LIDDELL

GLENCORE

Annual Review

2022

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Tables

Figures

Title Block

Name of operation	Liddell Coal Operations
Name of operator	Liddell Coal Operations Pty Ltd
Development consent / project approval #	DA-305-11-01
Name of holder of development consent / project approval	Liddell Coal Operations Pty Ltd
Mining lease #	ML1597, CCL708, ML1552, ML1313
Name of holder of mining lease	Liddell Tenements Pty Ltd
Water licence #	Refer to ***Table 3-3***
Name of holder of water licence	Refer to ***Table 3-3***
MOP/RMP start date	March 2021
MOP/RMP end date	December 2023
Annual Review start date	January 1st 2022
Annual Review end date	December 31st 2022

I, Tony Morris, 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 2022 to 31st December 2022 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	Tony Morris
Title of authorized reporting officer	Operations Manager
Signature of authorized reporting officer	
Date	

1. Statement of Compliance

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

Table 1-1 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 2021-2023	Yes
Aboriginal Heritage Impact Permit (AHIP No. 0000623)	Yes
OSSM 3916/2008 (Onsite Sewage Management System)	Yes

Table 1-2 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	Continuous air quality monitoring for PM10	Non-compliant	Monitoring unit HVAS 11 (Scriven) failed to monitor TSP on one occasion.	Section 6.3
DA 305-11-01	Schedule 3 Condition 16	Continuous air quality monitoring for PM10	Non-compliant	Monitoring unit HVAS 12 (Scriven) failed to monitor	Section 6.3

Non-Compliances					
				PM10 on one occasion.	
DA 305-11-01	Schedule 3 Condition 16	Continuous air quality monitoring for PM10	Non-compliant	Monitoring unit HVAS 21 (Antiene) failed to monitor PM10 on one occasion.	Section 6.3
DA 305-11-01	Schedule 3 Condition 11c	Monitor and report on compliance with the relevant blasting conditions	Non-compliant	Chain of Ponds Inn blast monitor failed to monitor blast vibration for four blast events	Section 6.2.3
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 14 dates throughout the reporting period due to hardware failures.	Section 6.3
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 19 dates throughout the reporting period due to hardware failures.	Section 6.3
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Non-compliant	Monitoring Point 11 failed to achieve PM10 data availability	Section 6.3

Non-Compliances					
				greater than 75% on 10 dates throughout the reporting period due to planned maintenance and hardware failures.	
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 9 dates throughout the reporting period due to planned maintenance and hardware failures.	Section 6.3

Table 1-3 Compliance status key

Compliance Status Key		
Risk Level	**Colour Code**	**Description**
High	Non-compliant	Non-compliance with potential 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

Compliance Status Key		
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 2-1*** and ***Figure 2-2*** 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 2-1.***

Table 2-1 Mine contacts

Name	Position	Company	Contact Numbers
Tony Morris	Operations Manager	Liddell Coal Operations	(02) 6570 9919
Mark Faulkner	Mining Manager	Liddell Coal Operations	(02) 6570 9937
Ben de Somer	Environment & Community Manager	Liddell Coal Operations	(02) 6570 9947

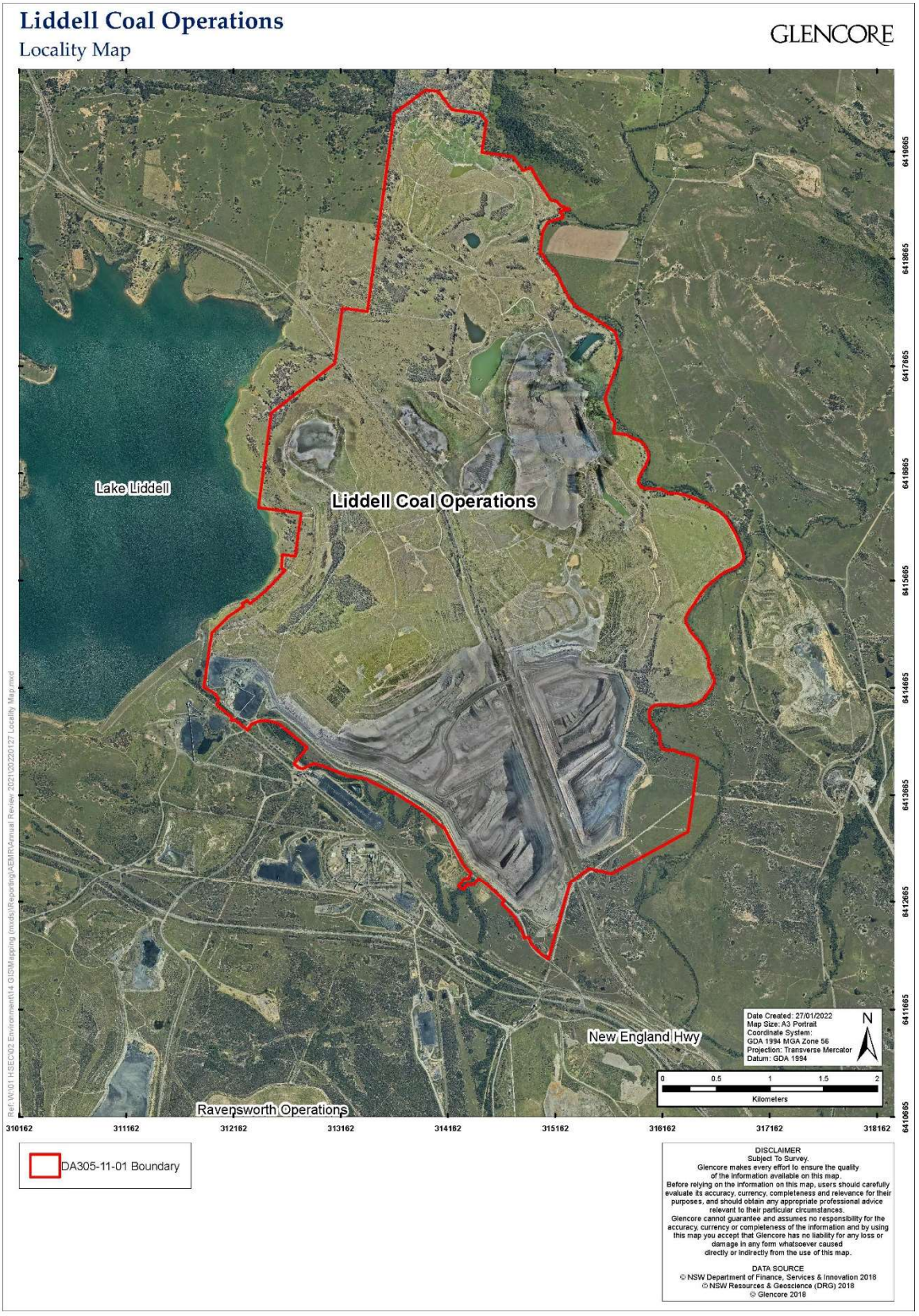

Figure 2-1 Locality Map

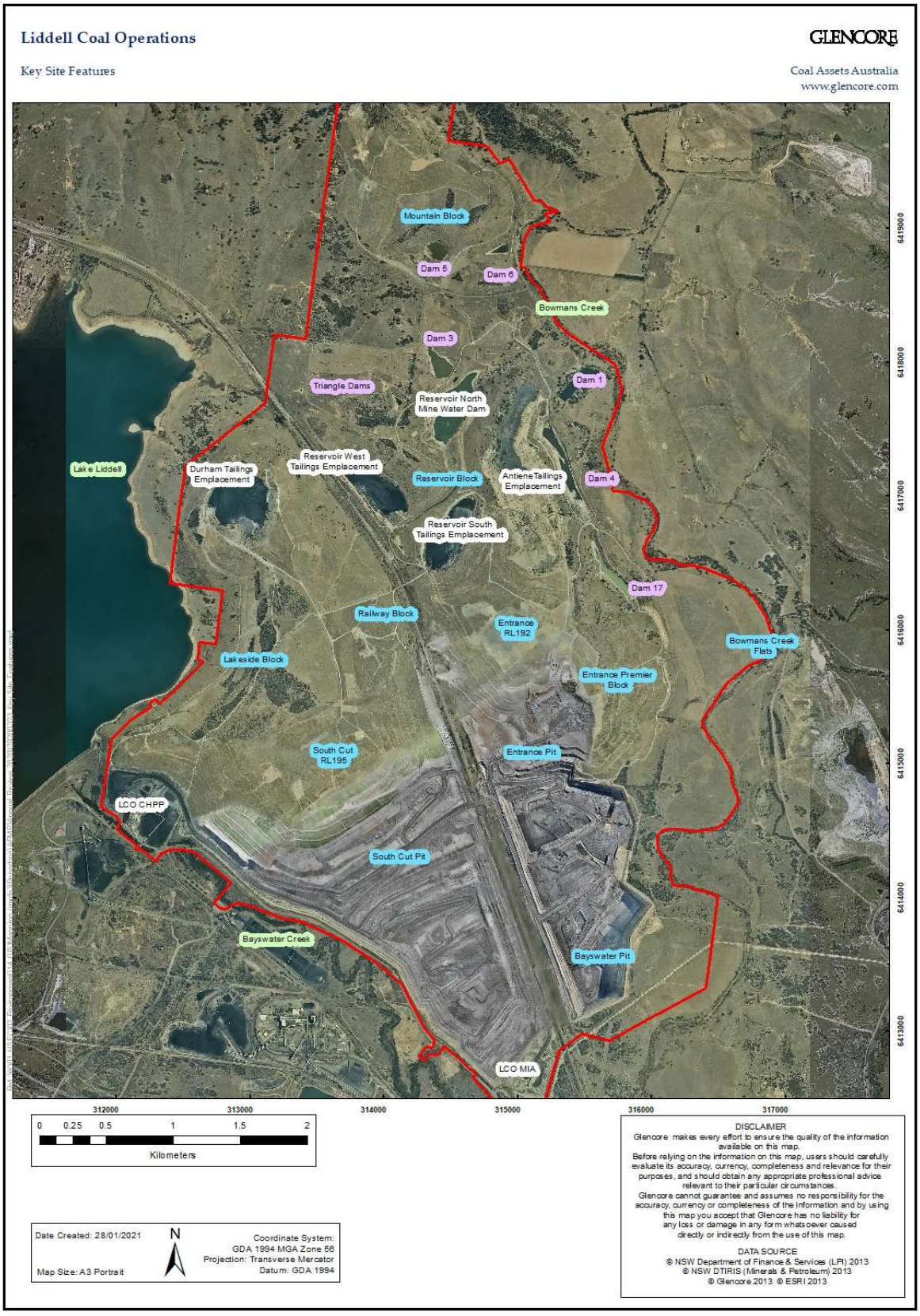

Figure 2-2 Key Site Features

3. Approvals

A number of development approvals, leases, licences and other approvals regulate mining operations at LCO. The status of development consents, licenses, relevant approvals and permits are listed in ***Table 3-1*** to ***Table 3-7*****.**

LCO operates primarily under one consolidated mining lease, ML 1597, as shown in ***Figure 3-1.***

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.

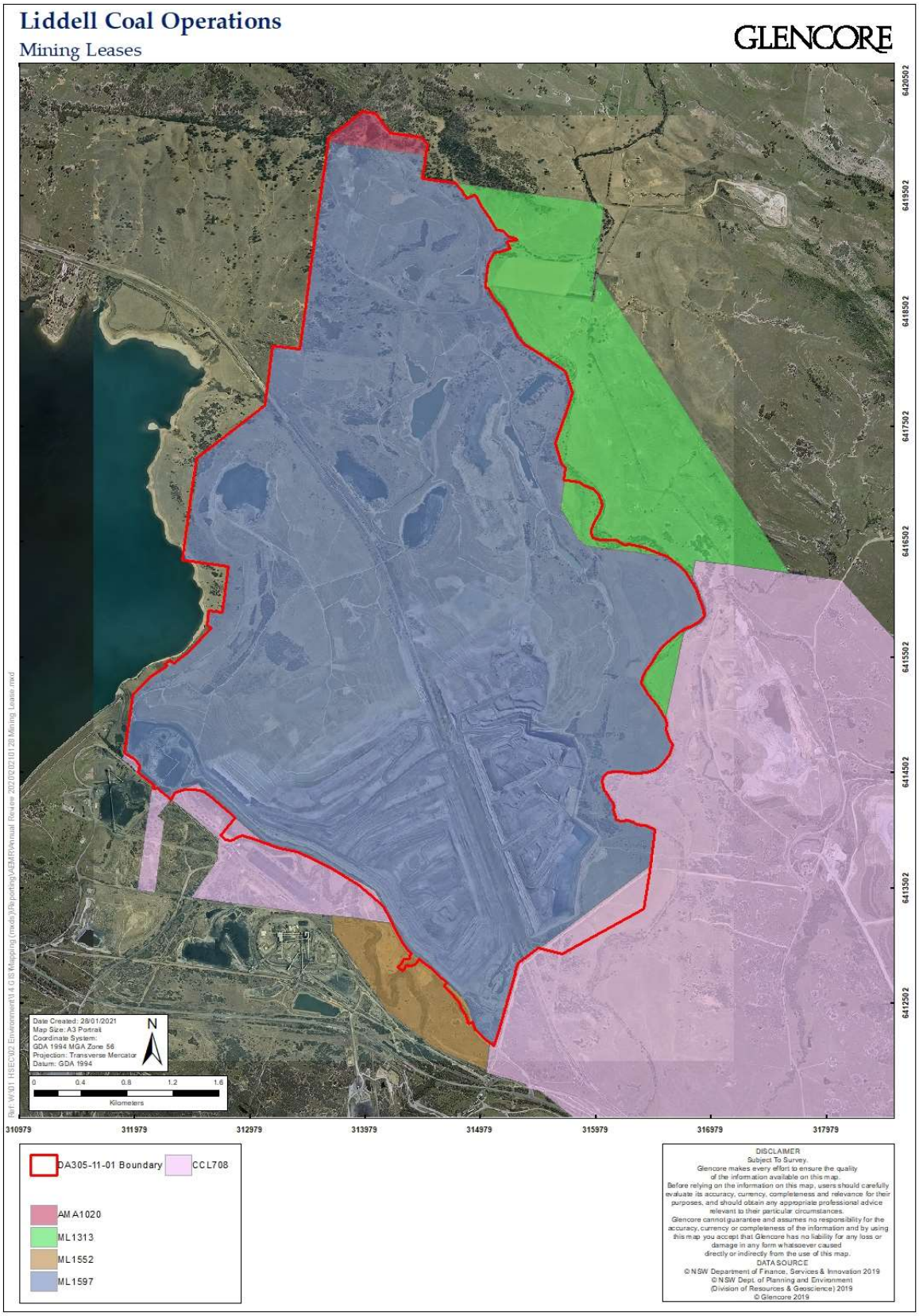

Figure 3-1 Mining Leases

Table 3-1 List of development approvals

Development Approvals			
Approval Number	**Authority**	**Description**	**Expiry Date**
DA 305-11-01	NSW Department of Planning, Infrastructure and Environment	Continued operation of the Liddell Colliery	31 December 2023
DA 305-11-01 Modification 2	NSW Department of Planning, Infrastructure 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	31 December 2023

Development Approvals			
		- Modifications to the footprint and size of the already approved Dam 13B.	
DA 305-11-01 MOD 3	NSW Department of Planning, Infrastructure 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	NSW Department of Planning, Infrastructure 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	NSW Department of Planning, Infrastructure 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	31 December 2028

Development Approvals			
		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.	
DA 305-11-01 MOD 6	NSW Department of Planning, Infrastructure 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	NSW Department of Planning, Infrastructure 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	Australian Government	- 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	31 December 2044

Development Approvals			
	Department of Agriculture, Water and the Environment	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)	

Table 3-2 List of leases and licences

Mining Leases, Environmental Protection Licence & Mining Operations Plan		
Mining Leases		
Title	**Authority**	**Expiry Date**
Mining Lease 1597	DPIE - Resources and Geoscience (NSW)	5 November 2028
Consolidated Coal Lease No. 708	DPIE - Resources and Geoscience (NSW)	30 December 2023 (renewal lodged 16 December 2022)
Mining Lease No. 1313	DPIE - Resources and Geoscience (NSW)	13 October 2023 (renewal lodged 13 October 2022)
Cumnock Sublease Mining lease No. 1552	DPIE - 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)

