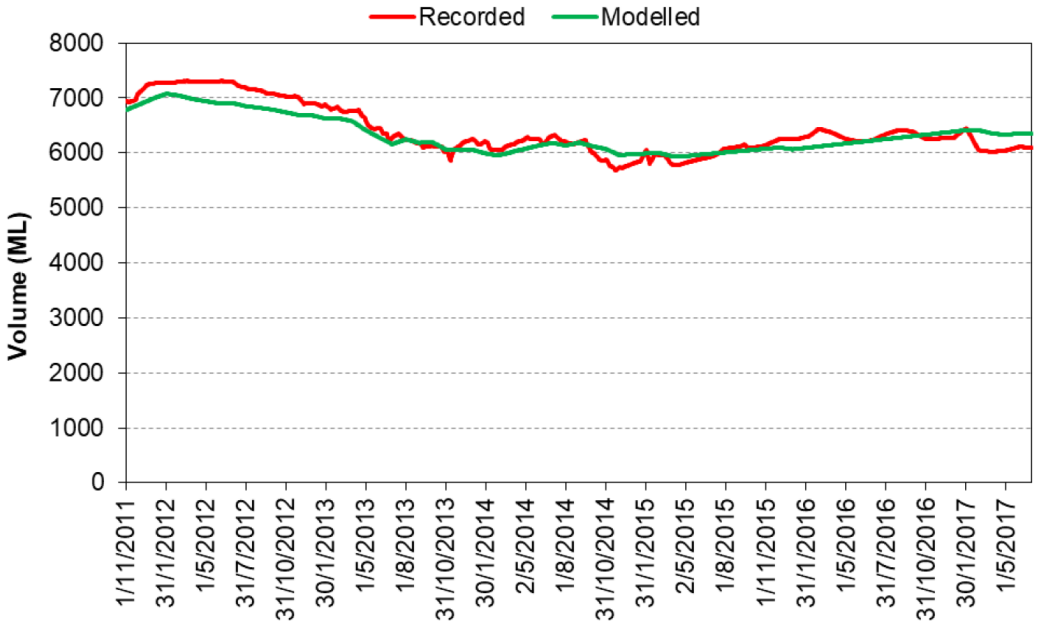

Figure 16 Calibrated model & estimated actual stored water volume – All Underground Storages

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

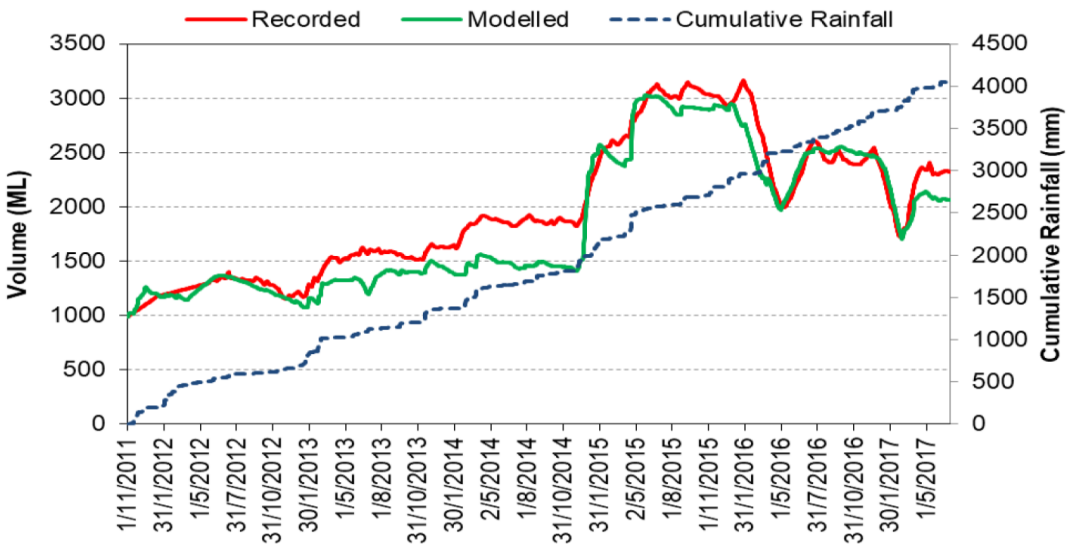

Figure 17 Calibrated model & estimated actual total stored water volume – main surface water storages

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 remained unchanged since they reproduce volumes derived from recorded water levels in the main LCO water storages well. 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 2018 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. Pit shell information for Mountain Block area should be collated for use in future model calibration revisions.

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. Bore M49 is being maintained below -21mAHD. During the reporting period Middle Liddell Bore ranged between -58mAHD and -40mAHD. **Section 7.3** details groundwater monitoring results (water level and water quality) for the reporting period.

Table 20 provides a summary of the water take in 2017 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 20 Groundwater take

Water Licence	Entitlement	Passive take	Active pumping	Total
WAL41499 (previously 20BL168063)	6000	0	0	0
WAL41498 (previously 20BL168062)	6000 (Combined) MLB	299ML	599ML	898ML
WAL41498 (previously 20BL172588)				
WAL39760 (previously 20BL168060)	5500 Haz 1&2	0	395ML	395ML
WAL18302	5	0	0	0
20WA210940 (previously 20BL017861)	5	0	0	0
WAL41493 (previously 20BL172293)	2500 (Combined) M49	395ML	930ML	1325ML
WAL41493 (previously 20BL168209)				
20BL169544	2500	0	0	0
WAL41497 (previously 20BL168061)	1000	0	0	0

Framework Representation

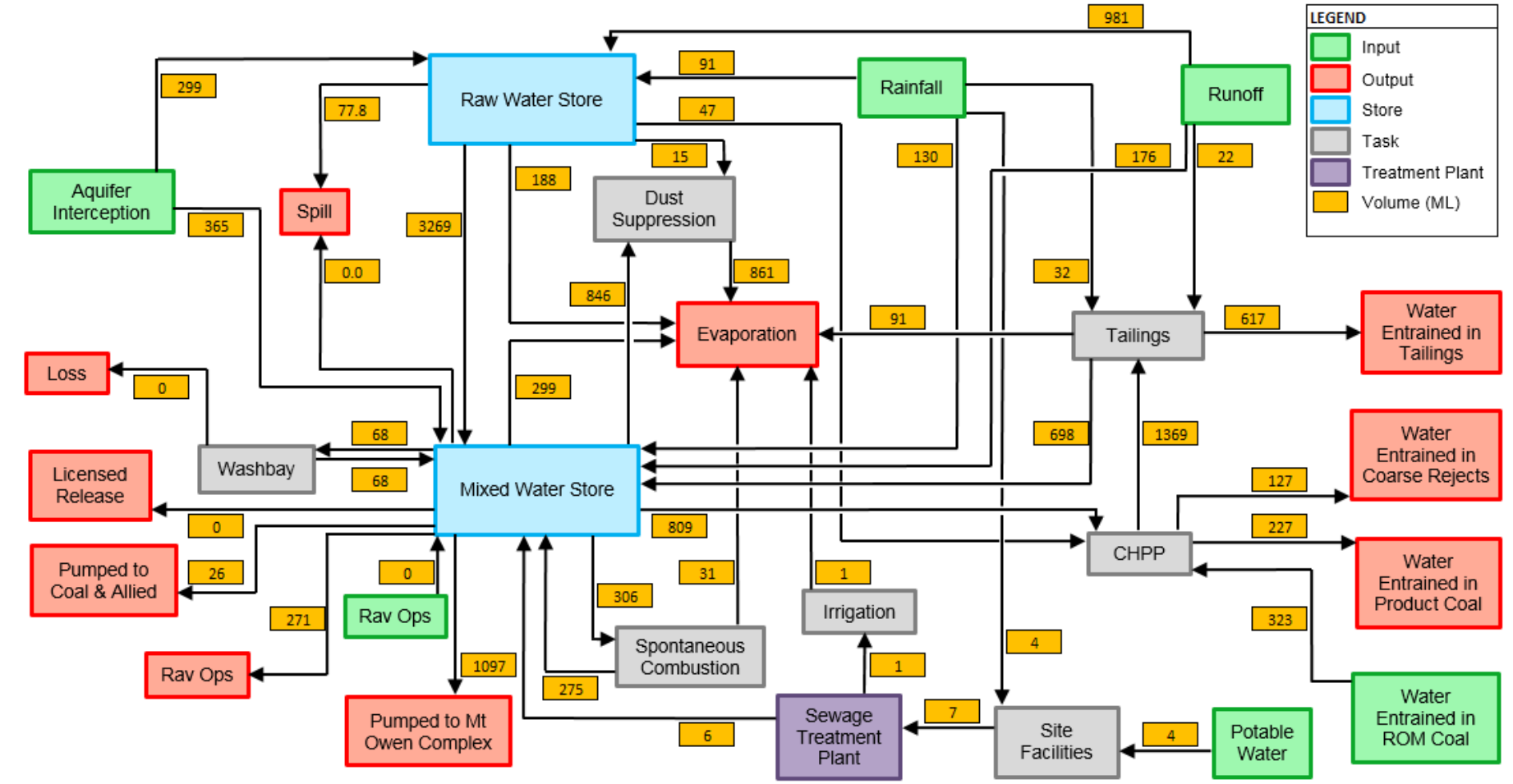

Figure 18 Site water balance

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. 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 21**. Noting the acronyms; TSS – Total Suspended Particulate, EC – Electrical Conductivity, TDS – Total Dissolved Solids.

Table 21 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**

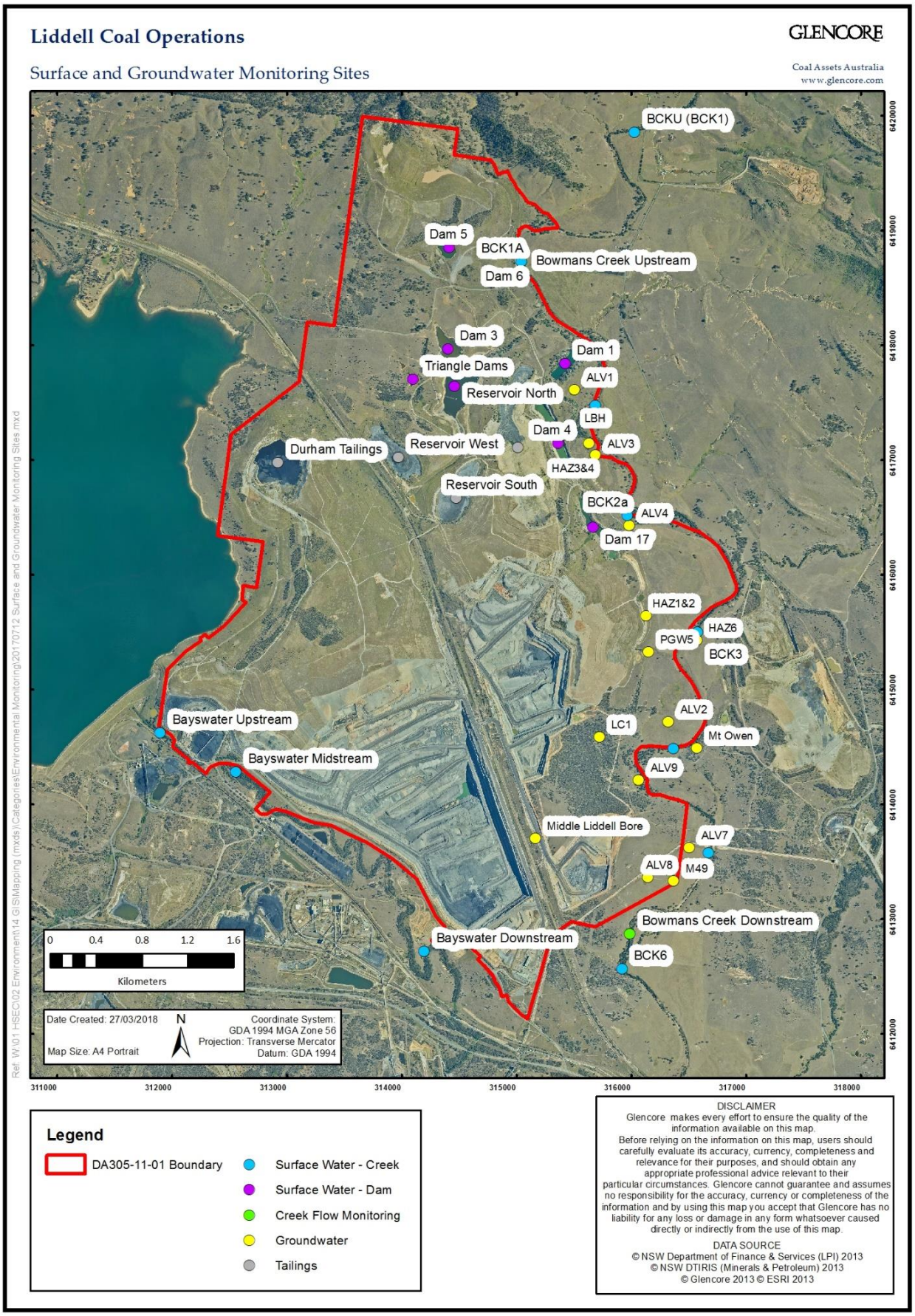

Figure 19 Surface and groundwater monitoring locations

7.2.2 Surface Water 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.

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 22 below summarises the trigger limit exceeded in Bowmans Creek during the reporting period. A summary of the triggers, observations and TARP investigations is included herein.

Table 22 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					8.34	2300		1480								
Feb						3060		1950								
Mar																
Apr																
May																
Jun																
Jul																
Aug																
Sep						2270		1310								
Oct						3060		2100								
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	8.41				8.47		74		8.47							
Feb					8.42	2160	164	1250								
Mar			56				128									
Apr																
May																
Jun																
Jul																
Aug																
Sep																
Oct																
Nov																
Dec																

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)

During 2017, LCO recorded below average rainfall and above average evaporation which has had observable changes to the flow and water quality of Bowmans Creek.

The measured TDS and EC levels along Bowmans Creek identified five (months) exceedances of flow applicable criteria during the reporting period. 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 EC

or TDS 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.

The measured pH levels consistently averaged 7.99 throughout the reporting period. There were five exceedances of the flowing WMP 90th%ile pH limits of 8.30; each occurring with slow or trickle flow observed at the site. During the reporting period, one pH TARP investigation occurred following three exceedances of the flowing 90th%ile trigger limits at BCK4. A TSS TARP investigation also occurred due to three exceedances of the flowing 90th%ile trigger limits on the following month. The investigation and findings were reported concurrently in accordance with the WMP and a summary is provided below.

BCK4 Investigation TARP

Surface water monitoring at BCK4 identified exceedances of the 90th%ile trigger limits for pH during December 2016 to February 2017 as well as TSS from January 2017 to March 2017. The investigation included the following;

- Field inspections of the site
- Review of flow conditions within the creek system
- Review of monitoring results
- Review of operational storages and assessment of leakage occurring

Based on climatic conditions, the inspection of the creek and riparian conditions upstream and downstream of the monitoring station, results at other water quality monitoring stations and of the lack of any pollution incidents at LCO during or prior to the time of notification; LCO determined that there was no potential for environmental harm. Additionally, that the triggers have the same causal factors that are not mining related.

Surface water comparison to EA Predictions

With reference to the EA predictions from the surface water assessment (Gilbert and Associates, 2013), this part identifies the predictions made with comparison to monitoring findings. The key conclusions of the predictive model simulations and surface water impact assessment have been compared to the findings of the WMP approved monitoring program and detailed in the table below. In brief, observations from the monitoring programs demonstrate impacts within the EA predictions.

Table 23 Surface Water Impact Comparison to EA predictions

Surface Water Impact Comparison to EA Predictions	
Key EA Conclusion	Comparison to Monitoring Observations
Changes to flows in local creeks due to expansion and subsequent capture and use of drainage from mine area catchments.	Mining remains within the approved extents hence no impacts to the catchment greater than predictions. Monitoring has not shown significant changes in creek line base flow due to mining operations. Rehabilitation activities aligning with current approved final landform design providing for impacts management in line with the EA.
Potential for export of contaminants (principally sediments and soluble salts) in mine area runoff and accidental spills from containment storages (principally sediments, soluble salts, oils and greases), causing degradation of local and regional water courses.	There were no pollution events during the reporting period. Monitoring has not identified mining related impacts to the surface water quality.
Short term increases in salinity during periods of licensed discharge under the HRSTS.	There were no discharge events under the HRSTS during the reporting period.

HRSTS Discharge Monitoring

Any discharges from Liddell Coal must be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS). During 2017, there were no discharge events from the site under the HRSTS.

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 WMP groundwater monitoring program adopts site specific trigger values 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. Accordingly, for groundwater quality, a trigger level of 80th percentile and 100th percentile of the historical record has been adopted. Currently, investigations into potential impacts are conducted if there are three consecutive exceedances of the nominated triggers.

During August 2017, LCO consulted with DoE, DPE and DPI Water to update the WMP; specifically updates to the groundwater triggers and Trigger Action Response Plan (TARP). **Table 24** presents the current site specific trigger levels for water level and groundwater quality adopted from January to July 2017 and shows the data relevant to the period August to December 2017. It should be noted that following a review of the PGW5 trigger it was determined that this site should not be retained as a trigger level site as this paired site contains one piezometer in the Pikes Gully Seam and one in the Overburden. Additionally, ALV9 was installed in December 2017 as per the WMP. This monitoring bore is intended to inform of any actual draw down impacts in Bowmans Creek at the predicted maximum impacted area, noting that drawdown is not predicted to commence until 2019.

Monitoring results observed during the reporting period are summarised in following **Section 7.3.2** with the breakdown of:

- Groundwater quality of alluvial and shallow bedrock aquifers including applicable ITARP summary of ALV3S Investigation – February 2017, ALV8L Investigation – September 2017 and ALV2S Investigation – December 2017
- Groundwater quality of Hard Rock Aquifer (Coal Measures) Review including applicable ITARP summary of PGW5S Investigation and PGW5L Further Investigation – July 2017
- Groundwater levels of Alluvial and Shallow Bedrock Aquifers including applicable ITARP summary of ALV8L Investigation – December 2017
- Groundwater levels of Hard Rock Aquifer (Coal Measures)
- Comparison to EA predictions

The groundwater monitoring locations (compliance and management bores) are shown on **Figure 19.**

Table 24 Groundwater quality impact assessment criteria

Groundwater Quality Impact Assessment Criteria											
		Groundwater Elevation (mAHD) – Definition #2				**EC (µS/cm)**					**pH**
		January – July 2017		August – December 2017		January – July 2017		August – December 2017			
		10th%ile	Ref. Min	10th%ile	Ref. Min	80%ile	Max	20%ile	80%ile	Max	
Alluvial and Shallow Bedrock Aquifers											
ALV1	Alluvial aquifer (L)	105.69	104.88	106.22	104.88	1520	2020	N/A	1370	2020	6.5 – 8.5
	Shallow bed rock (S)	105.97	104.35	106.44	104.35	1580	1770	N/A	1560	1770	
LBH	Alluvial aquifer (L)	102.21	104.55	105.74	104.55	1690	3090	N/A	1550	3090	
ALV3	Alluvial aquifer (L)	103.19	102.43	103.81	102.43	1490	3080	N/A	1390	3080	
	Shallow bed rock (S)	102.88	102.25	103.52	102.25	2630	4510	N/A	2800	4510	
ALV4	Alluvial aquifer (L)	101.76	94.86	102.14	100.97	2200	3080	N/A	1920	3080	
	Shallow bed rock (S)	101.03	100.28	101.42	100.28	5380	6430	N/A	5310	6430	
ALV2	Alluvial aquifer (L)	92.97	91.12	93.08	91.12	2940	4160	N/A	2830	4160	
	Shallow bed rock (S)	92.96	89.35	93.21	89.35	2830	3370	2560	2820	3370	
ALV7	Alluvial aquifer (L)	86.93	86.43	87.02	86.43	1900	2310	N/A	1780	2310	
	Shallow bed rock (S)	83.26	82.39	83.56	82.39	2260	2540	N/A	2230	2540	
ALV8	Alluvial aquifer (L)	84.98	83.66	85.06	63.66	1320	1880	N/A	1310	1880	
	Shallow bed rock (S)	82.18	80.94	82.99	80.94	2090	2400	1540	1990	2400	
Hard Rock Aquifers (Coal Measures)											
PGW5	Overburden (L)	93.24	86.22	N/A	N/A	5050	6060	N/A	N/A	N/A	6.5 – 8.5
	Coal Measure (S)	94.76	94.48	N/A	N/A	5770	6820	N/A	N/A	N/A	
Groundwater Level Trigger Definition #1 – 2m drawdown in Bowmans Creek Alluvium											
ALV9L		Groundwater elevation of monitoring piezometer ALV2L minus 5.0m (AHD).									
ALV8L		Groundwater elevation of monitoring piezometer ALV7L minus 4.5m (AHD).									

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 are shown in **Figure 20** to **Figure 24** and in **Appendix E**; a summary of these results during the reporting period is provided herein. During the reporting period, there were no exceedances of the 6.5 to 8.5 trigger values.

During the period October 2017 to December 2017, for the alluvial piezometers, there is an increasing trend in pH compared to the period January 2017 to July 2017, where pH typically showed a declining trend. In the shallow bedrock piezometers the pH was relatively stable from January 2017 to July 2017 before also showing a rising trend from August to the end of the year.

Historically, pH has shown a declining or stable trend throughout the first half of the year followed by a rising trend during the latter part as illustrated in **Figure 20** and **Figure 21**. It is considered that the current increase in pH will follow the same trend, decreasing again within a six month period. An investigation into the large peak observed in December 2014 concluded that the increase in pH was not mining-related. It is considered the changes in pH observed are due to climatic variations and the result of a prolonged period of below average rainfall. The monitoring program will continue to be implemented to observe any change in groundwater pH.

Table 25 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 25 Groundwater exceedances for EC in alluvial and shallow bedrock aquifers

Groundwater exceedances for EC in alluvial and shallow bedrock aquifers													
Site	ALV1L	ALV1S	LBH	ALV3L	ALV3S	ALV4L	ALV4S	ALV2L	ALV2S	ALV7L	ALV7S	ALV8L	ALV8S
Impact assessment Criteria between January and July 2017													
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					2910								
Feb					2750								
Mar					2850								
Apr													
May													
Jun									2840		2305	1330	2290
Jul								2990				1386	
Impact assessment Criteria between August and December 2017													
Limit	1370	1560	1550	1390	2800	1920	5310	2830	2820	1780	2230	1310	1990
Maximum	2020	1770	3090	3080	4510	3080	6430	4160	3370	2310	2540	1880	2400
Aug												1460	
Sep												1504	
Oct									2860		2240	1340	
Nov									2840		2260		
Dec							5320		2850				

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 – February 2017

ALV3S showed exceedances of the 80th percentile EC trigger level value in May 2016, defined as three (3) consecutive exceedances of the adopted 80th percentile trigger value. An investigation was undertaken by an external hydrogeologist as summarised in the 2016 Annual Review (LCO, 2017). The EC exceedances at ALV3S continued into 2017 and a further investigation was conducted by an external hydrogeologist to assess if the continued exceedance posed an environmental risk.

The further investigation is summarised as follows:

- There had been no mine-related activity in the vicinity of site ALV3 in the recent past. Review of water storage levels in Dam4, located adjacent and up-gradient of site ALV3, did not indicate any particular correlation with groundwater quality.

- There was no evidence of increased hydraulic connection between the water table aquifer and the underlying previously mined underground workings.

- Data at monitoring site ALV3 did not indicate a change in groundwater elevation within the alluvium or shallow bedrock (obtained from piezometers ALV3L and ALV3S respectively) outside of the range of historical observation. The minor vertically downward hydraulic gradient between the alluvium and shallow bedrock also remained consistent with historical observation.

- Groundwater elevation data therefore did not indicate that an adverse change in groundwater flow behaviour has occurred at site ALV3.

- Groundwater quality at ALV3S exhibits more variability than other shallow bedrock piezometers. The increased variability is interpreted as being due, 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'.

ALV8L Investigation – September 2017

ALV8L showed an exceedance of the 80th percentile EC trigger level value in August 2017, 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:

- The groundwater EC measured at ALV8L and ALV8S reflected natural variability due to climatic factors and there was not a mining-related impact. The climate data showed high evaporation and below average rainfall for the majority of 2017, which was considered to have resulted in the observed increase in EC.

- The observed groundwater EC remained within the historical range.

ALV2S Investigation – December 2017

During the reporting period, there was an exceedance of the 80th percentile EC trigger at piezometer ALV2S in December 2017, 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:

- The groundwater EC measured at ALV2L and ALV2S reflects natural variability due to climatic factors and there is not a mining-related impact. The climate data showed high evaporation and below average rainfall for the majority of 2017, which is considered to have resulted in the observed increase in EC.

- The observed groundwater EC at ALV2S was not outside of the maximum range recorded and was not of sufficient magnitude to lead to a downgradient impact on beneficial use.

- ALV2S was not within the extent of drawdown from mining operations and there was no potential seepage sources.

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 26 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. From August 2017 PGW5 was not retained as trigger level monitoring site.

Table 26 Groundwater exceedances for EC and pH in hard rock aquifers

Groundwater exceedances for EC and pH in hard rock aquifers				
Site	PGW5L	PGW5S	PGW5L	PGW5S
Impact assessment Criteria between January and July 2017				
80th%ile	5050	5770	6.5 – 8.5	
Maximum	6060	6820		
Jan	5740	6010		
Feb	5430			
Mar	5500			
Apr	5620	5850		
May	5620	5860		
Jun	5760	6010		
Jul	5610			
Impact assessment Criteria between August and December 2017				
80th%ile	N/A	N/A		
Maximum	N/A	N/A		
Aug				
Sep				
Oct				
Nov				
Dec				

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

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

PGW5S Investigation and PGW5L Further Investigation – July 2017

During 2017, there was an exceedance of the 80th percentile EC trigger value at PGW5S in June 2017, defined as three (3) consecutive exceedances of the adopted 80th percentile trigger value. An investigation was undertaken in July 2017 by an external hydrogeologist.

PGW5L exceeded the 80th percentile EC trigger value in December 2016, which was investigated. The exceedance continued into 2017 and a further investigation was conducted to assess if the continued exceedance posed an environmental risk.

The investigations are summarised as follows:

- Groundwater quality (as salinity) continued to reflect natural variability due to climatic factors and there was not a mining-related impact. The conclusion from the investigation of PGW5 conducted in February 2017, that there is no potential harm to the environment due the currently elevated groundwater salinity, was considered to have remained valid.

- The observed groundwater salinity remained within the historical range (referred to as the baseline dataset, specifically July 2005 to May 2017 inclusive).

- It was recommended that monitoring continues at PGW5 and that these piezometers, which are installed into the Overburden and Pikes Gully Seam respectively and, accordingly, are not water table aquifer piezometers, would not be retained as trigger level sites in the future. Further investigation of PGW5 was not considered necessary.

