LIDDELL

GLENCORE

2019 Annual Review

Status: Final

Version: 1

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Table 1 Title Block

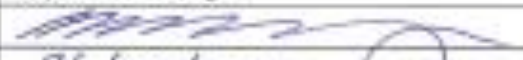
Name of operation	Liddell Coal Operations Pty Ltd
Name of operator	Liddell Coal Operations
Development consent / project approval #	DA-305-11-01
Name of holder of development consent / project approval	Liddell Coal Operations
Mining lease #	ML1597, CCL708, ML1552, ML1313
Name of holder of mining lease	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 2019
Annual Review end date	December 31st 2019

I, Murray Gregson, 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 2019 to 31st December 2019 and that I am authorized 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 authorized reporting officer	Murray Gregson
Title of authorized reporting officer	Operations Manager
Signature of authorized reporting officer	
Date	26/03/2020

1 Statement of Compliance

During the reporting period, LCO operated as per the approvals listed in **Section 3**. The following **Table 1** and **Table 2** provide a summary of LCO's compliance with key operational approvals.

Table 1 Statement of compliance

Statement of Compliance	
Approval	Were all conditions of approval complied with?
DA 305-11-01	No
ML #1597	Yes
ML #1313	Yes
CCL #708	Yes
ML #1552	Yes
EPL 2094	No
EPBC 2013/6908	Yes
MOP 2018-2020	Yes
Aboriginal Heritage Impact Permit (AHIP No. 0000623)	Yes
OSSM 3916/2008 (Onsite Sewage Management System)	Yes

During the reporting period LCO had a number of non-compliances listed below in **Table 2**.

Table 2 Non-compliances

Non Compliances					
Approval	Condition Reference	Condition Description	Compliance status*	Comment	Section of AR for detailed response
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Non-compliant	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit SX38-D1 on 37 occasions. Investigation determined that extraordinary events or regional conditions resulted in the exceedances opposed to contribution by LCO operations.	Section 6.3
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Non-compliant	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit SX38-D2 on 48 occasions. Investigation determined that extraordinary events or regional conditions resulted in the exceedances opposed to contribution by LCO operations.	Section 6.3
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Non-compliant	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit HVAS 21 (Antienne) on seven occasions. Investigation determined that	Section 6.3

				extraordinary events or regional conditions resulted in the exceedances opposed to contribution by LCO operations.	
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Non-compliant	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit HVAS 12 (Scrivens) on eight occasions. Investigation determined that extraordinary events or regional conditions resulted in the exceedances opposed to contribution by LCO operations.	Section 6.3
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Non-compliant	Monitoring Point 9 failed to achieve PM10 data availability greater than 75% on 8 dates throughout the reporting period due to hardware failures.	Section 6.8
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Non-compliant	Monitoring Point 10 failed to achieve PM10 data availability greater than 75% on 2 dates throughout the reporting period due to planned maintenance.	Section 6.8
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Non-compliant	Monitoring Point 11 failed to achieve PM10 data availability greater than 75% on 21 dates throughout the reporting period due to hardware failures and internal hardware failures requiring factory repairs.	Section 6.8
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Non-compliant	Monitoring Point 12 failed to achieve PM10 data availability greater than 75% on 12dates throughout the reporting period due to hardware failures and planned maintenance.	Section 6.8

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

Table 3 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 LCO 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. 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 LCO are shown in **Table 4**.

Table 4 Mine contacts

Name	Position	Company	Contact Numbers
Murray Gregson	Operations Manager	Liddell Coal Operations	(02) 6570 9919 (M) 0447 886 810
Mark Faulkner	Mining Manager	Liddell Coal Operations	(02) 6570 9937 (M) 0418 630 851
Ben de Somer	Environment and Community Manager	Liddell Coal Operations	(02) 6570 9947 (M) 0427 936 734

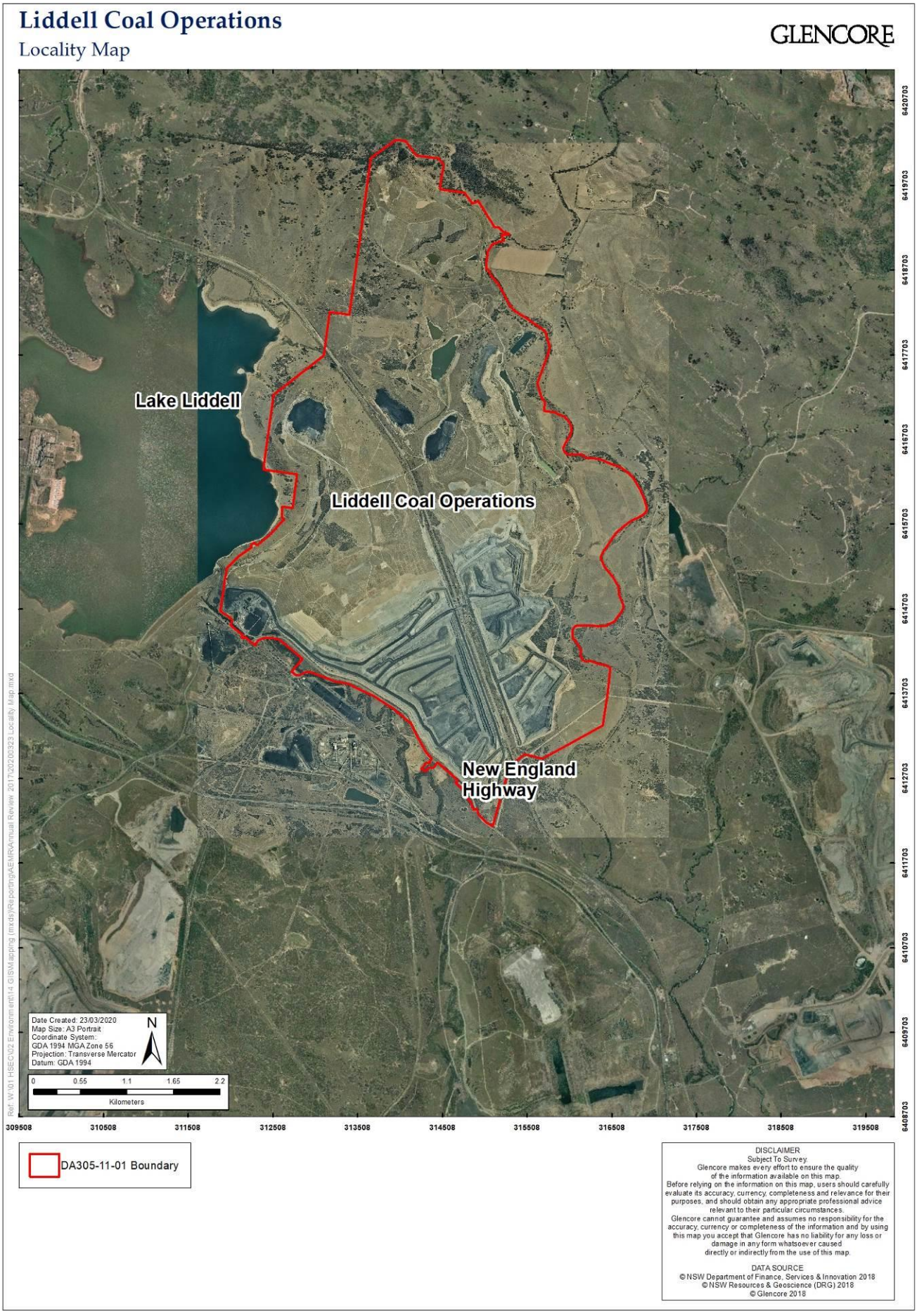


Figure 1 Locality map

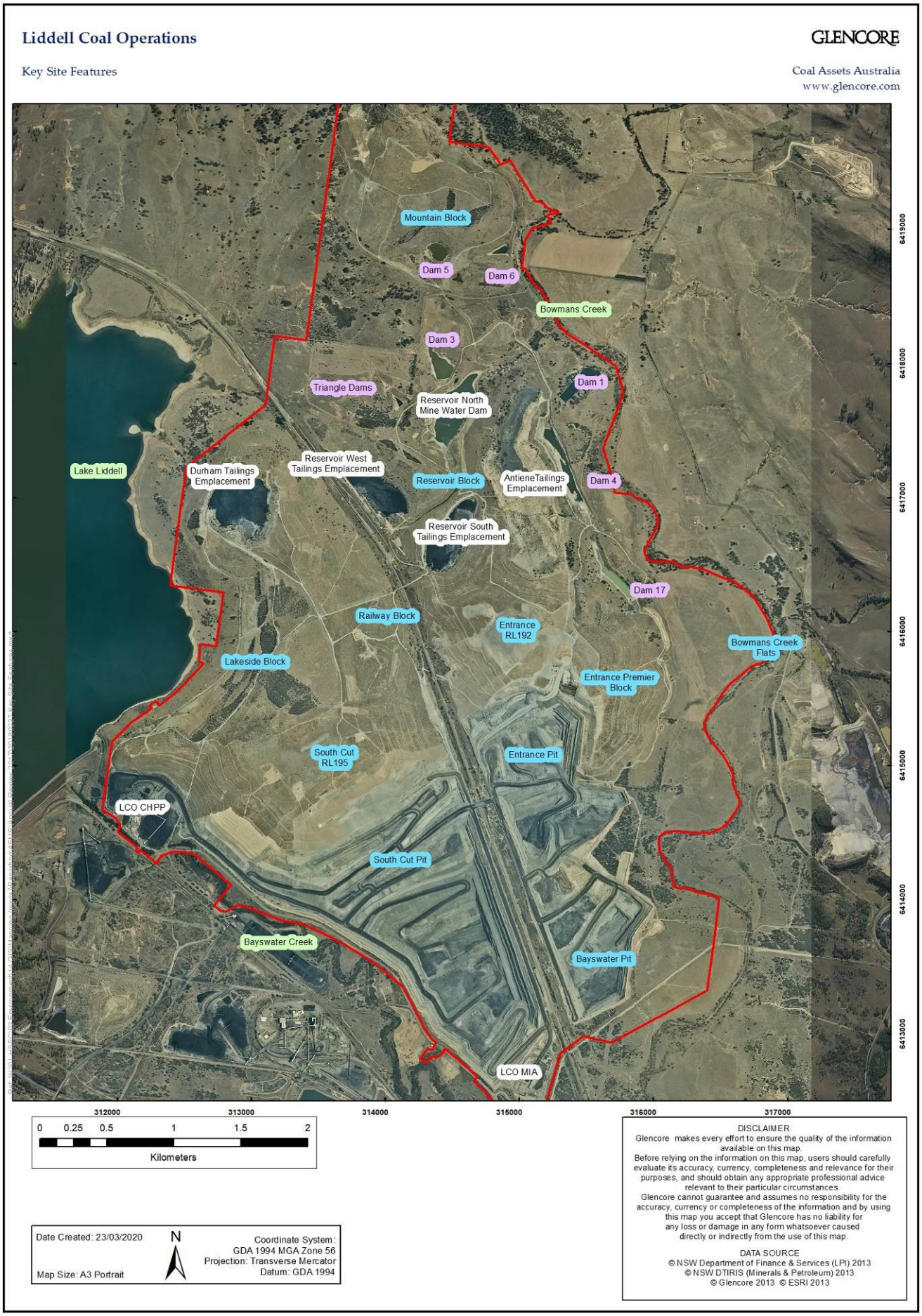


Figure 2 Aerial photograph of LCO – key site features

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 5.**

LCO operates primarily under one consolidated mining lease, ML 1597, as shown in **Figure 3**Error! Reference source not found..

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.

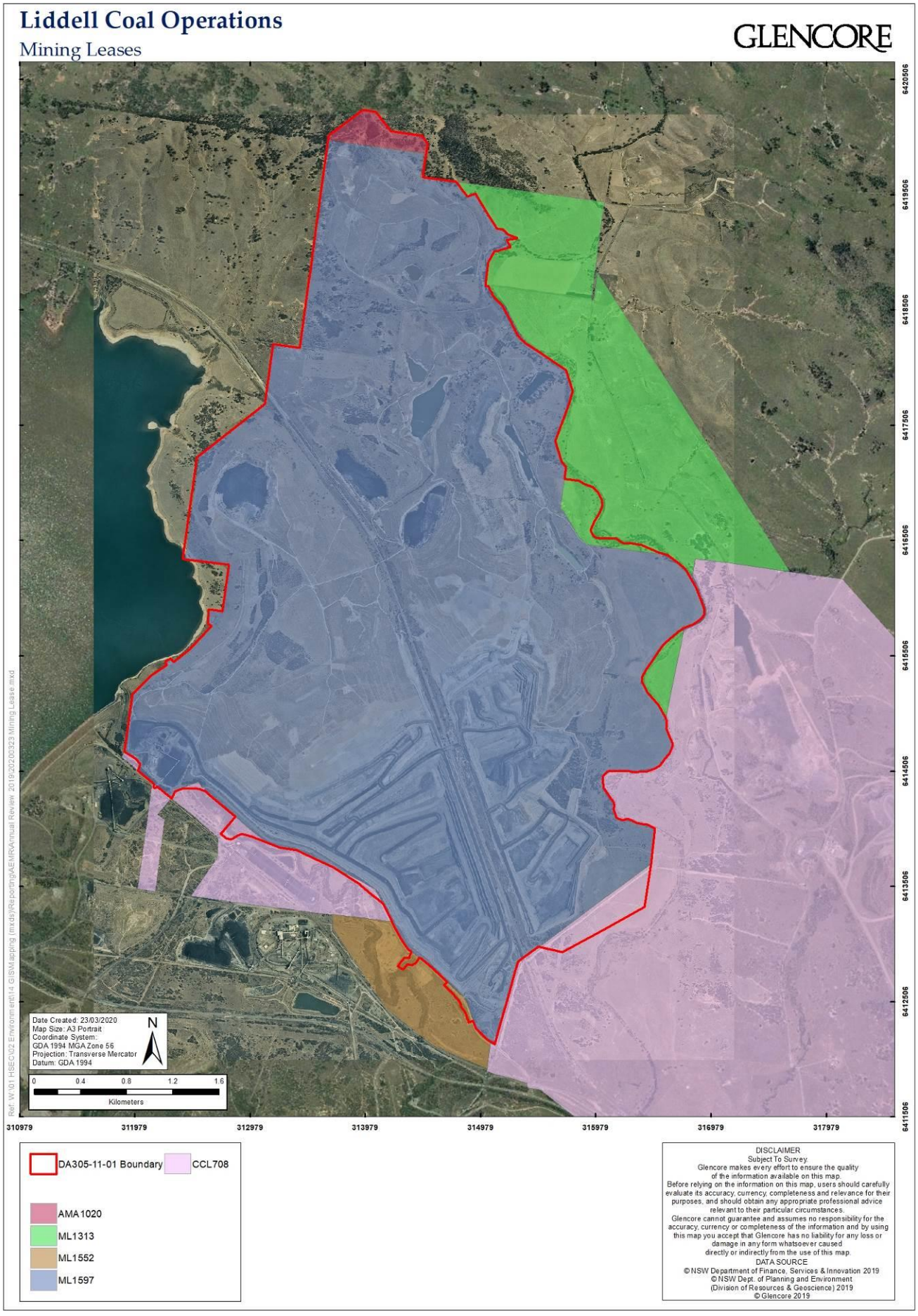


Figure 3 Mining Leases

Table 5 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
DA 305-11-01 MOD 7	- Department of Planning and Environment	- Changes to conditions of DA 305-11-01 to provide the necessary flexibility for mining operations and the associated final landform outcomes to meet the sites rehabilitation objectives; - Changes to Table 8 of Schedule 3, Condition 37 of DA 301-11-01 to reflect areas available for mine rehabilitation to grassland; - Changes to the Development Application Boundary (DA Boundary) to which DA 305-11-01 applies; and - Administrative amendments to Schedule 2, Conditions 2, Schedule 3, Condition 16 and Schedule 3, Condition 39.	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	DPE Department of Resources and Geoscience (NSW)	5 November 2028
Consolidated Coal Lease No. 708	DPE Department of Resources and Geoscience (NSW)	30 December 2023
Mining Lease No. 1313	DPE Department of Resources and Geoscience (NSW)	13 October 2023
Cumnock Sublease Mining lease No. 1552	DPE Department of Resources and Geoscience (NSW)	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 2018 – 2020 (MOP)	1 December 2017	1 December 2020
Mining Operations Plan Addendum	24 October 2018	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
Bowmans Creek Alluvial	WAL18302	Liddell Southern Tenements Pty Ltd	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	5	Nil
Bowmans Creek Alluvial	20WA210940 (awaiting WAL allocation)	Enex Foydell Limited	Irrigation	Jerrys Water Source/ Jerrys Management Zone/ Unregulated River	5	Nil
Hunter River via AGL Macquarie Generation	WAL7815	Liddell Tenements Pty Ltd	Industrial	Hunter Regulated River Water Source/ Zone 1B Regulated River	20	Nil

Groundwater Licences						
Locality	**Licence No.**	**Holder**	**Lot/DP**	**Purpose**	**Annual Extraction Allocation (ML)**	**Annual Extraction 2019 (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	Liddell Tenements Pty Ltd	33/862516	Industrial	6000	Nil
8 South 3 & 4	WAL41498	Liddell Tenements Pty Ltd	32/870789	Industrial	6000	Nil
Durham 2 & 4	WAL41497	Liddell Tenements Pty Ltd	3/237654	Industrial (2 bores)	1000	Nil
Haz 1&2	WAL39760	Enex Liddell Pty Ltd Mitsui Mitsushima Australia Pty Ltd	81/607296	Industrial (2 bores)	5500	524

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
M49	WAL41493	Liddell Southern Tenements Pty Ltd	32/545601	Dewatering	2500	545
Mt Owen 1	WAL41493 (previously 20BL168209)	Mt Owen Pty Ltd	353/867083	Stock, domestic, farming and test purposes	2500	Nil
Mt Owen 2	20BL169544	Mt Owen Pty Ltd	353/867083	Dewatering	2500	Nil
Middle Liddell	WAL41498	LCO Pty Ltd	1/237766	Dewatering	6000	613

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 2020
S90 Permit #c0000623	DA 305-11-01 Modification 5 development consent area	January/February 2015	3 December 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 September 2020

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	23 April 2019	23 April 2023
OSSM 3916/2008	Singleton Shire Council	Permit to Operate Aerated Wastewater Treatment System	Liddell Coal Operations Pty Limited	1 July 2018	30 June 2020

4 Operations Summary

During 2019, operational activities were conducted generally in accordance with the approved Mining Operations Plan (MOP) 2018-2020. An Addendum to this MOP was granted on 24 October 2018 to permit emplacement of a combined additional 580 thousand cubic metres of tailings in the Reservoir West and Reservoir South Tailings Dams during 2019. Emplacement of these additional tailings occurred throughout 2019.

During the reporting period there were a number of construction projects undertaken in accordance with the approved MOP and DA305-11-01. This included:

- Continued progression of mining operations in a southerly direction in the south pit and entrance pit as well as further clearance and mining in the Bayswater Pit
- Construction and commissioning 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 6.9**.
- 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.**
- Progression and modification approval of remediation plan for the Mountain Block area in order to commence remediation earthworks. Earthworks and infrastructure set up commenced in 2019 whilst final approvals were sought; detailed in **Section 8.7.**
- Continued implementation of biodiversity management plan commitments including habitat augmentation, weed management and supplementary planting as detailed in **Section 8.3**
- Implementation of cattle grazing across the South Cut Pasture Rehabilitation area to control Rhodes Grass and manage the rehabilitation in accordance with the post mining land use outlined in the Biodiversity Management Plan and MOP; detailed in **Section 8.3.1**
- Continued 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 2019.

Key production statistics are summarised in **Table 6** 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 6** below, the total ROM coal processed at Liddell's CHPP during the 2019 reporting period was 5,863,647 tonnes. The total product coal produced was 3,488,646 tonnes with 1,781,738 tonnes of coarse and 593,263 tonnes 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 2019

During the reporting period, 3,614,375 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 6 Production summary

Production Summary				
Material	**Approved limit**	**2018 actual**	**2019 forecast**	**2019 actual**
Prime Waste Rock / Overburden (bcm)	N/A	35,728,416	36,993,041	37,529,915
ROM Coal / Ore (t)	8,000,000	5,933,351	5,857,350	5,863,647
Coarse reject (t)	N/A	1,719,540	1,830,158	1,781,738
Fine reject (Tailings) (t)	N/A	175,366	609,385	593,263
Saleable product (t)	N/A	4,123,866	3,417,807	3,488,646

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 7.

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 necessary approvals are finalised(see **Section 8.7** for detail); and
- continued commissioning of tailings pipeline to Mt Owen Complex West Pit and subsequent tailings emplacement; and
- continued capping of the Antiene Tailings dam.

5 Actions Required at Previous Annual Review

NSW Department of Planning and Environment provided written advice on the 2018 Annual Review on the 14 May 2019 and noted no actions following review. The NSW Department of Planning and Environment – Resources Regulator provided written advice on the 2018 Annual Review on the 16 July 2019 and noted that the report satisfied the requirements of the conditions of Authorisations CCL708, ML1313, ML1552 and ML1597. There were no actions identified following the review.

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 7**.

Table 7 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 7** 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 8**.

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

Table 8 Noise monitoring results

Location	Date	Wind Speed (m/s)	LCO $L_{Aeq\ (15min)}$ dB	LCO $L_{Aeq\ (1min)}$ dB	Exceedance
	January				
1317 Hebden Road	07/1	3.9	IA	IA	NA
1246 Hebden Road	07/1	2.9	<20	<20	Nil
	February				
1317 Hebden Road	26/2	1.9	<20	<20	Nil
1246 Hebden Road	26/2	2.3	<20	22	Nil
	March				
1317 Hebden Road	26/3	3.0	<25	30	Nil
1246 Hebden Road	26/3	3.4	<20	25	NA
	April				
1317 Hebden Road	17/4	1.9	<25	28	Nil
1246 Hebden Road	17/4	2.1	30	43	N
	May				
1317 Hebden Road	22/5	2.5	30	33	Nil
1246 Hebden Road	23/5	1.6	30	35	Nil
	June				
1317 Hebden Road	6/6	1.2	31	36	Nil
1246 Hebden Road	6/6	1.4	NM	NM	Nil
	July				
1317 Hebden Road	4/7	3.0	IA	IA	Nil
1246 Hebden Road	4/7	3.0	IA	IA	Nil
	August				
1317 Hebden Road	28/8	1.6	34	42	Nil
1246 Hebden Road	28/8	1.4	<30	<30	Nil
	September				
1317 Hebden Road	26/9	1.4	24	28	Nil
1246 Hebden Road	26/9	1.3	26	30	Nil
	October				
1317 Hebden Road	21/10	3.9	IA	IA	NA
1246 Hebden Road	21/10	3.4	IA	IA	NA
	November				
1317 Hebden Road	21/11	1.4	<25	29	Nil
1246 Hebden Road	21/11	0.8	NM	NM	Nil
	December				
1317 Hebden Road	18/12	2.4	<20	<20	Nil
1246 Hebden Road	18/12	3.1	<20	<20	NA

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 2019 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 9** below sets out the blasting impact assessment criteria for the reporting year as per DA-305-11-01.

Table 9 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	-	Limits applicable between 1 January 2019 – 14 March 2019: <=30 above 12Hz and <=26 below 12Hz Limits applicable between 15 March 2019 – current: <=34 above 12Hz and <=28 below 12Hz or <=36 above 12Hz and <=30mm/s below 12z for two events only.	0%
Other public infrastructure*	-	50	0%

*Note: alternate vibration limits for railway infrastructure have been agreed with ARTC as per the approved Blast Management Plan in accordance with DA305-11-01 Schedule 3 Condition 4(a).

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 response line (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 accordance 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) were varied from 30 to 40mm/s PPV to maximum 50mm/s PPV on 4 October 2019in 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.

LCO and Ausgrid have developed several agreements related to blasting in proximity to the Newdell Zone Substation. These agreements include:

- Blast Vibration Mitigation Works Agreement – At the time, this related to vibration mitigation measures to be installed at the substation following investigations carried out by Ausgrid. Note that these works have been completed.
- Blast Vibration Consent Deed – This outlines that Ausgrid consents to LCO blasting above the previous vibration limits (20mm/s for 90% of blasts and 25mm/s for 100% of blasts) on the basis that blast mitigation works are completed at the Newdell Zone Substation. It allows for a staged approach to increases in blasting limits.
- Blast Vibration Works Monitoring Agreement – This outlines the respective obligations for Ausgrid to carry out the blast vibration works monitoring and commercial arrangements for Liddell to reimburse Ausgrid for the cost of the monitoring.

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 DPIE 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.

On the 15th March 2019 LCO provided notification of implementing a temporary increase in limits for the substation such that blasting does not cause:

a) ground vibration or VPPV that is greater than 34mm/s above 12Hz for any individual blast; and
b) ground vibration or VPPV that is greater than 28mm/s below 12Hz for any individual blast;

OR

c) ground vibration or VPPV that is greater than 36mm/s above 12Hz and ground vibration or VPPV that is greater than 30mm/s below 12Hz on more than two occasions for the period.

This temporary increase is currently agreed to expire on 1 April 2020, at which point limits will revert back to those agreed in 2017.

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 126 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.

A summary of blasting performance against DA305-11-01 during the reporting period is presented in **Table 10**.

Table 10 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	NA	None required
Newdell zone substation	-	< or =30mm/s above 12Hz for any individual blast; and < or =26mm/s below 12Hz for any individual blast.	Compliant	Continue liaising with infrastructure owners in order to determine an appropriate ground vibration level increase during the next reporting period	. Continued implementation of the approved Strategy and Agreements executed with Ausgrid.
Other Public Infrastructure	-	50	Compliant	NA	None required
Chain of Ponds Inn	150	40	Compliant	NA	Continued implementation of the approved Strategy. 9refer Section 6).

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 and Newdell Zone Substation providing that the blast management strategy developed for the Project is implemented.

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.

On the 12 February 2019, LCO received approval for DA 305-11-01 for Modification 7 which involved changes to the 'notes' specific to the impact assessment criteria in Schedule 3 Condition 19. Specifically, the change involved removing Note A (total impact) to Note B (incremental impact). Between the period of receipt of the Modification and the update of the AQMMP (approved 9 August 2019), LCO continued to investigate air quality exceedances in accordance with the current AQMMP until the revised plan and assessment methodology was approved

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, high volume air samplers (HVAS) and continuous PM10 Tapered Element Oscillating Monitors (TEOMs) to monitor any dust emissions, and an air quality monitoring protocol for evaluation of compliance with the air quality impact assessment criteria.

The compliance air quality monitoring network includes Depositional Dust Gauges, paired High Volume Air Samplers (PM10 and TSP) and 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;
- 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 11**.

Table 11 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	[b]2g/m^2/month	[a]4g/m^2/month

a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources);

b Incremental impact (i.e. incremental increase in concentrations due to the development on its own);

c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS3580.10:2003 Methods for Sampling and Analysis of Ambient Air Determination of Particulate Matter – Deposited Matter – Gravimetric Method; and

d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary.

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 12.**

Table 12 Impact assessment criteria for particulate matter

Pollutant	Averaging Period	[d]Criterion
Total Suspended Particulate Matter (TSP)	Annual	[a]90 µg/m^3
Particulate Matter <10µg (PM_{10})	24 hour	[b]50 µg/m^3
	Annual	[a]30 µg/ m^3

a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources);

b Incremental impact (i.e. incremental increase in concentrations due to the development on its own);

c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS3580.10:2003 Methods for Sampling and Analysis of Ambient Air Determination of Particulate Matter – Deposited Matter – Gravimetric Method; and

d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary.

During 2019, a significant amount of extraordinary events occurred (due to events such as dust storms, poor regional conditions and bushfires) which impacted the measured results at the LCO air quality monitoring units. The NSW Department of Planning, Industry and Environment (DPIE) determined there to be 66 days in which were determined to be extraordinary regional conditions. In line with DPIE advice for reporting the following 66 days are excluded from the annual averages reported in **Table 14** below:

Table 13 Extraordinary air quality events dates 2019

Month	Date	
January	16/1/2019	17/1/2019
February	13/2/2019	19/2/2019
March	6/3/2019	31/3/2019
April	26/4/2019	
August	8/8/2019	9/8/2019
September	6/9/2019	
October	7/10/2019	26/10/2019
	8/10/2019	27/10/2019
	18/10/2019	28/10/2019
	19/10/2019	28/10/2019
	24/10/2019	30/10/2019
	25/10/2019	31/10/2019
	26/10/2019	
November	1/11/2019	21/11/2019
	2/11/2019	22/11/2019
	7/11/2019	23/11/2019
	8/11/2019	26/11/2019
	12/11/2019	27/11/2019
	16/11/2019	28/11/2019
	17/11/2019	29/11/2019
	19/11/2019	30/11/2019
December	1/12/19	15/12/19
	2/12/19	16/12/19
	3/12/19	17/12/19
	4/12/19	18/12/19
	5/12/19	19/12/19
	6/12/19	20/12/19
	7/12/19	21/12/19
	8/12/19	22/12/19
	9/12/19	23/12/19
	10/12/19	27/12/19
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	14/12/19	31/12/19

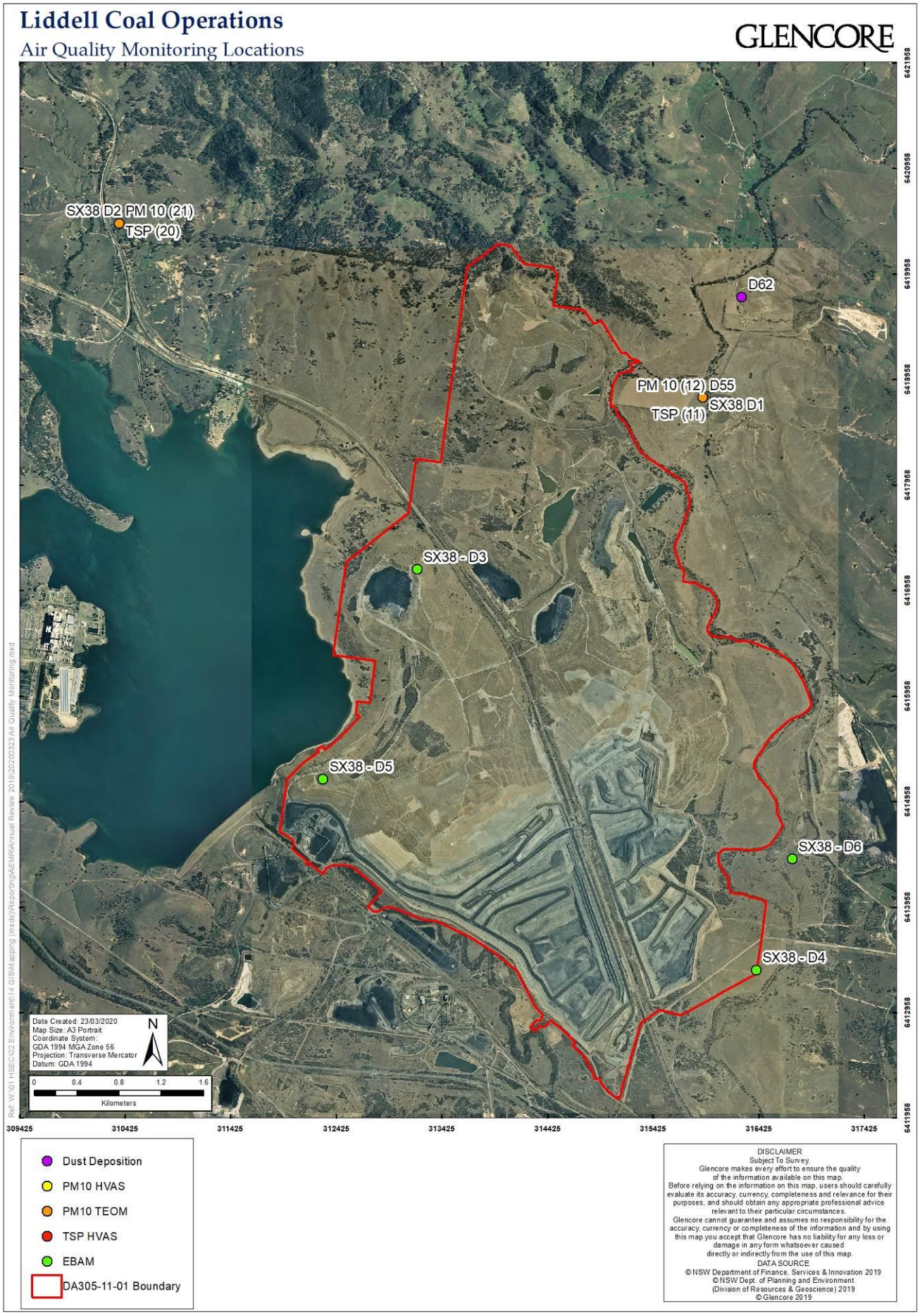

Figure 6 Air quality monitoring sites

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 14**.

Table 14 Annual average depositional dust comparison

Monitoring location	Approval Criteria (g/m2)	Performance during the reporting period (g/m^2)	Key management implications	Proposed management actions
D55	4	Compliant (2.5)	NA	None required
D62	4	Compliant (1.9)	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, despite regional conditions being poor at times throughout the year as identified in **Table 14**.

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. As detailed in **Table 14** during 2019 there were 66 days in which DPIE has identified as being impacted by extraordinary regional events. Out of the 66 days impacted, 11 of which occurred on days where TSP monitoring occurred. Therefore, the results from these 11 days adversely impacted by extraordinary conditions have been removed from the below figures and results. TSP monitoring results are presented in **Figure 7** and **Figure 8** and provided in **Appendix C**.

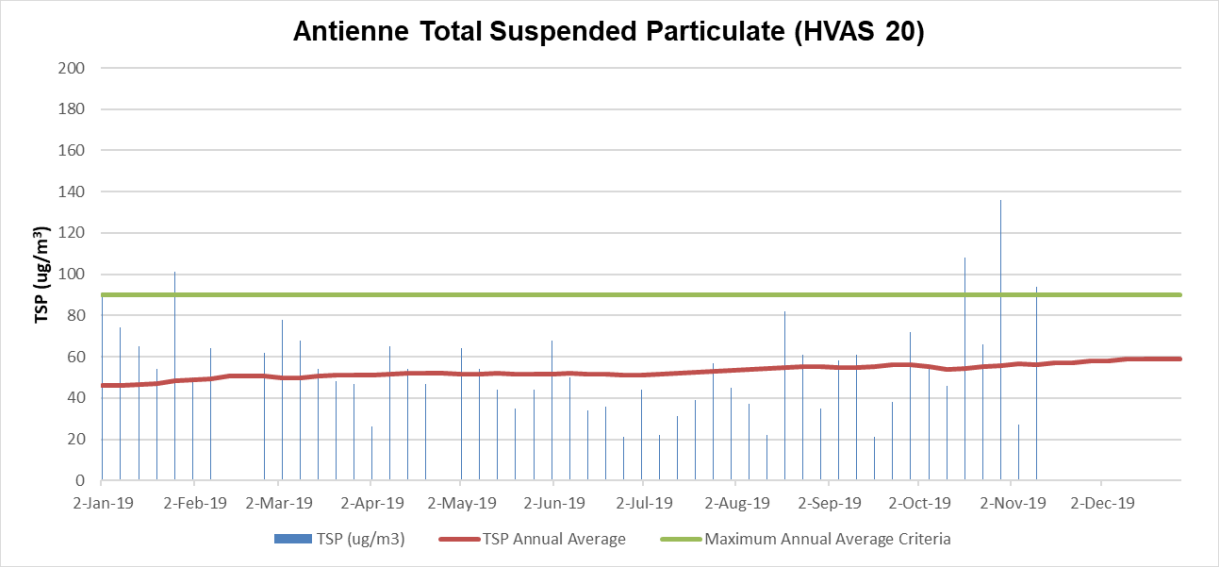

Figure 7 Antiene HVAS TSP Annual Results

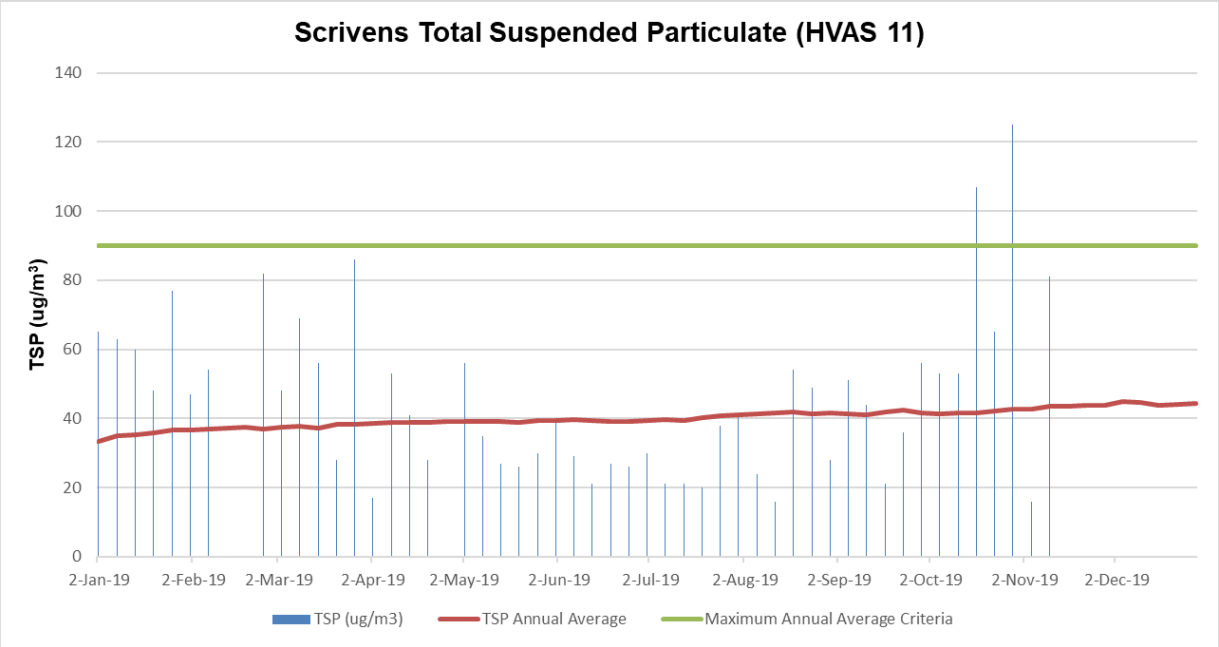

Figure 8 Scrivens HVAS TSP Annual Results

During the reporting period LCO complied with the TSP annual average goal (90µg/m^3) at the Antiene (HVAS 20) and Scrivens property (HVAS 11). Excluding the 11 days which were impacted by extraordinary conditions, the annual average TSP at HVAS 20 was 55 µg/m^3 and 46 µg/m^3 at HVAS 11.

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.

As detailed in **Table 14** during 2019 there was 66 days in which DPIE has identified as being impacted by extraordinary regional events. Out of the 66 days impacted, 11 of which occurred on days where HVAS monitoring occurred. Therefore, the results from these 11 days adversely impacted by extraordinary conditions have been removed from the below figures and results.

During the reporting period, LCO complied with the PM10 long term (annual average) criterion (30 µg/m^3) at Scrivens (HVAS 12) and Antiene (HVAS 21). The annual average PM10 at HVAS 12 was 18 ug/m^3 and the annual average PM10 at HVAS 21 was 20 µg/m3. During the reporting period there was there was 16 exceedances of the short term impact assessment criteria during the reporting period which were investigated by LCO. A summary of each exceedance is provided in **Table 16** below:

Table 15 HVAS PM10 Exceedances

Exceedance Date	Unit	Short Term Criterion (ug/m^3)	Monitored Result (ug/m^3)	Investigation Notes
26/4/2019	HVAS 12	50	103	Investigation determined that local environmental conditions surrounding the monitoring unit were more likely to have generated the high measured results due to a neighbouring property being prepped for agricultural purposes opposed to contribution from LCO. DPIE acknowledged the exceedance to be attributed to a regional dust event.
17/10/2019*	HVAS 12	50	53	HVAS 12 was upstream of LCO during the monitoring period therefore the measured results were likely the result of regional conditions opposed to contribution from LCO.
29/10/2019*	HVAS 12	50	53	Observations note regional smoke haze. During the monitoring period HVAS 12 was predominately upstream of LCO and for 16% of the monitoring period HVAS 21 was downstream. Contribution analysis estimates that during this downstream period 15% of the monitored result at HVAS 21 may have been contributed by operations at LCO.
	HVAS 21	50	58	
22/11/2019*	HVAS 12	50	80	Observations note regional smoke haze. During the monitoring period HVAS 12 was predominately upstream of LCO and for 12% of the monitoring period HVAS 21 was downstream. Contribution analysis estimates that during this downstream period 5% of the monitored result at HVAS 21 may have been contributed by operations at LCO.
	HVAS 21	50	99	
28/11/2019*	HVAS 12	50	52	Observations note regional smoke haze. During the monitoring period HVAS 12 was predominately upstream of LCO and for 22% of the monitoring period HVAS 21 was downstream. Contribution analysis estimates that during this downstream period 6% of the monitored result at HVAS 21 may have been contributed by operations at LCO.
	HVAS 21	50	66	
4/12/2019*	HVAS 12	50	51	Observations note regional smoke haze. During the monitoring period both HVAS 12 and HVAS 21 were upstream of LCO based off predominate wind direction.
	HVAS 21	50	54	
10/12/2019*	HVAS 12	50	87	Observations note regional smoke haze. During the monitoring period HVAS 12 and HVAS 21 were predominately upstream of LCO (<5% period where wind direction applied). Contribution analysis determined deposition was likely have occurred opposed to contribution to the measured results.
	HVAS 21	50	118	
16/12/2019*	HVAS 12	50	77	Observations note regional smoke haze.. During the monitoring period HVAS 12 was predominately upstream of LCO and for 13% of the monitoring period HVAS 21 was downstream. Contribution analysis estimates that during this downstream period deposition occurred across LCO.
	HVAS 21	50	90	
22/12/2019*	HVAS 21	50	59	Observations note regional smoke haze. During the monitoring period HVAS 12 was upstream of LCO and for 26% of the monitoring period HVAS 21 was downstream. Contribution analysis estimates that during this downstream period 9% of the monitored result at HVAS 21 may have been contributed by operations at LCO.
28/12/2019*	HVAS 21	50	58	Observations note regional smoke haze. During the monitoring period HVAS 12 was upstream of LCO and for 15% of the monitoring period HVAS 21 was downstream. Contribution analysis estimates that during this downstream period 41% of the monitored result at HVAS 21 may have been contributed by operations at LCO.

Orange shading –monitoring period determined to be impacted by extraordinary regional conditions under Note D of Schedule 3 Condition 16 by DPIE.*denotes exceedance investigation conducted under Note b of Schedule 3 Condition 16 and determined due to predominate wind direction and contribution analysis using nearfield real time monitoring units, the measured results were likely the result of regional conditions opposed to contribution from LCO

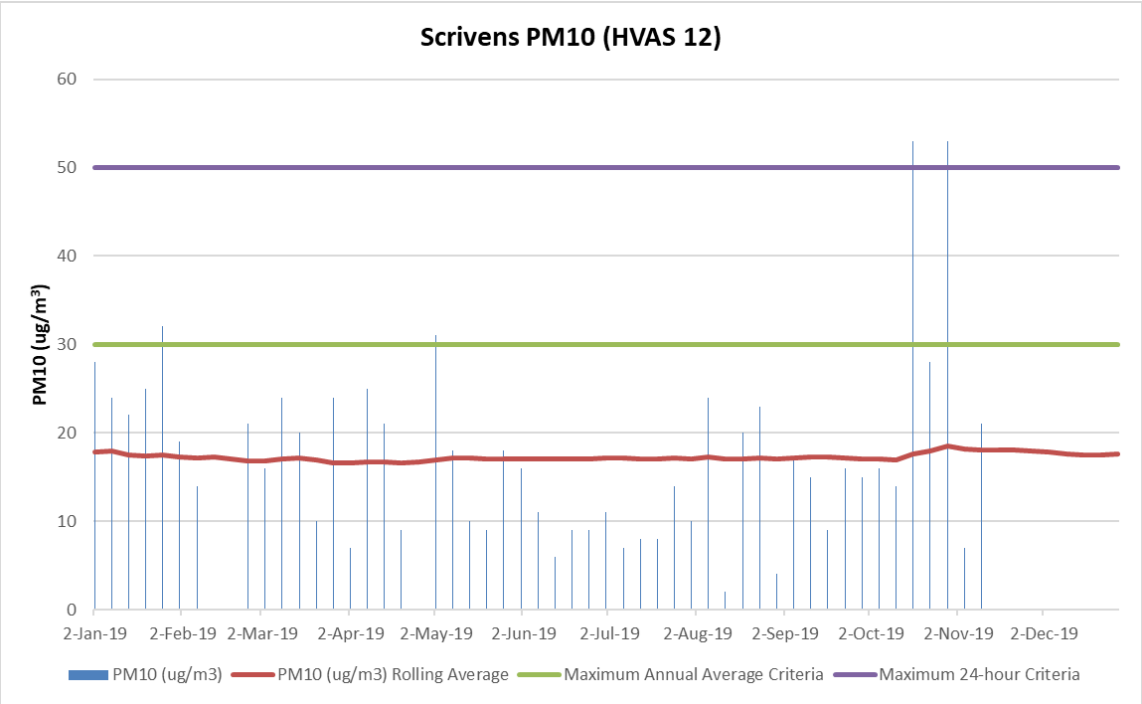

Figure 9 Scrivens HVAS PM10 Annual Results

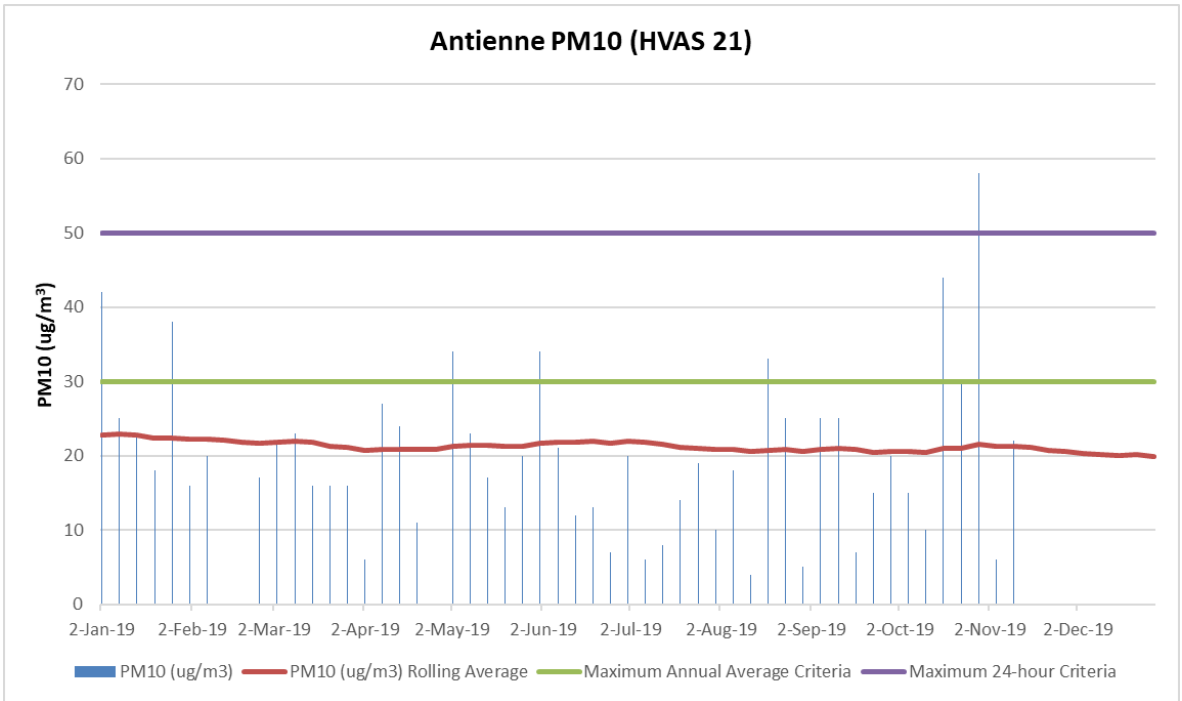

Figure 10 Antiene HVAS PM10 Annual Results

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 12**, on an annual basis. Whilst there was 16 exceedances of the short term impact criteria for HVAS, investigation has determined that these events were the result of regional conditions opposed to contribution by operations at LCO.