Table 3-3 List of surface water extraction licences

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

Table 3-4 List of groundwater licences

Groundwater Licences						
Locality	**Licence No.**	**Holder**	**Lot/DP**	**Purpose**	**Annual Extraction Allocation (ML)**	**Annual Extraction 2022 (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	500	0
8 South 3 & 4	WAL41498	Liddell Tenements Pty Ltd	32/870789	Industrial	6000	0
Durham 2 & 4	WAL41497	Liddell Tenements Pty Ltd	3/237654	Industrial (2 bores)	1000	0
Haz 1&2	WAL39760	Enex Liddell Pty Ltd Mitsui Mitsushima Australia Pty Ltd	81/607296	Industrial (2 bores)	5500	378
ALV1, ALV2, ALV3, ALV4,	20BL168053	LCO Pty Ltd	43/654013 201/848078	Test bore/Monitoring	N/A	N/A

Groundwater Licences						
ALV7, ALV8, ALV9			4/255403 81/607296 6/255403 32/545601			
M49	WAL41493	Liddell Southern Tenements Pty Ltd	32/545601	Dewatering	2500	974
Mt Owen 1	WAL41493 (previously 20BL168209)	Mt Owen Pty Ltd	353/867083	Stock, domestic, farming and test purposes	2500	0
Mt Owen 2	20BL169544	Mt Owen Pty Ltd	353/867083	Dewatering	2500	0
Middle Liddell	WAL41498	LCO Pty Ltd	1/237766	Dewatering	6000	0

Table 3-5 List of Aboriginal Heritage permits

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

Table 3-6 List of radiation management licences

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 2023

Table 3-7 List of effluent treatment permits

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 2032

4. Operations Summary

During 2022, there were a number of key activities undertaken in accordance with the RMP and DA 305-11-01. These activities included:

- Continued progression of mining operations in South pit, Entrance pit and Bayswater pit
- Continuation of capping and rehabilitation of the Antiene Tailings Storage Facility (TSF) and associated Dam 4; detailed in ***Section 8.2.2;***
- Commencement of capping works at the Reservoir South TSF, detailed in ***Section 8.2.2;***
- Completion of 37 hectares of final rehabilitation at the South Pit and Antiene TSF areas, as detailed in ***Section 8***;
- Continued building monitoring at the Chain of Ponds Inn; detailed in ***Section 6.6***;
- Continued implementation of biodiversity management plan and biodiversity offset management plan commitments including habitat augmentation, weed management and supplementary planting as detailed in ***Section 8.4*** and ***Section 8.5;***
- Implementation of management activities across the South Cut Pasture Rehabilitation area to manage the rehabilitation in accordance with the post mining land use outlined in the Biodiversity Management Plan and RMP; detailed in ***Section 8***; and
- Continued implementation of Indirect Offset commitments in ***Section 8.6*****.**

4.1 Mining Operations

The open cut mining sequence at LCO includes:

- Removal of overburden;
- Coal extraction, predominantly using excavators and trucks;
- Coal processing and transport.

Mining during 2022 targeted 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, including semi-soft and thermal coal types. Mining operations utilises hydraulic excavators and trucks to recover coal from multiple seams.

No mining was undertaken using dragline or highwall extraction methods during 2022.

Key production statistics are summarised in ***Table 4-1*** below. During the reporting period there was no non-compliance with the sites approved production limits.

4.2 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 4-1*** below, the total ROM coal processed at Liddell's CHPP during the 2022 reporting period was 4,918,195 tonnes. The total product coal produced was 3,503,162 tonnes with 1,215,442 tonnes of coarse and 498,185 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 2022.

During the reporting period, 3,426,728 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 4-1 Production summary

Production Summary				
Material	**Approved limit**	**2021 actual**	**2022 forecast**	**2022 actual**
Prime Waste Rock / Overburden (bcm)	N/A	31,958,000	25,860,000	28,172,000
ROM Coal / Ore (t)	8,000,000	4,986,000	4,439,000	4,918,000
Coarse reject (t)	N/A	1,002,860	N/A	1,215,442
Fine reject (Tailings) (t)	N/A	437,231	N/A	498,185
Saleable product (t)	N/A	3,424,000	2,893,000	3,504,000

4.3 Major Activities Proposed in the Next Reporting Period

Key activities planned for 2023 include:

- Continuation of mining in the South and Entrance pits, with final coal planned to be mined in February in the South pit and September in the Entrance pit;
- Continuation of detailed mine closure planning and commencement of execution of the closure plan following last coal;
- Proposed primary overburden emplacement rehabilitation of approx. 45 hectares in the South and Bayswater dumps;
- Completion of capping and rehabilitation works in the Antiene TSF and Dam 4 in accordance with the tailings emplacement rehabilitation strategy in the RMP;
- Ongoing capping and rehabilitation of the Reservoir South and West TSFs in accordance with the tailings emplacement rehabilitation strategy in the RMP;
- Continued implementation of the rehabilitation monitoring program and completion criteria;
- Continued implementation of Biodiversity Offset commitments;
- Continued implementation of Biodiversity Management commitments; and

- Continued transfer of tailings between LCO and Mt Owen Complex West Pit.

5. Actions Required at Previous Annual Review

NSW Department of Planning and Environment provided written advice on the 2022 Annual Review on the 26 May 2022 and considered it to generally satisfy the requirements of the approval. No further actions were identified.

A request for additional reporting requirements was received from NSW Department of Planning and Environment (DPE) on the 16 December 2022. A summary of the requirements and relevant updated section of the Annual Review is provided in ***Table 5-1***.

Table 5-1 Summary of additional reporting requirements by DPE to the 2022 Annual Review

Topic	Additional reporting requirement	Annual Review section updated
Biodiversity offsets	Report on the status of the long term security arrangement for biodiversity offsets required by the development consent for the mine. Please include information on the type(s) of long term security arrangements that have been implemented and/or are to be implemented for the mine.	***8.5 – Biodiversity Offset Management***
Greenhouse gas	Report on greenhouse gas emissions for the reporting period and include a comparison of actual greenhouse gas emissions against the predictions in the environmental assessment(s) for the mine. Please ensure that the method used to calculate the environmental assessment prediction(s) and annual emissions are calculated the same.	***6.4.1 – Reported greenhouse gas emissions*** ***6.4.2 – Comparison against predictions***
Greenhouse gas	Report all reasonable and feasible steps undertaken during the reporting period to improve energy efficiency and reduce greenhouse gas emissions generated by the mine.	***6.4.3 – Steps taken to improve energy efficiency and reduce GHG emissions***

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. The program addresses the requirements contained in DA 305-11-01.

Monthly attended noise monitoring is undertaken at representative locations surrounding LCO, shown in ***Figure 6-1.***

LCO has a real-time, directional noise monitoring unit programmed to send an SMS to key operational personnel when a trigger noise level is reached. Alarm conditions are measured and calculated with respect to low frequency noise levels, which is the noise frequency consistent with continuous open cut mining noise. It 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 identified in 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*** 6-1**.**

Table 6-1 Development consent noise impact assessment criteria

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 6-1*** 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.

6.1.1 Noise Monitoring Results

Attended compliance noise monitoring during the reporting period was undertaken on a monthly basis by a specialist noise consultant (EMM/Global Acoustics) at two representative neighbouring residential locations along Hebden Road (see ***Figure 6-1***). $L_{Aeq(15\ minute)}$ and $L_{A1(1\ minute)}$ measurements against compliance criteria are detailed in ***Table 6-2.***

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

Table 6-2 Noise monitoring results

Location	Date	Wind Speed (m/s)	LCO $L_{Aeq\ (15min)}$ (dB)	LCO $L_{A1\ (1min)}$ (dB)	Exceedance
January					
1317 Hebden Road	24/01/2022	3.5	IA	IA	Nil
1246 Hebden Road	24/01/2022	3.2	IA	IA	Nil
February					
1317 Hebden Road	09/02/2022	0.4	28	30	Nil
1246 Hebden Road	10/02/2022	0.3	28	30	Nil
March					
1317 Hebden Road	15/03/2022	2.2	<20	<20	Nil
1246 Hebden Road	15/03/2022	2.3	<25	27	NA
April					
1317 Hebden Road	20/04/2022	2.1	33	35	Nil
1246 Hebden Road	20/04/2022	3.5	28	32	NA
May					
1317 Hebden Road	19/05/2022	2.7	<25	27	Nil
1246 Hebden Road	19/05/2022	0.6	26	30	Nil
June					
1317 Hebden Road	22/06/2022	1.9	32	36	Nil
1246 Hebden Road	22/06/2022	1.4	31	35	Nil
July					
1317 Hebden Road	25/07/2022	1.0	27	30	Nil

Location	Date	Wind Speed (m/s)	LCO $L_{Aeq\ (15min)}$ (dB)	LCO $L_{A1\ (1min)}$ (dB)	Exceedance
1246 Hebden Road	25/07/2022	1.0	29	34	Nil
August					
1317 Hebden Road	10/08/2022	1.7	<20	<20	Nil
1246 Hebden Road	10/08/2022	1.2	IA	IA	Nil
September					
1317 Hebden Road	07/09/2022	1.9	IA	IA	Nil
1246 Hebden Road	07/09/2022	1.8	IA	IA	Nil
October					
1317 Hebden Road	27/10/2022	2.2	28	31	Nil
1246 Hebden Road	27/10/2022	2.2	32	36	NA
November					
1317 Hebden Road	16/11/2022	1.7	28	30	Nil
1246 Hebden Road	16/11/2022	2.0	35	37	Nil
December					
1317 Hebden Road	06/12/2022	3.3	<25	<25	Nil
1246 Hebden Road	06/12/2022	3.0	IA	IA	Nil

Notes to Table:

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.

6.1.2 Comparison to EA Predictions and Monitoring Trends

The Liddell Coal EA (2015) proposes that modifications to the development consent would not produce an exceedance of the LCO operational specific noise criteria ($L_{Aeq\ (15min)}$ 35 dB(A)) and ($L_{A1(1\ minute)}$ 45 dB(A)) at any surrounding privately owned residence during the reporting period. All noise monitoring events during 2022 were in accordance with these predictions. The long-term trend of noise results from 2019 to 2022 is compliant with the assessment criteria. Low level noise or inaudible results are generally recorded. The long term trend of results range from <20 to 34 (db) for $L_{Aeq(15\ minute)}$ and <20 to 44 (db) for $L_{A1(1\ minute)}$, with no non-compliances for the period

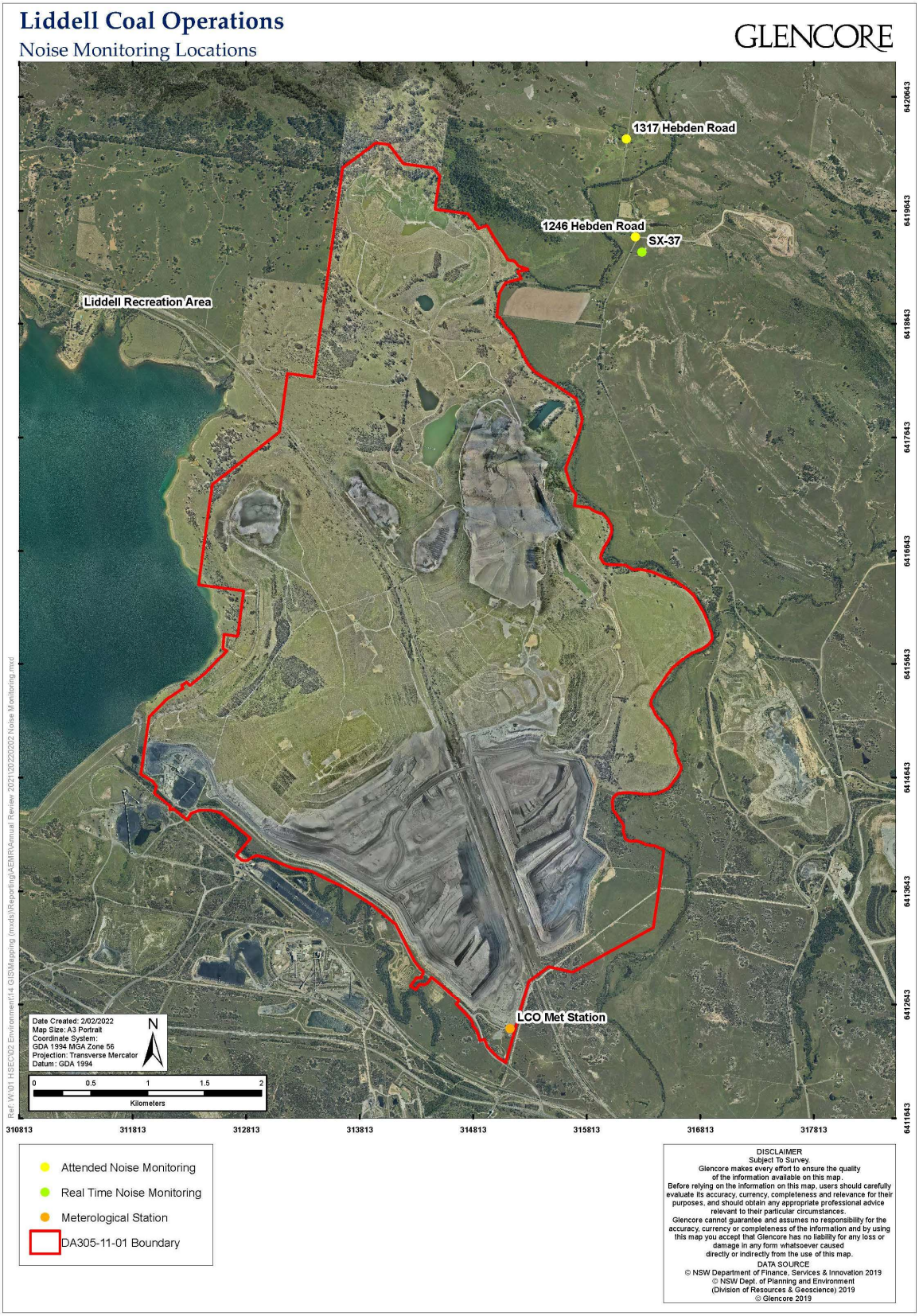

Figure 6-1 Noise monitoring locations

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 6-3*** below sets out the blasting impact assessment criteria for the reporting year as per DA-305-11-01.

Table 6-3 Blasting impact assessment criteria as per DA-305-11-01

Location	Airblast overpressure level $dBL_{in\ Peak}$	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	N/A		
		Limits applicable 2 April 2020 – present ≤30 for >12 Hz ≤26 for <12 Hz	0%
Other public infrastructure*	N/A	50	0%
Chain of Ponds Inn	150	50	0%

Notes:
*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).

6.2.1 Chain of Ponds Inn Blast Management Strategy

Additional to the blasting impact criteria specifically identified in the DA, the Chain of Ponds Inn (COPI) 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.

The adaptive management approach to blasting in the vicinity of COPI includes:

- A staged increase in the vibration level and air blast exposure
- Continual monitoring of vibration and air blast levels and corresponding structural behaviour

Limits for blast overpressure and ground vibration at the Chain of Ponds Inn have been gradually increased since 2015 as a result of the adaptive management process. 2022 blast criteria for maximum PPV was 50mm/s and a corresponding 150 dBL (implemented 4 October 2019 in accordance with the approved Blast Management Strategy). Further detail of management of COPI is in ***Section 6.7.*** This section only examines compliance with applicable limits during the reporting period.

6.2.2 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.

The temporary increase agreed to expired on 1 April 2020, at which point the limits reverted back to those agreed in 2017. Blasting activities have since moved well beyond the 350m control zone though monitoring is still completed to verify compliance.

6.2.3 Blast Monitoring Results

Blast monitoring locations are presented in ***Figure 6-2*** and monitoring results for the reporting period are provided in ***Appendix E -.***

Blast monitoring was undertaken at two privately owned residences, the Chain of Ponds Inn and Newdell Substation throughout the reporting period. There were 96 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 except Chain of Ponds Inn which recorded 95.8% blast data.

During the reporting period a failure to monitor non-compliance with DA305-11-01 ***Schedule 3 Condition 11c*** was reported. Four consecutive blast events (13/09/2022, 14/09/2022, and two blasts on 20/09/2022) failed to monitor, due to equipment damage. A non-compliance notification as per DA305-11-01 ***Schedule 5 Condition 12*** was submitted to DPE on the 27th September 2022.

A summary of blasting performance against DA305-11-01 during the reporting period is presented in ***Table 6-4.***

Table 6-4 Blasting performance summary

Location	Airblast overpressure level *$dBL_{in\ Peak}$*	Ground Vibration *mm/s*	Allowable exceedance	Performance during the reporting period	Key management implications	Proposed management actions
Residence on privately owned land (*Scrivens, Burlings*)	115	5	5% of the total number of blasts over a 12 month period	Compliant	N/A	None required
	120	10	0%			
Newdell Zone Substation*	N/A	*Limits applicable 2 April 2020 - present* ≤30 for >12 Hz	≤26 for <12 Hz 0%	Compliant	Blasting operations have moved outside the 350m control zone for the Substation.	Continued implementation of the approved Strategy and Agreements executed with Ausgrid (refer ***Section 6.2.2***). Update the Strategy to reflect blasting operations complete within control zone.
Other public infrastructure	N/A	50	0%	Compliant	N/A	None required

Location	Airblast overpressure level *$dBL_{in\ Peak}$*	Ground Vibration *mm/s*	Allowable exceedance	Performance during the reporting period	Key management implications	Proposed management actions
Chain of Ponds Inn	150	50	0%	Compliant	Ongoing periodic inspection program	Continued implementation of the approved Strategy (refer ***Section 6.2.1***). Update the strategy in consultation with building owner, Heritage NSW and DPIE once blasting is complete in the 350m control zone.