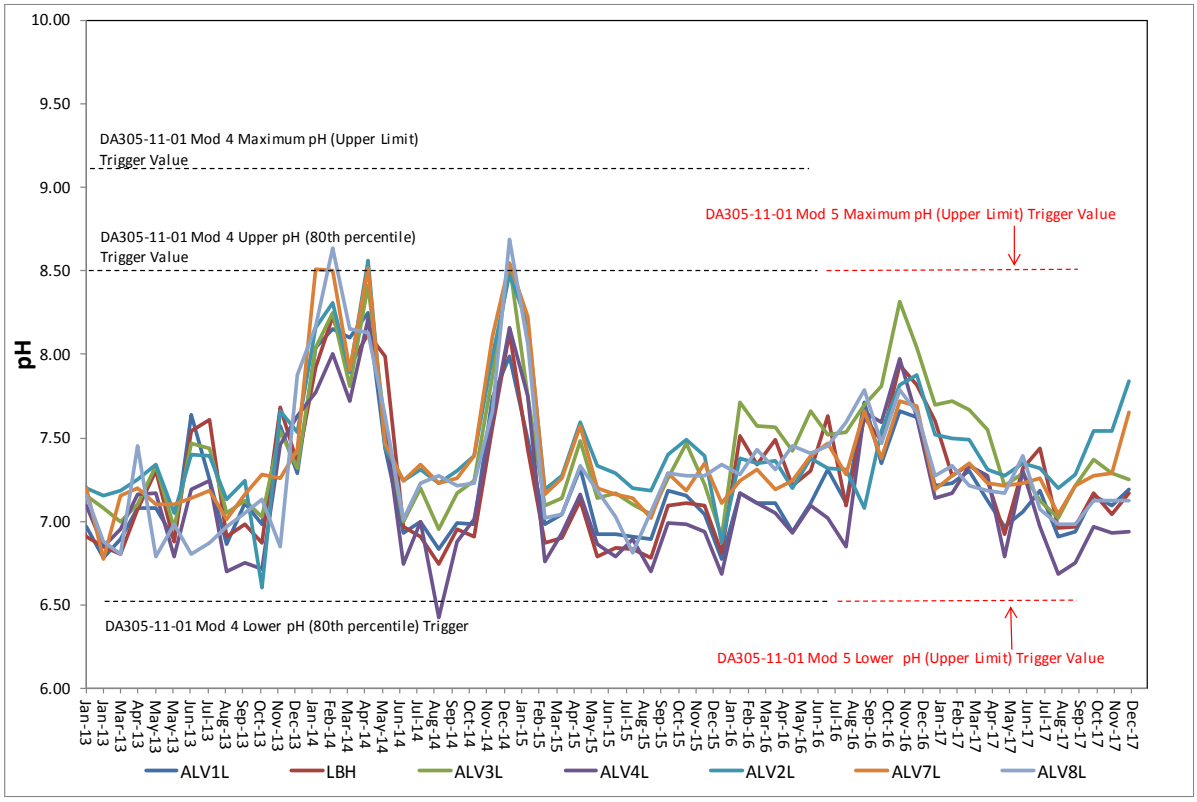

Figure 20 Groundwater pH data in alluvial bores – 2013 to 2017

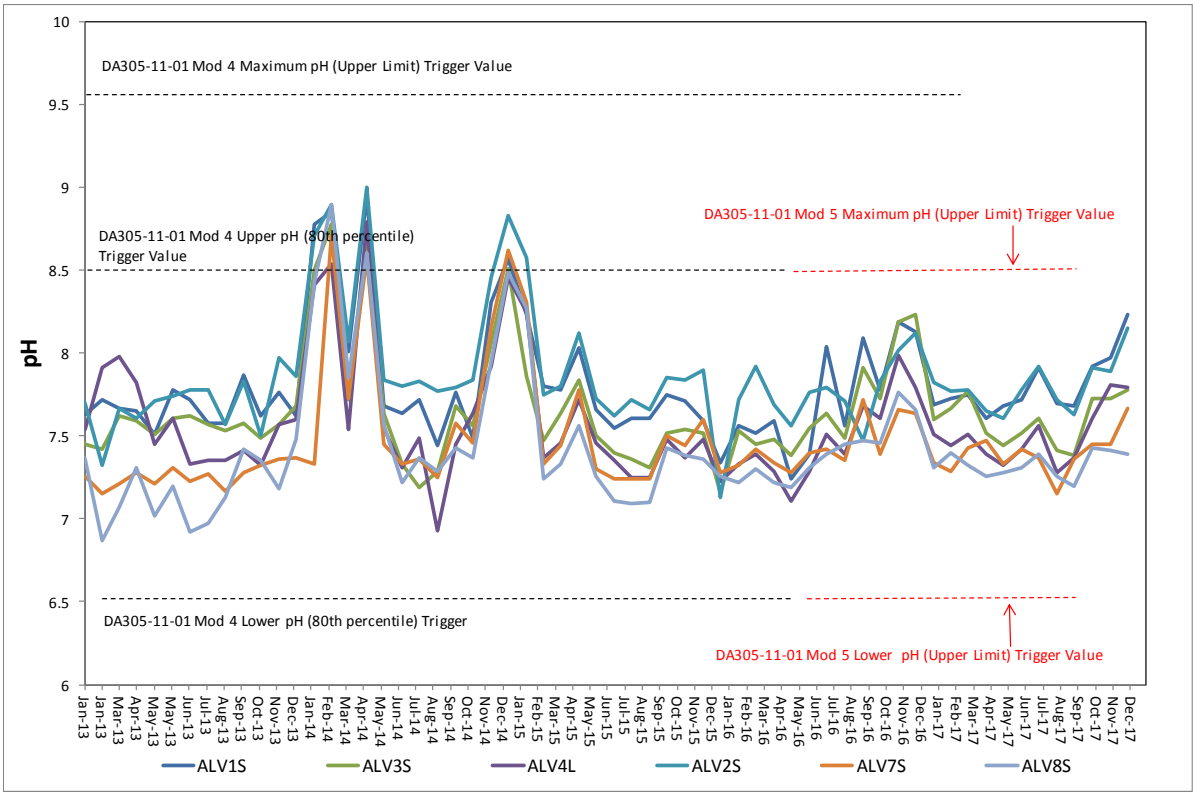

Figure 21 Groundwater pH data in shallow bedrock (overburden) bores – 2013 to 2017

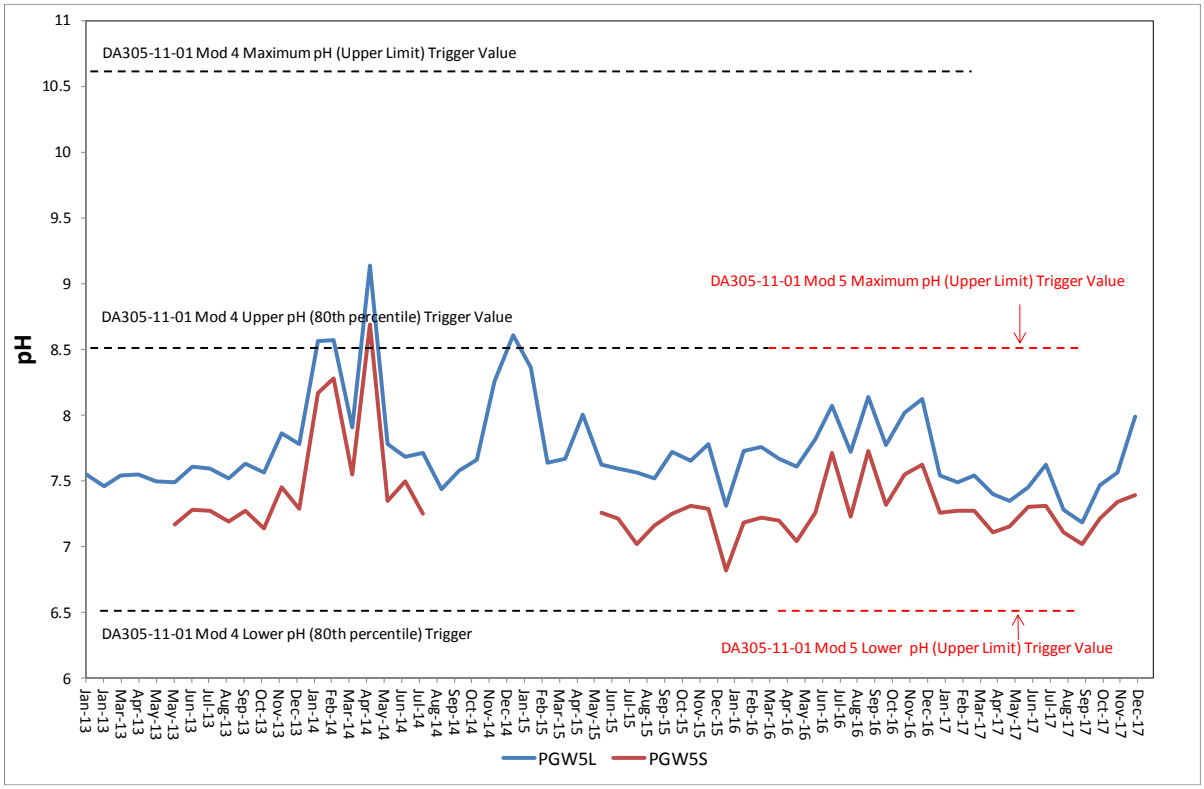

Figure 22 Groundwater pH data in hard rock (overburden & coal measure) piezometers – 2013 to 2017

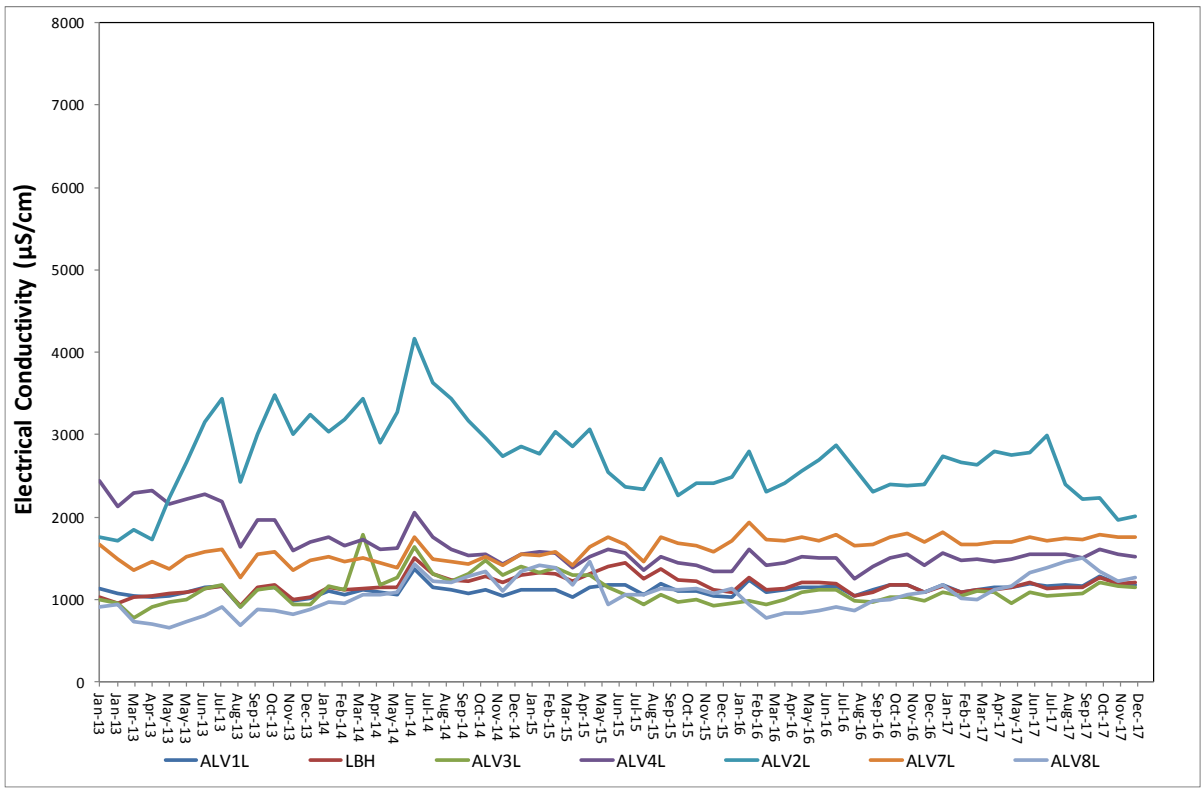

Figure 23 Groundwater Salinity (EC) in alluvial bores – 2013 to 2017

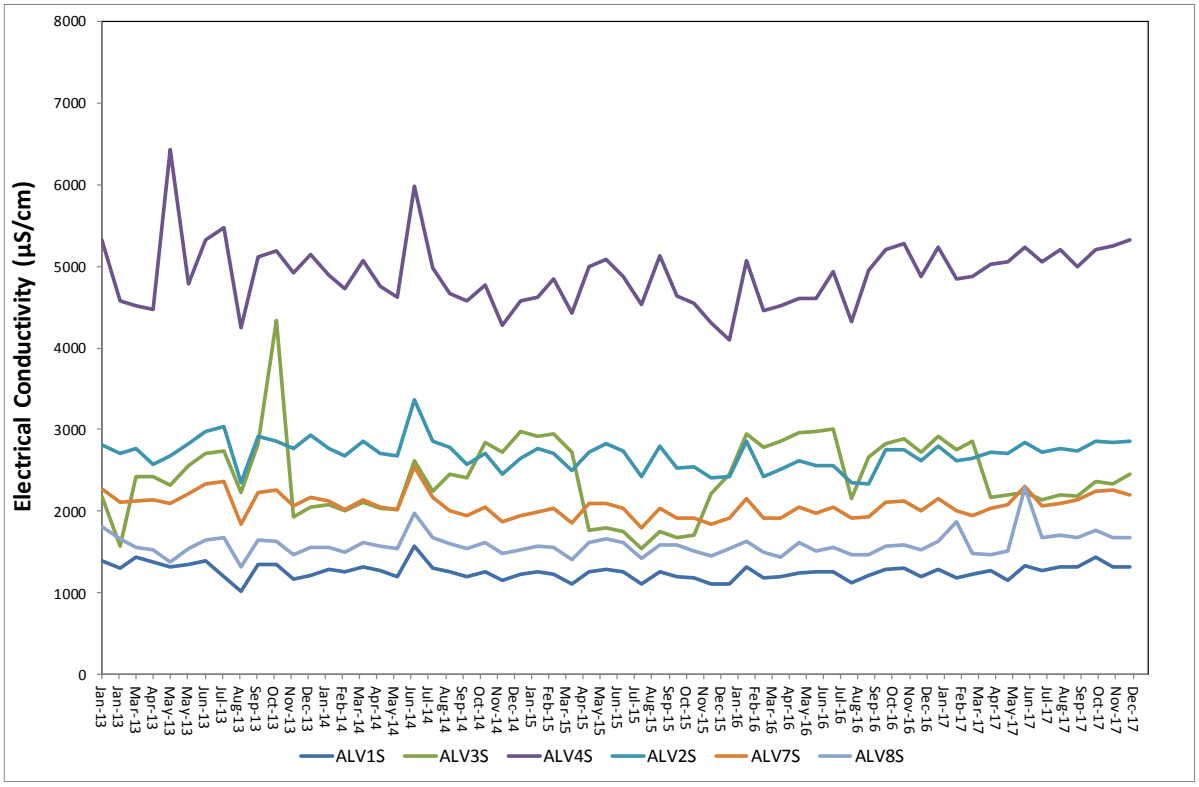

Figure 24 Groundwater Salinity (EC) in shallow bedrock (overburden) bores – 2013 to 2017

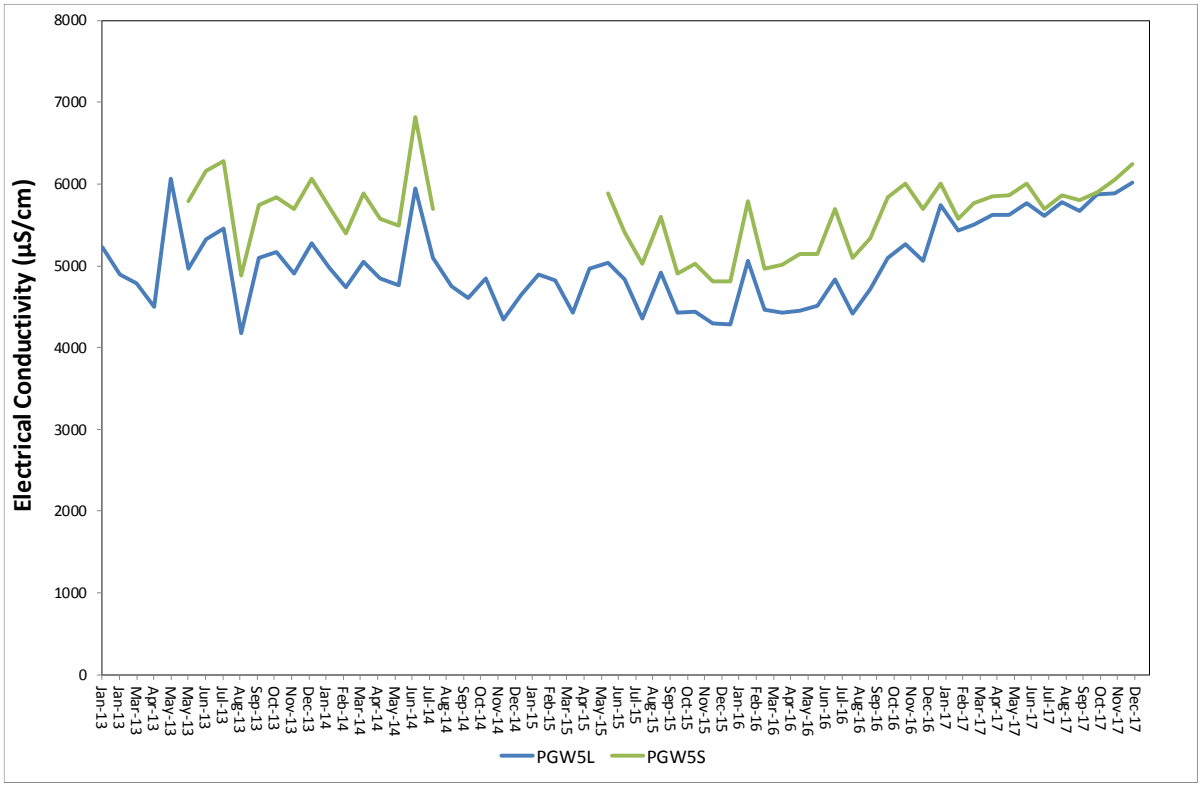

Figure 25 Groundwater Salinity (EC) hard rock (coal measures) bores – 2013 to 2017

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.

With reference to full historical monitoring results, 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.

Table 27 presents recorded exceedances of groundwater level triggers during the 2017 monitoring period.

Table 27 Groundwater level trigger exceedances

Groundwater level exceedances													
Site	ALV1L	ALV1S	LBH	ALV3L	ALV3S	ALV4L	ALV4S	ALV2L	ALV2S	ALV7L	ALV7S	ALV8L	ALV8S
Impact assessment Criteria between January and July 2017													
10%ile	105.69	105.97	102.21	103.19	102.88	101.76	101.03	92.97	92.96	86.93	83.26	84.98	82.18
Min	104.88	104.35	104.55	102.43	102.25	94.86	100.28	91.12	89.35	86.43	82.39	83.66	80.94
Jan													
Feb													
Mar													
Apr													
May													
Jun													
Jul													
Impact assessment Criteria between August and December 2017													
10%ile	106.22	106.44	105.74	103.81	103.52	102.14	101.42	93.08	93.21	87.02	83.56	85.06	82.99
Min	104.88	104.35	104.55	102.43	102.25	100.97	100.28	91.12	89.35	86.43	82.39	83.66	80.94
Aug													
Sep													
Oct												85.02	
Nov												84.80	
Dec				103.78	103.50							84.51	

ALV8L Investigation – December 2017

During the reporting period, there was an exceedance of the 80th percentile groundwater level trigger at piezometer ALV8L in December 2017, defined as three (3) consecutive exceedances of the adopted 80th percentile trigger value. An investigation was undertaken by an external hydrogeologist. Note that this triggered with respect to the updated trigger levels established from August 2017.

The investigation is summarised as follows:

- High evaporation and below average rainfall was observed during the majority of 2017 which led to a decrease in groundwater levels at site ALV8L. This decrease in groundwater elevation caused a depth trigger to occur later in the year.

- The exceedance was not outside of the maximum range recorded and was not considered to be of sufficient magnitude to lead to a downgradient impact on beneficial use.

- It was concluded that the groundwater depths measured at ALV8L and ALV8S reflect natural variability due to climatic factors and there was not a mining-related impact.

- In accordance with the WMP, if groundwater levels persist below the trigger level for a further 9 months, such that the exceedance has been continuous for 12 months, then a subsequent investigation shall be undertaken to confirm the exceedance remains unrelated to mining activity.

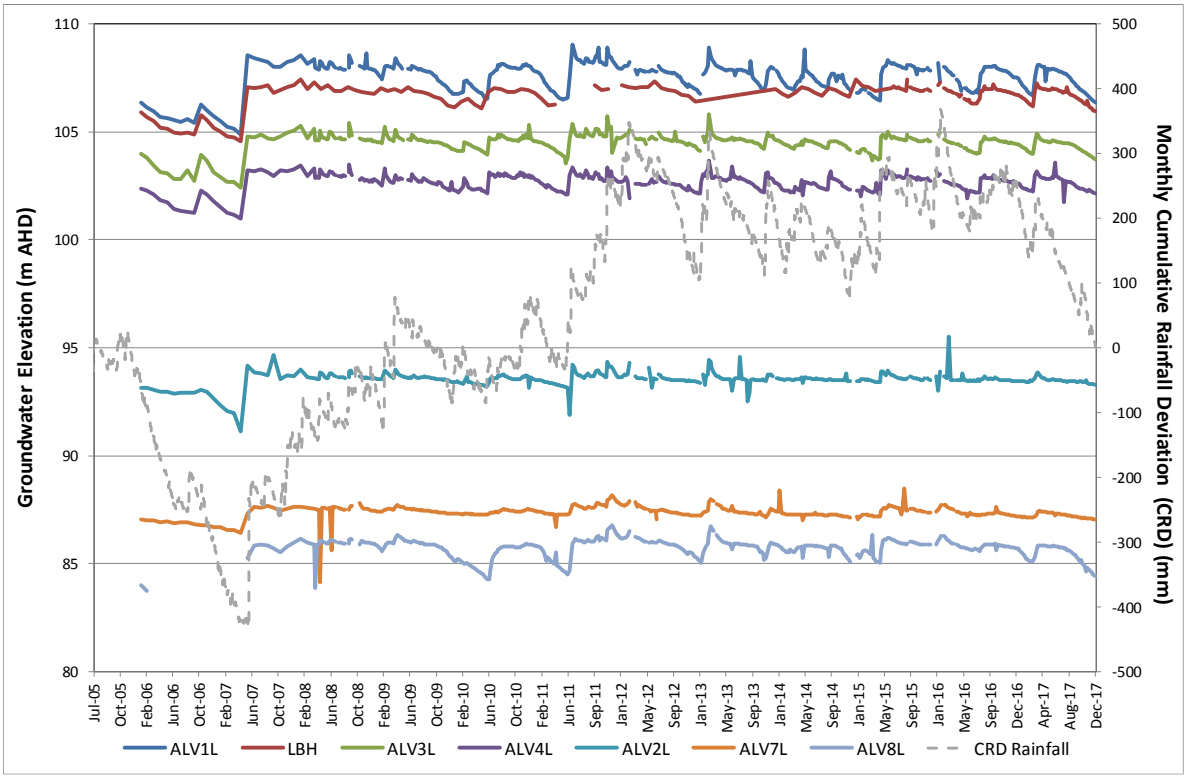

Figure 26 Groundwater level data in alluvial bores – 2006 - 2017

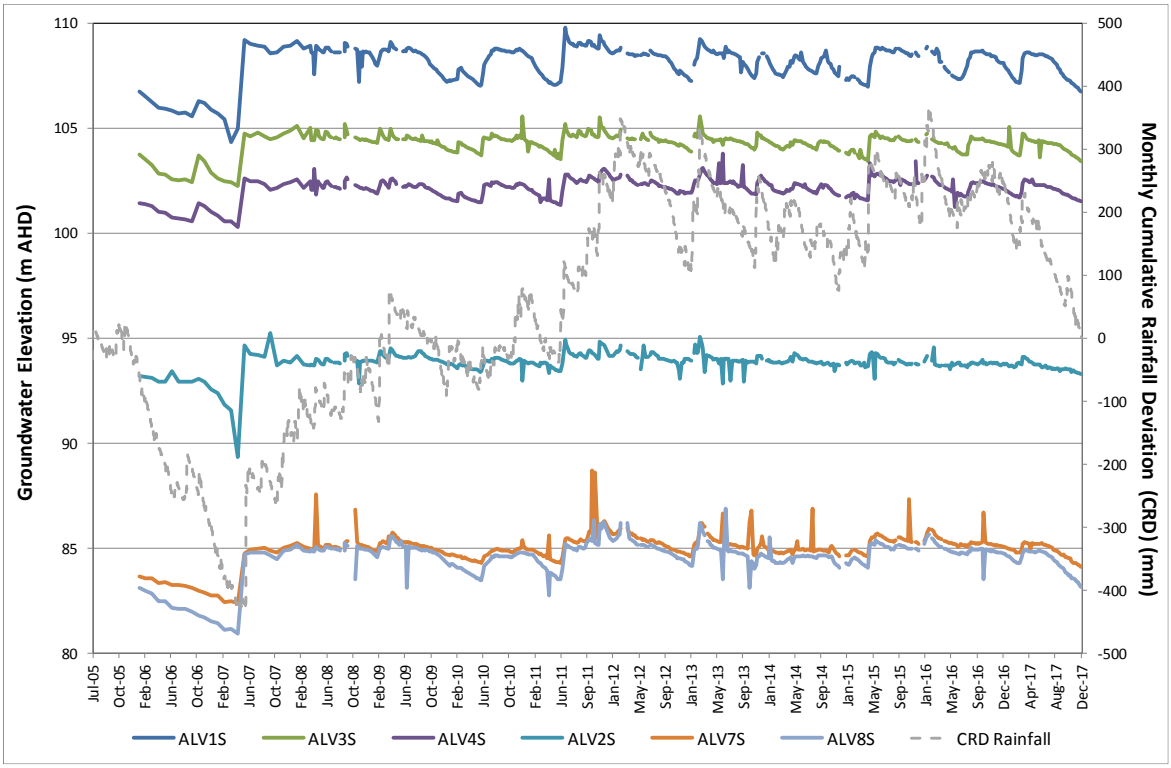

Figure 27 Groundwater level data in shallow bedrock bores – 2006 - 2017

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.

Noteworthy findings from the ongoing monitoring indicate that there is no significant connectivity between the Hazeldene workings and the actively mined Liddell Seams below. This is supported by the lack in response of groundwater elevations/pressures in the Hazeldene workings when drawn down of the mined Liddell seams occurs; refer to **Figure 28**.

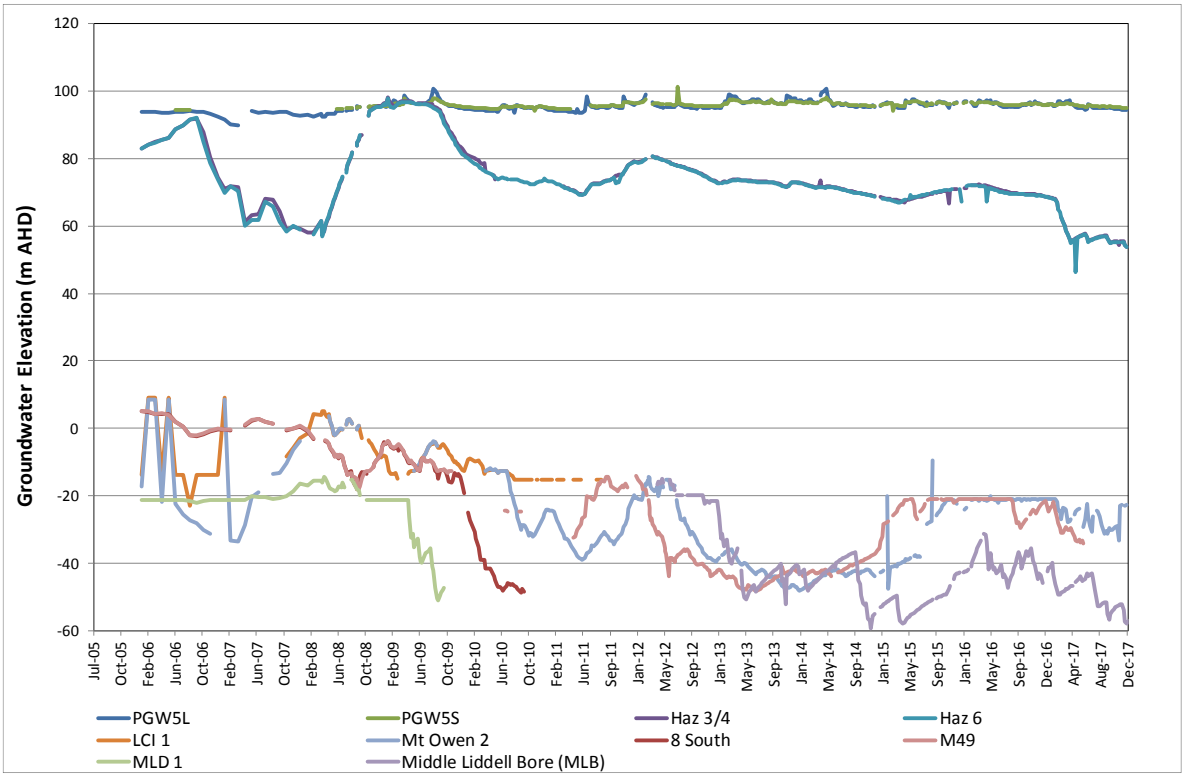

Figure 28 Groundwater level data in hard rock (coal measures) bores – 2006 – 2017

Groundwater Comparison to EA Predictions

With reference to the EA predictions from the groundwater assessment (SKM, 2013), this section identifies the predictions made with comparison to monitoring findings. The key conclusions of the predictive model simulations and groundwater impact assessment have been compared to the findings of the WMP approved monitoring program and detailed in **Table 28 below**. In brief, observations from the monitoring programs demonstrate impacts within the EA predictions.

Table 28 Groundwater Impact Comparison to EA predictions

Groundwater Impact Comparison to EA Predictions	
Key EA Conclusion	Comparison to Monitoring Observations
Impacts to Bowmans Creek alluvial aquifer	
With the exception of the final year of the Entrance Pit progression (year 2022), the magnitude of alluvial losses estimated by the model under the proposed is similar to the leakage rates predicted for current mining operations at LCO. These estimated losses from the alluvium amount to between 150 to 180 ML/year up to 2021, and peak at 270 ML/year for 2022.	Monitoring has not shown connectivity between the Entrance Pit and Bowman's Creek alluvial aquifer. No definition 1 groundwater level impact triggers initiated during 2017.
Under the proposed modification, model results predict that the progression of the South Pit has negligible impact on the Bowmans Creek alluvial aquifer in terms of increased leakage or drawdown.	Monitoring has not shown connectivity between the South Pit and Bowman's Creek alluvial aquifer. No definition 1 groundwater level impact triggers initiated during 2017. This EA conclusion is considered to be corroborated by monitoring results.
Estimates of historical baseflow contributions to Bowmans Creek streamflow suggest the peak estimated loss of groundwater flow caused by the proposed modification accounts for approximately 4% to 8% of the estimated baseflow component of streamflow and less than 2% of measured annual streamflow.	Monitoring has not shown connectivity between the mining operations and Bowman's Creek alluvial aquifer. This EA conclusion is considered to be corroborated by monitoring results.
Recent groundwater monitoring data and predictive model results indicate leakage from the alluvial aquifer induced by previous	Monitoring has not shown connectivity between the mining operations and

underground mining and current open cut mining activities at LCO are having negligible impact on groundwater levels within the alluvium. As a result the estimated losses in groundwater flow under the proposed modification are unlikely to have a significant impact on streamflow in Bowmans Creek or on water levels within the associated alluvial aquifer.	Bowman's Creek alluvial aquifer. This EA conclusion is considered to be corroborated by monitoring results.
Historical monitoring of groundwater within the Bowmans Creek alluvium suggests minimal impact of mining operations on groundwater quality, and model simulations provide no indication that the proposed modification will alter the hydrogeologic regime in a manner that would adversely affect groundwater quality.	Monitoring has not shown mining related impacts on Bowman's Creek alluvial aquifer. This EA conclusion is considered to be corroborated by monitoring results.
Predicted drawdown within the Bowmans Creek alluvial aquifer is expected to be negligible (less than 0.25 m) relative to current water levels up to 2019. When estimated leakage rates peak at the end of mining, drawdown is predicted to peak at less than one meter relative to current water levels. This peak drawdown estimate falls below the minimal impact criteria for aquifer interference activities as defined in the NSW Aquifer Interference Policy (2012).	Monitoring has not shown drawdown as a result of mining and the peak drawdown period has not been achieved during 2017. This EA conclusion is considered to be corroborated by monitoring results.
Impacts to hard rock aquifers	
Estimated total groundwater extraction from the regional hard rock aquifer, determined as the sum of - pit inflows and dewatering requirements, needed to accommodate the proposed modification peaks at less than 4,000 ML/year. LCO currently holds extraction licenses totalling 27,000 ML/year for this water source.	Modelled and measured extraction of hard rock aquifers is within licence limits and below the peak of 4,000ML/year estimations.
Post mining equilibrium simulations predict the Entrance Pit final void will act as a sink and the South Pit will act as a source for groundwater flow from and to the regional hard rock aquifer. Predicted increases in salinity in the South Pit final void (G&A, 2013) result in potential long term impacts to groundwater quality in the hard rock aquifer due to leakage of increasingly saline water from the South Pit final void when water levels in the void are above approximately 65 m AHD.	Not yet triggered.

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 2018 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 2018 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** shows the 2017 proposed, actual completed 2017 rehabilitation and forecast 2018 rehabilitation.

Table 29 Rehabilitation Status

Rehabilitation Status			
Mine Area Type [A]	Previous Reporting Period (Actual ha)	This Reporting Period (Actual ha)	Next Reporting Period (Forecast ha)
	2016	2017	2018
A: Total mine footprint	1525	1576	1616
B: Total active disturbance	757	771	743
C: Land being prepared for rehabilitation	0	0	0
D: Land under active rehabilitation	768	805	873
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. Additionally, annual biodiversity monitoring was completed in 2017 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 2017, LCO completed rehabilitation generally in accordance with the approved MOP. Additionally, LCO received approval of a revised 2015-2022 MOP in January 2017 aligning the operational position with rehabilitation and mining commitments to reflect accumulated changes throughout the previous years. **Table 30** shows the hectares put forward in the MOP, actuals as well as the variance. During Q4 2017, LCO has received approval of a new MOP 2018-2020 to realign the operational progress and the MOP with regards to disturbance and rehabilitation. Within the next reporting period, LCO forecasts to complete 40ha of disturbance and 68ha of rehabilitation. As per the EIS, LCO is completing rehabilitation progressively throughout the life of the operation.