Continuous Monitoring – PM10

LCO operate two continuous Tapered Element Oscillating Microbalance (TEOM) measuring 10µm Particulate Matter dust levels around the site. Air quality and meteorological monitoring data are evaluated against monitor-specific PM10 and meteorological triggers on a real-time basis with dust 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.

As detailed in **Table 14** during 2019 there was 66 days in which DPIE has identified as being impacted by extraordinary regional events. Therefore, the results PM10 results from these 66 days adversely impacted by extraordinary conditions have been removed from the below figures and results.

After excluding the 66 days in which monitoring occurred during extraordinary regional events, during the reporting period, LCO complied with the PM10 long term (annual average) criterion (30 µg/m^3) at SX38-D1 (Scrivens) and SX38-D2 (Antiene). The annual average PM10 at SX38-D1 was 17 ug/m^3 and the annual average PM10 at SX38-D2 was 22 µg/m3. During the reporting period, subsequent to excluding those results impacted my extraordinary events, the short term 24 hour criterion (50 µg/m^3) was exceeded 85 times during the reporting period at continuous monitoring units SX38-D1 and SX38-D2. A summary of each exceedance event is provided in **Table 17** below.

Table 16 Air quality exceedance summary

Exceedance Date	Unit	Short Term Criterion (ug/m^3)	Monitored Result (ug/m^3)	Investigation Results
16/01/2019	SX38-D2	50	55.8	Investigation determined regional air quality conditions impacted the measured results at this unit. Contribution analysis using nearfield real time monitoring units was completed and determined the measured results were likely the result of regional conditions opposed to contribution from LCO. DPIE acknowledged elevated dust levels in the region during this monitoring period.
10/02/2019	SX38-D2	50	57.9	Investigation determined that for the majority of the monitoring period SX38-D2 was upstream from LCO and therefore could not have been contributing to the measured results. Contribution analysis using nearfield real time monitoring units was completed for the remaining period and determined the measured results were likely the result of regional conditions opposed to contribution from LCO.
13/2/2019	SX38-D1	50	75.1	Investigation determined due to the predominate wind direction for the monitoring period, measured results were likely due to regional conditions opposed to contribution from LCO. A comparison of upstream and downstream air quality conditions during the monitoring period was also completed and determined that LCO did not significant contribute to the monitored levels.
	SX38-D2	50	74.8	
19/2/2019	SX38-D2	50	63.3	Investigation determined that for the majority of the monitoring period SX38-D2 was upstream from LCO and therefore could not have been contributing to the measured results. Contribution analysis using nearfield real time monitoring units was completed for the remaining period and determined the measured results were likely the result of regional conditions opposed to contribution from LCO.
6/3/2019	SX38-D1	50	56	Investigation determined due to the predominate wind direction being north westerly for the monitoring period, placing SX38-D1 upstream from LCO, measured results were likely due to regional conditions opposed to contribution from LCO.
11/3/2019	SX38-D2	50	52.7	Investigation determined due to the predominate wind direction being north westerly for the monitoring period, placing SX38-D2 upstream from LCO, measured results were likely due to regional conditions opposed to contribution from LCO.
31/3/2019	SX38-D1	50	69.9	Investigation determined due to the predominate wind direction being north westerly for the monitoring period, placing SX38-D1 and SX38-D2 upstream from LCO, measured results were likely due to regional conditions opposed to contribution from LCO.
	SX38-D2	50	70.5	
26/4/2019	SX38-D1	50	77.9	Investigation determined that local environmental conditions surrounding the monitoring unit were more likely to have generated the high measured results

				due to a neighbouring property being prepped for agricultural purposes opposed to contribution from LCO. DPIE acknowledged the monitoring as a regional dust event.
6/9/2019*	SX38-D1	50	74.6	For the majority of the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	78	
7/10/2019*	SX38-D1	50	61	During the monitoring period SX38-D1 was upstream of LCO and for 23% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 39% of the monitored result at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	64.1	
26/10/2019*	SX38-D1	50	86.7	For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	90.3	
27/10/2019*	SX38-D1	50	50.5	During the monitoring period SX38-D1 was upstream of LCO and for 8% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that deposition occurred across LCO during the downstream period.
	SX38-D2	50	56.7	
28/10/2019*	SX38-D2	50	57.7	Observations note regional smoke haze. For 28% of the monitoring period, SX38-D2 was downstream of LCO. Contribution analysis estimates that during this downstream period 49% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
29/10/2019*	SX38-D2	50	52.2	For 16% of the monitoring period, SX38-D2 was downstream of LCO. Contribution analysis estimates that during this downstream period 17% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
30/10/2019*	SX38-D1	50	71.0	Observations note regional smoke haze. During the monitoring period SX38-D1 and SX38-D2 were predominately upstream from LCO based on wind direction. For 8% and 6% of the period SX38-D1 and SX38-D2 were downstream of operations at LCO. In respect to contribution analysis and the distance from operations at LCO, it is unlikely that the measured results were significantly contributed to be LCO operations.
	SX38-D2	50	75.9	
31/10/2019*	SX38-D1	50	50.9	Observations note regional smoke haze.. During the monitoring period SX38-D1 was upstream of LCO and for 17% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that deposition occurred across LCO during the downstream period.
	SX38-D2	50	61.6	
1/11/2019*	SX38-D1	50	74.2	Observations note regional smoke haze.. During the monitoring period SX38-D1 was upstream of LCO and for 13% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 13% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	79.9	
7/11/2019*	SX38-D1	50	73.2	Observations note regional smoke haze. For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	71.1	
8/11/2019*	SX38-D1	50	73.4	Observations note regional smoke haze. For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	70.8	
12/11/2019*	SX38-D1	50	91	Observations note regional smoke haze. For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	116.6	
16/11/2019*	SX38-D2	50	58.7	Observations note regional smoke haze. For 31% of the monitoring period, SX38-D2 was downstream of LCO. Contribution analysis estimates that during this downstream period 25% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
17/11/2019*	SX38-D2	50	50.5	Observations note regional smoke haze. For 18% of the monitoring period, SX38-D2 was downstream of LCO. Contribution analysis estimates that during this downstream period 19% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
20/11/2019*	SX38-D2	50	53.4	Observations note regional smoke haze. For 43% of the monitoring period, SX38-D2 was downstream of LCO. Contribution analysis estimates that during

				this downstream period 65% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
21/11/2019*	SX38-D2	50	101.6	Observations note regional smoke haze. During the monitoring period SX38-D1 was predominately upstream of LCO (6% of the monitoring period the unit was downstream) and for 17% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 11% of the monitored results at SX38-D2 may have contributed been by operations at LCO.
22/11/2019*	SX38-D1	50	76	Observations note regional smoke haze. During the monitoring period SX38-D1 was predominately upstream of LCO (6% of the monitoring period the unit was downstream) and for 12% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 5% of the monitored results at SX38-D2 may have contributed been by operations at LCO.
	SX38-D2	50	97.7	
23/11/2019*	SX38-D1	50	62.1	Observations note regional smoke haze. During the monitoring period SX38-D1 was predominately upstream of LCO (3% of the monitoring period the unit was downstream) and for 43% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 18% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	63.3	
26/11/2019*	SX38-D1	50	236.3	Observations note regional smoke haze, dust storm and high winds. For the majority monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	211.5	
27/11/2019*	SX38-D1	50	72.9	Observations note regional smoke haze.. During the monitoring period SX38-D1 was predominately upstream of LCO (9% of the monitoring period the unit was downstream) and for 21% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 29% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	74.1	
28/11/2019*	SX38-D2	50	68	Observations note regional smoke haze. For 22% of the monitoring period, SX38-D2 was downstream of LCO. Contribution analysis estimates that during this downstream period 6% of the monitored results at SX38-D2 may have contributed been by operations at LCO.
29/11/2019*	SX38-D1	50	107.3	Observations note regional smoke haze. During the monitoring period SX38-D1 was predominately upstream of LCO (8% of the monitoring period the unit was downstream) and for 11% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that deposition occurred over LCO the downstream period.
	SX38-D2	50	109.4	
30/11/2019*	SX38-D1	50	61.7	Observations note regional smoke haze. During the monitoring period SX38-D1 was predominately upstream of LCO (2% of the monitoring period the unit was downstream) and for 21% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that deposition occurred over LCO during the downstream period.
	SX38-D2	50	73	
1/12/2019*	SX38-D1	50	66.6	Observations note regional smoke haze.. During the monitoring period SX38-D1 was upstream of LCO and for 24% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 15% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	56.3	
2/12/2019*	SX38-D1	50	109.9	Observations note regional smoke haze. For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	95	
3/12/2019*	SX38-D1	50	54.7	Observations note regional smoke haze. For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	50.2	
4/12/2019*	SX38-D1	50	57.3	Observations note regional smoke haze. For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	53.8	
5/12/2019*	SX38-D1	50	61.7	

	SX38-D2	50	61.5	Observations note regional smoke haze. For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
6/12/2019*	SX38-D1	50	104.5	Observations note regional smoke haze. For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	86.7	
7/12/2019*	SX38-D1	50	87	Observations note regional smoke haze.. During the monitoring period SX38-D1 was upstream of LCO and for 25% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 1% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	103.9	
9/12/2019*	SX38-D1	50	80.9	Observations note regional smoke haze. During the monitoring period SX38-D1 was predominately upstream of LCO (4% of the monitoring period the unit was downstream) and for 31% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 12% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	72	
10/12/2019*	SX38-D1	50	86	Observations note regional smoke haze.. For the monitoring period SX38-D1 and SX38-D2 were upstream of LCO therefore regional conditions are likely to have impacted the measured results at these units.
	SX38-D2	50	96.1	
11/12/2019*	SX38-D1	50	65.8	Observations note regional smoke haze. During the monitoring period SX38-D1 was upstream of LCO and for 47% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 22% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	83.9	
12/12/2019*	SX38-D2	50	51.4	Observations note regional smoke haze. For 35% of the monitoring period, SX38-D2 was downstream of LCO. Contribution analysis estimates that during this downstream period 45% of the monitored results at SX38-D2 may have contributed been by operations at LCO.
14/12/2019*	SX38-D2	50	51.2	Observations note regional smoke haze. For 28% of the monitoring period, SX38-D2 was downstream of LCO. Contribution analysis estimates that during this downstream period 16% of the monitored results at SX38-D2 may have contributed been by operations at LCO.
16/12/2019*	SX38-D1	50	67.9	Observations note regional smoke haze. During the monitoring period SX38-D1 was upstream of LCO and for 13% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that deposition occurred over LCO during the downstream period
	SX38-D2	50	80.4	
19/12/2019*	SX38-D1	50	87.1	Observations note regional smoke haze.. During the monitoring period SX38-D1 was upstream of LCO and for 11% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 11% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	105.7	
20/12/2019*	SX38-D2	50	54.6	Observations note regional smoke haze. For 45% of the monitoring period, SX38-D2 was downstream of LCO. Contribution analysis estimates that during this downstream period 23% of the monitored results at SX38-D2 may have contributed been by operations at LCO.
21/12/2019*	SX38-D1	50	76.1	Observations note regional smoke haze. During the monitoring period SX38-D1 was upstream of LCO and for 19% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that deposition occurred over LCO during the downstream period
	SX38-D2	50	89.1	
29/12/2019*	SX38-D1	50	52.1	Observations note regional smoke haze. During the monitoring period SX38-D1 was predominately upstream of LCO (9% of the monitoring period the unit was downstream) and for 17% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream period 36% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
	SX38-D2	50	68.8	
30/12/2019*	SX38-D1	50	75.6	Observations note regional smoke haze. During the monitoring period SX38-D1 was predominately upstream of LCO (6% of the monitoring period the unit was downstream) and for 13% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that during this downstream
	SX38-D2	50	77.8	

				period 23% of the monitored results at SX38-D2 may have been contributed by operations at LCO.
31/12/2019*	SX38-D1	50	67.2	Observations note regional smoke haze. During the monitoring period SX38-D1 was upstream of LCO and for 7% of the monitoring period SX38-D2 was downstream. Contribution analysis estimates that deposition occurred over LCO during the downstream period
	SX38-D2	50	76	

Orange shading – monitoring period determined to be impacted by extraordinary regional conditions under Note D of Schedule 3 Condition 16 by DPIE.
*denotes exceedance investigation conducted under Note b of Schedule 3 Condition 16 and determined due to predominate wind direction and contribution analysis using nearfield real time monitoring units, the measured results were likely the result of regional conditions opposed to contribution from LCO

Continuous monitoring points SX38-D1 and SX38-D2 failed to monitor PM10 continuously on 11 occasions in accordance with Section 2.11 of the approved LCO AQMMP. Section 4.5 of the National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 5 – Data Collection and Handling, 2001 (Prepared by the National Environment Protection Council Peer Review Committee), identifies an average concentration can only be valid if it is based on at least 75% of the expected samples in the daily averaging period.

LCO has identified that monitoring points SX38-D1 and SX38-D2 failed to achieve PM10 data availability greater than 75% a number of times, during the reporting period. These instances are summarised in **Table 18** below.

Table 17 Failure to meet PM10 data availability instances

Monitoring Period	Unit	Data Availability (%)	Comments
25/2/2019	SX38-D1	56.3	12 monthly planned maintenance
26/2/2019	SX38-D1	59.7	12 monthly planned maintenance
20/5/2019	SX38-D2	70.8	Suspected synchronisation fault
24/5/2019	SX38-D2	74.3	Suspected synchronisation fault
3/6/2019	SX38-D1	56.9	3 monthly planned maintenance with zero noise filter
3/6/2019	SX38-D2	17.4	12 monthly planned maintenance
4/6/2019	SX38-D1	59	3 monthly planned maintenance with zero noise filter
4/6/2019	SX38-D2	57.6	12 monthly planned maintenance
26/9/2019	SX38-D1	70.1	Outage due to powerline maintenance
24/10/2019	SX38-D1	66	Ausgrid line works
28/11/2019	SX38-D1	74.3	Ausgrid line works

Despite the above instances in which SX38-D1 and SX38-D2 failed to achieve PM10 daily availability greater than 75%, the overall valid data availability for each unit during 2019 was 97.9% and 97.7% respectively.

PM10 monitoring results, excluding the 66 days deemed as impacted by extraordinary conditions by DPIE, are presented in **Figure 11** and **Figure 12.**

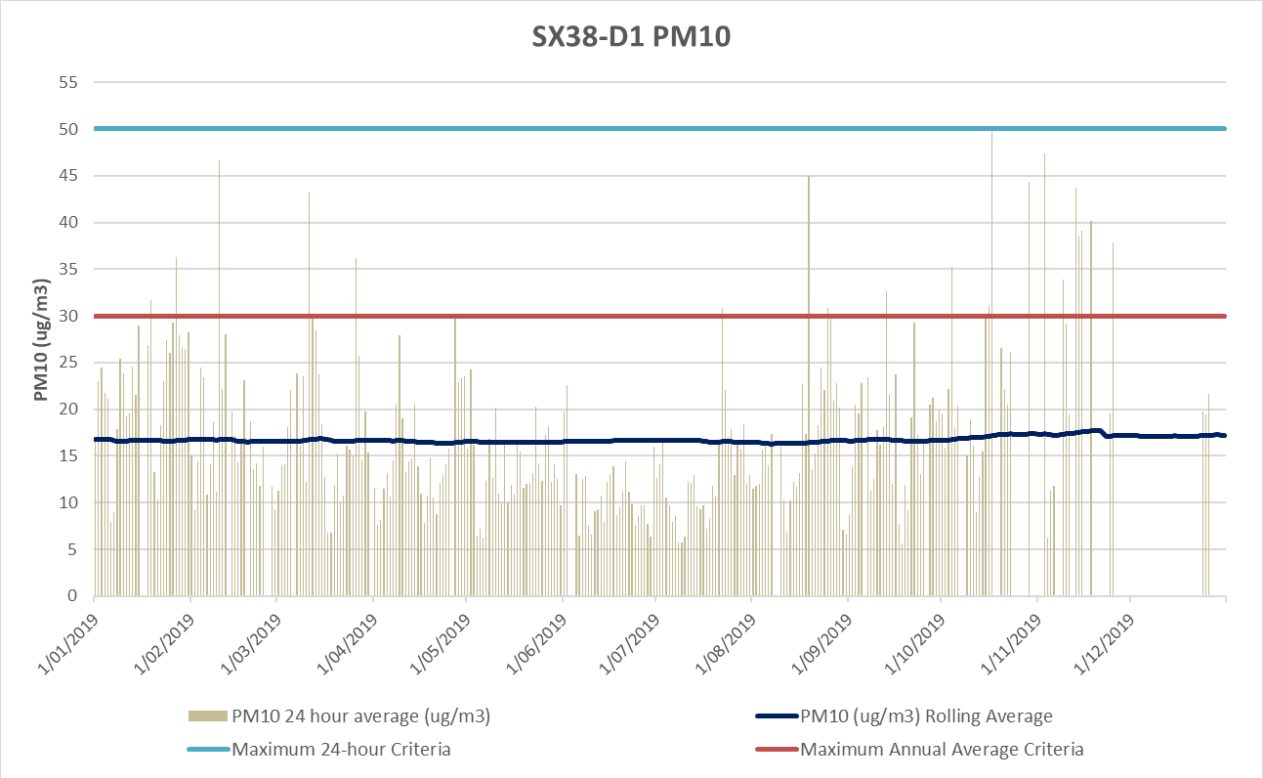

Figure 11 SX38-D1 TEOM PM10 Results

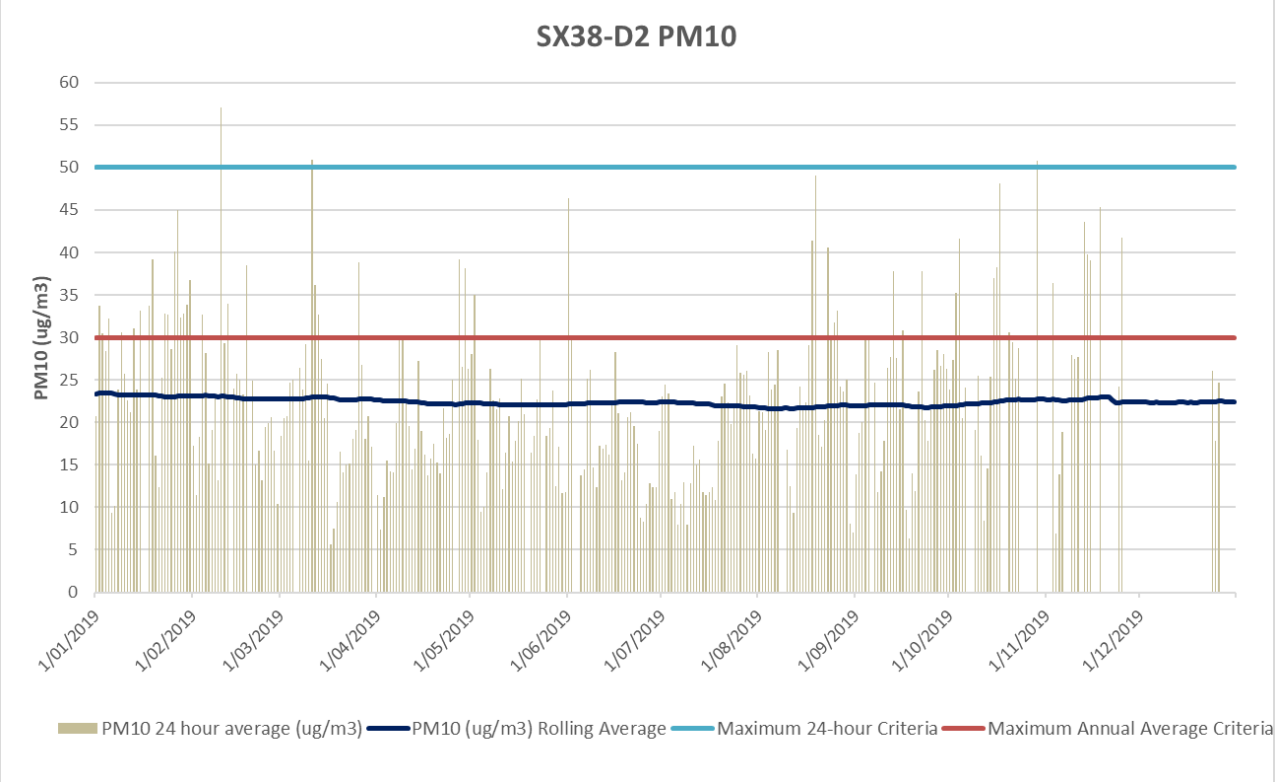

Figure 12 SX38-D2 TEOM PM10 Results

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/m^3 with the probability of this occurring being less

than 0.3%. While exceedance of this criteria was recorded at private residences (SX38-D1 and SX38-D2) during the reporting period, as predicted, LCOs contribution to these values was not considered significant and attributable to regional conditions.

Continuous PM10 Monitoring - EBAMs

EPL 2094 Condition M2.2 requires the continuous monitoring of four EBAM boundary monitoring units (as shown in Figure X above. For a 24 hour monitoring period measured by these units to be considered valid, Section 4.5 of the *National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 5 – Data Collection and Handling, 2001* (Prepared by the National Environment Protection Council Peer Review Committee), identifies an average concentration can only be valid if it is based on at least 75% of the expected samples in the averaging period.

Table 19 below identifies for each of the four monitoring units the dates in which PM10 data availability greater than 75% was not achieved and therefore are considered to be non-compliances with the requirement for continuous monitoring in Condition M2.2 of EPL 2094.

Table 18 Failure to meet PM10 data availability instances - EBAMs

Monitoring Point/Unit	Monitoring Period	Data Availability (%)	Comments
Point 9 (SX38-D3)	26/2/2019	32.6	Hardware failure
	27/02/2019	50	
	9/7/2019	61.1	Unit stopped due to battery charge. Batteries replaced
	21/7/2019	12.5	Unit stopped due to battery charge. Batteries replaced. Datataker lockup required unit resetting.
	22/7/2019	48.6	
	5/8/2019	32.6	Datataker lockup required unit resetting
	6/8/2019	68.1	
	19/9/2019	74.3	Main batteries failure requiring replacement
Point 10 (SX38-D4)	2/7/2019	47.2	Planned maintenance with zero filter installed
	3/7/2019	46.5	
Point 11 (SX38-D5)	29/1/2019	13.9	Internal hardware failure identified requiring the unit to be sent away for factory repairs. A replacement unit was sought, hired and installed.
	30/1/2019	0	
	31/1/2019	0	
	1/2/2019	0	
	2/2/2019	0	
	3/2/2019	0	
	4/2/2019	0	
	5/2/2019	38.2	
	17/7/2019	50	Hardware failure
	7/8/2019	59.7	Flow failure requiring vacuum pump to be replaced
	8/8/2019	36.8	

	9/8/2019	42.4	
	20/8/2019	65.3	
	21/8/2019	54.2	
	21/11/2019	70.8	Flow failure
	22/11/2019	41.7	
	26/11/2019	0	Flow failure. Unit was removed from site for testing
	27/11/2019	41.7	
	17/12/2019	39.6	Flow failure. Field testing and maintenance completed. EBAM was removed from site for workshop repairs and spare unit installed.
	18/12/2019	29.9	
	19/12/2019	41.7	
Point 12 (SX38-D6)	16/1/2019	46.5	Units datataker locked up and planned maintenance
	17/1/2019	0	
	18/1/2019	47.2	
	2/7/2019	50.7	Planned maintenance with zero filter installed
	3/7/2019	48.6	
	25/9/2019	65.3	Datataker locked up and reset
	3/10/2019	62.5	Planned maintenance and faulty temperature sensor
	4/10/2019	36.8	Faulty temperature sensor
	7/10/2019	65.3	Flow failure
	22/10/2019	66.7	Datataker media card failure. Datataker OEM advised of recurring issue
	7/11/2019	70.1	Datataker media card failure
	8/11/2019	65.3	

Despite the above instances in which SX38-D3, SX38-D4, SX38-D5, and SX38-D6 failed to achieve PM10 daily availability greater than 75%, the overall valid data availability for each unit during 2019 was 98.4%, 99.3%, 95.5% and 97.9% respectively.

Pollution Reduction Programs

During 2019, no new Pollution Reduction Programs were completed however LCO did continue to implement 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 – 96%
- Q2 May –92%
- Q3 August – 95%
- Q4 November – 88%

6.4 Visual and Stray Light

Visual impact management is undertaken in accordance with the practices outlined in the LCO MOP (LCO, 2018) 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 2019, 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 revised during the reporting period to incorporate changes resulting from the approval of Modification 7 to DA 305-11-01 during the review period. The revised plan was reviewed and approved by DPE in August 2019.

No due diligence or salvage programs were completed during 2019. No additional consultation activities were held in 2019 outside of the annual inspection and meeting.

The annual inspection and meeting was held with RAPs on 8 October 2019. During this inspection, RAPs visited the LID-BC-SAL and the Mountain Block sites which included a hydromulch application trial which

had been previously consulted on. The following actions were discussed and agreed on during the inspection:

- LCO to provide a map of extant sites and extents to attendees with the meeting minutes and as part of the next meeting;
- LCO to organise next annual meeting (2020) at a similar time of year and day; and
- LCO to provide a map of the areas visited and GPS coordinates to members.

All outstanding actions from the December 2018 Annual meeting were addressed prior to the 2019 inspection. Since the 2019 annual inspection, LCO has provided the requested maps with the meeting minutes and revised ACHMP to the LCO RAPs.

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.

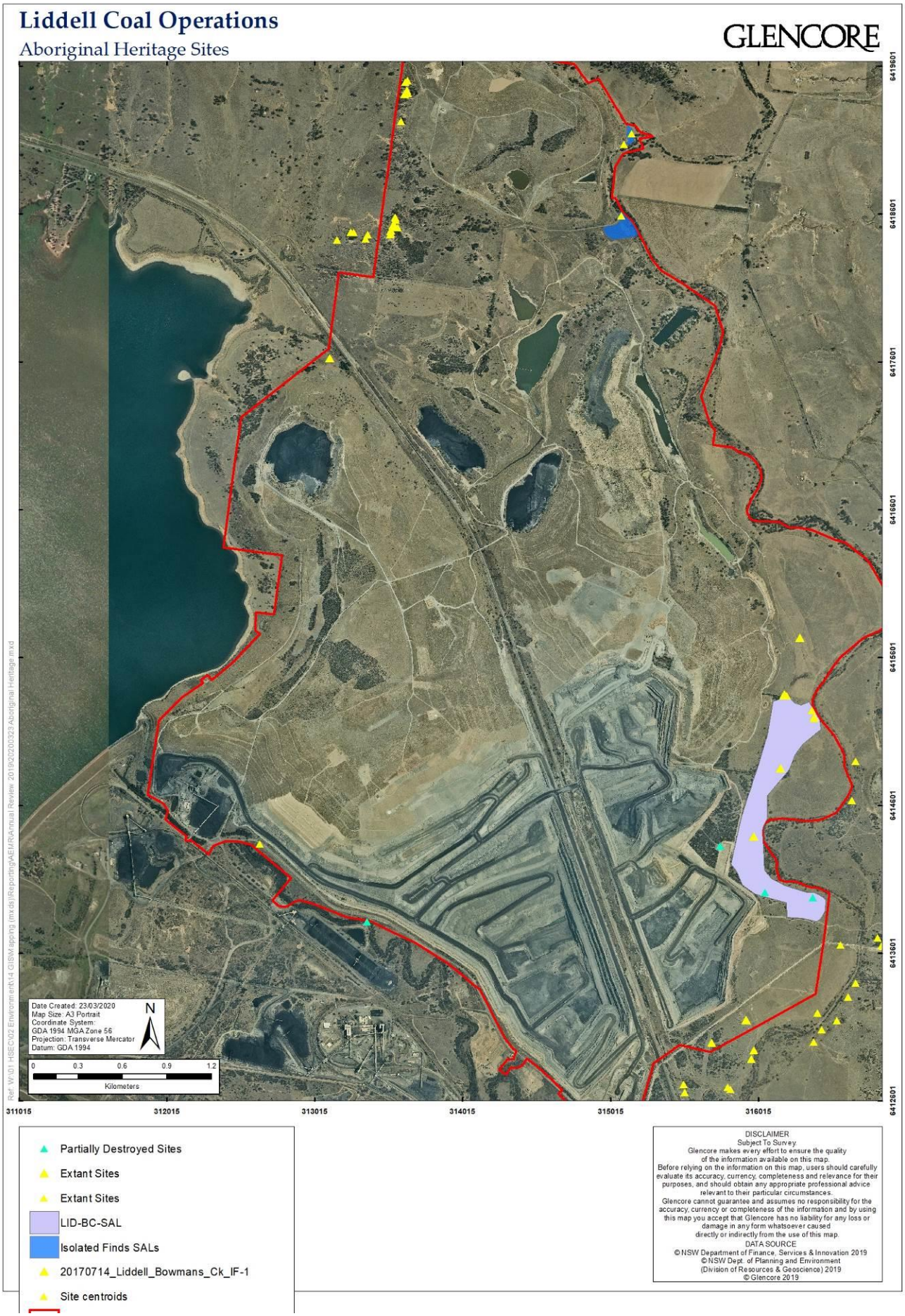

Figure 13 Aboriginal archaeological sites within Development Consent Boundary

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 Chain of Ponds Inn (COPI) 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 COPI 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 revised and approved by the DPE on the 17 October 2018 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, no impacts to the Inn Complex have been noted by either building vibration monitoring or visual inspection.

As identified initially in the 2017 Annual Review, some fragments of loose plaster from the ground floor archway had dislodged and fallen to the floor following a blast on the 11 May 2017. Subsequent to this, during a dilapidating update conducted on 9 October 2019 an additional small amount of loose plaster had fallen, but this could be attributed to a single blast vibration event. As per the approved management strategy, the damage was deemed insignificant and no structural impacts to the Inn occurred. Repairs to this plaster will be completed when the blasting program affecting the building is completed in approximately 2021.

Bill Jordan & Associates determined that there has been no structural impact to the Inn complex resulting from blasting during the reporting period.

Management Actions During 2019

As per the requirements of the management strategy, continuous monitoring of blasting as well as structure response monitoring occurred during 2019. No further stabilisation mitigation works were identified as being required. A summary of the building response monitoring is outlined below.

During the reporting period, levels of up to 40 mm/s PPV were measured at the COPI Complex with no measured or observed effects on the buildings. In accordance with Section 5.2 the COPI Strategy, Bill Jordan & Associates identified that no vulnerable walls or other items required further support and therefore recommended continuation of the blast management program in accordance with the approved Strategy.

A blast initiated on the 16 December 2019, a larger than expected displacement (though still within established tolerances) was recorded at the top of the monitored chimney. Following this event, a more detailed assessment was undertaken of the area of support for the chimney plus some structural modelling to better understand the possible vibrational characteristics of the chimney and the wall below it. No adverse factors were determined which may have affected the continuing blasting operations.

Analysis of Blast Monitoring

The structures were monitored with accelerometers on 6 occasions during the year, from 14/5/2019 to 16/12/2019. 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.

The accelerometer mounting locations chosen to best describe the behaviours of the buildings are shown in **Figure 14**. 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.

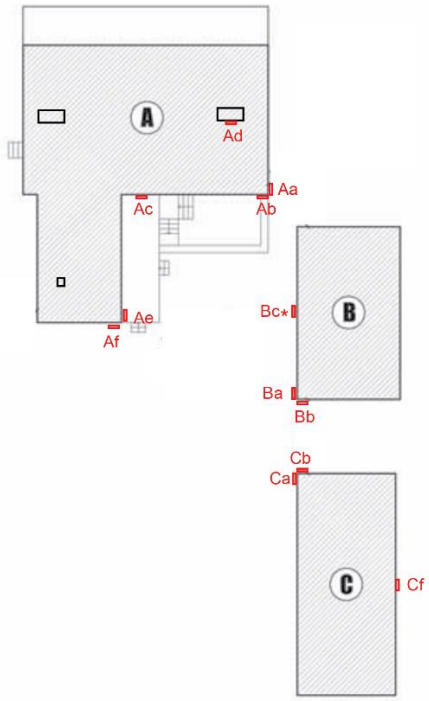

Figure 14 Diagram of accelerometers on COPI

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); the responses at these locations are measured by representative accelerometers at locations Ad and Bc.

No results recorded in 2019 suggested that any change was required in these criteria.

The maximum displacements recorded during the year at each location are shown in **Table 20**.

Table 19 Maximum displacements recorded in 2019

Location	Max. displacement (mm)	Tolerance	% of tolerance
Aa	0.67	7	9.6
Ab	0.96	7	13.7
Ac	1.08	7	15.4
Ad	4.90	12	40.8
Ae	0.93	7	13.3
Af	0.95	7	13.5
Ba	0.78	5	15.6
Bb	0.66	5	13.2
Bc	0.94	3	31.3
Ca	0.86	5	17.2
Cb	0.71	5	14.2
Cf	0.68	5	13.6

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

Visual Inspection Outcomes

Visual inspections were completed through the year on a minimum quarterly basis as per the approved Strategy. The buildings were assessed for damage as per the agreed methodology and no differences could be found in the condition of any of the buildings fabric which are attributable to blasting impacts.

Trends and compliance issues

During 2019, 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 2019.

Future Work

Continued 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 conducted by LCO in 2019.

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.

Coarse rejects generated from the LCO CHPP are in the order of 26% 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 transported to Bayswater Power Station, 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 Bayswater Power Station occurred during 2019.

LCO has approval to dispose of tailings in the Antienne, Reservoir West, Reservoir South and the Railway fines (now referred to as the Durham Tailings) emplacement areas.

The Antienne 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 Antienne TSF was submitted to the NSW Resources Regulator (formerly DRE) in December 2014 and LCO commenced capping of the Southern portion of Antienne TSF during 2016. LCO aims to recommence capping operations on the Northern portion during 2020, 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.

Deposition into the Reservoir South Tailings TSF initially ceased in 2014 and deposition into the Reservoir West TSF ceased in December 2013. Both facilities have been in a settling/drying stage since cessation of emplacement which has resulted in approximately 580 thousand cubic metres of combined additional capacity becoming available for tailings emplacement through consolidation. An addendum to the 2018 – 2020 Mining Operations Plan was approved by the Resources Regulator on 24 October 2018 which permitted the alternating emplacement of tailings between both Reservoir TSFs and the active Durham TSF throughout 2019.

Towards the end of 2019 LCO commenced the commissioning of tailings pipeline and emplacement of tailings into 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 as the three active onsite storages reach capacity. Based on current monitoring and consolidation forecasts, West Pit TSF has sufficient tailings disposal capacity for LCO life of mine.

Table 21 below shows indicative timeframes for capping and final rehabilitation for each facility which is subject to technical analysis of consolidation rates.

Table 20 Tailings emplacement and rehabilitation timeframes

	2019	2020	2021	2022	2023	2024	2025
RTEA (Reservoir South and West TSF)	Active	Active			Rehab	Rehab	Rehab
Durham TSF	Active	Active			Rehab	Rehab	Rehab
Antiene TSF	Rehab	Rehab	Rehab				
Mount Owen West Pit TSF		Active	Active	Active	Active		

6.10 Waste Management

LCO engage a licensed waste management contractor to handle, transport, track and dispose of all waste streams, including special waste and dangerous goods in accordance with EPL 2094, DA 305-11-01, the POEO Act (1997) and other applicable Commonwealth and State legislation.

Waste segregation is a key component of the LCO waste management system to ensure that waste groups are segregated appropriately to allow for treatment separately. The segregation of bins is inspected weekly by the licensed waste management contractor to identify any issues prior to the waste going offsite and to allow for any actions to be implemented as required.

On a monthly basis, LCO review waste statistics and volumes produced by the site. During this review, any events in which the recycling target of 92% is not achieved, the deviation away from the target is reviewed and a determination made whether the event is reasonable or whether a waste minimisation or recycling improvement can be implemented. During 2019, no opportunities for waste minimisation or recycling improvements were identified with the annual recycling target met and exceeded during periods throughout the term. **Table 22** below shows the total recycling efficiency percentage achieved monthly at LCO in 2019.

Table 21 Recycling efficiency recorded in 2019

Month	Total Recycled (%)	Comments
January	94.49	
February	93.97	
March	93.68	
April	91.18	
May	86.49	Minor increase in non-hazardous waste disposed
June	93.89	
July	91.12	
August	93.7	
September	91.66	
October	94.93	
November	93.90	
December	88.75	Minor increase in non-hazardous waste disposed
2019 Total	**92.43**	

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 2013/6908. During 2019, LCO consulted with DPIE to update the WMP following the approval of DA305-11-01 Modification 7 and the findings of the three yearly Independent Compliance Audit detailed in **Section 10**. The key updates comprised of revisions to the water licences register and contextual details to align with 2019 progression of operations.

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.
- To minimise the potential effects of erosion and its associated impacts as a result of mining operations changing flows or conditions downstream.

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, 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 use, 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 Bayswater 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.

During 2019, LCO completed an annual review of the site water balance as per Section 7.6 of the WMP including review of the total water flows within the water management system. **Table 23** contains a summary of the water balance results. A summary of the water flows onsite LCO during the reporting period is shown in **Figure 15**. Further, during the reporting period LCO consulted with DPIE to update the WMP; specifically updates to the training and communication requirements and contextual updates to align of the plan with current operations.

Table 22 Site water balance

2019 Site Water Balance	
Total Inputs (ML)	1,564
Total Outputs (ML)	3,151
Inputs minus Outputs (ML)	-1,588
Storage at Start (ML)	7,132
Storage at End (ML)	5,727
Change in Storage (ML)	-1,404
Imbalance (ML)	-183
Total Inputs + Total Outputs equals total flow through site (ML)	4715
Imbalance Percentage	3.9%

Water balance model calibration and validation is undertaken by comparing model estimates of total water volume stored in all monitored water storages against water volumes estimated from historical monthly monitoring records as required by DA305-11-01 Condition 23 and the WMP.

During 2019 the site water balance model was maintained to reflect current operations. The annual review of model calibration, summarised as the 'imbalance percentage' above, shows a 3.9% imbalance percentage demonstrating that the water balance is well calibrated. The imbalance is expected to be the cumulative effective of minor inaccuracies in storage measurements as well as modelled input/outputs (rainfall/run off inflow, evaporation, groundwater inflows, etc.). In accordance with DA 305-11-01, a 3yearly water balance model validation review will be undertaken during 2020 to provide for water balance accuracy

Mine Dewatering

The M49 Bore, Mt Owen Bore, Hazeldene 1 Bore and Middle Liddell Bore are utilised to manage water levels within the historic underground workings as required by the mine plan to maintain safe working conditions and water supply for mining operations. **Table 23** provides a summary of the water take in 2019 from the groundwater licences held by LCO with an extraction allocation. LCO did not take from any surface water licences during the reporting period.

Section 7.3 details groundwater monitoring results (water level and water quality) for the reporting period.

Table 23 Groundwater take

Locality	Water Licence	Entitlement	Passive take	Active pumping	Total
Durham 1	WAL41499 (previously 20BL168063)	500	0	0	0
8 South 3 & 4	WAL41498 (previously 20BL168062)	6000 (Combined)	196.22ML	613ML	809ML
Middle Liddell Bore	WAL41498 (previously 20BL172588)				
Hazeldene 1 & 2	WAL39760 (previously 20BL168060)	5500	0	524ML	524ML
Bowman's Creek	WAL18302	5	0	0	0
Bowman's Creek	20WA210940 (previously 20BL017861)	5	0	0	0
M49	WAL41493 (previously 20BL172293)	2500 (Combined)	365ML	545ML	910ML
Mt Owen 1	WAL41493 (previously 20BL168209)				
Mt Owen 2	20BL169544	2500	0	0	0
Durham 2 & 4	WAL41497 (previously 20BL168061)	1000	0	0	0

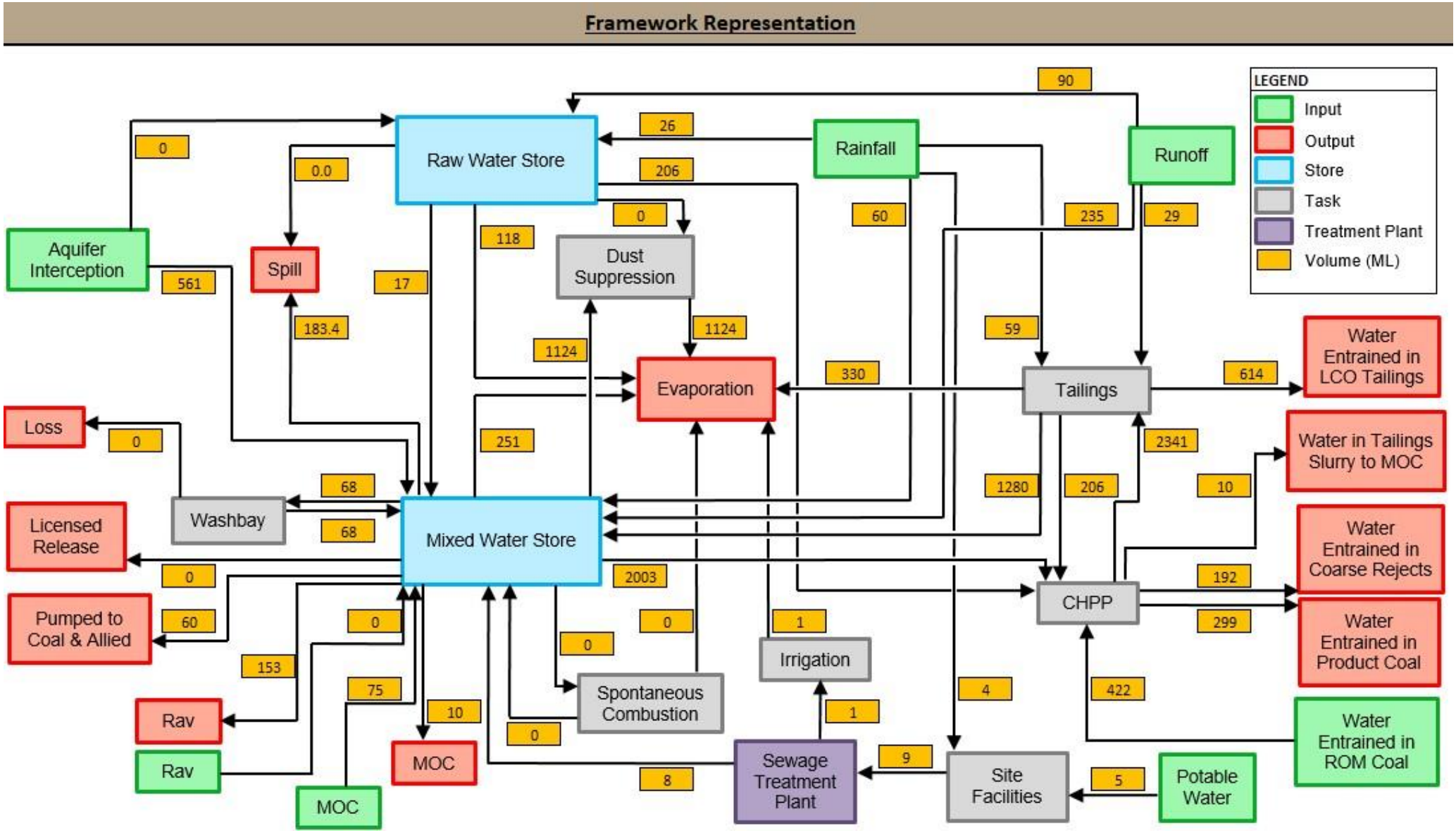

Figure 15 Site water balance

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

Table 24 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

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

The surface water monitoring locations are shown above on **Figure 16**.