6.2.4 Comparison to EA Predictions and Monitoring Trends

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. During 2022, compliance with the EA predictions was observed. The long-term trend of the blast results from 2019 to 2022 is compliant with the assessment criteria.

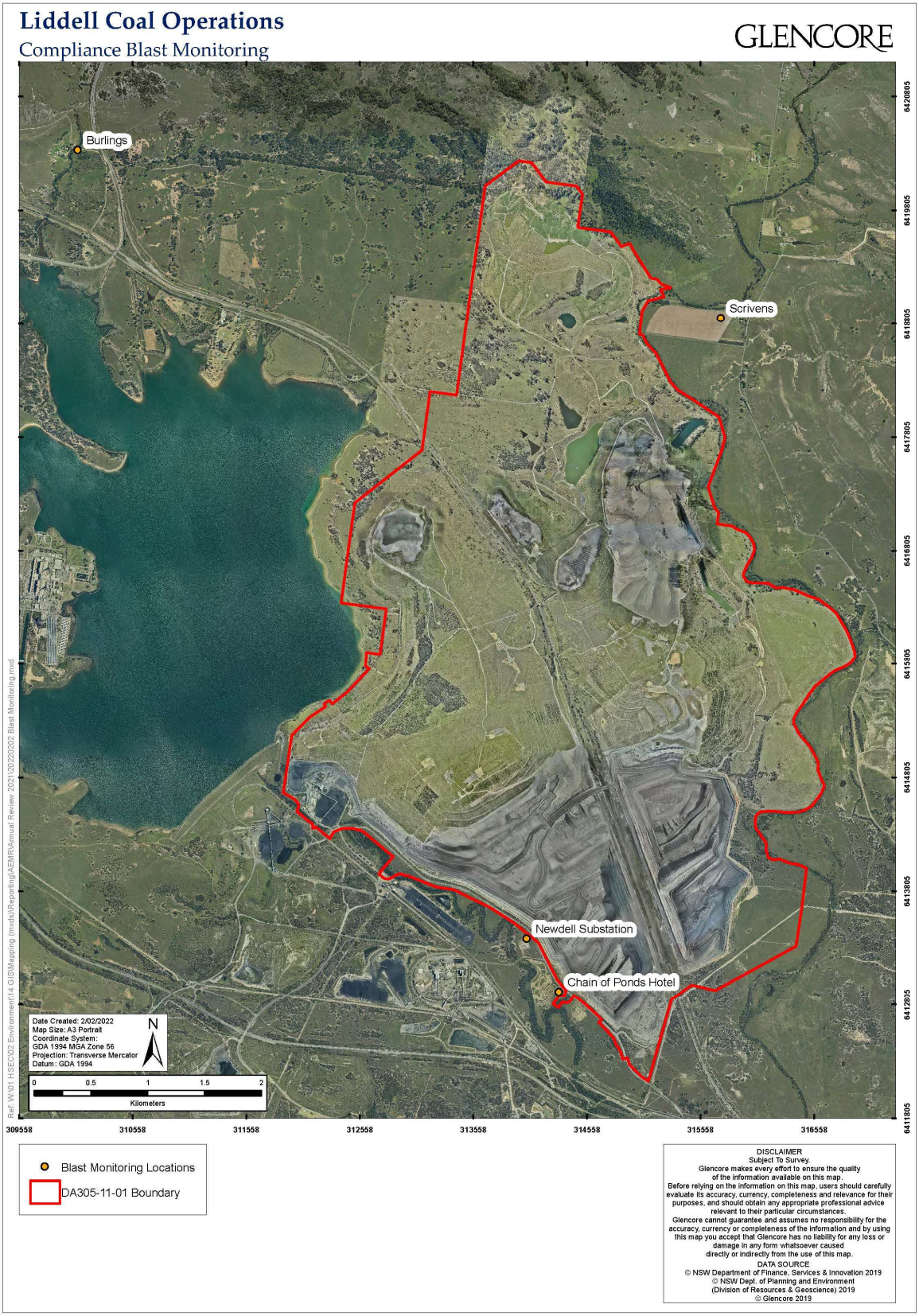

Figure 6-2 Compliance blast monitoring locations

6.3 Air Quality

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

The AQMMP was developed in accordance with ***Schedule 3 Condition 19*** of DA-305-11-01. In accordance with this condition, the AQMMP includes a combination of deposited dust gauges, 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 6-3.***

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 provides 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.

6.3.1 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 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 6-5.***

Table 6-5 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]2 g/m^2/month	[a]4 g/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/m3). Dust concentration is measured as total suspended particulate matter (TSP) and particulate matter of less than 10 microns in diameter (PM10). 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 6-6***.

Table 6-6 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.

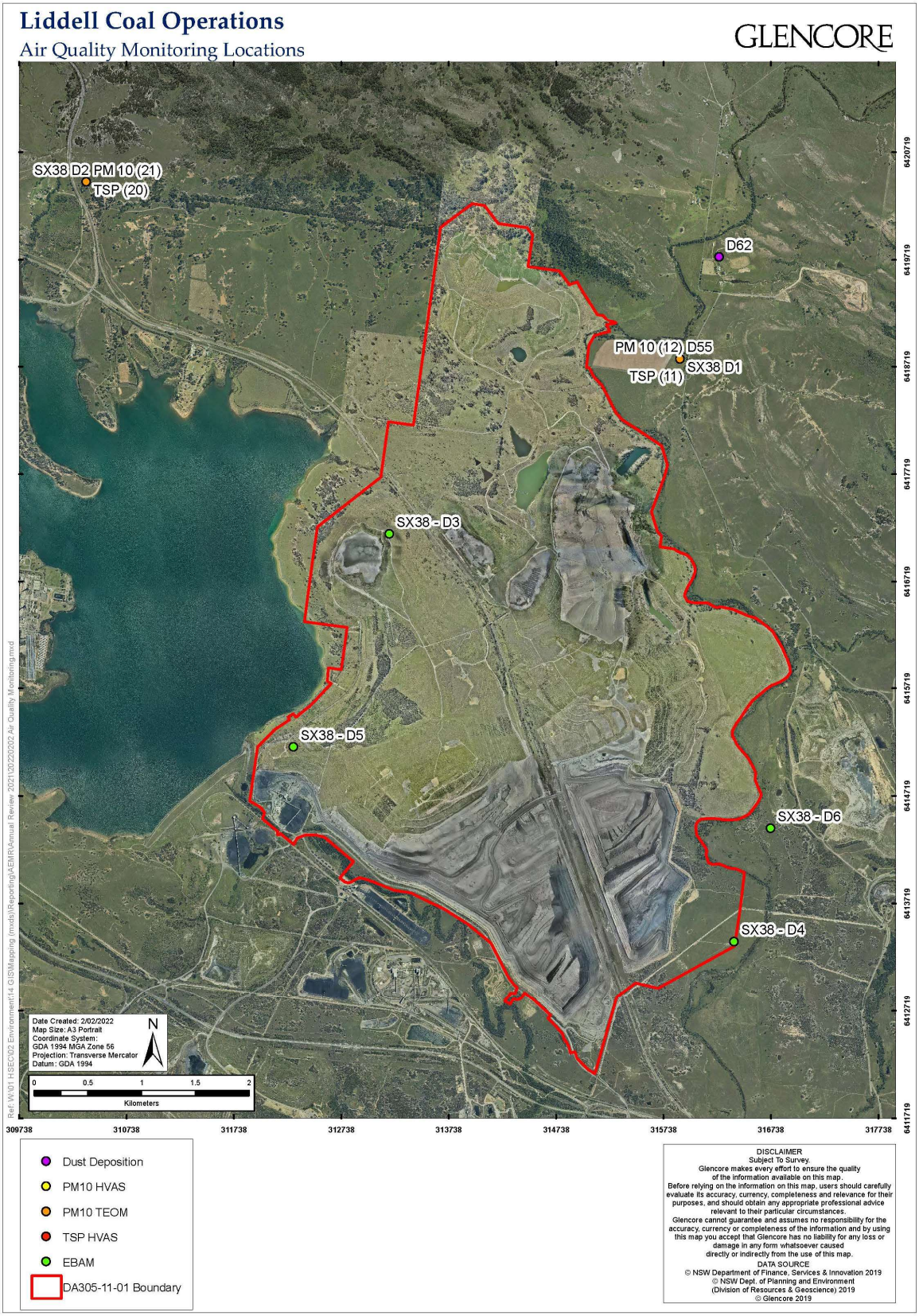

Figure 6-3 Air quality monitoring locations

6.3.2 Deposited Dust

The location of LCO's compliance depositional dust gauges are shown on ***Figure 6-3.*** 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 and are shown in ***Figure 6-4*** and ***Figure 6-5***. 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*** 6-7 ***Table 6-7***.

Table 6-7 Annual average depositional dust compliance summary

Monitoring location	Annual Average *(g/m2/month)*		Performance during the reporting period	Key management implications	Proposed management actions
	Max. total deposited dust	Max. increase in deposited dust			
D55	4	2	Compliant	N/A	None required
D62			Compliant	N/A	None required

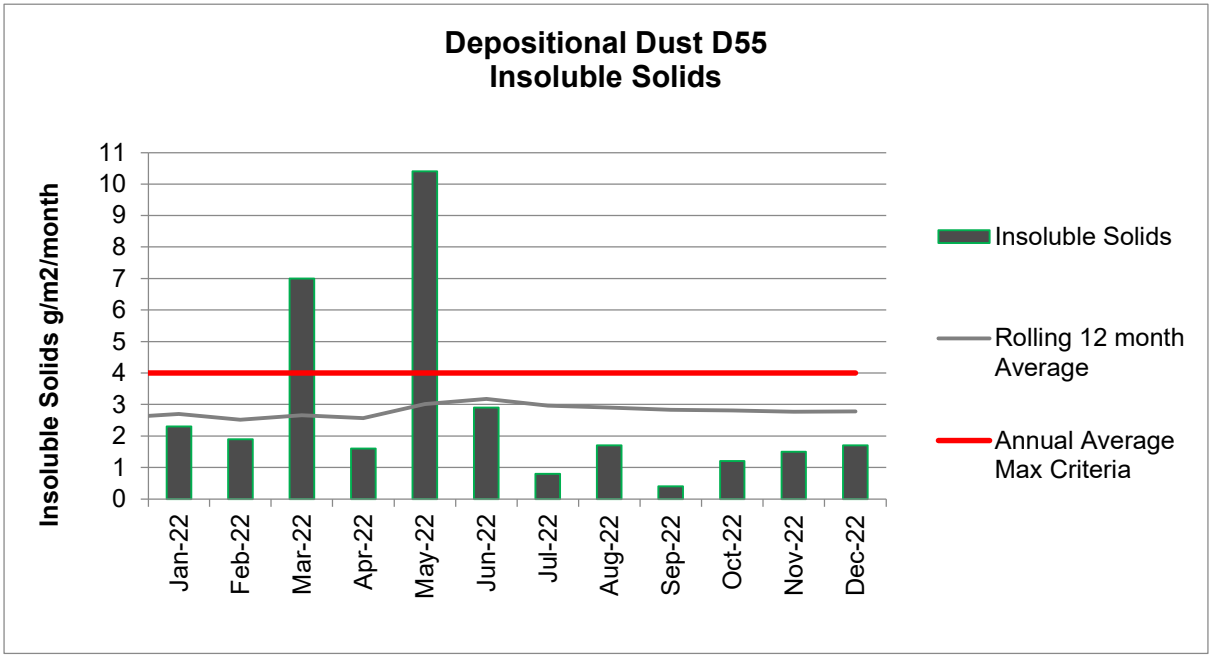

Figure 6-4 Depositional Dust D55 annual results

Note that in ***Figure 6-4***, results for March 2022 were elevated due to the paddock next to the dust gauge being ploughed. The results for May 2022 were elevated due to a large amount of course sediment in the sample. While monthly results vary, depositional dust compliance at monitor D55 is

assessed on the annual rolling average which remained under the compliance criteria throughout 2022.

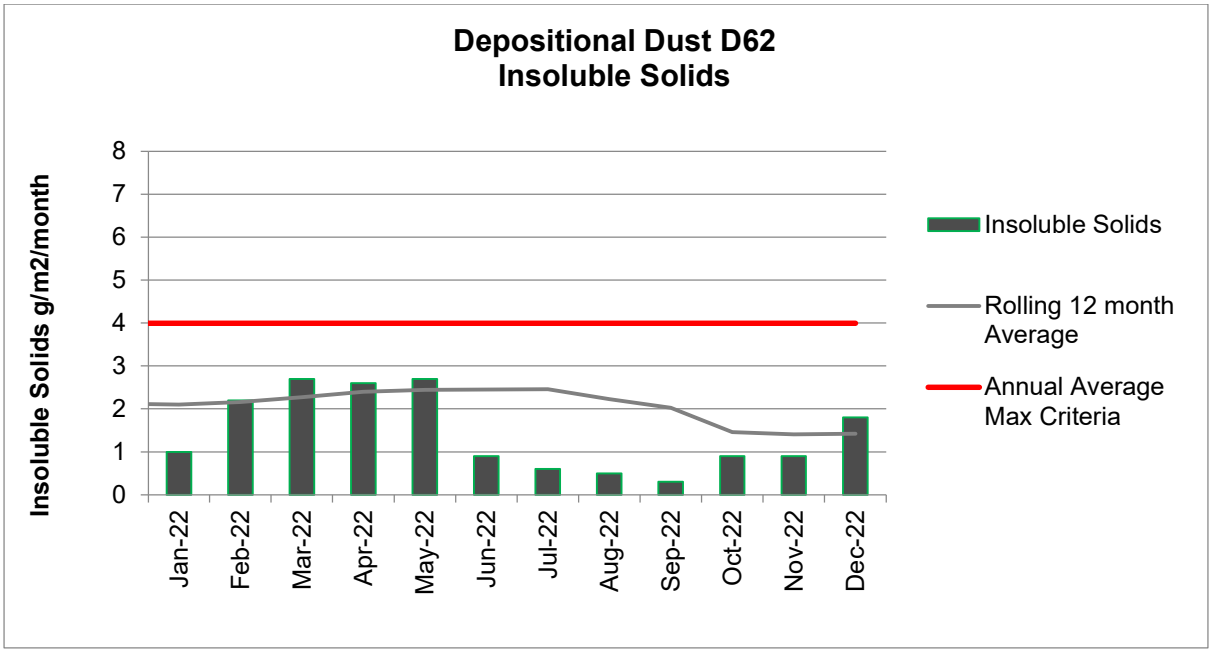

Figure 6-5 Depositional Dust D62 annual results

Figure 6-5 displays variable results at D62, however like D55 compliance is assessed on the annual rolling average which remained under the compliance criteria throughout 2022.

6.3.2.1 Deposited Dust - Comparison to EA Predictions and Monitoring Trends

The Liddell Coal Modification to Development Consent Environmental Assessment (EA) (Pacific Environment Limited, 2013) predicted that the modifications alone, or cumulatively, would 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, as identified in ***Table 6-7.*** Long term monitoring trends of depositional dust results are shown in ***Figure 6-6*** and ***Figure 6-7***. Results continue to be below the maximum annual average with some variation in monthly results.