Table 30 MOP Rehabilitation Status

	MOP		Full Year Actual		Variance	
	Disturbance (ha)	**Rehabilitation (ha)**	**Disturbance (ha)**	**Rehabilitation (ha)**	**Disturbance (ha)**	**Rehabilitation (ha)**
2017	51	30	51	37	0	+7

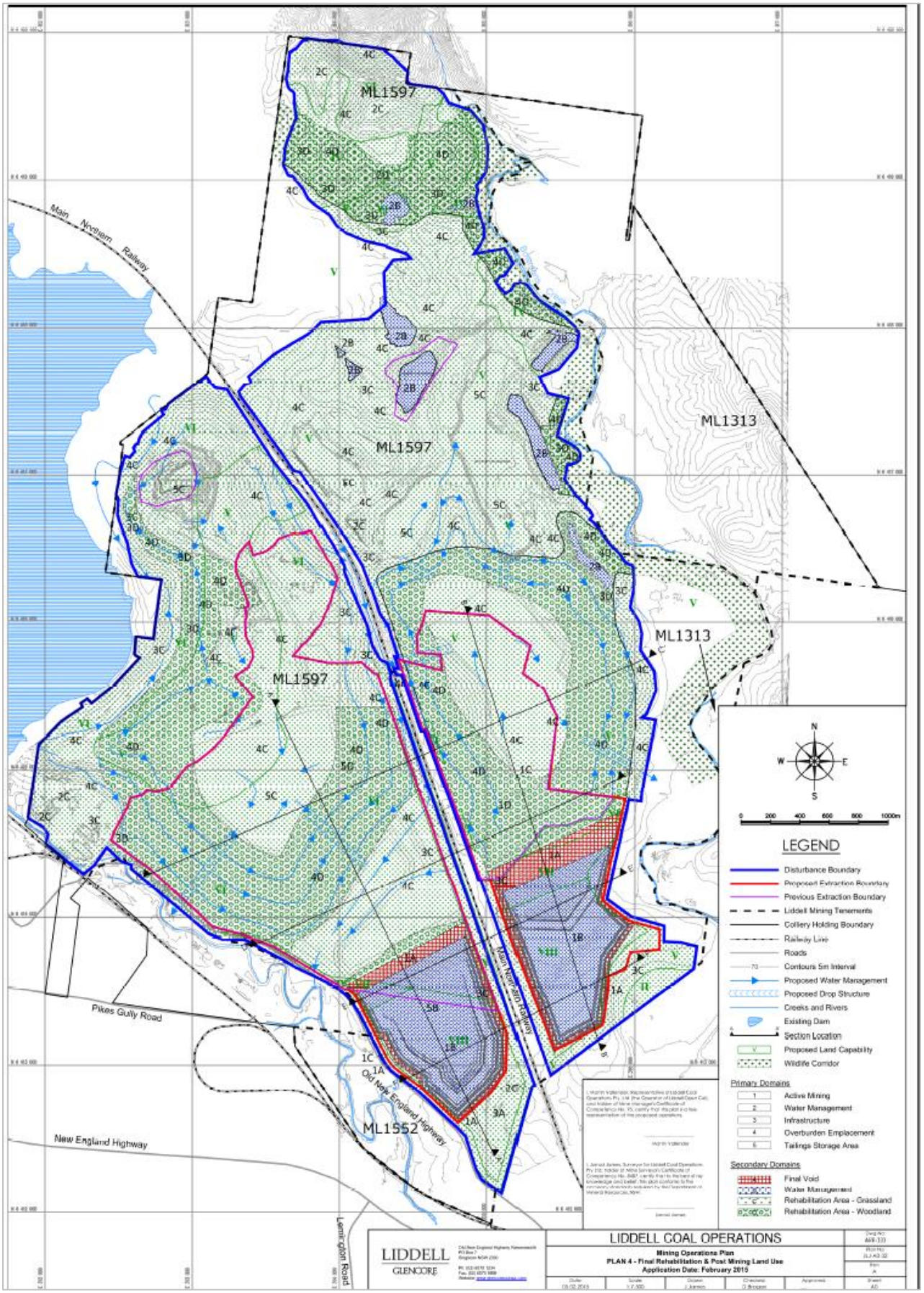

Figure 29 MOP Plan 4 – Current approved final landform

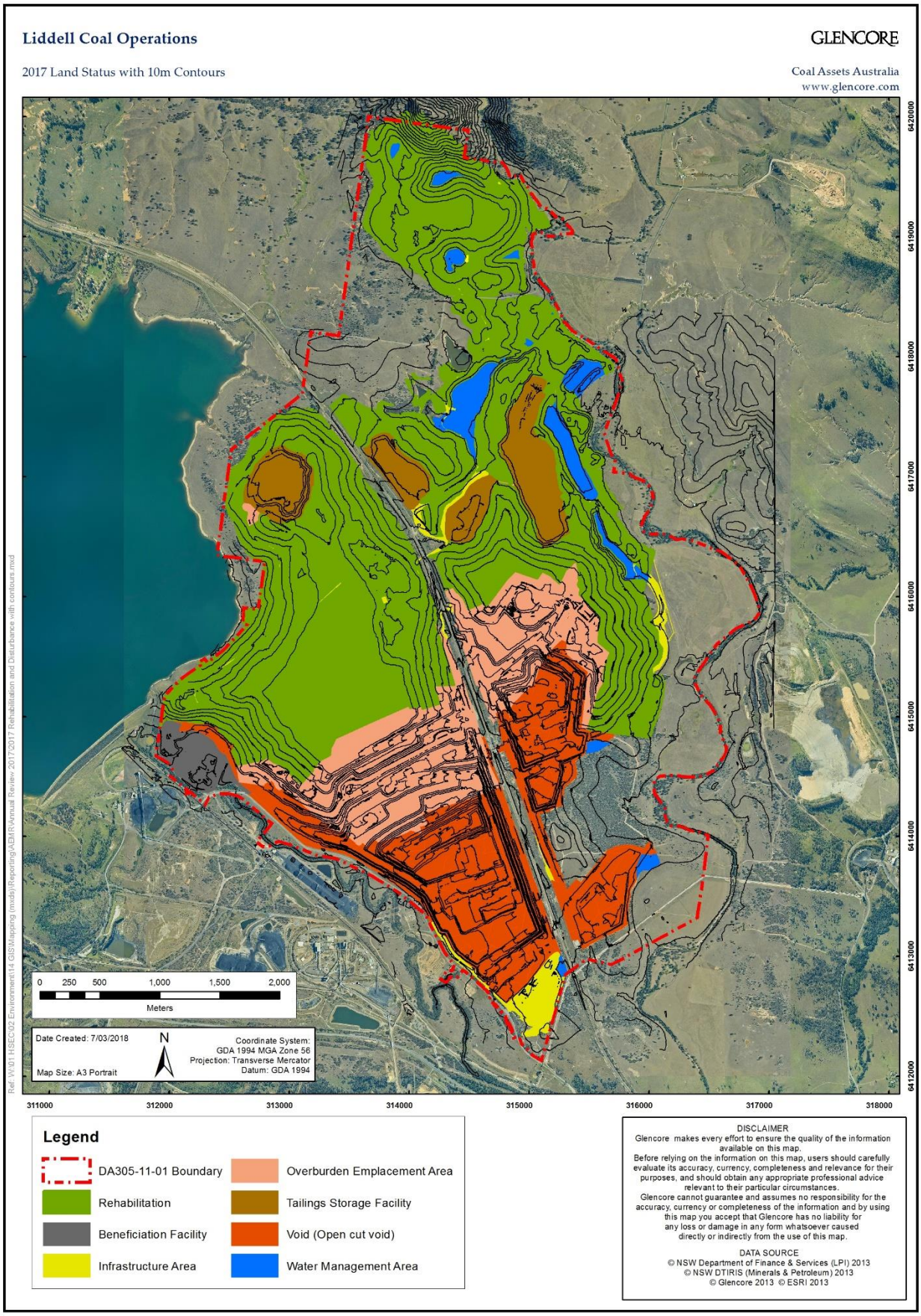

Figure 30 Current rehabilitation and disturbance status

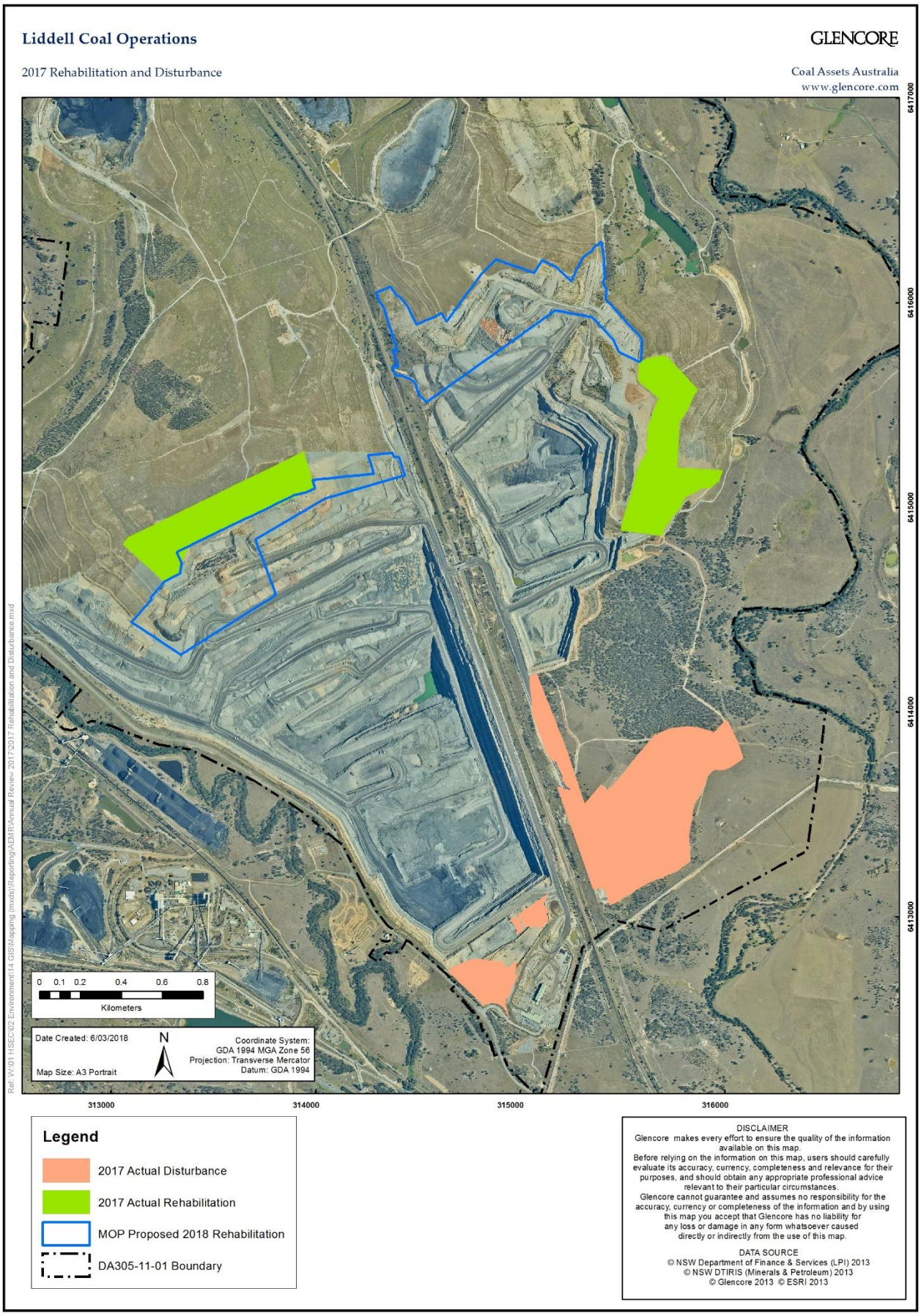

Figure 31 Rehabilitation and disturbance during 2017

8.3 Biodiversity Management

During 2017, 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 H** includes a summary of the rehabilitation establishments works completed during 2017.

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 and 2013 respectively. 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) to ensure that these areas remain in a similar if not improved state. Management of introduced species (in particular panic veldtgrass) along with increasing connectivity and riparian width of vegetation in this corridor would assist the habitat availability and complexity of this site. 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.

Introduced fauna species continue to be identified across these monitoring sites, however occur in low numbers. Predator species the fox (Vulpes vulpes), is of greatest concern as it is most likely to be supressing small terrestrial fauna populations. All other introduced fauna species were identified in low numbers not likely to be interfering with the recovery of other fauna groups.

Other key findings of the 2017 biodiversity monitoring program were as follows:

- There was a decrease in threatened fauna observed at one monitoring location during 2017compared 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 2017than any previous monitoring event.

- Stygofauna monitoring indicates substantial declines to diversity. 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 additional monitoring during autumn 2018 to determine whether these results are cause for concern.

- In-stream and riparian ecological monitoring and macroinvertebrate data have revealed only minor change since commencement of monitoring. These are considered stable and do not require intervention.

- General floristic diversity (both natives and introduced species) were lower during 2017 compared to previous events. This correlates with hotter and drier weather conditions than average, which likely prevented seedling emergence of many small annual species and may have caused plant withering (subsequently making identification of key plant features such as seeds and flowers difficult).

LCO will continue to implement the BMP commitments and recommendations detailed in the 2017 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 2017 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 31** below based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 31 BMP Performance Indicator Summary

Action/Item	Performance Indicators	Completion Criteria	Performance Comment
Year 2 2017			
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. Boundary secure.
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 completed.
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 2017, 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.	No translocation activities completed during 2017.
	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 unplanned clearing occurred during 2017.

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 unplanned clearing occurred during 2017.
	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 an 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.	Compliant. 17 hollow bearing or stag trees with sheeting bark cleared during 2017. Hollows and logs removed during clearing works have been placed in offset and rehabilitation areas. 30 nest boxes have been installed as part of an ongoing program. 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.	Compliant. Stock are managed within the areas available and shade/shelter trees are planted however additional works will be required in 2018.
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 and is maintained as required.
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

LCO also conduct a specific and detailed rehabilitation monitoring program as detailed in the MOP. Due to the age of the operation, LCO has established rehabilitation areas which are distinctly different reflecting the evolving rehabilitation objectives and practices. Each area has unique challenges for progressing towards the final land uses of pasture and woodland which are being managed by LCO. Further detail is provided in the below from the 2017 Rehabilitation Monitoring Report.

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.

Pasture Rehabilitation

The two broad pasture rehabilitation types across the LCO site include the older pasture areas that are dominated by Rhodes grass (Chloris gayana) and the newly established pasture areas that are dominated by a higher diversity of species including kikuyu (Cenchrus clandestinus) and lucerne (Medicago sativa).

The older pasture areas have a higher overall biomass but contain a lower diversity of species and generally consist of lower quality pasture species. The pasture in these areas is developed to a level that is likely to be suitable for grazing at this stage. These pastures are managed to increase diversity, particularly of higher quality pasture species including legumes and non-grass pasture species and to limit old “rank” growth and encourage new growth of the dominant pasture species Rhodes grass. LCO plans to commence installation of infrastructure to allow for rotational grazing of suitable rehabilitation pastures during 2018.

The newly established pasture areas have a lower cover and lower overall biomass than the older pasture areas but consist of a greater diversity of higher quality species including legumes and non-grass pasture species. These pasture areas are generally still establishing and are not likely to be able to support prolonged grazing at this stage, however, some areas may benefit from short periods of intensive grazing. These pastures should be managed to maintain and increase the diversity of high quality pasture species, increase cover and biomass and to limit the establishment of lower quality species such as Rhodes grass.

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.

Woodland Rehabilitation

Woodland rehabilitation areas are more variable and each of the rehabilitation areas face unique challenges. Most areas, however, contain suitable species in at least one vegetative layer. Importantly to note that woodland rehabilitation in particular is developed in stages wherein each strata layer is developed in turn.

Dominance of weed species, particularly invasive perennial grasses and galenia (Galenia pubescens) is a major threat to the establishment of a ground layer in all Woodland rehabilitation areas. The 2018 Weed action plan has included priority species and areas to manage weed presence to a minimum. Monitoring has identified that augmentation of rehabilitation areas that have poor cover or diversity in particular layers by direct seeding or planting of suitable native species in these layers will be an important part of progressing these areas towards the final land-use. Increasing the habitat value of these areas by installing; stag trees, hollows and rock and log piles

will also be important in improving the biometric scores for these rehabilitation areas. Planting 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.

Rehabilitation Management Performance Indicators

As per the MOP, the site progress towards the MOP performance Indictors/Completion Criteria was reviewed as part of the monitoring completed in 2017. **Table 32** MOP Performance Indicator Status – exceptions only

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 2017 monitoring.

A rehabilitation summary of areas established during 2017 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 8.7**. 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 32 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. Ongoing monitoring.
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 to continue.

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 to continue.
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.
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 and practical.
	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, Significant intervention identified and being actioned on an ongoing basis.
	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, Significant intervention identified and being actioned on an ongoing basis.

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.

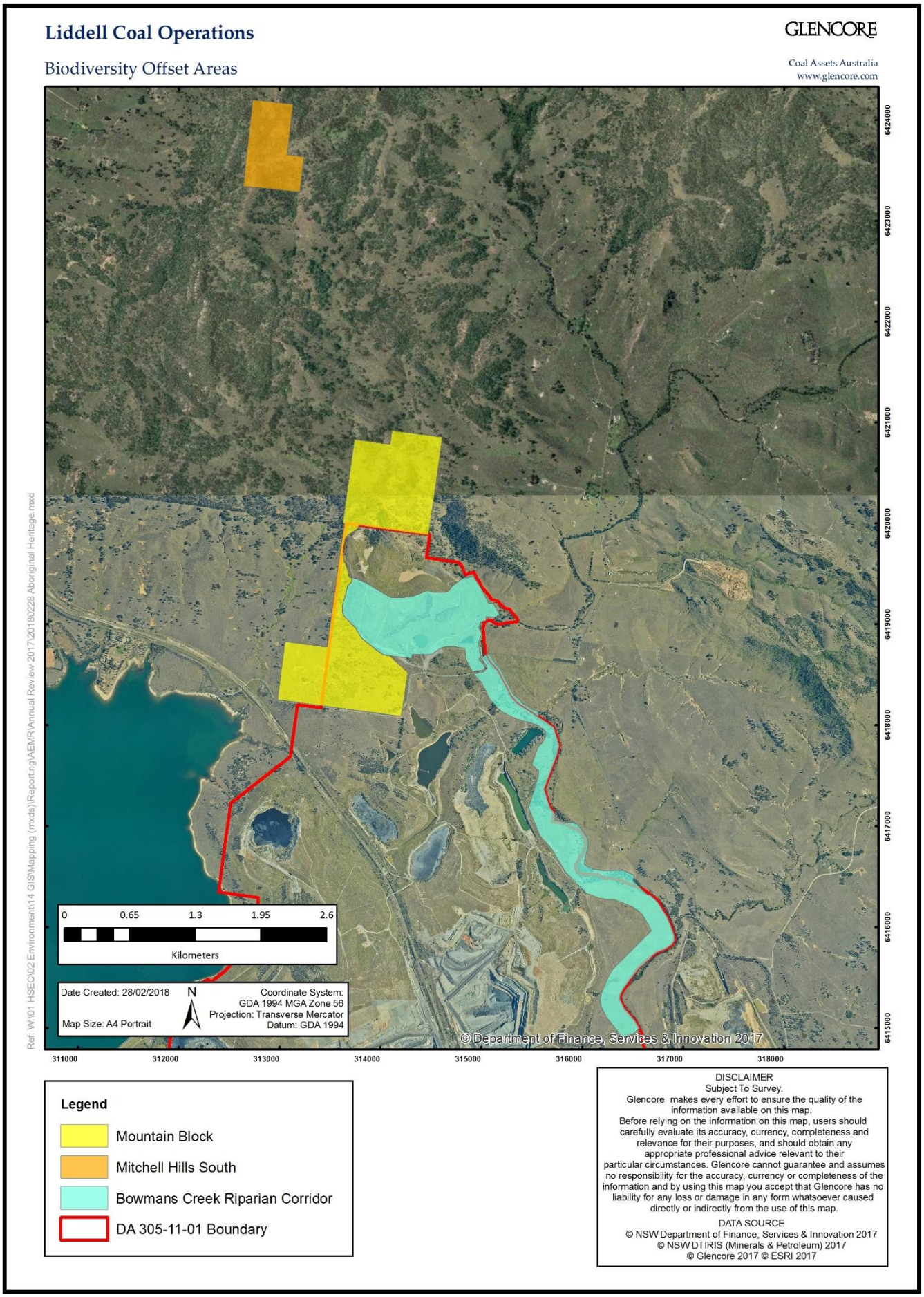
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Figure 32 shows LCO biodiversity offset area comprising of Mountain Block, Bowmans Creek Riparian Corridor and Mitchell Hills South Offset Areas. During 2017, LCO completed an ecological monitoring in accordance with the BOMP as well as commenced various 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 (despite challenging conditions year of minimal rainfall and high temperatures) 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, Mitchell Hills South 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 2017 biodiversity offset monitoring program were as follows:

- Remnant vegetation is generally in good condition; however some potentially problematic weed species are encroaching in these areas (particularly site R02 which has particularly high occurrence of exotic grass panic veldtgrass (Ehrharta erecta)).

- Levels of pig (Sus scrofa) appear to have reduced since the baseline monitoring event, likely as a result of management actions as part of the BOMP. These actions are likely to be assisting in the local recovery of the spotted-tailed quoll (Dasyurus maculatus maculatus) in these areas, which will hopefully increase in abundance during subsequent monitoring events.

- Although unlikely to yet be colonised, substantial nest box installation (200) activities have been undertaken in all three offsets. Ongoing monitoring should see an increasing trend in presence of hollow dependent species.

- Feral fauna species were observed across all offset areas; however no areas were considered to be “infested” by feral fauna. Current management practices seem to be keeping these levels relatively low.

- Vegetation of Bowmans Creek Riparian Corridor is highly disturbed and requires substantial intervention (remnant and regeneration areas). Active revegetation works have commenced (25,550 hiko tubestock planted and 7ha direct seeded) and should start to show progress in subsequent monitoring events.

- Regeneration of canopy species at Mountain Block sites WR03 and WR05 are progressing well and should not require substantial intervention for recovery. However revegetation sites in Bowmans Creek Riparian Corridor and WR10 in Mitchell Hills South were devoid of recruiting canopy species.

- Observed levels of threatened species during the 2017 monitoring event were low across all sites (remnant and regenerating), with the exception of micro-bats which did not discriminate between low and high quality vegetated areas, instead preferring areas in proximity to water resources.

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** below based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 33 BOMP Performance Indicator Summary

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
Year 2 2017				
Fencing and Signage				
All biodiversity offset areas	Removal of redundant fences.	Inspection undertaken to identify redundant fences. Commence removal of redundant fences.	Redundant fences removed.	Compliant. Assessed in separate program. Not undertaken as part of the biodiversity monitoring program. ~13,000m of fencing removed.
	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. Assessed in separate program. Not undertaken as part of the biodiversity monitoring program. ~3,600m of fencing repaired and ~9,500m installed.
	Information signage for the spotted-tailed quoll.	Informational signage (for the spotted-tailed quoll) is maintained.	Information signage for the spotted-tailed quoll has been installed and maintained.	Compliant. All identified signage is in good condition.
Grazing Management				
All biodiversity offset areas	All stock to be removed from biodiversity offset areas	No stock grazing	Grazing has not occurred in biodiversity offset areas	Compliant. No evidence of cattle grazing was evident during 2017.
	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. Assessed in separate program. Not undertaken as part of the biodiversity monitoring program.

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
	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.	Compliant.
Track Maintenance				
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. Assessed in separate program. Not undertaken as part of the biodiversity monitoring program.
	Minimum twice yearly (nominally in March and September) inspections to identify track conditions.	Inspections undertaken nominally in March and September. Action and repair track damage.	Tracks maintained in good usable condition.	Compliant. Not undertaken as part of this program. However tracks utilised for offset area access were all in good condition.
	Rehabilitation of unnecessary access tracks.	Tracks no longer required will be rehabilitated.	Unnecessary access tracks are rehabilitated	Compliant. Assessed in separate program. Not undertaken as part of the biodiversity monitoring program.
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),	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. Control measures are implemented in response to outcomes of the inspections.	Compliant. However feral fauna were identified in all offsets. Feral fauna were all identified in low numbers

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
	including timing, frequency, target species and methods to be used.		Measures are being taken to control feral animals in the biodiversity offset areas.	and do not appear to be increasing in abundance.
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.	Compliant. However feral fauna were identified in all offsets. Feral fauna were all identified in low numbers and do not appear to be increasing in abundance.
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. Feral fauna were identified in all offsets. Pest numbers appeared to be stable or decreasing (in the case of pigs (Sus scrofa)).
	Particular action is paid to managing foxes, feral cats and feral dogs in order to protect the spotted-tailed quoll population in this area.	Implementation of favoured fox, feral cat and feral dog control measures. Monitoring of impacts of fox, feral cat and feral dog control on spotted-tailed quoll population.	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. These feral fauna (with the exception of the pig) were identified in Mountain Block and Bowmans Creek Riparian Corridor. Feral fauna were all identified in low numbers and do not appear to be increasing in abundance. In fact pig presence was not detected during 2017.

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
	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. Feral fauna were identified in Mountain Block, Mitchell Hills and Bowmans Creek Riparian Corridor to be incorporated into 2018 plan.
Weed Management				
Bowmans Creek Riparian Corridor	Complete weed inspections 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.	Complaint. Assessed as part of separate inspection program; however weeds requiring management were identified for Bowmans Creek Riparian Corridor. Evidence of castor oil plant (Ricinus communis) spraying was evident and appeared successful.
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. Assessed as part of separate inspection program; however weeds requiring management were identified for Mountain Block in and in Mitchell Hills South in.

Relevant Offset Area	Action	2017 Performance Indicator	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. Targeted weed control works and targeted feral fauna control programs were undertaken in 2017 in response to species identified during the 2016 monitoring event.
	Confirmation of mapping of areas for regeneration, including appropriateness of target community	Revised in ongoing monitoring works, as needed.	Accurate mapping of regeneration areas.	Compliant. No change identified from 2016 monitoring event Target revegetation communities are appropriate. Natural recruitment is occurring in both offsets
	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.	Compliant. Regeneration was monitored as part of this program as indicated in Section 4.5 and as part of general site floristic monitoring. Regeneration is occurring in the offsets to varying degrees. Active revegetation is the main source of regeneration in the

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
				Bowmans Creek Riparian Corridor
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. Natural regeneration was identified in Mountain Block and in Mitchell Hills South.
Rehabilitation				
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.	Assessed as part of separate inspection program. Outcomes of this monitoring program should feed into rehabilitation planning for Bowmans Creek Corridor and Mountain Block
	Develop detailed performance criteria for all management zone types.		Criteria developed	Assessed in separate program.
	Implement rehabilitation/ revegetation program.	Implementation of plan.	Rehabilitation and revegetation plan implemented.	Compliant. Undertaken as part of separate program. Log stockpiles to increase habitat value were identified in central areas of Bowmans Creek Riparian Corridor (although not present within actual monitoring sites). Revegetation works have commenced in northern areas of Bowmans Creek Riparian

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
				Corridor as well as in central areas. Nest boxes have been installed in both of these BOAs.
Bowmans Creek Riparian Corridor	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.	Assessed in separate program.
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. Large log piles have been installed in the central area of Bowmans Creek Riparian Corridor.
		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.	
			Appropriate documentation is available of any habitat features salvaged.	

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
	Nest boxes are providing habitat value for native fauna.	Continue staged installation of nest boxes.	All nest boxes and monitored and maintained.	Compliant. Nest box installation has commenced in this BOA.
	Salvaged–reinstated hollows	Established nest boxes are subject to annual inspection and maintenance.	All salvaged re-instated hollows are monitored and maintained.	Compliant. Undertaken as part of separate program. Salvaged and reinstated log piles were identified in central areas of Bowmans Creek Riparian Corridor; however this is not directly occurring in monitoring sites. LCO are currently in the process of undertaking control of established willow (Salix sp.) trees in the Bowmans Creek Riparian Corridor. If appropriate, hollows will be salvaged and utilised within this offset, as will dead woody debris.
	Timing of nest box installation	Salvaged and re-instated hollows are subject to annual monitoring in conjunction with nest boxes.	Seasonal breeding opportunities are not lost due to delay in nest box installation.	Complaint. Over 100 nest boxes have been installed in Bowmans Creek Riparian Corridor.
	Salvaging, stockpiling and deployment of habitat features	Removed hollows will be replaced (with nest boxes) within six months of each discrete clearing event.	Suitable habitat features are salvaged, stockpiled and reused to augment habitat	Compliant. Undertaken as part of separate program.

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
			complexity (thus value) in rehabilitation/regeneration areas.	Salvaged and reinstated log piles were identified in central areas of Bowmans Creek Riparian Corridor; however this is not directly occurring in monitoring sites. LCO are currently in the process of undertaking control of established willow (Salix sp) trees in the Bowmans Creek Riparian Corridor. Where appropriate, hollows will be salvaged and utilised within this offset. As will dead woody debris. Nest boxes are ready to be installed.
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.	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.	All biodiversity offset areas have suitable levels of key habitat features, when compared (through monitoring) to remnant vegetation features.	Moving towards compliant. Nest boxes have been installed in all three BOAs. Log pile installation is continuing along Bowmans Creek Riparian Corridor.
Translocation				
All biodiversity offset areas	Translocation of tiger orchids or other threatened flora species (if encountered during pre-clearing process) to biodiversity offset areas.	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	None undertaken during 2017.