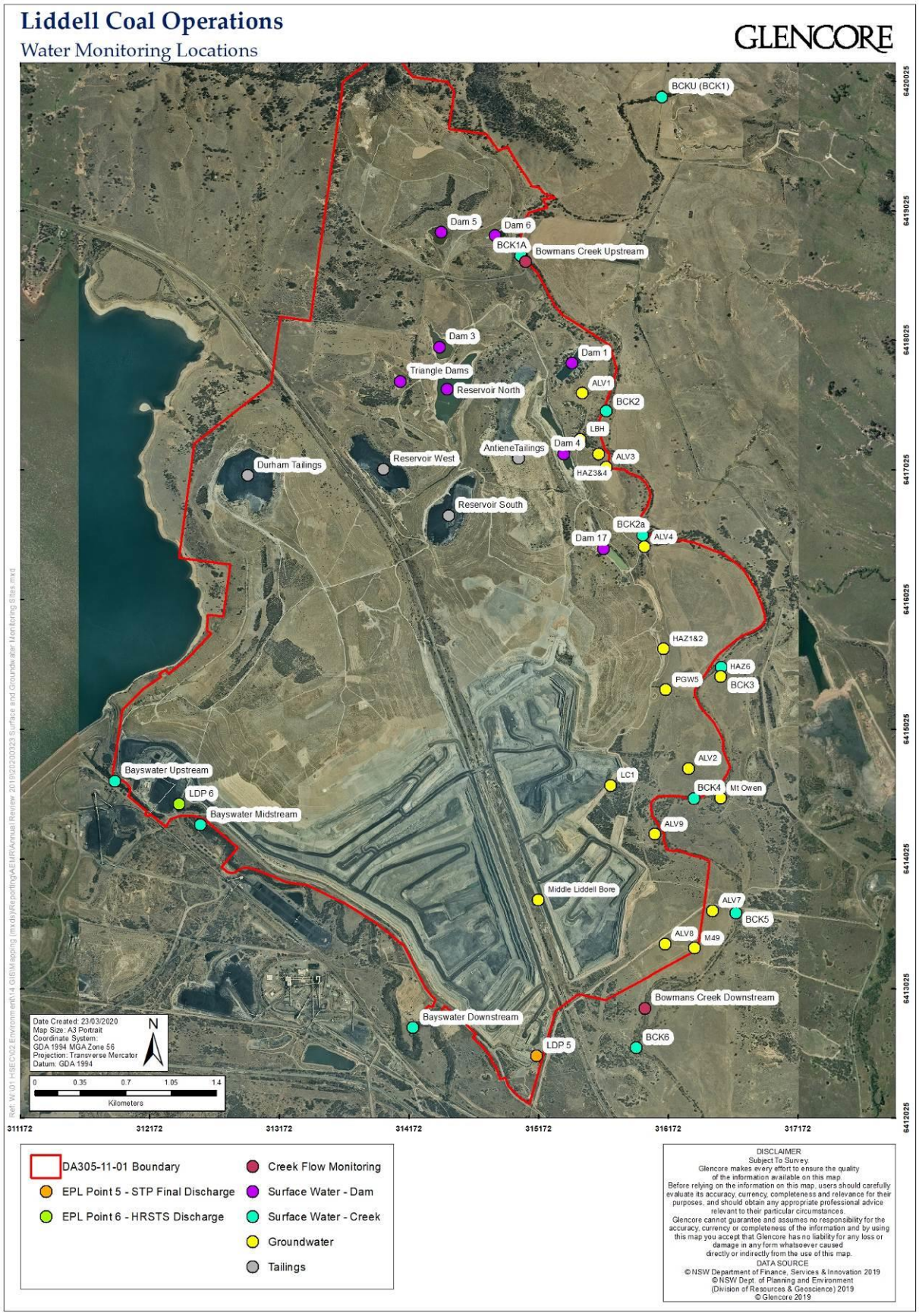

Figure 16 Surface and groundwater monitoring locations

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 25 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 25 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						6410		4880								
Feb						6840		4790								
Mar						5970		3570								
Apr						4120		2260								
May						3690		2090								
Jun						4630		2920								
Jul						3610		2220								
Aug						2780		1840								
Sep						3900		2600								
Oct						5650		4080								
Nov						5300		3540								
Dec						5490		3470								
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					8.84											
Feb																
Mar																
Apr																
May				529												
Jun																
Jul																
Aug																
Sep																
Oct																
Nov																
Dec																

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

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

During 2019, LCO recorded below average rainfall and above average evaporation which has had observable changes to the flow and water quality of Bowmans Creek. Upstream monitoring locations BCK1 and BCK1A were the only locations that haven't completely dried out during the reporting period. Sites BCK2-BCK6 all ceased flowing during Q4 2017.

The measured TDS and EC levels along Bowmans Creek identified a number of exceedances of flow applicable criteria during the reporting period. As shown by shading in Table 32 above, many 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. Of note, eight consecutive exceedances of EC and TDS criteria were recorded at monitoring location BCK 1A. In accordance with the surface water trigger action response plan, DPIE, DOE and DPIE-Water were notified in February, May, August and in January 2020 after each three month period of consecutive exceedances occurred. Investigations were undertaken at each occasion with findings reported to the same regulatory authorities; a summary of the findings is provided below. Also during the reporting period, one instance of exceeding TSS criteria and one instance of exceeding pH criteria during no flow conditions was also recorded. Given there were no sustained exceedances of the 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 of these results was required.

BCK1A Investigation TARP

Surface water monitoring at BCK1A identified exceedances of the 90th%ile trigger limits for EC and TDS from May 2018 to December 2019. As per the WMP, investigations have been undertaken and reported on three monthly intervals of the consecutive exceedances. During the reporting period, LCO reported investigation findings in February, May and August 2019; the following summarises the investigation status as at the end of the reporting period.

The investigation findings have determined that:

- No change to management or mining activities in the area.
- There is no discernible impacts to flora or fauna in the immediate area.
- It is unlikely that potential harm has occurred or will occur based on the current observations.
- The climate, creek flow and water quality monitoring observations corroborate the understanding the monitored EC & TDS levels are predominately naturally driven. This is demonstrated most recently by the decreasing EC & TDS trend as rainfall during the last six months normalises.
- The upstream and downstream monitoring locations have recorded ‘still’ or ‘dry’ flow conditions during the same trigger period indicating that the creek is behaving in an ephemeral manner and likely transitioning slowly to the ‘no flow’ applicable investigation trigger levels.
- Water was identified expressing from the western creek bank upstream of BCK1A.The source of the observed seepage is not clear based on the current information; hence it cannot be determined whether the observations are the result of historical mining activities.

Based on the current information, LCO does not consider there to be potential environmental harm however it is not clear if observations are the result of historical mining activities. Hence, as per the WMP investigation protocol, LCO has progressed to undertake further investigations to determine the source of the seep observations by commencing a Management/Mitigation TARP. LCO has taken management/mitigation measures through the dewatering an adjacent water management structure (Dam 6) to create a local groundwater sink to redirect and capture any potential groundwater flow from the historical mining and conducting further studies in consultation with DPIE. These studies are continuing in 2020.

MIA Onsite Sewerage System Discharge Quality

Liddell operate a Wastewater Treatment Plant (WWTP) at the Mine Infrastructure Area (MIA) for the treatment of waste water prior to discharge into the mine dirty water containment system. LCO has a water quality limits on the MIA WWTP discharge stated in the Development Consent, Singleton Shire Council OSSM Approval and the Environmental Protection Licence (as Licenced Discharge Point 5).

During the reporting period, there were no exceedances of the MIA WWTP limits requiring investigation.

HRSTS Discharge Monitoring

Any discharges from Liddell Coal must be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS). During 2019, LCO did not undertake any HRSTS discharge events.

Discharge Event

As reported in the 2018 Annual Review, a single offsite discharge of sediment laden water was recorded on the 28 November 2018. This event was reported to the NSW EPA and other required authorities in accordance with the LCO Pollution Incident Response Management Plan (PIRMP) and Water Management Plan (WMP) (approved under NSW DA305-11-01 and EPBC Approval 2013/6908). An investigation was subsequently undertaken in accordance with the LCO WMP. Details of this investigation are summarised below.

On 28 November 2018, LCO recorded a total of 35.6mm of rainfall. Whilst completing routine high rainfall inspections in accordance with the WMP a supervisor observed sediment laden runoff breaching a containment drain blocked by blast heave. This sediment laden runoff was observed to mix with run off from undisturbed areas of remnant vegetation and follow existing drainage lines to an isolated and pooled section of Bowmans Creek.

Actions to control and contain the sediment laden water were commenced immediately after identifying the failure. This included drainage repairs, pumping, water sampling and reporting to relevant authorities.

The captured sediment laden water was subsequently pumped from the isolated pool back into the LCO mine water system.

As the incident was responded to in a timely manner to mitigate potential impacts, it has not resulted in potential or actual environmental harm. LCO has identified and implemented system improvements to mitigate likelihood of a similar event reoccurring.

Subsequent to this event, LCO received a Penalty Infringement Notice from the EPA for breach of Section 120 of the *Protection of the Environment Operations Act 1997* on 2 July 2019.

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 **Table 27** below. In brief, observations from the monitoring programs demonstrate current impacts are within the EA predictions.

Table 26 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.	No breaches of the mine water containment system occurred during 2019.
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.

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. The following outlines groundwater trigger level definitions as defined in the WMP.

Groundwater level trigger definition

Groundwater level monitoring is carried out at least monthly on the shallow, unconfined, water table aquifers of Bowmans Creek alluvium and the underlying shallow bedrock. Water pressure monitoring is carried out at least monthly on the deeper, confined, hard rock aquifers.

There are three components to the groundwater level trigger definitions. These are described in detail in the WMP (LCO, 2018) and summarised as follows:

1. Impact trigger – An impact trigger is drawdown of 2m in the alluvium compared to the local reference site for the northern and southern impact zone as shown in the WMP; only applicable at ALV9 and ALV8L.
2. Investigation trigger – An investigation trigger and is measurement below the monthly, baseline (10th percentile) water level on three consecutive occasions. The purpose of this trigger is to identify unexpected changes to groundwater level. ALV9 does not have an investigation trigger because these triggers were developed using historical baseline data and ALV9 was a recent installation (December 2017) to provide greater coverage for the identification of alluvial groundwater impacts in the northern drawdown area.
3. Subsequent Investigation Trigger - A Subsequent Investigation Trigger is designed to address the potential for harm to listed threatened species, communities and migratory species of concern to EPBC Approval 2013/6908. Following an investigation of an exceedance of Groundwater Level Trigger Definition #2 that concludes the exceedance is not mining-related, should groundwater levels continue to be measured below the lower 10th percentile for a further nine months, such that the exceedance has continued continuously for 12 months, then a subsequent investigation shall be undertaken to confirm that the exceedance remains unrelated to mining activity.

Groundwater quality trigger definition

There are two components to the groundwater quality trigger definitions. These are described in detail in the WMP and summarised as follows:

1. EC investigation trigger – An investigation trigger because of a monthly measurement either below the, baseline (20^{th} percentile) or above the monthly baseline (80^{th} percentile) on three consecutive occasions. Note the 20^{th} percentile triggers levels are designed to identify downward leakage from the alluvium to the shallow bedrock to provide another mechanism to detect potential alluvial impacts in addition to the water level triggers and.

2. pH investigation trigger - An investigation trigger because of a monthly measurement either above or below the default pH trigger values from ANZECC (2000) for lowland rivers located in NSW.

Table 27 presents the current site specific trigger levels for water level and groundwater quality and shows the data relevant to the reporting period.

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 summaries
- Groundwater quality of hard rock aquifer
- Groundwater levels of Alluvial and Shallow Bedrock Aquifers including applicable ITARP summaries
- Groundwater level of hard rock aquifers
- Comparison to EA predictions

The groundwater monitoring locations (compliance and management bores) are shown above on **Figure 16**.

Table 27 Groundwater quality impact assessment criteria

Groundwater Quality Impact Assessment Criteria							
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).						
		Groundwater Elevation (mAHD) – Definition #2 & #3		**EC (µS/cm)**			**pH**
		10th percentile	Ref. Min	20th percentile	80th percentile	Max	
Alluvial and Shallow Bedrock Aquifers							
ALV1	Alluvial aquifer (L)	106.22	104.88	N/A	1370	2020	6.5 – 8.5
	Shallow bed rock (S)	106.44	104.35	N/A	1560	1770	
LBH	Alluvial aquifer (L)	105.74	104.55	N/A	1550	3090	
ALV3	Alluvial aquifer (L)	103.81	102.43	N/A	1390	3080	
	Shallow bed rock (S)	103.52	102.25	N/A	2800	4510	
ALV4	Alluvial aquifer (L)	102.14	100.97	N/A	1920	3080	
	Shallow bed rock (S)	101.42	100.28	N/A	5310	6430	
ALV2	Alluvial aquifer (L)	93.08	91.12	N/A	2830	4160	
	Shallow bed rock (S)	93.21	89.35	2560	2820	3370	
ALV7	Alluvial aquifer (L)	87.02	86.43	N/A	1780	2310	
	Shallow bed rock (S)	83.56	82.39	N/A	2230	2540	
ALV8	Alluvial aquifer (L)	85.06	83.66	N/A	1310	1880	
	Shallow bed rock (S)	82.99	80.94	1540	1990	2400	
Hard Rock Aquifers (Coal Measures)							
PGW5	Overburden (L)	N/A	N/A	N/A	N/A	N/A	6.5 – 8.5
	Coal Measure (S)	N/A	N/A	N/A	N/A	N/A	

7.3.2 Monitoring Results Review

Groundwater quality

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 17** to **Figure 20** and in **Appendix E**; a summary of these results during the reporting period is provided herein.

There were no exceedances, individual or consecutive, of pH investigation trigger limits. The average pH levels in the alluvium and shallow underlying bedrock were 7.00 and 7.51 respectively. The pH level across both systems appear to have a relatively stable trend that has existed throughout the data collection period as shown in **Figure 17** and **Figure 18**.

Table 29 summarises the EC measurements of groundwater, with comparison to the applicable trigger levels. There have been numerous exceedances of the EC upper limit and one exceedances of the EC lower limit. Long term monitoring results are shown in **Figure 19** and **Figure 20.**

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

Groundwater exceedances for EC (dS/cm) in alluvial and shallow bedrock aquifers													
Site	ALV1L	ALV1S	LBH	ALV3L	ALV3S	ALV4L	ALV4S	ALV2L	ALV2S	ALV7L	ALV7S	ALV8L	ALV8S
Impact assessment Criteria													
Lower Limit	-	-	-	-	-	-	-	-	*2.56*	-	-	-	*1.54*
Upper Limit	*1.37*	*1.56*	*1.55*	*1.39*	*2.80*	*1.92*	*5.31*	*2.83*	*2.82*	*1.78*	*2.23*	*1.31*	*1.99*
Maximum	*2.02*	*1.77*	*3.09*	*3.08*	*4.51*	*3.08*	*6.43*	*4.16*	*3.37*	*2.31*	*2.54*	*1.88*	*2.40*
Jan											2.24		
Feb									2.45				
Mar	1.53		1.59	1.48			5.87		3.27		2.78		
Apr	1.49		1.62	1.45			5.61		3.24		3.02		
May	1.53		1.65	1.57			6.04		3.33		2.83		
Jun											2.60		
Jul	1.47			1.45			5.66		3.12		3.04		
Aug	1.44			1.42			5.53		3.00		2.99		
Sep											2.73		
Oct	1.41			1.40			5.34		2.95		3.07		
Nov	1.59		1.66	1.54			6.01		3.26		3.51		
Dec	1.38								2.90		3.14		

Green Shading – Denotes an exceedance of the 20%ile investigation limit
Orange Shading – Denotes an exceedance of the 80%ile investigation limit
Yellow Shading – Denotes an exceedance of the 100%ile maximum investigation limit

On four occasions the requirement for an investigation has been triggered by three consecutive exceedances of the upper EC limit across the following bores; ALV1L, LBH, ALV3L, ALV4S, ALV2S and ALV7S. The conclusions of those four investigations are summarised in below.

Hard Rock Aquifer (Coal Measures)

Groundwater quality monitoring results for the hard rock aquifers during the reporting period is shown in **Appendix E**. Monitoring of piezometers at site PGW5 is used as reference information for groundwater pressurisation of the strata between the Bowmans Creek shallow bedrock and lower overburden and underground workings. Monitoring results have not triggered investigation and are consistent with historical trends.

Table 29 ITARP investigations for quality triggers completed in 2019

Month of 3rd exceedance	Site	Conclusions
May	ALV1L ALV2S ALV3L ALV4S ALV7S LBH	• Observations at have not exceeded reference maximums to date with the exception of May 2019 at ALV7S. • During the previous 24 months, climate data shows high evaporation and below average rainfall with significant variation in residual rainfall mass curve that is the longest downward trend since 2005. • Recent minor stabilization of the rainfall CRD aligns directly with increased flows in the creek, increased recharge of groundwater levels and increased EC levels throughout the alluvial and shallow bedrock system. • The direct relationship between these monitoring observations and rainfall implies that the measurements are due to climatic variations rather than a specific mining related impact. It was therefore considered that the reduced rainfall recharge has led to the rising trend in EC observed at ALV3S. • This mechanism reflects natural variability due to climatic factors and is not considered to be a mining-related impact and potential environmental harm.
August	ALV7S	• During the previous 24 months, climate data shows high evaporation and below average rainfall with significant variation in residual rainfall mass curve that is the longest downward trend since 2005. • The elevated levels are believed to be related to the anomalous water level decline observed at ALV7 and ALV8. The decreased recharge from the alluvium is considered to have resulted in the observed increase in salinity with the current levels of salinity considered to be more representative of the shallow bedrock aquifer. • No potential or actual environmental harm due to mining activities is indicated as a result of the elevated EC. The elevated EC is considered to be representative of the natural salinity of the shallow bedrock without the diluting influence of seepage from the overlying alluvium. • Given the localised groundwater sink, there is no risk to the surrounding alluvial aquifers or downstream environment.
November	ALV7S	• Generally, groundwater level trends in ALV7, and in the Bowmans Creek area monitoring bores more widely, show a close correlation to the rainfall and evaporation CRD trends. Periods of groundwater level decline in ALV7S have been observed during previous periods of below average rainfall and this period of elevated EC coincides with the current period of below average rainfall and above average evaporation. • The EC measurements are caused by the water level decline observed at ALV7S. • While the maximum reference EC trigger has been exceeded, the possibility of potential or actual environmental harm due to mining activities is low. The groundwater depths measured at ALV7S reflect natural variability due to climatic factors and it is unlikely that the EC increase is a mining-related impact. The elevated EC is considered to be representative of the natural salinity of the coal measures without the diluting influence of seepage from the overlying alluvium. Given the localised groundwater sink, there is no risk to the surrounding alluvial aquifers or downstream environment. • The lack of groundwater in the alluvium precludes further investigation. When there is significant recharge to the alluvium, further investigation could be conducted to determine whether connectivity between the alluvial and fractured rock aquifers has altered.
December	ALV1L ALV2S	• EC observations at ALV1L and ALV2S have not exceeded reference maximums to date. • During the previous 24 months, climate data shows high evaporation and below average rainfall with significant variation in residual rainfall mass curve that is the longest downward trend since 2005. • The direct relationship between these monitoring observations and rainfall; as well as the trending relationship with EC and residual mass curves, implies that the measurements are due to climatic variations rather than a specific mining related impact. It is not expected that there is potential for harm to the environment as the system is varying naturally.

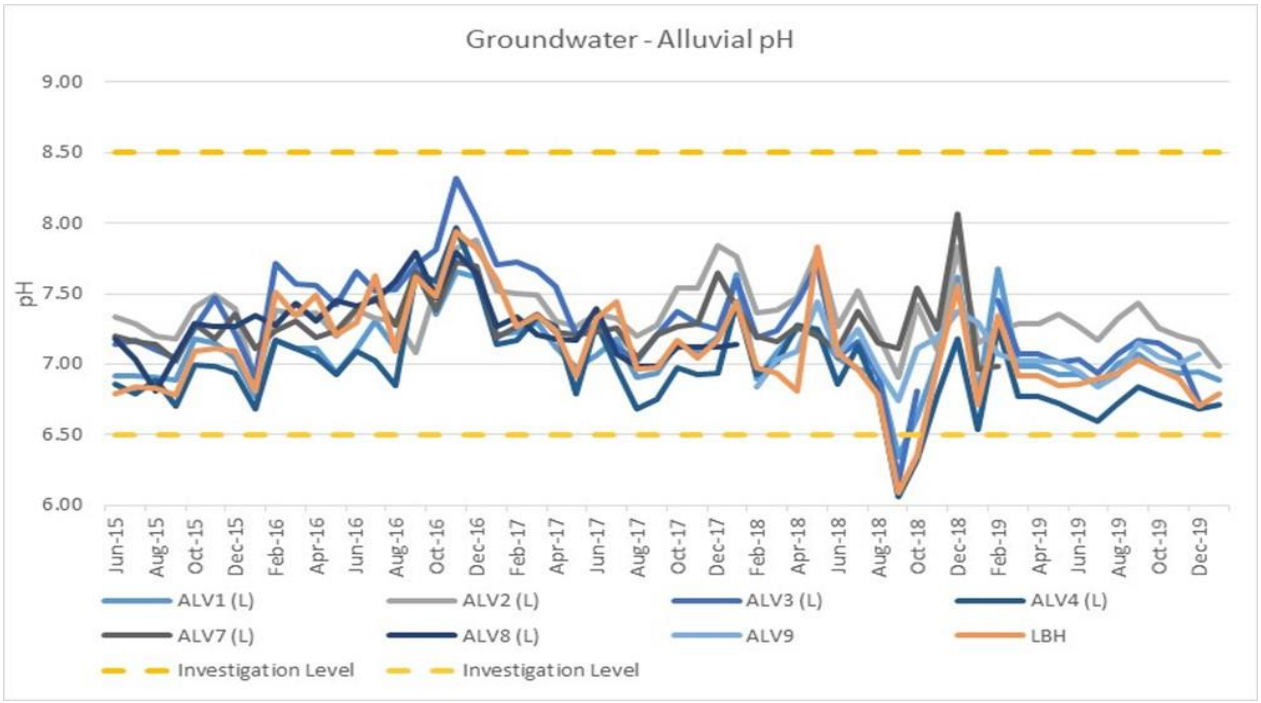

Figure 17 Groundwater pH data in alluvial bores – 2015 to 2019

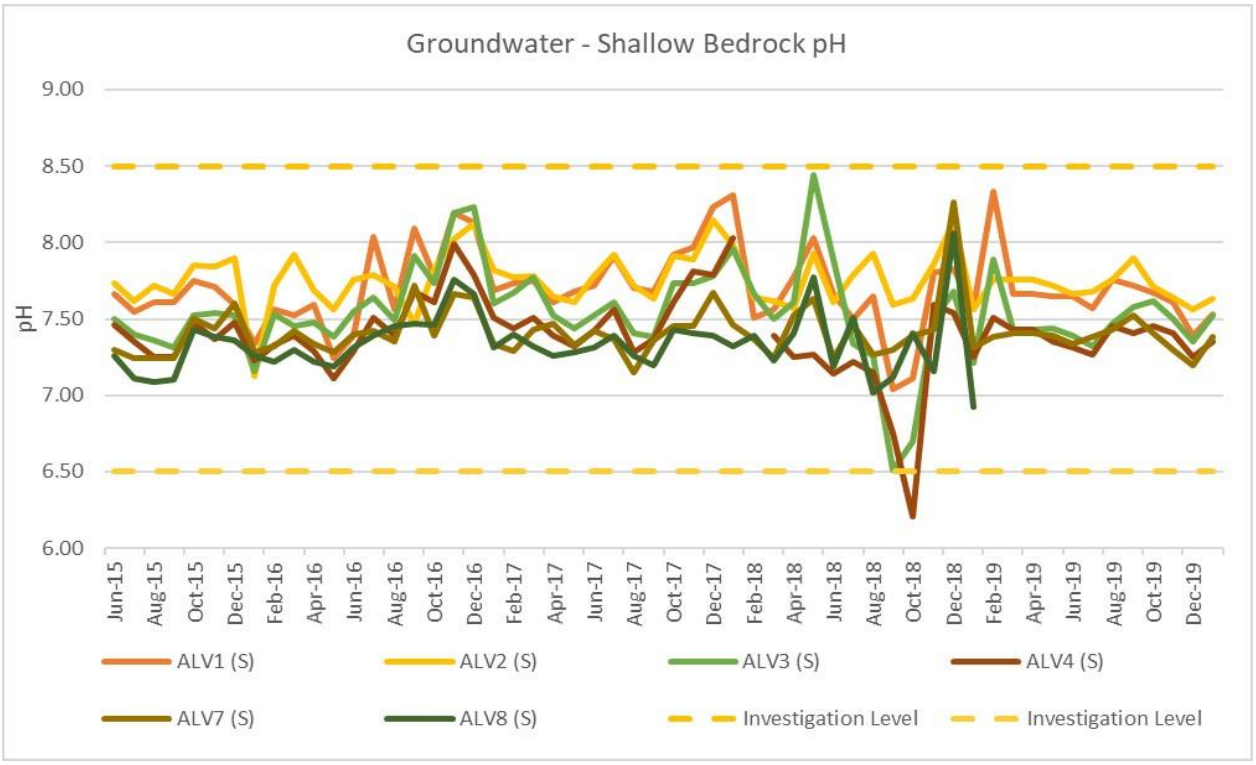

Figure 18 Groundwater pH data in shallow bedrock (overburden) bores – 2015 to 2019

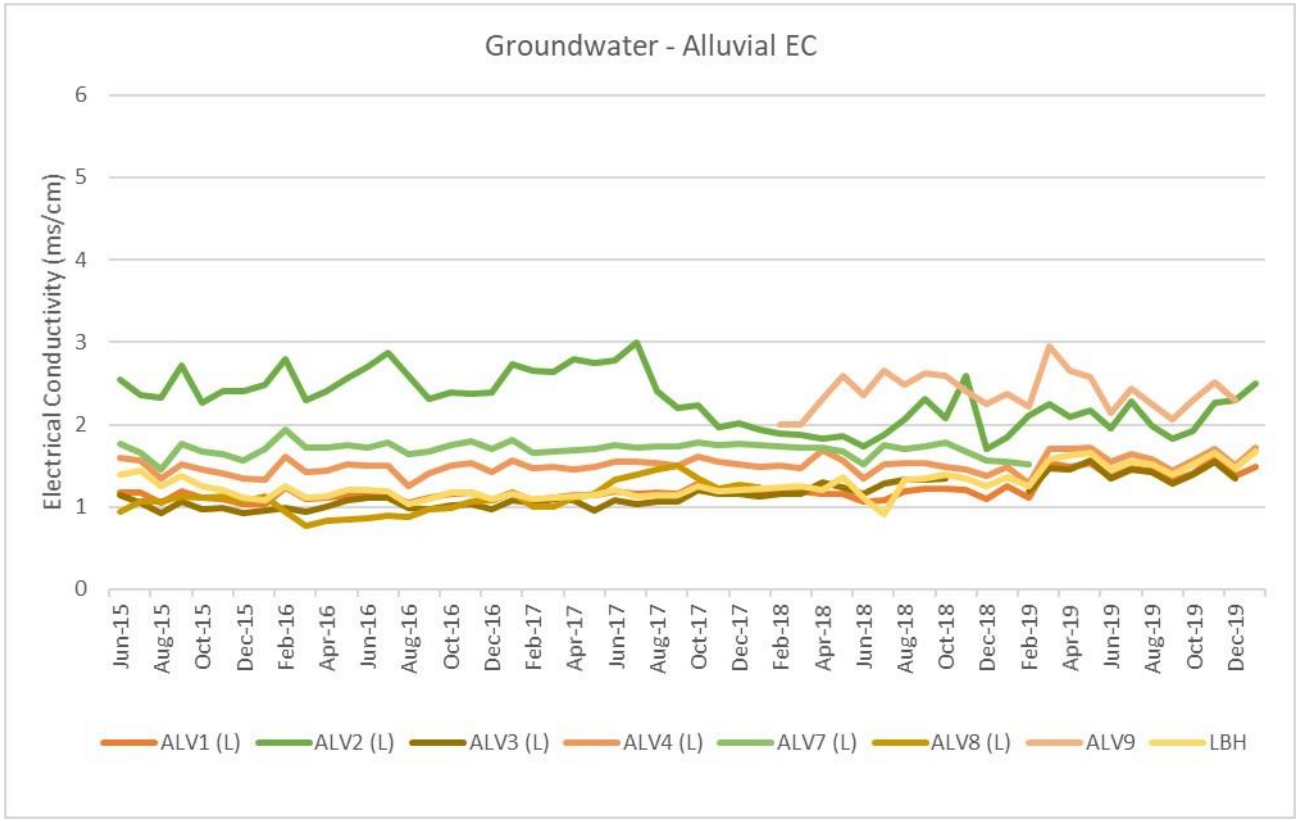

Figure 19 Groundwater Salinity (EC) in alluvial bores – 2015 to 2019

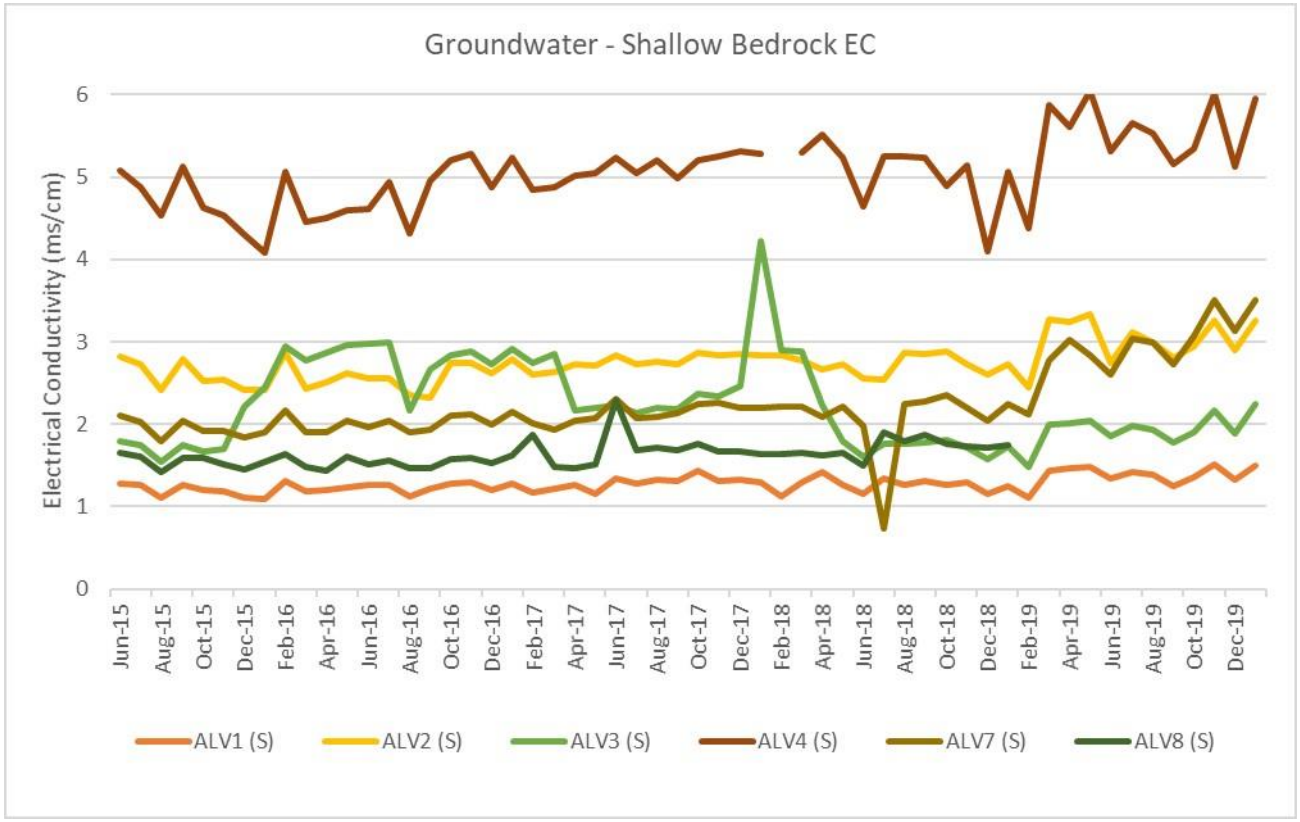

Figure 20 Groundwater Salinity (EC) in shallow bedrock (overburden) bores – 2015 to 2019

Groundwater Levels

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 21** and **Figure 22** respectively.

The residual mass curve for rainfall is also presented in **Figure 21** and **Figure 22**. 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). The CRDs trends for rainfall and evaporation provide the information to understand climatic conditions; for instance a decreasing rainfall CRD trend indicates measured rainfall is below the long term average and an increasing CRD indicates measured evaporation greater than long term averages. This was developed from the SILO dataset (Station No. 061208 at Ravensworth). The SILO dataset consists patched (infilled and interpolated) climatic data throughout Australia, necessary to fill in any missing observations days, for example.

Groundwater elevations within the water table aquifer decrease with distance downstream. This is because the elevation of the water table within a near surface aquifer (for example, the water table aquifer at LCO), is typically 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 and underlying shallow bedrock.

With respect to trigger exceedances, there were no exceedances of the Impact Triggers for alluvial draw down impact assessment. There were a number of Investigation and Subsequent Investigation (Definition 2 & 3 respectively) trigger level exceedances summarised herein.

During 2019, there were a greater number of groundwater level exceedances compared to previous years and a number of monitoring sites declined to dry. This is considered a response to the continuing drought climatic conditions being measured. The decline in residual mass curve (rainfall) coupled with an increasing residual mass curve (evaporation) suggested that below average rainfall and higher than average evaporation conditions prevailed for the last three years. The low rainfall and high evaporation conditions coincided with a consistent decline in groundwater levels across all alluvial and shallow bed rock piezometers installed along the aquifer of Bowman's Creek.

Table 30 presents recorded exceedances of groundwater level triggers during the 2019 monitoring period. **Table 32** presents a summary of the ITARP investigations completed in 2019. Noteworthy, in accordance with the WMP, where groundwater levels continuously trigger after the initial investigation (triggered on three consecutive months) & it has been determined not to be a mining related impact; subsequent investigations occur at 12 consecutive months and then at 24 consecutive months unless otherwise recommended through the investigation findings. ALV9 does not have an applicable Definition #2 investigation trigger as these triggers were developed using historical baseline date and ALV9 is in place to detect potential draw down impacts.

No groundwater investigations have concluded that mining activities have resulted in impacts not approved for LCO.

Table 30 Groundwater level trigger exceedances

Groundwater level exceedances													
Site	ALV1L	ALV1S	LBH	ALV3L	ALV3S	ALV4L	ALV4S	ALV2L	ALV2S	ALV7L	ALV7S	ALV8L	ALV8S
10%ile	106.22	106.44	105.74	103.81	103.52	102.14	101.42	93.08	93.21	87.05	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
Jan	105.74	106.1	105.2	102.98	102.51	101.56	100.91	92.6	92.52	86.14	78.65	83.66	73.43
Feb	105.53	105.80	105.09	102.9	102.44	101.42	100.81	92.58	92.5	85.92	77.22	83.66	71.74
Mar	105.39	105.63	105.17	102.81	102.35	101.32	100.75	92.46	92.48	85.48	76.40	83.66	71.74
Apr	105.92	106.20	105.46	103.06	102.47	101.38	100.74	92.86	92.67	85.32	76.38	83.66	71.74
May	105.92	106.25	105.57	103.08	102.53	101.39	100.75	92.87	92.71	85.32	75.60	83.66	71.74
Jun	105.88	106.25	105.53	103.10	102.51	101.37	100.71	92.63	92.51	85.32	75.07	83.66	71.74
Jul	105.86	106.27	105.5	103.04	102.50	101.37	100.70	92.33	92.27	85.32	74.63	83.66	71.74
Aug	105.72	106.14	105.21	102.95	102.44	101.30	100.62	92.05	91.95	85.32	74.12	83.66	71.74
Sep	105.65	106.07	105.33	102.88	102.37	101.25	100.58	91.85	91.65	85.32	73.66	83.66	71.74
Oct	105.60	105.99	105.06	102.81	102.35	101.21	100.52	91.69	91.13	85.32	73.38	83.66	71.74
Nov	105.41	105.70	104.94	102.72	102.24	101.10	100.41	90.88	90.48	85.32	72.85	83.66	71.74
Dec	105.27	105.4	104.88	102.66	102.21	101.03	100.34	90.50	89.78	85.32	72.46	83.66	71.74

Orange Shading – Denotes an exceedance of the 10%ile investigation limit
Yellow Shading – Denotes an exceedance of the 100%ile maximum investigation limit

Table 31 Groundwater level trigger exceedances investigation summary

Month of Investigation trigger	Site	Conclusions
January	ALV7L ALV7S ALV8SA LV7	• There appears to be no clear correlation between the levels measured at these bores with that of the underground workings, inferring continued lack of connectivity hence no depressurisation at these bores. • ALV7L and ALV7S are not within the extent of predicted drawdown impacts from mining operations. Whilst ALV8S is in the predicted drawdown location, this bore is not connected to the alluvium. Further, ALV7L is used as the reference bore for potential drawdown at ALV8L and there has been no exceedance of drawdown trigger investigation limits. • The large and rapid groundwater level decline at ALV7S and ALV8S is considered to be due to the groundwater storage mechanisms of the shallow bedrock and the dewatering of a fracture horizon and is therefore not considered a mining related impact. • Water levels along the whole system have generally declined similarly. Further, the observed decline is consistent for both the shallow bedrock and alluvium along the whole system; implying groundwater levels is driven by climatic variations rather than a specific mining related impact. • The climate data shows high evaporation and below average rainfall with significant variation in residual rainfall mass curve that is the longest downward trend since 2005. As evidenced by the rainfall CRD and streamflow measurements, there has been no significant ease in drought conditions. Since there is direct relationship between these bores and rainfall, it is not expected that there is potential for harm to the environment as the system is varying naturally.
February	ALV2S	• It is considered that the groundwater levels measured at ALV2S reflect natural variability due to climatic factors and there is not a mining-related impact. The climate data shows below average rainfall for around two years, which is considered to have resulted in the observed groundwater levels.

		• It is highlighted that the observed groundwater level at ALV2S is not outside of the maximum range recorded and is not of sufficient magnitude to lead to a downgradient impact on beneficial use. • ALV2S is not within the extent of drawdown from mining operations and there are no potential seepage sources. Furthermore, ALV2L is used as the reference site for the northern drawdown impact monitoring location and shows a consistent groundwater level trend. • Water levels along the whole system are generally declining. Further, the observed decline is consistent for both the shallow bedrock and alluvium along the whole system; implying groundwater levels is driven by climatic variations rather than a specific mining related impact. This conclusion has been corroborated by previous ITARP investigations at LCO, which have all yielded a clear link between climatic variations and low groundwater levels.
June	ALV4L	• The conclusion drawn by the previous trigger report for ALV4L still apply. The groundwater levels measured at ALV4L are considered to reflect natural variability due to climatic factors and there are no mining related impacts identified. The below average rainfall and high evaporation observed since 2017 have resulted in reduced recharge and declining groundwater levels throughout the Bowmans Creek alluvium. • The groundwater level at ALV4L has not declined below the maximum range recorded and is not of sufficient magnitude to lead to a downgradient impact on beneficial use. No environmental harm due to mining activities is indicated.
July	ALV1L ALV2S ALV3L ALV3S	• The conclusion drawn by the previous trigger report (3 month exceedances) for ALV1L, ALV2S, ALV3L and ALV3S still apply. The 12-month groundwater level trigger exceedances observed at ALV1L, ALV2S, ALV3L and ALV3S are considered to reflect natural variability due to climatic factors and there are no mining related impacts identified. The below average rainfall and high evaporation observed since 2017 have resulted in reduced recharge and declining groundwater levels throughout the Bowmans Creek alluvium. • The groundwater levels at ALV1L, ALV2S, ALV3L and ALV3S remain above their respective maximum range recorded. No environmental harm due to mining activities is indicated.
August	ALV4S LBH	• Regarding the groundwater level triggers at ALV4S and LBH, the conclusions drawn by the previous trigger reports (3-month exceedances) still remain relevant. The 12-month groundwater level trigger exceedance observed at these sites are considered to reflect natural variability due to climatic factors and there are not considered to be mining related. • The groundwater level at both these sites remain above their respective reference maximum range. The below average rainfall and high evaporation observed since 2017 have resulted in reduced recharge and declining groundwater levels throughout the system. No environmental harm due to mining activities is indicated.
September	ALV8L ALV1S ALV2L	• Regarding ALV1S and ALV2L - The conclusions drawn by the previous trigger reports (3-month exceedances) remain relevant. The WMP Component 1 (drawdown) Trigger has not been exceeded. The 12-month groundwater level trigger exceedance (WMP Component 2 Trigger) observed at these sites (and other Bowmans Creek area monitoring bores) are considered to reflect natural variability due to climatic factors and are not considered to be mining related. The groundwater level at both these sites remain above their respective reference maximum range. The below average rainfall and high evaporation observed since 2017 have resulted in reduced recharge and declining groundwater levels throughout the system. No environmental harm due to mining activities is indicated. • Regarding ALV8L - Generally, groundwater level trends in ALV8L, and in the Bowmans Creek area monitoring bores more widely, show a close correlation to the rainfall and evaporation CRD trends. Periods of groundwater level decline in ALV8L have been observed during previous periods of below average rainfall, including the Millennium Drought, when ALV8L ran dry. ALV8L has been dry since April 2018, coinciding with a period of below average rainfall and above average evaporation. The period of below average evaporation has been observed since 2012. ALV7L (the ALV8L reference bore) has a water level trend similar to ALV8L, and ALV7L ran dry 12 months after ALV8L. Also, a number of other Bowmans Creek monitoring bores have exceeded their respective triggers but have not yet triggered the WMP response protocol. • Assessments carried out prior to and as part of the MOD5 GIA concluded that the recharge to the coal measure fractured rock aquifer is likely very low. This is primarily driven by the relatively high

		ratio of horizontal to vertical permeability of the alluvium and regolith, which reduces the capacity for water to migrate vertically in the geological profile from the alluvium to the fresh coal measure units, as is the case in the ALV8 area. • The mining consent has approved some impacts to the Bowmans Creek alluvium and the groundwater model showed that these impacts are predominantly driven by the removal of the Davis Creek Fault and Dyke and the dewatering of the former Liddell M49 underground workings. The mining of the Davis Creek Fault and Dyke below the Lemington seams and the dewatering of the M49 workings have not occurred to date, nor have there been any containment failures of water stored in the underground; therefore, they are unlikely to have impacted the water level in ALV8L. • The groundwater depths measured at ALV8L reflect natural variability due to climatic factors and it is unlikely that the decline is a mining-related impact. The lack of groundwater in the alluvium precludes further investigation. When there is significant recharge to the alluvium, further investigation could be conducted to determine whether connectivity between the alluvial and fractured rock aquifers has altered. The trigger exceedance in ALV8L is not outside of the maximum range recorded, considering it has run dry previously, and it is unlikely that future beneficial use of the alluvial resource will be impacted
December	ALV1L ALV2S	• EC observations at ALV1L and ALV2S have not exceeded reference maximums to date. • During the previous 24 months, climate data shows high evaporation and below average rainfall with significant variation in residual rainfall mass curve that is the longest downward trend since 2005. The direct relationship between these monitoring observations and rainfall; as well as the trending relationship with EC and residual mass curves, implies that the measurements are due to climatic variations rather than a specific mining related impact. Hence it is not expected that there is potential for harm to the environment as the system is varying naturally.

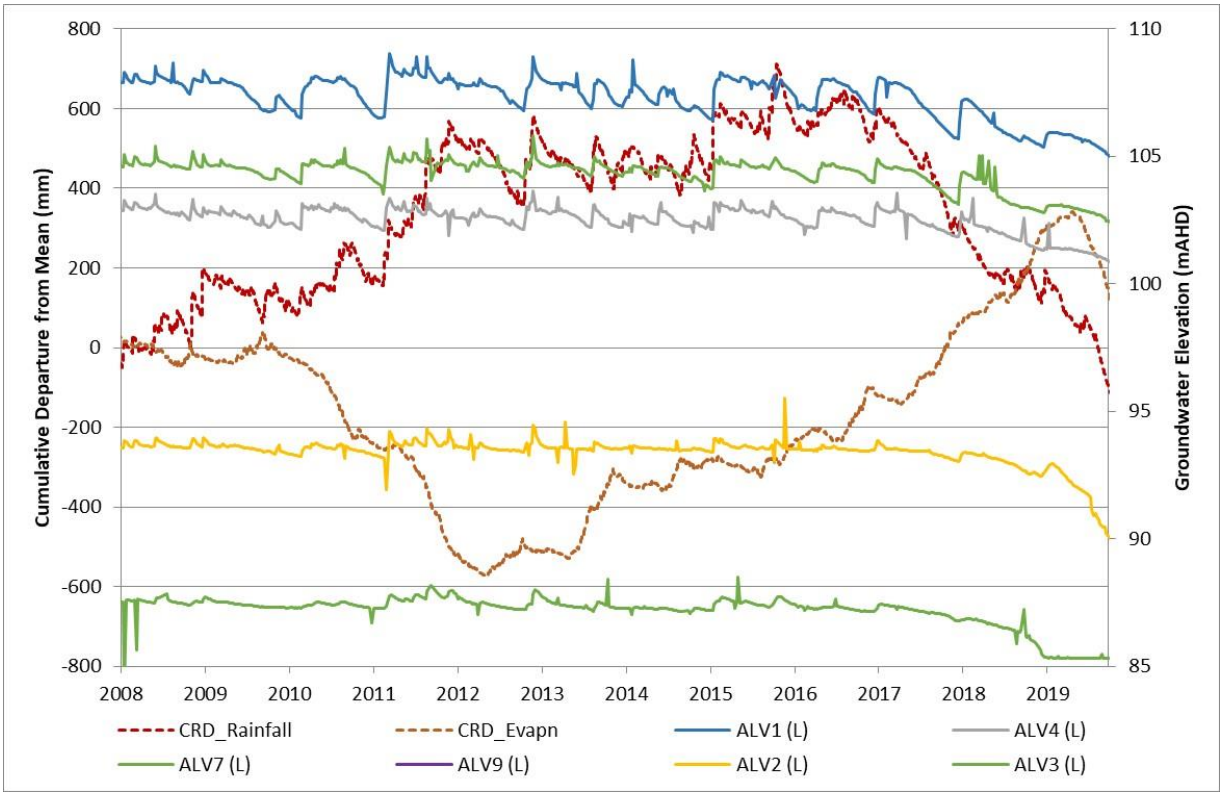

Figure 21 Groundwater level data in alluvial bores – 2008 - 2019

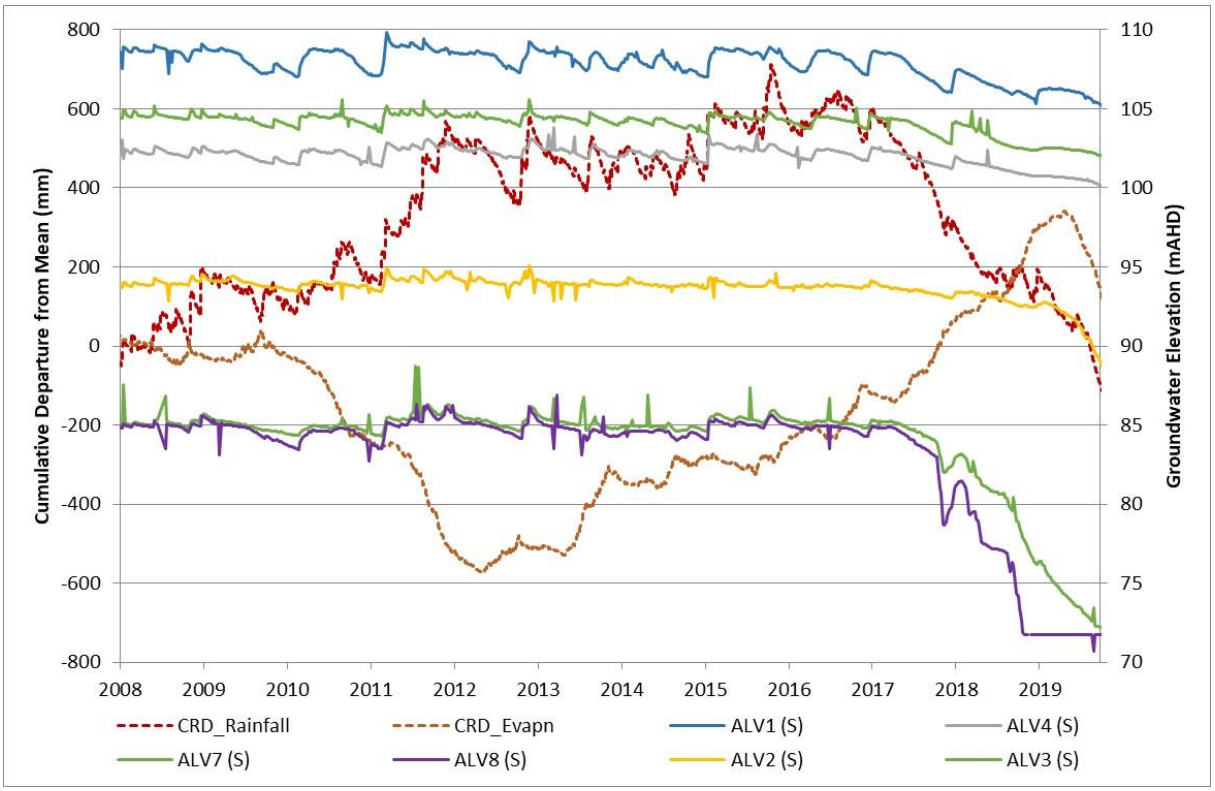

Figure 22 Groundwater level data in shallow bedrock bores – 2008 - 2019

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 16**. The groundwater elevations 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.