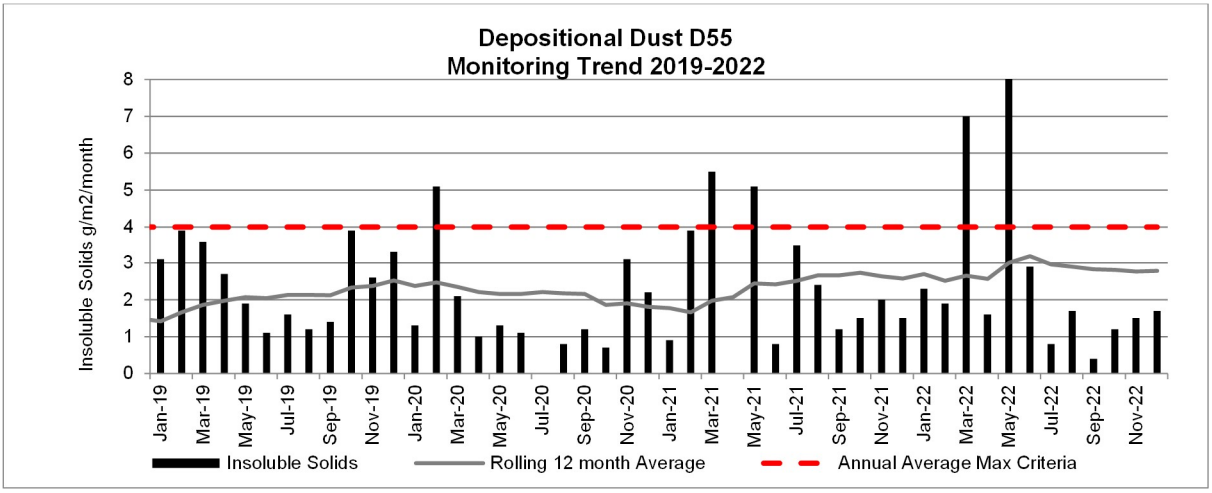

Figure 6-6 Depositional dust D55 monitoring trend 2019-2022

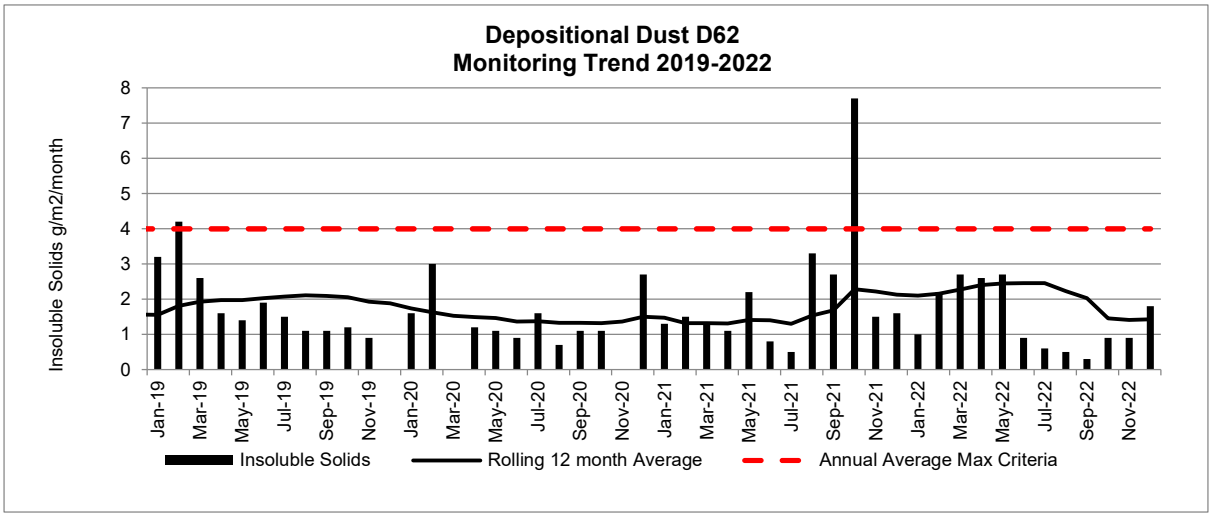

Figure 6-7 - Depositional dust D62 monitoring trend 2019-2022

6.3.3 High Volume Air Sampling - TSP

LCO operates two compliance High Volume Air Samplers (HVAS) which sample Total Suspended Particulates (TSP), as shown in ***Figure 6-3.*** In accordance with the Air Quality Monitoring Program and EPL requirements, TSP is measured by the HVAS every six days.

During the reporting period a failure to monitor non-compliance with DA305-11-01 ***Schedule 3 Condition 16*** was reported. Monitoring unit HVAS 11 (Scriven) failed to monitor TSP on one occasion. A non-compliance notification as per DA305-11-01 ***Schedule 5 Condition 12*** was submitted to DPE on the ***14th February*** **2022**.

TSP monitoring results are presented in ***Figure 6-8, Figure 6-9*** and provided in ***Appendix C.***

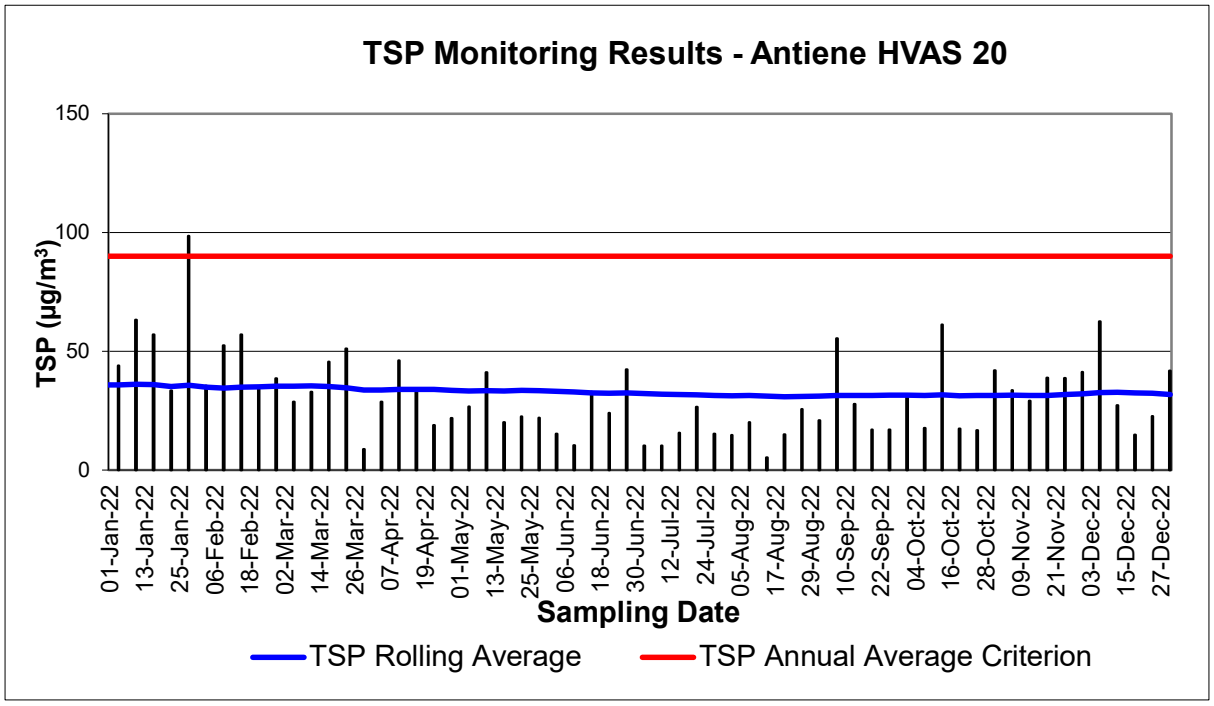

Figure 6-8 Antiene HVAS TSP annual results

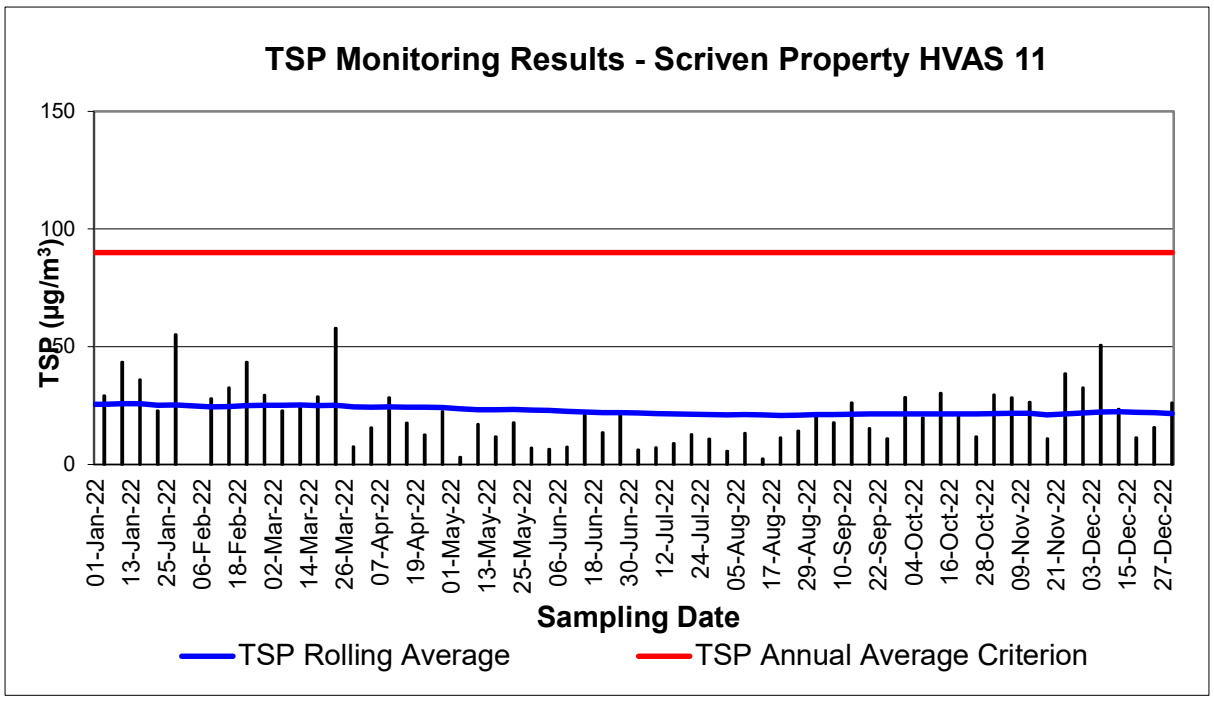

Figure 6-9 Scrivens HVAS TSP annual results

During the reporting period, both monitoring sites complied with the TSP annual average criteria. A summary of LCO's HVAS TSP performance with compliance criteria is presented in ***Table 6-8.***

The annual rolling average TSP at the completion of 2022 was:

- 42 µg/m^3 at HVAS 20 (Antiene)
- 26 µg/m^3 at HVAS 11 (Scriven)

Table 6-8 Annual average TSP compliance summary

Monitoring location	Approval Criteria *(µg/m^3)*	Performance during the reporting period	Key management implications	Proposed management actions
HVAS 20 (Antiene)	90	Compliant	N/A	None required
HVAS 11 (Scriven)				

6.3.4 High Volume Air Sampling – PM10

LCO operates two compliance High Volume Air Samplers (HVAS) which sample fine particulates with an aerodynamic diameter of less than 10 microns (PM10), as shown in ***Figure 6-3***. In accordance with the Air Quality Management and Monitoring Program and EPL requirements, PM10 is measured by the samplers every six days.

During the reporting period, two failures to monitor non-compliances with DA305-11-01 ***Schedule 3 Condition 16*** were reported. Monitoring unit HVAS 12 (Scriven) failed to monitor PM10 on one occasion and monitoring unit HVAS 21 (Antiene) failed to monitor PM10 on one occasion. A non-compliance notification as per DA305-11-01 ***Schedule 5 Condition 12*** was submitted to DPE on the ***14th February*** **2022**.

PM10 monitoring results are presented in ***Figure 6-10*** and ***Figure 6-11,*** 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.

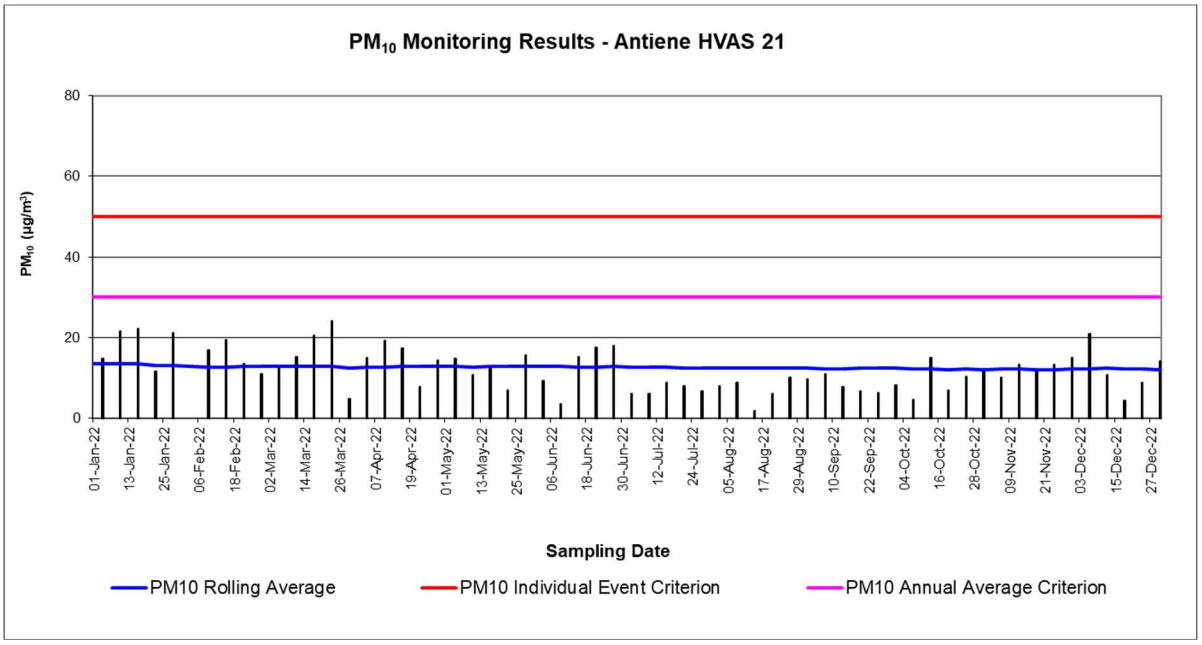

Figure 6-10 - Antiene PM10 (HVAS 21) annual results

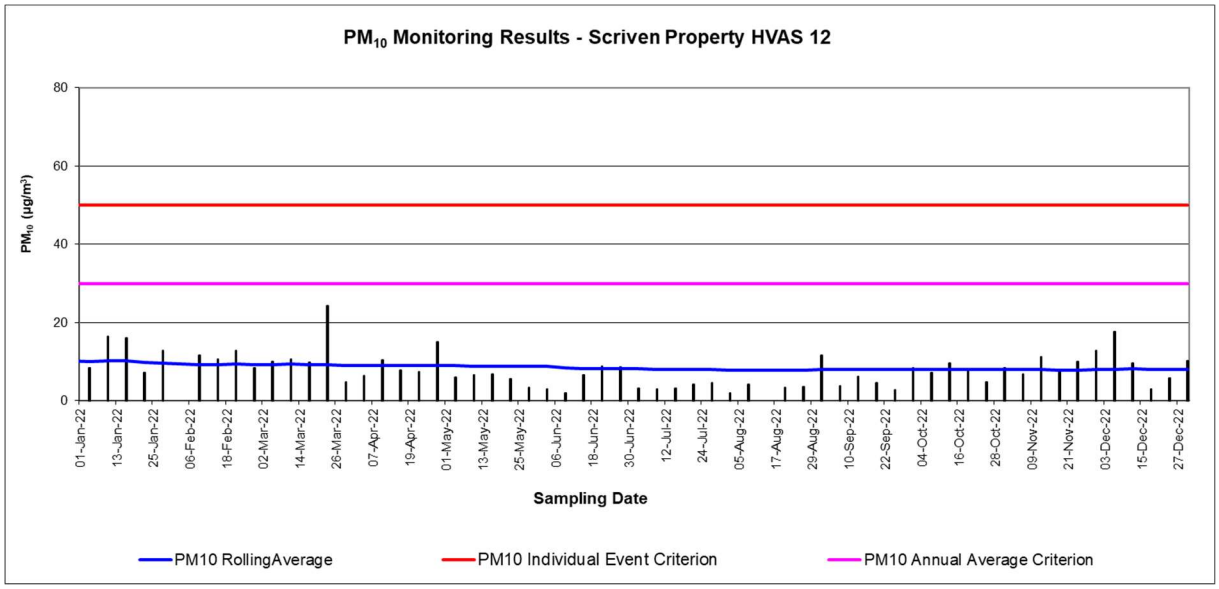

Figure 6-11 - Scrivens PM10 (HVAS 12) annual results

During the reporting period, LCO complied with the PM_{10} long term (annual rolling average), and short term 24 hour criterion. A summary of LCO's HVAS PM_{10} performance with compliance criteria is presented in ***Table 6-9.***

The annual rolling average PM_{10} at the completion of 2022 was:

- 12 µg/m^3 at HVAS 21 (Antiene)
- 8 µg/m^3 at HVAS 12 (Scriven)

Table 6-9 Annual average HVAS PM10 compliance summary

Monitoring location	Approval Criteria *(µg/m^3)*	Performance during the reporting period	Key management implications	Proposed management actions
HVAS 21 (Antiene)	30	Compliant	N/A	None required
HVAS 12 (Scriven)				

Table 6-10 Short-term average HVAS PM10 compliance summary

Monitoring location	Approval Criteria *(µg/m^3)*	Performance during the reporting period	Key management implications	Proposed management actions
HVAS 21 (Antiene)	50	Compliant	N/A	None required
HVAS 12 (Scriven)				

6.3.4.1 High Volume Air Samplers - Comparison to EA Predictions and Monitoring Trends

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 were predicted to experience annual average PM10 levels above the relevant criterion, as per ***Table 6-6,*** on an annual basis. All annual averages at high volume air samplers were below the maximum annual average PM_{10} of 30 µg/m^3, as the modelling predicted. Long term monitoring trends of HVAS PM_{10} are shown in ***Figure 6-12*** and ***Figure 6-13***. Results continue to be below the maximum annual rolling average with only a small number of exceedances of the 24 hours short term criteria during the peak of drought and bushfires.