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
	Methods to be adopted are detailed within the Biodiversity Management Plan.		the Biodiversity Management Plan.	
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. Offset area adequately fenced.
	Rehabilitation works to address stabilisation and erosion issues, as necessary.	Implementation, as needed.	Creek bank is stable and erosion issues are addressed.	Assessed in separate program.
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. Collected seed resources are used in revegetation/rehabilitation works.	Rehabilitation/revegetation works use seeds collected onsite, thus maintaining as much genetic similarity (local provenance) as possible.	Undertaken as part of separate program. No substantial seeding resources identified during 2017 monitoring.
Erosion Sedimentation and Salinity				
All biodiversity offset areas	Undertake erosion and sediment inspection and map areas requiring remediation.	Complete inspection and mapping (year 1).	Appropriate erosion and sediment control measures required have been identified and implemented.	Undertaken as part of separate program

Relevant Offset Area	Action	2017 Performance Indicator	Completion Criteria	Performance Comment
	Develop remediation plan and implement.	Remediation plan developed and commenced where practical.	There are no areas of significant erosion or sedimentation.	Undertaken as part of separate program
	Monitor completed erosion works and action repairs if required.		Erosion control works are stable and successful.	No reparation works identified.
Bushfire Management				
All biodiversity offset areas	The current Bushfire Management Plan will be updated according to the approved modification. Bushfire Management Plan will be implemented.	Implementation of requirements of updated Bushfire Management Plan.		Undertaken as part of separate program. No bushfire activity was evident in any of the offset areas.
Monitoring				
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
	Undertake annual inspections of LCO rehabilitation and active regeneration areas	Annual inspections completed	Annual inspections completed	Compliant
	Native fauna presence in rehabilitation/regeneration areas	Fauna monitoring completed	Fauna monitoring confirms that native fauna species are recorded within rehabilitation/regeneration areas.	Compliant

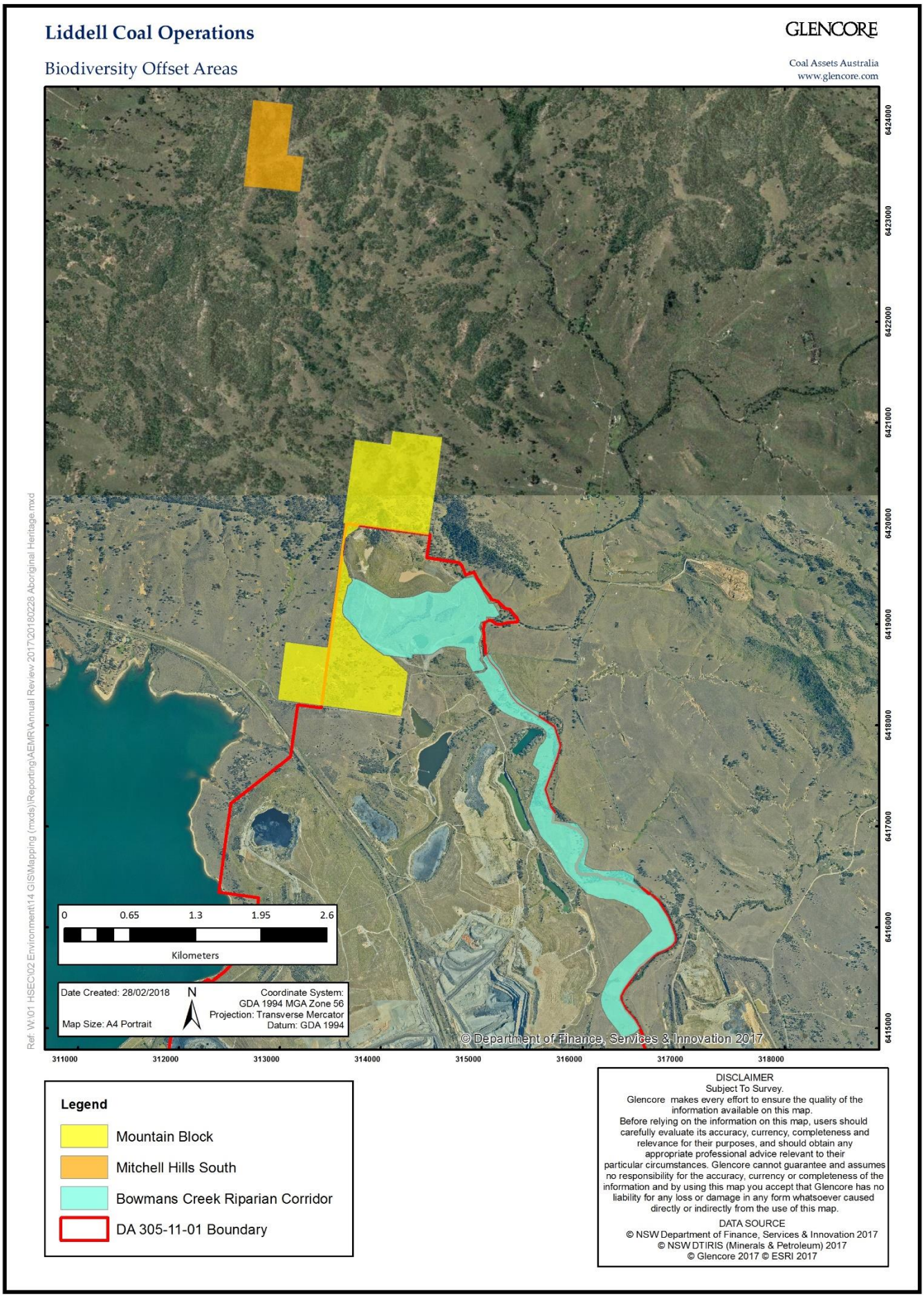


Figure 32 Biodiversity offset areas

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.

A number of tasks are proposed as part of the IOMP as follows:

i. develop individual recognition software (based on data from camera traps);

ii. develop and implement a standard camera trapping methodology for spotted-tailed quolls;

iii. derive key demographic information for population viability assessments (from relatively poorly understood populations);

iv. increase understanding of habitat connectivity in contemporary landscapes; and

v. increase knowledge of habitat use by female quolls at the interface of agro-ecosystems and conservation areas.

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, known as the Quoll Identification Toolkit (QIT). The December 2016 report noted success in developing the automated recognition algorithim. In June 2017, the Research team reported that the QIT development has been successful with initial build of the software completed, with the final payment of $12,000 issued in July 2017.

To ensure a quality product, the Research team recommended a period of further internal user testing and refinement of the software for the remainder of 2017 and early 2018 before releasing to the wider public. This includes documenting a user manual and finalising a scientific paper for publication.

For the remaining projects approved under the IOMP, LCO submitted a revised IOMP and associated justification to DoE 30 March 2017. The proposed amendments were recommended by project partner representatives from the University of New England and NSW Dept. of Primary Industries as potential improvements on the quoll conservations outcomes currently approved. The revised IOMP was approved on the 5 September 2017 with the following projects:

- Development of standard camera trapping protocol based on the QIT project. Implement cross tenure monitoring program (Royal National Park, Wollemi National Park and Middle Foy Brook Area) integrating live trapping, camera trapping, population viability and genetic analysis.
- Trap and track (using telemetry collars) 6 female quolls for 3 years. Assess habitat use by female spotted-tailed quolls.

LCO is currently negotiating and finalising a Research Agreement with the University of New England to complete these projects over the next 4 years. Further information can be source with the IOMP published online at www.liddellcoal.com.au.

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 annually. Results from the 2017 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, the canopy layer in Trial Plot 1 is dense (approximately 1000 stems per hectare and 60% cover) and between approximately 5m and 10m in height. The canopy is dominated by spotted gum (*Corymbia maculata*) with narrow-leaved ironbark (*Eucalyptus crebra*), rough-barked apple (*Angophora floribunda*) and grey box (*Eucalyptus moluccana*) present throughout. Lemon-scented gum (*Corymbia citriodora*) is also present in low numbers throughout the Trial Plot 1 area. The mid layer is sparse, consisting of isolated shrubs at densities of less than 100 stems per hectare. Species present include sickle wattle (*Acacia falcata*), hickory wattle (*Acacia implexa*) and blackthorn (*Bursaria spinosa*). The ground layer has a cover of around 80% and is dominated by Rhodes Grass (*Chloris gayana*) and galenia (*Galenia pubescens*). Some native ground layer species were present in low numbers including; ruby saltbush (*Enchylaena tomentosa*) and climbing saltbush (*Einadia nutans*). A thin litter layer consisting of the leaves and bark of eucalypts, particularly spotted gum (*Corymbia maculata*) is present across the Trial Plot 1 area. Topsoil development remains minimal at this stage.

For Area 2, the canopy layer in Trial Plot 2 is patchy but developing well in most areas. It occurs at approximately 1400 stems per hectare and 40% cover and between approximately 5m and 8m in height. The canopy is dominated by grey box (*Eucalyptus moluccana*) and narrow-leaved ironbark (*Eucalyptus crebra*). Rough-barked apple (*Angophora floribunda*) is present throughout. The mid layer is patchy and dominated by weeping myall (*Acacia* pendula) and sticky hop-bush (*Dodonaea viscosa*). Shrub species occur at densities of approximately 400 stems per hectare. The ground layer has a cover of around 70% and is dominated by Rhodes Grass (*Chloris gayana*) and galenia (*Galenia pubescens*). Some native ground layer species were present in low numbers including; shorthair plumegrass (*Dichelachne micrantha*), barbed wire grass (*Cymbopogon refractus*) and bluegrass (*Dichanthium sericeum*). Species from the family Chenopodeaceae including; ruby saltbush (*Enchylaena tomentosa*) and climbing saltbush (*Einadia nutans*) were common under weeping myall (*Acacia pendula)*. A thin litter layer consisting of the leaves and bark of eucalypts and exotic grasses is present across the Trial Plot 2 area. Topsoil development remains minimal at this stage.

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 annually. Supplementary planting, selective tree thinning and habitat augmentation works are planned to occur in 2018 to further develop the rehabilitation areas.

Over the course of the trial, the areas have changed significantly with both exhibiting challenges in developing ground cover and mid story. Notably, it highlights the consistent evolution of the vegetation and maintenance works required to achieve the target communities as well as the staging of vegetation development; i.e. as canopy develops the mid and ground cover changes significantly.

Project 2

Overview: 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. This area has become the first case of the rehabilitation trial – a) OGM, topsoil and overburden ripped surface.

In response to the rehabilitation performance in the Entrance Pit woodland areas, LCO have since revised the ground preparation techniques and extended to a new trial area on the South Cut western batter and established two new cases. This trial extension involves two 4ha plots comparing woodland development when sown into: b) OGM and overburden ripped surface; c) topsoil and overburden ripped surface. Hence, the trial now comprises three cases.

The monitoring results of the two 4ha plots have shown initial groundcover strike rate significantly greater in the topsoiled areas. With the persistent drought conditions throughout much of 2017, the ground cover and cover crops have suffered significant die back however native canopy and mid story species have emerged. Many of the plants that have established are too small for definitive identification and it is expected that monitoring in 2018 will better indicate the establishment of the areas.

Findings:

2017 monitoring results of the Entrance Pit woodland areas have shown effective management of weed species occurring however some species still present requiring continued focus. The distribution of native canopy and mid story species is patchy across the Entrance Pit Premier Woodland area. Generally, Canopy species occur at very low densities across the area (less than 25 stems per hectare), however, a small number of isolated patches have good numbers of native species in all layers. Mid story species also had a patchy distribution across the area, however, mid story species were more common than those in the canopy and occurred across the area at densities of approximately 400-500 stems per hectare. Cooba (*Acacia salicina*) was the dominant species in the shrub layer, other common mid story species include blue bush (*Maireana microphylla*), western silver wattle (*Acacia decora*), fan wattle (*Acacia amblygona*) and sickle wattle (*Acacia falcata*). The ground layer is dominated by native couch grass (*Cynodon dactylon*) and exotic species including; coolah grass (*Panicum coloratum*), galenia (*Galenia pubescens*) and kikuyu (*Cenchrus clandestinus*). A diversity of native ground layer species are present in low densities. Commonly encounter native ground layer species include; barbed wire grass (*Cymbopogon refractus*), spear grass (*Austrostipa scabra*), ruby salt bush (*Enchylaena tomentosa*) and climbing salt-bush (*Einadia nutans*).

Litter development was minimal across the Entrance Pit Premier Woodland area. Where present it was dominated by of the leaves and stems of grass species. Topsoil development remains minimal on the slopes at this stage with the substrate below consisting of coarse spoil material that is weathering.

The vegetation is partly compatible in its composition with the target vegetation community of woodland where canopy species are present. Most of this area does not appear compatible with a woodland community due to the low density of canopy species evident. Measures to continue the development of the woodland area have been identified (supplementary planting, etc.) and will be conducted during the next reporting period.

8.7 Mountain Block

The previous MOP included a strategy and timeline for rehabilitation remediation works at the Mt Block area to address landform stability issues and erosion impacts.

The original schedule can be summarised into three key tasks:

- Development and implementation of a geotechnical investigation program;
- Completion of detailed remediation design; an
- Tender, contract award and commencement of works.

To date and as reported in the 2015 and 2016 Annual Review's, the geotechnical investigation has been completed, however the detailed design has not been completed nor remediation works commenced as previously programmed. The delay has occurred due to decision to commit project management resources and earthmoving equipment to other life of mine projects, notably the Antiene Tailings Capping project.

In acknowledgement that the issue needs to be addressed and progress made to address this rehabilitation legacy, during Q4 2017 LCO commissioned external expertise to finalise a detailed design ready for tender. The design development process includes the following components:

- Obtaining bulk soil samples for flume testing in the laboratory, in order to quantify the materials erosion risk of the material to be used in the outer slopes;
- Analysis of the materials, using the Water Erosion Prediction Project (WEPP) analysis software to determine sustainable flow lengths and slopes;

- Updating the conceptual designs of the final landform by incorporating “Applied Geofluv™” and Geographic information Systems (GIS) erosion risk analysis, to optimise the conceptual design. It will include a constructability analysis in 3D for consultation and initial costing;

- Final design for the final landform, incorporating issues raised from the conceptual landform reviews;

- Analysis of the proposed final landform, using the SIBERIA erosion model to quantify the short and long term erosion risk (with and without vegetation);

- Providing engineering details for tender that include construction drawings, together with a Bill of Quantities and technical specifications; and

- Final reporting to summarise the design details and any residual risks.

It is expected that this scope of works will be completed in Q1 2018. Regular consultation with DRG/DPE is planned throughout the process to monitor progress and provide input where required, with first meeting completed October 31 2017 to establish the remediation design approach.

It is understood that at the conclusion of this process in Q1 2018, LCO will be required to append additional information to the current MOP detailing the expected timeline for implementation of the remediation works for compliance reporting

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.

No complaints were received during the reporting period.

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

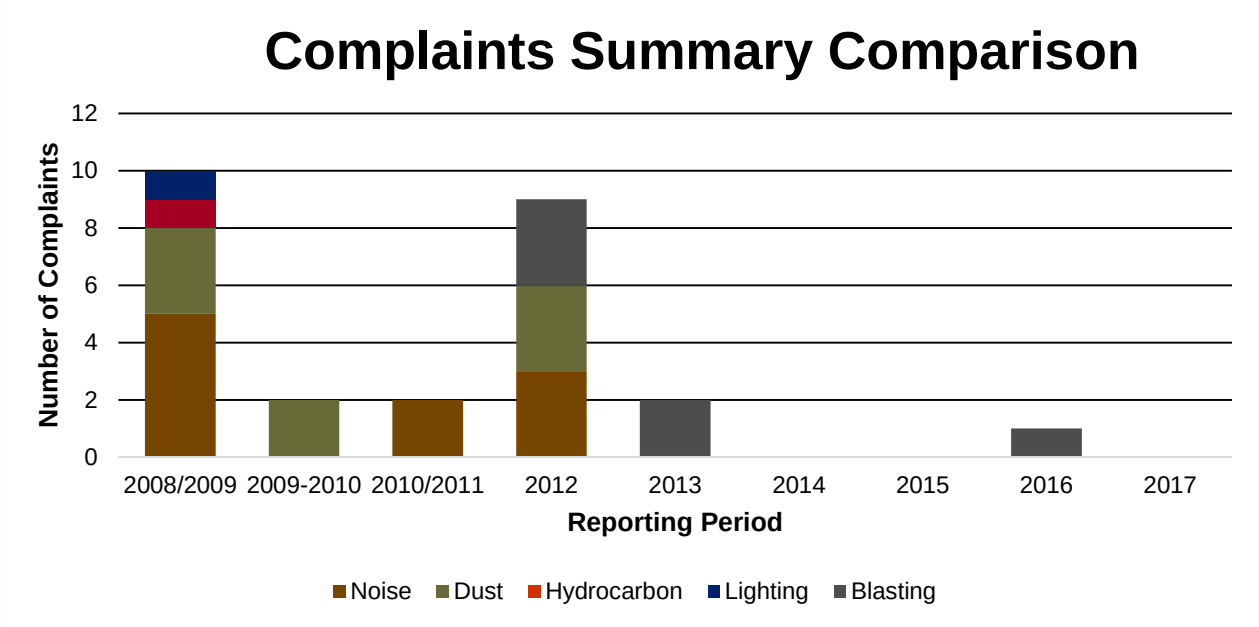


Figure 33 Complaints summary

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 and are also 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 2017 and again in November 2017.

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 34 Community Investment Program Recipients

Community Investment Projects	
Muswellbrook Relay for Life	Movember Foundation
Singleton Amateur Theatrical Society	Lake Liddell Recreation Area
Singleton Public School	Upper Hunter Conservatorium of Music
Oxfam Australia	Variety the children's charity
Watagan Mountains Campdraft Event	Singleton Public Library (Toy Library)
Palative Care Unit Newcastle	Hunter Valley Fly Fishing Club
Singleton PCYC	Little Wings flight service for sick kids
Muswellbrook High School	

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 35.**

Table 35 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, 2016 and 2017 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 8.7
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	As per consultation with DRE, the MOP period has been shortened from seven to three years to allow for evolving mine planning. Commitments remain calendar year based for rehabilitation and disturbance.
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. A review of pasture rehabilitation establishment was completed during 2017 finding that
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 seeded..
General Rehabilitation	Implement a formal review process to assess the immediate and long term	Administrative	Ongoing. Rhodes grass domination of the South Cut

	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 controls (for biodiversity and woodland corridor areas).		rehabilitation areas has been identified as requiring strategic control to ensure the development of the pasture areas to meet MOP completion criteria. During 2018, LCO are planning 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 engage specialist rehabilitation consultant to review rehabilitation performance across the site, detail the prevalence of Rhodes grass and assess effectiveness of current management practices. Recommendations from the report are being actioned during 2018 including, rotational grazing, slashing and supplementary planting. During 2018, 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.
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 and 2018.

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 36.**

Table 36 Non-compliance summary

Approval	Condition Reference	Condition Description	Description	Action taken
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 1/1/2017 for 15hrs, 4/2/2017 to 13/2/2017 and 17/02/2017 to 20/02/2017.	Fault checked the sensor with no issues found. Configured alarm logic to notify when erroneous data is being reported. Sensor replaced in February 2017 and no issues since.
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 one occasions during the reporting period, monitoring results were submitted outside the 7day timeframe.	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 and proposed environmental performance improvement measures to be completed in the next reporting period:

- LCO's mining operations will continue to progress in a southerly direction in both mining areas. Additionally, further clearance and mining in the Bayswater Pit (South Entrance Pit) will occurring in alignment with the MOP.

- LCO will submit a revised Mining Operations Plan 2018-2020 in Q2/Q3 2018 in consultation with DRE regarding the Mountain Block Remediation Strategy.

- **Section 6.2** discusses the blasting performance and specific management actions required at the Newdell Sub Station. A blast monitoring system for various components been installed by Ausgrid and it is envisaged that the staged increase in blast vibration and transition to alternate vibration limits will continue occur during 2018.

- **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 2018 in order to progress the vibration trigger limits in consultation with DPE.

- **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 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 2018. 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 2018. 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;
    - Augment the habitat resource (nest boxes, log piles) to encourage fauna diversity;
    - Continue to conduct maintenance works such as targeted feral fauna and flora management as required;
    - Continued implementation of active regeneration works in all offset areas; and
    - Monitoring of direct seeding and planting of tube stock trials completed in Bowman's Creek Riparian Corridor in 2017 to inform further active regeneration works.
    - Trial remediation methodology 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 update and submission of the Aboriginal and Cultural Heritage Management Plan in early 2018.

- **Section 8.5** details the progress of the Indirect Offset Management program. During 2018, 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 and schedule commencement of remediation 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 (2016) Noise Management Plan*

LCO (2017) Spontaneous Combustion Management Plan**

LCO (2017) Air Quality Management and Monitoring Program*

LCO (2016) Land Clearing and Topsoil Stripping Procedure**

LCO (2017) Liddell Dust Management TARP**

LCO (2016) Waste Management Plan**

LCO (2017) Environmental Management Strategy*

LCO (2016) Aboriginal Cultural Heritage Management Plan*

LCO (2017) 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

Glencore Coal

COAL RECEIVALS

Report Period 01/01/2017 12:00 am to 31/12/2017 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	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
Pacific National	Sunday 01 January 2017	LD256	CM to Kansai (Maizuru Power Station)	Mizunagi II	1 January 2017			8,482.40									8,482.40
	Summary of Sunday 01 January 2017							8,482.40									8,482.40
	Monday 02 January 2017	LD158	GCS to Qinhuangdac Jan'17 #191CN	Anangel Grace	2 January 2017	9,030.80											9,030.80
		LD326	GCS to Qinhuangdac Jan'17 #191CN	Anangel Grace	2 January 2017	7,259.92			1,116.28								8,376.20
	Summary of Monday 02 January 2017					16,290.72			1,116.28								17,407.00
	Tuesday 03 January 2017	LD188	CM to Kansai (Maizuru Power Station)	Mizunagi II	3 January 2017			8,950.90									8,950.90
	Summary of Tuesday 03 January 2017							8,950.90									8,950.90
	Thursday 05 January 2017	LD162	XMO to Chugoku EPC - JFY16 8th, 9th Shipment	Sincere Pisces	5 January 2017			8,432.80									8,432.80
	Summary of Thursday 05 January 2017							8,432.80									8,432.80
	Saturday 07 January 2017	LD260	XMO to Chugoku EPC - JFY16 8th, 9th Shipment	Sincere Pisces	8 January 2017			8,943.60									8,943.60
	Summary of Saturday 07 January 2017							8,943.60									8,943.60
	Sunday 08 January 2017	LD214	XMO to Chugoku EPC - JFY16 8th, 9th Shipment	Sincere Pisces	8 January 2017				8,900.00								8,900.00
	Summary of Sunday 08 January 2017								8,900.00								8,900.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 11 January 2017	LD306	Liddell to JFE - Apr'16-Mar'17 4th	Vittoria	12 January 2017			1,412.56		7,614.64							9,027.20
		Summary of Wednesday 11 January 2017						1,412.56		7,614.64							9,027.20
	Thursday 12 January 2017	LD276	Liddell to JFE - Apr'16-Mar'17 4th	Vittoria	13 January 2017					9,051.80							9,051.80
		LD338	Liddell to JFE - Apr'16-Mar'17 4th	Vittoria	12 January 2017				8,568.60								8,568.60
		LD388	GCS (XMO) to SJEP CY17	Ibis Wind	12 January 2017			6,780.69						2,102.11			8,882.80
		Summary of Thursday 12 January 2017						6,780.69	8,568.60	9,051.80				2,102.11			26,503.20
	Saturday 14 January 2017	LD222	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	Cape Harvest	14 January 2017				8,568.00								8,568.00
		Summary of Saturday 14 January 2017							8,568.00								8,568.00
	Sunday 15 January 2017	LD182	Q4 LD to China Steel Corp - JFY16	China Steel Excellence	15 January 2017									8,780.60			8,780.60
		LD234	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	Cape Harvest	15 January 2017	1,221.28		6,651.12									7,872.40
		Summary of Sunday 15 January 2017				1,221.28		6,651.12						8,780.60			16,653.00
	Monday 16 January 2017	LD162	Q4 LD to China Steel Corp - JFY16	China Steel Excellence	16 January 2017									8,375.60			8,375.60
		LD240	Q4 LD to China Steel Corp - JFY16	China Steel Excellence	16 January 2017									8,132.40			8,132.40
		Summary of Monday 16 January 2017												16,508.00			16,508.00
	Tuesday 17 January 2017	LD108	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	Cape Harvest	17 January 2017				8,493.60								8,493.60
		LD172	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	Cape Harvest	17 January 2017			8,411.00									8,411.00
		Summary of Tuesday 17 January 2017						8,411.00	8,493.60								16,904.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 18 January 2017	LD160	Hokkaido EPC Year 1 of 3 - Base Tonnage	Corona Garland	18 January 2017			8,986.10									8,986.10
		LD250	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	Cape Harvest	19 January 2017			9,004.80									9,004.80
		LD316	Hokkaido EPC Year 1 of 3 - Base Tonnage	Corona Garland	19 January 2017				8,565.60								8,565.60
		LD340	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	Cape Harvest	18 January 2017			8,973.60									8,973.60
		LD386	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	Cape Harvest	18 January 2017			8,876.20									8,876.20
		Summary of Wednesday 18 January 2017						35,840.70	8,565.60								44,406.30
	Thursday 19 January 2017	LD200	Q4 LD to China Steel Corp - JFY16	China Steel Excellence	19 January 2017			8,556.20									8,556.20
		LD270	Hokkaido EPC Year 1 of 3 - Base Tonnage	Corona Garland	19 January 2017			3,070.44	6,026.06								9,096.50
		Summary of Thursday 19 January 2017						11,626.64	6,026.06								17,652.70
	Friday 20 January 2017	LD320	Hokkaido EPC Year 1 of 3 - Base Tonnage	Corona Garland	20 January 2017				9,202.60								9,202.60
		Summary of Friday 20 January 2017							9,202.60								9,202.60
	Sunday 22 January 2017	LD134	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	NSU Responsibility	22 January 2017			8,557.40									8,557.40
		Summary of Sunday 22 January 2017						8,557.40									8,557.40
	Monday 23 January 2017	LD308	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	NSU Responsibility	24 January 2017			8,101.80									8,101.80
		Summary of Monday 23 January 2017						8,101.80									8,101.80
	Tuesday 24 January 2017	LD104	Liddell to Ube - JFY16 Mits.Paper Avg Apr & Oct BM	Ashlya Star	24 January 2017			9,086.80									9,086.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD206	Liddell to Ube - JFY16 Mits.Paper Avg Apr & Oct BM	Ashlya Star	24 January 2017			8,629.00									8,629.00
		Summary of Tuesday 24 January 2017						17,715.60									17,715.60
	Wednesday 25 January 2017	LD152	Liddell to Ube - JFY16 Mits.Paper Avg Apr & Oct BM	Ashlya Star	25 January 2017				8,576.60								8,576.60
		LD362	Liddell to Ube - JFY16 Mits.Paper Avg Apr & Oct BM	Ashlya Star	25 January 2017				7,996.40								7,996.40
		Summary of Wednesday 25 January 2017							16,573.00								16,573.00
	Thursday 26 January 2017	LD182	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	NSU Responsibility	26 January 2017			9,129.80									9,129.80
		Summary of Thursday 26 January 2017						9,129.80									9,129.80
	Friday 27 January 2017	LD128	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	NSU Responsibility	27 January 2017				8,356.80								8,356.80
		LD266	Liddell to Ube - JFY16 Mits.Paper Avg Apr & Oct BM	Ashlya Star	28 January 2017			1,927.46	7,058.44								8,985.90
		LD302	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	NSU Responsibility	28 January 2017			8,471.40									8,471.40
		Summary of Friday 27 January 2017						10,398.86	15,415.24								25,814.10
	Saturday 28 January 2017	LD172	Liddell to NSC JFY16 GC NEWC Oct-Dec'16	NSU Responsibility	28 January 2017				8,841.80								8,841.80
		LD304	GCS to Ube (USC Coal) - JFY'16- Mitsubishi Rayon	Pictor	29 January 2017				8,658.80								8,658.80
		Summary of Saturday 28 January 2017							17,500.60								17,500.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Monday 30 January 2017	LD298	GCS to Ube (USC Coal) - JFY'16-Mitsubishi Rayon	Pictor	31 January 2017					6,045.93	2,491.67						8,537.60
		Summary of Monday 30 January 2017								6,045.93	2,491.67						8,537.60
	Tuesday 31 January 2017	LD226	Liddell to Ube - JFY16 Yes October BM	Energy Sunrise	31 January 2017					8,993.80							8,993.80
		Summary of Tuesday 31 January 2017								8,993.80							8,993.80
	Thursday 02 February 2017	LD222	Q4 LD to China Steel Corp - JFY16	China Steel Team	2 February 2017									8,882.00			8,882.00
		LD266	Liddell to Ube - JFY16 Yes October BM	Energy Sunrise	3 February 2017				4,880.40	3,760.80							8,641.20
		Summary of Thursday 02 February 2017							4,880.40	3,760.80				8,882.00			17,523.20
	Friday 03 February 2017	LD116	Liddell to Chugoku - JFY16	Sincere Pisces	3 February 2017			9,023.20									9,023.20
		LD198	Liddell to Chugoku - JFY16	Sincere Pisces	3 February 2017			9,025.60									9,025.60
		LD250	Liddell to Chugoku - JFY16	Sincere Pisces	3 February 2017			7,775.60									7,775.60
		LD308	Liddell to Chugoku - JFY16	Sincere Pisces	4 February 2017				8,469.60								8,469.60
		LD332	Liddell to Chugoku - JFY16	Sincere Pisces	3 February 2017				8,907.20								8,907.20
		LD368	Liddell to Chugoku - JFY16	Sincere Pisces	3 February 2017				9,116.80								9,116.80
		Summary of Friday 03 February 2017						25,824.40	26,493.60								52,318.00
	Saturday 04 February 2017	LD174	Q4 LD to China Steel Corp - JFY16	China Steel Team	4 February 2017					4,276.11				4,206.89			8,483.00
		LD256	Liddell to Chugoku - JFY16	Sincere Pisces	5 February 2017			8,961.40									8,961.40
		LD382	Liddell to Chugoku - JFY16	Sincere Pisces	4 February 2017				9,038.00								9,038.00
		Summary of Saturday 04 February 2017						8,961.40	9,038.00	4,276.11				4,206.89			26,482.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Tuesday 07 February 2017	LD282	Liddell to NSC JFY16 Fixed Price	Azalea Island	8 February 2017					8,520.60							8,520.60
		Summary of Tuesday 07 February 2017								8,520.60							8,520.60
	Wednesday 08 February 2017	LD380	Liddell to NSC JFY16 Fixed Price	Azalea Island	8 February 2017					8,606.80							8,606.80
		Summary of Wednesday 08 February 2017								8,606.80							8,606.80
	Thursday 09 February 2017	LD150	Liddell to NSC JFY16 Fixed Price	Azalea Island	9 February 2017			4,213.02		4,290.78							8,503.80
		Summary of Thursday 09 February 2017						4,213.02		4,290.78							8,503.80
	Saturday 11 February 2017	LD112	Liddell to Ube - JFY16 JEN GC NEWC swap closing c	Velsheda	11 February 2017				8,409.80								8,409.80
		Summary of Saturday 11 February 2017							8,409.80								8,409.80
	Sunday 12 February 2017	LD270	Liddell to NSC JFY16 Fixed Price	Azalea Island	13 February 2017			3,187.17		5,851.63							9,038.80
		Summary of Sunday 12 February 2017						3,187.17		5,851.63							9,038.80
	Thursday 16 February 2017	LD246	Liddell to Ube - JFY16 JEN GC NEWC swap closing c	Velsheda	16 February 2017		7,358.59						1,291.41				8,650.00
		Summary of Thursday 16 February 2017					7,358.59						1,291.41				8,650.00
	Friday 17 February 2017	LD116	Liddell to NSC JFY16 Fixed Price	New Stage	17 February 2017		8,390.80										8,390.80
		LD204	Liddell to NSC JFY16 Fixed Price	New Stage	18 February 2017			7,267.10									7,267.10
		Summary of Friday 17 February 2017					8,390.80	7,267.10									15,657.90
	Sunday 19 February 2017	LD252	Liddell to NSC JFY16 Fixed Price	New Stage	19 February 2017			4,544.56		4,000.24							8,544.80
		Summary of Sunday 19 February 2017						4,544.56		4,000.24							8,544.80
	Tuesday 07 March 2017	LD182	Buiga to Nippon Paper - JFY16	Pacific Laurel	7 March 2017		8,249.00										8,249.00
		LD246	Q4 LD to China Steel Corp - JFY16	Paola Bottigileri	7 March 2017									8,928.00			8,928.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD356	GCS (XMO) to SJEP CY17	Corona Nature	7 March 2017											9,008.00	9,008.00
		Summary of Tuesday 07 March 2017					8,249.00							8,928.00		9,008.00	26,185.00
	Wednesday 08 March 2017	LD244	Q4 LD to China Steel Corp - JFY16	Paola Bottiglieri	9 March 2017				1,246.84							7,919.76	9,166.60
		Summary of Wednesday 08 March 2017							1,246.84							7,919.76	9,166.60
	Saturday 11 March 2017	LD246	Liddell to NSC JFY16 Fixed Price	Pacific Oak	11 March 2017					9,084.20			0.00				9,084.20
		LD302	Liddell to NSC JFY16 Fixed Price	Pacific Oak	12 March 2017			9,151.10									9,151.10
		LD352	Liddell to NSC JFY16 Fixed Price	Pacific Oak	11 March 2017			0.00	6,715.84				1,909.16				8,625.00
		Summary of Saturday 11 March 2017						9,151.10	6,715.84	9,084.20			1,909.16				26,860.30
	Sunday 12 March 2017	LD224	Liddell to NSC JFY16 Fixed Price	Pacific Oak	12 March 2017			9,093.20					0.00				9,093.20
		LD386	Liddell to NSC JFY16 Fixed Price	Pacific Oak	12 March 2017		8,702.60										8,702.60
		Summary of Sunday 12 March 2017					8,702.60	9,093.20					0.00				17,795.80
	Monday 13 March 2017	LD160	LD - UBE JFY17 - YES - 20kt April BM	Calypso Island	13 March 2017		8,897.60										8,897.60
		LD314	Liddell to NSC JFY16 Fixed Price	Pacific Oak	13 March 2017			7,585.93					1,694.17				9,280.10
		Summary of Monday 13 March 2017					8,897.60	7,585.93					1,694.17				18,177.70
	Tuesday 14 March 2017	LD126	LD - UBE JFY17 - YES - 20kt April BM	Calypso Island	14 March 2017		8,512.00						0.00				8,512.00
		LD244	Liddell to Ube - JFY16 JEN GC NEWC swap closing c	Calypso Island	15 March 2017			7,504.18					1,497.32				9,001.50
		Summary of Tuesday 14 March 2017					8,512.00	7,504.18					1,497.32				17,513.50