Figure 25 shows there is a significant difference in groundwater elevation between the alluvial and shallow bedrock water table piezometers and the groundwater elevations maintained in the previous underground workings, as indicated by 8 South (whilst available), M49 and the Middle Liddell Bore (MLB).

Piezometers PGW5L and PGW5S overlie the Hazeldene workings. As shown in **Figure 25**, there is no groundwater level response at site PGW5S due to changes in groundwater elevation in the Hazeldene monitoring locations (Haz 1 to Haz 6).

Groundwater levels in the Liddell underground workings are subject to depressurisation due to dewatering activities to accommodate current open cut mining operations at LCO. Piezometer LC1 has been dry since July 2010 as a result of these dewatering activities. M49 and Mount Owen 2 have declined in response to active dewatering in the second half of 2019.

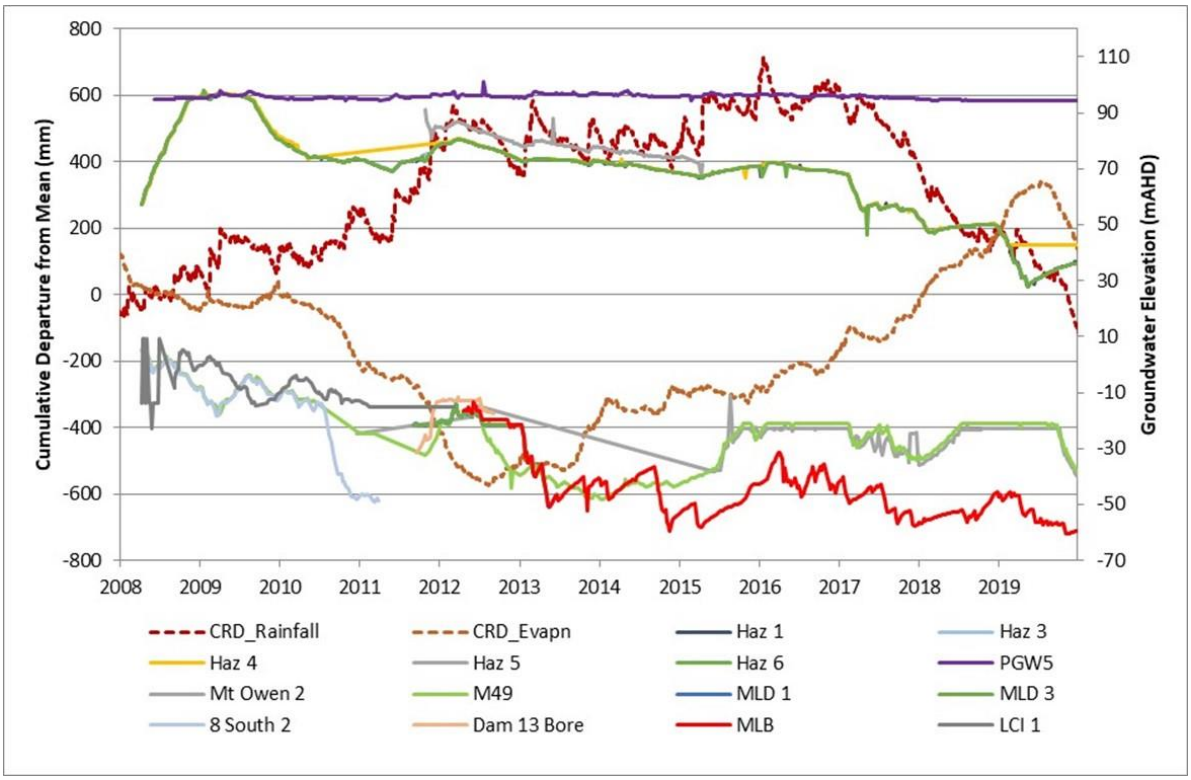

Figure 23 Groundwater level data in hard rock (coal measures) bores – 2008 – 2019

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 33** below. In brief, observations from the monitoring programs demonstrate impacts within the EA predictions.

Table 32 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 and investigations have not determined there to be unapproved leakage from Bowman's Creek alluvial aquifer to the Entrance Pit. No definition 1 groundwater level impact triggers initiated during 2019.
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 and investigations have not determined there to be impacts on Bowmans Creek alluvium due to mining in the South Pit. 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.	Alluvium has declined with prolonged drought conditions. 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 underground mining and current open cut mining activities at LCO	Monitoring has not shown mining related impacts on Bowman's Creek alluvial aquifer. This EA conclusion is

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.	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).	The southern potential impact monitoring bore and reference alluvial bore were dry for the majority off 2019; hence no drawdown measured. The northern potential impact area showed near equivalent pressures for impact and reference site. 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 estimated 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 Mining Land Use

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 24** 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 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 25. 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.

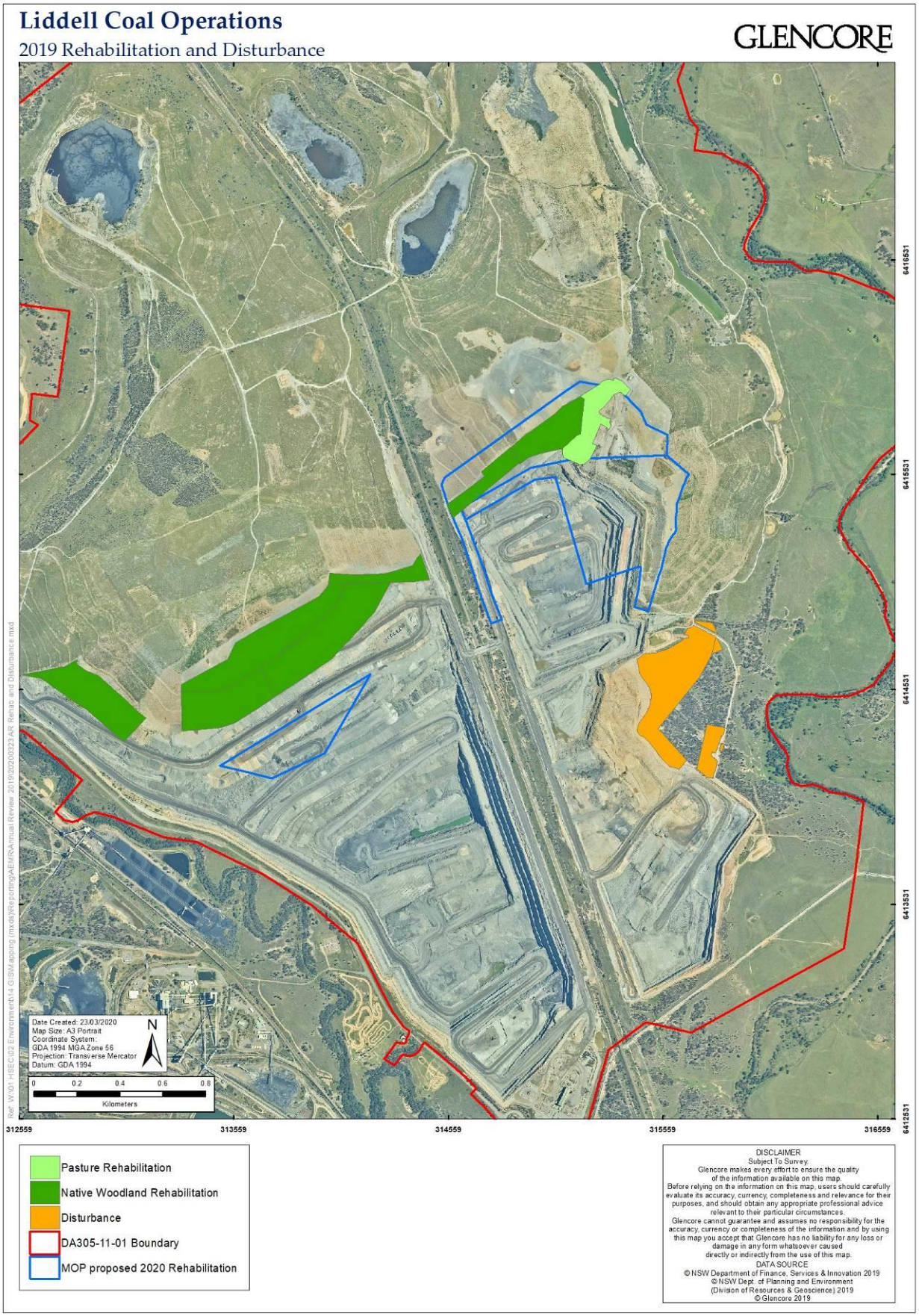

Figure 26 shows the 2019 proposed, actual completed 2019 rehabilitation and forecast 2020

rehabilitation.

Table 33 Rehabilitation Status

Rehabilitation Status			
Mine Area Type [A]	Previous Reporting Period (Actual ha)	This Reporting Period (Actual ha)	Next Reporting Period (Forecast ha)
	2018	2019	2020
A: Total mine footprint	1615	1628	1637
B: Total active disturbance	743	706	645
C: Land being prepared for rehabilitation	0	0	0
D: Land under active rehabilitation	872	922	992
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 to date.

MOP Rehabilitation Commitments

During 2019, LCO completed rehabilitation generally in accordance with the approved MOP. **Table 35** shows the hectares put forward in the MOP, actuals as well as the variance. Within the next reporting period, LCO forecasts to complete 10ha of disturbance and 69.7ha of rehabilitation. As per the EIS, LCO is completing rehabilitation progressively throughout the life of the operation.

Table 34 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
2018	40	68.3	39	67	-1	-1
2019	11	48.8	13	50.49	+1	+1.7
				MOP Cumulative Variance	+1	+7.7

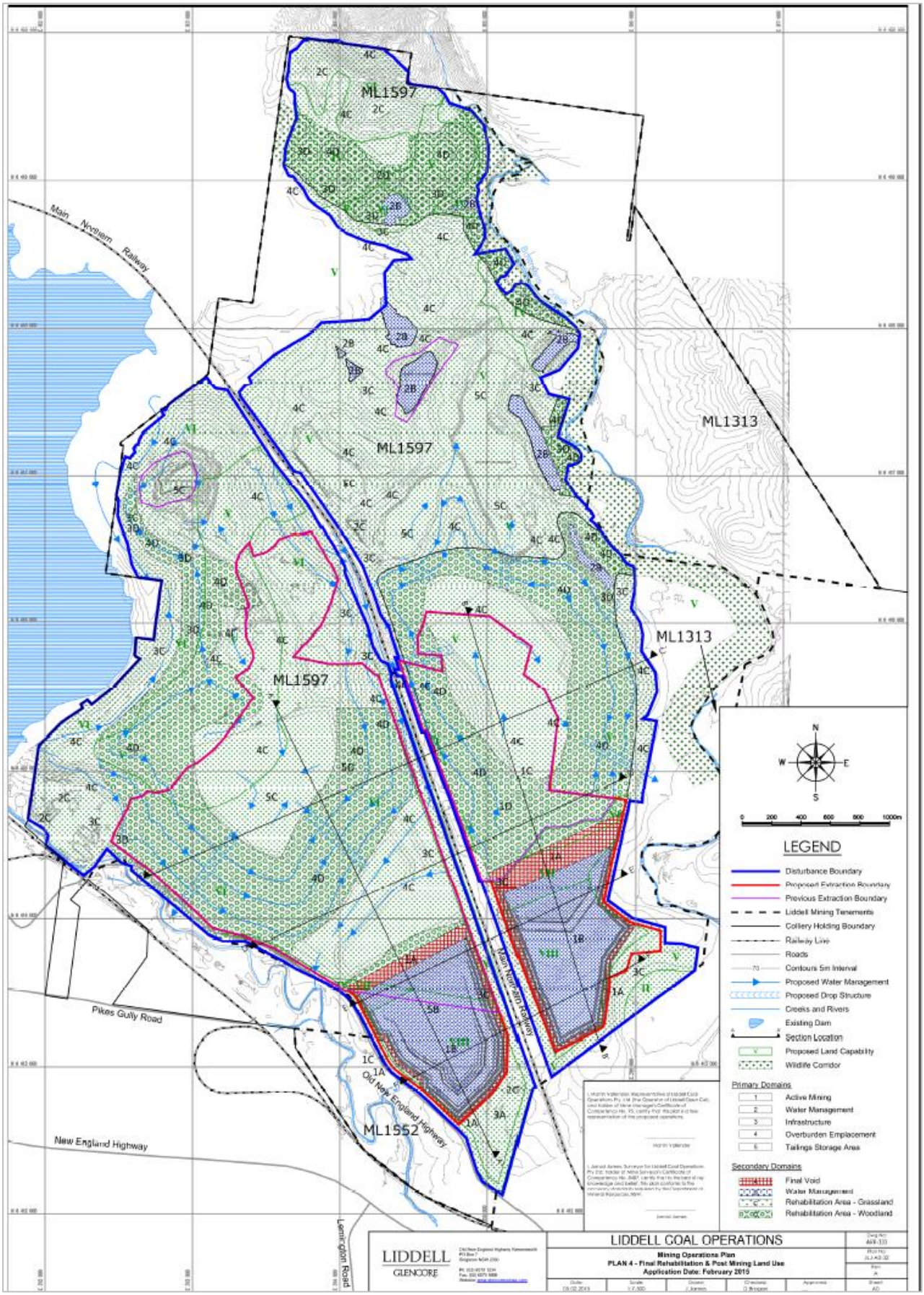

Figure 24 MOP Plan 4 – Current approved final landform

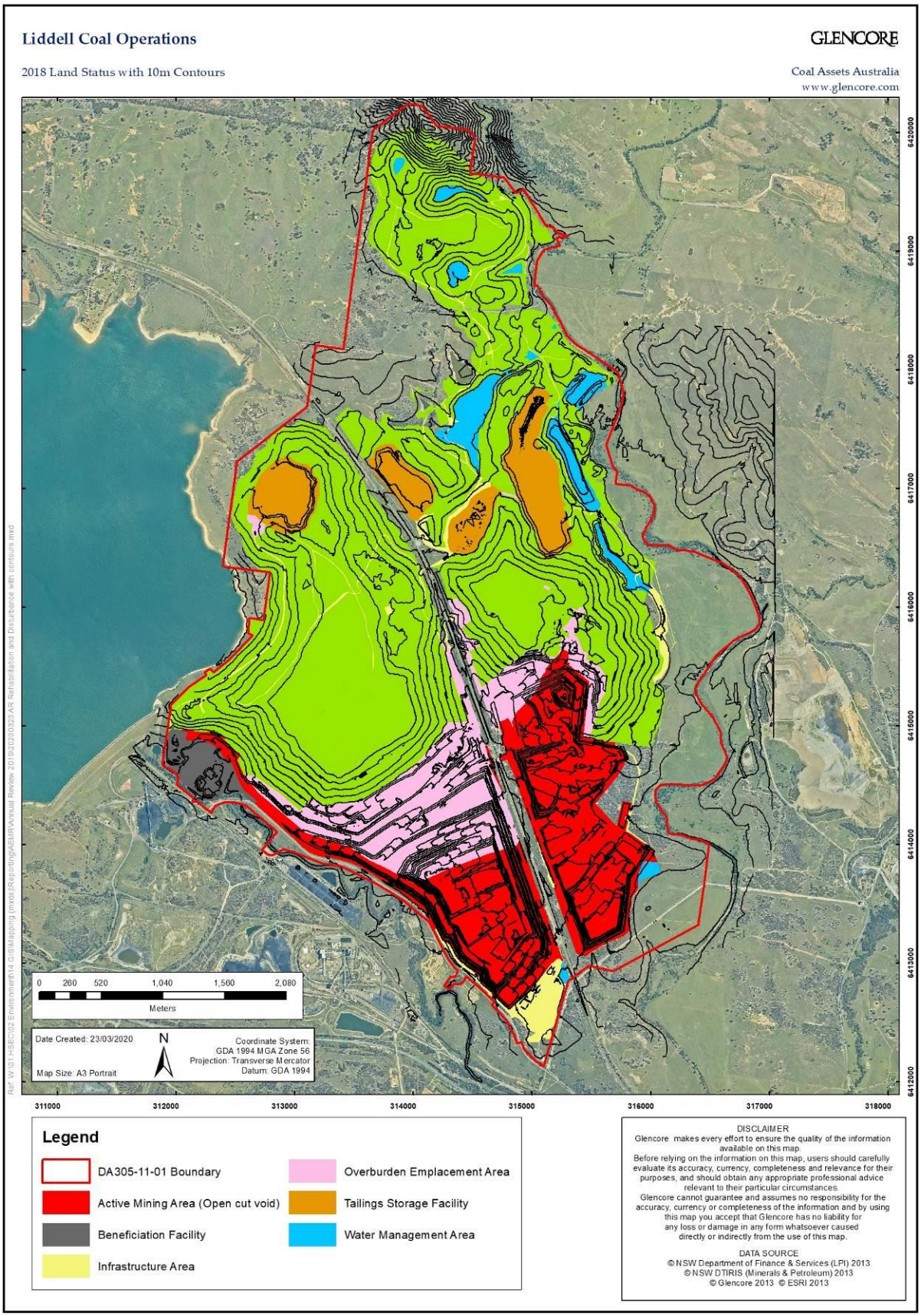

Figure 25 Current rehabilitation and disturbance status

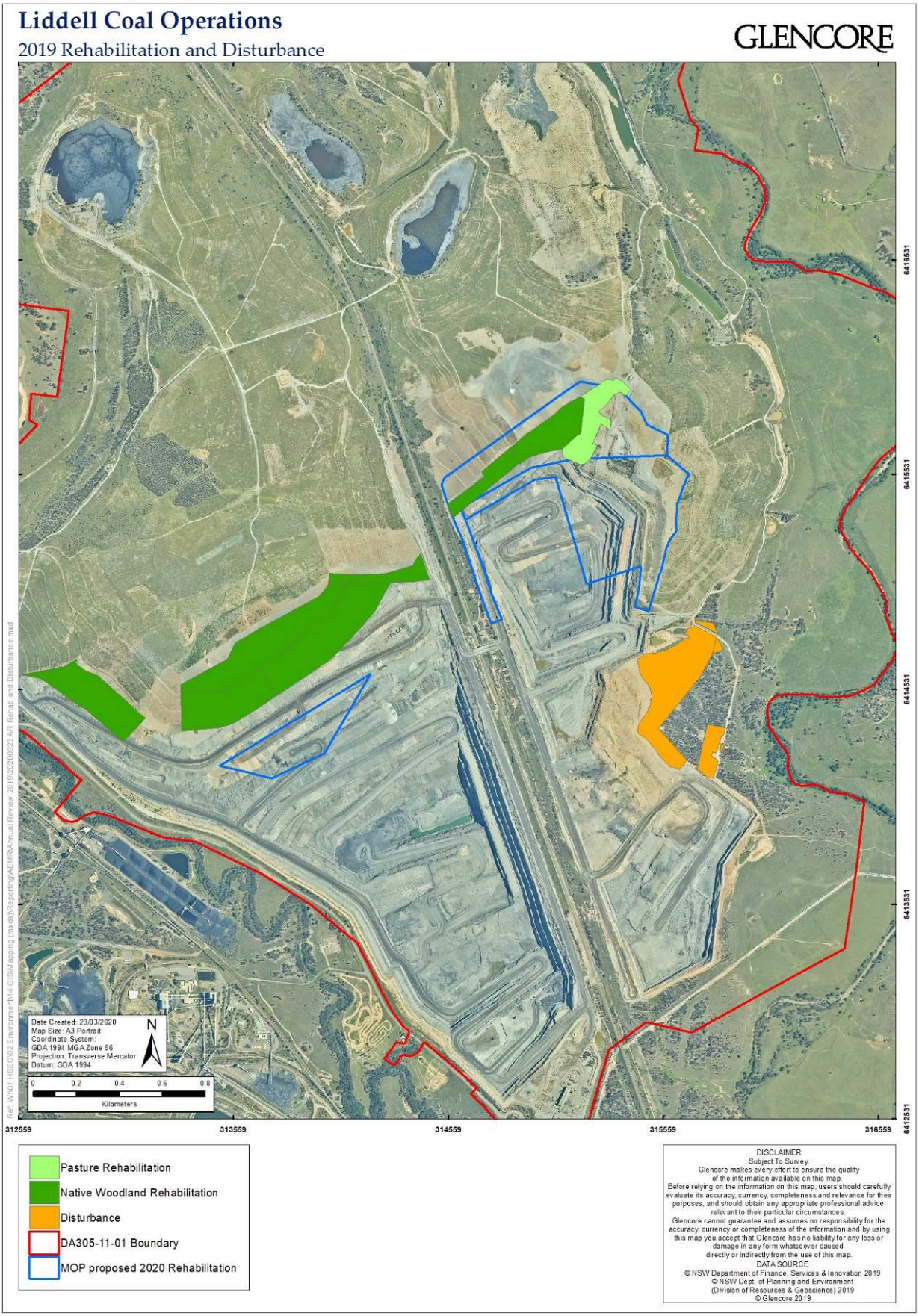

Figure 26 Rehabilitation and disturbance during 2019

8.3 Biodiversity Management

During 2019, 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 2019.

The BMP was updated and approved in consultation with the Department of Planning on the 17 December 2019.

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). Since its original development, the BMP has been subsequently revised to include an additional three years performance indicators. 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 except for decreases in groundcover species and diversity as a result of drought. Rehabilitation site WR01 conversely has undergone significant growth of canopy vegetation. Both provide a range of habitat features that have remained intact and unaltered by mining and mining-related activities. Prolonged drought conditions are considered to have impacted the monitoring results of the BMP area.

The key findings of the 2019 biodiversity monitoring program were as follows:

- Rehabilitation site WR01 is now considered statistically floristically similar to remnant vegetation. However, remains quite distinct in terms of floristic structure to benchmark vegetation.
- Substantial canopy defoliation was observed at remnant site R02, the cause of this was attributed to prolonged drought.
- Remnant vegetation at sites W01 and W03 are generally in good condition. However, some potentially problematic weed species are present in these areas that should be controlled.
- A decrease in native diversity at W01, WR01 and R02 was observed in 2019.
- An increase in native species diversity at remnant site W03 correlates with a decrease in total native cover and an increase in introduced cover. Care should be taken to control introduced species with increasing coverage.
- Weed infestation (specifically Rhodes grass (Chloris gayana)) at rehabilitation site WR01 was previously problematic, however was not recorded in 2019. This is attributable to drought and weed management works.
- Riparian remnant site R02 is dominated by introduced species which are out-competing natives. Given their prevalence over an extended period, these are unlikely to recover to former levels without intervention.
- Bird diversity was generally much lower than average across all monitoring sites compared to prior years. This is likely to have been a natural fluctuation due to the hot dry conditions present at the time of survey reducing bird activity. Water resources were also limited.

- There has not been a notable increase in the extent of feral species presence, however continued management of predators (particularly fox (Vulpes vulpes)) will increase habitat value for native fauna.
- Stygofauna diversity at all sites were low/absent, this was consistent with most previous monitoring events.
- No signs consistent with myrtle rust, Phytophthora or Chytrid fungus were identified.

LCO will continue to implement the BMP commitments and recommendations detailed in the 2019 BMP monitoring report. Key recommendations to be implemented during 2020 by LCO will include:

- Continued supplementary plantings to assist in infilling vegetation where gaps in certain strata have been identified.
- Progressive installation of habitat features such as boulders, rocks and logs prior to seeding/planting activities, and/or adjacent to established rehabilitation areas.
- Continued weed and feral fauna management.

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 2019 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 36** below based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 35 BMP Performance Indicator Summary

Action/Item	Performance Indicator	Compliance	Performance Comment
Year 4 2019			
Fencing, Signage and Access Control			
Minimum twice-yearly inspections of fences and signage to identify any works required. Fencing and signage of relevant parts of BMP area should be as per Section 4.1	Inspections undertaken nominally in March and September. 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	Signage installed and maintained as required
Access Track Maintenance			
Minimum twice a year BMP Area inspections to identify track conditions, any works required and any unnecessary tracks to be remediated	Inspections undertaken nominally in March and September. Action and repair track damage or remediation where applicable.	Compliant	
Minimum twice yearly BMP Area inspections to identify track conditions, any works required and any unnecessary tracks to be remediated	Inspections undertaken nominally in March and September. Action and repair track damage or remediation where applicable.	Compliant	
Topsoil Management			
Areas containing weeds that may pose a threat to rehabilitation are targeted using appropriate weed control methods prior to topsoil stripping. Methods may include, foliar spraying, basal bark spaying, cut and paint, slashing and other mechanical methods as deemed appropriate.	Pre-stripping weed control of topsoil is completed, as needed.	Compliant. Weed control is completed prior to topsoil stripping (where required) to minimise future potential impact to rehabilitation success.	Weeds are managed in line with Weed Action Plan. Preclearance survey identifies any weed infestations requiring further management.
Creek and Drainage Line Protection			

Action/Item	Performance Indicator	Compliance	Performance Comment
Fencing/protection of LCO controlled side of riparian corridor (as part of Offset Management Plan).	Refer to fencing action items above in table.		
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. If identified (or potential identified), management actions for specific pathogens are developed and implemented.	Compliant.	No signs likely to be associated with Phytophthora, myrtle rust or chytrid fungus observed during 2019 BMP monitoring.
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. Seeds are collected, stored and handled according to appropriate program. Collected seed resources are used in revegetation/rehabilitation works.	Complaint.	Seed resources being collected and substituted in seed mix for rehabilitation as key species are available.
Vegetation Clearing			
Detailed pre-clearing procedure is to be implemented when clearing of woody native vegetation (including shrub, groundcover and isolated trees in grasslands).	Pre-clearing process is to be implemented as part of Ground Disturbance Permit process. Outcomes of pre-clearing process are recorded and recommendations are implemented.	Compliant.	LCO implements pre-clearing as part of Ground Disturbance Permit process with outcomes recorded and recommendations implemented.
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 Ground Disturbance Permit process.	Compliant.	LCO implements tree-felling as part of Ground Disturbance Permit process, with outcomes recorded and recommendations implemented.

Action/Item	Performance Indicator	Compliance	Performance Comment
	Outcomes of tree-felling process are recorded and recommendations are 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. Any translocated individuals are subject to regular monitoring and maintenance works, if required. Reporting of translocation works and monitoring works is maintained.	Compliant.	One tiger orchid was translocated to Mountain Block BOA and has been subject to monitoring as required. Translocation is thus far deemed successful.
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.	Compliant	Remnant monitoring sites are in areas of undisturbed vegetation which are fenced to prevent unauthorised access. No accidental damage or removal of remnant vegetation was evident during BMP inspections. Fence line inspections are undertaken biannually in accordance with commitments of the BMP.
Remnant vegetation is protected from disturbance.	Remnant vegetation will be fenced or sign-posted as necessary to protect from disturbance. Annual inspections are completed to assess condition of fences and signs, areas of erosion concern, weeds or feral animals requiring control.	Compliant.	Remnant monitoring sites are in areas of undisturbed vegetation which are fenced to prevent unauthorised access. No accidental damage or removal of remnant vegetation was evident. Annual monitoring included assessment of areas of erosion concern and introduced species.

Action/Item	Performance Indicator	Compliance	Performance Comment
	Management works will be conducted, as necessary.		Fence line inspections are undertaken biannually in accordance with commitments of the BMP.
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. Appropriate action is undertaken if regeneration is deemed as being inadequate.	Compliant.	Annual monitoring included assessing degree of regeneration of native trees. Native regeneration was identified and considered adequate at R02, W01 and W03.
Weed Control			
Complete weed inspections of BMP area every two months to document diversity and abundance of noxious weed 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.	Compliant	Inspections being completed as required with appropriate weed priorities actioned.
Weed inspections of remnant and rehabilitation areas	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.	Compliant.	Inspections being completed as required with appropriate weed priorities actioned. Annual Weed Action Plan completed and implemented. Annual monitoring undertaken and management recommendations to be actioned. Previously identified weeds being targeted and noted as being effective during monitoring and inspections.
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.	Compliant	Feral animal inspections are undertaken every two months in accordance with commitments of the BMP. Foxes (Vulpes vulpes) were identified in low numbers and subsequently should be key species for management in 2020. Unlike previous

Action/Item	Performance Indicator	Compliance	Performance Comment
			monitoring years, the pig (Sus scrofa) was not detected and presence appears to be declining.
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.	Compliant	Annual Pest Action Plan developed and implemented for 2019. Pest numbers appeared to be stable and low.
Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register.	Compliant	Vertebrate pest control register maintained and updated throughout 2019.
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 works as required.	Compliant	Recommendations for enhancement measured are provided for supplementary planting however no works are recommended until drought conditions are broken.
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. Salvaged features are either re-instated into areas with low levels of habitat features or stockpiled appropriately for later use. 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.	Compliant	Habitat material is identified during the pre-clearance process and salvaged where possible to reinstate into BMP areas.

Action/Item	Performance Indicator	Compliance	Performance Comment
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.	Compliant	Remnant vegetation and suitably established rehabilitation areas have been supplemented with nest boxes. Annual monitoring in accordance with “Year A” conducted in 2019.
Salvaged–reinstated hollows	An indicative sample of salvaged and re-instated hollows are subject to annual monitoring in conjunction with nest boxes.	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.	Compliant	Hollows and logs removed during clearing works have been placed in offset and rehabilitation areas. Ongoing habitat augmentation works will continue with clearing in 2020.
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*)	Compliant	Supplementary plantings include plant resources as deemed necessary.
Grazing Management			
Stock rotation	Cattle are grazed within improved pasture areas within mine rehabilitation >3years where practical Stocked will be managed to allow pasture recovery and maintain pasture availability and sufficient groundcover.	Compliant	LCO coordinate a cattle grazing trial and rotate stock between paddocks under supervision of district agronomist
Bushfire Management			

Action/Item	Performance Indicator	Compliance	Performance Comment
Bushfire Management Plan will be implemented	Implementation of requirements of updated Bushfire Management Plan.	Compliant	Bushfire Management Plan updated in 2018. No signs of bushfire impacts were noted during the 2019 monitoring event.
Ecological Monitoring			
Undertake floristic, fauna, LFA, waterbird, nest box, stygofauna and instream/riparian monitoring program throughout LCO	Monitoring program completed and reported.	Compliant	Monitoring completed in 2019 indicates remnant sites have remained relatively stable since commencing monitoring; however rehabilitation is still young and will not be likely to provide comparable floristic and faunal diversity to reference vegetation for a number of years.
Undertake annual inspections of LCO rehabilitation areas as per the MOP	Annual inspections completed	Compliant	Annual inspections of LCO rehabilitation areas completed and included in this Annual Review.
Native fauna presence in rehabilitation/regeneration areas	Fauna monitoring completed.	Compliant	2019 fauna monitoring completed and indicates native fauna is present in rehabilitated vegetation. Introduced fauna are also present and should be subject to ongoing control to reduce impact on native vegetation and faunal assemblages. Increased structural and vegetation diversity in rehabilitation areas will increase native fauna diversity in these areas with time. The number of introduced fauna species is higher in rehabilitated area. However, this should decrease with improved niche availability for native fauna.

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 2019 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. Prolonged drought conditions has additionally hindered the development of rehabilitation. 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. During 2019, LCO completed a rotational grazing program through an initial 100ha of suitable rehabilitation pastures on the South Cut RL195. Monitoring completed in 2019 generally showed a higher diversity than transects from the same domains surveyed in 2018 prior to grazing. Due to the success of this program, in 2020 LCO are intending to install additional infrastructure on suitable rehabilitation to extend the rotational grazing program.

Generally, newly established pasture which has been exposed to prolonged drought conditions have been a limited factor in pasture development for the new pasture. Due to the slow establishment of the new pasture areas and generally low cover assessment of the quality and diversity of the pasture was not able to be meaningfully assessed. These areas will continue to be monitored through specific monitoring events as well as LCO inspections to determine if additional action needs to be taken to further develop this pasture.

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 2020 Weed action plan will include 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. Habitat values have been increased through the installation of stag trees, hollows and rock and log piles throughout 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. Newly established woodland rehabilitation development has been slow, likely due

to the prolonged drought conditions and are to continue to be monitored to determine if additional actions are required.

The quality of rehabilitation as compared to the representativeness of the rehabilitation to the target vegetation communities has improved over time. A number of actions have been made recently to improve the quality of existing rehabilitation including weed control efforts, installation of stag trees, supplementary planting and thinning works in existing woodland rehabilitation

Rehabilitation Management Performance Indicators

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. LCO utilise a Trigger Action Response Plan (TARP) to provide a framework for assessing rehabilitation areas performance and identification of maintenance actions as appropriate. The TARP identifies key aspects of rehabilitation (such as landform stability), subsequent key elements (for instance erosion control) and then a condition rating ('green' requires no intervention to 'amber' and 'red' which require some investigation /intervention. **Table 37** below identifies the TARP elements that as having a status other than 'green'.

As per the MOP, the site progress towards the MOP performance Indictors/Completion Criteria was reviewed as part of the monitoring completed in 2019. **Appendix G** lists all of the completion criteria and comments from the 2019 monitoring.

A rehabilitation summary of areas established during 2019 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 remediate. LCO progress with the RAP is outlined below in **Section 8.7**. The following table does not include these this areas as they are reported upon specifically in line with a RAP.

Table 36 MOP TARP Status – exceptions only

Aspect/Category	Key Element	Element Number	2019 Status	`MOP Detail		Comment
Landform Stability	Erosion Control	3	Amber	Trigger	Minor gully or tunnel erosion present and/or active rilling >200 mm deep.	Isolated areas identified with remediation required. Ongoing maintenance and monitoring.
				Response	A suitably trained person to inspect the site. Investigate opportunities to install water management infrastructure to address erosion. Remediate as appropriate.	
Topsoil Availability	Topsoil Quantity	8	Amber	Trigger	Topsoil balance indicates a deficiency in topsoil available for rehabilitation over the Life of the Mine.	During 2019 LCO ceased using topsoil alternatives (OGM) due to changes in exemptions. LCO will continue to investigate suitable alternatives with consideration to rehabilitation performance and removal of OGM as a suitable alternative.
				Response	Investigate options and alternatives (e.g. OGM) to be able to meet future topsoil requirements Continue direct seeding on spoil where possible and approved.	
Vegetation	Groundcover	9	Amber/Red	Trigger	Vegetation is not on a timely trajectory of developing groundcover of diversity or density consisted with final landform and/or completion criteria. No/limited target groudcover present	Entrance Pit RL192 pasture established in 2018 had between 10-30% cover. Cover across the site is low in response to dry conditions. Current procedures are likely to be sufficient, continue to monitor with considerations of weather conditions.
				Response	A suitably trained person to inspect the site. Investigate the use of appropriate management options to remediate. Remediate as appropriate.	
	Weed Presence	10	Amber/Red	Trigger	Weeds are limiting the establishment of rehabilitation significantly.	Some recent woodland areas have a high cover of weed species (galenia pubescence and penesetium clandestinus) that pose particular risk to target vegetation establishment. This is not atypical for new rehabilitation areas. LCO is conducting weed control in these areas and will continue to monitor revegetation performance. LCO regularly monitor weed presence conduct control activities.
				Response	Engage weed management contractor to remove introduced species from the site as soon as practicable. Investigate management measures to assist native plant establishment including use of ameliorants and implement as appropriate.	

Aspect/Category	Key Element	Element Number	2019 Status	`MOP Detail		Comment
	Species Composition	11	Amber	Trigger	Woodland vegetation is not on a timely trajectory of developing native tree and shrub species composition consistent with final landform and/or completion criteria.	Woodland rehabilitation is broadly consistent with the target vegetation in the tree and shrub layers. Planting has been undertaken in areas with low representation in shrub and ground layers, these plantings installed in 2019 will need to be assessed for survival in 2020 due to drought conditions. The woodland seed mix has been adjusted to increase native shrub establishment.
				Response	Review native seed mix and amend accordingly. Consider remedial actions such as tubestock planting, reseeding or other management practices to achieve required species composition.	
Vegetation	Species Composition	12	Amber	Trigger	Pasture vegetation is not a timely trajectory developing grass and legumes species consistent with final landform and completion criteria, appropriate to the district and suitable for cattle grazing.	Pasture areas are generally suitable to sustain grazing. Some older pasture areas require maintenance/intervention (such as grazing and supplementary sowing) to improve species diversity. Pasture composition appears to be responding well to trial grazing completed in 2019.
				Response	Investigate additional weeding and re-seeding where required and ensure seed mix utilised is consistent with desired species composition.	
Biodiversity	Habitat Corridors	13	Amber	Trigger	Habitat corridors are successfully established and consistent with the desired vegetation community composition however are not being utilised for fauna species movement.	LCO continually develop and include habitat material into rehabilitation areas. Woodland vegetation corridors are still developing and as such future monitoring events will further inform if any additional actions are required. LCO have undertaken establishment of stag trees throughout older rehabilitation in 2019 to increase habitat features.
				Response	Investigate whether sufficient habitat features (rock piles, felled hollow bearing trees, nest boxes etc.) are available and have been incorporated into the corridors.	

8.4 Biodiversity Offset Management

As part of the approved DA305-11-01 Mod 5, LCO developed a Biodiversity Offset Management Plan (BOMP) to guide ongoing management of the LCO biodiversity offset areas to maintain and enhance biodiversity values, particularly those relating to threatened species and threatened ecological communities (TECs) within the LCO biodiversity offset areas. **Figure 29** shows LCO biodiversity offset area comprising of Mountain Block, Bowmans Creek Riparian Corridor and Mitchell Hills South Offset Areas. During 2019, 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.

The LCO BOMP was updated in consultation the Department of Planning, Industry & Environment and approved on the 21 August 2019.

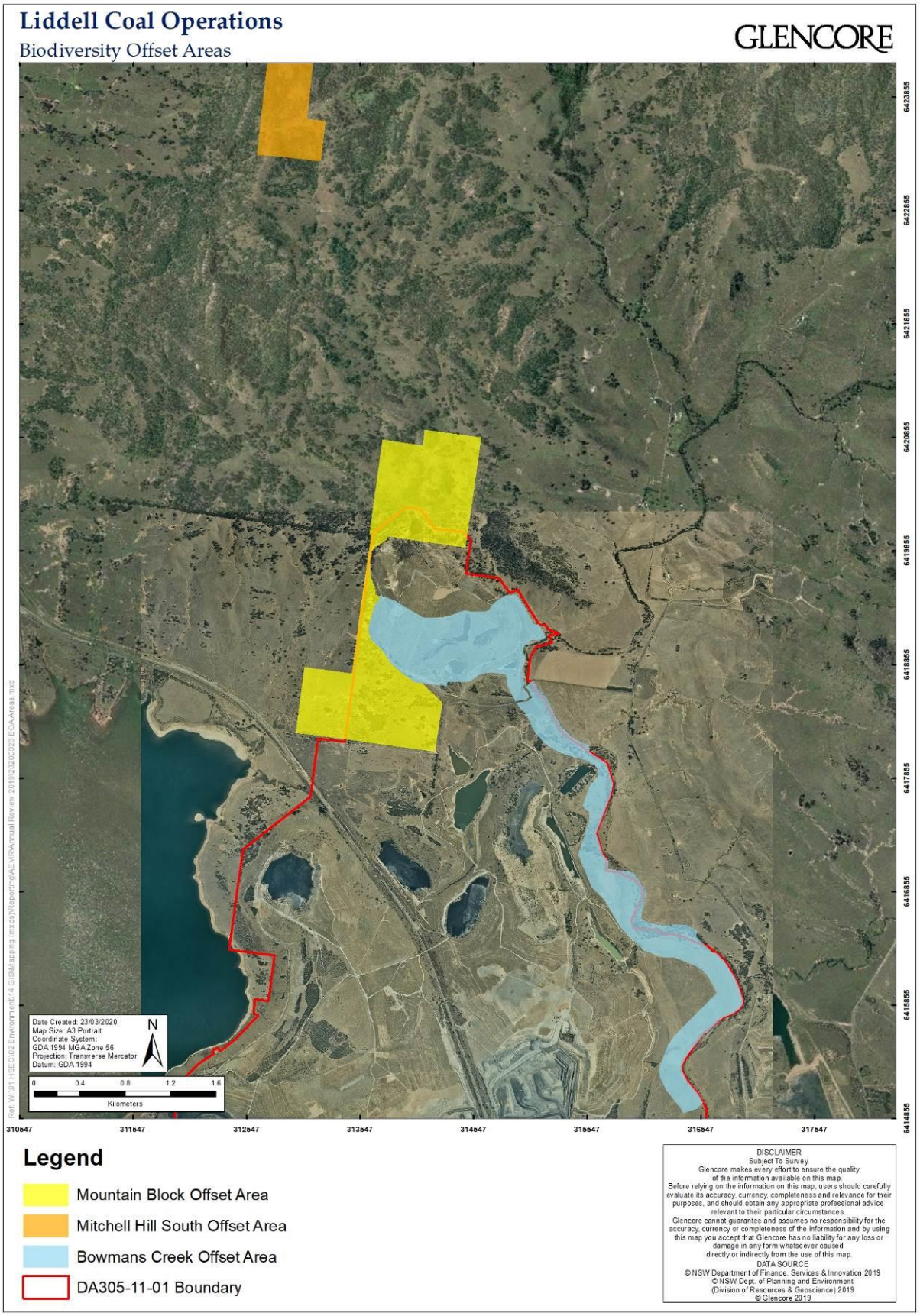

Figure 27 Biodiversity Offset Areas

Biodiversity Offset Monitoring Summary

In general, the remanent vegetation of Mitchell Hills South has the highest habitat values of the biodiversity offset areas, with high hollow densities, rock on rock habitat, moderate log presence, abundant shrubs, low introduced species although they key lacking habitat is permanent water. Bowmans Creek Riparian Corridor requires the greatest amount of ongoing active management, particularly for high introduced groundcover species, to improve recruitment of canopy species and increase of habitat features such as logs and boulders. Quality habitat was also noted in Mountain Block, however much of the vegetation within the offset is regrowth and has not yet developed hollows or other habitat complexity (such as logs). Permanent water resources in this BOA are also limited, particularly with prolonged drought conditions. Although remnant vegetation at the BOAs was in good/moderate condition (considering drought) and the general coverage of weed species was low (monitoring sites had invasive species present that require active management to prevent reduction in ecological value over time.

Although not necessarily within monitoring plots and subsequently may not be reflected within quantitative monitoring results LCO has been undertaking extensive management actions within the Mountain Block, Mitchell Hills South and Bowmans Creek Riparian Corridor since 2017. Of particular note was the decline in occurrence of galenia (*Galenia pubescens*) across some areas of the BOAs as a result of targeted weed spraying works. This should allow for recovery of small native herbs and grasses that had potential to be out competed. Works have been targeted at areas deemed in greatest need of management. A summary of management actions completed in 2019 include:

- Supplementary planting of target vegetation in Bowmans Creek Riparian Corridor.
- Weed and pest management throughout all BOAs.
- Seed collection to supplementary seeding resources for regeneration purposes.
- Hydromulching of an area of erosion containing sensitive aboriginal cultural heritage items.
- Installation and repair of nest boxes.

The 2019 monitoring, identified low utilisation of monitoring sites by feral fauna. This low utilisation may be attributable to management actions of these species or could correlate with a poor breeding season as a result of reduced resources. This result may lead to an increased usage of some areas by spotted-tailed quolls (Dasyurus maculatus maculatus) during the 2020 monitoring event. Ongoing management of these feral species is recommended as a priority to retain these low levels of occurrence.