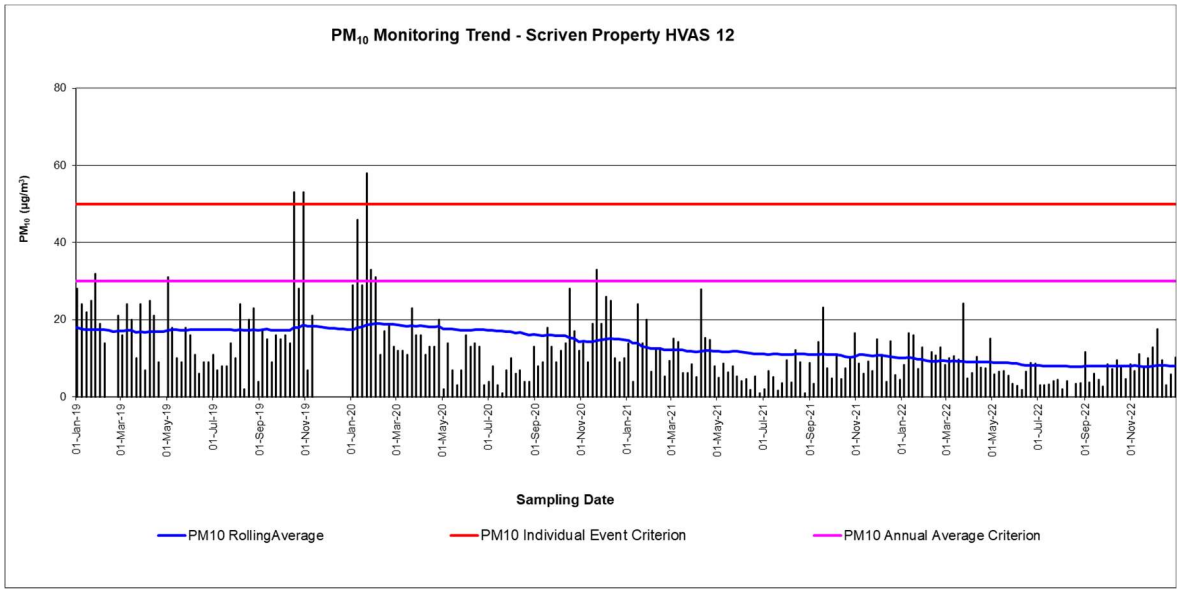

Figure 6-12 – Scriven HVAS PM10 monitoring trend 2019-2022

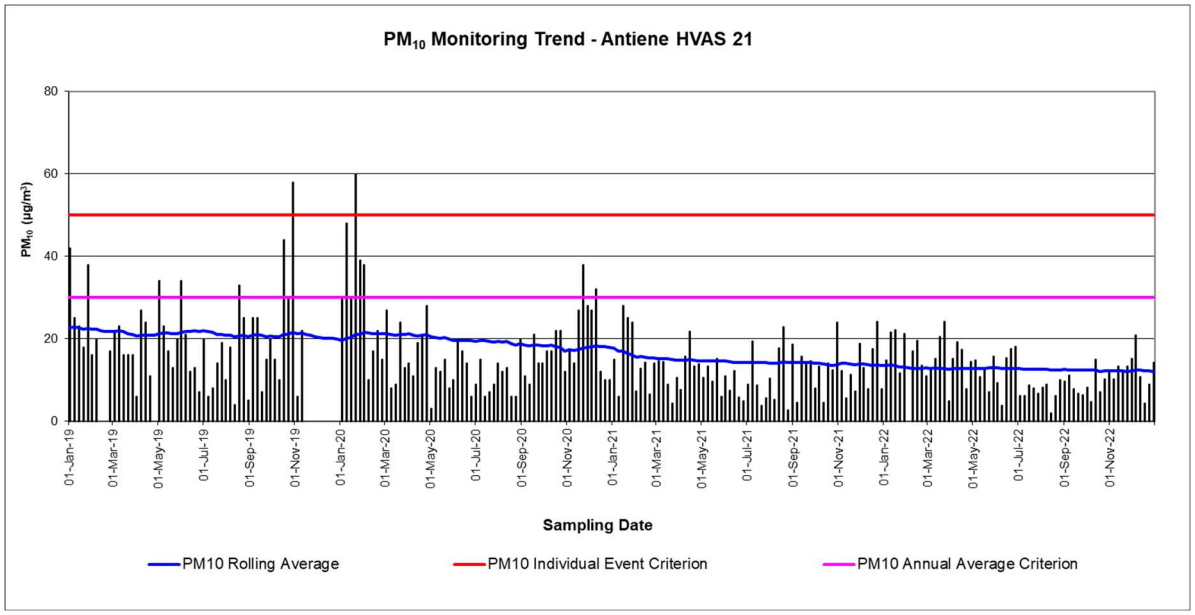

Figure 6-13 Antiene HVAS PM10 monitoring trend 2019-2022

6.3.5 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.

During the reporting period, LCO complied with the PM_{10} long term (annual rolling average) criterion at monitors DX38-D1 (Scrivens) and SX38-D2 (Antiene). A summary of LCO's TEOM PM_{10} performance with compliance criteria is presented in ***Table 6-11.***

Table 6-11 Annual average TEOM PM10 compliance summary

Monitoring location	Approval Criteria *(µg/m³)*	Performance during the reporting period	Key management implications	Proposed management actions
SX38-D1 (Scriven)	30	Compliant	N/A	None required
SX38-D2 (Antiene)				

The annual rolling average PM_{10} at the completion of 2022 was:

- 12.3 µg/m³ at SX38-D1 (Scriven)
- 15.6 µg/m³ at SX38-D2 (Antiene)

The short term 24 hour criterion (50 µg/m³) was not exceeded during the reporting period at continuous monitoring units SX38-D1 and SX38-D2.

During the reporting period, continuous monitoring points SX38-D1 and SX38-D2 achieved data availability of 98.8% and 99.2% respectively.

PM10 monitoring results are presented in ***Figure 6-14*** and ***Figure 6-15***.

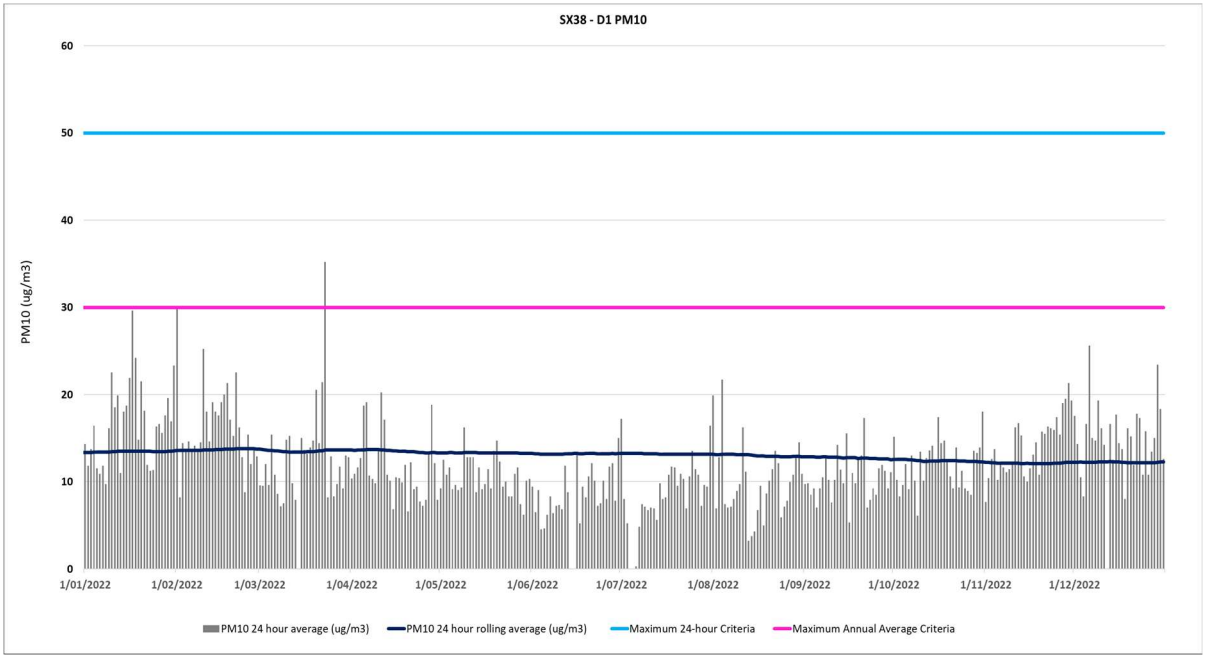

Figure 6-14 SX38-D1 TEOM PM10 results

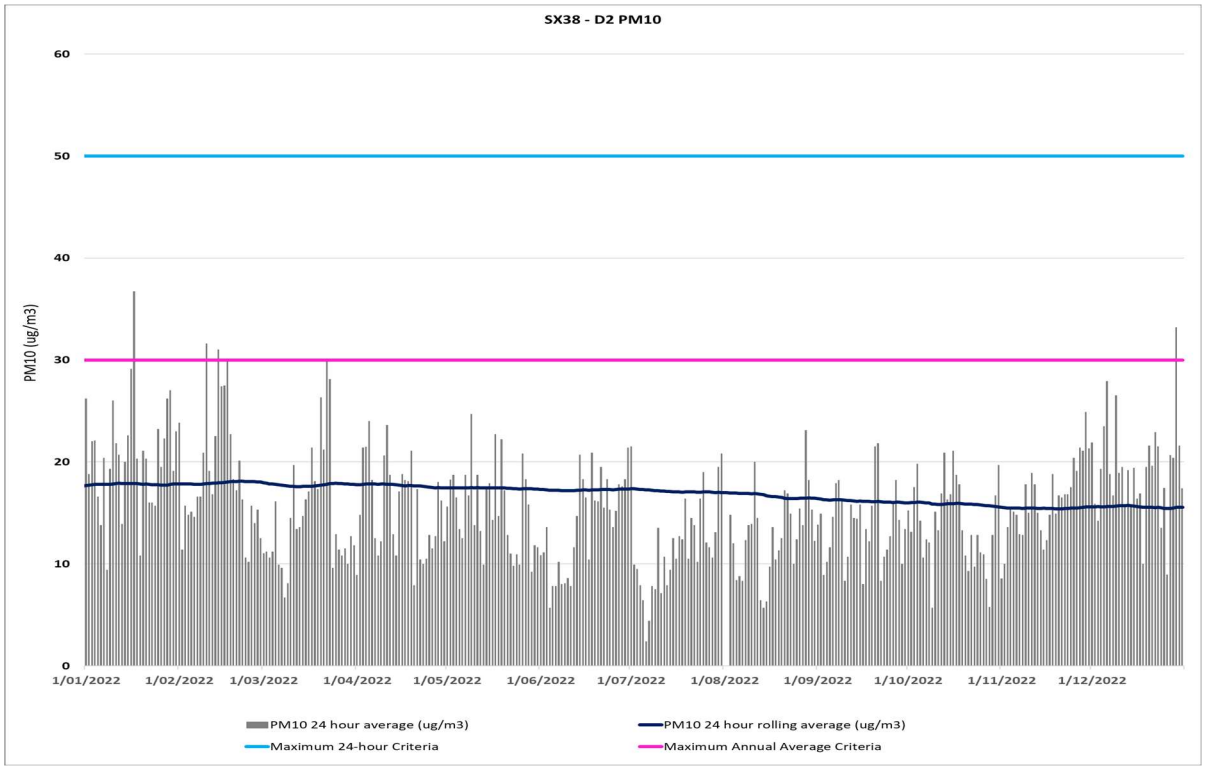

Figure 6-15 SX38-D2 TEOM PM10 results

6.3.5.1 Continuous PM10 Monitoring - Comparison to EA Predictions and Monitoring Trend

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%. All annual averages at the TEOM monitors were below the maximum annual average PM_{10} of 30 µg/m^3, as the modelling predicted.

Long term monitoring trends of continuous HVAS PM_{10} are shown in ***Figure 6-16*** and ***Figure 6-17.*** Results continue to be below the maximum annual rolling average with only a small number of exceedances of the 24 hours short term criteria during the peak of drought and bushfires.