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 15 March 2017	LD144	Bulga to Tohoku EPC-Oct'16-Sep'17 12.5% Ash FP	Lily Fortune	15 March 2017		7,120.00										7,120.00
		LD278	LD - UBE JFY'17 - YES - 20kt April BM	Calypso Island	16 March 2017								1,934.81			5,339.39	7,274.20
		Summary of Wednesday 15 March 2017					7,120.00						1,934.81			5,339.39	14,394.20
	Thursday 16 March 2017	LD174	Bulga to Hokuriku EPC - JFY16 Buyers Option	North Fortune	16 March 2017		7,613.09									1,195.01	8,808.10
		LD330	Bulga to Kansai EPC - Jan'17 - Dec'17 - FP 1st & 2nd shipment	Maizuru Kichijo	16 March 2017					8,344.60							8,344.60
		LD360	Liddell to NSC JFY16 Fixed Price	Pacific Oak	16 March 2017						6,034.11		3,200.69				9,234.80
		Summary of Thursday 16 March 2017					7,613.09			8,344.60	6,034.11		3,200.69			1,195.01	26,387.50
	Friday 17 March 2017	LD216	Bulga to Hokuriku EPC - JFY16 Buyers Option	North Fortune	17 March 2017		8,482.40										8,482.40
		Summary of Friday 17 March 2017					8,482.40										8,482.40
	Saturday 18 March 2017	LD176	Bulga to Tohoku EPC-Oct'16-Sep'17 12.5% Ash FP	Lily Fortune	18 March 2017					8,833.20							8,833.20
		Summary of Saturday 18 March 2017								8,833.20							8,833.20
	Sunday 19 March 2017	LD260	Liddell to JFE - Apr'16-Mar'17 4th	Azul Integra	19 March 2017								4,161.05	4,301.95			8,463.00
		Summary of Sunday 19 March 2017											4,161.05	4,301.95			8,463.00
	Tuesday 21 March 2017	LD144	Liddell to JFE - Apr'16-Mar'17 4th	Azul Integra	21 March 2017			8,934.80									8,934.80
		Summary of Tuesday 21 March 2017						8,934.80									8,934.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 22 March 2017	LD228	Liddell to Ube - Mitsubishi Paper (30kt Mar'17)	Pilatus Venture	23 March 2017			8,452.80									8,452.80
		Summary of Wednesday 22 March 2017						8,452.80									8,452.80
	Friday 24 March 2017	LD122	Liddell to Ube - Mitsubishi Paper (30kt Mar'17)	Pilatus Venture	24 March 2017											8,510.40	8,510.40
		LD288	Liddell to Ube - Mitsubishi Paper (30kt Mar'17)	Pilatus Venture	25 March 2017			8,732.20									8,732.20
		Summary of Friday 24 March 2017						8,732.20								8,510.40	17,242.60
	Saturday 25 March 2017	LD140	Liddell to JFE - Apr'16-Mar'17 4th	Azul Integra	25 March 2017					0.00			9,156.80				9,156.80
		LD218	Liddell to NSC JFY16 Fixed Price	Cape Vanguard	25 March 2017		3,756.07				1,197.53		3,292.20				8,245.80
		Summary of Saturday 25 March 2017					3,756.07			0.00	1,197.53		12,449.00				17,402.60
	Sunday 26 March 2017	LD208	Liddell to NSC JFY16 Fixed Price	Cape Vanguard	26 March 2017			9,026.60									9,026.60
		LD256	Liddell to NSC JFY16 Fixed Price	Cape Vanguard	26 March 2017		6,946.24							0.00	1,423.96	0.00	8,370.20
		LD328	Liddell to NSC JFY16 Fixed Price	Cape Vanguard	26 March 2017			5,059.23					4,003.97				9,063.20
		Summary of Sunday 26 March 2017					6,946.24	14,085.83					4,003.97	0.00	1,423.96	0.00	26,460.00
	Monday 27 March 2017	LD106	Q4 LD to China Steel Corp - JFY16	Magnus Oldendorff	27 March 2017									0.00	9,177.20		9,177.20
		Summary of Monday 27 March 2017												0.00	9,177.20		9,177.20
	Wednesday 29 March 2017	LD208	Q4 LD to China Steel Corp - JFY16	Magnus Oldendorff	29 March 2017			4,035.94						3,484.22		1,251.64	8,771.80
		LD370	Liddell to NSC JFY16 Fixed Price	Cape Vanguard	29 March 2017			3,878.37		0.00			5,213.43				9,091.80
		Summary of Wednesday 29 March 2017						7,914.31		0.00			5,213.43	3,484.22		1,251.64	17,863.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Friday 07 April 2017	LD300	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Shin Sekiyo	8 April 2017			7,529.64			1,580.76						9,110.40
		Summary of Friday 07 April 2017						7,529.64			1,580.76						9,110.40
	Monday 10 April 2017	LD116	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Shin Sekiyo	10 April 2017			8,662.60									8,662.60
		Summary of Monday 10 April 2017						8,662.60									8,662.60
	Tuesday 11 April 2017	LD144	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Shin Sekiyo	11 April 2017			7,860.20									7,860.20
		LD306	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Shin Sekiyo	11 April 2017			9,019.60									9,019.60
		Summary of Tuesday 11 April 2017						16,879.80									16,879.80
	Wednesday 12 April 2017	LD162	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Shin Sekiyo	12 April 2017			3,984.61					4,018.39				8,003.00
		LD208	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Shin Sekiyo	12 April 2017			4,541.89					4,592.21				9,134.10
		Summary of Wednesday 12 April 2017						8,526.50					8,610.60				17,137.10
	Friday 14 April 2017	LD172	LD - UBE JFY'17 - JEN April BM	Key Knight	14 April 2017											8,708.00	8,708.00
		LD220	Liddell to NSC JFY17-GC NEWC Jan-Mar	New Stage	14 April 2017			4,408.70					4,650.10				9,058.80
		LD368	Liddell to NSC JFY17-GC NEWC Jan-Mar	New Stage	14 April 2017		9,011.60										9,011.60
		Summary of Friday 14 April 2017					9,011.60	4,408.70					4,650.10			8,708.00	26,778.40
	Saturday 15 April 2017	LD130	LD - UBE JFY'17 - JEN April BM	Key Knight	15 April 2017								2,563.54			6,479.86	9,043.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Saturday 15 April 2017											2,563.54			6,479.86	9,043.40
	Monday 17 April 2017	LD288	Hokkaido EPC Year 1 of 3 - Base Tonnage	Shin Sapporo Maru	18 April 2017			9,224.50									9,224.50
		Summary of Monday 17 April 2017						9,224.50									9,224.50
	Wednesday 19 April 2017	LD364	Liddell to NSC JFY17-GC NEWC Jan-Mar	New Stage	19 April 2017									0.00	8,981.00		8,981.00
		Summary of Wednesday 19 April 2017												0.00	8,981.00		8,981.00
	Thursday 20 April 2017	LD214	Hokkaido EPC Year 1 of 3 - Base Tonnage	Shin Sapporo Maru	20 April 2017		3,644.70	5,171.90									8,816.60
		LD352	Hokkaido EPC Year 1 of 3 - Base Tonnage	Shin Sapporo Maru	20 April 2017			9,133.80									9,133.80
		Summary of Thursday 20 April 2017					3,644.70	14,305.70									17,950.40
	Friday 21 April 2017	LD138	Hokkaido EPC Year 1 of 3 - Base Tonnage	Shin Sapporo Maru	21 April 2017			9,107.40									9,107.40
		LD250	Hokkaido EPC Year 1 of 3 - Base Tonnage	Shin Sapporo Maru	21 April 2017			8,713.40									8,713.40
		LD306	Hokkaido EPC Year 1 of 3 - Base Tonnage	Shin Sapporo Maru	22 April 2017			8,645.40									8,645.40
		Summary of Friday 21 April 2017						26,466.20									26,466.20
	Saturday 29 April 2017	LD164	Liddell to NSC JFY17-GC NEWC Jan-Mar	Ototachibana	29 April 2017			8,703.00									8,703.00
		Summary of Saturday 29 April 2017						8,703.00									8,703.00
	Monday 01 May 2017	LD294	GCS to Kobe IPP - Apr'17-Mar'18	ADS Kristiansand	2 May 2017		1,356.43	7,567.57									8,924.00
		LD354	GCS to Kobe IPP - Apr'17-Mar'18	ADS Kristiansand	1 May 2017			8,806.60									8,806.60
		Summary of Monday 01 May 2017					1,356.43	16,374.17									17,730.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Tuesday 02 May 2017	LD208	Liddell to NSC JFY17-GC NEWC Jan-Mar	Tsukuba Maru	2 May 2017			8,996.20									8,996.20
		Summary of Tuesday 02 May 2017						8,996.20									8,996.20
	Wednesday 03 May 2017	LD164	Q1 GCS to NS&SM corp - JFY17	Tsukuba Maru	3 May 2017									8,597.20			8,597.20
		LD258	Q1 GCS to NS&SM corp - JFY17	Tsukuba Maru	3 May 2017									8,829.00			8,829.00
		LD374	Liddell to NSC JFY17-GC NEWC Jan-Mar	Tsukuba Maru	3 May 2017			8,603.60									8,603.60
		Summary of Wednesday 03 May 2017						8,603.60						17,426.20			26,029.60
	Thursday 04 May 2017	LD178	Q1 LD to China Steel Corp - JFY17	Panamanian	4 May 2017									7,546.60			7,546.60
		LD324	Q1 LD to China Steel Corp - JFY17	Panamanian	5 May 2017									9,004.60			9,004.60
		Summary of Thursday 04 May 2017												16,551.20			16,551.20
	Friday 05 May 2017	LD148	Q1 LD to China Steel Corp - JFY17	Panamanian	5 May 2017									9,153.40			9,153.40
		Summary of Friday 05 May 2017												9,153.40			9,153.40
	Sunday 07 May 2017	LD336	Q1 LD to China Steel Corp - JFY17	Panamanian	7 May 2017			6,862.82						2,233.38			9,096.20
		Summary of Sunday 07 May 2017						6,862.82						2,233.38			9,096.20
	Tuesday 16 May 2017	LD154	MO to Idemitsu - JFY17 - Base tonnage April RP	Jag Akshay	16 May 2017			8,997.70									8,997.70
		Summary of Tuesday 16 May 2017						8,997.70									8,997.70
	Saturday 27 May 2017	LD142	Q1 LD to China Steel Corp - JFY17	KM Tokyo	27 May 2017									9,110.60			9,110.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD236	Q1 LD to China Steel Corp - JFY17	KM Tokyo	27 May 2017									8,810.20			8,810.20
		LD352	Q1 LD to China Steel Corp - JFY17	KM Tokyo	27 May 2017			1,117.14						7,639.46			8,756.60
		Summary of Saturday 27 May 2017						1,117.14						25,560.26			26,677.40
	Sunday 28 May 2017	LD114	Q1 LD to China Steel Corp - JFY17	KM Tokyo	28 May 2017			9,104.40									9,104.40
		LD230	Liddell to NSC JFY17-Fixed Price - $84.97	Azalea Island	28 May 2017			8,480.20									8,480.20
		Summary of Sunday 28 May 2017						17,584.60									17,584.60
	Monday 29 May 2017	LD322	Liddell to NSC JFY17-Fixed Price - $84.97	Azalea Island	30 May 2017			8,958.80									8,958.80
		Summary of Monday 29 May 2017						8,958.80									8,958.80
	Tuesday 30 May 2017	LD146	Liddell to NSC JFY17-Fixed Price - $84.97	Azalea Island	30 May 2017			9,123.80									9,123.80
		LD208	Liddell to NSC JFY17-Fixed Price - $79.85	New Stage	30 May 2017			9,186.90									9,186.90
		LD270	Liddell to NSC JFY17-Fixed Price - $84.97	Azalea Island	31 May 2017			8,916.60									8,916.60
		Summary of Tuesday 30 May 2017						27,227.30									27,227.30
	Wednesday 31 May 2017	LD154	Liddell to NSC JFY17-Fixed Price - $84.97	Azalea Island	1 June 2017			8,961.20									8,961.20
		LD278	Liddell to NSC JFY17-Fixed Price - $79.85	New Stage	1 June 2017			8,904.20									8,904.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD334	Liddell to NSC JFY17-Fixed Price - $79.85	New Stage	31 May 2017			8,896.20									8,896.20
		Summary of Wednesday 31 May 2017						26,761.60									26,761.60
	Saturday 03 June 2017	LD290	LD - UBE JFY'17 - JEN GC NEWC (Jun'17) 27.5kt	Century Wave	4 June 2017			9,112.80									9,112.80
		Summary of Saturday 03 June 2017						9,112.80									9,112.80
	Sunday 04 June 2017	LD358	LD - UBE JFY'17 UBE own use 24kt April BM	Jozen	4 June 2017			8,329.20									8,329.20
		Summary of Sunday 04 June 2017						8,329.20									8,329.20
	Friday 16 June 2017	LD386	MO to CSC Spot	FPMC B 107	16 June 2017									8,928.00			8,928.00
		Summary of Friday 16 June 2017												8,928.00			8,928.00
	Sunday 18 June 2017	LD124	LD - UBE JFY'17 - Mit. Paper - 100kt April BM plus USD$0.75	Noshima	18 June 2017			9,163.20									9,163.20
		LD208	LD - UBE JFY'17 - Mit. Paper - 100kt April BM plus USD$0.75	Noshima	18 June 2017			8,457.40									8,457.40
		LD340	MO to CSC Spot	FPMC B 107	18 June 2017											8,956.60	8,956.60
		Summary of Sunday 18 June 2017						17,620.60								8,956.60	26,577.20
	Monday 19 June 2017	LD226	LD - UBE JFY'17 - Mit. Paper - 100kt April BM plus USD$0.75	Noshima	19 June 2017		8,670.40										8,670.40
		Summary of Monday 19 June 2017					8,670.40										8,670.40
	Tuesday 20 June 2017	LD182	LD - UBE JFY'17 - Mit. Paper - 100kt April BM plus USD$0.75	Noshima	20 June 2017		6,422.76	2,179.44									8,602.20
		Summary of Tuesday 20 June 2017					6,422.76	2,179.44									8,602.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Sunday 25 June 2017	LD362	Q1 LD to China Steel Corp - JFY17	Ioicos Dignity	25 June 2017		9,097.00										9,097.00
		Summary of Sunday 25 June 2017					9,097.00										9,097.00
	Monday 26 June 2017	LD162	Q1 LD to China Steel Corp - JFY17	Ioicos Dignity	26 June 2017			6,584.89						2,062.51			8,647.40
		Summary of Monday 26 June 2017						6,584.89						2,062.51			8,647.40
	Wednesday 28 June 2017	LD294	Liddell to JFE - Apr'17-Mar'18 (April RP - 1.75)	Shin Ohgishima	29 June 2017			9,182.00									9,182.00
		Summary of Wednesday 28 June 2017						9,182.00									9,182.00
	Thursday 29 June 2017	LD304	Liddell to JFE - Apr'17-Mar'18 (April RP - 1.75)	Shin Ohgishima	30 June 2017					8,711.40							8,711.40
		Summary of Thursday 29 June 2017								8,711.40							8,711.40
	Friday 30 June 2017	LD266	Q1 XCS to Kobe Steel SS - JFY17	Coral Ring	1 July 2017			3,120.01						6,155.79			9,275.80
		Summary of Friday 30 June 2017						3,120.01						6,155.79			9,275.80
	Saturday 01 July 2017	LD278	Liddell to JFE - Apr'17-Mar'18 (April RP - 1.75)	Shin Ohgishima	2 July 2017			7,923.16								1,041.04	8,964.20
		Summary of Saturday 01 July 2017						7,923.16								1,041.04	8,964.20
	Sunday 02 July 2017	LD152	Liddell to NSC JFY17- GC NEWC Apr-Jun	Spring Brave	2 July 2017					8,644.00							8,644.00
		LD240	Liddell to NSC JFY17- GC NEWC Apr-Jun	Spring Brave	2 July 2017					9,247.10							9,247.10
		Summary of Sunday 02 July 2017								17,891.10							17,891.10
	Monday 03 July 2017	LD152	Liddell to NSC JFY17- GC NEWC Apr-Jun	Spring Brave	3 July 2017			8,500.80									8,500.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Monday 03 July 2017						8,500.80									8,500.80
	Wednesday 05 July 2017	LD202	Liddell to NSC JFY17- GC NEWC Apr-Jun	Spring Brave	5 July 2017			9,126.00									9,126.00
		LD338	Liddell to JFE - Apr'17-Mar'18 (April RP - 1.75)	Shin Ohgishima	5 July 2017			8,893.40								0.00	8,893.40
		Summary of Wednesday 05 July 2017						18,019.40								0.00	18,019.40
	Wednesday 12 July 2017	LD280	Q1 LD to China Steel Corp - JFY17	China Steel Responsibility	13 July 2017											8,965.80	8,965.80
		Summary of Wednesday 12 July 2017														8,965.80	8,965.80
	Thursday 13 July 2017	LD120	GCS to GIAG (Hangzhou Steel) Jul '17	HL Pioneer	13 July 2017								8,667.20				8,667.20
		LD348	GCS to GIAG (Hangzhou Steel) Jul '17	HL Pioneer	13 July 2017								8,531.00				8,531.00
		Summary of Thursday 13 July 2017											17,198.20				17,198.20
	Friday 14 July 2017	LD158	GCS to GIAG (Hangzhou Steel) Jul '17	HL Pioneer	14 July 2017								8,830.80				8,830.80
		LD318	GCS to GIAG (Hangzhou Steel) Jul '17	HL Pioneer	15 July 2017								8,700.40				8,700.40
		Summary of Friday 14 July 2017											17,531.20				17,531.20
	Tuesday 18 July 2017	LD264	LD - UBE JFY'17 - TEIJIN GC Newc (Avg. Q3,Q4, Q1&Q2+2.20 22kt	Star Emily	18 July 2017			8,711.80									8,711.80
		LD280	LD - UBE JFY'17 - TEIJIN GC Newc (Avg. Q3,Q4, Q1&Q2+2.20 22kt	Star Emily	19 July 2017						9,191.00						9,191.00
		Summary of Tuesday 18 July 2017						8,711.80			9,191.00						17,902.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 19 July 2017	LD270	LD - UBE JFY'17 - TEIJIN GC Newc (Avg. Q3,Q4, Q1&Q2+2.20 22kt	Star Emily	20 July 2017			2,991.55								6,170.85	9,162.40
		Summary of Wednesday 19 July 2017						2,991.55								6,170.85	9,162.40
	Friday 21 July 2017	LD288	GCS (XMO) to SJEP CY17	C.S. Olive	22 July 2017			8,616.00									8,616.00
		Summary of Friday 21 July 2017						8,616.00									8,616.00
	Saturday 22 July 2017	LD214	GCS to Kobe IPP - Apr'17-Mar'18	Oceana	22 July 2017			8,809.80									8,809.80
		LD288	GCS (XMO) to SJEP CY17	C.S. Olive	23 July 2017			8,634.60									8,634.60
		Summary of Saturday 22 July 2017						17,444.40									17,444.40
	Sunday 23 July 2017	LD138	GCS to Kobe IPP - Apr'17-Mar'18	Oceana	23 July 2017						8,476.80						8,476.80
		Summary of Sunday 23 July 2017									8,476.80						8,476.80
	Monday 24 July 2017	LD174	GCS (XMO) to SJEP CY17	C.S. Olive	24 July 2017						8,703.40						8,703.40
		Summary of Monday 24 July 2017									8,703.40						8,703.40
	Tuesday 25 July 2017	LD158	CM to Itochu (Tohoku EPC) - MO	Ever Imperial	25 July 2017						9,125.20						9,125.20
		LD346	CM to Itochu (Tohoku EPC) - MO	Ever Imperial	25 July 2017						8,604.00						8,604.00
		Summary of Tuesday 25 July 2017									17,729.20						17,729.20
	Wednesday 26 July 2017	LD160	Liddell to NSC JFY17- GC NEWC Apr-Jun	Tsukuba Maru	26 July 2017					9,183.90							9,183.90
		LD224	CM to Itochu (Tohoku EPC) - MO	Ever Imperial	26 July 2017						8,627.80						8,627.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD298	Liddell to NSC JFY17- GC NEWC Apr-Jun	Tsukuba Maru	27 July 2017					8,866.80							8,866.80
		Summary of Wednesday 26 July 2017								18,050.70	8,627.80						26,678.50
	Thursday 27 July 2017	LD152	Liddell to NSC JFY17- GC NEWC Apr-Jun	Ocean Creation	27 July 2017			9,279.00									9,279.00
		Summary of Thursday 27 July 2017						9,279.00									9,279.00
	Friday 28 July 2017	LD178	Liddell to NSC JFY17- GC NEWC Apr-Jun	Ocean Creation	28 July 2017			8,761.80									8,761.80
		Summary of Friday 28 July 2017						8,761.80									8,761.80
	Saturday 29 July 2017	LD160	Liddell to NSC JFY17- GC NEWC Apr-Jun	Ocean Creation	29 July 2017			1,375.85			1,764.62					5,855.52	8,996.00
		LD358	Liddell to NSC JFY17- GC NEWC Apr-Jun	Ocean Creation	29 July 2017			8,653.60									8,653.60
		Summary of Saturday 29 July 2017						10,029.45			1,764.62					5,855.52	17,649.60
	Monday 31 July 2017	LD152	Rav North to Pen - Jun'17- Feb'18	Giants Causeway	31 July 2017					1,320.73			7,973.07				9,293.80
		Summary of Monday 31 July 2017								1,320.73			7,973.07				9,293.80
	Wednesday 02 August 2017	LD258	GCS to Mazda (SCM) - Aug'17	Santa Paula	2 August 2017						9,292.80						9,292.80
		Summary of Wednesday 02 August 2017									9,292.80						9,292.80
	Thursday 03 August 2017	LD200	GCS to Mazda (SCM) - Aug'17	Santa Paula	3 August 2017						9,278.20						9,278.20
		Summary of Thursday 03 August 2017									9,278.20						9,278.20
	Friday 04 August 2017	LD222	GCS to Mazda (SCM) - Aug'17	Santa Paula	4 August 2017					3,009.56	5,617.84						8,627.40
		Summary of Friday 04 August 2017								3,009.56	5,617.84						8,627.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Saturday 05 August 2017	LD290	LD - UBE JFY'17 - Mit. Paper - 100kt April BM plus USD$0.75	Ocean Morning	6 August 2017					9,220.20							9,220.20
		Summary of Saturday 05 August 2017								9,220.20							9,220.20
	Sunday 06 August 2017	LD310	LD - UBE JFY'17 - Mit. Paper - 100kt April BM plus USD$0.75	Ocean Morning	7 August 2017					9,122.10							9,122.10
		Summary of Sunday 06 August 2017								9,122.10							9,122.10
	Tuesday 08 August 2017	LD304	LD - UBE JFY'17 - Mit. Paper - 100kt April BM plus USD$0.75	Ocean Morning	9 August 2017					8,868.90							8,868.90
		Summary of Tuesday 08 August 2017								8,868.90							8,868.90
	Friday 11 August 2017	LD264	MG to GIAG to KOSEP Aug	Pan Danglin	12 August 2017			9,166.00									9,166.00
		Summary of Friday 11 August 2017						9,166.00									9,166.00
	Saturday 12 August 2017	LD150	Cumnock to Kyushu EPC - Jul'17 - Jun'18	Sincere Salute	12 August 2017					8,565.80							8,565.80
		Summary of Saturday 12 August 2017								8,565.80							8,565.80
	Sunday 13 August 2017	LD134	Cumnock to Kyushu EPC - Jul'17 - Jun'18	Arcadia Salute	13 August 2017			9,121.70									9,121.70
		LD220	GCS to Kobe IPP - Apr'17- Mar'18	Rich Wave	13 August 2017			8,448.40									8,448.40
		LD266	Cumnock to Kyushu EPC - Jul'17 - Jun'18	Sincere Salute	13 August 2017					9,004.50							9,004.50
		Summary of Sunday 13 August 2017						17,570.10		9,004.50							26,574.60
	Friday 18 August 2017	LD348	Liddell to NSC JFY17- Fixed Price - $84.97	NSU Responsibility	18 August 2017			8,463.00									8,463.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Friday 18 August 2017						8,463.00									8,463.00
	Saturday 19 August 2017	LD304	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Responsibility	19 August 2017						8,841.40						8,841.40
		Summary of Saturday 19 August 2017									8,841.40						8,841.40
	Monday 21 August 2017	LD154	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Responsibility	21 August 2017	9,322.00											9,322.00
		LD192	GCS to Hokuriku EPC - Oct'16 - Sep'17-GC NEWC	Relyo	21 August 2017						8,570.60						8,570.60
		Summary of Monday 21 August 2017				9,322.00					8,570.60						17,892.60
	Tuesday 22 August 2017	LD146	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Responsibility	22 August 2017			6,046.73					3,150.47				9,197.20
		Summary of Tuesday 22 August 2017						6,046.73					3,150.47				9,197.20
	Thursday 24 August 2017	LD322	GCS (XMO) to SJEP CY17-Mutual option (1 shipment)	Houyo	25 August 2017			8,644.20									8,644.20
		Summary of Thursday 24 August 2017						8,644.20									8,644.20
	Friday 25 August 2017	LD356	GCS (XMO) to SJEP CY17-Mutual option (1 shipment)	Houyo	25 August 2017						8,590.80						8,590.80
		Summary of Friday 25 August 2017									8,590.80						8,590.80
	Sunday 27 August 2017	LD202	Bulga to Nakayama IPP - JFY2017	Star Iris	27 August 2017	4,326.31					4,529.69						8,856.00
		LD298	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Sage Sagittarius	28 August 2017						4,416.08		4,438.92				8,855.00
		Summary of Sunday 27 August 2017				4,326.31					8,945.76		4,438.92				17,711.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Monday 28 August 2017	LD164	XMO to Idemitsu - Jul17 - Dec'17 Suzukawa	Thor Menelaus	28 August 2017						4,552.82					4,609.18	9,162.00
		Summary of Monday 28 August 2017									4,552.82					4,609.18	9,162.00
	Tuesday 29 August 2017	LD144	(CM) to Tokuyama GC Newc	Rin Yo	29 August 2017						4,528.70		4,541.30				9,070.00
		LD304	(CM) to Tokuyama GC Newc	Rin Yo	30 August 2017						4,363.49		4,267.51				8,631.00
		LD330	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Sage Sagittarius	29 August 2017						4,438.41		4,386.59				8,825.00
		Summary of Tuesday 29 August 2017									13,330.60		13,195.40				26,526.00
	Wednesday 30 August 2017	LD164	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Sage Sagittarius	30 August 2017			8,659.00									8,659.00
		LD208	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Sage Sagittarius	30 August 2017			9,062.00									9,062.00
		LD304	MG to GIAG to EWP Aug	Oriental Navigator	31 August 2017						8,530.00						8,530.00
		Summary of Wednesday 30 August 2017						17,721.00			8,530.00						26,251.00
	Thursday 31 August 2017	LD128	Liddell to Chugoku - JFY17 - 90kt (Apr Ref Price)	Sage Sagittarius	31 August 2017								4,552.40			4,702.60	9,255.00
		LD168	LD - UBE JFY17 - JEN Oct BM	Sakizaya Glory	31 August 2017			9,225.00									9,225.00
		Summary of Thursday 31 August 2017						9,225.00					4,552.40			4,702.60	18,480.00
	Friday 01 September 2017	LD108	LD - UBE JFY17 - JEN Oct BM	Sakizaya Glory	1 September 2017			2,551.79			6,030.21						8,582.00
		Summary of Friday 01 September 2017						2,551.79			6,030.21						8,582.00
	Saturday 02 September 2017	LD214	LD - UBE JFY17 - JEN Oct BM	Sakizaya Glory	2 September 2017	7,065.21							2,052.79				9,118.00
		Summary of Saturday 02 September 2017				7,065.21							2,052.79				9,118.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Sunday 03 September 2017	LD142	XMO to Chugoku EPC - JFY17 4th shipment	Sincere Pisces	3 September 2017							9,023.00					9,023.00
		Summary of Sunday 03 September 2017										9,023.00					9,023.00
	Wednesday 06 September 2017	LD348	XCM to TOSOH JFY17 - 3rd/ 4th Shipment	Mitose	6 September 2017			4,578.17					4,755.83				9,334.00
		Summary of Wednesday 06 September 2017						4,578.17					4,755.83				9,334.00
	Thursday 07 September 2017	LD276	GCS to Ube - UBE own use October RP	Jozen	7 September 2017			9,253.00									9,253.00
		Summary of Thursday 07 September 2017						9,253.00									9,253.00
	Saturday 09 September 2017	LD296	Liddell to NSC JFY17- Fixed Price - $84.97	Hsin May	10 September 2017			9,025.00									9,025.00
		Summary of Saturday 09 September 2017						9,025.00									9,025.00
	Sunday 10 September 2017	LD176	Liddell to NSC JFY17- Fixed Price - $84.97	Hsin May	10 September 2017			8,460.00									8,460.00
		Summary of Sunday 10 September 2017						8,460.00									8,460.00
	Monday 11 September 2017	LD156	Liddell to JFE - Apr'17- Mar'18 (April RP - 1.75)	Azul Integra	11 September 2017			8,722.00									8,722.00
		LD218	Liddell to NSC JFY17- Fixed Price - $84.97	Hsin May	11 September 2017			6,886.18					2,198.82				9,085.00
		Summary of Monday 11 September 2017						15,608.18					2,198.82				17,807.00
	Wednesday 13 September 2017	LD128	Liddell to NSC JFY17- Fixed Price - $84.97	Hsin May	13 September 2017			5,882.73					2,637.27				8,520.00
		Summary of Wednesday 13 September 2017						5,882.73					2,637.27				8,520.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Thursday 14 September 2017	LD114	Liddell to JFE - Apr'17-Mar'18 (April RP - 1.75)	Azul Integra	14 September 2017			9,127.00									9,127.00
		LD164	Liddell to JFE - Apr'17-Mar'18 (April RP - 1.75)	Azul Integra	14 September 2017			9,108.00									9,108.00
		Summary of Thursday 14 September 2017						18,235.00									18,235.00
	Friday 15 September 2017	LD178	Liddell to JFE - Apr'17-Mar'18 (April RP - 1.75)	Azul Integra	15 September 2017			4,667.03				2,117.64	2,529.33				9,314.00
		Summary of Friday 15 September 2017						4,667.03				2,117.64	2,529.33				9,314.00
	Saturday 23 September 2017	LD122	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Newstar	23 September 2017			7,092.88					1,469.72				8,562.60
		LD164	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Newstar	23 September 2017			7,287.21					1,361.99				8,649.20
		Summary of Saturday 23 September 2017						14,380.09					2,831.71				17,211.80
	Sunday 24 September 2017	LD108	Liddell to NSC JFY17-Fixed Price - $84.97	NSU Newstar	24 September 2017	7,831.52							1,096.48				8,928.00
		Summary of Sunday 24 September 2017				7,831.52							1,096.48				8,928.00
	Tuesday 26 September 2017	LD184	Bulga to Chugoku EPC - 13% Ash Tranche 2	Houyo	26 September 2017			5,984.79					2,766.21				8,751.00
		Summary of Tuesday 26 September 2017						5,984.79					2,766.21				8,751.00
	Wednesday 27 September 2017	LD166	Liddell to Chugoku - JFY17 - 25kt (Oct/Dec'17 GC Newc)	Houyo	27 September 2017			5,934.82					2,602.78				8,537.60