It is anticipated that floristic and fauna value provided by the BOAs will increase with time as more management actions required by the BOMP are initiated and as tubestock planted begin to grow and provide improved habitat value (canopy coverage and foraging resources).

Key findings of the 2019 biodiversity offset monitoring program were as follows:

- Remnant vegetation is generally in good condition (considering drought), however some potentially problematic weed species are present in areas close to the Bowmans Creek (R02 and W07).
- Signs of drought-related stress, particularly canopy defoliation were evident throughout most areas (particularly riparian vegetation).
- Of the fauna groups monitored, bird diversity has undergone the greatest decrease of the fauna groups in 2019 from baseline. Bird diversity can greatly fluctuate from year to year due to the mobility of this group and these increased bird diversities do not appear to correspond to any substantial changes in habitat (other than declines in availability of surface water due to prolonged drought).
- Levels of observed feral fauna remain low, likely because of management actions being undertaken. These actions may be assisting in the ongoing presence of the spotted-tailed quoll (Dasyurus maculatus maculatus).
- Although many are yet to be colonised (some less than two years old), substantial nest box installation activities have been undertaken in all BOAs. Nest boxes are currently showing moderate signs of occupation. Ongoing monitoring should see an increase in presence of hollow dependent species in BOAs.

- Revegetation sites along Bowmans Creek Riparian Corridor are highly disturbed and require substantial intervention. Active revegetation has been undertaken with varying levels of success that will be assisted by infill planting and reduced water stress. These should start to show progress in subsequent monitoring. Several areas require entire re-planting efforts.
- Revegetation sites in Bowmans Creek Riparian Corridor are largely devoid of recruiting canopy species and require additional plantings.
- Observed levels of threatened species during the 2019 monitoring were low across all sites (remnant and regenerating), except for micro-bats which did not discriminate between low- and high-quality vegetated areas, instead preferring areas in proximity to water resources.
- No signs consistent with myrtle rust, Phytophthora or Chytrid fungus were identified.

Biodiversity Offset Performance Indicators

The BOMP includes 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 years four to six of the implementation of this BOMP 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 37** below based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 37 BOMP Performance Indicator Summary

Relevant Offset Area	Action	2019 Performance Indicator	Compliance	Performance Comment
Year 4 2019				
Pathogen Management				
All biodiversity offset areas	If reasonable potential for pathogens is identified in the BOAs, 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. If identified (or potential identified), management actions for specific pathogens are developed and implemented.	Compliant	No signs likely to be associated with Phytophthora, myrtle rust or chytrid fungus observed in any of the BOAs.
Fencing and Signage				
All biodiversity offset areas	Repair boundary fences, restricting unauthorised access to property and controlling livestock movements	All boundary fences in place and gates are secured.	Compliant	Boundary fences and gates appeared secure during monitoring event. Fences are additionally monitored during BOMP inspections completed by LCO.
	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.	Compliant	All new fencing conforms to required standard.
	Inspections of fences every two months to identify condition.	Inspections every two months. Damaged critical fences to be repaired within one week (temporary if needed), final repairs and non-critical repairs to be completed in one month.	Compliant	Fenceline inspections are undertaken every two months in accordance with the BOMP
	Information signage for the spotted-tailed quoll.	Informational signage (for the spotted-tailed quoll) is maintained.	Compliant	Signage is installed and in good condition. New offset signage also present.

Relevant Offset Area	Action	2019 Performance Indicator	Compliance	Performance Comment
Cultural Heritage				
All biodiversity offset areas	Detailed rehabilitation planning for the Bowmans Creek Riparian Corridor managing outcomes of cultural heritage assessment.	Implement plan as required.	Compliant	Planning and due diligence surveys completed. Aboriginal Cultural Heritage Management Plan (ACHMP) revised to include proposed revegetation methods in sensitive areas.
	Implement protocols for identification of potential cultural heritage issues, including how to avoid or mitigate impacts.	Implement protocol.	Compliant	Implemented as per the approved ACHMP
Grazing Management				
All biodiversity offset areas	All stock to be removed from BOAs	No stock grazing	Compliant	No evidence of cattle grazing was evident during 2019 in any BOA
	Minimum bi-monthly inspections to determine presence of rogue stock and assess condition of fences.	To be completed bi-monthly.	Compliant	Cattle inspections are undertaken bi-monthly in accordance with the BOMP.
	Remove reported rogue stock and repair damaged fences.	Action and remove reported rogue stock and repair damaged fences.	Compliant	Fence reparation works are undertaken in accordance with the BOMP.
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.	Compliant	Due diligence assessments have been completed for all biodiversity offset areas.
	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.	Complaint	Access tracks inspections are undertaken bi-annually in accordance with BOMP commitments
	Rehabilitation of unnecessary access tracks.	Tracks no longer required will be rehabilitated.	Compliant	All tracks present are considered necessary
Pest Management				

Relevant Offset Area	Action	2019 Performance Indicator	Compliance	Performance Comment
All biodiversity offset areas	Complete feral animal inspections of BOAs 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.	Compliant	Feral animal inspections are undertaken every two months in accordance with commitments of the BOMP. Feral fauna was identified however in low numbers and do not appear to be increasing in abundance Foxes (Vulpes vulpes), fallow deer (Dama dama) and a cat (Felis catus) were identified in low numbers and subsequently should be key species for management in 2020.
	Develop and implement an annual pest animal action plan.	Develop and implement pest animal action plan. Stable or downward trend in population size recorded.	Compliant	Annual pest action plan developed and implemented during 2019. Pest numbers appeared to be stable during monitoring events.
	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.	Compliant	No feral dogs were recorded in any BOAs during 2019, however foxes were identified in both Mountain Block and Bowmans Creek Riparian Corridor and a cat was identified in Mitchell Hills South during 2019. Feral fauna were identified in low numbers and do not appear to be increasing in abundance.
	Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register.	Compliant	Vertebrate pest control register developed and implemented.
Weed Management				
All biodiversity offset areas	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.	Compliant	Inspections completed in accordance with the BOMP. Evidence of galenia and introduced grass spraying was evident and appeared successful.
Natural Regeneration				
Mountain Block and Mitchell Hills South	Mapping of areas naturally regenerating and subject to revegetation works to track if	Revised in ongoing monitoring works, as needed.	Compliant	Regenerating areas appear to be progressing however drought conditions have hindered

Relevant Offset Area	Action	2019 Performance Indicator	Compliance	Performance Comment
	natural/assisted regeneration is on track to meet final hectare goals.			development. Mapping to be completed in future when conditions have improved.
Mountain Block and Mitchell Hills South	Management of regeneration progress is responsive to monitoring outcomes.	Assess progress/outcomes of natural regeneration and assess and implement assisted regeneration measures as required.	Compliant	Monitoring of regeneration progress was made in 2019 and appear to be progressing.
Assisted Regeneration				
Mountain Block and Mitchell Hills South	Review need for assisted regeneration where outcomes of natural regeneration is deemed lacking.	Natural regeneration.	Compliant	Natural regeneration was identified in BOAs. Additional supplementary planting deemed required.
Rehabilitation				
Mountain Block	Modification 7 Area transferred back under BOMP management	-	N/A	Mountain Block rehabilitation area works commenced in 2019 and offset area is to be transferred back into the BOMP once complete.
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Develop detailed performance criteria for all management zone types.	Detailed criteria developed based on annual monitoring of analogue sites.	Compliant	BOMP criteria updated in 2018 in response to progressive monitoring results.
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Implement rehabilitation/ revegetation program.	Implementation of plan.	Compliant	Log stockpiles to increase habitat value were identified in central Bowmans Creek Riparian Corridor (not present in monitoring sites). Revegetation works commenced in Bowmans Creek Riparian Corridor and Mountain Block. Nest boxes have been installed in both BOAs.
Bowmans Creek Riparian Corridor	Positive feedback loop from monitoring results.	Feedback from monitoring is incorporated into ongoing review and improvement of plan.	Compliant	To be updated in response to these works.
Habitat Augmentation				
Bowmans Creek Riparian Corridor	Salvage of habitat features (particularly for the spotted-tailed quoll) such as hollow-bearing trees, logs, stumps, large rocks and boulders.	Suitable habitat features identified during the pre-clearing process are salvaged.	Compliant	Large log piles and rock piles have been installed in central Bowmans Creek Riparian Corridor.

Relevant Offset Area	Action	2019 Performance Indicator	Compliance	Performance Comment
		Salvaged features are either re-instated into areas with low levels of habitat features or stockpiled appropriately for later use. Timber or boulder piles will be constructed in riparian areas and areas of regeneration, revegetation and/or rehabilitation (as appropriate) to provide potential quoll den habitat.		
Bowmans Creek Riparian Corridor	Nest boxes are providing habitat value for native fauna.	Continue staged installation of nest boxes.	Compliant	Nest box installation is taking place in this BOA. Signs of presence and actual occupation of nest boxes is occurring.
All biodiversity offset areas	Habitat and hollow augmentation will occur in Mountain Block and Mitchell Hills South offset areas if monitoring identifies a dearth of key habitat features such as log piles or boulder piles.	Habitat augmentation, if required.	Compliant	Nest boxes have been installed in all BOAs. Log pile installation continuing along Bowmans Creek Riparian Corridor.
Translocation				
All biodiversity offset areas	Translocation of tiger orchids or other threatened flora species (if identified in pre-clearing process) to BOAs. Methods to be adopted are detailed within the BMP.	Tiger orchids are salvaged and translocated according to the process in the BMP as needed.	Compliant	One tiger orchid successfully translocated to Mountain Block in 2018. This orchid was still alive in 2019
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.	Compliant	Need for fencing reparation works were not identified.

Relevant Offset Area	Action	2019 Performance Indicator	Compliance	Performance Comment
Bowmans Creek Riparian Corridor	Rehabilitation works to address stabilisation and erosion issues, as necessary.	Implementation, as needed.	Compliant	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.	Compliant	No substantial seeding resources identified during 2019 monitoring. Seed collection has been occurring as resources are available.
Erosion Sedimentation and Salinity				
Mountain Block	Control of erosion in southern paddocks	Commence hydromulch trials of gullies in southern paddocks.	Compliant	Trial completed in late 2019 and results for success are being monitored.
	Monitor completed erosion works and action repairs if required.	Monitor completed erosion works and action repairs if required.	Complaint	Undertaken as part of separate program
Bushfire				
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.	Compliant	Bushfire Management Plan implemented.
Monitoring				
All biodiversity offset areas	Undertake floristic, fauna, LFA and nest box monitoring program	Monitoring program completed and reported	Compliant	

Relevant Offset Area	Action	2019 Performance Indicator	Compliance	Performance Comment
	Undertake annual inspections of LCO rehabilitation and active regeneration areas	Annual inspections completed	Compliant	
	Native fauna presence in rehabilitation/regeneration areas	Fauna monitoring completed	Compliant	

8.5 Indirect Offset Management

Liddell Coal Operations (LCO) received approval for the extension of Liddell Open Cut Coal Mining Operations under the State Environmental Planning and Assessment Act 1979 (EPA Act) on 1 December 2014 (DA 3015-11-01 Modification 5) and approval under the Commonwealth Environment Protection Biodiversity Conservation Act 1999 (EPBC Act) on 24 December 2014 (EPBC Approval 2013/6908).

The State and Commonwealth approvals 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 Plan (IOP) was been prepared to satisfy the conditions of the State and Commonwealth approvals relating to this financial contribution. A revised IOP was submitted on the 23 March 2017 and subsequently approved by the Australian Government Department of Environment & Energy (DoEE) on the 5 May 2018. The revised IOP details amended projects Task 2 Surveying/Monitoring STQ Populations and Task 3 Assess Habitat Use by Female STQ.

Management Actions during the reporting period

Task 1 Development of Individual Recognition Software for Quolls

To recap, Task 1 involves the development and sharing of computer software that enables the identification of individual quolls from remote camera data. The 2017 Annual Report LCO advised that the software development was successful, with the initial build of the Quoll Identification Toolkit (QIT) completed utilising $80,000 funds providing by LCO under research agreement with Invasive Animals Limited (IAL).

During the 2019 reporting period further work was completed with support from OEH funding to refine the identification algorithm in the Quoll Identification Toolkit (QIT) and its transferability to a freely available software platform. The task summary provided below in **Table 39** provides an updated list of actions.

Table 38. QIT Development Progress

Action	Status
1. Continue to refine Matlab based version (address issues raised in initial testing).	Complete
2. Conduct user testing with NSW OEH Saving our Species and UNE/NSW Dept. Primary Industries project groups.	Progress made in 2018/19 FY with additional funding from OEH
3. Undertake refinements to QIT once testing is complete	Awaiting outcome of user-testing
4. Prepare scientific paper for publication	In progress
5. Develop user manual	In progress
6. Release of QIT for use	In progress

Task 2 Surveying/Monitoring STQ Populations

A PHD student was engaged and employed to oversee the completion of the project and continue from the camera trapping network installations in 2018. The camera trapping program was successfully implemented at the Middle Foy Brook area with over 30 individuals being identified (~90% of the total camera sightings could be assigned to unique individuals) as described in the following **Table 40**.

Table 39 - Summary of Quoll identification results from the Liddell Coal Site

Quoll Identification	Quantity
Total quoll detections	1029
Individual has been uniquely identified	932
Individual identification possible with more images	79
Individual ID not possible	18

Deployment of the program into the Mt Royal and Wollemi National Parks was delayed during the reporting period whilst awaiting Scientific Licence approval from OEH. A Scientific Licence (SL102237) granted has been granted for Mt Royal NP and the camera network has been installed and data collected. This data is still undergoing analysis at the time of writing this report and further update will be made in the mid-year report prepared for the IOMP.

Task 3 Assess Habitat Use by Female STQ

Implementation of Task 3 was successful, capturing and fitting telemetry tracking collars on 6 female quolls from the Liddell Coal/Middle Foy Brook site. During the exercise, sixteen Quoll captures were recorded during the first trapping period in accordance with approvals from UNE Animal Ethics Committee and OEH Scientific Licensing.

Five out of the six of these individuals had been previously identified through camera trapping and the remaining female was not identified in the camera trapping program.

Management Actions during the next reporting period

QIT Toolkit

User testing program is still progressing utilising images and quoll identification collected by NSW OEH and NSW DPI project groups, including images from the Liddell camera footage and trapping. LCO will continue to liaise with IAL on progress towards QIT release, and subsequent publication of a scientific paper detailing the software-based recognition of individual quolls from camera trap images.

2019 Implementation – Tasks 2 and 3

The projects will continue to be implemented as described in the IOP, with the relevant Scientific Licence (SL102237) being recently approved by the Office of Environment and Heritage, permitting the additional monitoring work to be undertaken on NPWS tenures.

Funds in relation to the Year 3 implementation have been provided confirmed in the Independent Environmental Audit 2019. Additional spend information will be provided on completion of a mid-year summary report detailing progress, financial reporting and results to date. This information will underpin the 2020 IOP Annual Progress Report.

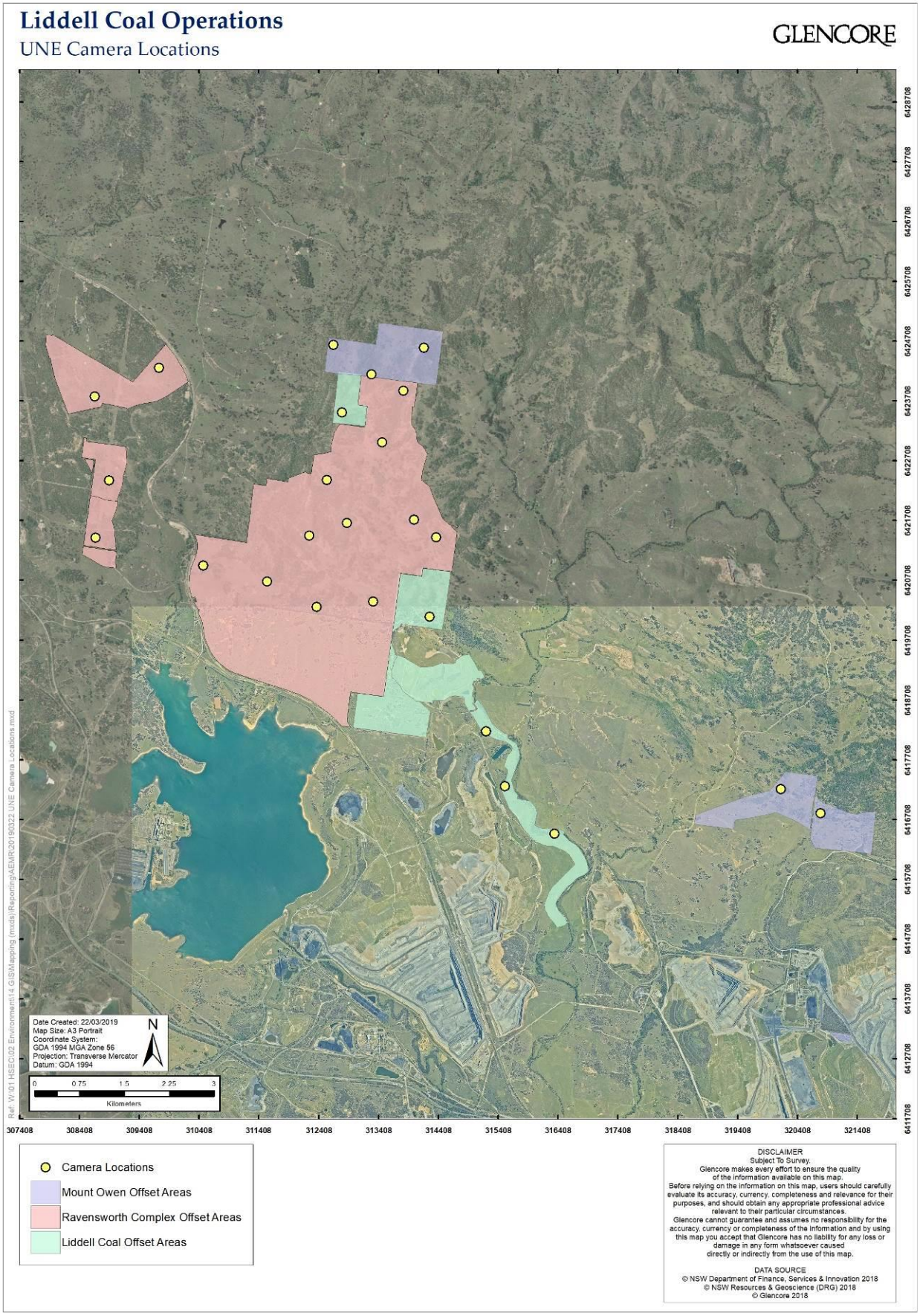

Figure 28 UNE monitoring program camera locations

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; below summarises current status of each area.

For Area 1, the canopy layer in Trial Plot 1 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. One species that is not consistent with the target vegetation community being silver leaved ironbark (*Eucalyptus melanophloia)* was identified as occurring sporadically throughout the Trial Plot 1 Woodland area. The mid layer is patchy and dominated by weeping myall (*Acacia pendula*) and sticky hop-bush (*Dodonaea viscosa*). With densities of shrub species at approximately 400 stems per hectare. The ground layer has a cover of around 30% 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. A thin litter layer consisting of the leaves and bark of eucalypts and exotic grasses is present across the Trial Plot 1 area. Due to the age of the rehabilitation, topsoil development remains minimal at this stage.

For Area 2, the canopy layer in Trial Plot 2 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. One species that is not consistent with the target vegetation community being lemon-scented gum (*Corymbia citriodora*) is also present in low numbers throughout the Trial Plot 2 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 reduced cover of around 20% and includes 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. Due to the age of the rehabilitation, topsoil development remains minimal at this stage.

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 2019 to further develop the rehabilitation areas pending the improvement of drought conditions.

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.

Findings:

2019 monitoring results of the Entrance Pit woodland areas have shown effective management of weed species occurring however some species still present requiring continued focus. Entrance Premier rehabilitation has been established in three stages between 2015 and 2017. Earlier rehabilitation (established in 2015 and 2016) is characterised by a patchy distribution of shrubs and canopy species and an understorey dominated by couch and exotic pasture grasses. Rehabilitation established in 2017 typically has a higher density and diversity of shrub and canopy species. In the 2015-16 rehabilitation canopy species occur at very low densities (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*). LCO completed supplementary infill planting in 2019, predominately in the 2016 and 2016 rehabilitation, to improve native establishment however with persistent drought conditions, despite additional watering, the success of these supplementary planting works has been impacted. The overall impact of the drought on these plantings will be monitored during 2020 and additional planting works to be planned when drought conditions have eased.

The monitoring results of the two 4ha plots have shown clearly observable differences. The vegetation across these area varies in its composition and structure relative to the presence/absence of topsoil. The topsoiled area generally has a higher cover of ground layer species (approximately 65%) but had minimal shrub and canopy layer species evident at the time of inspection (<50 stems per hectare for both). The areas that have minimal topsoil had a lower cover of ground layer species (40%) but a higher number of mid and canopy layer species (500 and 200 stems per hectare respectively) were evident. 2019 monitoring has concluded that the non-topsoiled area has a good representation of target species, particularly mid and canopy layer species. Some native species of grass and groundcovers, particularly salt bushes have been observed to have a better ability to establish in reject material or with minimal topsoil. Persistent drought conditions throughout 2019 have impacted the further establishment of vegetation within these trial plots.

8.7 Mountain Block

As per the current MOP/RMP approved November 2017, the following design development process was completed during early 2018:

- Obtaining 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.

The outcomes of the design process presented to NSW DPE and Resources Regulator (formerly DRG) on the 23 April 2018. It was agreed that LCO would progress the remediation design ready for release as construction tender by end Q3 2018.

In parallel it was also identified that LCO required DA305-11-01 approval boundary to address areas of rehabilitation legacy and instability across the entire slope. DA Modification 7 was prepared and submitted in August 2018 to meet this requirement. LCO received approval for Modification 7 on 12 February 2019.

The construction tender for the remediation works was released in early November 2018, after a short delay to conduct a constructability peer review with the assistance of the NSW Soil Conservation Service to further inform the design and tender specification. Tender submission period closed mid December 2018 with a preferred tender selected in 2019.

Post the approval of Modification 7, LCO progressed an Ancillary Mining Lease Application to add the extension area to ML1597. In the interim until this approval was granted in late 2019, LCO commenced the construction of infrastructure for the remediation project and commenced disturbance activities where extension was not required.

Management Actions during the next reporting period

At the time of writing this report, LCO received approval for the Ancillary Mining Lease Application on the 28 January 2020. Subsequently to this, LCO updated the Mining Operations Plan to include the remediation strategy and timeline for rehabilitation works at the Mountain Block to address landform stability issues and erosion impacts. This Mining Operations Plan was subsequently approved on the 17 February 2020.

In 2020, LCO will complete the works within the Mountain Block remediation which will include bulk shaping, soil amelioration, rock drains, revegetation, surface erosion protection and maintenance as required.

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 31.**

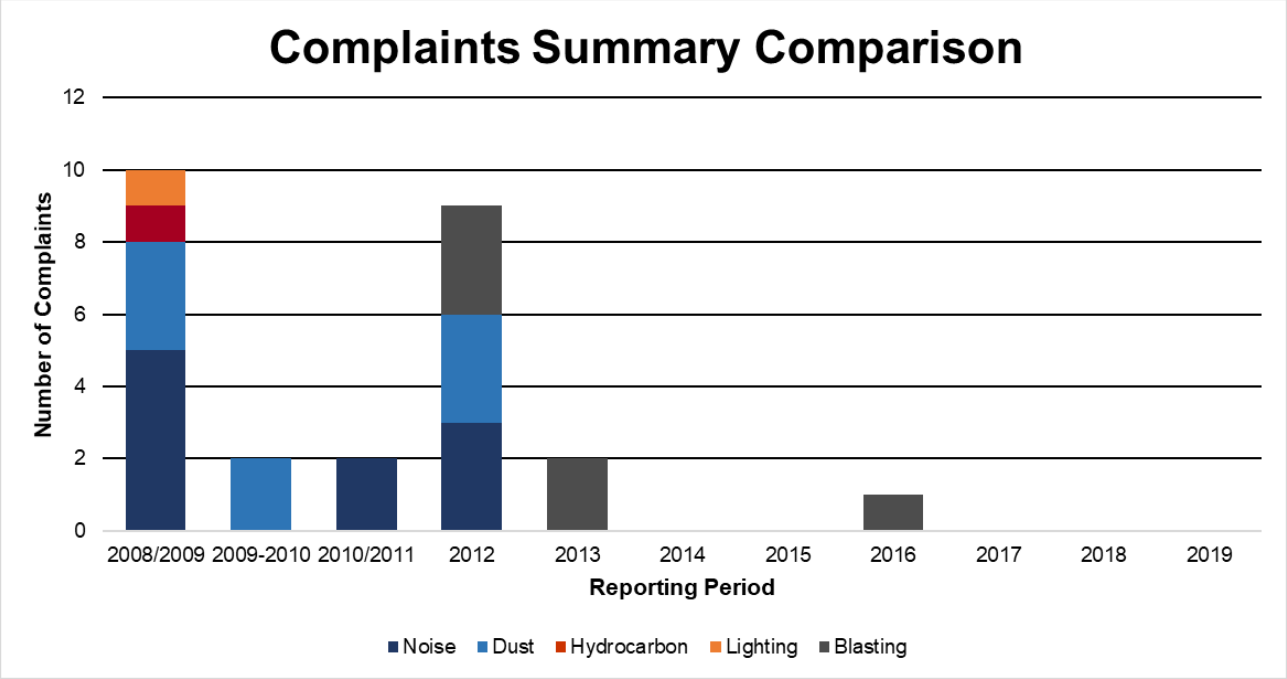

Figure 29 Complaints summary

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 the Greater Ravensworth Area community 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 2019 and again in November 2019.

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 40 Community Investment Program Recipients

Community Investment Projects	
Gresford Show	Branxton Golf Club
Lake Liddell Recreational Area	Lifeline Direct
Singleton Toy Library	Muswellbrook Public School
Upper Hunter Team Penning	King St Public School
Singleton Public School	Muswellbrook South Public School
Variety Childrens Hospital	Upper Hunter Conservatorium of Music
Worlds Greatest Shave	Singleton Fly Fishing Club
Muswellbrook Girl Guides	Muswellbrook High School
Westpac Rescue Helicopter	Sandy Hollow High School
Singleton Pre School	Singleton High School
Hebden Community Hall	

10 Independent Audit

An independent environmental audit was undertaken for the Department of Planning & Environment for the period of 31 December 2015 to 07 February 2019 by AECOM and was completed over the period of 4 – 7 February 2019. 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, opportunities for improvement and actions to address is summarised below in **Table 42.**

Table 41 Independent audit non-compliances and opportunities for improvement

Condition Reference	Description	Risk Level	Action taken
DA 305-11-01			
Non-Compliances			
Schedule 2, Condition 8	Obtain building certificates which verify the building was constructed in accordance with the requirements of condition 8, schedule 2.	Administrative	As construction and occupation certifications were not obtained for the buildings, and cannot be obtained retrospectively, LCO obtained Building Code and Bushfire assessments which determined that the buildings are in accordance with the code and standard required by Schedule 2, Condition 8.
Schedule 3, Condition 4	Two exceedances of blast criteria occurred during the audit period. These exceedances were in relation to ground vibration measurements recorded at the Newdell zone substation. On the basis of the two exceedances at the Newdell zone substation, this condition has been assessed as non-compliant. However no recommendations are considered necessary as LCO has since implemented measures to address these exceedances in line with the approved blast management strategy.	Low	None required
Schedule 3, Condition 16	Compliance monitoring results were reviewed by the auditors. 10 exceedances occurred of the short term impact criteria for PM10 24hr in 2018. The exceedances were either a result of regional dust events, and therefore fell under 'note d' of Table 3-5 or a result of offsite contributions and therefore unlikely that LCO operations caused an exceedance of short term impact assessment criteria. This condition is found to be non-compliant due to the exceedances which have been recorded against PM10 short term criteria. As a result of MOD 7 being approved future exceedances of this nature would not be considered a non-compliance if investigations conclude they are a result of increased background concentrations from other sources and not LCO operations. As a result, no recommendation is considered required.	Low	None required
Schedule 3, Condition 21A	An incident occurred on 28 November 2018 in which sediment laden run-off breached a containment drain and flowed into an isolated pool within Bowman's Creek. The incident was reported to the EPA and other agencies in accordance with the PIRMP and WMP. The	Low	None required

	DPE attended site for an inspection on the 29 November and requested an investigation report into the incident. LCO's investigation concluded that the incident did not cause or threaten material harm to the environment. The auditors consider that whilst the incident response minimised potential impacts to the environment and LCO's conclusion that the incident did not cause material harm to the environment appears reasonable, LCO is non-compliant with this condition as a pollutant (sediment) entered waters (Bowman's Creek). LCO has since implemented further system improvements to mitigate the likelihood of similar event reoccurrences. Therefore no further recommendations are made.		
Schedule 3, Condition 21B	In June/July 2018 the MIA STP treated effluent exceeded the E.coli concentration limit of 100 CFU/100 ml at the discharge. It is noted treated effluent from the plant undergoes UV disinfection and is recycled into the mine dirty water system and contained onsite. In response to the exceedance LCO engaged a maintenance and wastewater treatment plant contractor to investigate the exceedance and undertake maintenance work. Given the response and thorough investigation into the exceedance no further recommendations are provided.	Low	None required
Schedule 3, Condition C35	Waste management and minimisation was reported in the previous Annual Environmental Management Reports which were prepared prior to 2015. Since 2015 LCO has been preparing Annual Reviews in accordance with the post-approval requirements for State Significant Mining Developments Annual Review Guideline released by the DPE in October 2015. This guideline does not require the inclusion of waste reporting. Waste management and waste minimisation was not reported in the LCO 2015, 2016 and 2017 Annual Reviews and on this basis, this condition is considered non-compliant. Report on waste management and minimisation in the Annual Review	Administrative	Section 6.1 of the Annual Review updated.
Environmental Protection Licence 2094			
L1.1	An incident occurred on 28 November 2018 in which sediment laden run-off breached a containment drain and flowed into an isolated pool within Bowman's Creek. The incident was reported to the EPA and other agencies in accordance with the PIRMP and WMP. The DPE attended site for an inspection on the 29 November and requested an investigation report into the incident. LCO's investigation concluded that the incident did not cause or threaten material harm to the environment. The auditors consider that whilst the incident response minimised potential impacts to the environment and LCO's conclusion that the incident did not cause material harm to the environment appears reasonable, LCO is non-compliant with this condition as a pollutant (sediment) entered waters (Bowman's Creek). LCO has since implemented further system improvements to mitigate the likelihood of similar event reoccurrences. Therefore no further recommendations are made.	Low	None required

L2.4	On 18 June 2018 a sample taken from EPA monitoring point 5 measured a faecal coliform concentration of 120 CFU/100ml. This is an exceedance of LCOs licenced discharge criteria of 100CFU/100ml. It is noted treated effluent from the plant undergoes UV disinfection and is recycled into the mine dirty water system and contained onsite. In response to the exceedance LCO engaged a maintenance and wastewater treatment plant contractor to investigate the exceedance and undertake maintenance work. Given the response and thorough investigation into the exceedance no further recommendations are provided.	Low	None required
M2.2	PM10 was not monitored continuously over the audit period; as a result this condition has been assessed as non-compliant. Despite working towards a continuous data availability target of 90%, LCO reported all instances where a valid 24 hour average was not available due to less than 75% availability of data as a non-compliance with the requirement for continuous monitoring. Seek clarification from the EPA on an appropriate data availability target for continuous monitoring to factor in a reasonable period of monitor downtime. This could be in the form of a variation to the EPL to include a minimum percentage of time on line (e.g. 90%) for the continuous monitors.	Low	LCO sought clarification from the EPA by providing record of the current process LCO was using to assess the data availability target for continuous monitoring. No response has been received from the EPA to date.
M4.1	LCO reported that weather monitoring was not captured continuously throughout the audit period. Based on LCO's investigations and follow up actions being implemented the auditors did not make any further recommendations.	Low	None required
Mining Leases			
Condition 18 ML 1597	Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan. Incident occurred on 28 of November as described above resulting is discharge of sediment laden-run off. LCO has since implemented further system improvements to mitigate the likelihood of similar event reoccurrences. Therefore no further recommendations are made.	Low	None required
Opportunities for Improvement			
Environmental Management Strategy	Update the Monitoring Plans in Appendix A of the Environmental Management Strategy to reflect current monitoring undertaken e.g. include new groundwater monitoring bore ALV9 and additional real-time monitor (E-BAM) locations.	N/A	Monitoring plans in Appendix A of the Environmental Management Strategy updated and approved by DPIE on the 8 August 2019
Air Quality Management and Monitoring Program	It is recommended that the AQMMP reference the specific requirements of EPL monitoring condition M2.2 and improve the discussion of how LCO are complying with the requirements of this condition, specifically the requirement for continuous monitoring and how this is defined.	N/A	AQMMP references updated to include the specific requirements of EPL monitoring conditions M 2.2. AQMMP was approved by DPIE on the 9 August 2019.

	It is recommended that the figures in the AQMMP include reference to EPL Monitoring Point numbers (point 9, 10, 11 & 12) or outline clearly the link between the EPA monitoring Point numbers and the LCO unit references (e.g. SX38-D3).	N/A	Figures in the AQMMP were updated to include the EPL Monitoring point numbers. AQMMP was approved by DPIE on the 9 August 2019.
	It is recommended that Section 2.11 of the AQMMP, Air Quality Monitoring, is reviewed and updated to improve readability. For example, improvements could be made to the heading level structure to clearly delineate which monitoring method the sub sections are referring to.	N/A	Section 2.11 of the AQMMP was reviewed and updated to improve readability. AQMMP was approved by DPIE on the 9 August 2019.
Biodiversity – general	Monitor the impacts of grazing by native herbivores (e.g. kangaroos) on vegetation establishment during annual rehabilitation and or biodiversity monitoring and if impacts are identified investigate management strategies to exclude herbivores from impacted areas.	N/A	Section 5.6 of the Biodiversity Management Plan was updated to include the monitoring of impacts through grazing by native herbivores.
Rehabilitation Management Plan	Include further details in the MOP of how the TARP is used as a tool to track progress towards meeting the rehabilitation completion criteria. This could better reflect the input from the annual rehabilitation monitoring, biodiversity monitoring and biodiversity offset monitoring and the recommendations made in these monitoring reports by the specialist ecologists.	N/A	MOP amended and reapproved 17 September 2019
Biodiversity Management Plan	It is recommended that LCO review its flora monitoring methodology and analysis with contemporary methods. Any changes adopted should be documented within the BMP.	N/A	LCO engaged suitably qualified experts to provide recommendations on the flora monitoring methodology and analysis. Subsequent to this, the BMP was updated to include the revised methodology and was approved by DPIE 17 December 2019.
	Biodiversity Management Plan Section 3.3.4 Introduced Species. This Section would benefit from including the species Hyparrhenia hirta (Coolatai) given its prevalence at nearby offset sites and invasive capability.	N/A	Section 3.3.4 was updated and approved by DPIE 17 December 2019.
	Biodiversity Management Plan Section 4.3 Topsoil Management. This section could benefit from a statement that explains that stockpiled soil will be used as soon as practicable to minimise loss of seed store. In addition, this section of the BMP could be enhanced with a statement that indicates that a register detailing the location of topsoil removal and deposition is kept.	N/A	Section 4.3 was updated and approved by DPIE 17 December 2019.
	Include discussion of vehicle weed hygiene management within the BMP and BOMP.	N/A	Section 4.12 of the BMP and 3.7 of the BOMP was updated to include discussion of vehicle weed hygiene and was approved by DPIE 9 May 2019 (BOMP) and 17 December 2019 (BMP).
	Biodiversity Management Plan Section 4.10 Remnant Vegetation and Habitat Management, this Section could benefit from referencing the Bushfire Management Plan or including information from the Bushfire Management Plan relating to ecological burns and fire intervals for the different communities.	N/A	Section 4.10 was updated and approved by DPIE 17 December 2019.

	Biodiversity Management Plan Section 4.11.1 Post-Mining Land Use Design Objectives. This section refers to the rehabilitation strategy which aims to emulate the pre-mining grazing areas yet does not discuss what these pre-mining grazing areas were like. For example, it does not indicate if these pre-mining grazing areas were dominated by native or exotic pastures. It is recommended reference to 'pre-mining grazing' areas should be removed and the objective of establishing pasture (native or exotic) suitable for grazing stated.	N/A	Section 4.11.1 was updated and approved by DPIE 17 December 2019.
Erosion and Sediment Control Plan	Update Section 8.6.4 of the WMP – Ensure consistency with regards to soil type and more clearly detail the design standards LCO adopts demonstrating it is consistent with the Managing Urban Stormwater Soil and Construction, Volume 2E: Mines and Quarries.	N/A	Section 8.6.4 of the WMP was updated and approved by DPIE 9 May 2019.
Surface Water - General	Include discussion in the WMP of the oil water separator and the management of the treated water and waste solids. This could reference the Waste Management Bioremediation Area Procedure.	N/A	Section 5.4 of the WMP was updated and approved by DPIE 9 May 2019
Surface Water Management Plan	Update Figure 9-1, in the WMP, to include the location of the Licensed Discharge Points (LDP 5 and LDP 6) and also show Dam 6.	N/A	Figure 9-1 of the WMP was updated and approved by DPIE 9 May 2019
	Change reference to LCO Rehabilitation Plan in WMP to reference the MOP.	N/A	References throughout the WMP were updated and approved by DPIE 9 May 2019
STP - General	Replace faded signage at the CHPP STP.	N/A	CHPP signage and pipeline delineation replaced
Biodiversity Offset Management Strategy	Biodiversity Offset Strategy Section 3.4 Grazing Management is predominantly focussed on grazing by stock and has limited discussion on the potential impacts of overgrazing by native species (e.g. kangaroos). The BOMP could benefit from some discussion on potential management strategies for overabundant native species.	N/A	Section 3.4 updated and approved by DPIE 9 May 2019
EPL 2094 Condition U1.1	With the next EPL Variation, request that the completed PRPs and Special Conditions are removed from the Licence	N/A	LCO submitted a letter to the EPA on the 28 June 2019 requesting the removal of the completed PRPs and Special Conditions from the license.
ML 1552 Condition 5	Update the PIRMP to reflect the requirement of ML 1552 to report environmental incidents to the RR.	N/A	PIRMP was updated to reflect the requirement and published on the LCO website.

The next independent audit is to be undertaken in February 2022.

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 43.**

Table 42 Non-compliance summary

Approval	Condition Reference	Condition Description	Description	Action taken
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit SX38-D1 on 37 occasions.	Each exceedance of short term impact assessment criterion was investigated and determined extraordinary events or regional conditions resulted in the exceedances opposed to contribution by LCO operations.
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit SX38-D2 on 48 occasions.	Each exceedance of short term impact assessment criterion was investigated and determined extraordinary events or regional conditions resulted in the exceedances opposed to contribution by LCO operations.
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit HVAS 21 (Antienne) on seven occasions.	Each exceedance of short term impact assessment criterion was investigated and determined extraordinary events or regional conditions resulted in the exceedances opposed to contribution by LCO operations.
DA 305-11-01	Schedule 3 Condition 16	Short term impact assessment criterion for particular matter	Short term impact assessment criterion for particular matter exceeded the 24 hour averaging period PM10 criterion at monitoring unit HVAS 12 (Scrivens) on eight occasions.	Each exceedance of short term impact assessment criterion was investigated and determined extraordinary events or regional conditions resulted in the exceedances opposed to contribution by LCO operations.
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Monitoring Point 9 failed to achieve PM10 data availability greater than 75% on 8 dates throughout the reporting period due to hardware failures.	Hardware failures were actioned and repaired by suitably qualified technicians.
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Monitoring Point 10 failed to achieve PM10 data availability greater than 75% on 2 dates throughout the reporting period due to planned maintenance.	Nil

EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Monitoring Point 11 failed to achieve PM10 data availability greater than 75% on 21 dates throughout the reporting period due to hardware failures and internal hardware failures requiring factory repairs.	External and internal hardware failures were actioned and repaired by suitably qualified technicians.
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Monitoring Point 12 failed to achieve PM10 data availability greater than 75% on 12 dates throughout the reporting period due to hardware failures and planned maintenance.	Hardware failures were actioned and repaired by suitably qualified technicians.

* 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 both mining areas. No further clearing for mining progression is planned once remaining 10ha in the Entrance Pit is completed in Q1 2020.
- LCO will consult and seek approval for the next MOP term 2021-2023.
- Implementation of remediation works in Mountain Block.
- **Section 6.2** discussed the blasting performance and specific management actions required at the Newdell Sub Station. Implementation of the blast management strategy and incremental increase in vibration limits in consultation with Ausgrid will continue in 2020.
- **Section 6.6** discussed 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 2020.
- **Section 6.9** discussed the decreasing onsite tailings capacity, LCO aims to finalise commissioning and continue transfer of tailings through pipeline to Mt Owen Complex (West Pit) as approved by DA305-11-01 Mod 6.
- **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 completed during 2019. LCO will continue to implement the BMP and MOP management commitments including but not limited to:
    - Augment the habitat resource to encourage fauna diversity;
    - Conduct maintenance (weed control, erosion repairs, tree thinning, etc.) works as required;
    - Complete supplementary planting to improve species diversity pending drought conditions;
    - Continue rehabilitation trial areas; and
    - Continue to further 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.) and water resources.

- **Section 8.4** outlined the current status of Offset areas, monitoring results and management actions completed during 2019. LCO will continue to 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 (rock piles, log piles) to encourage fauna diversity;
    - Continue to conduct maintenance works such as targeted feral fauna and flora management;
    - Continued implementation of active regeneration works in all offset areas; and
    - Monitor trial remediation methodology for eroded areas of the Mountain Block Offset Area;
- **Section 8.5** detailed the progress of the Indirect Offset Management program. During 2020, LCO will work to progress the quoll monitoring project in conjunction with the UNE.