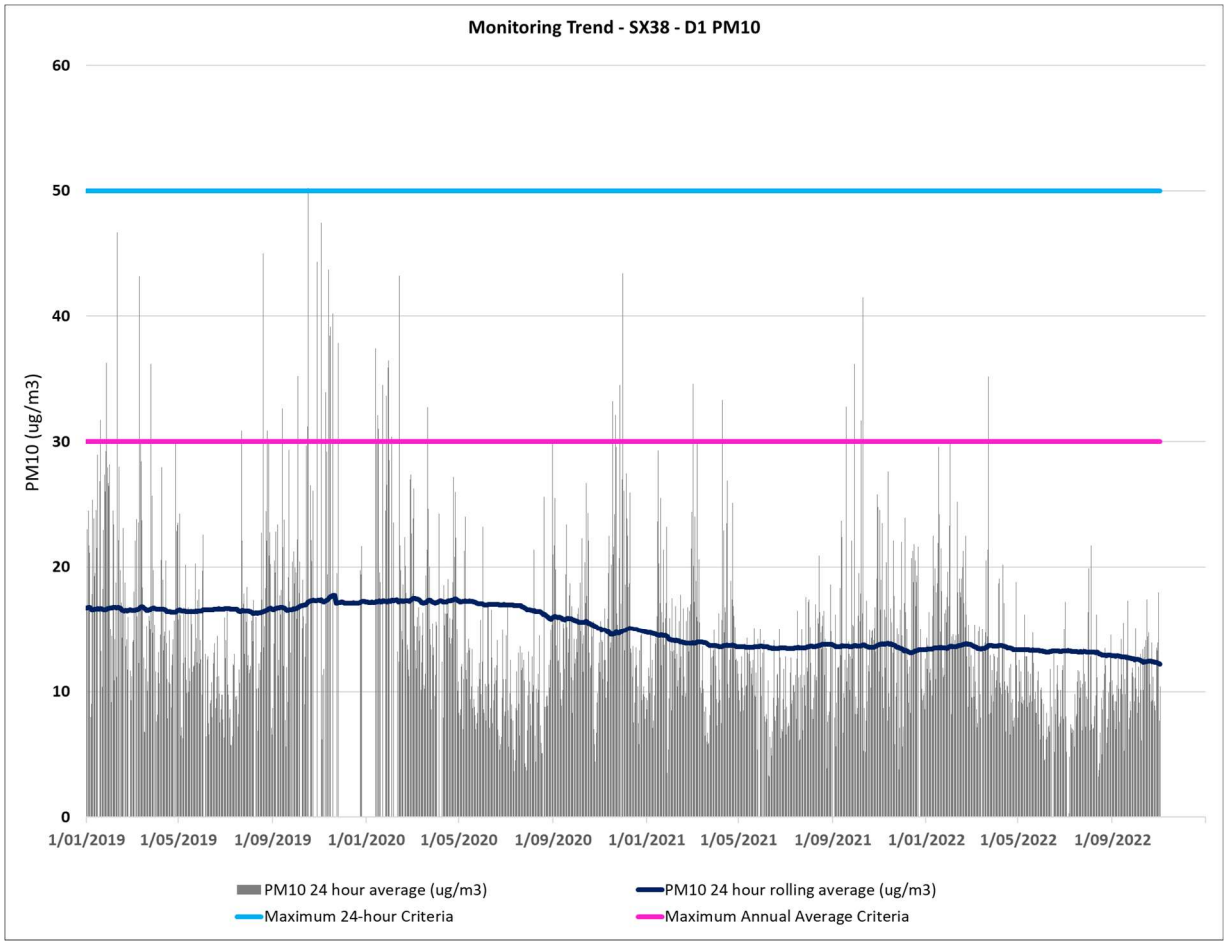

Figure 6-16 SX38 D1 TEOM monitoring trend 2019-2022

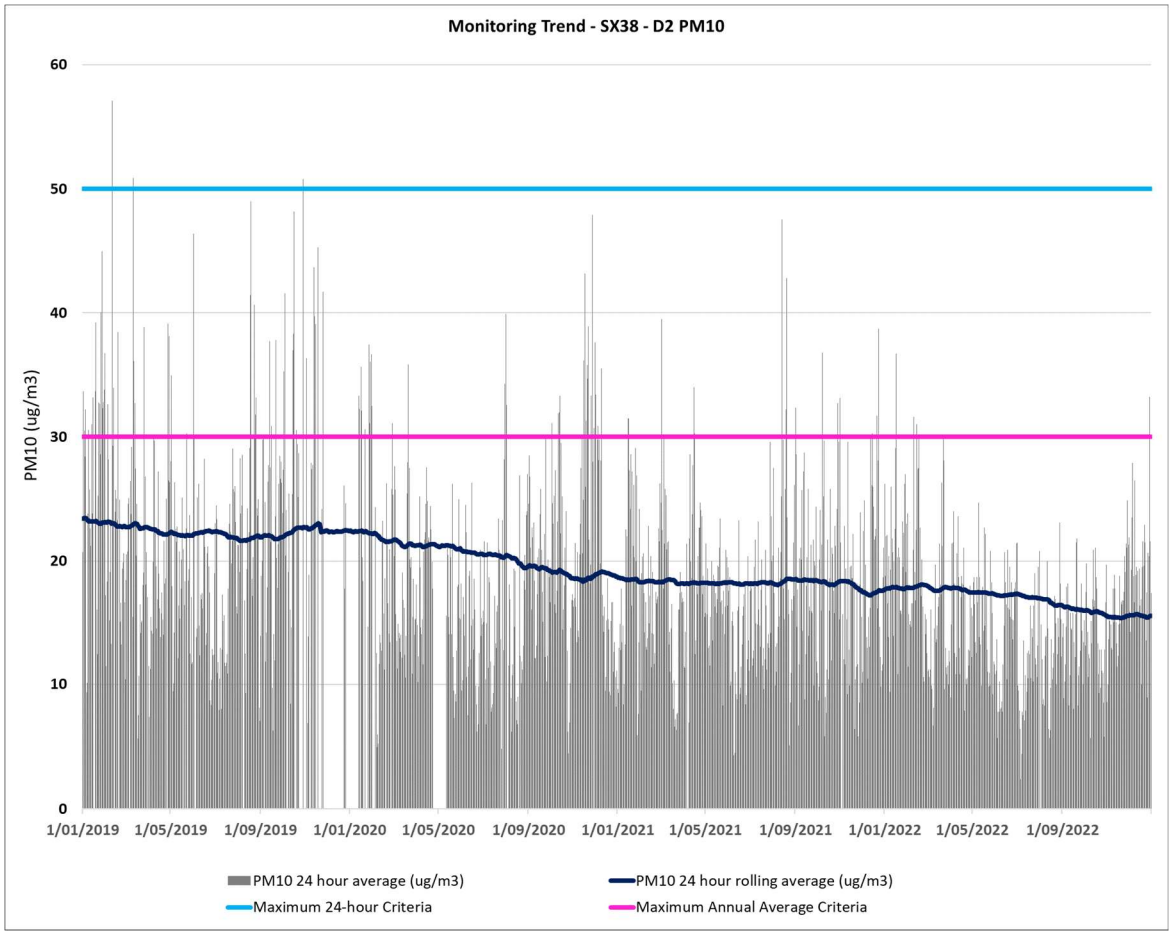

Figure 6-17 SX38 D2 TEOM monitoring trend 2019-2022

6.3.6 Continuous PM10 Monitoring - EBAMs

EPL 2094 Condition M2.2 requires the continuous monitoring of four EBAM boundary monitoring units (as shown in ***Figure 6-3***). 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. Failure to monitor PM10 continuously in accordance with Section 4.4 of the approved LCO AQMMP included:

- SX38-D3 – 14 occasions
- SX38-D4 – 19 occasions
- SX38-D5 –10 occasions
- SX38-D6 – 9 occasions

Table 6-12 below identifies for each of the four monitoring units the dates in which PM10 data availability greater than 75% was not achieved.

Table 6-12 Failure to meet PM10 data availability instances - EBAMs

Monitoring Unit	Monitoring Period	Data Availability *(%)*	Comments
SX38-D3	15/02/2022	29.2%	Flow failure
	18/02/2022	51.4%	Flow failure
	1/04/2022	52.1%	Unit stopped. Replaced 4x batteries
	26/05/2022 to 27/05/2022	12.5% 55.6%	Power failed
	7/06/2022 – 9/06/2022	52.8% 27.1% 61.1%	Issue with pressure sensor and other alarms, then monitor stopped. Replaced data taker. Flows erratic leading to high dust levels
	23/06/2022	66.7%	Filter pressure alarms. Investigated filter pressure alarms. Calibrated
	4/07/2022	35.4%	Replaced batteries with recharged spares
	8/07/2022	44.4%	Power outage
	21/07/2022-22/07/2022	49.3% 45.8%	Upgraded solar panels and solar controller firmware, 12M PM with zero noise filter installed overnight. Removed zero noise filter.
	6/12/2022	50.7%	EBAM stopped at 19:40 on 5/12/22 and restarted at 10:00 6/12/22. Cause unknown.
SX38-D4	8/02/2022	66.0%	Error writing to CF card. Corrected remotely.
	2/04/2022 – 3/04/2022	16.0% 0%	Unexplained instrument fault – symptoms show extended flow failure.
	5/04/2022 – 6/04/2022	52.8% 50.0%	Zero noise filter installed overnight.
	1/05/2022	13.9%	Power outage

Monitoring Unit	Monitoring Period	Data Availability *(%)*	Comments
	14/05/2022 – 16/05/2022	0% 0% 62.5%	Too little battery charge. Battery recharged 0900 16/5
	25/05/2022 – 27/05/2022	11.8% 0% 32.6%	Low voltage disconnect had engaged. Replaced batteries and cleaned solar panels.
	14/06/2022	37.5%	Tape failure. Hardware fail alarm and low flow alarms evident on arrival.
	2/07/2022 – 4/07/2022	62.5% 0% 0%	Stopped due to low battery charge on 2/7. Replaced batteries with recharged spares and data restored 5/07/2022.
	8/07/2022 – 9/07/2022	19.4% 66.7%	Break in both compliance and repository data – cause unknown
	13/07/2022	62.5%	Maintenance performed on monitor causing outage
SX38-D5	7/03/2022 – 10/03/2022	0% 0% 0% 41.7%	Flow failure. Replaced vacuum pump.
	1/04/2022	63.9%	Replacement of batteries required
	4/07/2022	12.5%	Replacement of batteries required
	7/07/2022 – 8/07/2022	36.8% 50.0%	Cause unknown as to the lost data
	21/07/2022 – 22/07/2022	44.4% 45.8%	Upgraded solar panels and solar controller firmware, 12M PM with zero noise filter installed overnight. Removed zero noise filter.
SX38-D6	16/05/2022	73.6%	Power failure
	31/05/2022 - 2/06/2022	65.3% 0%	Flow/power failure

Monitoring Unit	Monitoring Period	Data Availability *(%)*	Comments
		33.3%	
	4/07/2022 – 8/07/2022	0% 0% 0% 0% 59.7%	Monitor stopped due to poor weather until the batteries generated sufficient charge

Despite the above instances in which the four EBAM boundary monitors failed to achieve PM10 daily availability greater than 75%, the overall valid data availability for each unit during 2021 is shown in ***Table 6-13.***

Table 6-13 Annual PM10 data availability - EBAMs

Monitoring Unit	Overall data availability
SX38-D3	97.0%
SX38-D4	95.8%
SX38-D5	97.8%
SX38-D6	98.0%

6.3.7 Pollution Reduction Programs

During 2022, no new Pollution Reduction Programs were completed. LCO continued to implement Haul Road Dust Monitoring program as established from a 2013 PRP for ***Particulate Matter Control Best Practice – Wheel Generated Dust***. The 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 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 meteorological 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 January – 87%
- Q2 May – 83%
- Q3 August – 83%

- Q4 November – 87%

6.4 Greenhouse Gas Emissions

6.4.1 Reported Greenhouse Gas Emissions

LCO reports greenhouse gas emissions (GHG) in accordance with National Energy and Greenhouse Gases (NGER) legislation. Each financial year, LCO is required to submit to the federal government the emissions from their NGERs registered facility. Also, because LCO emits over 100kt of CO2e- each year, LCO is registered as a Safeguard facility and therefore also had a Safeguard baseline. Emissions above the baseline for that year need to be offset by retiring Australian Carbon Credit Units (ACCUs). The NGERs reporting year is based on a financial year, not a calendar year such as this Annual Review. In order to prevent incompatible public reporting, the values in this report also cover a financial year. The following Table 6-14 contains the Scope 1 (direct emissions from the mining activities during FY22), and Scope 2 emissions (electricity consumption by the mine during FY22).

Table 6-14 Scope 1 and Scope 2 emissions FY22

Scope 1 **tCO2e**	**Safeguard Baseline** **tCO2e**	**Scope 2** **tCO2e**
168, 363	176,827	20, 728

6.4.2 Comparison Against Predictions

In LCO's EIA for modification 5 of the development consent predicted Scope 1 emissions to total 329,569 tCO2e- for the calendar year of 2022. As seen in Table 6-14, Scope 1 emissions were well below this at 168,363 tCO2e- for FY22. However, Scope 2 emissions were predicted to be 11,878 tCO2e- for the calendar year of 2022 but were recorded as 20,728 tCO2e- for FY22. Because the time interval in the EIA and NGERs reporting year are different a direct comparison between the two is not possible. It is worth noting that the Mod 5 EIA did not consider water transfers via electric pumps between GRAWTS sites. Furthermore, LCO reported Scope 1 emissions were below the Safeguard Baseline limit.

6.4.3 Steps Taken to Improve Energy Efficiency and Reduce GHG Emissions

LCO is a part of a wider coal assets held by Glencore across Australia. Glencore Coal Assets Australia (GCAA) are themselves a part of the global Glencore mining portfolio. In line with the ambitions of the 1.5^{o}C scenarios set out by the IPCC, Glencore target a short-term reduction of 15% by 2026 and a medium-term 50% reduction of our total (Scope 1, 2 and 3) emissions by 2035 on 2019 levels. Post 2035, Glencore's ambition is to achieve, with a supportive policy environment, net zero total emissions by 2050.

Glencore incorporates energy costs and our carbon footprint into our annual planning process. Commodity departments, such as Glencore Coal Assets Australia, are required to provide energy and GHG emissions forecasts for each asset over the forward planning period and provide details of emissions reduction projects.

In the case of LCO this includes involvement with GCAA when considering available GHG abatement technology and mine planning to optimise efficiency (which usually translates into reduced fuel consumption).

6.5 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 2022, no lighting complaints were received.

6.5.1 Comparison to EA Predictions and Long-Term Trends

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 predicted no lighting complaints were received in 2022.

The long-term trend is generally compliant. Only 1 lighting complaint was received in 2020.

6.6 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. Site locations are shown in ***Figure 6-18.*** There was no further salvage of artefacts during the reporting period.

No additional consultation activities were held in 2022 outside of the annual inspection and meeting.

A replacement annual inspection with the Registered Aboriginal Parties (RAPs) for 2021 was held online 28th January 2022 and the presentation and minutes distributed to all RAPs. The planned annual inspection and meeting with the RAPs for 2022 was held on 6th December, 2022. Several items regarding archaeological site management were discussed, in summary:

- Sensitive Archaeological Landscape (SAL) exclusion of vehicles and persons;
- An update of closure works, review of heritage permits and management of artefacts post mine closure;
- Archaeological site and artefact management post mine closure;
- Site delineation including fencing, bunting, and signage particularly site LID35;

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

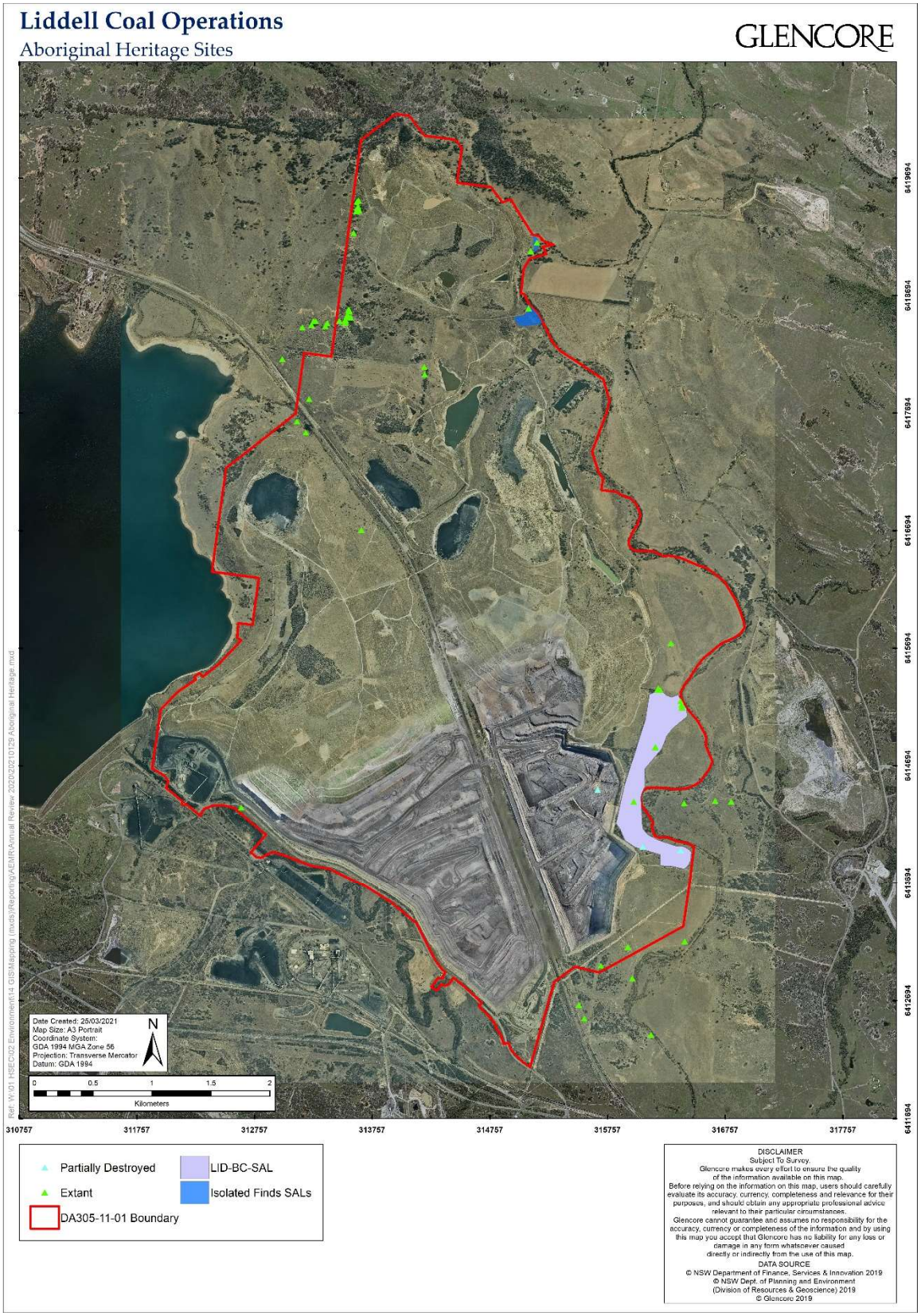

Figure 6-18 Aboriginal archaeological site locations

6.7 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 were 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.

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 350 metres of 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 blasting related impacts to the Inn Complex have been noted by either building vibration monitoring or visual inspection.

6.7.1 Management Actions During 2022

As per the requirements of the management strategy, continuous monitoring of blasting as well as structure response monitoring occurred during 2022. No stabilisation mitigation works were identified as being required. A summary of the building response monitoring is outlined below.

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.

6.7.2 Analysis of Blast Monitoring

In 2022, no additional monitoring was triggered from blasting within 350 metres of the Inn.

6.7.3 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.

6.7.4 Trends and Compliance

During 2022, there were no exceedances of the compliance limits at the Chain of Ponds Inn nor was there any significant damage resulting from 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.

6.7.5 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 2022.