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD252	Liddell to Chugoku - JFY17 - 25kt (Oct/ Dec'17 GC Newc)	Houyo	28 September 2017			6,487.38					2,575.62				9,063.00
		Summary of Wednesday 27 September 2017						12,422.21					5,178.39				17,600.60
	Thursday 28 September 2017	LD192	Liddell to NSC JFY17- Fixed Price - $84.97	NSU Responsibility	28 September 2017	5,898.85							2,703.15				8,602.00
		Summary of Thursday 28 September 2017				5,898.85							2,703.15				8,602.00
	Friday 29 September 2017	LD188	Liddell to NSC JFY17- Fixed Price - $84.97	NSU Responsibility	29 September 2017	5,908.08							2,806.52				8,714.60
		Summary of Friday 29 September 2017				5,908.08							2,806.52				8,714.60
	Saturday 30 September 2017	LD172	Liddell to NSC JFY17- Fixed Price - $84.97	NSU Responsibility	30 September 2017	6,209.64							2,718.36				8,928.00
		LD224	LD - UBE JFY'17 - YES - 60kt Oct BM	Nadine Venture	30 September 2017			9,079.40									9,079.40
		Summary of Saturday 30 September 2017				6,209.64		9,079.40					2,718.36				18,007.40
	Wednesday 04 October 2017	LD322	GCS to Kobe IPP - Apr'17- Mar'18	Legato II	5 October 2017								2,886.78		6,285.42		9,172.20
		Summary of Wednesday 04 October 2017											2,886.78		6,285.42		9,172.20
	Thursday 05 October 2017	LD122	GCS to Kobe IPP - Apr'17- Mar'18	Legato II	5 October 2017			4,642.75								3,909.45	8,552.20
		LD200	GCS to Kobe IPP - Apr'17- Mar'18	Legato II	5 October 2017						0.00		6,584.67		2,597.73		9,182.40
		Summary of Thursday 05 October 2017						4,642.75			0.00		6,584.67		2,597.73	3,909.45	17,734.60
	Friday 06 October 2017	LD230	GCS to Kobe IPP - Apr'17- Mar'18	Legato II	6 October 2017			5,059.17			0.00		3,892.23				8,951.40
		Summary of Friday 06 October 2017						5,059.17			0.00		3,892.23				8,951.40
	Saturday 07 October 2017	LD182	GCS to Beamplus #109	Genco Tiberius	7 October 2017								9,206.20				9,206.20

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD266	GCS to Beamplus #109	Genco Tiberius	7 October 2017								9,081.20				9,081.20
		Summary of Saturday 07 October 2017											18,287.40				18,287.40
	Sunday 08 October 2017	LD126	Q2 LDto China Steel Corp - JFY17	Ocean Happy	8 October 2017										8,795.00		8,795.00
		LD226	GCS to Kobe IPP - Apr'17-Mar'18	Legato II	8 October 2017	1,891.78					6,689.22						8,581.00
		LD276	GCS to Beamplus #109	Genco Tiberius	9 October 2017								8,654.20				8,654.20
		Summary of Sunday 08 October 2017				1,891.78					6,689.22		8,654.20		8,795.00		26,030.20
	Monday 09 October 2017	LD368	GCS to Beamplus #109	Genco Tiberius	9 October 2017								8,829.80				8,829.80
		Summary of Monday 09 October 2017											8,829.80				8,829.80
	Friday 13 October 2017	LD182	LD - UBE JFY'17 - Mit. Paper - 30kt Oct BM plus USD$1	Sagar Moti	13 October 2017			3,165.50			5,538.30						8,703.80
		Summary of Friday 13 October 2017						3,165.50			5,538.30						8,703.80
	Saturday 14 October 2017	LD172	GCS (XMO) to SJEP CY17- Mutual option (4 shipments)	Ishizuchi	14 October 2017						8,690.40						8,690.40
		LD222	LD - UBE JFY'17 - Mit. Paper - 30kt Oct BM plus USD$1	Sagar Moti	14 October 2017	9,150.20											9,150.20
		LD334	GCS to Hokkaido (Hepburn Thermal Coal) Oct'17-Sep'18	Corona Splendor	14 October 2017						9,244.00						9,244.00
		Summary of Saturday 14 October 2017				9,150.20					17,934.40						27,084.60
	Sunday 15 October 2017	LD178	GCS to Hokkaido (Hepburn Thermal Coal) Oct'17-Sep'18	Corona Splendor	15 October 2017						9,169.00						9,169.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		Summary of Sunday 15 October 2017									9,169.00						9,169.00
	Wednesday 18 October 2017	LD184	XMO to POSCO - Q4 CY17	Orient Angel	18 October 2017											9,149.40	9,149.40
		Summary of Wednesday 18 October 2017														9,149.40	9,149.40
	Thursday 19 October 2017	LD188	LD - UBE JFY'17 - Mit. Paper - 30kt Oct BM plus USD$1	Sagar Moti	19 October 2017											9,177.60	9,177.60
		LD228	LD - UBE JFY'17 - Mit. Paper - 30kt Oct BM plus USD$1	Sagar Moti	19 October 2017											8,697.60	8,697.60
		Summary of Thursday 19 October 2017														17,875.20	17,875.20
	Friday 20 October 2017	LD158	LD - UBE JFY'17 - Mit. Paper - 30kt Oct BM plus USD$1	Sagar Moti	20 October 2017											8,521.00	8,521.00
		LD240	LD - UBE JFY'17 - Mit. Paper - 30kt Oct BM plus USD$1	Sagar Moti	20 October 2017	8,645.00											8,645.00
		Summary of Friday 20 October 2017				8,645.00										8,521.00	17,166.00
	Saturday 21 October 2017	LD136	XMO to POSCO - Q4 CY17	Orient Angel	23 October 2017	8,655.40											8,655.40
		LD338	XMO to POSCO - Q4 CY17	Orient Angel	21 October 2017											8,630.00	8,630.00
		Summary of Saturday 21 October 2017				8,655.40										8,630.00	17,285.40
	Wednesday 25 October 2017	LD168	Saxonvale to Dalo - Jul'17 - Jun'18 Yr 1 of 3	Icicos Dignity	25 October 2017			8,848.40									8,848.40
		LD350	Saxonvale to Dalo - Jul'17 - Jun'18 Yr 1 of 3	Icicos Dignity	25 October 2017						9,201.60						9,201.60
		Summary of Wednesday 25 October 2017						8,848.40			9,201.60						18,050.00
	Thursday 26 October 2017	LD124	CM to Sendai Power Station Oct/ Nov 2017	Coral Gem	26 October 2017			4,594.23					4,581.77				9,176.00
		Summary of Thursday 26 October 2017						4,594.23					4,581.77				9,176.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Friday 27 October 2017	LD128	Liddell to NSC JFY17-Fixed Price - $84.97	Ototachibana	27 October 2017	8,484.40											8,484.40
		LD324	Saxonvale to Dalo - Jul'17 - Jun'18 Yr 1 of 3	Ioicos Dignity	27 October 2017			9,185.00									9,185.00
		Summary of Friday 27 October 2017				8,484.40		9,185.00									17,669.40
	Monday 30 October 2017	LD244	MO to Idemitsu - JFY'17 - Base tonnage April RP	Dyna Crane	30 October 2017			9,186.50									9,186.50
		Summary of Monday 30 October 2017						9,186.50									9,186.50
	Tuesday 31 October 2017	LD148	MO to Idemitsu - JFY'17 - Base tonnage April RP	Dyna Crane	31 October 2017			9,063.60									9,063.60
		Summary of Tuesday 31 October 2017						9,063.60									9,063.60
	Wednesday 01 November 2017	LD160	Liddell to NSC JFY17-Fixed Price - $84.97	Ototachibana	1 November 2017	9,150.60											9,150.60
		Summary of Wednesday 01 November 2017				9,150.60											9,150.60
	Thursday 02 November 2017	LD148	Liddell to NSC JFY17-Fixed Price - $84.97	Ototachibana	2 November 2017	8,582.40											8,582.40
		Summary of Thursday 02 November 2017				8,582.40											8,582.40
	Friday 03 November 2017	LD214	Liddell to NSC JFY17-Fixed Price - $84.97	Ototachibana	3 November 2017						8,587.40						8,587.40
		LD358	MO to Idemitsu - JFY'17 - Base tonnage April RP	Dyna Crane	3 November 2017							2,244.38			6,424.02		8,668.40
		Summary of Friday 03 November 2017									8,587.40	2,244.38			6,424.02		17,255.80

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Saturday 04 November 2017	LD172	GCS to Kobe IPP - Apr'17-Mar'18	Omicron Sky	4 November 2017						8,573.20						8,573.20
		Summary of Saturday 04 November 2017									8,573.20						8,573.20
	Sunday 05 November 2017	LD172	Liddell to NSC JFY17-Fixed Price - $84.97	Ototachibana	5 November 2017	7,086.44						2,138.86					9,225.30
		Summary of Sunday 05 November 2017				7,086.44						2,138.86					9,225.30
	Tuesday 07 November 2017	LD248	MO to Akemi IPP - JFY17 - Oct RP minus USD$1.50	Robin Wind	8 November 2017	8,521.60											8,521.60
		Summary of Tuesday 07 November 2017				8,521.60											8,521.60
	Saturday 11 November 2017	LD152	Liddell to NSC JFY17- GC NEWC Jul-Sep	H S C	11 November 2017	8,632.20											8,632.20
		LD192	XMO to Chugoku EPC - JFY17 6th & 7th shipment	Sincere Pisces	11 November 2017											8,794.20	8,794.20
		LD304	Liddell to NSC JFY17- GC NEWC Jul-Sep	H S C	12 November 2017	8,623.40											8,623.40
		Summary of Saturday 11 November 2017				17,255.60										8,794.20	26,049.60
	Sunday 12 November 2017	LD104	Q3 LD to China Steel Corp - JFY17	China Steel Sustainability	12 November 2017											8,928.00	8,928.00
		LD226	Q3 LD to China Steel Corp - JFY17	China Steel Sustainability	12 November 2017										8,934.40		8,934.40
		Summary of Sunday 12 November 2017													8,934.40	8,928.00	17,862.40
	Monday 13 November 2017	LD264	MO to Chugoku EPC - Spot	Mizunagi II	14 November 2017											9,129.40	9,129.40
		Summary of Monday 13 November 2017														9,129.40	9,129.40
	Wednesday 15 November 2017	LD226	Q3 LD to China Steel Corp - JFY17	China Steel Sustainability	15 November 2017			2,595.72							6,436.68		9,032.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD294	Liddell to JFE - Apr'17-Mar'18 (Oct RP-1.75)	Shin Koho	16 November 2017			3,949.89								4,585.31	8,535.20
		Summary of Wednesday 15 November 2017						6,545.61							6,436.68	4,585.31	17,567.60
	Saturday 18 November 2017	LD196	Liddell to JFE - Apr'17-Mar'18 (Oct RP-1.75)	Shin Koho	18 November 2017							1,125.14				7,388.26	8,513.40
		Summary of Saturday 18 November 2017										1,125.14				7,388.26	8,513.40
	Sunday 19 November 2017	LD218	Liddell to JFE - Apr'17-Mar'18 (Oct RP-1.75)	Shin Koho	19 November 2017							8,812.20					8,812.20
		Summary of Sunday 19 November 2017										8,812.20					8,812.20
	Friday 24 November 2017	LD226	CM to Hokkaido - Nov/Dec 2017	Shin Sapporo Maru	24 November 2017										8,861.90		8,861.90
		Summary of Friday 24 November 2017													8,861.90		8,861.90
	Saturday 25 November 2017	LD156	CM to Hokkaido - Nov/Dec 2017	Shin Sapporo Maru	25 November 2017						2,724.48					5,704.72	8,429.20
		Summary of Saturday 25 November 2017									2,724.48					5,704.72	8,429.20
	Sunday 26 November 2017	LD196	CM to Itochu (Tohoku EPC) - Additional panamax #1 (Oct/Dec'17)	Lily Fortune	26 November 2017			5,114.56						3,727.04		0.00	8,841.60
		Summary of Sunday 26 November 2017						5,114.56						3,727.04		0.00	8,841.60
	Monday 27 November 2017	LD144	GCS - Chugoku (Rav North) Oct'17 to sep'18	Sage Sagittarius	27 November 2017	8,905.40											8,905.40
		Summary of Monday 27 November 2017				8,905.40											8,905.40
	Sunday 03 December 2017	LD114	LD - UBE JFY'17 UBE own use 6kt GC NEWC Q3'17	Century Wave	3 December 2017				4,475.62			4,185.38					8,661.00
		Summary of Sunday 03 December 2017							4,475.62			4,185.38					8,661.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 06 December 2017	LD302	LD - UBE JFY'17 UBE own use 6kt GC NEWC Q3'17	Century Wave	6 December 2017				3,941.02		5,321.98						9,263.00
		LD358	Mt Owen to Shikoku EPC - JFY17 (Yr4-5) 6th shipment	Tachibana	6 December 2017				8,688.80								8,688.80
		Summary of Wednesday 06 December 2017							12,629.82		5,321.98						17,951.80
	Thursday 07 December 2017	LD132	Mt Owen to Shikoku EPC - JFY17 (Yr4-5) 6th shipment	Tachibana	7 December 2017	4,144.32									4,718.98		8,863.30
		LD256	Q3 GCS to NS&SM corp - JFY'17	Kashima Maru	8 December 2017	8,643.80											8,643.80
		Summary of Thursday 07 December 2017				12,788.12									4,718.98		17,507.10
	Friday 08 December 2017	LD138	Q3 LD to China Steel Corp - JFY17	China Steel Success	8 December 2017										8,835.80		8,835.80
		Summary of Friday 08 December 2017													8,835.80		8,835.80
	Saturday 09 December 2017	LD276	Q3 LD to China Steel Corp - JFY17	China Steel Success	10 December 2017		1,645.84								7,085.56		8,731.40
		Summary of Saturday 09 December 2017					1,645.84								7,085.56		8,731.40
	Sunday 10 December 2017	LD182	LD - UBE JFY'17 - YES - 60kt Oct BM	Calypso Island	10 December 2017				9,175.40								9,175.40
		LD256	LD - UBE JFY'17 - YES - 60kt Oct BM	Calypso Island	10 December 2017						6,997.98		1,799.22				8,797.20
		Summary of Sunday 10 December 2017							9,175.40		6,997.98		1,799.22				17,972.60
	Monday 11 December 2017	LD162	Q3 GCS to NS&SM corp - JFY'17	Kashima Maru	11 December 2017	9,038.40											9,038.40
		LD308	LD - UBE JFY'17 - YES - 60kt Oct BM	Calypso Island	12 December 2017				9,195.00								9,195.00
		Summary of Monday 11 December 2017				9,038.40			9,195.00								18,233.40

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
	Wednesday 13 December 2017	LD148	Q3 LD to China Steel Corp - JFY17	China Steel Success	13 December 2017	2,061.05	6,529.95										8,591.00
		LD244	LD - UBE JFY'17 - YES - 60kt Oct BM	Calypso Island	13 December 2017				9,152.80								9,152.80
		LD308	Q3 GCS(Rav North) to NS&SM corp - JFY'17	Ototachibana	14 December 2017	8,490.60											8,490.60
		Summary of Wednesday 13 December 2017				10,551.65	6,529.95		9,152.80								26,234.40
	Thursday 14 December 2017	LD222	Q3 GCS(Rav North) to NS&SM corp - JFY'17	Ototachibana	14 December 2017				8,650.00								8,650.00
		Summary of Thursday 14 December 2017							8,650.00								8,650.00
	Friday 15 December 2017	LD166	GCS to J Power - JFY17 Oct-Dec (Q4) Mutual Option	Rosco Poplar	15 December 2017		8,794.80										8,794.80
		LD256	Ulan to Talpower - CY17 (Yr5-6)	Hebei Shijiazhuang	15 December 2017		0.00				1,574.76	7,672.84					9,247.60
		LD276	LD - UBE JFY'17 - YES - 60kt Oct BM	Calypso Island	15 December 2017							8,815.00					8,815.00
		Summary of Friday 15 December 2017					8,794.80				1,574.76	16,487.84					26,857.40
	Saturday 16 December 2017	LD150	GCS to Ube - UBE own use October RP	Jozen	16 December 2017				2,941.35		6,217.65						9,159.00
		LD210	LD - UBE JFY'17 UBE own use 24kt Oct BM	Jozen	16 December 2017				4,063.82		4,727.58						8,791.40
		LD298	GCS to J Power - JFY17 Oct-Dec (Q4) Mutual Option	Rosco Poplar	17 December 2017		3,996.57				4,570.43						8,567.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD316	XMO to Chugoku EPC - JFY17 6th & 7th shipment	Sincere Pisces	16 December 2017		6,981.73		1,711.27								8,693.00
		LD346	GCS to Ube - UBE own use October RP	Jozen	16 December 2017				8,300.80								8,300.80
		Summary of Saturday 16 December 2017					10,978.29		17,017.24		15,515.67						43,511.20
	Sunday 17 December 2017	LD268	GCS to Hokkaido (3* 81 @ USD$94.75)	Tarumaesan Maru	18 December 2017				0.00		9,251.80						9,251.80
		LD388	XMO to Chugoku EPC - JFY17 6th & 7th shipment	Sincere Pisces	17 December 2017				8,628.60								8,628.60
		Summary of Sunday 17 December 2017							8,628.60		9,251.80						17,880.40
	Monday 18 December 2017	LD170	XMO to Chugoku EPC - JFY17 6th & 7th shipment	Sincere Pisces	18 December 2017				8,698.80			0.00					8,698.80
		LD318	LD - UBE JFY17 UBE own use 24kt Oct BM	Jozen	18 December 2017				4,388.05		4,239.95						8,628.00
		Summary of Monday 18 December 2017							13,086.85		4,239.95	0.00					17,326.80
	Tuesday 19 December 2017	LD152	Liddell to NSC JFY17- GC NEWC Jul-Sep	Nissaki	19 December 2017						9,304.00						9,304.00
		LD312	LD - UBE JFY17 UBE own use 24kt Oct BM	Jozen	19 December 2017				5,876.27		2,498.93						8,375.20
		LD364	Liddell to NSC JFY17- GC NEWC Jul-Sep	Nissaki	19 December 2017						8,743.20						8,743.20
		Summary of Tuesday 19 December 2017							5,876.27		20,546.13						26,422.40
	Wednesday 20 December 2017	LD152	Liddell to NSC JFY17- GC NEWC Jul-Sep	Nissaki	20 December 2017	8,907.00											8,907.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD338	GCS to Ube - Mizushima Energy (180kt)	ADS Arendal	21 December 2017				8,279.60								8,279.60
		LD362	Liddell to NSC JFY17- GC NEWC Jul-Sep	Nissaki	20 December 2017	7,274.52	1,166.48										8,441.00
		Summary of Wednesday 20 December 2017				16,181.52	1,166.48		8,279.60								25,627.60
	Friday 22 December 2017	LD144	XCM to TOSOH JFY'17 - 5th/ 6th Shipment	TTM Phoenix	22 December 2017				8,991.00								8,991.00
		LD264	Liddell to NSC JFY17- GC NEWC Jul-Sep	Nissaki	22 December 2017	8,644.00											8,644.00
		LD310	GCS to Ube - Mizushima Energy (180kt)	ADS Arendal	23 December 2017				8,502.60								8,502.60
		Summary of Friday 22 December 2017				8,644.00			17,493.60								26,137.60
	Saturday 23 December 2017	LD140	Liddell to NSC JFY17- GC NEWC Jul-Sep	Nissaki	23 December 2017						8,975.00						8,975.00
		LD256	LD - UBE JFY'17 - TEIJIN Oct BM 22kt	ADS Arendal	24 December 2017				8,525.00								8,525.00
		LD356	Liddell to NSC JFY17- GC NEWC Jul-Sep	Argolis	23 December 2017	8,886.00											8,886.00
		Summary of Saturday 23 December 2017				8,886.00			8,525.00		8,975.00						26,386.00
	Sunday 24 December 2017	LD126	Liddell to NSC JFY17- GC NEWC Jul-Sep	Argolis	24 December 2017	1,290.69							7,783.31				9,074.00
		LD290	Liddell to NSC JFY17- GC NEWC Jul-Sep	Argolis	24 December 2017	8,688.00											8,688.00

Freight Company	Depart Mine	Train No	Contract Description	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
						Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD356	LD - UBE JFY'17 - TEIJIN Oct BM 22kt	ADS Arendal	24 December 2017				1,932.15		7,287.85						9,220.00
		Summary of Sunday 24 December 2017				9,978.69			1,932.15		7,287.85		7,783.31				26,982.00
	Wednesday 27 December 2017	LD360	XMO to Idemitsu - Jul17 - Dec'17 Suzukawa	Earth Ocean	27 December 2017				9,124.00								9,124.00
		Summary of Wednesday 27 December 2017							9,124.00								9,124.00
	Thursday 28 December 2017	LD136	Q4 LD to China Steel Corp - JFY17	Sea Express	28 December 2017	4,050.84			5,112.46								9,163.30
		LD206	Mt Owen to Shikoku EPC - JFY17 (Yr4-5) Option	Corona Splendor	28 December 2017				8,682.40								8,682.40
		Summary of Thursday 28 December 2017				4,050.84			13,794.86								17,845.70
	Saturday 30 December 2017	LD232	NCA to JPow Newlands Switch	Tai Keystone	30 December 2017		8,709.00										8,709.00
		LD386	Liddell to Kyushu EPC - JFY'17	Corona Queen	30 December 2017								8,632.80				8,632.80
		Summary of Saturday 30 December 2017					8,709.00						8,632.80				17,341.80
	Sunday 31 December 2017	LD158	Liddell to Kyushu EPC - JFY'17	Corona Queen	31 December 2017	1,714.64	6,851.36										8,566.00
		LD206	Liddell to Kyushu EPC - JFY'17	Corona Queen	31 December 2017				8,705.20								8,705.20
		LD252	Liddell to Kyushu EPC - JFY'17	Corona Queen	31 December 2017				9,126.60								9,126.60
		Summary of Sunday 31 December 2017				1,714.64	6,851.36		17,831.80								26,397.80
	Summary of Pacific National					242,236.29	166,906.99	949,853.69	340,582.66	191,040.12	305,506.65	46,134.44	227,425.96	148,991.55	88,557.67	181,328.59	2,888,564.60
Summary of Liddell Coal Marketing Pty Ltd						242,236.29	166,906.99	949,853.69	340,582.66	191,040.12	305,506.65	46,134.44	227,425.96	148,991.55	88,557.67	181,328.59	2,888,564.60
Grand Total						242,236.29	166,906.99	949,853.69	340,582.66	191,040.12	305,506.65	46,134.44	227,425.96	148,991.55	88,557.67	181,328.59	2,888,564.60

COAL UNLOADED DELTA

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

Coal Receivals total	2,888,564.60
Coal Unloaded delta Total:	
Adj Total:	2,888,564.6

sbrennan Tue Jan 23 2018 13:40:40 GMT+1100 (AEDT)

Appendix B - Meterological Summary

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
01/01/2017	25.2	25	3.3	0.6
01/02/2017	26.5	25.5	4.5	0
01/03/2017	23.6	22.7	3.9	14.4
01/04/2017	19.6	19	2	0.4
01/05/2017	17.5	17.3	2.04	0
01/06/2017	11	10.9	1.83	0
01/07/2017	8.3	8.3	1.7	0
01/08/2017	12.8	12.3	2.9	0.2
01/09/2017	11.4	11.4	1.8	0
01/10/2017	18.2	17.9	2.4	0
01/11/2017	17.6	17.2	2.7	0
01/12/2017	27.24	26.67	2.69	0
02/01/2017	23.3	22.6	4.3	9.4
02/02/2017	26.7	25.9	4.4	0
02/03/2017	23.9	23.1	3	0
02/04/2017	18.3	17.6	3.84	3
02/05/2017	20.3	19.8	2.54	0
02/06/2017	11.8	11.3	2.43	0
02/07/2017	9.3	9	2	0
02/08/2017	11.4	11.2	2.1	0
02/09/2017	14.4	14.2	2.7	0
02/10/2017	16.4	16.3	1.9	0
02/11/2017	18.6	18.3	2.8	0
02/12/2017	24.97	24.36	4.2	21.4
03/01/2017	22.8	21.9	4.9	0
03/02/2017	25.9	25	3.6	0
03/03/2017	23.6	22.7	3.8	0
03/04/2017	17.2	16.5	3.59	2
03/05/2017	16.1	15.6	3.34	0
03/06/2017	14.6	14.1	1.45	0
03/07/2017	11	10.6	1.7	0.2
03/08/2017	11.9	11.5	2.5	12.2
03/09/2017	20.1	19.5	5.4	0
03/10/2017	20.1	19.5	2	0
03/11/2017	23.3	22.8	3.8	0
03/12/2017	22.31	21.54	5.59	0.2
04/01/2017	22.4	21.4	5	0
04/02/2017	28.9	27.5	3	0
04/03/2017	21.9	21.2	1.5	19.2
04/04/2017	17	16.3	3.2	3