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

COAL RECEIVALS

Report Period 01/01/2019 12:00 am to 31/12/2019 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	Tuesday 01 January 2019	LD102	Q3 LD to China Steel Corp - JFY18	Amami	1 January 2019				1,414.85	7,168.55							8,583.40
		LD186	MO to GIAG	Hyundai Samcheonpo	1 January 2019					8,482.20							8,482.20
		Summary of Tuesday 01 January 2019							1,414.85	15,650.75							17,065.60
	Wednesday 02 January 2019	LD174	Liddell to NSC JFY18 Fixed Price	New Expedition	2 January 2019				8,845.40								8,845.40
		LD224	Liddell to NSC JFY18 Fixed Price	New Expedition	3 January 2019				8,558.60								8,558.60
		LD332	MO to GIAG	Hyundai Samcheonpo	2 January 2019					9,079.80							9,079.80
		LD388	Liddell to NSC JFY18 Fixed Price	New Expedition	2 January 2019				7,192.33				1,488.07				8,680.40
		Summary of Wednesday 02 January 2019							24,596.33	9,079.80			1,488.07				35,164.20
	Thursday 03 January 2019	LD242	Liddell to NSC JFY18 Fixed Price	New Expedition	3 January 2019				4,866.50	4,128.50							8,995.00
		Summary of Thursday 03 January 2019							4,866.50	4,128.50							8,995.00
	Friday 04 January 2019	LD354	MO to GIAG	Hyundai Samcheonpo	4 January 2019					8,648.00							8,648.00
		Summary of Friday 04 January 2019								8,648.00							8,648.00
	Saturday 05 January 2019	LD174	MO to GIAG	Hyundai Samcheonpo	6 January 2019					8,887.80							8,887.80
		LD360	Liddell to NSC JFY18 Fixed Price	New Expedition	5 January 2019				3,090.11				5,465.89				8,556.00
		Summary of Saturday 05 January 2019							3,090.11	8,887.80			5,465.89				17,443.80
	Sunday 06 January 2019	LD150	Liddell to NSC JFY18 GC NEWC Oct-Dec	Dyna Globe	6 January 2019				9,208.00								9,208.00
		LD314	UL to GIAG (TPC) (MO Brand)	Tai Kudos	7 January 2019					9,145.00							9,145.00

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 06 January 2019							9,208.00	9,145.00							18,353.00
	Tuesday 08 January 2019	LD214	Liddell to NSC JFY18 GC NEWC Oct-Dec	Dyna Globe	8 January 2019				8,928.00								8,928.00
		Summary of Tuesday 08 January 2019							8,928.00								8,928.00
	Friday 11 January 2019	LD212	Liddell to NSC JFY18 GC NEWC Oct-Dec	Dyna Globe	11 January 2019				4,314.24	4,244.56			0.00				8,558.80
		Summary of Friday 11 January 2019							4,314.24	4,244.56			0.00				8,558.80
	Monday 14 January 2019	LD130	Liddell to NSC JFY18 GC NEWC Oct-Dec	NSU Sirius	14 January 2019				4,500.65				4,427.35				8,928.00
		LD160	Q4 LD to China Steel Corp - JFY18 (Jan Laycan)	Spring Wealth	14 January 2019				8,506.40								8,506.40
		Summary of Monday 14 January 2019							13,007.05				4,427.35				17,434.40
	Wednesday 16 January 2019	LD212	Liddell to NSC JFY18 GC NEWC Oct-Dec	NSU Sirius	16 January 2019				6,335.93				2,124.07				8,460.00
		Summary of Wednesday 16 January 2019							6,335.93				2,124.07				8,460.00
	Thursday 17 January 2019	LD200	GCS to Kailuan (HK) Intl. Jan '19	Silver Geneva	17 January 2019								8,520.20				8,520.20
		LD226	Q4 LD to China Steel Corp - JFY18 (Jan Laycan)	Spring Wealth	17 January 2019				5,829.68					2,970.12			8,799.80
		Summary of Thursday 17 January 2019							5,829.68				8,520.20	2,970.12			17,320.00
	Saturday 19 January 2019	LD250	GCS to Kailuan (HK) Intl. Jan '19	Silver Geneva	19 January 2019								8,932.60				8,932.60
		LD382	MG to GIAG (KOWEPO) Jan'19 (110kt @ US $76.88) CXL	Pacific Power	19 January 2019								9,041.80				9,041.80
		Summary of Saturday 19 January 2019											17,974.40				17,974.40
	Sunday 20 January 2019	LD174	GCS to Kailuan (HK) Intl. Jan '19	Silver Geneva	20 January 2019								8,523.80				8,523.80

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 Sunday 20 January 2019											8,523.80				8,523.80
	Monday 21 January 2019	LD154	UL to GIAG (TPC) (MO Brand)	Great Cheer	21 January 2019								9,238.00				9,238.00
		LD360	GCS to Kailuan (HK) Intl. Jan '19	Silver Geneva	21 January 2019								9,063.00				9,063.00
		Summary of Monday 21 January 2019											18,301.00				18,301.00
	Tuesday 22 January 2019	LD222	Liddell to NSC JFY18 GC NEWC Oct-Dec	Kashima Maru	22 January 2019				4,505.43				4,346.77				8,852.20
		LD320	Liddell to NSC JFY18 GC NEWC Oct-Dec	Kashima Maru	23 January 2019				5,885.88	2,650.12							8,536.00
		Summary of Tuesday 22 January 2019							10,391.31	2,650.12			4,346.77				17,388.20
	Wednesday 23 January 2019	LD212	GCS to Xindeco	Anangel Ocean	23 January 2019								9,197.60				9,197.60
		Summary of Wednesday 23 January 2019											9,197.60				9,197.60
	Thursday 24 January 2019	LD214	Liddell to NSC JFY18 GC NEWC Oct-Dec	Kashima Maru	24 January 2019				4,324.26	4,266.74							8,591.00
		LD338	GCS to Xindeco	Anangel Ocean	24 January 2019								8,518.80				8,518.80
		Summary of Thursday 24 January 2019							4,324.26	4,266.74			8,518.80				17,109.80
	Friday 01 February 2019	LD262	Cumnock to Nip Steel Corp - Spot (16-18kt @ US$100)	Cape Harvest	2 February 2019				8,852.40								8,852.40
		Summary of Friday 01 February 2019							8,852.40								8,852.40
	Monday 04 February 2019	LD202	UL to GIAG (TPC) (MO Brand)	Spring Glory	4 February 2019					4,643.31			4,464.29				9,107.60
		Summary of Monday 04 February 2019								4,643.31			4,464.29				9,107.60
	Friday 08 February 2019	LD112	Liddell to NSC JFY18 GC NEWC Oct-Dec	New Future	8 February 2019			3,723.75	4,601.25								8,325.00
		LD224	Liddell to NSC JFY18 GC NEWC Oct-Dec	New Future	8 February 2019					8,928.00							8,928.00
		Summary of Friday 08 February 2019						3,723.75	4,601.25	8,928.00							17,253.00

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	
	Saturday 09 February 2019	LD284	Liddell to NSC JFY18 GC NEWC Oct-Dec	New Future	10 February 2019	7,442.59		1,119.41									8,562.00
		LD322	Liddell to NSC JFY18 GC NEWC Oct-Dec	New Future	9 February 2019						9,087.20						9,087.20
		Summary of Saturday 09 February 2019				7,442.59		1,119.41			9,087.20						17,649.20
	Sunday 10 February 2019	LD138	HVOCS NSSM 3rd Quarter (Jan/ Mar'19) 400kt - October RP	Pacific Oak	10 February 2019				5,079.57				3,848.43				8,928.00
		LD244	GCS to Kobe IPP - Apr'18- Mar'19	Legato II	11 February 2019				8,927.80								8,927.80
		LD314	Liddell to NSC JFY18 GC NEWC Oct-Dec	New Future	10 February 2019						8,551.00						8,551.00
		Summary of Sunday 10 February 2019							14,007.37		8,551.00		3,848.43				26,406.80
	Monday 11 February 2019	LD178	HVOCS NSSM 3rd Quarter (Jan/ Mar'19) 400kt - October RP	Pacific Oak	11 February 2019				7,899.76				1,027.04				8,926.80
		LD278	GCS to Kobe IPP - Apr'18- Mar'19	Legato II	12 February 2019			5,823.40			3,227.80						9,051.20
		Summary of Monday 11 February 2019						5,823.40	7,899.76		3,227.80		1,027.04				17,978.00
	Tuesday 12 February 2019	LD282	Liddell to NSC JFY18 GC NEWC Oct-Dec	Pacific Oak	13 February 2019				8,864.80								8,864.80
		Summary of Tuesday 12 February 2019							8,864.80								8,864.80
	Wednesday 13 February 2019	LD192	UL to GIAG (TPC) (MO Brand)	SM Challenger	13 February 2019			4,394.17		4,187.43							8,581.60
		LD272	Q4 LD to China Steel Corp - JFY18 (Feb Laycan)	Tai Kudos	14 February 2019				8,509.80								8,509.80

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	
		LD370	Liddell to NSC JFY18 GC NEWC Oct-Dec	New Future	13 February 2019			6,372.19			2,619.41						8,991.60
		Summary of Wednesday 13 February 2019						10,766.36	8,509.80	4,187.43	2,619.41						26,083.00
	Thursday 14 February 2019	LD102	Liddell to NSC JFY18 GC NEWC Oct-Dec	Pacific Oak	14 February 2019			3,372.95			5,222.25						8,595.20
		LD224	Q4 LD to China Steel Corp - JFY18 (Feb Laycan)	Tai Kudos	14 February 2019										8,725.80		8,725.80
		Summary of Thursday 14 February 2019						3,372.95			5,222.25				8,725.80		17,321.00
	Friday 15 February 2019	LD192	Q4 LD to China Steel Corp - JFY18 (Feb Laycan)	Tai Kudos	15 February 2019										9,023.60		9,023.60
		LD246	Q4 LD to China Steel Corp - JFY18 (Feb Laycan)	Tai Kudos	15 February 2019										8,854.80		8,854.80
		LD322	Q4 LD to China Steel Corp - JFY18 (Feb Laycan)	Tai Kudos	16 February 2019				8,767.40								8,767.40
		LD326	HVOCS NSSM 3rd Quarter (Jan/ Mar'19) 400kt - October RP	Pacific Oak	15 February 2019	7,435.43					1,638.77						9,074.20
		Summary of Friday 15 February 2019				7,435.43			8,767.40		1,638.77				17,878.40		35,720.00
	Saturday 16 February 2019	LD102	Q4 LD to China Steel Corp - JFY18 (Feb Laycan)	Tai Kudos	16 February 2019				3,583.12						4,746.88		8,330.00
		LD276	Liddell to NSC JFY18 GC NEWC Oct-Dec	Kure Maru	17 February 2019	5,556.68							2,757.12				8,313.80
		LD360	UL to GIAG (TPC) (MO Brand)	Ocean Garlic	16 February 2019					4,178.72	2,752.46		1,665.03				8,596.20
		Summary of Saturday 16 February 2019				5,556.68			3,583.12	4,178.72	2,752.46		4,422.15		4,746.88		25,240.00

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 17 February 2019	LD102	Liddell to NSC JFY18 GC NEWC Oct-Dec	Kure Maru	17 February 2019	8,852.00											8,852.00
		Summary of Sunday 17 February 2019				8,852.00											8,852.00
	Monday 18 February 2019	LD150	Liddell to Ube - Teijin - GCI 2019 Q1 + 2.20	Energy Hope	18 February 2019				2,033.33		6,478.67						8,512.00
		LD198	Liddell to NSC JFY18 GC NEWC Oct-Dec	Kure Maru	22 February 2019			3,025.24			3,455.24		2,170.32				8,650.80
		LD226	HVOCS NSSM Q4 2018	Kure Maru	22 February 2019				9,036.80								9,036.80
		LD360	Liddell to Ube - Teijin - GCI 2019 Q1 + 2.20	Energy Hope	18 February 2019				8,589.60								8,589.60
		Summary of Monday 18 February 2019						3,025.24	19,659.73		9,933.90		2,170.32				34,789.20
	Friday 22 February 2019	LD270	J Power JFY18 (1 Panamax ex Newcastle @ US $108.39/600(	Corona Nature	23 February 2019			8,985.40									8,985.40
		Summary of Friday 22 February 2019						8,985.40									8,985.40
	Saturday 23 February 2019	LD230	Q4 Bulga to Nippon Steel - JFY18	Kure Maru	23 February 2019	8,550.60											8,550.60
		LD356	J Power JFY18 (1 Panamax ex Newcastle @ US $108.39/600(	Corona Nature	23 February 2019			7,588.58	1,603.22								9,191.80
		Summary of Saturday 23 February 2019				8,550.60		7,588.58	1,603.22								17,742.40
	Sunday 24 February 2019	LD320	HVOCS to Tohoku ECP	Noshiro Maru	25 February 2019					4,089.44	4,425.96						8,515.40
		Summary of Sunday 24 February 2019								4,089.44	4,425.96						8,515.40
	Monday 25 February 2019	LD380	Liddell to NSC JFY18 Fixed Price	KSL Santos	25 February 2019	9,052.60											9,052.60
		Summary of Monday 25 February 2019				9,052.60											9,052.60
	Tuesday 26 February 2019	LD156	Liddell to NSC JFY18 Fixed Price	KSL Santos	26 February 2019				5,953.04	3,228.76							9,181.80

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	
		LD244	Liddell to NSC JFY18 Fixed Price	KSL Santos	26 February 2019	6,136.90									2,577.50		8,714.40
		LD348	Liddell to NSC JFY18 Fixed Price	KSL Santos	26 February 2019						6,578.47		2,022.33				8,600.80
		Summary of Tuesday 26 February 2019				6,136.90			5,953.04	3,228.76	6,578.47		2,022.33		2,577.50		26,497.00
	Wednesday 27 February 2019	LD156	HVOCS to Tohoku ECP	Noshiro Maru	28 February 2019						8,928.00						8,928.00
		Summary of Wednesday 27 February 2019									8,928.00						8,928.00
	Friday 01 March 2019	LD184	HVOCS to Warkworth	HL Gladstone	1 March 2019										8,928.00		8,928.00
		Summary of Friday 01 March 2019													8,928.00		8,928.00
	Saturday 02 March 2019	LD112	Liddell to Ube - JEN - Pricing Option 2B (17.5kt) GC Newc Future Curve	Coral Jasper	2 March 2019						8,534.80						8,534.80
		Summary of Saturday 02 March 2019									8,534.80						8,534.80
	Sunday 03 March 2019	LD148	Liddell to Ube - JEN - Pricing Option 2B (17.5kt) GC Newc Future Curve	Coral Jasper	3 March 2019				4,266.64						4,350.56		8,617.20
		Summary of Sunday 03 March 2019							4,266.64						4,350.56		8,617.20
	Monday 04 March 2019	LD208	UL to GIAG (TPC) (MO Brand)	Cemtex Fortune	4 March 2019					8,556.00							8,556.00
		Summary of Monday 04 March 2019								8,556.00							8,556.00
	Tuesday 05 March 2019	LD108	Liddell to NSC JFY18 Fixed Price	Juno Horizon	5 March 2019						9,130.20						9,130.20
		LD174	Liddell to NSC JFY18 Fixed Price	Juno Horizon	5 March 2019	8,517.40											8,517.40
		Summary of Tuesday 05 March 2019				8,517.40					9,130.20						17,647.60
	Wednesday 06 March 2019	LD184	Liddell to NSC JFY18 Fixed Price	Juno Horizon	6 March 2019					8,608.60							8,608.60
		Summary of Wednesday 06 March 2019								8,608.60							8,608.60
	Thursday 07 March 2019	LD354	Liddell to NSC JFY18 Fixed Price	Juno Horizon	7 March 2019	4,791.35					3,857.65						8,649.00

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 Thursday 07 March 2019				4,791.35					3,857.65						8,649.00
	Friday 08 March 2019	LD256	Liddell to JFE - Apr'18-Mar'19 Mutual Option - October RP	Cape Green	9 March 2019						8,584.40						8,584.40
		LD322	Liddell to JFE - Apr'18-Mar'19 Mutual Option - October RP	Cape Green	8 March 2019	8,542.40											8,542.40
		Summary of Friday 08 March 2019				8,542.40					8,584.40						17,126.80
	Saturday 09 March 2019	LD188	Liddell to JFE - Apr'18-Mar'19 Mutual Option - October RP	Cape Green	9 March 2019						9,190.80						9,190.80
		LD230	Liddell to NSC JFY18 Fixed Price	Kashima Maru	9 March 2019					7,384.91			1,553.29				8,938.20
		Summary of Saturday 09 March 2019								7,384.91	9,190.80		1,553.29				18,129.00
	Sunday 10 March 2019	LD210	Liddell to JFE - Apr'18-Mar'19 Mutual Option - October RP	Cape Green	11 March 2019					2,668.43		6,483.57					9,152.00
		Summary of Sunday 10 March 2019								2,668.43		6,483.57					9,152.00
	Monday 11 March 2019	LD102	Liddell to NSC JFY18 Fixed Price	Kashima Maru	11 March 2019						5,965.31		2,560.09				8,525.40
		Summary of Monday 11 March 2019									5,965.31		2,560.09				8,525.40
	Tuesday 12 March 2019	LD274	Liddell to Chugoku - JFY19	Corona Optimum	13 March 2019						8,568.20						8,568.20
		LD380	Liddell to Chugoku - JFY19	Corona Optimum	12 March 2019						8,556.00						8,556.00
		Summary of Tuesday 12 March 2019									17,124.20						17,124.20
	Wednesday 13 March 2019	LD148	UL to GIAG (TPC) (MO Brand)	Cemtex Orient	13 March 2019					8,556.00							8,556.00

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	
		LD362	Liddell to Chugoku - JFY19	Corona Optimum	13 March 2019				8,850.00								8,850.00
		Summary of Wednesday 13 March 2019							8,850.00	8,556.00							17,406.00
	Friday 15 March 2019	LD108	Liddell to NSC JFY18 Fixed Price	Sen-Oku	15 March 2019	8,471.80											8,471.80
		LD344	Liddell to Chugoku - JFY19	Corona Optimum	15 March 2019					6,043.99	0.00	2,403.01					8,447.00
		Summary of Friday 15 March 2019				8,471.80				6,043.99	0.00	2,403.01					16,918.80
	Saturday 16 March 2019	LD186	MO to TPC Year 2 of 8 107-au-A20801	Spring Glory	16 March 2019					9,104.20			0.00				9,104.20
		LD258	Liddell to Ube - Ube Own Use - 10kt (Oct/ Nov/Dec)	Tokiwa Maru	17 March 2019				8,511.60								8,511.60
		Summary of Saturday 16 March 2019							8,511.60	9,104.20			0.00				17,615.80
	Sunday 17 March 2019	LD104	Liddell to NSC JFY18 Fixed Price	Sen-Oku	17 March 2019	4,260.53							4,199.47				8,460.00
		LD344	Liddell to Ube - Ube Own Use - 10kt (Oct/ Nov/Dec)	Tokiwa Maru	17 March 2019	2,696.80			6,452.60								9,149.40
		Summary of Sunday 17 March 2019				6,957.33			6,452.60				4,199.47				17,609.40
	Tuesday 19 March 2019	LD384	Liddell to NSC JFY18 Fixed Price	Santa Lucia	19 March 2019					8,384.80							8,384.80
		Summary of Tuesday 19 March 2019								8,384.80							8,384.80
	Thursday 21 March 2019	LD268	Liddell to NSC JFY18 Fixed Price	Santa Lucia	22 March 2019	3,216.52				2,538.18			2,668.50				8,423.20
		Summary of Thursday 21 March 2019				3,216.52				2,538.18			2,668.50				8,423.20
	Thursday 28 March 2019	LD182	LD to Ube - JFY19 - Ishihara Sangyo/ YES - April RP	Tai Kudos	28 March 2019										8,686.40		8,686.40
		LD262	LD to Ube - JFY19 - Ishihara Sangyo/ YES - April RP	Tai Kudos	29 March 2019					9,047.60							9,047.60

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	
		Summary of Thursday 28 March 2019								9,047.60					8,686.40		17,734.00
	Saturday 30 March 2019	LD258	LD to Ube - JFY19 - Ishihara Sangyo/ YES - April RP	Tai Kudos	30 March 2019					4,820.43			4,871.77				9,692.20
		Summary of Saturday 30 March 2019								4,820.43			4,871.77				9,692.20
	Saturday 06 April 2019	LD202	Liddell to NSC JFY18 Fixed Price	Kure Maru	6 April 2019	4,024.02			4,388.98								8,413.00
		Summary of Saturday 06 April 2019				4,024.02			4,388.98								8,413.00
	Sunday 07 April 2019	LD220	Liddell to NSC JFY18 Fixed Price	Kure Maru	7 April 2019				7,068.27				1,067.93				8,136.20
		Summary of Sunday 07 April 2019							7,068.27				1,067.93				8,136.20
	Friday 12 April 2019	LD332	Liddell to NSC - GC Newc Jan - Mar	New Expedition	13 April 2019				9,048.80								9,048.80
		Summary of Friday 12 April 2019							9,048.80								9,048.80
	Saturday 13 April 2019	LD362	Liddell to NSC - GC Newc Jan - Mar	New Expedition	13 April 2019				3,625.02	4,950.58							8,575.60
		Summary of Saturday 13 April 2019							3,625.02	4,950.58							8,575.60
	Sunday 14 April 2019	LD278	Liddell to NSC - GC Newc Jan - Mar	New Expedition	15 April 2019					5,597.24			3,035.56				8,632.80
		Summary of Sunday 14 April 2019								5,597.24			3,035.56				8,632.80
	Friday 19 April 2019	LD206	LD to Ube - JFY19 - Mitsubishi Paper - April RP plus US $0.80	Sagar Ratan	19 April 2019				8,556.00								8,556.00
		Summary of Friday 19 April 2019							8,556.00								8,556.00
	Saturday 20 April 2019	LD270	LD to Ube - JFY19 - Mitsubishi Paper - April RP plus US $0.80	Sagar Ratan	20 April 2019				4,305.95						4,520.45		8,826.40
		Summary of Saturday 20 April 2019							4,305.95						4,520.45		8,826.40

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	
	Sunday 21 April 2019	LD276	LD to China Steel Corp - Q1 Apr Laycan	China Steel Entrepreneur	21 April 2019										8,928.00		8,928.00
		Summary of Sunday 21 April 2019													8,928.00		8,928.00
	Monday 22 April 2019	LD112	LD to China Steel Corp - Q1 Apr Laycan	China Steel Entrepreneur	22 April 2019			5,651.76							3,276.24		8,928.00
		LD332	LD to China Steel Corp - Q1 Apr Laycan	China Steel Entrepreneur	22 April 2019										8,675.80		8,675.80
		Summary of Monday 22 April 2019						5,651.76							11,952.04		17,603.80
	Wednesday 24 April 2019	LD174	Liddell to NSC - GC Newc Jan - Mar	NSU Responsibility	24 April 2019			3,987.10					3,996.30				7,983.40
		Summary of Wednesday 24 April 2019						3,987.10					3,996.30				7,983.40
	Thursday 25 April 2019	LD172	LD to China Steel Corp - Q1 Apr Laycan	Oceanic Power	25 April 2019				8,552.00								8,552.00
		LD288	Liddell to NSC - GC Newc Jan - Mar	Santa Lucia	26 April 2019			8,928.00									8,928.00
		LD360	Liddell to NSC - GC Newc Jan - Mar	NSU Responsibility	25 April 2019			5,111.52					3,743.68				8,855.20
		Summary of Thursday 25 April 2019						14,039.52	8,552.00				3,743.68				26,335.20
	Saturday 27 April 2019	LD328	Liddell to NSC - GC Newc Jan - Mar	Santa Lucia	28 April 2019			8,920.00									8,920.00
		LD372	HVOCS Okinawa EPC	Shinryo Maru	27 April 2019					8,847.40							8,847.40
		Summary of Saturday 27 April 2019						8,920.00		8,847.40							17,767.40
	Tuesday 30 April 2019	LD144	HVOCS Okinawa EPC	Shinryo Maru	30 April 2019			8,572.80									8,572.80
		Summary of Tuesday 30 April 2019						8,572.80									8,572.80
	Wednesday 01 May 2019	LD370	Liddell to NSC - GC Newc Jan - Mar	Santa Lucia	1 May 2019				1,806.81				6,693.59				8,500.40
		Summary of Wednesday 01 May 2019							1,806.81				6,693.59				8,500.40

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	
	Monday 06 May 2019	LD224	Liddell to NSC - GC Newc Jan - Mar	Sen-Oku	6 May 2019								3,402.17		5,433.23		8,835.40
		LD260	Liddell to NSC - GC Newc Jan - Mar	Sen-Oku	7 May 2019			2,990.43	6,107.37								9,097.80
		Summary of Monday 06 May 2019						2,990.43	6,107.37				3,402.17		5,433.23		17,933.20
	Friday 10 May 2019	LD166	Liddell to NSC - GC Newc Jan - Mar	Hisui Horizon	10 May 2019					8,556.00							8,556.00
		Summary of Friday 10 May 2019								8,556.00							8,556.00
	Sunday 12 May 2019	LD170	HVOCS NSSM April RP (Apr-Sep)	Kachidoki	12 May 2019			4,322.03		4,812.17							9,134.20
		Summary of Sunday 12 May 2019						4,322.03		4,812.17							9,134.20
	Tuesday 14 May 2019	LD102	LD to China Steel Corp - Q1 May Laycan	China Steel Exploration	14 May 2019			4,046.16							4,416.84		8,463.00
		Summary of Tuesday 14 May 2019						4,046.16							4,416.84		8,463.00
	Wednesday 15 May 2019	LD146	GCS to Kobe IPP - Apr'19-Mar'20	SBI Jive	15 May 2019				5,097.68				3,864.32				8,962.00
		LD306	GCS to Kobe IPP - Apr'19-Mar'20	SBI Jive	16 May 2019				8,918.00								8,918.00
		Summary of Wednesday 15 May 2019							14,015.68				3,864.32				17,880.00
	Friday 17 May 2019	LD330	LD to Ube - JFY19 - JEN - April RP	Argo Wind	17 May 2019			5,394.96					3,012.04				8,407.00
		Summary of Friday 17 May 2019						5,394.96					3,012.04				8,407.00
	Monday 20 May 2019	LD250	GCS to Kobe IPP - Apr'19-Mar'20	SBI Jive	20 May 2019			3,706.05							5,173.55		8,879.60
		Summary of Monday 20 May 2019						3,706.05							5,173.55		8,879.60
	Sunday 26 May 2019	LD338	LD to Ube - JFY19 - JEN - April RP	Argo Wind	26 May 2019				6,527.01	2,002.99							8,530.00
		Summary of Sunday 26 May 2019							6,527.01	2,002.99							8,530.00

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 29 May 2019	LD156	Liddell to NSC - GC Newc Jan - Mar	New Expedition	29 May 2019				8,558.40								8,558.40
		LD382	Liddell to NSC - GC Newc Jan - Mar	New Expedition	29 May 2019				8,409.00								8,409.00
		Summary of Wednesday 29 May 2019							16,967.40								16,967.40
	Thursday 30 May 2019	LD130	Liddell to NSC - GC Newc Jan - Mar	Navios Symphony	30 May 2019			7,593.80									7,593.80
		Summary of Thursday 30 May 2019						7,593.80									7,593.80
	Friday 31 May 2019	LD202	Liddell to NSC - GC Newc Jan - Mar	New Expedition	31 May 2019					9,049.80							9,049.80
		Summary of Friday 31 May 2019								9,049.80							9,049.80
	Saturday 01 June 2019	LD230	Liddell to NSC - GC Newc Jan - Mar	New Expedition	1 June 2019			4,967.24		3,649.36							8,616.60
		LD300	Liddell to NSC - GC Newc Jan - Mar	Navios Symphony	2 June 2019			4,076.30		4,076.30							8,152.60
		Summary of Saturday 01 June 2019						9,043.54		7,725.66							16,769.20
	Sunday 09 June 2019	LD354	CM to Itochu (Tohoku EPC) - JFY'19 - April RP	Noshiro Maru	9 June 2019			8,456.20									8,456.20
		Summary of Sunday 09 June 2019						8,456.20									8,456.20
	Monday 10 June 2019	LD108	Dongguan City Huihuang Energy Co., Ltd June '19	Amami	10 June 2019								8,396.20				8,396.20
		Summary of Monday 10 June 2019											8,396.20				8,396.20
	Tuesday 11 June 2019	LD190	Dongguan City Huihuang Energy Co., Ltd June '19	Amami	11 June 2019								9,117.00				9,117.00
		Summary of Tuesday 11 June 2019											9,117.00				9,117.00
	Wednesday 12 June 2019	LD290	Liddell to JFE - April RP minus US$0.50	Bisan Clover	13 June 2019			9,234.40									9,234.40

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 Wednesday 12 June 2019						9,234.40									9,234.40
	Thursday 13 June 2019	LD252	Liddell to JFE - April RP minus US$0.50	Bisan Clover	13 June 2019			8,223.60									8,223.60
		LD318	Liddell to NSC - Fixed Price	Pacific Oak	14 June 2019			5,399.35					3,129.45				8,528.80
		Summary of Thursday 13 June 2019						13,622.95					3,129.45				16,752.40
	Friday 14 June 2019	LD120	HVOCS NSSM April RP (Apr-Sep)	Kashima Maru	14 June 2019			8,960.50									8,960.50
		LD174	Liddell to NSC - Fixed Price	Pacific Oak	14 June 2019			9,236.60									9,236.60
		LD252	Liddell to NSC - Fixed Price	Pacific Oak	14 June 2019			7,784.40									7,784.40
		LD310	Liddell to NSC - Fixed Price	Pacific Oak	15 June 2019			8,954.40									8,954.40
		Summary of Friday 14 June 2019						34,935.90									34,935.90
	Sunday 16 June 2019	LD114	GCS to Xiamen Port Trading	Cape Maria	16 June 2019								9,266.40				9,266.40
		LD182	LD to Ube - JFY19 - Ishihara Sangyo/ YES - April RP	Marinicki	16 June 2019			8,623.00									8,623.00
		LD224	LD to Ube - JFY19 - Ishihara Sangyo/ YES - April RP	Marinicki	16 June 2019			9,189.40									9,189.40
		Summary of Sunday 16 June 2019						17,812.40					9,266.40				27,078.80
	Monday 17 June 2019	LD138	HVOCS Daicel Corp - April RP	Marinicki	17 June 2019			4,308.40					4,493.80				8,802.20
		Summary of Monday 17 June 2019						4,308.40					4,493.80				8,802.20
	Tuesday 18 June 2019	LD148	LD to China Steel Corp - Q1 Jun Laycan	Cemtex Diligence	18 June 2019			1,125.57							6,211.03		7,336.60
		LD208	GCS to Xiamen Port Trading	Cape Maria	18 June 2019								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	
		LD330	LD to China Steel Corp - Q1 Jun Laycan	Cemtex Diligence	19 June 2019										8,458.60		8,458.60
		LD382	GCS to Xiamen Port Trading	Cape Maria	18 June 2019								8,598.40				8,598.40
		Summary of Tuesday 18 June 2019						1,125.57					17,526.40		14,669.63		33,321.60
	Wednesday 19 June 2019	LD116	HVOCS NSSM April RP (Apr-Sep)	Kashima Maru	19 June 2019			4,496.38					4,431.62				8,928.00
		LD212	LD to China Steel Corp - Q1 Jun Laycan	Cemtex Diligence	20 June 2019					4,059.85					5,067.35		9,127.20
		LD306	Liddell to NSC - Fixed Price	Alpha Hope	20 June 2019			8,507.60									8,507.60
		Summary of Wednesday 19 June 2019						13,003.98		4,059.85			4,431.62		5,067.35		26,562.80
	Thursday 20 June 2019	LD254	Liddell to NSC - Fixed Price	Alpha Hope	20 June 2019								0.00		9,227.40		9,227.40
		LD362	Liddell to NSC - Fixed Price	Alpha Hope	20 June 2019			8,404.40									8,404.40
		Summary of Thursday 20 June 2019						8,404.40					0.00		9,227.40		17,631.80
	Wednesday 26 June 2019	LD350	HVOCS NSSM Q1	Hisui Horizon	26 June 2019			6,984.90					2,091.70				9,076.60
		Summary of Wednesday 26 June 2019						6,984.90					2,091.70				9,076.60
	Thursday 27 June 2019	LD204	Ulan to Hokkaido EPC - JFY19 - April RP minus US $2.00	Corona Ace	27 June 2019		9,157.40										9,157.40
		Summary of Thursday 27 June 2019					9,157.40										9,157.40
	Saturday 29 June 2019	LD162	Starport Trading and Development Ltd	Yue Dian 103	29 June 2019								9,027.80				9,027.80
		Summary of Saturday 29 June 2019											9,027.80				9,027.80
	Thursday 04 July 2019	LD124	GCS to Zhejiang	Pacific Resource	4 July 2019								8,552.00				8,552.00
		LD266	Liddell to NSC - Fixed Price	NSU Quest	5 July 2019			9,117.80									9,117.80

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	
		LD320	Liddell to NSC - Fixed Price	NSU Quest	4 July 2019			8,463.00									8,463.00
		Summary of Thursday 04 July 2019						17,580.80					8,552.00				26,132.80
	Saturday 06 July 2019	LD216	Liddell to NSC - Fixed Price	NSU Quest	6 July 2019			4,011.33		5,092.27							9,103.60
		Summary of Saturday 06 July 2019						4,011.33		5,092.27							9,103.60
	Sunday 07 July 2019	LD136	CM to TOSOH JFY'19	Sea Pearl	7 July 2019					8,576.20							8,576.20
		LD270	GCS to GIAG	Omaha	8 July 2019		8,315.80										8,315.80
		Summary of Sunday 07 July 2019					8,315.80			8,576.20							16,892.00
	Monday 08 July 2019	LD168	GCS to Zhejiang	Pacific Resource	8 July 2019					3,154.74			5,965.46				9,120.20
		Summary of Monday 08 July 2019								3,154.74			5,965.46				9,120.20
	Tuesday 09 July 2019	LD128	GCS to XPT	Christina	9 July 2019					2,826.36			6,292.84				9,119.20
		LD186	GCS to GIAG	Omaha	9 July 2019		8,857.80										8,857.80
		LD266	LD to Ube - JFY19 - Teijin - (the average of gC NEWC Futures Curve Mid)	Lake Dawn	10 July 2019		8,329.00										8,329.00
		LD282	GCS to Yellow River Logistics	Golden Deb	9 July 2019					2,857.63			6,285.37				9,143.00
		Summary of Tuesday 09 July 2019					17,186.80			5,683.99			12,578.21				35,449.00
	Wednesday 10 July 2019	LD132	LD to Ube - JFY19 - Teijin - (the average of gC NEWC Futures Curve Mid)	Lake Dawn	10 July 2019			3,923.80			5,246.80						9,170.60
		Summary of Wednesday 10 July 2019						3,923.80			5,246.80						9,170.60
	Thursday 11 July 2019	LD124	GCS to China Coal Solutions	Lake Dolphin	11 July 2019					4,816.66			4,237.34				9,054.00
		LD302	GCS to GIAG	Omaha	12 July 2019		8,939.60										8,939.60
		Summary of Thursday 11 July 2019					8,939.60			4,816.66			4,237.34				17,993.60
	Saturday 13 July 2019	LD102	GCS to China Coal Solutions	Berge Ishizuchi	13 July 2019					7,845.12			1,177.08				9,022.20

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	
		Summary of Saturday 13 July 2019								7,845.12			1,177.08				9,022.20
	Sunday 14 July 2019	LD246	Liddell to NSC - Fixed Price	Feng May	15 July 2019			7,956.80									7,956.80
		LD380	GCS to China Coal Solutions	Lake Dolphin	14 July 2019			3,384.77		2,089.05			2,477.98				7,951.80
		Summary of Sunday 14 July 2019						11,341.57		2,089.05			2,477.98				15,908.60
	Monday 15 July 2019	LD146	Starport Trading and Development Ltd	ADS Galtesund	15 July 2019					6,429.45			2,571.15				9,000.60
		LD198	Liddell to NSC - Fixed Price	Feng May	16 July 2019		9,154.40										9,154.40
		Summary of Monday 15 July 2019					9,154.40			6,429.45			2,571.15				18,155.00
	Tuesday 16 July 2019	LD128	Liddell to NSC - Fixed Price	Feng May	16 July 2019		2,319.06	5,567.66		1,285.08							9,171.80
		Summary of Tuesday 16 July 2019					2,319.06	5,567.66		1,285.08							9,171.80
	Wednesday 17 July 2019	LD118	Liddell to NSC - Fixed Price	Feng May	17 July 2019						8,806.80						8,806.80
		LD298	Liddell to NSC - Fixed Price	Feng May	18 July 2019		3,986.12				4,412.88						8,399.00
		Summary of Wednesday 17 July 2019					3,986.12				13,219.68						17,205.80
	Thursday 18 July 2019	LD126	GCS to Kobe IPP - Apr'19-Mar'20	Legato II	18 July 2019			8,487.80									8,487.80
		LD248	GCS to Kobe IPP - Apr'19-Mar'20	Legato II	18 July 2019			8,069.60									8,069.60
		LD306	GCS to Xiamen Port Trading	Striggla	19 July 2019					6,327.52			2,632.28				8,959.80
		Summary of Thursday 18 July 2019						16,557.40		6,327.52			2,632.28				25,517.20
	Saturday 20 July 2019	LD212	LD to China Steel Corp - Q2 Jul Laycan	Dedalos	20 July 2019		0.00	6,105.69			2,184.31						8,290.00
		Summary of Saturday 20 July 2019					0.00	6,105.69			2,184.31						8,290.00
	Sunday 21 July 2019	LD186	Cumnock to Kyushu EPC - 4 panamax	Elegant Salute	21 July 2019			9,076.20									9,076.20

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	
		LD224	LD to China Steel Corp - Q2 Jul Laycan	Dedalos	21 July 2019			8,470.60									8,470.60
		Summary of Sunday 21 July 2019						17,546.80									17,546.80
	Tuesday 23 July 2019	LD168	GCS to China Coal Solutions	Mineral Antwerpen	23 July 2019					6,464.91			2,684.09				9,149.00
		Summary of Tuesday 23 July 2019								6,464.91			2,684.09				9,149.00
	Wednesday 24 July 2019	LD350	GCS to Far Eastern New Century	Canpotex Inspire	24 July 2019			9,195.00									9,195.00
		Summary of Wednesday 24 July 2019						9,195.00									9,195.00
	Sunday 28 July 2019	LD104	GCS to XPT	Shi Dai 10	28 July 2019					5,902.78			2,514.62				8,417.40
		Summary of Sunday 28 July 2019								5,902.78			2,514.62				8,417.40
	Tuesday 30 July 2019	LD176	LD to Ube - JFY19 - Mitsubishi Paper - April RP plus US $0.80	Mercury Ocean	30 July 2019			8,607.00									8,607.00
		Summary of Tuesday 30 July 2019						8,607.00									8,607.00
	Wednesday 31 July 2019	LD172	GCS to Hong Kong Topway Trading	Federal Island	31 July 2019					5,870.48			2,476.52				8,347.00
		LD204	LD to Ube - JFY19 - Mitsubishi Paper - April RP plus US $0.80	Mercury Ocean	1 August 2019			9,195.00									9,195.00
		Summary of Wednesday 31 July 2019						9,195.00		5,870.48			2,476.52				17,542.00
	Thursday 01 August 2019	LD198	Mangoola to GIAG	Kalliopi L	1 August 2019					8,423.20			0.00				8,423.20
		LD278	GCS to Kobe IPP - Apr'19-Mar'20	Kagara	2 August 2019			8,497.00									8,497.00
		LD330	LD to Ube - JFY19 - Mitsubishi Paper - April RP plus US $0.80	Mercury Ocean	1 August 2019			8,601.00									8,601.00
		Summary of Thursday 01 August 2019						17,098.00		8,423.20			0.00				25,521.20

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	
	Friday 02 August 2019	LD160	GCS to Kobe IPP - Apr'19-Mar'20	Kagara	2 August 2019			8,938.40									8,938.40
		LD222	GCS to Kobe IPP - Apr'19-Mar'20	Kagara	2 August 2019			8,521.40									8,521.40
		LD364	Liddell to NSC - GC Newc Apr-Jun	Santa Lucia	2 August 2019			8,407.00									8,407.00
		Summary of Friday 02 August 2019						25,866.80									25,866.80
	Saturday 03 August 2019	LD176	GCS to Kobe IPP - Apr'19-Mar'20	Kagara	3 August 2019			8,870.60									8,870.60
		LD244	Liddell to NSC - GC Newc Apr-Jun	Santa Lucia	3 August 2019			9,091.80									9,091.80
		LD316	GCS to Kobe IPP - Apr'19-Mar'20	Kagara	4 August 2019						7,957.80						7,957.80
		LD386	Liddell to NSC - GC Newc Apr-Jun	Santa Lucia	3 August 2019					9,111.80							9,111.80
		Summary of Saturday 03 August 2019						17,962.40		9,111.80	7,957.80						35,032.00
	Sunday 04 August 2019	LD116	Liddell to NSC - GC Newc Apr-Jun	Santa Lucia	4 August 2019						8,620.00						8,620.00
		LD160	Liddell to NSC - GC Newc Apr-Jun	Santa Lucia	4 August 2019			5,644.38			2,816.42						8,460.80
		Summary of Sunday 04 August 2019						5,644.38			11,436.42						17,080.80
	Monday 05 August 2019	LD116	LD to China Steel Corp - Q2 Jul Laycan	Agios Spyridonas	6 August 2019			8,365.80									8,365.80
		Summary of Monday 05 August 2019						8,365.80									8,365.80
	Sunday 11 August 2019	LD172	GCS to XPT	Xin Yuan	11 August 2019					6,088.04			2,502.16				8,590.20
		Summary of Sunday 11 August 2019								6,088.04			2,502.16				8,590.20
	Sunday 18 August 2019	LD276	LD to China Steel Corp - Q2	China Steel Harmony	19 August 2019			9,219.80									9,219.80

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 Sunday 18 August 2019						9,219.80									9,219.80
	Monday 19 August 2019	LD346	GCS to Zhejiang	Maran Pioneer	19 August 2019						5,726.46		2,913.94				8,640.40
		Summary of Monday 19 August 2019									5,726.46		2,913.94				8,640.40
	Wednesday 21 August 2019	LD144	LD to China Steel Corp - Q2	China Steel Harmony	21 August 2019			8,496.00									8,496.00
		Summary of Wednesday 21 August 2019						8,496.00									8,496.00
	Thursday 22 August 2019	LD166	Liddell to NSC - GC Newc Apr-Jun	NSU Ultimate	22 August 2019			8,869.40									8,869.40
		LD278	Liddell to NSC - GC Newc Apr-Jun	NSU Ultimate	23 August 2019			8,373.00									8,373.00
		Summary of Thursday 22 August 2019						17,242.40									17,242.40
	Friday 23 August 2019	LD210	Liddell to NSC - GC Newc Apr-Jun	NSU Ultimate	23 August 2019			8,909.80									8,909.80
		LD302	Liddell to NSC - GC Newc Apr-Jun	NSU Ultimate	24 August 2019			9,209.80									9,209.80
		Summary of Friday 23 August 2019						18,119.60									18,119.60
	Saturday 24 August 2019	LD230	Liddell to NSC - GC Newc Apr-Jun	NSU Ultimate	24 August 2019			9,027.60									9,027.60
		LD284	Liddell to NSC - GC Newc Apr-Jun	NSU Ultimate	25 August 2019			7,974.78		1,262.62							9,237.40
		LD364	Liddell to NSC - GC Newc Apr-Jun	NSU Ultimate	24 August 2019			9,165.40									9,165.40
		Summary of Saturday 24 August 2019						26,167.78		1,262.62							27,430.40
	Sunday 25 August 2019	LD120	GCS to Xiamen ITG Group Corp., Ltd	Dangjin	25 August 2019								8,733.00				8,733.00
		LD240	GCS to Zhejiang	Maran Pioneer	25 August 2019								9,161.20				9,161.20
		LD388	Liddell to NSC - GC Newc Apr-Jun	NSU Ultimate	25 August 2019					9,136.00							9,136.00

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 25 August 2019								9,136.00			17,894.20				27,030.20
	Monday 26 August 2019	LD116	GCS to Xiamen ITG Group Corp., Ltd	Dangjin	26 August 2019								9,203.70				9,203.70
		Summary of Monday 26 August 2019											9,203.70				9,203.70
	Tuesday 27 August 2019	LD138	GCS to China Coal Solutions	Anangel Conqueror	27 August 2019								8,684.00				8,684.00
		Summary of Tuesday 27 August 2019											8,684.00				8,684.00
	Wednesday 28 August 2019	LD134	GCS to Ningbo Huamo	Transcenden Grace	28 August 2019								8,972.50				8,972.50
		LD322	GCS to China Coal Solutions	Anangel Conqueror	28 August 2019								8,671.00				8,671.00
			Liddell to NSC - GC Newc Apr-Jun	Sea Rising	29 August 2019					9,122.00							9,122.00
		Summary of Wednesday 28 August 2019								9,122.00			17,643.50				26,765.50
	Friday 30 August 2019	LD132	Liddell to NSC - GC Newc Apr-Jun	Sea Rising	30 August 2019			9,185.60									9,185.60
		LD166	Liddell to NSC - GC Newc Apr-Jun	Sea Rising	30 August 2019			8,646.00									8,646.00
		LD220	Liddell to NSC - GC Newc Apr-Jun	Sea Rising	30 August 2019					9,301.00							9,301.00
		Summary of Friday 30 August 2019						17,831.60		9,301.00							27,132.60
	Saturday 31 August 2019	LD210	Liddell to NSC - GC Newc Apr-Jun	Sea Rising	31 August 2019			2,613.06			5,938.94						8,552.00
		Summary of Saturday 31 August 2019						2,613.06			5,938.94						8,552.00
	Sunday 01 September 2019	LD104	GCS to Ningbo Huamo	Hua Yang Chuan QI	1 September 2019								9,209.60				9,209.60
		LD196	Ulan to GIAG (EWP)	Glovis Ambition	1 September 2019						8,557.00						8,557.00
		Summary of Sunday 01 September 2019									8,557.00		9,209.60				17,766.60
	Monday 02 September 2019	LD112	Ulan to GIAG (EWP)	Glovis Ambition	2 September 2019						9,244.60						9,244.60
		LD156	Ulan to GIAG (EWP)	Glovis Ambition	2 September 2019						9,205.00						9,205.00

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 Monday 02 September 2019									18,449.60						18,449.60
	Tuesday 03 September 2019	LD166	GCS to Kobe IPP - Apr'19-Mar'20	Star Astrid	3 September 2019			1,263.50		7,271.90							8,535.40
		LD266	GCS to Kobe IPP - Apr'19-Mar'20	Star Astrid	4 September 2019			9,467.60									9,467.60
		Summary of Tuesday 03 September 2019						10,731.10		7,271.90							18,003.00
	Wednesday 04 September 2019	LD188	Hokkaido EPC Year 3 of 3 - Base Tonnage	Poro Nupuri Maru	4 September 2019						8,675.60						8,675.60
		Summary of Wednesday 04 September 2019									8,675.60						8,675.60
	Thursday 05 September 2019	LD148	GCS to Kobe IPP - Apr'19-Mar'20	Star Astrid	5 September 2019					8,550.60							8,550.60
		LD306	GCS to Kobe IPP - Apr'19-Mar'20	Star Astrid	6 September 2019					5,465.09	3,053.11						8,518.20
		Summary of Thursday 05 September 2019								14,015.69	3,053.11						17,068.80
	Friday 06 September 2019	LD300	Hokkaido EPC Year 3 of 3 - Base Tonnage	Poro Nupuri Maru	7 September 2019						9,131.80						9,131.80
		Summary of Friday 06 September 2019									9,131.80						9,131.80
	Saturday 07 September 2019	LD166	Hokkaido EPC Year 3 of 3 - Base Tonnage	Poro Nupuri Maru	7 September 2019						9,066.40						9,066.40
		LD204	Hokkaido EPC Year 3 of 3 - Base Tonnage	Poro Nupuri Maru	7 September 2019						8,588.60						8,588.60
		LD264	Science City (Guangzhou) Investment Group Co., Ltd	Golden Empress	7 September 2019								8,547.00				8,547.00
		LD372	Hokkaido EPC Year 3 of 3 - Base Tonnage	Poro Nupuri Maru	7 September 2019			8,587.60									8,587.60
		Summary of Saturday 07 September 2019						8,587.60			17,655.00		8,547.00				34,789.60

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	
	Sunday 08 September 2019	LD104	Hokkaido EPC Year 3 of 3 - Base Tonnage	Poro Nupuri Maru	8 September 2019			8,517.60									8,517.60
		LD278	Starport Trading and Development Ltd	Samatan	8 September 2019								8,500.40				8,500.40
		Summary of Sunday 08 September 2019						8,517.60					8,500.40				17,018.00
	Friday 13 September 2019	LD178	LD to Ube - JFY19 - Teijin - (the average of gC NEWC Futures Curve Mid)	Century Wave	13 September 2019			9,137.40									9,137.40
		Summary of Friday 13 September 2019						9,137.40									9,137.40
	Monday 16 September 2019	LD264	Bulga to Asia Cement Aug-Oct '19	Ledra	16 September 2019					5,944.41			2,313.99				8,258.40
		Summary of Monday 16 September 2019								5,944.41			2,313.99				8,258.40
	Tuesday 17 September 2019	LD200	NCA to KOSPO (MG)	HL Hadong	17 September 2019			8,485.00									8,485.00
		LD226	NCA to KOSPO (MG)	HL Hadong	17 September 2019			9,004.40									9,004.40
		LD348	NCA to KOSPO (MG)	HL Hadong	17 September 2019			8,942.60									8,942.60
		Summary of Tuesday 17 September 2019						26,432.00									26,432.00
	Monday 23 September 2019	LD132	Liddell to NSC - GC Newc Apr-Jun	Morning Cloud	23 September 2019			8,497.40									8,497.40
		LD286	Liddell to NSC - GC Newc Apr-Jun	Morning Cloud	24 September 2019											8,353.20	8,353.20
		Summary of Monday 23 September 2019						8,497.40								8,353.20	16,850.60
	Saturday 28 September 2019	LD376	Liddell to NSC - GC Newc Apr-Jun	Morning Cloud	28 September 2019						8,130.40						8,130.40
		Summary of Saturday 28 September 2019									8,130.40						8,130.40
	Sunday 29 September 2019	LD286	Ulan to GIAG (KOEN/ KOSE)	HL Samarinda	30 September 2019					8,486.00			0.00				8,486.00