6.7.6 Future Work

There are no future blasts scheduled within the 350 metre blast control zone. The current monitoring program will continue and as blasting has moved beyond the control zone LCO will seek to finalise management commitments of the approved Strategy in consultation with the building owner, Heritage NSW and DPE.

6.8 Exploration

No exploration activities were conducted by LCO in 2022.

6.9 Spontaneous Combustion

Fine coal along the ribs of exposed pillars in old underground workings associated with the Liddell coal seam were historically linked to spontaneous combustion at LCO. Measures to control spontaneous combustion are documented in the ***LCO Spontaneous Combustion Management Plan (SCMP)***.

To assist with the management of spontaneous combustion, the mine plan keeps the underground workings submerged with water for as long as possible to limit coal exposure to oxygen. An integrated pumping network enables underground workings to be de-watered just prior to excavation. By eliminating the coal's exposure to the atmosphere and thus its propensity to combust, a significant reduction in the environmental hazard has been realised.

LCO managed spontaneous combustion in the Entrance Pit during the reporting period. As per the mine plan, underground workings in the E06 and E07 strips were mined through during pit progression to the lower coal seams. Upon exposure, the workings exhibited spontaneous combustion visible in the highwall. Heat affected material was removed where possible, dumped low in spoil areas and covered with at least 20 m of inert material, as per the SCMP.

The Department was notified of the localised spontaneous combustion in December 2021 as a flare up caused a plume to be visible from the nearby New England Highway. The exposed underground working continued to show signs of spontaneous combustion throughout 2022. There were no odour or air quality complaints relating to spontaneous combustion during the reporting period.

The mine design incorporates benches for sealing off the high wall, which minimises the ingress of oxygen to exposed workings. The sealing of old underground tunnels in the highwall in the Entrance Pit occurred in 2022. This process involves dumping mine spoil and fines against the highwall, and using pit dozers to push the material against the highwall in line with the final landform design.

Where required, heat affected 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. Heat affected coal stockpiles did not occur in 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.

LCO are undertaking a detailed review of spontaneous combustion risks as part of mine closure planning and will prepare a management strategy during 2023. Following the completion of coal mining in the Entrance pit, exposed underground working will be buttressed with overburden material to provide long-term cover to limit air ingress into the workings to minimise spontaneous combustion in the long-term.

6.10 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.

6.10.1 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.

6.10.1.1 Course Rejects Disposal

Coarse rejects generated from the LCO CHPP are approximately 32% of ROM coal processed, and consist of carbonaceous shale, mudstone and claystone, with minor coarser rocks such as siltstone and sandstone. Coarse rejects are co-dispersed throughout the overburden dumps with a minimum of 5m cover from 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.

6.10.1.2 Reclaimed Tailings Transport

Under DA 305-11-01, up to 0.5 Mtpa of tailings reclaimed from LCO can be transported to Bayswater Power Station. The actual annual rate depends 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 2022.

6.10.1.3 Tailings Disposal

LCO has approval to dispose of tailings in the Antienne, Reservoir West, Reservoir South and the Durham emplacement areas at Liddell, and also to transfer tailings to Mount Owen's West Pit.

The Antienne tailings storage facility (TSF) reached capacity and use of the 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 recommenced capping operations on in late 2020 after a period of further drying and consolidation. Works continued in 2022 and approximately

37 ha of the TSF project area was rehabilitated, with the remaining areas planned to be completed in 2023 (includes adjacent Dam 4).

The Reservoir South TSF commenced capping in 2022. Works completed during the reporting period included site preparation, including removal of topsoil from rehabilitation areas, realignment of infrastructure around the work areas and installation of drainage, and commencement of emplacing the capping layer. Works will continue to progress throughout 2023.

The Reservoir West TSF remained in care and maintenance during 2022. Detailed design and geotechnical assessments were completed during 2022, with a High Risk Activity Notification submitted in February 2023. Initial works and capping are scheduled to commence during 2023.LCO commenced emplacement of tailings into Mount Owen's West Pit void in 2020 as approved under DA305-11-01 Modification 6 and this continued throughout 2022. Tailings was deposited into the LCO Durham TSF on occasion during 2022. Based on monitoring and consolidation forecasts, West Pit TSF has sufficient tailings disposal capacity for LCO life of mine. Deposition will continue into the West Pit void with occasional deposition to the Durham TSF during pipeline maintenance periods or outage.

6.10.1.4 Capping and Rehabilitation

Table 6-15 below shows indicative timeframes for capping and final rehabilitation for each facility which is subject to technical analysis of consolidation rates.

Table 6-15 Tailings emplacement and rehabilitation timeframes

Name	2022	2023	2024
RTEA (Reservoir South and West TSF)	Rehabilitation	Rehabilitation	Rehabilitation
Durham TSF	Active	Active	Rehabilitation
Antiene TSF	Rehabilitation	Rehabilitation	Monitoring and Maintenance
Mount Owen West Pit TSF	Active	Active	Active (LCO no longer emplacing tailings)

6.11 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 2022, no opportunities for waste minimisation or recycling improvements were identified. While the monthly recycling target was met

and exceeded during months of 2022, the annual total was within 1% of the target. ***Table 6-16*** below shows the total recycling efficiency percentage achieved monthly at LCO in 2022.

Table 6-16 Recycling efficiency recorded in 2022

Month	Total Recycled (%)	Comments
January	95.21%	
February	94.21%	
March	89.39%	Increased amount of disposed hazardous (hydraulic hoses) this month, reducing the recycled waste.
April	91.77%	Scrap metal recycled this month was lower. Effluent recycled off-site was also lower. This contributed to a reduction in recycled waste.
May	84.27%	Mixed solid waste higher for this month, contributing to higher waste disposed of.
June	92.08%	
July	87.39%	Non-hazardous recycled (Tyres off site, effluent offsite, scrap metal) lower this month, leading to overall recycled waste lower.
August	94.28%	
September	90.33%	Hazardous recycled was lower this month including waste oil, resulting in lower recycled waste overall.
October	88.47%	Waste oil recycled was lower again in October. Tyres offsite were also lower this month.
November	90.17%	No scrap metal recycled this month, contributing to a reduction in waste recycled overall.
December	93.40%	
2022 Total	**91.09%**	

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*** (WMP). The 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***.

The WMP was updated and approved in the previous reporting period.

The water management system at LCO is integrated between the open cut operations and former underground operations. 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 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, mitigation of 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.

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 participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing discharge from Licensed Discharge Point 6 located on Bayswater Creek. Discharges take place during high flow periods in compliance with HRSTS regulations. LCO 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. The strategic use of available mine water storages at each operation reduces the requirement for additional dams and voids.

During 2022, LCO completed an annual review of the site water balance as per Section 7.5 of the WMP including review of the total water flows within the water management system. ***Table 7-1*** contains a summary of the water balance results. A summary of the water flows onsite at LCO during the reporting period is shown in ***Figure 7-1***.

Table 7-1 Site water balance

2022 Site Water Balance		
Total Inputs (ML)	8663	Key inputs – aquifer interception, transfers from Greater Ravensworth sites, rainfall, runoff, potable water and water entrained in ROM coal
Total Outputs (ML)	12384	Key outputs – transfers to Greater Ravensworth sites, discharge under HRSTS, evaporation, water entrained in product coal, coarse rejects and tailings slurry.
Inputs minus Outputs (ML)	-3721	-
Storage at Start (ML)	12312	-
Storage at End (ML)	7168	-
Change in Storage (ML)	-5144	-
Imbalance (ML)	-1423	-
Total Inputs + Total Outputs equals total flow through site (ML)	21,047	-
Imbalance Percentage	6.8%	-

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 2022 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 6.8% imbalance percentage demonstrating that the water balance is calibrated. The imbalance is expected to be the cumulative effective of minor inaccuracies in storage measurements as well as modelled inputs and outputs (rainfall/run off inflow, evaporation, groundwater inflows, etc.).

Figure 7-1 below reflects the site water balance and the key inputs and outputs that contribute to the overall site water balance at LCO, also listed in ***Table 7-1*** above.

In accordance with DA 305-11-01, the most recent 3-yearly water balance model validation review was undertaken by Hydro Engineering & Consulting Pty Ltd in 2020 to provide for water balance accuracy. The water balance model validation review is due to be completed in 2023.

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 7-2 provides a summary of the water take in 2022 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 7.4 details groundwater monitoring results (water level and water quality) for the reporting period.

Table 7-2 Groundwater take

Locality	Water Licence	Entitlement (ML)	Passive take (ML)	Active pumping (ML)	Total take (ML)
Durham 1	WAL41499 (previously 20BL168063)	500	0	0	0
8 South 3 & 4	WAL41498 (previously 20BL168062)	6000 (Combined)	0	0	0
Middle Liddell Bore	WAL41498 (previously 20BL172588)				
Hazeldene 1 & 2	WAL39760 (previously 20BL168060)	5500	0	378.4	378.4
Bowman's Creek	WAL18302	5	0	0	0
Bowman's Creek	20WA210940 (previously 20BL017861)	5	0	0	0
M49	WAL41493 (previously 20BL172293)	2500 (Combined)	957.72	974.00	1,931.72
Mt Owen 1	WAL41493 (previously 20BL168209)				
Mt Owen 2	20BL169544	2500	0	0	0
Durham 2 & 4	WAL41497 (previously 20BL168061)	1000	0	0	0

Note – total take has been calculated by assessing the difference between passive take into the underground workings and the volume actively pumped from the workings. In instances where passive take exceeds the active take volume, the passive take will be reported as the total take due to extraction using pumping infrastructure occurring from the volume passively taken. In instances where active pumping exceeds the passive take into the workings, the total volume reported will be the active pumping volume minus the volume passively taken from the undergrounds.

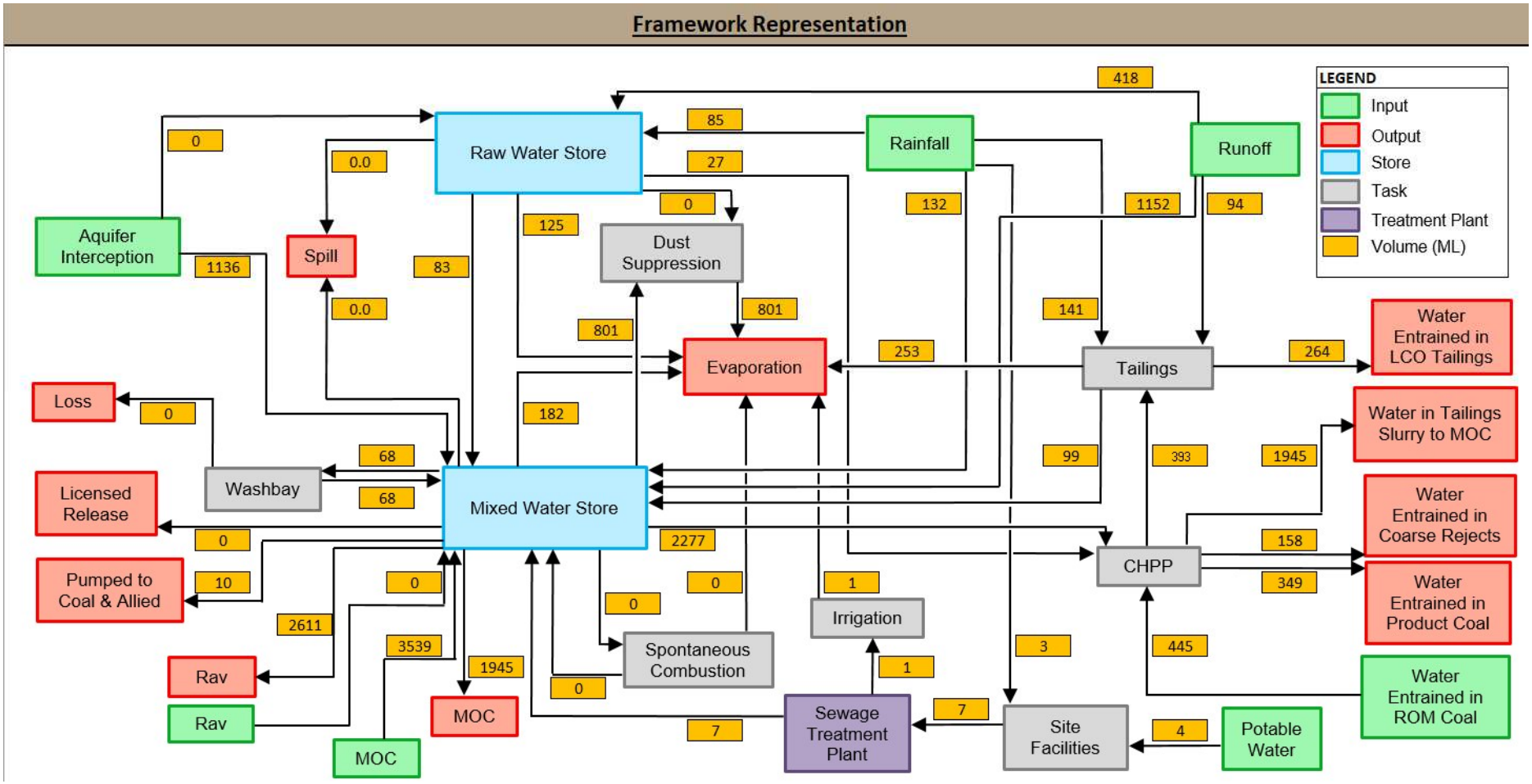

Figure 7-1 Water balance

7.2 Surface Water Monitoring

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

Bayswater Creek is considered to be a highly disturbed system with respect to ANZECC 2000 with low ecological value and a flow regime which is controlled by discharges from Lake Liddell with the remaining catchment not sufficient to maintain flow within the creek adjacent to LCO. Bowmans Creek is considered to be a moderately disturbed system with respect to ANZECC 2000 with moderate ecological value. Based on long term streamflow monitoring, flow within Bowmans Creek is intermittent adjacent to LCO although consistent flow is recorded further downstream nearer to the Hunter River.

The ephemeral nature of flow within the creeks adjacent to LCO means that stagnant pools of water are sometimes monitored which may have higher/atypical concentrations of the key parameters (pH, Total Suspended Solids (TSS) and Electrical Conductivity (EC) and Total Dissolved Solids (TDS)) than during periods of flow. To reflect the natural ponding and varying quality of both creeks, the WMP sets site specific and flow determinant impact assessment criteria for both creeks. This criterion has been determined based on a statistical analysis of data collected over a 5 year period in accordance with ANZECC (2000) guidelines.

LCO's interpretation and response to monitoring results is detailed in the WMP Section 10 Surface Water and Groundwater Response Plan, which has been implemented during the reporting period to investigate exceedances of determined criteria. It is important to note that before an exceedance is to be considered to have been reached, monitoring will continue for up to two observations beyond the initial exceedance measurement (i.e. a total of three consecutive exceedances of a trigger value). This is to check that the exceedance is repeated, ongoing, and not erroneous. Notwithstanding, a decision is made whether the initial exceedance requires immediate investigation.

The creek trigger levels are presented in ***Table 7-3***

Table 7-3 Water Management Plan trigger values for surface water quality

Location	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

Notes to table:

Trigger Level when creek is flowing

Trigger Level when no flow in creek

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

TSS Total suspended solids (mg/L)
EC Electrical conductivity (µS/cm)
TDS Total dissolved solids (mg/L)

Monitoring during the reporting period was completed as per the approved WMP. The following sections detail exceedances, if any, of applicable WMP trigger levels.

The surface water monitoring locations are shown below on ***Figure 7-2***.