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
04/05/2017	16	15.4	3.29	0
04/06/2017	14.1	13.9	1.12	0
04/07/2017	17.3	16.8	5.4	0
04/08/2017	13.7	13	6.9	0.2
04/09/2017	17.9	17.2	6.5	0
04/10/2017	20.6	20.2	2.7	0
04/11/2017	18.1	17.4	2.9	4.2
04/12/2017	21.14	20.28	3.78	0.4
05/01/2017	23.8	22.8	4.3	0
05/02/2017	32.8	32.3	3.3	0
05/03/2017	20.2	19.6	1.4	21
05/04/2017	16.9	16.1	2.52	5.4
05/05/2017	15.3	15.4	1.4	0
05/06/2017	12.1	11.7	2.32	0
05/07/2017	14.6	14	3.8	0
05/08/2017	15.7	15	6.2	0
05/09/2017	16	15.1	7.5	0
05/10/2017	23.9	23.2	2.4	0
05/11/2017	16.2	15.4	4.8	0.6
05/12/2017	20.14	19.27	3.25	2
06/01/2017	23.8	22.8	5.1	0
06/02/2017	34.1	33	4.1	0
06/03/2017	21.7	21.2	2.8	0.2
06/04/2017	16.4	15.8	2.04	3.4
06/05/2017	16.8	16.6	2.26	0.2
06/06/2017	12.8	12.1	4.45	0
06/07/2017	13.5	12.8	3.4	0
06/08/2017	15.7	15.2	4.8	0
06/09/2017	15.9	15.1	7.3	0
06/10/2017	21.6	21.2	3.4	0
06/11/2017	20.3	19.7	4.5	4
06/12/2017	21.85	21.03	3.95	1.8
07/01/2017	24.4	23.5	4.2	0
07/02/2017	27.5	26.6	5.6	0
07/03/2017	20	19.4	3.5	1.4
07/04/2017	17.6	17.1	2.79	0.2
07/05/2017	17.9	17.5	3.21	0
07/06/2017	11.2	10.6	2.31	14.4
07/07/2017	12.7	12	3.2	0
07/08/2017	15.9	15.2	7.1	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
07/09/2017	16	15.2	4.7	0
07/10/2017	17.6	16.7	4.5	0
07/11/2017	18.1	17.4	3.7	0
07/12/2017	26.26	25.83	3.25	0
08/01/2017	26.2	25.9	2.3	0
08/02/2017	25.1	24.1	5.1	0.6
08/03/2017	19.2	18.4	3.4	0.4
08/04/2017	18.4	18	1.58	0
08/05/2017	13.9	13.6	2.58	0
08/06/2017	14.2	13.7	1.7	8.8
08/07/2017	12.9	12.3	3.6	0
08/08/2017	13.8	13	6	0
08/09/2017	15.5	14.7	5.3	0
08/10/2017	17	16.3	1.7	1
08/11/2017	16	15.1	4.3	6
08/12/2017	24.66	24.21	3.57	0
09/01/2017	29.6	29.6	2.9	0
09/02/2017	28	26.7	2.2	0
09/03/2017	19.8	19	2.6	0.8
09/04/2017	20.6	20.1	3.85	8
09/05/2017	15	14.5	2.58	0
09/06/2017	14.1	13.5	1.89	4.2
09/07/2017	12.1	11.4	3.3	0
09/08/2017	14.1	13.4	3.6	0
09/09/2017	13.5	12.8	3.1	0
09/10/2017	23.8	23	3.8	0.2
09/11/2017	16.9	16.3	3.6	0
09/12/2017	21.11	20.32	3.85	5.2
10/01/2017	29.1	28.7	2.5	0
10/02/2017	33.1	31.1	2.5	0
10/03/2017	20.7	20.1	2.8	0
10/04/2017	15.9	15.2	6.64	0.4
10/05/2017	14.4	14.3	1.56	0
10/06/2017	14.5	13.8	2.83	1
10/07/2017	11.6	11.1	2.5	0
10/08/2017	16.2	15.5	4.5	0
10/09/2017	12.8	12.7	1.8	0
10/10/2017	20.2	19.4	4.4	0
10/11/2017	17.9	17.2	3.8	0
10/12/2017	22.04	21.21	3.48	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
11/01/2017	32.3	32.1	3.4	0
11/02/2017	36.1	35.4	3.7	0
11/03/2017	20.8	20.4	1.9	0
11/04/2017	19.2	18.6	3.45	0
11/05/2017	14.7	14.3	2.21	0
11/06/2017	14.5	13.9	1.91	0.6
11/07/2017	10.5	10.2	2.1	0
11/08/2017	21.3	20.7	6.1	0
11/09/2017	16.3	16.1	3.1	0
11/10/2017	24	23.4	1.8	0
11/11/2017	18.5	17.8	3.9	0
11/12/2017	23.44	22.75	3.17	0
12/01/2017	27	26.1	5.9	0
12/02/2017	32.2	31.7	4.4	0
12/03/2017	23.2	23.2	1.8	0
12/04/2017	19.2	18.5	2.85	0
12/05/2017	15.1	14.7	1.67	0.6
12/06/2017	15	14.4	1.49	0
12/07/2017	10.8	10.5	1.6	0
12/08/2017	16	15.3	4.6	0
12/09/2017	21.2	20.6	3.4	0
12/10/2017	23.9	23.2	5	3.2
12/11/2017	18.4	17.7	3.9	0
12/12/2017	25.53	24.71	3.24	0
13/01/2017	32.5	32	4.9	0
13/02/2017	25.4	26	3.8	0
13/03/2017	24.2	23.7	3.3	0
13/04/2017	18.7	18.1	1.94	0
13/05/2017	15.5	15.1	1.3	0
13/06/2017	15	14.4	2.46	0
13/07/2017	10.7	10.6	1.3	0
13/08/2017	14.9	14.4	2.5	0
13/09/2017	25.2	24.9	4.7	0
13/10/2017	20.5	20	2.2	0
13/11/2017	19	18.1	3.8	0
13/12/2017	28.29	27.86	2.31	0
14/01/2017	33.9	33.4	5.1	0
14/02/2017	23.9	22.9	6.3	0
14/03/2017	24.2	23.4	5.7	0
14/04/2017	18.7	18.5	1.51	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
14/05/2017	16	15.4	1.93	0.2
14/06/2017	15.1	14.4	1.97	0.6
14/07/2017	13.2	12.6	3.2	1.4
14/08/2017	15.5	14.9	3.1	0
14/09/2017	14.1	13.3	6.4	9.2
14/10/2017	18.2	17.4	4.8	8.2
14/11/2017	19.2	18.3	3.8	0
14/12/2017	31.92	31.68	2.63	0
15/01/2017	23.8	23	6.1	0
15/02/2017	24.3	23.4	3.7	0
15/03/2017	22.5	21.7	4.9	2.6
15/04/2017	17.9	17.7	2.25	0
15/05/2017	15.7	15.3	1.86	0.2
15/06/2017	14.8	14.3	1.48	0
15/07/2017	14	13.4	2	0
15/08/2017	17.7	17.3	3.1	0
15/09/2017	16	15.2	5.2	0
15/10/2017	19.5	18.6	4.6	0.2
15/11/2017	21	20.4	2.9	0
15/12/2017	28.3	27.65	3.99	0
16/01/2017	26.1	25.5	2.7	0
16/02/2017	28	27.6	2.2	0
16/03/2017	25.4	24.8	2.7	6.4
16/04/2017	18.9	18.6	2.37	0
16/05/2017	14.9	14.6	1.95	0
16/06/2017	14.2	13.6	1.74	0
16/07/2017	12.3	11.9	1.3	0
16/08/2017	20.8	20.2	7.4	0
16/09/2017	17.1	16.4	4.9	0
16/10/2017	18.6	17.8	5	0
16/11/2017	20.1	19.5	2.1	0
16/12/2017	28.88	28.2	2.57	0
17/01/2017	30.4	29.9	3.3	0
17/02/2017	26.9	27.8	2.9	17.2
17/03/2017	21.9	21.3	4.5	0.4
17/04/2017	18.3	18.1	2.47	0
17/05/2017	13.8	13.8	1.73	0
17/06/2017	14.9	14.4	1.26	0
17/07/2017	12.8	12.6	1.9	0
17/08/2017	17.5	16.8	6.5	0

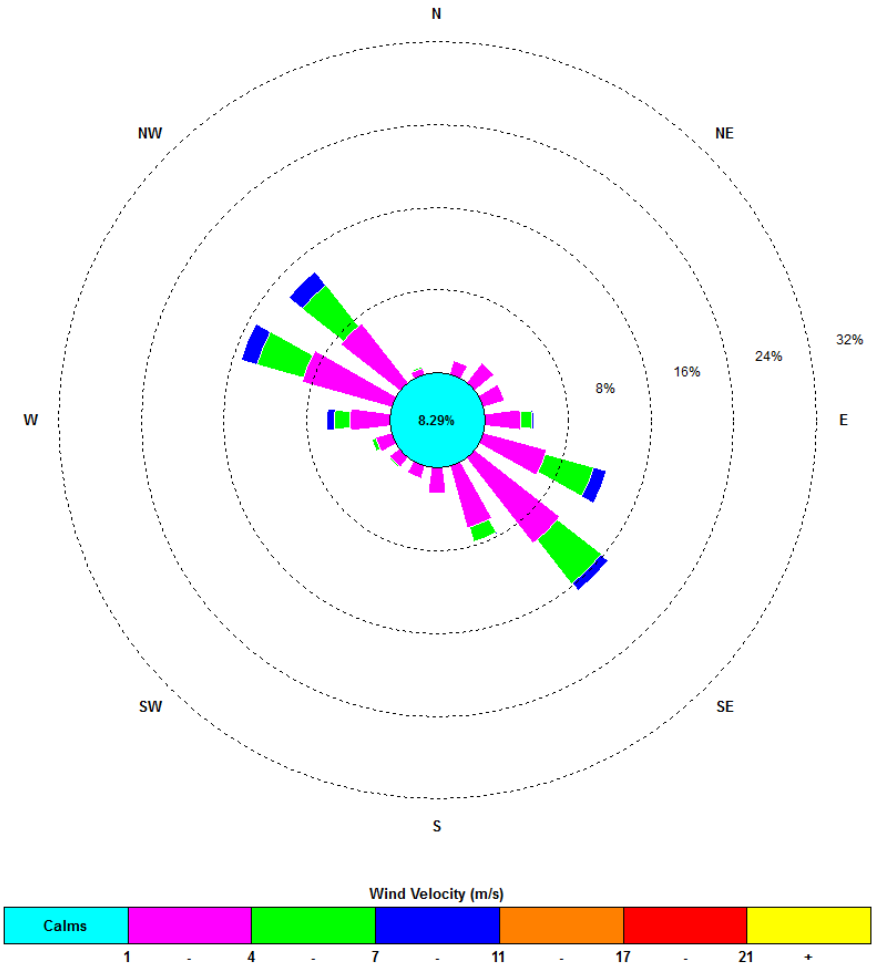
Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
17/09/2017	13.7	13.2	2.5	0
17/10/2017	20.3	19.4	5	0
17/11/2017	21.4	20.5	3.5	0.2
17/12/2017	26.6	25.83	3.55	0.2
18/01/2017	33.3	32.7	7.3	0
18/02/2017	27.1	25.8	3.6	2.2
18/03/2017	21.8	21.1	7.2	12.6
18/04/2017	18.5	18.3	2.11	0
18/05/2017	14.9	14.8	2.13	0
18/06/2017	15	14.4	2.52	0.2
18/07/2017	16.4	15.8	4.7	0
18/08/2017	14.7	13.9	7.4	0
18/09/2017	17.2	17	2.9	0
18/10/2017	21.8	20.9	4.3	0
18/11/2017	19.6	19	2.1	6.8
18/12/2017	27.55	26.85	2.52	0.2
19/01/2017	22.2	21.3	5.2	0.8
19/02/2017	22.7	21.9	2.6	5.2
19/03/2017	25.1	24.5	4.2	11
19/04/2017	18.9	18.6	2.31	0
19/05/2017	15.4	15	1.54	16.4
19/06/2017	16.2	15.4	3.07	0.2
19/07/2017	13.6	12.9	6.1	0
19/08/2017	12.2	11.6	3.4	0
19/09/2017	20.2	19.9	5	0
19/10/2017	22.6	22.3	1.8	0
19/11/2017	19.4	18.7	4.4	0.2
19/12/2017	32.36	31.77	3.39	0.2
20/01/2017	25.2	24.8	4.4	6.6
20/02/2017	23.1	24.1	4.1	0
20/03/2017	24.6	24	1.9	0
20/04/2017	18.2	17.8	2.62	0
20/05/2017	17.9	17.3	1.51	16
20/06/2017	15.3	14.7	2.03	0.2
20/07/2017	13.4	12.6	5.9	0
20/08/2017	10.3	10.4	2	0
20/09/2017	14.8	14.7	1.6	0
20/10/2017	19	18.4	3	27.8
20/11/2017	20.8	20	4.6	2.8
20/12/2017	32.64	32.02	4.97	0.8

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
21/01/2017	24.1	23.2	5.4	0
21/02/2017	22.2	21.9	2.8	0
21/03/2017	25.2	24.7	1.8	0
21/04/2017	17.5	17.4	1.47	0
21/05/2017	18	17.4	1.77	0.4
21/06/2017	13.7	13.2	2.59	0
21/07/2017	11	10.7	2.4	0
21/08/2017	10.8	10.6	2.1	0
21/09/2017	18.6	18.3	2.7	0
21/10/2017	16.1	15.3	3.9	0
21/11/2017	20.4	19.4	4.5	0
21/12/2017	22.34	21.62	4.59	0.6
22/01/2017	24	23.2	3.8	0
22/02/2017	24.8	24.3	2.6	0
22/03/2017	24.5	23.9	2.9	6.8
22/04/2017	17.5	17.4	1.11	1.6
22/05/2017	17.8	17.2	2.06	0
22/06/2017	13	12.8	1.55	0.2
22/07/2017	11.3	10.6	3.2	0
22/08/2017	13.9	13.5	2.3	0
22/09/2017	22.4	21.9	3.3	0
22/10/2017	16.5	15.9	2.6	0.2
22/11/2017	19.8	19	3.9	0
22/12/2017	22.61	21.82	3.41	1.2
23/01/2017	28.1	27.7	1.9	0
23/02/2017	26.6	26.1	2.5	0
23/03/2017	21.7	21.1	2.6	4.8
23/04/2017	18.5	18.3	1.78	0.2
23/05/2017	18.2	17.7	1.89	0
23/06/2017	13.4	12.8	3.06	0
23/07/2017	13.9	13.2	4.8	0
23/08/2017	15.2	15.1	1.8	0
23/09/2017	27.4	26.9	4.8	0
23/10/2017	17.1	16.2	3.8	3.2
23/11/2017	22	21.3	2.3	0
23/12/2017	27.31	26.54	2.83	0
24/01/2017	32.3	31.8	6.2	0
24/02/2017	25.7	24.9	3.9	0
24/03/2017	20.4	19.7	3.6	22.8
24/04/2017	18.5	18.3	1.88	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
24/05/2017	18.2	17.5	3.93	0
24/06/2017	15.3	14.7	3.25	0
24/07/2017	15.3	14.7	3.9	0
24/08/2017	14.8	14.1	2.9	0
24/09/2017	29.9	29.4	5.9	0
24/10/2017	21.2	20.7	2.9	0
24/11/2017	23.5	23.2	2.3	0
24/12/2017	29.7	29.42	4.02	0
25/01/2017	21.6	20.8	4.2	2.2
25/02/2017	22.6	21.7	4.4	3.4
25/03/2017	21.3	20.6	1.9	2.8
25/04/2017	20.3	19.9	3.02	2.4
25/05/2017	14.8	14.3	1.8	0
25/06/2017	15.3	14.6	3.24	0
25/07/2017	14.3	13.6	3.3	0
25/08/2017	13.5	12.9	3.1	0
25/09/2017	24	23.4	5.4	0
25/10/2017	24.6	24	3.1	0
25/11/2017	23.3	22.6	3.9	0
25/12/2017	20.91	20.15	5.33	0.6
26/01/2017	22.5	21.8	2.9	0.4
26/02/2017	21.8	21	4.5	2.4
26/03/2017	23.2	22.6	2.1	0
26/04/2017	17.9	17.1	5.02	1
26/05/2017	14	13.5	2.49	0
26/06/2017	13.3	13	2.17	0
26/07/2017	16.9	16.3	5.3	0
26/08/2017	13.1	12.7	2.2	0
26/09/2017	18.9	18.2	3	0
26/10/2017	21.6	21	3.4	20.8
26/11/2017	24	23.1	2.9	0
26/12/2017	20.18	19.39	4.79	0.8
27/01/2017	24.6	23.7	4.5	0.4
27/02/2017	22	21.1	4.3	10.4
27/03/2017	23.1	22.6	1.4	0
27/04/2017	14.3	13.5	3.22	0
27/05/2017	13.9	13.9	1.35	0
27/06/2017	10.1	10.2	1.23	0
27/07/2017	12.6	12.5	1.7	0
27/08/2017	14.2	13.3	4.9	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
27/09/2017	19.4	18.7	2.2	0
27/10/2017	18.5	17.8	2.8	1.4
27/11/2017	22.5	21.8	2.5	0
27/12/2017	23.82	22.92	5.34	0
28/01/2017	27.7	27.2	2.3	4.6
28/02/2017	22	21.2	3.5	4
28/03/2017	25.8	25.1	2.8	0
28/04/2017	15.1	14.7	1.6	0
28/05/2017	16.5	16	3.71	0.2
28/06/2017	12.8	12.2	2.15	2.8
28/07/2017	13.8	13.2	3.5	0
28/08/2017	11.5	11	2	0
28/09/2017	22	21.5	3.8	0
28/10/2017	22.7	22.2	2.1	0
28/11/2017	23.4	22.5	3.7	0
28/12/2017	26.32	25.76	2.48	0
29/01/2017	28.9	28.6	2.3	0
29/03/2017	27	26.4	2.3	0
29/04/2017	15.6	15.2	3.03	0
29/05/2017	14.4	13.7	4.27	0
29/06/2017	12.8	12.1	1.89	2.8
29/07/2017	13.8	13.1	3.1	0
29/08/2017	11	10.9	2.2	0
29/09/2017	21.5	20.7	4.3	0
29/10/2017	27.4	26.9	4.1	0
29/11/2017	23.8	22.9	4.4	0
29/12/2017	30.63	30.2	2.66	0
30/01/2017	31.4	31	3.6	0
30/03/2017	23.5	22.9	2.9	62
30/04/2017	15.7	15.7	2.09	0
30/05/2017	11.8	11	3.7	0
30/06/2017	11.2	10.7	2.27	0.2
30/07/2017	17.9	17.4	3.7	0
30/08/2017	13.4	13	2.6	0
30/09/2017	21.2	20.5	4.2	0
30/10/2017	26.8	26.5	4.8	0
30/11/2017	25.4	24.5	3.1	0
30/12/2017	29.23	28.58	5.36	1.6
31/01/2017	33.5	32.9	4.8	0
31/03/2017	18.5	17.9	3.4	0.2

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
31/05/2017	11.7	11.4	2.5	0
31/07/2017	14.2	14	3.2	0.6
31/08/2017	12.6	12.2	2.7	0
31/10/2017	17.7	16.9	3.5	0
31/12/2017	24.87	23.9	5.48	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-17	3.7	2.4	1.1	0.6	4
Feb-17	3.1	2.1	2.4	1.6	4
Mar-17	1.8	1.1	2.2	1.5	4
Apr-17	3.2	1.5	1.9	1	4
May-17	2.2	1.5	1.4	1.1	4
Jun-17	1.6	1.1	0.9	0.5	4
Jul-17	2.8	1.4	1	0.6	4
Aug-17	0.9	0.6	0.5	0.3	4
Sep-17	1	0.7	0.7	0.5	4
Oct-17	1.7	1.2	0.9	0.4	4
Nov-17	1.3	0.8	1.1	0.6	4
Dec-17	4.8	3	4.3	2.2	4

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

High Volume Air Sampling Compliance Monitoring Results – TSP					
Date	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
6-Jan-17	27	30	42	46	90
12-Jan-17	55	30	67	47	90
18-Jan-17	41	30	70	47	90
24-Jan-17	35	30	46	47	90
30-Jan-17	43	30	52	47	90
5-Feb-17	33	30	41	46	90
11-Feb-17	60	31	101	47	90
17-Feb-17	73	29	79	48	90
23-Feb-17	67	30	114	46	90
1-Mar-17	18	29	25	45	90
7-Mar-17	25	29	33	45	90
13-Mar-17	64	29	84	45	90
19-Mar-17	21	29	30	45	90
25-Mar-17	26	29	40	45	90
31-Mar-17	24	29	30	43	90
6-Apr-17	19	28	20	43	90
12-Apr-17	34	27	48	43	90
18-Apr-17	21	27	44	42	90
24-Apr-17	27	27	68	42	90
30-Apr-17	17	27	34	42	90
6-May-17	24	27	29	42	90
12-May-17	48	27	75	42	90
18-May-17	40	28	56	43	90
24-May-17	22	27	30	43	90
30-May-17	10	27	23	42	90
5-Jun-17	20	27	36	42	90
11-Jun-17	20	28	24	43	90
17-Jun-17	43	28	62	43	90
23-Jun-17	23	29	28	43	90
29-Jun-17	6	29	10	43	90
5-Jul-17	12	28	22	44	90
11-Jul-17	31	29	38	44	90
17-Jul-17	14	29	21	44	90
23-Jul-17	15	29	24	43	90
29-Jul-17	9	29	16	43	90
4-Aug-17	4	29	9	43	90
10-Aug-17	12	29	19	43	90
16-Aug-17	27	29	44	44	90
22-Aug-17	53	29	65	44	90
28-Aug-17	37	30	44	44	90
3-Sep-17	29	30	43	44	90
9-Sep-17	45	30	51	45	90

High Volume Air Sampling Compliance Monitoring Results – TSP					
15-Sep-17	22	31	37	44	90
21-Sep-17	22	31	27	44	90
27-Sep-17	66	32	91	45	90
3-Oct-17	61	32	118	47	90
9-Oct-17	27	32	47	48	90
15-Oct-17	31	32	33	47	90
21-Oct-17	24	32	30	47	90
27-Oct-17	21	32	24	47	90
2-Nov-17	48	32	64	47	90
8-Nov-17	10	32	21	46	90
14-Nov-17	42	32	50	46	90
20-Nov-17	39	32	40	46	90
26-Nov-17	51	32	74	46	90
2-Dec-17	13	31	21	45	90
8-Dec-17	80	32	72	45	90
14-Dec-17	92	33	72	46	90
20-Dec-17	33	33	51	46	90
26-Dec-17	19	33	29	45	90

High Volume Air Sampling Compliance Monitoring Results – PM10						
Date	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-17	9	11	12	17	50	30
12-Jan-17	29	11	30	17	50	30
18-Jan-17	16	11	25	17	50	30
24-Jan-17	19	11	22	17	50	30
30-Jan-17	15	11	18	17	50	30
5-Feb-17	12	11	16	17	50	30
11-Feb-17	31	12	50	17	50	30
17-Feb-17	36	12	34	17	50	30
23-Feb-17	26	12	38	18	50	30
1-Mar-17	6	12	8	17	50	30
7-Mar-17	9	12	14	17	50	30
13-Mar-17	25	12	31	17	50	30
19-Mar-17	8	12	8	17	50	30
25-Mar-17	11	12	16	17	50	30
31-Mar-17	11	12	11	17	50	30
6-Apr-17	8	12	10	16	50	30
12-Apr-17	11	12	14	16	50	30
18-Apr-17	9	11	17	16	50	30
24-Apr-17	12	11	24	16	50	30
30-Apr-17	7	11	16	16	50	30
6-May-17	8	11	14	16	50	30
12-May-17	21	11	31	16	50	30
18-May-17	16	11	27	16	50	30
24-May-17	9	11	12	16	50	30
30-May-17	4	11	13	16	50	30
5-Jun-17	8	11	18	16	50	30
11-Jun-17	7	11	9	16	50	30
17-Jun-17	16	12	21	16	50	30
23-Jun-17	9	12	14	17	50	30
29-Jun-17	2	12	6	17	50	30
5-Jul-17	5	12	11	17	50	30
11-Jul-17	12	12	18	17	50	30
17-Jul-17	6	12	13	17	50	30
23-Jul-17	5	12	9	17	50	30
29-Jul-17	4	12	7	17	50	30
4-Aug-17	1	12	2	17	50	30
10-Aug-17	7	12	7	17	50	30
16-Aug-17	17	12	26	17	50	30
22-Aug-17	24	12	24	17	50	30
28-Aug-17	14	12	13	17	50	30
3-Sep-17	14	12	18	17	50	30
9-Sep-17	12	12	14	17	50	30

High Volume Air Sampling Compliance Monitoring Results – PM10						
15-Sep-17	7	12	11	17	50	30
21-Sep-17	10	12	13	17	50	30
27-Sep-17	34	13	34	18	50	30
3-Oct-17	22	13	34	18	50	30
9-Oct-17	11	13	25	18	50	30
15-Oct-17	9	13	10	18	50	30
21-Oct-17	12	13	14	18	50	30
27-Oct-17	11	13	12	18	50	30
2-Nov-17	17	13	25	18	50	30
8-Nov-17	0	13	4	18	50	30
14-Nov-17	11	13	14	18	50	30
20-Nov-17	8	13	11	18	50	30
26-Nov-17	18	13	21	18	50	30
2-Dec-17	6	13	9	17	50	30
8-Dec-17	32	13	32	18	50	30
14-Dec-17	33	13	28	18	50	30
20-Dec-17	19	13	29	18	50	30
26-Dec-17	6	13	10	18	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	8.04	866	455	8	8.34	2300	1480	9	8.13	1120	665	5	8.20	1140	632	6	8.41	1160	688	32	8.47	1700	993	74
Feb	7.91	912	505	8	7.83	3060	1950	<5	7.84	1180	606	<5	8.00	1140	668	<5	8.34	1230	759	38	8.42	2160	1250	164
Mar	7.73	863	592	8	7.82	963	646	20	7.22	1000	680	45	7.24	1100	698	58	7.97	1090	694	56	7.95	1820	1120	128
Apr	7.96	655	438	<5	7.89	796	506	<5	7.95	833	539	<5	7.95	848	551	9	7.99	871	546	14	8.01	953	587	5
May	8.01	770	412	6	8.07	927	538	8	8.03	995	554	6	8.03	1130	634	8	8.06	1110	614	16	8.02	1230	724	14
Jun	8.11	819	438	<5	8.17	957	494	6	8.08	927	507	<5	8.13	964	504	<5	8.17	1000	538	6	8.20	1040	568	10
Jul	8.04	844	464	9	8.05	1140	626	7	8.03	1080	588	<5	8.17	1060	572	<5	8.22	1060	592	9	8.22	1180	638	7
Aug	7.67	857	467	<5	7.51	1280	826	<5	7.44	1040	613	13	7.29	1040	594	<5	8.17	1050	636	6	8.04	1290	807	<5
Sep	7.74	860	478	<5	7.83	2270	1310	8	7.61	1070	619	<5	7.62	1080	594	<5	8.07	1090	648	17	8.06	1420	844	6
Oct	7.73	860	538	<5	7.70	3060	2100	<5	7.74	1040	636	<5	7.69	1090	696	<5	7.99	1080	677	17	8.09	1580	981	6
Nov	8.00	886	504	10	7.95	3050	2110	<5	8.07	1100	636	8	7.89	1120	621	40	8.22	1190	696	26	8.33	1860	1110	18
Dec	7.93	914	522	10	7.80	4160	2990	11	7.54	1160	681	8	Dry	Dry	Dry	Dry	8.19	1230	728	42	8.22	2090	1320	33