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 29 September 2019								8,486.00			0.00				8,486.00
	Monday 30 September 2019	LD290	GCS to Kobe IPP - Apr'19-Mar'20	Legato II	1 October 2019						8,603.20						8,603.20
		LD354	Ulan to GIAG (KOEN/ KOSE)	HL Samarinda	30 September 2019						9,185.80						9,185.80
		Summary of Monday 30 September 2019									17,789.00						17,789.00
	Tuesday 01 October 2019	LD214	GCS to Kobe IPP - Apr'19-Mar'20	Legato II	1 October 2019											8,521.80	8,521.80
		Summary of Tuesday 01 October 2019														8,521.80	8,521.80
	Wednesday 02 October 2019	LD150	GCS to Kobe IPP - Apr'19-Mar'20	Legato II	2 October 2019			2,715.56								5,648.44	8,364.00
		Summary of Wednesday 02 October 2019						2,715.56								5,648.44	8,364.00
	Thursday 03 October 2019	LD166	LD to China Steel Corp - Q3	Santorini	3 October 2019											8,445.00	8,445.00
		LD250	Liddell to JFE - April RP minus US$0.50	Azul Fortuna	3 October 2019			3,546.38								5,594.82	9,141.20
		LD354	LD to China Steel Corp - Q3	Santorini	3 October 2019											9,055.20	9,055.20
		Summary of Thursday 03 October 2019						3,546.38								23,095.02	26,641.40
	Friday 04 October 2019	LD240	Liddell to JFE - April RP minus US$0.50	Azul Fortuna	4 October 2019			9,170.00									9,170.00
		LD288	Korea EWP	Ocean Prometheus	5 October 2019						7,805.10		0.00				7,805.10
		Summary of Friday 04 October 2019						9,170.00			7,805.10		0.00				16,975.10
	Saturday 05 October 2019	LD112	Liddell to JFE - April RP minus US$0.50	Azul Fortuna	5 October 2019						8,494.20						8,494.20
		LD184	KOWEPO	Western Marine	5 October 2019						8,463.00		0.00				8,463.00
		LD278	Liddell to JFE - April RP minus US$0.50	Azul Fortuna	6 October 2019						9,092.20		0.00				9,092.20

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	
		LD342	Liddell to JFE - April RP minus US$0.50	Azul Fortuna	5 October 2019			7,477.68		1,658.32							9,136.00
		Summary of Saturday 05 October 2019						7,477.68		1,658.32	26,049.40		0.00				35,185.40
	Sunday 06 October 2019	LD108	KOWEPO	Western Marine	6 October 2019						8,586.60		0.00				8,586.60
		LD202	Korea EWP	Ocean Prometheus	6 October 2019						8,542.58		501.62				9,044.20
		Summary of Sunday 06 October 2019									17,129.18		501.62				17,630.80
	Monday 07 October 2019	LD160	Liddell to NSC - Fixed Price	NSU Keystone	7 October 2019											8,522.00	8,522.00
		LD212	Liddell to NSC - Fixed Price	NSU Keystone	7 October 2019					8,381.40							8,381.40
		LD282	Liddell to NSC - Fixed Price	NSU Keystone	8 October 2019						8,122.06		259.14				8,381.20
		Summary of Monday 07 October 2019								8,381.40	8,122.06		259.14			8,522.00	25,284.60
	Tuesday 08 October 2019	LD116	Liddell to NSC - Fixed Price	NSU Keystone	8 October 2019					8,550.00							8,550.00
		LD190	Liddell to NSC - Fixed Price	NSU Keystone	8 October 2019					8,523.40							8,523.40
		LD342	Liddell to NSC - Fixed Price	Benitamou	8 October 2019					9,093.20							9,093.20
		Summary of Tuesday 08 October 2019								26,166.60							26,166.60
	Wednesday 09 October 2019	LD168	Ulan to GIAG (EWP)	Frontier Discovery	9 October 2019						9,188.00						9,188.00
		LD326	Ulan to GIAG (EWP)	Frontier Discovery	10 October 2019						8,474.00		0.00				8,474.00
		Summary of Wednesday 09 October 2019									17,662.00		0.00				17,662.00
	Thursday 10 October 2019	LD126	Liddell to NSC - Fixed Price	NSU Keystone	10 October 2019					5,432.73	3,007.27						8,440.00
		LD366	Liddell to NSC - Fixed Price	Benitamou	10 October 2019				2,239.14	6,890.86							9,130.00
		Summary of Thursday 10 October 2019							2,239.14	12,323.58	3,007.27						17,570.00
	Sunday 13 October 2019	LD264	Ulan to GIAG (KOMIPO)	HL Atlas	14 October 2019						8,556.80						8,556.80
		Summary of Sunday 13 October 2019									8,556.80						8,556.80

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	
	Monday 14 October 2019	LD308	Ulan to GIAG (KOMIPO)	HL Atlas	15 October 2019						8,440.40						8,440.40
		Summary of Monday 14 October 2019									8,440.40						8,440.40
	Tuesday 15 October 2019	LD114	Ulan to GIAG (KOMIPO)	HL Atlas	15 October 2019					8,271.80			0.00				8,271.80
		Summary of Tuesday 15 October 2019								8,271.80			0.00				8,271.80
	Thursday 17 October 2019	LD198	MG to GIAG (KMPC)	SM Samarinda	17 October 2019						8,446.00		0.00				8,446.00
		Summary of Thursday 17 October 2019									8,446.00		0.00				8,446.00
	Friday 18 October 2019	LD154	MG to GIAG (KMPC)	SM Samarinda	18 October 2019						9,122.40		0.00				9,122.40
		Summary of Friday 18 October 2019									9,122.40		0.00				9,122.40
	Saturday 19 October 2019	LD150	HVOCS Hokkaido Electric EPC - JFY2019 (Yr 3 of 3) Cargo 3	Poro Nupuri Maru	19 October 2019				8,544.70								8,544.70
		LD382	LD to Ube - JFY19 - JEN - Pricing Option 1	Century Wave	19 October 2019				9,177.00								9,177.00
		Summary of Saturday 19 October 2019							17,721.70								17,721.70
	Sunday 20 October 2019	LD186	Liddell to NSC - Fixed Price	Shin-Ei	20 October 2019					8,465.30							8,465.30
		LD292	HVOCS Hokkaido Electric EPC - JFY2019 (Yr 3 of 3) Cargo 3	Poro Nupuri Maru	21 October 2019				8,458.40								8,458.40
		Summary of Sunday 20 October 2019							8,458.40	8,465.30							16,923.70
	Monday 21 October 2019	LD216	Liddell to NSC - Fixed Price	Shin-Ei	21 October 2019	8,895.00											8,895.00
		LD348	Liddell to NSC - Fixed Price	Shin-Ei	21 October 2019	9,227.60											9,227.60
		Summary of Monday 21 October 2019				18,122.60											18,122.60
	Tuesday 22 October 2019	LD154	HVOCS NSSM Q2	Pacific Power	22 October 2019	9,242.60											9,242.60

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	
		LD348	LD to Ube - JFY19 - JEN - Pricing Option 1	Century Wave	22 October 2019						9,093.40						9,093.40
		Summary of Tuesday 22 October 2019				9,242.60					9,093.40						18,336.00
	Wednesday 23 October 2019	LD320	HVOCS NSSM Q2	Pacific Power	23 October 2019	9,271.40											9,271.40
		LD388	Ulan to GIAG (KOEN/ KOSE)	Oriental Enterprise	23 October 2019						8,647.24		503.16				9,150.40
		Summary of Wednesday 23 October 2019				9,271.40					8,647.24		503.16				18,421.80
	Thursday 24 October 2019	LD146	LD to China Steel Corp - Q3	Spring Wealth	24 October 2019											9,171.40	9,171.40
		LD216	Ulan to GIAG (KOEN/ KOSE)	Oriental Enterprise	24 October 2019						8,507.73		525.17				9,032.90
		LD316	Bulga to Hokkaido EPC - Base Tonnage - April RP 2019 minus US$1.25.	Corona Ace	25 October 2019				9,191.40								9,191.40
			Liddell to NSC - Fixed Price	Shin-Ei	24 October 2019											9,145.60	9,145.60
		LD380	HVOCS NSSM Q2	Pacific Power	24 October 2019											8,553.40	8,553.40
		Summary of Thursday 24 October 2019							9,191.40		8,507.73		525.17			26,870.40	45,094.70
	Friday 25 October 2019	LD260	Bulga to Hokkaido EPC - Base Tonnage - April RP 2019 minus US$1.25.	Corona Ace	25 October 2019				8,654.00								8,654.00
		LD370	Ulan to GIAG (KOMIPO)	Maran Guardian	25 October 2019				1,224.28		7,334.32		0.00				8,558.60
		Summary of Friday 25 October 2019							9,878.28		7,334.32		0.00				17,212.60
	Sunday 27 October 2019	LD234	Taiwan Power	Ocean Sapphire	27 October 2019				8,366.00								8,366.00
		LD278	Taiwan Power	Ocean Sapphire	28 October 2019				8,425.40								8,425.40
		Summary of Sunday 27 October 2019							16,791.40								16,791.40

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	
	Monday 28 October 2019	LD156	GCS to Kobe IPP - Apr'19-Mar'20	Andromeda Ocean	28 October 2019				8,603.80								8,603.80
		LD226	GCS to Kobe IPP - Apr'19-Mar'20	Andromeda Ocean	28 October 2019				8,450.00								8,450.00
		LD280	GCS to Kobe IPP - Apr'19-Mar'20	Andromeda Ocean	28 October 2019				8,642.00								8,642.00
		LD360	Taiwan Power	Ocean Sapphire	28 October 2019				8,457.60								8,457.60
		Summary of Monday 28 October 2019							34,153.40								34,153.40
	Tuesday 29 October 2019	LD118	LD to Ube - JFY19 - Ishihara Sangyo/ YES - April RP	Cymona Progress	29 October 2019				6,505.58	2,016.42							8,522.00
		LD178	Taiwan Power	Ocean Sapphire	29 October 2019				9,132.00								9,132.00
		Summary of Tuesday 29 October 2019							15,637.58	2,016.42							17,654.00
	Wednesday 30 October 2019	LD276	GCS to Kobe IPP - Apr'19-Mar'20	Andromeda Ocean	30 October 2019					7,683.90							7,683.90
		Summary of Wednesday 30 October 2019								7,683.90							7,683.90
	Friday 01 November 2019	LD102	LD to Ube - JFY19 - Ishihara Sangyo/ YES - April RP	Cymona Progress	1 November 2019						8,504.60						8,504.60
		LD220	GCS to Kobe IPP - Apr'19-Mar'20	Andromeda Ocean	1 November 2019				9,110.00								9,110.00
		Summary of Friday 01 November 2019							9,110.00		8,504.60						17,614.60
	Saturday 02 November 2019	LD174	GCS to Kobe IPP - Apr'19-Mar'20	Andromeda Ocean	2 November 2019						9,129.20		0.00				9,129.20
		Summary of Saturday 02 November 2019									9,129.20		0.00				9,129.20
	Sunday 03 November 2019	LD204	Bulga to Hokuriku EPC (GC Newc Sep/ Oct) Shipment 2	North Fortune	3 November 2019											9,077.40	9,077.40

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	
		LD340	Bulga to Hokuriku EPC (GC Newc Sep/ Oct) Shipment 2	North Fortune	3 November 2019											9,169.60	9,169.60
		Summary of Sunday 03 November 2019														18,247.00	18,247.00
	Wednesday 06 November 2019	LD258	Saxonvale to Daio - Jul'19 - Jun'20 Yr 3 of 3 Spec A	Aom Georgina	7 November 2019				9,159.00				0.00				9,159.00
		LD302	HVOCS NSSM Q3	Santa Lucia	7 November 2019				4,408.28	4,151.72							8,560.00
		Summary of Wednesday 06 November 2019							13,567.28	4,151.72			0.00				17,719.00
	Friday 08 November 2019	LD250	Cumnock to Kyushu EPC - Buyer's Positive Option 1st MO	Noble Salute	8 November 2019											9,096.20	9,096.20
		Summary of Friday 08 November 2019														9,096.20	9,096.20
	Saturday 09 November 2019	LD164	Cumnock to Kyushu EPC - Buyer's Positive Option 1st MO	Noble Salute	9 November 2019				8,569.80								8,569.80
		LD260	Liddell to Chugoku	Fengtun Fei	10 November 2019											9,115.10	9,115.10
		LD328	Cumnock to Kyushu EPC - Buyer's Positive Option 1st MO	Noble Salute	9 November 2019				9,173.00								9,173.00
		Summary of Saturday 09 November 2019							17,742.80							9,115.10	26,857.90
	Sunday 10 November 2019	LD116	LD to China Steel Corp - Q3	Lord Star	10 November 2019		9,301.80										9,301.80
		LD212	Cumnock to Kyushu EPC - Buyer's Positive Option 1st MO	Noble Salute	10 November 2019				8,418.40								8,418.40
		LD292	Liddell to Chugoku	Fengtun Fei	11 November 2019			9,066.60									9,066.60

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	
		Summary of Sunday 10 November 2019					9,301.80	9,066.60	8,418.40								26,786.80
	Monday 11 November 2019	LD142	Liddell to Chugoku	Fengtun Fei	11 November 2019			9,206.80									9,206.80
		LD270	HVOCS NSSM October RP (Oct-Mar)	Southern Harmony	12 November 2019			9,182.40									9,182.40
		LD306	(CM) to Tokuyama AFY 2019/20	Nirai	12 November 2019					9,165.40							9,165.40
		LD358	Liddell to Chugoku	Fengtun Fei	11 November 2019			8,391.60									8,391.60
		Summary of Monday 11 November 2019						26,780.80		9,165.40							35,946.20
	Tuesday 12 November 2019	LD214	(CM) to Tokuyama AFY 2019/20	Nirai	12 November 2019			8,462.00									8,462.00
		Summary of Tuesday 12 November 2019						8,462.00									8,462.00
	Wednesday 13 November 2019	LD202	Liddell to Chugoku	Fengtun Fei	13 November 2019			3,257.60			5,251.60						8,509.20
		LD280	Liddell to NSC - Fixed Price	Southern Harmony	14 November 2019			8,513.40									8,513.40
		LD308	Liddell to NSC - Fixed Price	Southern Harmony	14 November 2019					7,810.00							7,810.00
		Summary of Wednesday 13 November 2019						11,771.00		7,810.00	5,251.60						24,832.60
	Thursday 14 November 2019	LD208	Liddell to NSC - Fixed Price	Southern Harmony	14 November 2019			9,211.40									9,211.40
		LD264	Liddell to NSC - Fixed Price	Southern Harmony	15 November 2019			0.00			8,593.60						8,593.60
		LD372	Liddell to NSC - Fixed Price	Southern Harmony	14 November 2019					9,081.70							9,081.70
		Summary of Thursday 14 November 2019						9,211.40		9,081.70	8,593.60						26,886.70
	Friday 15 November 2019	LD112	Ulan to GIAG (EWP)	Ocean Prometheus	15 November 2019						8,587.20						8,587.20
		LD184	Idemitsu CY'19 - November	GL La Paz	15 November 2019		8,591.80										8,591.80
		Summary of Friday 15 November 2019					8,591.80				8,587.20						17,179.00
	Saturday 16 November 2019	LD102	Liddell to NSC - Fixed Price	Southern Harmony	16 November 2019					8,586.60			0.00				8,586.60
		Summary of Saturday 16 November 2019								8,586.60			0.00				8,586.60

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 18 November 2019	LD172	Liddell to NSC - Fixed Price	Spring Brave	22 November 2019					4,867.51	3,628.69						8,496.20
		Summary of Monday 18 November 2019								4,867.51	3,628.69						8,496.20
	Friday 22 November 2019	LD250	Liddell to NSC - Fixed Price	Spring Brave	22 November 2019			9,282.60					0.00				9,282.60
		Summary of Friday 22 November 2019						9,282.60					0.00				9,282.60
	Saturday 23 November 2019	LD164	Liddell to NSC - Fixed Price	Spring Brave	23 November 2019			8,602.80									8,602.80
		LD288	Ulan to GIAG (EWP)	Ocean Prometheus	24 November 2019						8,616.40						8,616.40
		Summary of Saturday 23 November 2019						8,602.80			8,616.40						17,219.20
	Sunday 24 November 2019	LD254	Liddell to NSC - GC Newc Jul-Sep	Benitamou	24 November 2019			8,677.00									8,677.00
		Summary of Sunday 24 November 2019						8,677.00									8,677.00
	Monday 25 November 2019	LD110	Liddell to NSC - GC Newc Jul-Sep	Benitamou	25 November 2019			9,297.80									9,297.80
		LD166	Liddell to NSC - Fixed Price	Spring Brave	25 November 2019			6,994.17		0.00			1,515.83				8,510.00
		Summary of Monday 25 November 2019						16,291.97		0.00			1,515.83				17,807.80
	Tuesday 26 November 2019	LD110	Liddell to NSC - GC Newc Jul-Sep	Benitamou	26 November 2019			8,787.50					510.30				9,297.80
		Summary of Tuesday 26 November 2019						8,787.50					510.30				9,297.80
	Thursday 28 November 2019	LD138	LD to Ube - JFY19 - Teijin - October BM	Crimson Ace	28 November 2019			8,680.60									8,680.60
		LD204	HVOCS to Hong Kong Taizhong Energy Pty Limited (25 Nov- 05 Dec)	Yuan Xin Hai	28 November 2019			1,417.67					7,617.33				9,035.00
		LD338	Liddell to NSC - GC Newc Jul-Sep	Benitamou	28 November 2019			4,162.37		4,940.43							9,102.80
		Summary of Thursday 28 November 2019						14,260.63		4,940.43			7,617.33				26,818.40

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	
	Friday 29 November 2019	LD262	HVOCS to Hong Kong Taizhong Energy Pty Limited (25 Nov- 05 Dec)	Yuan Xin Hai	29 November 2019								8,497.20				8,497.20
		Summary of Friday 29 November 2019											8,497.20				8,497.20
	Saturday 30 November 2019	LD102	HVOCS to Hong Kong Taizhong Energy Pty Limited (01-10Dec)	Alcmene	30 November 2019								8,695.40				8,695.40
		Summary of Saturday 30 November 2019											8,695.40				8,695.40
	Sunday 01 December 2019	LD182	LD to Ube - JFY19 - Teijin - October BM	Crimson Ace	1 December 2019			8,629.20									8,629.20
		LD296	HVOCS to Hong Kong Taizhong Energy Pty Limited (25 Nov- 05 Dec)	Yuan Xin Hai	2 December 2019								9,174.20				9,174.20
		Summary of Sunday 01 December 2019						8,629.20					9,174.20				17,803.40
	Thursday 05 December 2019	LD248	GCS to Kobe IPP - Apr'19-Mar'20	KM Mt. Jade	5 December 2019				9,037.20								9,037.20
		LD298	GCS to Kobe IPP - Apr'19-Mar'20	KM Mt. Jade	6 December 2019				9,218.60								9,218.60
		Summary of Thursday 05 December 2019							18,255.80								18,255.80
	Friday 06 December 2019	LD172	Ulan to GIAG (KOEN/ KOSE)	Oriental Enterprise	6 December 2019						4,650.95		4,605.65				9,256.60
		LD258	GCS to Kobe IPP - Apr'19-Mar'20	KM Mt. Jade	6 December 2019				9,262.40								9,262.40
		Summary of Friday 06 December 2019							9,262.40		4,650.95		4,605.65				18,519.00
	Saturday 07 December 2019	LD264	GCS to Kobe IPP - Apr'19-Mar'20	KM Mt. Jade	8 December 2019						7,057.75		2,164.05				9,221.80
		LD332	GCS to Kansai	Aquila Ocean	7 December 2019		9,098.00	0.00									9,098.00

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 Saturday 07 December 2019					9,098.00	0.00			7,057.75		2,164.05				18,319.80
	Sunday 08 December 2019	LD320	Ulan to GIAG (KOSE/ KOEN)	Pan Flower	8 December 2019						8,648.55		520.65				9,169.20
		Summary of Sunday 08 December 2019									8,648.55		520.65				9,169.20
	Tuesday 10 December 2019	LD116	LD to Ube - JFY19 - Mitsubishi Paper - October RP plus US $0.80	Baltic K	10 December 2019		9,217.00										9,217.00
		Summary of Tuesday 10 December 2019					9,217.00										9,217.00
	Wednesday 11 December 2019	LD212	LD to Ube - JFY19 - Mitsubishi Paper - October RP plus US $0.80	Baltic K	11 December 2019		8,625.40										8,625.40
		LD300	Ulan to GIAG (KMPC)	Lowlands Orchid	12 December 2019						9,255.80		0.00				9,255.80
		Summary of Wednesday 11 December 2019					8,625.40				9,255.80		0.00				17,881.20
	Thursday 12 December 2019	LD224	Liddell to Kyushu EPC	FJ Blu	12 December 2019					8,606.00							8,606.00
		LD374	Ulan to GIAG (KMPC)	Lowlands Orchid	12 December 2019						8,628.60		0.00				8,628.60
		Summary of Thursday 12 December 2019								8,606.00	8,628.60		0.00				17,234.60
	Friday 13 December 2019	LD202	Liddell to Kyushu EPC	FJ Blu	13 December 2019		9,013.80										9,013.80
		LD272	Liddell to Kyushu EPC	FJ Blu	13 December 2019		8,028.18	1,213.62									9,241.80
		Summary of Friday 13 December 2019					17,041.98	1,213.62									18,255.60
	Saturday 14 December 2019	LD170	HVOCS to Shanghai Conch Building Materials	Ju Hua Hai	14 December 2019								9,278.80				9,278.80
		LD240	LD to Ube - JFY19 - Mitsubishi Paper - October RP plus US $0.80	Baltic K	15 December 2019			6,600.30						2,066.90			8,667.20

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	
		LD322	HVOCS to Shanghai Conch Building Materials	Ju Hua Hai	15 December 2019								9,251.60				9,251.60
		LD376	Liddell to Kyushu EPC	FJ Blu	14 December 2019		9,288.80										9,288.80
		Summary of Saturday 14 December 2019					9,288.80	6,600.30					18,530.40	2,066.90			36,486.40
	Sunday 15 December 2019	LD120	Liddell to Kyushu EPC	FJ Blu	15 December 2019		8,581.60										8,581.60
		LD202	Bulga to Hokuriku EPC	North Fortune	15 December 2019			9,164.60									9,164.60
		LD254	Liddell to NSC - GC Newc Jul-Sep	BBG Honor	15 December 2019			8,671.40					0.00				8,671.40
		LD302	Liddell to NSC - GC Newc Jul-Sep	BBG Honor	16 December 2019			8,644.00									8,644.00
		LD380	Liddell to Kyushu EPC	FJ Blu	15 December 2019		8,569.80										8,569.80
		Summary of Sunday 15 December 2019					17,151.40	26,480.00					0.00				43,631.40
	Monday 16 December 2019	LD142	Ulan to GIAG (EWP)	Sunlight	16 December 2019						9,131.60		0.00				9,131.60
		LD174	Liddell to NSC - GC Newc Jul-Sep	BBG Honor	16 December 2019			9,190.00									9,190.00
		LD282	Ulan to GIAG (EWP)	Sunlight	17 December 2019			4,582.75			4,704.05						9,286.80
		Summary of Monday 16 December 2019						13,772.75			13,835.65		0.00				27,608.40
	Tuesday 17 December 2019	LD112	Bulga to Hokuriku EPC	North Fortune	17 December 2019			9,145.40									9,145.40
		LD160	Liddell to NSC - GC Newc Jul-Sep	Delfin	17 December 2019		9,059.60										9,059.60
		LD248	Liddell to NSC - GC Newc Jul-Sep	Delfin	18 December 2019					9,244.00							9,244.00
		LD306	Bulga to Hokuriku EPC	North Fortune	18 December 2019			9,068.60									9,068.60
		LD342	Liddell to NSC - GC Newc Jul-Sep	BBG Honor	17 December 2019			9,235.80					0.00				9,235.80

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 Tuesday 17 December 2019					9,059.60	27,449.80		9,244.00			0.00				45,753.40
	Wednesday 18 December 2019	LD288	Liddell to NSC - GC Newc Jul-Sep	Delfin	19 December 2019					9,205.40							9,205.40
		Summary of Wednesday 18 December 2019								9,205.40							9,205.40
	Thursday 19 December 2019	LD144	Ulan to Hokkaido EPC - JFY19 - April RP minus US $2.00	Corona Joyful	19 December 2019		9,181.00										9,181.00
		LD192	Bulga to Hokuriku EPC	North Fortune	19 December 2019			8,508.40									8,508.40
		LD260	Bulga to Hokuriku EPC	North Fortune	20 December 2019		4,178.70	4,331.90									8,510.60
		Summary of Thursday 19 December 2019					13,359.70	12,840.30									26,200.00
	Friday 20 December 2019	LD174	Ulan to Hokkaido EPC - JFY19 - April RP minus US $2.00	Corona Joyful	20 December 2019		8,613.00										8,613.00
		LD256	Liddell to JFE - October RP minus US $0.50	Bisan Clover	20 December 2019					9,393.00							9,393.00
		LD386	CM to Hokkaido - Spot	Corona Youthful	20 December 2019		9,246.20										9,246.20
		Summary of Friday 20 December 2019					17,859.20			9,393.00							27,252.20
	Saturday 21 December 2019	LD194	Liddell to JFE - October RP minus US $0.50	Bisan Clover	21 December 2019			9,213.60					0.00				9,213.60
		LD242	Liddell to JFE - October RP minus US $0.50	Bisan Clover	21 December 2019			2,736.13			5,904.07		0.00				8,640.20
		LD304	Dongguan City Huihuang Energy Co., Ltd	Germ Sophia	22 December 2019								8,538.80				8,538.80

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	
		LD384	Liddell to JFE - October RP minus US $0.50	Bisan Clover	21 December 2019			9,225.80									9,225.80
		Summary of Saturday 21 December 2019						21,175.53			5,904.07		8,538.80				35,618.40
	Sunday 22 December 2019	LD126	Liddell to NSC - GC Newc Jul-Sep	Aom Georgina	22 December 2019			8,506.80									8,506.80
		LD186	CM to Hokkaido - Spot	Corona Youthful	22 December 2019		9,200.80										9,200.80
		LD246	Liddell to NSC - GC Newc Jul-Sep	Aom Georgina	23 December 2019			9,078.00					0.00				9,078.00
		LD290	Liddell to NSC - GC Newc Jul-Sep	Aom Georgina	23 December 2019			0.00		9,208.80							9,208.80
		LD550	CM to Hokkaido - Spot	Corona Youthful	22 December 2019		9,182.60	0.00									9,182.60
		Summary of Sunday 22 December 2019					18,383.40	17,584.80		9,208.80			0.00				45,177.00
	Monday 23 December 2019	LD162	Liddell to NSC - GC Newc Jul-Sep	Aom Georgina	23 December 2019					1,382.69	7,821.51		0.00				9,204.20
		LD250	LD to Shikoku (Q4'19 7 Trains)	Tokiwa Maru	24 December 2019			8,184.99			1,070.81						9,255.80
		Summary of Monday 23 December 2019						8,184.99		1,382.69	8,892.31		0.00				18,460.00
	Thursday 26 December 2019	LD252	LD to Shikoku (Q4'19 7 Trains)	Tokiwa Maru	27 December 2019		9,171.60										9,171.60
		Summary of Thursday 26 December 2019					9,171.60										9,171.60
	Friday 27 December 2019	LD116	LD to Shikoku (Q4'19 7 Trains)	Tokiwa Maru	27 December 2019			5,602.93			3,192.07						8,795.00
		LD262	GCS to Kobe IPP - Apr'19-Mar'20	Corona Splendor	28 December 2019									8,890.60			8,890.60
		Summary of Friday 27 December 2019						5,602.93			3,192.07			8,890.60			17,685.60

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	
	Saturday 28 December 2019	LD216	GCS to Kobe IPP - Apr'19-Mar'20	Corona Splendor	28 December 2019						9,377.40		0.00				9,377.40
		LD264	GCS to Kobe IPP - Apr'19-Mar'20	Corona Splendor	29 December 2019						8,600.40		0.00				8,600.40
		LD332	GCS to Kobe IPP - Apr'19-Mar'20	Corona Splendor	28 December 2019						8,475.00		0.00				8,475.00
		Summary of Saturday 28 December 2019									26,452.80		0.00				26,452.80
	Sunday 29 December 2019	LD162	GCS to Kobe IPP - Apr'19-Mar'20	Corona Splendor	29 December 2019									8,499.80			8,499.80
		LD234	GCS to Kobe IPP - Apr'19-Mar'20	Corona Splendor	29 December 2019		8,957.60										8,957.60
		LD338	GCS to Kobe IPP - Apr'19-Mar'20	Corona Splendor	29 December 2019						9,039.20		0.00				9,039.20
		Summary of Sunday 29 December 2019					8,957.60				9,039.20		0.00	8,499.80			26,496.60
	Monday 30 December 2019	LD120	GCS to Kobe IPP - Apr'19-Mar'20	Corona Splendor	30 December 2019			5,887.21			3,209.99						9,097.20
		LD316	GCS to Kobe IPP - Apr'19-Mar'20	Corona Splendor	30 December 2019			9,061.00									9,061.00
		Summary of Monday 30 December 2019						14,948.21			3,209.99						18,158.20
	Tuesday 31 December 2019	LD184	GCS to Marubeni (Kamisu Power) - October'19 RP	Durban Bay	31 December 2019					9,042.00							9,042.00
		Summary of Tuesday 31 December 2019								9,042.00							9,042.00
	Summary of Pacific National					134,184.20	224,166.47	915,311.47	498,086.26	564,625.29	577,506.86	8,886.58	426,429.68	22,427.42	125,282.02	117,469.16	3,614,375.40
Summary of Liddell Coal Marketing Pty Ltd						134,184.20	224,166.47	915,311.47	498,086.26	564,625.29	577,506.86	8,886.58	426,429.68	22,427.42	125,282.02	117,469.16	3,614,375.40
Grand Total						134,184.20	224,166.47	915,311.47	498,086.26	564,625.29	577,506.86	8,886.58	426,429.68	22,427.42	125,282.02	117,469.16	3,614,375.40

COAL UNLOADED DELTA

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

Coal Receivals total	3,614,375.40
Coal Unloaded delta Total:	
Adj Total:	3,614,375.4

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Appendix B - Meteorological Summary

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
1/01/2019	28.6	28.0	3.1	0
2/01/2019	29.7	29.3	2.7	0
3/01/2019	27.6	26.9	3.6	0
4/01/2019	29.5	29.1	2.2	0
5/01/2019	32.3	31.6	5.2	0
6/01/2019	21.3	20.5	4.5	1.2
7/01/2019	21.7	20.9	4.1	3
8/01/2019	27.5	26.8	2.6	0
9/01/2019	27.3	26.6	3.4	17.6
10/01/2019	25.0	24.1	3.9	4.4
11/01/2019	26.2	25.3	3.3	9.6
12/01/2019	27.8	27.3	2.5	0.2
13/01/2019	26.3	25.5	4.8	0
14/01/2019	27.2	26.4	2.8	0
15/01/2019	30.8	30.4	2.3	0
16/01/2019	31.9	31.5	2.5	0
17/01/2019	31.6	31.0	2.8	0
18/01/2019	32.4	31.8	2.8	0
19/01/2019	31.8	31.2	4.6	0
20/01/2019	24.2	23.4	4.2	0.8
21/01/2019	25.2	24.5	2.3	2.4
22/01/2019	27.9	27.4	1.9	0
23/01/2019	28.6	28.1	3.5	7.2
24/01/2019	26.8	25.9	4.1	0.2
25/01/2019	30.1	29.5	1.9	0
26/01/2019	34.4	34.0	3.1	0
27/01/2019	32.1	31.5	3.7	0
28/01/2019	28.3	27.4	4.0	0
29/01/2019	30.2	29.5	2.7	0
30/01/2019	31.3	30.7	2.3	0
31/01/2019	31.4	31.0	3.4	0
1/02/2019	21.5	20.7	4.6	1
2/02/2019	24.0	23.2	3.6	6.8
3/02/2019	27.1	26.3	2.8	0
4/02/2019	28.9	28.3	2.8	0
5/02/2019	27.9	27.2	4.7	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
6/02/2019	27.1	26.3	4.6	0
7/02/2019	27.2	26.5	2.8	0
8/02/2019	27.1	26.4	2.7	6.2
9/02/2019	26.7	26.0	4.9	2.4
10/02/2019	23.7	23.1	2.7	0
11/02/2019	25.5	25.0	2.4	0
12/02/2019	28.9	28.7	4.1	0
13/02/2019	25.6	25.0	4.5	0
14/02/2019	23.0	22.0	5.5	0
15/02/2019	22.6	21.7	5.4	0
16/02/2019	23.5	22.6	3.9	0
17/02/2019	25.7	25.2	2.3	0
18/02/2019	28.9	28.5	2.0	0
19/02/2019	29.1	28.6	4.0	0.2
20/02/2019	24.9	23.9	4.6	0
21/02/2019	23.0	22.3	5.3	5.4
22/02/2019	21.7	20.9	4.9	0.6
23/02/2019	20.5	19.7	4.5	3
24/02/2019	20.6	19.8	5.1	1
25/02/2019	21.2	20.3	4.3	0
26/02/2019	22.7	22.1	2.2	0
27/02/2019	23.4	22.7	4.4	0
28/02/2019	23.6	22.9	3.6	0
1/03/2019	24.4	23.6	4.2	0
2/03/2019	24.2	23.2	4.1	0
3/03/2019	24.6	23.8	2.7	0
4/03/2019	25.9	25.3	2.7	0
5/03/2019	26.9	26.5	2.2	0
6/03/2019	28.9	28.5	4.1	1.2
7/03/2019	20.2	19.5	5.4	0
8/03/2019	24.3	23.8	2.2	0
9/03/2019	25.1	24.6	3.1	5
10/03/2019	26.4	25.7	2.3	0.2
11/03/2019	28.2	27.5	3.0	0
12/03/2019	27.7	26.9	3.5	0
13/03/2019	24.1	23.1	6.0	0
14/03/2019	25.6	24.9	2.4	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
15/03/2019	22.7	21.8	5.0	0
16/03/2019	20.2	19.4	2.8	22.4
17/03/2019	19.9	19.2	1.6	19.4
18/03/2019	21.1	20.4	2.7	7.8
19/03/2019	21.4	20.7	1.7	0
20/03/2019	23.0	22.3	2.1	0
21/03/2019	23.5	22.8	2.6	0
22/03/2019	22.8	22.0	2.9	7.6
23/03/2019	23.4	22.8	2.3	3.8
24/03/2019	26.0	25.4	2.1	0.4
25/03/2019	24.6	24.0	3.8	1
26/03/2019	23.0	22.4	3.9	0
27/03/2019	20.8	20.0	4.6	0
28/03/2019	20.8	20.2	2.8	0
29/03/2019	22.0	21.6	1.7	0
30/03/2019	19.8	19.0	4.4	74.6
31/03/2019	16.9	16.2	4.6	0
1/04/2019	16.8	16.2	3.0	1.8
2/04/2019	18.8	18.0	3.2	0.8
3/04/2019	19.6	19.0	2.1	0.2
4/04/2019	19.5	18.9	2.5	0
5/04/2019	19.8	19.1	2.8	0.8
6/04/2019	22.7	22.1	2.3	0
7/04/2019	25.7	25.2	3.0	0
8/04/2019	26.2	25.9	2.8	0
9/04/2019	25.5	25.0	4.6	0
10/04/2019	17.4	16.7	4.0	0
11/04/2019	17.4	16.8	3.2	0
12/04/2019	18.6	17.9	2.6	0
13/04/2019	19.4	18.9	1.8	0
14/04/2019	18.1	17.7	2.0	0
15/04/2019	18.6	18.1	2.1	0
16/04/2019	18.7	18.3	2.3	3.8
17/04/2019	19.1	18.6	2.7	0.2
18/04/2019	19.7	19.3	2.1	0
19/04/2019	20.5	19.8	3.1	0
20/04/2019	21.1	20.3	2.8	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
21/04/2019	20.9	20.3	1.9	0
22/04/2019	20.3	19.9	1.8	0
23/04/2019	20.3	19.8	2.8	0
24/04/2019	20.2	19.9	1.6	0
25/04/2019	21.2	20.9	2.0	0
26/04/2019	22.9	22.3	4.1	0
27/04/2019	16.4	16.1	2.5	0
28/04/2019	17.9	17.3	3.2	0
29/04/2019	16.7	16.6	2.9	0
30/04/2019	17.5	17.4	1.3	0
1/05/2019	18.9	18.7	1.3	0
2/05/2019	20.5	20.2	1.2	0
3/05/2019	20.0	19.5	2.2	7.8
4/05/2019	18.7	18.1	1.7	9
5/05/2019	16.0	15.6	1.9	0
6/05/2019	15.9	15.4	2.4	0
7/05/2019	16.9	16.2	3.8	0
8/05/2019	17.4	16.8	4.4	0
9/05/2019	14.5	14.1	2.1	0
10/05/2019	12.9	12.5	3.8	1.8
11/05/2019	14.8	14.0	6.8	0
12/05/2019	14.2	13.6	2.3	0
13/05/2019	16.0	15.7	1.3	0
14/05/2019	18.6	18.1	2.7	0
15/05/2019	15.8	15.6	2.3	0
16/05/2019	15.9	15.7	1.9	0
17/05/2019	16.8	16.7	1.4	0
18/05/2019	16.6	16.4	2.0	0
19/05/2019	16.6	16.2	2.0	0
20/05/2019	16.7	16.5	1.9	0
21/05/2019	19.1	18.5	2.7	0
22/05/2019	19.0	18.5	2.2	0
23/05/2019	17.7	17.4	1.7	0
24/05/2019	18.0	17.5	2.4	0
25/05/2019	17.8	17.4	2.7	0
26/05/2019	18.2	17.6	3.4	0
27/05/2019	14.6	13.8	7.2	0.4

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
28/05/2019	12.9	12.1	5.9	0
29/05/2019	15.1	14.4	7.8	0
30/05/2019	12.0	11.2	5.3	0
31/05/2019	12.2	11.4	3.7	0
1/06/2019	13.0	12.2	2.3	0.2
2/06/2019	15.2	14.6	1.0	0.2
3/06/2019	13.0	12.3	4.0	3.2
4/06/2019	11.9	11.1	4.2	0.2
5/06/2019	13.0	12.5	1.8	0
6/06/2019	12.2	12.0	2.2	0
7/06/2019	12.9	12.4	1.8	0
8/06/2019	13.0	12.5	1.2	0.2
9/06/2019	16.0	15.4	2.4	0.2
10/06/2019	16.5	15.7	3.2	0
11/06/2019	18.1	17.6	2.3	0
12/06/2019	17.1	16.7	2.8	0
13/06/2019	19.0	18.4	3.9	0
14/06/2019	14.2	13.9	2.2	0
15/06/2019	11.7	11.6	1.5	0
16/06/2019	11.0	10.9	1.2	0
17/06/2019	14.5	13.8	1.5	0
18/06/2019	14.7	14.0	2.1	1.2
19/06/2019	12.5	12.0	2.1	0
20/06/2019	10.1	9.9	1.6	0
21/06/2019	9.9	9.4	2.4	0
22/06/2019	9.5	9.0	2.3	0
23/06/2019	11.1	10.6	1.9	0.8
24/06/2019	12.0	11.3	2.0	7.8
25/06/2019	13.5	12.8	2.2	4
26/06/2019	14.7	14.0	3.3	0.8
27/06/2019	14.3	13.6	2.9	0
28/06/2019	13.0	12.6	1.2	0.2
29/06/2019	13.5	13.4	1.5	0
30/06/2019	15.7	15.1	3.2	0
1/07/2019	11.5	11.1	1.4	0
2/07/2019	13.8	13.4	2.5	0
3/07/2019	12.9	12.5	2.7	0.2

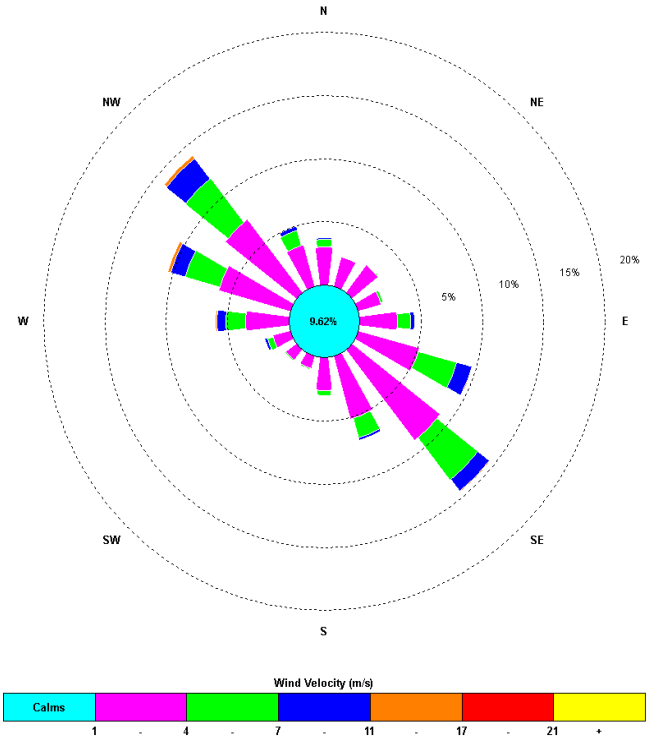
Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
4/07/2019	14.0	13.4	2.9	5.2
5/07/2019	14.2	13.5	3.2	0.6
6/07/2019	14.3	13.5	3.1	0.6
7/07/2019	14.3	13.6	1.6	0.2
8/07/2019	13.8	13.2	2.4	1.8
9/07/2019	14.3	13.5	3.2	0
10/07/2019	12.3	11.5	3.6	0
11/07/2019	15.9	15.2	6.7	0
12/07/2019	16.2	15.4	5.7	0
13/07/2019	14.5	13.7	7.1	0
14/07/2019	11.5	10.6	7.2	0
15/07/2019	13.7	12.8	5.9	0
16/07/2019	13.8	13.0	5.2	0
17/07/2019	13.6	12.8	4.8	0
18/07/2019	14.3	13.5	5.0	0
19/07/2019	12.7	12.2	3.5	0
20/07/2019	12.2	11.9	2.0	0
21/07/2019	15.6	15.1	3.7	0
22/07/2019	16.4	15.9	1.6	0
23/07/2019	17.2	16.6	3.8	0
24/07/2019	17.2	16.6	4.4	0
25/07/2019	12.9	12.6	1.8	0
26/07/2019	14.3	13.9	2.7	0
27/07/2019	14.3	14.1	1.9	0
28/07/2019	13.4	13.2	2.0	0
29/07/2019	14.7	14.1	2.6	0
30/07/2019	14.0	13.3	2.6	0.4
31/07/2019	13.4	12.7	2.3	0
1/08/2019	14.1	13.6	1.5	0
2/08/2019	12.7	12.4	1.7	0
3/08/2019	15.4	14.6	3.5	0
4/08/2019	13.3	12.9	2.1	0
5/08/2019	14.3	13.9	2.1	0
6/08/2019	15.3	14.8	2.7	0
7/08/2019	15.9	15.2	3.3	0
8/08/2019	16.6	16.2	4.9	0
9/08/2019	14.7	13.9	8.0	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
10/08/2019	11.1	10.2	7.1	1.6
11/08/2019	9.7	8.8	8.2	2.6
12/08/2019	11.9	11.1	4.6	0
13/08/2019	12.6	12.0	2.6	0
14/08/2019	11.7	11.5	2.5	0
15/08/2019	13.6	13.1	3.5	0
16/08/2019	16.3	15.6	3.7	0
17/08/2019	16.7	16.0	3.2	0
18/08/2019	16.8	16.5	2.1	0
19/08/2019	14.6	13.7	5.7	0
20/08/2019	13.7	12.8	6.2	0
21/08/2019	15.8	15.0	6.9	0
22/08/2019	16.2	15.4	5.7	0
23/08/2019	13.1	12.8	1.6	0
24/08/2019	16.7	16.0	3.8	0
25/08/2019	18.5	17.9	3.0	0
26/08/2019	16.6	15.7	3.3	0
27/08/2019	16.3	15.4	3.0	0
28/08/2019	16.9	16.2	2.2	0
29/08/2019	13.5	12.9	2.9	0
30/08/2019	12.3	11.4	2.1	17.6
31/08/2019	13.8	13.1	2.1	6.8
1/09/2019	16.7	16.1	1.7	0
2/09/2019	17.0	16.4	3.2	0
3/09/2019	18.4	17.9	3.0	0
4/09/2019	20.5	20.3	3.1	0
5/09/2019	19.3	18.8	2.6	0
6/09/2019	20.9	20.1	5.5	0
7/09/2019	14.6	13.8	8.4	0
8/09/2019	15.6	14.8	6.3	0
9/09/2019	14.3	13.4	5.1	0
10/09/2019	13.7	13.0	2.8	0
11/09/2019	14.7	14.3	1.6	0
12/09/2019	18.6	18.2	3.7	0
13/09/2019	19.0	18.3	2.4	0
14/09/2019	17.6	16.9	2.9	0
15/09/2019	18.9	18.5	2.5	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
16/09/2019	21.5	20.8	4.7	0
17/09/2019	12.6	11.7	3.5	19.2
18/09/2019	14.9	14.2	3.8	20.8
19/09/2019	17.9	17.1	3.1	0.6
20/09/2019	18.8	18.0	2.4	0
21/09/2019	20.5	20.2	1.7	0
22/09/2019	21.1	20.6	4.0	0
23/09/2019	17.7	17.2	3.5	0
24/09/2019	15.1	14.9	2.2	0
25/09/2019	15.8	15.2	2.3	0
26/09/2019	17.2	16.6	2.0	0
27/09/2019	20.5	19.8	3.7	0
28/09/2019	19.3	18.6	4.5	0
29/09/2019	17.1	16.7	2.4	0
30/09/2019	16.6	15.8	4.2	0
1/10/2019	17.4	16.5	3.4	0
2/10/2019	18.8	18.5	2.3	0
3/10/2019	22.4	22.1	2.5	0
4/10/2019	24.5	23.8	4.5	0
5/10/2019	18.4	17.5	4.4	0
6/10/2019	21.4	20.9	2.0	0
7/10/2019	26.4	25.9	3.5	0
8/10/2019	19.6	18.8	4.3	0
9/10/2019	15.8	14.9	3.5	0
10/10/2019	15.9	15.2	3.4	0
11/10/2019	15.7	14.8	4.0	0.2
12/10/2019	13.6	12.9	3.9	1.4
13/10/2019	15.6	14.8	2.9	0
14/10/2019	18.4	17.9	2.0	0
15/10/2019	22.2	21.7	2.1	0
16/10/2019	23.7	23.3	2.6	0
17/10/2019	22.2	21.4	4.9	0
18/10/2019	20.8	20.0	4.1	0
19/10/2019	22.6	21.9	4.4	0
20/10/2019	18.8	18.0	3.1	0
21/10/2019	18.5	17.8	3.0	0
22/10/2019	20.5	19.8	2.7	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
23/10/2019	23.3	22.7	2.4	0
24/10/2019	27.0	26.5	2.7	0
25/10/2019	28.8	28.3	4.4	0
26/10/2019	27.9	27.3	7.0	0
27/10/2019	20.5	20.1	2.6	0
28/10/2019	19.0	18.4	4.0	0
29/10/2019	21.6	20.9	2.3	0
30/10/2019	24.4	24.1	1.9	0
31/10/2019	25.8	25.4	3.0	0
1/11/2019	24.2	23.6	2.6	0
2/11/2019	25.9	25.4	2.2	0
3/11/2019	24.5	24.1	3.9	14.4
4/11/2019	22.9	22.1	4.0	2.8
5/11/2019	17.7	16.9	3.9	2
6/11/2019	20.7	20.0	4.2	0
7/11/2019	26.3	25.7	6.0	0
8/11/2019	25.1	24.4	6.2	0
9/11/2019	18.7	17.7	5.0	0
10/11/2019	20.5	19.7	5.0	0
11/11/2019	21.5	21.1	2.5	0
12/11/2019	28.0	27.4	5.4	0
13/11/2019	21.9	21.2	4.1	0
14/11/2019	22.8	22.2	3.1	0
15/11/2019	26.7	25.9	5.1	0
16/11/2019	23.0	22.2	3.9	0
17/11/2019	21.0	20.1	4.4	0
18/11/2019	23.3	22.6	2.8	0
19/11/2019	28.2	27.6	3.4	0
20/11/2019	23.2	22.2	5.4	0
21/11/2019	26.5	25.9	2.4	0
22/11/2019	28.9	28.3	4.1	0
23/11/2019	23.7	22.8	4.0	0
24/11/2019	21.1	20.2	4.0	0
25/11/2019	25.1	24.4	3.2	0
26/11/2019	26.9	26.4	5.7	0
27/11/2019	21.1	20.3	2.8	0
28/11/2019	23.2	22.5	2.9	0

Date Sampled	Average Air temp @ 2m (°C)	Average Air temp @ 10m (°C)	Average Wind Speed (m/s)	Daily Rain (mm)
29/11/2019	26.2	25.6	2.7	0
30/11/2019	27.7	27.1	4.2	0
1/12/2019	24.1	23.2	4.9	0
2/12/2019	19.5	18.6	8.0	0
3/12/2019	22.5	21.6	6.1	0
4/12/2019	25.9	25.2	5.2	0
5/12/2019	27.4	26.8	4.4	0
6/12/2019	29.9	29.4	5.0	0
7/12/2019	24.5	23.8	3.1	0
8/12/2019	24.0	23.0	4.6	0
9/12/2019	25.5	24.8	2.5	0
10/12/2019	29.8	29.2	3.5	0
11/12/2019	23.0	22.0	5.7	0
12/12/2019	22.0	20.9	5.4	0
13/12/2019	22.2	21.2	4.9	0
14/12/2019	25.1	24.3	3.2	0
15/12/2019	27.5	26.8	3.0	0
16/12/2019	24.7	24.0	5.6	0
17/12/2019	22.4	21.3	5.1	0
18/12/2019	24.1	23.3	2.9	0
19/12/2019	29.8	29.2	3.6	0
20/12/2019	24.8	23.9	4.7	0
21/12/2019	30.1	29.4	3.4	0
22/12/2019	22.1	21.0	7.2	0
23/12/2019	21.1	20.1	4.3	0
24/12/2019	25.3	24.3	5.2	0
25/12/2019	25.4	24.4	5.0	0
26/12/2019	26.1	25.2	3.6	0
27/12/2019	25.9	25.0	3.8	0
28/12/2019	27.8	27.3	2.5	0
29/12/2019	31.4	31.2	2.1	0
30/12/2019	32.0	31.7	2.2	0
31/12/2019	34.5	34.0	4.2	0



Annual Windrose

Appendix C - Air Quality Monitoring Results

Depositional Dust Compliance Monitoring Results					
Month	D55		D62		Criteria
	Insoluble Solids g/m2/month	Annual Average g/m2/month	Insoluble Solids g/m2/month	Annual Average g/m2/month	Annual Average g/m2/month
Jan-19	3.1	1.4	3.2	1.6	4
Feb-19	3.9	1.7	4.2	1.8	4
Mar-19	3.6	1.9	2.6	1.9	4
Apr-19	2.7	2.0	1.6	2.0	4
May-19	1.9	2.1	1.4	2.0	4
Jun-19	1.1	2.0	1.9	2.0	4
Jul-19	1.6	2.1	1.5	2.1	4
Aug-19	1.2	2.1	1.1	2.1	4
Sep-19	1.4	2.1	1.1	2.1	4
Oct-19	3.9	2.3	1.2	2.1	4
Nov-19	2.6	2.4	0.9	1.9	4
Dec-19	3.3	2.5	7c	1.9	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
2-Jan-19	65	44	91	60	90
8-Jan-19	63	43	74	60	90
14-Jan-19	60	43	65	61	90
20-Jan-19	48	43	54	60	90
26-Jan-19	77	43	101	60	90
1-Feb-19	47	43	50	59	90
7-Feb-19	54	43	64	58	90
13-Feb-19		42		58	90
19-Feb-19		41		57	90
25-Feb-19	82	42	62	56	90
3-Mar-19	48	42	78	56	90
9-Mar-19	69	43	68	56	90
15-Mar-19	56	43	54	57	90
21-Mar-19	28	42	48	56	90
27-Mar-19	86	43	47	55	90
2-Apr-19	17	43	26	55	90
8-Apr-19	53	43	65	55	90
14-Apr-19	41	43	54	55	90
20-Apr-19	28	43	47	55	90
26-Apr-19		43		55	90
2-May-19	56	44	64	56	90
8-May-19	35	44	54	56	90
14-May-19	27	44	44	56	90
20-May-19	26	44	35	56	90
26-May-19	30	43	44	55	90
1-Jun-19	40	44	68	56	90
7-Jun-19	29	44	50	56	90
13-Jun-19	21	44	34	56	90
19-Jun-19	27	44	36	56	90
25-Jun-19	26	44	21	56	90
1-Jul-19	30	44	44	56	90
7-Jul-19	21	44	22	56	90
13-Jul-19	21	44	31	56	90
19-Jul-19	20	43	39	56	90
25-Jul-19	38	43	57	56	90
31-Jul-19	41	44	45	56	90
6-Aug-19	24	44	37	56	90
12-Aug-19	16	43	22	55	90
18-Aug-19	54	43	82	56	90
24-Aug-19	49	44	61	56	90
30-Aug-19	28	44	35	56	90
5-Sep-19	51	44	58	56	90

High Volume Air Sampling Compliance Monitoring Results – TSP					
11-Sep-19	44	44	61	56	90
17-Sep-19	21	44	21	56	90
23-Sep-19	36	43	38	55	90
29-Sep-19	56	44	72	55	90
5-Oct-19	53	44	54	55	90
11-Oct-19	53	44	46	55	90
17-Oct-19	107	46	108	57	90
23-Oct-19	65	46	66	57	90
29-Oct-19	125	47	136	57	90
4-Nov-19	16	46	27	57	90
10-Nov-19	81	47	94	57	90
16-Nov-19		47		57	90
22-Nov-19		47		57	90
28-Nov-19		46		57	90
4-Dec-19		46		57	90
10-Dec-19		46		56	90
16-Dec-19		46		56	90
22-Dec-19		46		55	90
28-Dec-19		46		55	90

*Blank cells indicate days where air quality was determined to have been impacted by extraordinary events by DPIE

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
2-Jan-19	28	18	42	23	50	30
8-Jan-19	24	18	25	23	50	30
14-Jan-19	22	17	23	23	50	30
20-Jan-19	25	17	18	22	50	30
26-Jan-19	32	17	38	22	50	30
1-Feb-19	19	17	16	22	50	30
7-Feb-19	14	17	20	22	50	30
13-Feb-19					50	30
19-Feb-19	21	17	17	22	50	30
25-Feb-19	16	17	22	22	50	30
3-Mar-19	24	17	23	22	50	30
9-Mar-19	20	17	16	22	50	30
15-Mar-19	10	17	16	21	50	30
21-Mar-19	24	17	16	21	50	30
27-Mar-19	7	17	6	21	50	30
2-Apr-19	25	17	27	21	50	30
8-Apr-19	21	17	24	21	50	30
14-Apr-19	9	17	11	21	50	30
20-Apr-19	21	17	17	22	50	30
26-Apr-19					50	30
2-May-19	31	17	34	21	50	30
8-May-19	18	17	23	21	50	30
14-May-19	10	17	17	21	50	30
20-May-19	9	17	13	21	50	30
26-May-19	18	17	20	21	50	30
1-Jun-19	16	17	34	22	50	30
7-Jun-19	11	17	21	22	50	30
13-Jun-19	6	17	12	22	50	30
19-Jun-19	9	17	13	22	50	30
25-Jun-19	9	17	7	22	50	30
1-Jul-19	11	17	20	22	50	30
7-Jul-19	7	17	6	22	50	30
13-Jul-19	8	17	8	22	50	30
19-Jul-19	8	17	14	21	50	30
25-Jul-19	14	17	19	21	50	30
31-Jul-19	10	17	10	21	50	30
6-Aug-19	24	17	18	21	50	30
12-Aug-19	2	17	4	21	50	30
18-Aug-19	20	17	33	21	50	30
24-Aug-19	23	17	25	21	50	30
30-Aug-19	4	17	5	21	50	30
5-Sep-19	17	17	25	21	50	30

High Volume Air Sampling Compliance Monitoring Results – PM10						
11-Sep-19	15	17	25	21	50	30
17-Sep-19	9	17	7	21	50	30
23-Sep-19	16	17	15	20	50	30
29-Sep-19	15	17	20	21	50	30
5-Oct-19	16	17	15	21	50	30
11-Oct-19	14	17	10	21	50	30
17-Oct-19	53	18	44	21	50	30
23-Oct-19	28	18	30	21	50	30
29-Oct-19	53	18	58	22	50	30
4-Nov-19	7	18	6	21	50	30
10-Nov-19	21	18	22	21	50	30
16-Nov-19					50	30
22-Nov-19					50	30
28-Nov-19					50	30
4-Dec-19					50	30
10-Dec-19					50	30
16-Dec-19					50	30
22-Dec-19					50	30
28-Dec-19					50	30

*Blank cells indicate days where air quality was determined to have been impacted by extraordinary events by DPIE

Appendix D - Surface Water Monitoring Results

Water Quality - Bowmans Creek																				
Month	BCK1 (Bowmans Creek Upstream)				BCK 1A				BCK2				BCK2A				BCK3				BCK4			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jan	7.36	1160	13	689	7.76	6410	12	4880	Dry				Dry				7.93	1890	83	1140	8.84	2290	90	1500
Feb	8.18	1200	<5	748	8.16	6840	6	4790									Too low to sample				Too low to sample			
Mar	7.82	1050	12	619	7.99	5970	20	3570									Dry				Dry			
Apr	8.02	1030	10	663	8.17	4120	8	2260									7.74	1180	31	710	8.11	2810	<5	1770
May	8	1190	11	688	8.19	3690	6	2090									6.73	2380	529	1540	8.09	2800	9	1760
Jun	7.97	1210	<5	726	8.06	4630	<5	2920									Too low to sample				8.20	2890	17	1820
Jul	7.55	1150	5	714	7.66	3610	<5	2220									Too low to sample				7.82	2460	44	2460
Aug	8.1	1180	<5	652	7.70	2780	23	1840									Dry				Dry			
Sep	7.89	1240	11	728	7.78	3900	14	2600																
Oct	7.85	1220	11	738	7.61	5650	12	4080																
Nov	8.1	1250	11	629	7.50	5300	7	3540																
Dec	7.72	1230	29	726	7.47	5490.00	<5	3470																

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	Dry				Dry				7.77	3320	13	2340	7.87	4880	8	3410	Dry			
Feb									8.23	3660	<5	2350	8.35	5270	16	3400				
Mar									7.99	2570	18	1320	8.11	3950	<5	2480				
Apr									8.1	3450	23	2050	8.15	4560	17	2510				
May									8.12	3710	6	2160	8.09	5050	8	3180				
Jun									8.07	3530	<5	2130	8.16	5100	<5	3220				
Jul									7.7	3430	8	2290	7.91	4220	<5	2920				
Aug									8.01	3250	8	2130	7.8	4030	15	2850				
Sep									7.91	3400	16	2150	7.93	4130	12	2590				
Oct									7.74	3330	6	2230	7.75	4290	6	2820				
Nov									7.72	3380	10	2150	7.78	4140	17	2520				
Dec									7.75	3400	<5	2250	7.71	4490	<5	2880				

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Appendix E - Groundwater Monitoring Results

Water Quality - Groundwater Monthly Monitoring Results																		
Month	ALV1 Large						ALV1 Small						ALV2 Large					
	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	6.76	1.26	5.45	Brown	Nil	Slight	7.57	1.25	5.09	Clear	Yes	Clear	7.15	1.84	5.28	Clear	Nil	Clear
Feb	7.68	1.11	5.66	Clear	Nil	Clear	8.33	1.12	5.39	Clear	Nil	Clear	7.24	2.11	5.30	Clear	Nil	Slight
Mar	6.98	1.53	5.80	Grey	Yes	Slight	7.66	1.44	5.56	Clear	Nil	Clear	7.29	2.24	5.42	Grey	Nil	Slight
Apr	6.93	1.49	5.27	Orange/Brown	Yes	Slight	7.65	1.47	4.99	Clear	Yes	Clear	7.35	2.10	5.02	Clear	Nil	Clear
May	6.93	1.53	5.27	Brown	Yes	Slight	7.65	1.49	4.94	Clear	Yes	Clear	7.27	2.17	5.01	Clear	Nil	Clear
Jun	6.96	1.36	5.31	Orange	Nil	Slight	7.60	1.34	4.94	Clear	Nil	Clear	7.14	1.95	5.25	Grey	Nil	Slight
Jul	6.85	1.47	5.33	Brown	Nil	Slight	7.57	1.42	4.92	Clear	Yes	Clear	7.17	2.28	5.55	Clear	Nil	Slight
Aug	7.00	1.44	5.47	Orange	Yes	Slight	7.76	1.39	5.05	Clear	Nil	Clear	7.32	1.99	5.83	Brown	Nil	Slight
Sep	7.07	1.32	5.54	Clear	Nil	Slight	7.72	1.25	5.12	Clear	Nil	Clear	7.43	1.83	6.03	Clear	Nil	Slight
Oct	6.96	1.41	5.59	Orange	Yes	Slight	7.67	1.36	5.20	Clear	Nil	Clear	7.26	1.92	6.19	Clear	Nil	Slight
Nov	6.94	1.59	5.78	Clear	Nil	Clear	7.61	1.51	5.49	Clear	Nil	Clear	7.20	2.27	7.00	Clear	Nil	Slight
Dec	6.95	1.38	5.92	Clear	Nil	Clear	7.39	1.33	5.79	Clear	Nil	Clear	7.16	2.30	7.38	Grey	Nil	Slight

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	7.56	2.73	5.36	Clear	Yes	Clear	Too low to sample						7.21	1.73	7.00	Clear	Yes	Clear
Feb	7.76	2.45	5.38	Clear	Nil	Clear	7.45	7.89	6.61	Grey	Nil	Slight	7.89	1.48	7.07	Clear	Nil	Clear
Mar	7.76	3.27	5.40	Grey	Yes	Slight	7.07	7.43	6.70	Brown	Yes	Turbid	7.43	1.99	7.16	Clear	Yes	Clear
Apr	7.72	3.24	5.21	Clear	Yes	Clear	7.01	7.44	6.45	Grey	Nil	Slight	7.44	2.01	7.04	Grey	Yes	Slight
May	7.66	3.33	5.17	Clear	Yes	Clear	7.03	7.39	6.43	Grey	Nil	Slight	7.39	2.04	6.98	Clear	Yes	Clear
Jun	7.61	2.74	5.37	Clear	Nil	Clear	7.07	7.42	6.41	Clear	Nil	Clear	7.42	1.86	7.00	Clear	Yes	Clear
Jul	7.68	3.12	5.61	Clear	Yes	Clear	6.94	7.32	6.47	Clear	Nil	Clear	7.32	1.98	7.01	Clear	Yes	Clear
Aug	7.76	3.00	5.93	Clear	Yes	Clear	7.07	7.47	6.56	Clear	Nil	Slight	7.47	1.93	7.07	Clear	Nil	Clear
Sep	7.90	2.80	6.23	Grey	Nil	Slight	7.17	7.58	6.63	Clear	Nil	Clear	7.58	1.78	7.14	Clear	Yes	Clear
Oct	7.71	2.95	6.75	Clear	Yes	Clear	7.15	7.62	6.70	Clear	Nil	Slight	7.62	1.91	7.16	Clear	Yes	Clear
Nov	7.64	3.26	7.40	Clear	Nil	Clear	7.06	7.50	6.79	Clear	Nil	Clear	7.50	2.17	7.27	Clear	Yes	Clear
Dec	7.56	2.90	8.10	Clear	Yes	Clear	6.73	7.35	6.85	Grey	Nil	Slight	7.35	1.89	7.30	Clear	Yes	Clear

Water Quality - Groundwater Monthly Monitoring Results																		
	ALV4 Large						ALV4 Small						PGW5 Large					
Month	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	6.54	1.49	6.14	Brown	Yes	Turbid	7.25	5.07	6.79	Clear	Yes	Clear	7.14	5.56	13.27	Clear	Yes	Clear
Feb	7.27	1.29	6.28	Brown	Nil	Slight	7.51	4.38	6.89	Clear	Nil	Clear	7.22	7.23	13.45	Clear	Nil	Clear
Mar	6.77	1.71	6.38	Brown/Grey	Yes	Slight	7.43	5.87	6.95	Grey	Yes	Slight	7.38	7.34	11.86	Clear	Nil	Clear
Apr	6.72	1.71	6.32	Grey	Nil	Turbid	7.35	5.61	6.96	Clear	Yes	Clear	7.19	7.02	12.22	Clear	Yes	Clear
May	6.65	1.72	6.31	Grey	Nil	Slight	7.31	6.04	6.95	Clear	Yes	Clear	7.11	7.46	13.29	Clear	Nil	Clear
Jun	6.69	1.56	6.33	Clear	Nil	Clear	7.34	5.31	6.99	Clear	Yes	Clear	7.00	6.31	13.80	Clear	Nil	Clear
Jul	6.59	1.64	6.33	Clear	Nil	Clear	7.27	5.66	7.00	Clear	Yes	Clear	7.09	7.52	14.35	Clear	Nil	Clear
Aug	6.72	1.59	6.40	Brown	Nil	Slight	7.45	5.53	7.08	Clear	Yes	Clear	7.16	7.34	15.31	Clear	Nil	Clear
Sep	6.84	1.45	6.45	Brown	Nil	Slight	7.41	5.15	7.12	Clear	Nil	Clear	7.21	6.53	15.58	Clear	Nil	Clear
Oct	6.78	1.57	6.49	Orange	Nil	Turbid	7.45	5.34	7.18	Clear	Yes	Clear	7.09	6.87	16.54	Clear	Yes	Clear
Nov	6.73	1.70	6.60	Orange	Nil	Slight	7.41	6.01	7.29	Clear	Yes	Clear	7.01	7.83	17.38	Clear	Nil	Clear
Dec	6.68	1.51	6.67	Brown	Nil	Slight	7.25	5.12	7.36	Clear	Yes	Clear	7.08	6.56	18.84	Clear	Yes	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	Dry		11.53				6.96	1.54	7.63	Brown	Nil	Slight	7.31	2.24	15.12	Clear	Yes	Clear
Feb	Dry		11.53				6.98	1.51	7.85	Brown	Nil	Turbid	7.38	2.11	16.55	Clear	Yes	Slight
Mar	Dry		11.53				Too low to sample		8.29	Too low to sample			7.41	2.78	17.37	Grey	Yes	Slight
Apr	Dry		11.54				Dry						7.39	3.02	17.39	Grey	Nil	Slight
May	Dry		11.50										7.34	2.83	18.17	Grey	Yes	Slight
Jun	Dry		11.53										7.29	2.6	18.70	Grey	Nil	Slight
Jul	Dry												7.38	3.04	19.14	Clear	Yes	Slight
Aug													7.43	2.99	19.65	Clear	Yes	Slight
Sep													7.52	2.73	20.11	Grey	Nil	Slight
Oct													7.41	3.07	20.39	Clear	Yes	Slight
Nov													7.30	3.51	20.92	Clear	Nil	Clear
Dec													7.20	3.14	21.31	Clear	Nil	Clear

Water Quality - Groundwater Monthly Monitoring Results																		
	ALV8 Large						ALV8 Small						ALV9 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	Dry						Dry						7.30	2.38	4.48	Orange	Yes	Turbid
Feb													7.07	2.22	4.69	Orange	Nil	Turbid
Mar													7.02	2.95	4.84	Orange	Nil	Turbid
Apr													7.01	2.66	4.56	Orange	Nil	Turbid
May													6.95	2.57	4.86	Brown	Nil	Turbid
Jun													6.83	2.14	5.06	Brown	Nil	Slight
Jul													6.84	2.43	5.21	Brown	Nil	Slight
Aug													6.93	2.24	5.44	Light orange	Nil	Slight
Sep													7.15	2.06	5.71	Orange	Nil	Slight
Oct													7.05	2.29	5.96	Orange/brown	Nil	Turbid
Nov													7.00	2.52	6.45	Brown	Nil	Turbid
Dec													7.07	2.29	6.65	Brown	Nil	Turbid

Water Quality - Groundwater Monthly Monitoring Results						
LBH (Coal Measures)						
Month	pH	Conductivity (mS.cm-1)	Depth to Water (m)	Colour	Odour	Turbidity
Jan	6.71	1.36	5.59	Clear	Nil	Clear
Feb	7.34	1.25	5.70	Clear	Nil	Clear
Mar	6.92	1.59	5.62	Clear	Nil	Clear
Apr	6.85	1.62	5.33	Grey	Nil	Slight
May	6.86	1.65	5.22	Clear	Nil	Clear
Jun	6.90	1.45	5.26	Clear	Nil	Clear
Jul	6.74	1.55	5.29	Clear	Nil	Clear
Aug	6.94	1.51	5.58	Clear	Nil	Clear
Sep	7.03	1.39	5.46	Clear	Nil	Clear
Oct	6.96	1.52	5.73	Clear	Nil	Clear
Nov	6.90	1.66	5.85	Clear	Nil	Clear
Dec	6.70	1.47	5.91	Clear	Yes	Clear

Appendix F - Blast Monitoring Results

Blast Monitoring Results										
			Chain of Ponds Hotel		Burlings		Scrivens		Substation	
Date	Time	Location	Overpressure (dBL)	Ground Vibration (mm/s)	Overpressure (dBL)	Ground Vibration (mm/s)	Overpressure (dBL)	Ground Vibration (mm/s)	Overpressure (dBL)	Ground Vibration (mm/s)
4/1/2019	12:50	South Pit	115.2	6.13	94.90	0.07	90.50	0.04	117.2	19.11
7/1/2019	12:58	Bayswater Pit	108.2	1.01	100.50	0.08	96.10	0.06	109.9	0.77
11/1/2019	13:02	South Pit	106.4	1.15	91.10	0.05	96.70	0.05	106.4	0.73
15/1/2019	13:05	Entrance Pit	89.2	0.42	88.10	0.05	89.80	0.04	101.2	0.3
17/1/2019	15:36	South Pit	109.1	0.43	88.60	0.01	81.20	0.01	101.7	0.12
17/1/2019	15:37	South Pit	111.1	0.89	84.20	0.01	86.30	0.01	112.7	0.95
18/1/2019	12:51	South Pit	126.7	18.66	102.30	0.12	84.60	0.09	114.8	3.74
21/1/2019	15:25	South Pit	121.6	1.94	97.10	0.02	90.50	0.01	116.6	0.71
24/1/2019	12:13	Entrance Pit	83.6	0.17	106.40	0.03	91.80	0.03	96.1	0.11
24/1/2019	12:17	Bayswater Pit	118.1	1.62	95.50	0.06	100.30	0.05	114	0.77
24/1/2019	12:17	South Pit	106.2	0.7	99.40	0.05	94.90	0.03	99.7	0.66
29/1/2019	12:57	Bayswater Pit	117.4	1.44	88.30	0.02	87.80	0.03	117.9	1.79
31/1/2019	12:57	Bayswater Pit	87.5	0.24	99.10	0.01	97.50	0.01	102.6	0.15
4/2/2019	15:37	South Pit	125.8	5.46	93.60	0.02	88.10	0.02	116.7	1.08
6/2/2019	13:17	Entrance Pit	101.8	0.96	93.30	0.06	94.50	0.04	104.2	0.55
7/2/2019	13:00	South Pit	118.2	5.42	94.20	0.07	96.00	0.05	121.1	8.67
8/2/2019	13:15	South Pit	117	2.81	101.10	0.03	96.70	0.03	116.8	1.83
8/2/2019	13:17	South Pit	121.6	7.81	96.00	0.02	94.50	0.01	114.1	1.02
14/2/2019	12:58	Entrance Pit	105.2	0.77	104.70	0.09	96.20	0.06	104.9	0.57
14/2/2019	13:00	Entrance Pit	104	0.6	108.70	0.04	99.00	0.03	106	0.42
15/2/2019	9:00	South Pit	116.2	2.64	88.50	0.01	90.80	0.01	108.7	0.6

Blast Monitoring Results										
22/2/2019	9:03	Bayswater Pit	114.9	1.64	109.70	0.05	102.00	0.03	114.3	1.19
26/2/2019	12:59	South Pit	116.1	3.03	91.30	0.03	96.90	0.02	121.5	6.02
28/2/2019	12:56	Bayswater Pit	110.3	0.82	89.50	0.05	95.40	0.03	108.4	0.44
28/2/2019	13:00	South Pit	130	6.88	92.90	0.06	94.60	0.08	128.5	3.36
5/03/2019	12:58	South Pit	111.3	2.84	81.60	0.04	88.10	0.04	111	2.16
8/03/2019	13:16	Bayswater Pit	103.4	1.08	85.80	0.09	92.20	0.05	101.5	0.6
8/03/2019	13:19	South Pit	111.1	2.96	87.30	0.06	91.00	0.03	115	6.06
13/03/2019	13:04	South Pit	121.2	9.75	108.10	0.02	102.90	0.01	115.1	1.3
14/03/2019	12:58	Bayswater Pit	112	0.36	88.90	0.01	94.50	0.01	110.4	0.2
19/03/2019	11:14	Bayswater Pit	103.8	0.78	90.30	0.03	100.70	0.02	101.5	0.35
26/03/2019	15:25	South Pit	117.2	2.47	89.60	0.02	95.10	0.01	114.9	0.56
28/03/2019	12:54	Entrance Pit	106.5	0.84	94.80	0.11	96.70	0.06	105.3	0.47
2/04/2019	12:59	Bayswater Pit	110.80	0.32	93.60	0.01	95.3	0.01	111	0.16
4/04/2019	15:34	South Pit	117.70	4.15	90.70	0.09	90.5	0.05	119.8	2.97
4/04/2019	15:35	South Pit	115.10	2.38	97.90	0.02	95.4	0.01	109.9	0.57
11/04/2019	12:59	Entrance Pit	110.10	0.29	87.60	0.01	91.5	0.02	107.9	0.23
12/04/2019	13:21	Bayswater Pit	105.30	0.88	90.10	0.06	97.5	0.06	106.3	0.62
15/04/2019	12:57	Entrance Pit	101.50	0.28	89.90	0.02	95	0.01	101.5	0.18
17/04/2019	15:24	South Pit	114.40	1.20	89.50	0.01	91.6	0.01	108.8	0.5
18/04/2019	15:25	South Pit	116.90	4.69	91.30	0.08	91.6	0.05	116.3	3.95
1/05/2019	13:10	Bayswater Pit	109.80	1.07	86.50	0.04	93.6	0.02	110.7	0.83
2/05/2019	12:59	South Pit	109.60	2.93	80.70	0.08	83.9	0.07	111.3	2.19
9/05/2019	12:59	Bayswater Pit	104.40	1.26	86.80	0.06	93.7	0.03	103.1	0.65
13/05/2019	12:55	South Pit	116.10	0.57	86.50	0.01	93.9	0.01	119.9	1.57
14/05/2019	15:33	South Pit	124.60	22.37	92.90	0.09	99.6	0.03	118.3	3.26
15/05/2019	12:55	Entrance Pit	111.70	0.51	92.10	0.02	101.5	0.02	112.3	0.44

Blast Monitoring Results										
16/05/2019	12:57	South Pit	119.20	6.62	91.30	0.07	91.1	0.05	115.3	2.65
23/05/2019	12:52	South Pit	120.40	1.01	83.70	0.01	92.4	0.01	121.2	2.6
24/05/2019	12:26	South Pit	113.10	5.35	89.70	0.07	98.4	0.07	111.8	2.37
30/05/2019	13:02	South Pit	114.60	0.33	97.60	0.01	96.4	0.01	118.6	0.34
5/06/2019	13:42	Bayswater Pit	110.60	1.58	90.20	0.07	99.7	0.05	111	1.27
6/06/2019	12:58	South Pit	115.80	7.38	91.30	0.15	91.6	0.11	117	5.26
7/06/2019	12:58	Bayswater Pit	104.60	0.38	97.20	0.04	90.4	0.03	104.6	0.41
12/06/2019	12:58	Bayswater Pit	101.90	0.35	108.10	0.02	87	0.01	103.4	0.21
13/06/2019	15:44	Entrance Pit	108.10	0.70	100.70	0.04	93.9	0.03	106.4	0.78
18/06/2019	12:57	Entrance Pit	105.70	0.36	95.90	0.02	96.9	0.01	103.5	0.27
19/06/2019	15:37	Bayswater Pit	118.60	1.96	97.10	0.07	104	0.07	117	0.93
19/06/2019	15:45	South Pit	115.80	2.85	88.80	0.05	96.3	0.03	118.2	5.77
25/06/2019	12:51	South Pit	113.10	3.81	92.20	0.19	91.3	0.09	114.1	4.33
27/06/2019	12:58	Entrance Pit	111.10	1.07	100.60	0.13	100.6	0.08	109.8	0.99
1/07/2019	12:58	South Pit	120.80	7.14	92.40	0.07	91.5	0.04	117.7	4.69
3/07/2019	12:56	Bayswater Pit	103.60	1.20	95.20	0.06	96.3	0.05	103.5	0.44
4/07/2019	12:59	South Pit	119.60	3.27	96.70	0.03	97.3	0.03	122.8	2.58
4/07/2019	12:59	South Pit	119.60	3.27	99.00	0.03	97.3	0.03	122.8	2.58
4/07/2019	12:59	South Pit	119.60	2.51	96.70	0.03	97.3	0.02	116.3	0.52
16/07/2019	12:27	Bayswater Pit	114.80	0.31	102.10	0.01	102.4	0.01	116.8	0.24
16/07/2019	12:29	Entrance Pit	105.70	0.55	101.30	0.08	94	0.06	103	0.29
18/07/2019	16:27	South Pit	121.30	8.61	94.40	0.08	92.2	0.04	113.4	2.61
22/07/2019	12:59	Entrance Pit	107.40	1.14	90.20	0.08	97	0.05	105.1	0.86
23/07/2019	12:58	South Pit	111.80	14.97	104.20	0.10	97.6	0.06	113.3	15.88
24/07/2019	12:49	Entrance Pit	113.90	0.19	101.00	0.01	100.5	0.01	113.6	0.17
29/07/2019	13:01	Entrance Pit	102.90	0.71	83.50	0.07	97.1	0.05	101.8	0.37

Blast Monitoring Results										
30/07/2019	12:50	Bayswater Pit	103.70	0.55	88.60	0.02	96	0.01	100.9	0.26
31/07/2019	12:28	South Pit	117.50	3.34	90.70	0.05	89	0.04	111.3	1
1/08/2019	15:26	South Pit	114.10	2.27	85.80	0.03	87.7	0.02	114.8	1.31
1/08/2019	15:28	Bayswater Pit	107.40	0.35	92.20	0.02	94.6	0.01	104.6	0.21
6/08/2019	12:42	Entrance Pit	101.70	0.26	97.00	0.01	87.1	0.01	102.2	0.12
12/08/2019	13:11	South Pit	113.50	8.02	100.90	0.20	93.1	0.08	117.1	14.73
14/08/2019	13:02	South Pit	115.30	1.10	88.20	0.03	88.9	0.02	116.1	0.91
14/08/2019	13:06	Entrance Pit	102.50	0.55	89.60	0.04	89.5	0.02	102.2	0.28
15/08/2019	12:58	Bayswater Pit	103.10	0.34	106.80	0.02	91.9	0.01	104.8	0.25
16/08/2019	11:54	South Pit	114.50	7.70	99.40	0.12	101.5	0.06	118.1	4.5
22/08/2019	15:30	Bayswater Pit	101.10	0.45	103.70	0.02	96.8	0.01	99	0.27
22/08/2019	15:35	South Pit	117.60	1.38	103.10	0.01	97.3	0	111.8	0.35
23/08/2019	12:25	Entrance Pit	99.00	0.60	86.20	0.07	90.2	0.06	98.6	0.52
27/08/2019	12:54	South Pit	117.10	17.03	90.50	0.06	91.9	0.04	119.6	7
29/08/2019	12:54	Bayswater Pit	105.70	0.45	98.70	0.03	105.1	0.01	108.6	0.43
4/09/2019	15:31	South Pit	114.00	1.43	102.40	0.01	99.4	0.01	109.4	0.49
5/09/2019	12:32	Entrance Pit	106.70	0.42	87.80	0.03	97.1	0.02	104	0.29
5/09/2019	12:34	Bayswater Pit	109.90	4.06	92.20	0.15	94.6	0.07	108.5	1.17
12/09/2019	15:22	South Pit	116.20	1.66	114.90	0.01	107.8	0.01	111.7	0.62
16/09/2019	12:55	Entrance Pit	105.40	0.67	103.10	0.07	96.3	0.07	96.9	0.36
30/09/2019	12:57	Bayswater Pit	108.30	2.13	98.60	0.11	95.9	0.08	105.7	1.38
1/10/2019	12:53	Bayswater Pit	105.00	1.23	97.00	0.08	92.2	0.04	106.3	0.68
9/10/2019	13:14	South Pit	119.80	28.19	95.00	0.07	86.9	0.03	111.6	3.35
9/10/2019	13:16	Bayswater Pit	109.70	0.39	89.90	0.03	98.6	0.01	108.6	0.18
10/10/2019	13:00	South Pit	115.60	6.51	87.30	0.08	86	0.05	118	4.12
16/10/2019	15:27	South Pit	113.20	24.96	89.90	0.08	85.1	0.05	108.4	2.93

Blast Monitoring Results										
18/10/2019	12:47	Bayswater Pit	106.10	0.71	95.70	0.04	96.7	0.05	104.1	0.37
22/10/2019	12:11	South Pit	112.90	3.49	89.40	0.05	90.2	0.05	110.1	1.19
28/10/2019	12:28	Entrance Pit	102.20	1.11	90.60	0.05	91.7	0.04	101	0.52
28/10/2019	12:30	South Pit	113.20	0.39	91.30	0.01	101.3	0.01	115.2	0.41
29/10/2019	13:00	Bayswater Pit	104.70	1.03	83.00	0.07	91.5	0.06	101.1	0.62
29/10/2019	13:03	Bayswater Pit	115.20	1.44	92.40	0.05	98	0.04	112.6	0.54
31/10/2019	10:56	South Pit	116.10	1.49	91.80	0.03	93.3	0.02	116.3	1.05
6/11/2019	14:06	Entrance Pit	106.70	1.16	97.50	0.07	89.7	0.06	105.5	0.98
11/11/2019	13:24	Entrance Pit	97.10	0.11	100.30	0.01	94.5	0.02	98.9	0.04
13/11/2019	12:58	Bayswater Pit	109.60	0.93	96.90	0.07	102.9	0.04	109.1	0.61
14/11/2019	15:46	Entrance Pit	97.10	0.15	98.30	0.01	95.6	0.02	102.2	0.08
15/11/2019	09:01	Bayswater Pit	107.80	1.48	105.30	0.08	106.7	0.05	96.1	0.6
18/11/2019	12:55	Entrance Pit	97.40	0.19	88.50	0.01	88.7	0.02	97.7	0.07
20/11/2019	12:57	South Pit	110.80	16.65	91.30	0.11	87	0.07	114.6	8.65
21/11/2019	12:54	Entrance Pit	101.50	0.12	81.60	0.01	93.2	0.02	101.5	0.05
22/11/2019	16:12	Bayswater Pit	113.80	1.03	90.60	0.06	89.2	0.04	102.7	0.74
27/11/2019	12:57	Bayswater Pit	115.10	0.34	98.70	0.02	98.7	0.02	114.6	0.22
4/12/2019	09:21	Bayswater Pit	100.30	0.78	104.30	0.04	102.8	0.02	98.3	0.41
4/12/2019	09:33	South Pit	115.60	3.17	109.3	0.08	101.9	0.07	115.2	1.66
7/12/2019	09:05	South Pit	120.9	14.46	91.3	0.12	91.6	0.06	115.4	4.79
9/12/2019	12:54	Entrance Pit	99	0.12	97	0.01	89.9	0.02	97.8	0.06
11/12/2019	12:54	Bayswater Pit	106.4	0.31	101.8	0.01	103.5	0.02	108.4	0.24
12/12/2019	12:03	Bayswater Pit	103.3	1.31	106.2	0.06	90.6	0.04	99.9	0.85
16/12/2019	13:03	South Pit	119.5	20.56	104.5	0.08	101.2	0.04	112.4	5.95
18/12/2019	13:03	Entrance Pit	111.9	0.25	90.6	0.01	97	0.02	107.1	0.15
20/12/2019	12:20	Entrance Pit	97.8	1.26	95.6	0.13	92	0.11	96.1	0.72

Blast Monitoring Results										
23/12/2019	12:51	Entrance Pit	108.5	0.23	102	0.01	94.9	0.02	109.3	0.12

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/green	None constructed in 2019.

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/green	Ongoing rehabilitation surveyed confirmed as compliant. No landform drainage issues within rehabilitation areas – except Mountain Block.
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. No discharges in 2019
	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 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 informal undulations.
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	15/green	Initial tailing capping layer of 1.5m has commenced on the Antiene Tailings Dam in 2016. Ongoing works. No

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
produce free draining landforms.						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/green	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	16/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 appropriate for the final landuse.	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/amber	Topsoil deficit known. Substitute materials utilised as per rehabilitation strategy. Ongoing maintenance and rehabilitation operations to achieve target vegetation.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	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
Ecosystem Establishment 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	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)	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
from bushfire, weeds and feral animals		*Field Manual for 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/green	Operations ongoing. Bushfire Hazard Assessment completed in 2019.
	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/green	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. LCO is implementing rotational grazing where practical to continue pasture improvement. 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/green	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 works planned to continue in 2020.
		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 2020.
Ecosystem Sustainability Phase – no rehabilitation in this 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/ N/A	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/ N/A	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/ N/A	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/ N/A	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	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/ N/A	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
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	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/ N/A	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/ N/A	Operations ongoing, trending towards target, works to ensure composition is trending towards target ongoing
	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.

Domain Objective	Performance Indicator	Completion Criteria	Justification/ Source	Complete (Yes/No)	TARP Element(s) / Status	Comment
	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/ N/A	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/ N/A	Operations ongoing, trending towards target.
		Woodland corridors are assessed to provide contiguous structural habitat.	EA Section 7.16.9	No	14/ N/A	Operations ongoing, trending towards target.

Appendix H - Rehabilitation Detail

2019 Rehabilitation Detail					
South Pit RL120W					
Domain	4	**Re-vegetation Date:**	December 2019	**Area:**	7.37ha
Land Use: Woodland **Seed/Plant Mix:** Native woodland and cover crop This area is on the western extents of the South Pit overburden emplacement area facing the Old New England Highway. Landform shaping was completed in September 2019 comprising of a 10 degree west facing slope. Surface water drainage includes graded contour drains directing flow towards the South Pit void. Topsoil was sourced from stockpiles from areas previously cleared for mining advancement. Topsoil was applied at 120mm as well as gypsum at 10t/ha. 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. Additional habitat material was constructed including installation of stag trees, logs and/or rock piles for native fauna. Seeding was completed by hand immediately following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland. Status/Progress: No cover crop had established due to absence of rainfall until recent rainfall in early 2020 which has resulted in initial establishment being evident. 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 3 years.					
Entrance RL180 and RL192					
Domain	4	**Re-vegetation Date:**	September 2019	**Area:**	7.58ha
Land Use: Woodland **Seed/Plant Mix:** Native woodland and cover crop This area is on the western extents of the Entrance Pit overburden emplacement facing the main southern railway. Landform shaping was completed in July 2019 comprising of a 10 degree west facing slope and a flat top section containing additional material shaped for visual micro relief. Surface water drainage includes graded contour drains directing flow south towards the entrance pit void downslope. Topsoil was sourced from stockpiles from areas previously cleared for mining advancement. Topsoil was applied at 120mm as well as gypsum at 10t/ha. 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. Additional habitat material was constructed including installation of stag trees, logs and/or rock piles for native fauna. Seeding was completed by hand immediately following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland. Status/Progress: Absence of significant rainfall and prolonged drought conditions until early 2020 hindered development of cover crop. Recent rainfall has resulted in initial establishment. 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 3 years.					
Entrance RL180 Top of Dump					
Domain	4	**Re-vegetation Date:**	December 2019	**Area:**	4.56ha
Land Use: Pastoral/grazing **Seed/Plant Mix:** Liddell summer pasture seed mix Landform shaping completed in July 2019comprising flat top of emplacement area. The area was ripped to reduce compaction, rock raked and gypsum applied at 10T/ha (50% recycled and 50% natural mined). Additionally fertilizer application of 250 kg/ha of DAP was applied post recommendation from a local agronomist. Chisel ploughed surface prior to seeding which was undertaken immediately following site preparation. Liddell summer pasture seed mix applied using locally sourced seed (see Table 24 for details). Status/Progress: Absence of significant rainfall and prolonged drought conditions until early 2020 hindered development of cover crop. Recent rainfall has resulted in initial establishment. Continue monitor and apply maintenance measures as necessary.					
South Cut RL180 East					
Domain	4	**Re-vegetation Date:**	December	**Area:**	10.99ha
Land Use: Woodland					

Seed/Plant Mix: Native woodland and cover crop

This area is on the eastern extents of the South Pit overburden emplacement facing South Pit void. Landform shaping was completed in December 2019 comprising of a predominately 10 degree (with some slightly steeper sections) south facing slop. Surface water drainage includes graded contour drains directing into a drop structure shaped into the landform which is planned for completion in 2020.

Topsoil was sourced from stockpiles from areas previously cleared for mining advancement. Topsoil was applied at 120mm as well as gypsum at 10t/ha. 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. Additional habitat material was constructed including installation of stag trees, logs and/or rock piles for native fauna. Seeding was completed by hand immediately following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland.

Status/Progress: Absence of significant rainfall and prolonged drought conditions until early 2020 hindered development of cover crop. Recent rainfall has resulted in initial establishment. 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 3 years.

South Pit RL180 West

Domain	4	**Re-vegetation Date:**	October 2019	**Area:**	7.11ha

Land Use: Woodland

Seed/Plant Mix: Native woodland and cover crop

This area is on the western extents of the South Pit overburden emplacement facing South Pit void. Landform shaping was completed in May 2019 comprising of a 10 degree south facing slope. Surface water drainage includes graded contour drains directing into a drop structure in the South Pit RL180 East rehabilitation shaped into the landform which is planned for completion in 2020.

Topsoil was sourced from stockpiles from areas previously cleared for mining advancement. Topsoil was applied at 120mm as well as gypsum at 10t/ha. 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. Additional habitat material was constructed including installation of stag trees, logs and/or rock piles for native fauna. Seeding was completed by hand immediately following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland.

Status/Progress: Absence of significant rainfall and prolonged drought conditions until early 2020 hindered development of cover crop. Recent rainfall has resulted in initial establishment. 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 3 years.

South Cut RL195

Domain	4	**Re-vegetation Date:**	October 2019	**Area:**	10.4ha

Land Use: Woodland

Seed/Plant Mix: Native woodland and cover crop

This area is on the top of the dump of the South Pit overburden emplacement. Landform shaping was completed in March 2019. Surface water drainage includes graded contour drains directing into a drop structure in the South Pit RL180 East rehabilitation shaped into the landform which is planned for completion in 2020.

Topsoil was sourced from stockpiles from areas previously cleared for mining advancement. Topsoil was applied at 120mm as well as gypsum at 10t/ha. 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. Additional habitat material was constructed including installation of stag trees, logs and/or rock piles for native fauna. Seeding was completed by hand immediately following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland.

Status/Progress: Absence of significant rainfall and prolonged drought conditions until early 2020 hindered development of cover crop. Recent rainfall has resulted in initial establishment. 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 3 years.

South Pit RL195 East

Domain	4	**Re-vegetation Date:**	September 2019	**Area:**	2.48ha

Land Use: Woodland

Seed/Plant Mix: Native woodland and cover crop

This area is on the eastern extents of the South Pit overburden emplacement facing the main southern railway. Landform shaping was completed in March 2019 comprising of a 10 degree south facing slope. Surface water drainage includes graded contour drains directing into a drop structure in the South Pit RL180 East rehabilitation shaped into the landform which is planned for completion in 2020.

Topsoil was sourced from stockpiles from areas previously cleared for mining advancement. Topsoil was applied at 120mm as well as gypsum at 10t/ha. 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. Additional habitat material was constructed including installation of logs and/or rock piles for native fauna. Seeding was completed by hand immediately

following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland.

Status/Progress: Absence of significant rainfall and prolonged drought conditions until early 2020 hindered development of cover crop. Recent rainfall has resulted in initial establishment. 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 3 years.