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	8.47	1880	1080	8	8.23	1340	762	5	8.30	3830	2440	10	8.39	4950	3130	8	Dry	Dry	Dry	Dry
Feb	8.40	2050	1180	22	7.65	1430	804	11	7.87	3860	2260	7	8.13	5340	3230	8	Dry	Dry	Dry	Dry
Mar	8.04	1910	1130	12	7.31	1380	864	18	7.70	3510	2350	<5	8.05	4360	2740	<5	Dry	Dry	Dry	Dry
Apr	8.13	1050	628	6	8.12	1060	644	<5	7.98	3900	2570	<5	8.26	5100	3400	<5	Dry	Dry	Dry	Dry
May	8.12	1250	726	7	8.04	1330	766	5	7.84	2640	1710	14	8.13	3910	2580	8	Dry	Dry	Dry	Dry
Jun	8.23	1040	638	5	8.18	1190	613	6	7.90	3970	2240	10	8.27	5060	3270	19	Dry	Dry	Dry	Dry
Jul	8.24	1400	766	<5	8.07	1350	763	7	8.02	3970	2480	8	8.35	5260	3280	5	Dry	Dry	Dry	Dry
Aug	8.13	1730	1030	<5	7.54	1290	798	<5	7.78	3530	2380	8	8.25	4750	3220	<5	Dry	Dry	Dry	Dry
Sep	8.14	1820	1070	<5	7.73	1320	772	<5	7.86	3460	2230	6	8.11	4340	2840	<5	Dry	Dry	Dry	Dry
Oct	8.18	1980	1220	<5	7.63	1380	872	<5	7.86	3410	2350	7	8.17	4560	2990	<5	Dry	Dry	Dry	Dry
Nov	8.42	1940	1150	<5	7.95	1470	842	<5	8.01	3340	2290	9	8.30	4460	3020	<5	Dry	Dry	Dry	Dry
Dec	8.28	1970	1090	27	7.81	1590	1010	11	7.94	3740	2130	11	8.17	5270	3340	6	Dry	Dry	Dry	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	7.21	1.17	3.84	Clear	Nil	Clear	7.69	1.28	3.36	Clear	Nil	Clear	7.52	2.74	4.40	Clear	Nil	Clear
Feb	7.23	1.08	4.20	Clear	Nil	Clear	7.73	1.18	3.79	Clear	Nil	Clear	7.50	2.66	4.43	Clear	Nil	Clear
Mar	7.30	1.12	4.54	Brown	Nil	Slight	7.75	1.23	4.06	Clear	Nil	Clear	7.49	2.66	4.39	Clear	Nil	Clear
Apr	7.12	1.14	3.13	Brown	Nil	Slight	7.61	1.27	2.56	Clear	Nil	Clear	7.31	2.79	4.20	Clear	Nil	Clear
May	6.97	1.14	3.28	Clear	Nil	Clear	7.68	1.15	2.69	Grey	Nil	Slight	7.27	2.75	4.35	Clear	Nil	Clear
Jun	7.06	1.19	3.31	Brown	Nil	Slight	7.72	1.33	2.70	Grey	Nil	Slight	7.35	2.78	4.37	Clear	Nil	Clear
Jul	7.18	1.16	3.40	Clear	Nil	Slight	7.91	1.28	2.77	Clear	Nil	Clear	7.32	2.99	4.39	Clear	Nil	Clear
Aug	6.91	1.18	3.56	Orange	Nil	Slight	7.70	1.32	2.98	Grey	Nil	Slight	7.20	2.40	4.44	Clear	Nil	Clear
Sep	6.94	1.16	3.90	Orange	Nil	Slight	7.68	1.31	3.41	Clear	Nil	Slight	7.28	2.21	4.44	Clear	Nil	Clear
Oct	7.15	1.28	4.28	Orange	Nil	Turbid	7.92	1.43	3.89	Clear	Nil	Clear	7.54	2.23	4.44	Clear	Nil	Clear
Nov	7.09	1.20	4.50	Orange	Nil	Slight	7.97	1.32	4.10	Clear	Nil	Clear	7.54	1.97	4.50	Clear	Nil	Clear
Dec	7.19	1.18	4.76	Orange	Nil	Slight	8.23	1.32	4.37	Clear	Nil	Slight	7.84	2.01	4.58	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	7.82	2.79	4.09	Clear	Nil	Clear	7.70	1.09	5.13	Clear	Nil	Clear	7.60	2.91	5.35	Clear	Yes	Slight
Feb	7.77	2.61	4.19	Clear	Nil	Clear	7.72	1.05	5.32	Clear	Nil	Slight	7.67	2.75	5.59	Clear	Yes	Clear
Mar	7.78	2.64	4.10	NR	Yes	NR	7.67	1.10	5.56	Clear	Nil	Clear	7.77	2.85	5.83	Clear	Yes	Clear
Apr	7.65	2.72	3.87	Clear	Yes	Clear	7.55	1.09	4.85	Clear	Nil	Clear	7.52	2.17	5.02	Clear	Yes	Clear
May	7.61	2.71	4.10	Grey	Nil	Slight	7.21	0.95	4.97	Clear	Nil	Clear	7.44	2.20	5.14	Clear	Yes	Slight
Jun	7.78	2.84	4.14	Grey	Yes	Clear	7.29	1.09	4.95	Clear	Nil	Clear	7.52	2.23	5.13	Grey	Yes	Slight
Jul	7.92	2.72	4.18	Grey	Yes	Slight	7.12	1.03	5.01	Clear	Nil	Clear	7.61	2.14	5.18	Clear	Yes	Slight
Aug	7.72	2.76	4.32	Clear	Nil	Clear	7.02	1.06	5.06	Clear	Nil	Clear	7.41	2.20	5.24	Clear	Nil	Clear
Sep	7.63	2.73	4.30	Clear	Nil	Clear	7.21	1.07	5.12	Clear	Nil	Clear	7.38	2.18	5.33	Clear	Yes	Clear
Oct	7.91	2.86	4.34	Clear	Nil	Clear	7.37	1.21	5.35	Clear	Nil	Clear	7.73	2.37	5.69	Clear	Nil	Clear
Nov	7.89	2.84	4.40	Clear	Nil	Clear	7.29	1.16	5.55	Clear	Nil	Clear	7.73	2.34	5.79	Clear	Yes	Clear
Dec	8.15	2.85	4.53	Clear	Nil	Clear	7.25	1.15	5.73	Clear	Nil	Clear	7.78	2.46	6.01	Grey	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	7.14	1.57	5.19	Clear	Nil	Clear	7.51	5.24	5.67	Clear	Nil	Clear	7.54	5.74	9.81	Clear	Nil	Clear
Feb	7.17	1.47	5.35	Clear	Nil	Clear	7.44	4.84	5.85	Clear	Yes	Clear	7.49	5.43	10.26	Clear	Nil	Clear
Mar	7.33	1.48	5.45	Clear	Nil	Clear	7.51	4.90	5.97	Clear	Nil	Clear	7.54	5.49	9.29	Clear	Nil	Clear
Apr	7.27	1.46	4.78	Clear	Nil	Clear	7.39	5.02	5.18	Clear	Nil	Clear	7.40	5.62	9.72	Clear	Nil	Clear
May	6.79	1.49	4.91	Clear	Nil	Clear	7.32	5.05	5.36	Grey	Yes	Slight	7.35	5.62	10.88	Clear	Nil	Clear
Jun	7.30	1.55	4.91	Clear	Nil	Clear	7.42	5.24	5.39	Grey	Yes	Slight	7.45	5.76	11.39	Clear	Nil	Clear
Jul	6.97	1.55	4.86	Clear	Nil	Clear	7.56	5.05	5.44	Clear	Nil	Clear	7.62	5.61	10.27	Clear	Nil	Clear
Aug	6.68	1.54	5.00	Clear	Nil	Clear	7.28	5.20	5.57	Clear	Nil	Clear	7.28	5.78	10.81	Clear	Nil	Clear
Sep	6.75	1.5	5.12	Clear	Nil	Clear	7.37	4.99	5.68	Clear	Nil	Clear	7.18	5.67	10.78	Clear	Nil	Clear
Oct	6.97	1.61	5.34	Clear	Nil	Clear	7.61	5.21	5.87	Clear	Nil	Clear	7.47	5.87	10.84	Clear	Nil	Clear
Nov	6.93	1.55	5.45	Orange	Nil	Turbid	7.81	5.25	6.02	Clear	Nil	Clear	7.56	5.89	11.08	Clear	Nil	Clear
Dec	6.94	1.52	5.52	Orange	Nil	Turbid	7.79	5.32	6.14	Clear	Nil	Slight	7.99	6.02	11.40	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	7.26	6.01	9.88	Grey	Yes	Slight	7.19	1.82	6.56	Clear	Nil	Clear	7.34	2.15	8.73	Clear	Yes	Clear
Feb	7.27	5.57	10.08	Grey	Nil	Slight	7.27	1.67	6.61	Clear	Nil	Clear	7.29	2.01	8.84	Clear	Yes	Clear
Mar	7.27	5.72	9.66	Grey	Yes	Turbid	7.35	1.67	6.63	Grey	Nil	Slight	7.43	1.96	9.01	Clear	Yes	Slight
Apr	7.11	5.85	9.64	Grey	Yes	Slight	7.23	1.69	6.33	Clear	Nil	Slight	7.47	2.04	8.52	Clear	Yes	Slight
May	7.15	5.86	10.27	Grey	Nil	Slight	7.21	1.70	6.38	Grey	Nil	Slight	7.33	2.08	8.55	Grey	Yes	Slight
Jun	7.30	6.01	10.54	Brown	Nil	Turbid	7.23	1.75	6.45	Clear	Nil	Slight	7.42	2.31	8.55	Grey	Yes	Slight
Jul	7.31	5.69	9.97	Brown	Nil	Turbid	7.26	1.72	6.48	Grey	Nil	Slight	7.37	2.07	8.63	Clear	Yes	Clear
Aug	7.11	5.86	10.36	Brown	Nil	Turbid	7.04	1.74	6.55	Clear	Nil	Clear	7.15	2.09	8.81	Clear	Nil	Clear
Sep	7.02	5.8	10.16	Brown	Nil	Turbid	7.21	1.73	6.59	Clear	Nil	Clear	7.36	2.14	9.04	Clear	Nil	Clear
Oct	7.21	5.9	10.43	Brown	Nil	Turbid	7.27	1.78	6.63	Clear	Nil	Clear	7.45	2.24	9.21	Clear	Yes	Clear
Nov	7.34	6.05	10.62	Brown	Nil	Turbid	7.29	1.76	6.66	Clear	Nil	Clear	7.45	2.26	9.47	Clear	Nil	Clear
Dec	7.39	6.25	10.76	Brown	Nil	Turbid	7.65	1.76	6.70	Clear	Nil	Clear	7.67	2.20	9.59	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	7.27	1.18	6.39	Clear	Nil	Clear	7.31	1.63	7.33	Clear	Yes	Clear	7.60	1.16	3.90	Clear	Nil	Clear
Feb	7.33	1.01	6.72	Brown	Nil	Slight	7.40	1.87	7.56	Clear	Yes	Slight	7.27	1.09	4.10	Clear	Nil	Clear
Mar	7.21	1.00	6.88	Clear	Nil	Slight	7.32	1.49	7.73	Clear	Nil	Slight	7.34	1.12	4.38	NR	NR	NR
Apr	7.18	1.12	6.15	Clear	Nil	Clear	7.26	1.47	7.15	Clear	Nil	Clear	7.24	1.12	3.33	Grey	Nil	Slight
May	7.17	1.16	6.20	Clear	Nil	Clear	7.28	1.51	7.20	Grey	Yes	Slight	6.92	1.15	3.61	Grey	Nil	Slight
Jun	7.39	1.33	6.21	Clear	Nil	Clear	7.31	2.29	7.20	Clear	Yes	Slight	7.32	1.20	3.61	Clear	Nil	Clear
Jul	7.07	1.39	6.25	Clear	Nil	Clear	7.39	1.68	7.26	Clear	Nil	Clear	7.44	1.13	3.66	Clear	Nil	Clear
Aug	6.98	1.46	6.39	Clear	Nil	Clear	7.26	1.71	7.55	Clear	Nil	Clear	6.96	1.14	3.72	Clear	Nil	Clear
Sep	6.98	1.50	6.57	Clear	Nil	Clear	7.20	1.68	7.87	Clear	Nil	Clear	6.97	1.14	3.92	Clear	Nil	Clear
Oct	7.12	1.34	7.00	Brown	Nil	Slight	7.43	1.76	8.26	Clear	Nil	Clear	7.17	1.26	4.14	Clear	Nil	Clear
Nov	7.12	1.22	7.22	Grey	Nil	Slight	7.41	1.68	8.45	Clear	Nil	Clear	7.04	1.19	4.34	Clear	Nil	Clear
Dec	7.12	1.27	7.51	Brown	Yes	Slight	7.39	1.67	8.71	Clear	Yes	Clear	7.17	1.21	4.55	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)
3/1/2017	12:48	South Pit	0.48	100.60	0.09	107.90	0.02	99.3	0.25	97.7
4/1/2017	12:47	Entrance Pit	0.65	105.30	0.07	104.20	0.04	103	0.59	104.4
5/1/2017	13:15	South Pit	7.73	123.00	0.04	96.00	0.03	92.6	2.87	117.6
6/1/2017	13:22	South Pit	6.27	125.70	0.05	103.10	0.04	98.4	2.85	121.5
9/1/2017	13:03	South Pit	9.19	118.50	0.06	91.40	0.04	87.4	9.66	117.4
9/1/2017	13:03	South Pit	0.41	94.40	0.06	90.00	0.03	88.6	0.51	91.7
9/1/2017	13:15	Entrance Pit	0.41	94.40	0.06	90.00	0.03	88.6	0.51	91.7
11/1/2017	12:50	South Pit	0.42	108.50	0.01	93.90	0.01	93.4	0.46	110.6
12/1/2017	12:48	Entrance Pit	0.83	103.70	0.04	100.40	0.02	92.6	0.65	101.8
16/1/2017	13:03	South Pit	0.45	97.10	0.06	83.00	0.02	85.9	0.33	98.9
17/1/2017	12:52	South Pit	10.98	117.40	0.11	103.30	0.05	85.4	6.36	114.7
19/1/2017	12:47	South Pit	0.28	108.00	0.01	104.30	0.01	93.5	0.23	111.4
19/1/2017	12:48	Entrance Pit	0.73	97.50	0.05	102.50	0.03	92.2	0.84	96.4
25/1/2017	13:04	South Pit	2.15	113.30	0.05	101.60	0.03	90	3.35	116.5
25/1/2017	13:05	South Pit	1.33	102.70	0.02	97.10	0.01	89.5	6.48	114.6
25/1/2017	13:15	Entrance Pit	1.08	111.40	0.06	101.30	0.06	100.4	1.2	112.2
27/1/2017	12:25	South Pit	11.50	119.10	0.04	100.80	0.03	94.7	5.2	116.6
27/1/2017	12:25	South Pit	11.50	119.10	0.04	100.80	0.03	94.7	5.2	116.6
30/1/2017	12:50	South Pit	1.31	112.3	0.02	87	0.01	90.5	2.22	114
1/2/2017	13:35	South Pit	1.54	109.80	0.03	93.20	0.02	97.1	0.79	106.2
1/2/2017	13:25	South Pit	4.99	119.00	0.06	93.30	0.02	87.9	3.55	115.4
8/2/2017	12:55	Entrance Pit	0.84	108.50	0.06	112.60	0.05	93.6	0.93	108.7
9/2/2017	12:41	Entrance Pit	0.88	102.50	0.09	98.50	0.14	94.5	0.83	100.8

Blast Monitoring Results										
13/2/2017	12:52	Entrance Pit	0.37	97.20	0.02	84.40	0.02	94.8	0.23	96.5
15/2/2017	12:48	Entrance Pit	1.16	102.60	0.18	100.00	0.09	95.9	0.88	103.9
16/2/2017	12:53	South Pit	4.02	118.40	0.02	83.70	0.01	99.5	1.51	114.9
20/2/2017	12:50	South Pit	0.19	106.20	0.01	96.60	0	88.1	0.15	104.9
21/2/2017	10:43	South Pit	3.44	111.00	0.06	93.30	0.05	96.8	12.85	118.9
22/2/2017	12:45	Entrance Pit	0.64	101.00	0.07	90.20	0.05	98.2	0.44	100
22/2/2017	12:55	South Pit	1.69	111.40	0.01	98.10	0.01	81.2	0.72	107.8
23/2/2017	12:45	Entrance Pit	0.79	100.70	0.05	90.50	0.04	97.9	0.74	100.1
27/2/2017	13:28	South Pit	5.32	119.10	0.04	110.40	0.02	99.9	2.56	118.7
2/3/2017	12:50	South Pit	2.32	112.50	0.02	94.80	0.03	87.3	2.88	117.4
9/3/2017	13:30	South Pit	17.09	119.80	0.07	96.20	0.04	95.2	6.92	127.7
9/3/2017	13:30	South Pit	17.09	119.80	0.07	96.20	0.04	95.2	6.92	127.7
10/3/2017	12:22	South Pit	2.34	120.60	0.01	101.00	0.01	96.4	0.92	116
13/3/2017	12:58	South Pit	0.76	103.60	0.01	84.20	0.01	88.9	3.09	111.7
15/3/2017	13:40	South Pit	4.11	114.50	0.03	91.20	0.03	93.7	1.47	111.2
16/3/2017	12:50	Entrance Pit	0.68	107.20	0.05	89.50	0.06	99.6	0.66	106.8
23/3/2017	15:03	South Pit	6.32	117.30	0.09	93.90	0.06	95.9	11.32	121
31/3/2017	12:34	South Pit	14.04	122.70	0.07	99.10	0.06	94.4	6.56	117.3
31/3/2017	12:34	South Pit	14.04	122.70	0.07	99.10	0.06	94.4	6.56	117.3
3/4/2017	12:48	Entrance Pit	0.59	106.40	0.06	92.80	0.09	101.1	0.66	105.5
3/4/2017	12:48	Entrance Pit	0.59	106.40	0.06	92.80	0.09	101.1	0.66	105.5
6/4/2017	12:50	Entrance Pit	0.71	102.40	0.06	87.80	0.04	95.4	0.72	102.3
7/4/2017	12:42	South Pit	12.61	115.40	0.09	97.90	0.07	103.1	7.14	114.8
13/4/2017	13:27	South Pit	5.04	113.40	0.05	89.60	0.03	90.2	2.02	111.3
13/4/2017	13:29	South Pit	5.09	117.30	0.12	88.30	0.08	96	18.35	124.4
21/4/2017	12:19	South Pit	14.92	115.60	0.05	85.60	0.03	82.2	9.86	112.8
24/4/2017	16:12	Entrance Pit	0.71	101.20	0.06	89.70	0.04	96.7	0.51	100.5
24/4/2017	16:12	Entrance Pit	0.71	101.20	0.06	89.70	0.04	96.7	0.51	100.5

Blast Monitoring Results										
26/4/2017	13:30	South Pit	6.56	118.00	0.05	98.50	0.04	96.1	3.7	115.6
27/4/2017	12:45	Entrance Pit	0.78	104.80	0.07	89.60	0.09	100.9	0.74	104.5
28/4/2017	12:31	South Pit	8.00	116.10	0.04	96.00	0.03	92.1	4.56	116.6
28/4/2017	12:31	South Pit	8.00	116.10	0.04	96.00	0.03	92.1	4.56	116.6
3/5/2017	13:05	South Pit	6.30	126.20	0.03	101.60	0.02	95.4	3.15	119
4/5/2017	13:10	South Pit	8.80	116.60	0.17	99.60	0.13	95	9.11	119.1
4/5/2017	13:12	Entrance Pit	0.62	102.60	0.06	96.90	0.06	94.2	0.47	100.5
5/5/2017	13:16	Bayswater Pit	0.55	104.40	0.02	81.30	0.02	84.3	0.42	101.7
8/5/2017	13:15	Entrance Pit	0.49	106.50	0.05	89.60	0.06	96.5	0.38	104.3
8/5/2017	13:15	Entrance Pit	0.49	106.50	0.05	89.60	0.06	96.5	0.38	104.3
10/5/2017	12:53	South Pit	23.45	124.00	0.05	86.50	0.02	89.3	18.82	118.6
11/5/2017	15:30	Entrance Pit	0.56	100.00	0.07	92.50	0.05	99.8	0.52	98.8
11/5/2017	15:36	South Pit	4.21	115.20	0.15	93.80	0.09	91.8	7.2	121.3
16/5/2017	13:24	South Pit	0.32	100.80	0.02	86.50	0.01	81.6	8.86	113.4
16/5/2017	13:35	South Pit	2.29	114.70	0.03	86.80	0.02	87.8	1.14	109.6
17/5/2017	13:24	Bayswater Pit	0.36	105.20	0.02	93.40	0.02	84.6	0.33	102
18/5/2017	13:24	Entrance Pit	0.96	115.30	0.06	101.70	0.06	101.6	1.03	116.5
18/5/2017	13:47	South Pit	5.08	109.30	0.09	104.70	0.09	94.7	10.31	113.8
19/5/2017	12:34	South Pit	4.25	121.50	0.05	97.40	0.03	90.5	2.42	115
23/5/2017	13:19	South Pit	0.27	117.00	0.01	82.50	0	81.8	0.26	113.9
24/5/2017	12:51	Entrance Pit	0.27	102.70	0.04	108.80	0.02	97.7	0.23	100.2
25/5/2017	12:55	South Pit	4.47	115.70	0.06	90.10	0.04	91.6	5.32	120
25/5/2017	12:53	Entrance Pit	0.23	94.20	0.02	81.00	0.01	91.2	0.21	93.3
29/5/2017	12:50	South Pit	2.20	123.10	0.01	100.50	0.01	97.8	6.67	121.4
30/5/2017	15:37	Bayswater Pit	0.39	111.60	0.02	86.70	0.02	90.8	0.48	107.2
1/6/2017	12:56	South Pit	3.17	114.10	0.06	95.30	0.05	96	7.54	119.9
1/6/2017	12:56	South Pit	3.17	114.10	0.06	95.30	0.05	96	7.54	119.9
6/6/2017	13:29	Entrance Pit	1.42	112.10	0.09	100.80	0.06	102.8	1.41	108.9

Blast Monitoring Results										
6/6/2017	13:40	Bayswater Pit	1.46	109.40	0.03	103.00	0.02	105.2	0.85	105.4
7/6/2017	11:32	South Pit	2.78	120.60	0.07	99.20	0.03	106.8	2.05	114.6
9/6/2017	12:19	South Pit	7.46	119.60	0.07	93.70	0.04	92.8	10.37	121.9
20/6/2017	12:52	South Pit	13.53	129.00	0.03	92.40	0.02	91.5	20.73	127.9
22/6/2017	12:57	Bayswater Pit	1.61	119.50	0.07	99.40	0.04	109	0.69	116.4
23/6/2017	12:28	South Pit	1.14	119.00	0.03	86.80	0.02	94.6	6.97	125.7
26/6/2017	12:54	Entrance Pit	0.82	108.90	0.05	90.70	0.05	103.6	0.81	107.3
28/6/2017	12:21	South Pit	3.46	113.70	0.07	89.70	0.05	102.5	4.04	113.3
29/6/2017	15:25	South Pit	1.35	120.40	0.01	88.10	0.01	92.6	1.16	112.8
30/6/2017	16:25	South Pit	1.35	120.40	0.01	88.10	0.01	92.6	1.16	112.8
5/7/2017	13:25	South Pit	2.09	123.70	0.02	113.40	0.02	94.3	1.01	121.2
5/7/2017	13:26	South Pit	1.15	109.50	0.05	114.50	0.02	100.1	1.33	114.6
6/7/2017	12:55	South Pit	4.93	121.90	0.02	100.50	0.01	92.4	1.33	111.3
6/7/2017	12:59	Bayswater Pit	1.23	106.90	0.07	101.10	0.05	92.1	0.86	105.7
11/7/2017	13:04	Entrance Pit	1.08	99.80	0.11	87.00	0.07	96.1	1.01	100.9
11/7/2017	13:04	South Pit	0.43	99.70	0.02	82.70	0.01	99.2	0.8	107.9
13/7/2017	12:55	South Pit	5.19	115.30	0.04	92.00	0.03	99.6	4.18	114.3
14/7/2017	10:15	South Pit	20.77	120.10	0.12	97.10	0.05	85.2	5.58	113.4
14/7/2017	10:15	South Pit	20.77	120.10	0.12	97.10	0.05	85.2	5.58	113.4
21/7/2017	12:26	South Pit	6.51	128.50	0.02	99.50	0.01	92.5	1.39	121.4
21/7/2017	12:28	South Pit	1.62	109.50	0.02	88.20	0.02	86.9	0.96	105.4
27/7/2017	13:32	Bayswater Pit	0.53	105.70	0.02	91.30	0.01	87.7	0.35	102.3
31/7/2017	12:51	South Pit	4.73	121.40	0.04	82.20	0.01	84.4	0.95	112.3
31/7/2017	12:50	South Pit	0.22	103.80	0.01	77.50	0	83.1	0.13	102.3
1/8/2017	12:51	South Pit	5.03	114.70	0.09	93.90	0.09	91.5	8.11	115.5
3/8/2017	13:22	Bayswater Pit	1.31	110.50	0.03	103.60	0.02	89.6	0.6	106.5
9/8/2017	13:40	South Pit	2.24	123.60	0.02	99.30	0.01	96.4	0.99	117.6
9/8/2017	13:41	South Pit	13.07	119.30	0.08	98.90	0.03	86.9	3.42	114.3

Blast Monitoring Results										
10/8/2017	12:58	Entrance Pit	0.69	104.60	0.05	103.20	0.05	95.7	0.49	105
10/8/2017	12:59	South Pit	5.12	118.00	0.07	107.90	0.07	96.7	7.37	119.5
15/8/2017	14:25	Bayswater Pit	1.36	109.30	0.05	108.50	0.03	95.9	1.42	103.9
17/8/2017	9:20	South Pit	3.30	123.50	0.02	104.20	0.01	90	0.87	115.4
21/8/2017	12:38	Entrance Pit	0.77	104.80	0.04	86.20	0.03	95	0.44	103.8
21/8/2017	12:54	Entrance Pit	0.82	107.80	0.05	93.30	0.04	99.8	0.55	106.9
22/8/2017	15:37	South Pit	4.33	122.20	0.02	89.30	0.01	92.5	1.17	112.1
22/8/2017	15:39	South Pit	2.55	119.80	0.04	89.10	0.01	94.6	1.09	113.2
23/8/2017	12:43	South Pit	1.91	119.30	0.07	91.40	0.04	92.3	2.54	119
24/8/2017	12:40	South Pit	0.99	109.50	0.01	95.20	0.01	84	1.65	109.1
24/8/2017	12:40	South Pit	0.99	109.50	0.01	95.20	0.01	84	1.65	109.1
29/8/2017	15:32	South Pit	1.25	108.40	0.02	88.60	0.02	89.5	1.57	111.7
29/8/2017	15:51	South Pit	4.16	111.10	0.17	87.60	0.08	90	12.55	116.4
31/8/2017	14:32	Entrance Pit	0.95	111.90	0.04	112.40	0.06	115.1	0.75	109.5
7/9/2017	13:35	South Pit	10.45	117.60	0.07	105.70	0.05	97	6.84	117
11/9/2017	13:37	South Pit	14.02	120.80	0.02	102.00	0.01	90.9	1.51	1.51
11/9/2017	13:42	South Pit	4.52	125.90	0.03	96.90	0.04	102.8	1.24	115.9
12/9/2017	13:28	Entrance Pit	0.57	102.80	0.06	101.60	0.07	97.4	0.5	102.5
12/9/2017	13:26	Entrance Pit	0.40	103.60	0.03	99.30	0.03	90.7	0.28	101.3
14/9/2017	9:20	South Pit	1.17	117.20	0.01	104.40	0.01	108.7	0.91	112.8
15/9/2017	12:27	South Pit	8.22	121.20	0.12	103.20	0.06	108.8	3.7	117.9
18/9/2017	13:27	South Pit	5.45	112.60	0.18	103.80	0.05	109	14.98	112.2
20/9/2017	13:32	Entrance Pit	0.50	94.60	0.06	87.30	0.05	92.9	0.55	97.4
20/9/2017	13:34	Entrance Pit	1.31	103.30	0.14	87.90	0.08	94.2	0.97	102.1
21/9/2017	13:23	Entrance Pit	0.76	99.10	0.08	101.80	0.06	96.9	0.75	95.3
26/9/2017	13:27	Entrance Pit	0.62	107.80	0.07	97.10	0.08	98.5	0.61	107.6
26/9/2017	13:27	Entrance Pit	0.62	107.80	0.07	97.10	0.08	98.5	0.61	107.6
28/9/2017	9:20	South Pit	0.74	113.30	0.01	86.70	0.01	89.2	0.64	112.7

Blast Monitoring Results										
28/9/2017	9:20	South Pit	0.74	113.30	0.01	86.70	0.01	89.2	0.64	112.7
29/9/2017	12:19	South Pit	16.46	128.60	0.09	106.90	0.04	93.2	4.94	121.4
3/10/2017	13:29	South Pit	5.18	111.90	0.11	99.20	0.06	90.2	11.93	111.9
3/10/2017	13:38	Bayswater Pit	0.26	101.10	0.01	84.40	0.01	84.1	0.17	101.2
4/10/2017	13:19	Entrance Pit	0.48	93.60	0.05	89.30	0.04	86.3	0.55	95.2
4/10/2017	13:22	Entrance Pit	0.92	110.20	0.11	100.10	0.06	99.4	0.88	110.1
5/10/2017	12:16	South Pit	2.77	114.00	0.01	87.30	0.01	82.8	14.81	114.9
6/10/2017	12:16	South Pit	1.79	103.50	0.08	98.20	0.07	87.8	2.62	108.4
9/10/2017	15:38	South Pit	18.47	115.80	0.06	105.60	0.02	97.1	1.87	110.3
11/10/2017	13:18	Bayswater Pit	0.92	106.80	0.04	92.80	0.03	96.4	0.78	102.6
12/10/2017	12:53	South Pit	1.81	114.20	0.01	110.20	0.01	103	1.33	116.5
19/10/2017	13:30	Bayswater Pit	1.65	105.70	0.09	96.80	0.04	92	1.2	103.3
23/10/2017	13:13	South Pit	3.34	111.20	0.09	100.60	0.08	95.4	5.54	116.6
25/10/2017	13:10	South Pit	1.85	112.40	0.05	99.40	0.06	94	1.95	113.2
25/10/2017	13:12	South Pit	3.13	107.30	0.03	108.10	0.03	102.7	5.29	109
27/10/2017	13:40	Bayswater Pit	1.55	107.20	0.06	89.90	0.03	94	1.2	104.7
31/10/2017	13:02	South Pit	5.16	121.60	0.07	93.30	0.04	94.3	6.51	123.1
2/11/2017	13:09	South Pit	4.73	114.00	0.03	80.70	0.02	83.7	15.57	115.7
2/11/2017	13:11	South Pit	36.00	119.00	0.03	84.00	0.02	83.1	3.11	111
7/11/2017	13:07	Bayswater Pit	1.29	113.30	0.07	93.90	0.03	102.2	1.24	110.9
8/11/2017	15:40	South Pit	9.77	117.30	0.07	95.80	0.05	99.2	6.8	119.3
8/11/2017	15:40	South Pit	9.77	117.30	0.07	95.80	0.05	99.2	6.8	119.3
14/11/2017	13:07	Bayswater Pit	0.73	104.10	0.02	101.30	0.02	94.6	0.49	102.9
15/11/2017	12:59	South Pit	1.86	111.50	0.01	94.30	0.01	89.7	9.25	118.5
15/11/2017	13:02	South Pit	15.18	118.60	0.05	95.90	0.04	86.2	19.62	117.9
16/11/2017	13:54	Bayswater Pit	0.41	110.80	0.01	87.50	0.01	96.6	0.2	106.9
20/11/2017	13:10	South Pit	28.39	119.90	0.03	95.50	0.02	99.6	2.82	110.8
21/11/2017	13:12	South Pit	1.29	111.30	0.03	91.50	0.03	95	1.7	112.6

Blast Monitoring Results										
22/11/2017	13:14	Entrance Pit	0.61	98.60	0.09	102.50	0.06	89	1.01	100
23/11/2017	13:07	South Pit	4.17	110.60	0.04	93.90	0.03	79.8	7.62	112.5
28/11/2017	13:07	South Pit	2.13	113.10	0.08	100.20	0.07	85.7	2.44	114.4
28/11/2017	13:07	South Pit	1.60	103.30	0.02	92.60	0.01	88.3	6.8	113
28/11/2017	13:10	South Pit	1.61	107.60	0.06	93.30	0.06	87.3	13.32	117.7
29/11/2017	13:10	Bayswater Pit	0.63	110.00	0.03	105.50	0.02	100.1	0.34	108
29/11/2017	13:10	Bayswater Pit	0.63	110.00	0.03	105.50	0.02	100.1	0.34	108
30/11/2017	13:11	Entrance Pit	0.35	103.00	0.05	93.70	0.03	98.1	0.43	99.4
1/12/2017	12:05	Entrance Pit	1.24	103.20	0.12	97.50	0.18	95.1	0.68	104.2
6/12/2017	12:03	South Pit	13.92	114.70	0.05	108.00	0.03	92.7	7.48	109.6
7/12/2017	13:06	Entrance Pit	0.75	103.10	0.06	98.10	0.05	104.3	0.72	103.4
13/12/2017	13:10	South Pit	8.19	114.70	0.07	94.40	0.05	84.1	3.21	109.6
15/12/2017	12:06	South Pit	5.15	113.90	0.06	101.90	0.05	95.1	2.82	109.6
18/12/2017	13:00	Bayswater Pit	0.41	108.50	0.01	91.90	0.01	97.7	0.4	110
21/12/2017	13:10	South Pit	3.22	109.80	0.08	107.20	0.04	101.7	14.06	115.4
21/12/2017	13:12	South Pit	5.19	116.70	0.06	98.70	0.02	96.7	2.49	109.4

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 2017.

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 2017
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 in accordance with the Water Management Plan 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 incorporate 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 Antiene Tailings Dam in 2016. Ongoing works.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
produce free draining landforms.						No other tailings dams ready for capping
	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. No other tailings dams ready for capping
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. No areas identified as having issues from compaction.
	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 to continue in 2018.
		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

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	Stem density	Minimum total tree/shrub densities for seeded areas to be: Year 1 – 1,000 stems/ha Year 5 – 500 stems/ha Year 10 – 400 stems/ha As confirmed by rehabilitation monitoring.	LCO Rehabilitation Monitoring Strategy (GSSE)	No	na	Operations ongoing, no significant issues identified in 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
	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
	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, works to ensure composition is trending towards target ongoing

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, works to ensure composition is trending towards target ongoing
	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

2017 Rehabilitation Detail					
Entrance Premier RL150					
Domain	4	**Re-vegetation Date:**	20 November 2017	**Area:**	19.1ha
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 2017 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 during this process selectively left on the surface. Topsoil was applied at 120mm as well as gypsum at 7t/ha. Seeding was completed by hand immediately following site preparation with woodland species seed mix modified slightly with considerations of the soil chemistry. Status/Progress: No cover crop has established due to absence of rainfall. No surface erosion has occurred and deep ripping should mitigate rill occurrence. 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.					
South Cut RL195 Western					
Domain	4	**Re-vegetation Date:**	27 January 2017	**Area:**	4.4ha
Land Use: Pastoral/grazing **Seed/Plant Mix:** Liddell winter pasture seed mix Landform shaping completed in Q1 2017 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 was evident mid-year. Drought conditions throughout the year have 'burnt off' many species of the pasture mix. Continue monitor and apply maintenance measures as necessary.					
South Cut RL195 Center					
Domain	4	**Re-vegetation Date:**	22 December 2017	**Area:**	13.6ha
Land Use: Pastoral/grazing **Seed/Plant Mix:** Liddell summer pasture seed mix Landform shaping completed in Q4 2017 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: No establishment of cover crop or other pasture species due to complete absence of rainfall and drought conditions. Continue monitor and apply maintenance measures as necessary.					