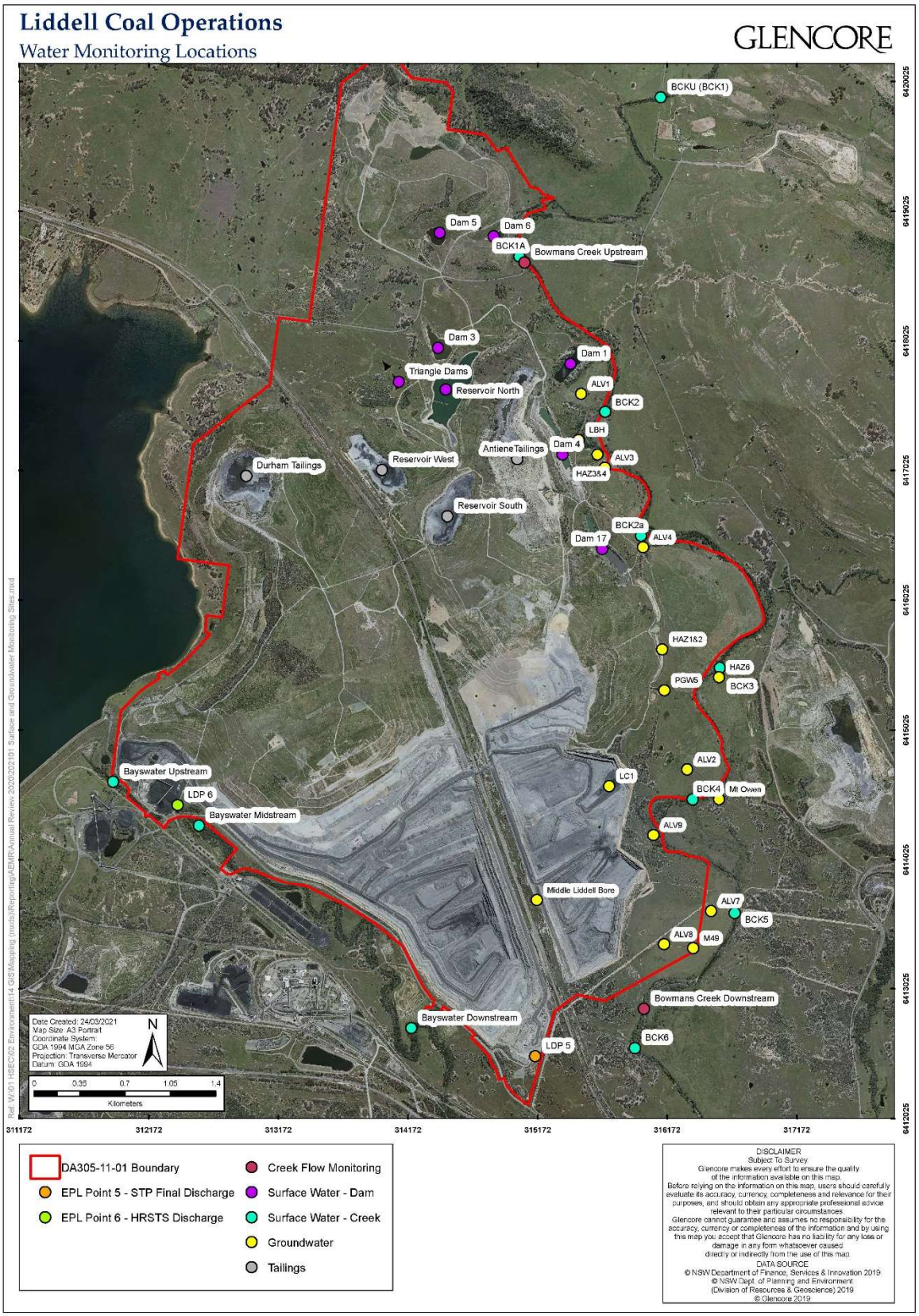

Figure 7-2 Surface and groundwater monitoring locations

7.2.1 Surface Water Monitoring Results Review

7.2.1.1 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.

Table 7-4 below summarises the monitoring results in Bayswater Creek during the reporting period. There were 35 exceedances of individual water quality trigger criteria. In accordance with the WMP surface water trigger response plan, the results were mostly transient (i.e. occurred less than 3 consecutive months) and monitoring continued. There were 3 occasions where the results were consecutive over 3 months which triggered an investigation.

The investigations for pH at Bayswater Creek Midstream and Bayswater Creek Downstream found that there was not any failure of mine water containment system and that the water in Bayswater Creek was predominately comprised of discharged water from LCO's LDP6 and discharges from Lake Liddell under the Hunter River Salinity Trading Scheme, and therefore compliant with EPL 2094. No further action was required.

Table 7-4 Bayswater Creek water quality results

Month	Bayswater Creek Upstream					Bayswater Creek Midstream					Bayswater Creek Downstream				
	Flow	pH	EC (µS/cm	TDS (mg/L)	TSS (mg/L)	Flow	pH	EC (µS/cm	TDS (mg/L)	TSS (mg/L)	Flow	pH	EC (µS/cm	TDS (mg/L)	TSS (mg/L)
Jan-22	Slow	7.95	2500	2210	<5	Slow	8.62	5110	3860	<5	Steady	8.15	2950	2510	<5
Feb-22	Trickle	7.91	4810	3250	10	Still	8.32	5700	4180	<5	Dry	-	-	-	-
Mar-22	Slow	8.10	2600	2060	<5	Steady	8.36	3020	2230	<5	Steady	8.42	2920	2200	<5
Apr-22	Trickle	7.75	4190	2450	<5	Slow	8.28	4630	3120	<5	Trickle	7.89	5080	3410	<5
May-22	Trickle	7.84	4390	2870	9	Trickle	8.29	5000	3430	<5	Trickle	7.97	5880	3830	7
Jun-22	Steady	8.08	6080	4510	11	Slow	8.12	5970	4320	6	Dry	-	-	-	-
Jul-22	Fast	8.41	2560	1780	6	Fast	8.44	2650	1740	8	Fast	8.38	2680	1800	9
Aug-22	Slow	8.37	2620	1610	8	Steady	8.44	2860	1840	9	Slow	8.41	2820	1880	6
Sep-22	Trickle	8.02	4880	3250	14	Trickle	8.61	6080	3930	11	Trickle	8.58	5980	3900	8
Oct-22	Steady	8.14	2590	1900	5	Steady	8.22	2610	1930	7	Steady	8.52	2600	1930	6
Nov-22	Slow	7.62	1880	1110	22	Slow	8.60	5490	3690	13	Slow	8.51	4780	3170	11
Dec-22	Slow	8.01	6220	4610	26	Still	8.24	5940	4330	6	Trickle	8.50	4420	3020	31

Notes to Table:

Exceedance of the 90%ile trigger limit as applicable for the flow conditions
Exceedance of the maximum trigger limit as applicable for the flow conditions
\- unable to obtain a sample due to water level being too low to sample

7.2.1.2 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.

Error! Reference source not found. to ***Table 7-7*** below summarises the monitoring results collected from Bowmans Creek during the reporting period.

Table 7-5 Bowmans Creek trigger limit summary – northern sites

Month	BCK1 (Upstream)					BCK 1A					BCK2				
	Flow	pH	EC (µS/cm)	TDS (mg/L)	TSS (mg/L)	Flow	pH	EC (µS/cm)	TDS (mg/L)	TSS (mg/L)	Flow	pH	EC (µS/cm)	TDS (mg/L)	TSS (mg/L)
Jan-22	Steady	7.99	727	443	8	Steady	8.07	758	448	16	Slow	7.87	723	431	10
Feb-22	Slow	7.78	732	628	8	Slow	7.88	808	684	13	Slow	7.88	844	522	14
Mar-22	Slow	7.86	627	383	<5	Steady	7.89	692	410	<5	Steady	7.93	604	404	<5
Apr-22	Steady	7.91	712	392	<5	Steady	7.98	772	442	<5	Slow	7.95	741	406	<5
May-22	Steady	7.99	783	402	<5	Steady	8.04	820	436	<5	Slow	8.06	827	444	<5
Jun-22	Slow	8.01	830	470	<5	Slow	8.07	876	492	<5	Steady	8.04	851	472	18
Jul-22	Steady	7.85	371	274	7	Steady	7.87	386	264	7	Steady	7.82	427	262	13
Aug-22	Steady	7.97	427	264	16	Steady	7.96	444	274	12	Fast	8.02	475	277	7
Sep-22	Steady	8.02	594	335	<5	Steady	8.01	625	336	<5	Steady	8.19	572	346	<5
Oct-22	Steady	7.88	541	339	<5	Steady	7.85	575	364	<5	Steady	8.01	654	390	<5
Nov-22	Slow	8.48	439	310	16	Steady	7.92	446	274	19	Slow	7.82	366	284	24
Dec-22	Slow	7.86	778	457	8	Slow	7.95	878	533	11	Slow	7.95	773	452	14

Notes to Table:

Exceedance of the 90%ile trigger limit as applicable for the flow conditions

Exceedance of the maximum trigger limit as applicable for the flow conditions

\- unable to obtain a sample due to water level being too low to sample

Table 7-6 Bowmans Creek trigger limit summary – middle sites

Month	BCK2A					BCK3					BCK4				
	Flow	pH	EC (µS/cm)	TDS (mg/L)	TSS (mg/L)	Flow	pH	EC (µS/cm)	TDS (mg/L)	TSS (mg/L)	Flow	pH	EC (µS/cm)	TDS (mg/L)	TSS (mg/L)
Jan-22	Steady	7.86	735	434	14	Slow	7.84	770	460	20	Slow	7.84	784	468	29
Feb-22	Slow	7.94	832	520	11	Slow	7.98	861	534	20	Slow	8	868	535	23
Mar-22	Steady	7.97	606	414	<5	Slow	7.74	666	440	8	Steady	7.89	639	432	<5
Apr-22	Slow	8.02	741	413	<5	Slow	7.84	781	444	11	Slow	7.93	776	469	5
May-22	Slow	8.07	820	426	<5	Slow	8.15	851	462	<5	Slow	7.99	856	430	<5
Jun-22	Steady	8.02	836	509	6	Slow	8.06	877	525	10	Trickle	7.99	884	536	11
Jul-22	Steady	7.86	434	275	10	Slow	7.75	450	273	12	Steady	7.77	389	270	14
Aug-22	Fast	8.06	474	276	8	Fast	8.04	493	272	8	Steady	7.9	469	260	11
Sep-22	Steady	8.29	568	333	<5	Steady	8.16	594	443	<5	Steady	8.23	6.9	342	<5
Oct-22	Steady	8.08	605	372	<5	Steady	7.9	621	382	10	Steady	8	618	400	<5
Nov-22	Slow	7.78	357	268	23	Slow	7.8	356	272	24	Slow	7.62	312	240	41
Dec-22	Slow	8.04	755	476	5	Slow	7.94	760	488	14	Slow	7.89	751	432	10

Notes to Table:

Exceedance of the 90%ile trigger limit as applicable for the flow conditions

Exceedance of the maximum trigger limit as applicable for the flow conditions

\- unable to obtain a sample due to water level being too low to sample

Table 7-7 Bowmans Creek trigger limit summary – southern sites

Month	BCK5					BCK6 (Downstream)				
	Flow	pH	EC (µS/cm)	TDS (mg/L)	TSS (mg/L)	Flow	pH	EC (µS/cm)	TDS (mg/L)	TSS (mg/L)
Jan-22	Slow	7.94	792	456	14	Steady	7.86	704	438	16
Feb-22	Slow	8.07	879	544	16	Slow	7.82	851	526	15
Mar-22	Steady	7.91	659	425	<5	Steady	7.94	639	406	<5
Apr-22	Slow	8.01	782	473	<5	Slow	7.96	775	463	<5
May-22	Slow	8.08	865	438	<5	Slow	8.02	853	436	<5
Jun-22	Steady	8.03	903	560	<5	Steady	7.93	890	519	<5
Jul-22	Steady	7.79	397	268	12	Steady	7.83	398	274	14
Aug-22	Steady	7.99	513	292	7	Steady	8.03	508	276	8
Sep-22	Slow	8.17	6.4	359	<5	Steady	8.16	600	357	<5
Oct-22	Steady	8.07	628	390	<5	Steady	7.66	625	411	<5
Nov-22	Slow	7.72	340	257	33	Steady	7.62	331	264	39
Dec-22	Slow	7.97	773	464	8	Slow	7.88	747	423	9

Notes to Table:

Exceedance of the 90%ile trigger limit as applicable for the flow conditions

Exceedance of the maximum trigger limit as applicable for the flow conditions

\- unable to obtain a sample due to water level being too low to sample

During 2022, LCO experienced above average rainfall conditions which was reflected in the flow conditions along Bowmans Creek. Water was available at all sampling locations throughout the year with flow conditions generally steady during the year.

There was one exceedance of trigger criteria along Bowmans Creek during the reporting period. In accordance with the WMP surface water trigger response plan, the result was transient (i.e. occurred less than 3 consecutive months) and monitoring continued, no additional investigation was required. The system has responded well to rainfall since the 2019 drought. Note further investigation at the BCK1A sampling location is detailed in the sections below.

7.2.1.3 BCK1A Investigation TARP

In the 2019 Annual Review, LCO reported that exceedances of the 90th%ile trigger limits for EC and TDS occurred at BCK1A. These exceedances continued until mid-2020, with no exceedances in 2021 or 2022 (as per *Error! Reference source not found.* above). As per the WMP investigation protocol, LCO c onducted investigations to determine the source of the trigger exceedances by commencing a management/mitigation TARP. In response to the TARP, Dam 6, a water management structure, was dewatered to create a local groundwater sink, capturing potential groundwater flow from the historical mining area. Further studies were conducted in consultation with DPE.

On 9 September 2020, LCO submitted a BCK1A Management TARP investigation report. Stage 1 of the investigation included the development a conceptual site model (CSM) to assess mechanisms that may be causing the elevated salinity. The assessment identified a complex groundwater system with several potential mechanisms ('natural' processes and 'man-made stressors') for the elevated salinity, and recommended that further works be undertaken, Stage 2, to confirm or negate potential mechanisms.

Stage 2 was undertaken in 2020 to address the identified knowledge gaps and included the installation of a targeted groundwater-monitoring network to test the relative hydraulic conductivity of strata, review groundwater quality and levels, and further refine the CSM. A key finding from this work was that the EC trigger exceedances were anticipated to be predominantly a result of the adverse climatic conditions (below average rainfall and above average evaporation).

Stage 3 has included a review of monitoring data that continued to be collected from June 2020 to December 2022 (inclusive) and refinements to the CSM based on the data review.

The main findings were as follows:

- The elevated EC in Bowmans Creek persisted until mid-2020 and subsequently reduced to below trigger values (currently remaining below trigger values).
- The elevated EC is expected to have been a result of groundwater flow discharging to Bowmans Creek, low rainfall resulting in limited surface flow and less dilution of the brackish groundwater discharging to Bowmans Creek, and high evaporation. This conclusion was consistent with the Stage 2 finding, remaining valid.
- From mid-2020 to December 2022 (to the end of the monitoring period assessed in Stage 3) and the return of above average rainfall and below average evaporation, there have been no EC trigger exceedances.

Whilst the studies demonstrate the elevated salinity is not directly linked to historical mining activities and Dam 6, groundwater flows are interacting with soil in backfilled extraction areas and out of pit dumps before exiting to Bowmans Creek. In line with investigation recommendations, LCO intends to continue monitoring to inform mine closure planning and ability to progress this area for mining title relinquishment in the future.

Additionally, LCO is implementing a Tributary Rehabilitation Monitoring Plan (TRMP), the main aim of which is to establish a baseline of ecological health of Bowman's and Bayswater Creeks before closure and to identify potential impacts to ecological health, which may be associated with observed changes in water quality. The monitoring completed during 2020-2022 has not shown sustained impact to the aquatic health of Bowmans Creek.

Additional assessments and monitoring are being undertaken in the areas of concern as part of detailed mine closure planning.

7.2.1.4 MIA Onsite Sewerage System Discharge Quality

LCO operate a Wastewater Treatment Plant (WWTP) at the Mine Infrastructure Area (MIA) for the treatment of wastewater 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 WMP limits requiring investigation.

7.2.1.5 HRSTS Discharge Monitoring

Any discharges from Liddell Coal must be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS). LCO discharged under a number of HRSTS blocks in January, March, April, July, August, September, October and November2022.

There was no exceedances of water quality or volume criteria during discharge events in 2022. A summary of water quality results is in ***Appendix F -***.

7.3 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 7-8*** below. In brief, observations from the monitoring programs demonstrate current impacts are within the EA predictions.

Table 7-8 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	No breaches of the mine water containment system occurred during 2022.

Surface Water Impact Comparison to EA Predictions	
(principally sediments, soluble salts, oils and greases), causing degradation of local and regional water courses.	Ongoing study and assessment of groundwater interactions with the rehabilitated Mt Block mining area and Bowmans Creek to inform mine closure planning.
Short term increases in salinity during periods of licensed discharge under the HRSTS.	LCO discharged under the Hunter River Salinity Trading Scheme on a number of occasions during the reporting period. Water quality and quantities discharged followed licenced conditions.

7.4 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.

7.4.1 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, 2021) and summarised as follows:

1. Impact trigger – An impact trigger is drawdown of 2 m 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 subsequent 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.

7.4.2 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 (20th percentile) or above the monthly baseline (80th percentile) on three consecutive occasions. Note the 20th percentile trigger 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. For this impact to occur, it needs to be associated with a declining water level in the alluvium that is not climate related.
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 on three consecutive occasions. Applies to all ALV series piezometers (except ALV9) and LBH.

Table 7-9 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 7.4.3*** 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 7-2.***

Table 7-9 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	

Groundwater Quality Impact Assessment Criteria							
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	

7.4.3 Monitoring Results Review

7.4.3.1 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 7-3*** to ***Figure 7-6*** and in ***Appendix D*** -; a summary of these results during the reporting period is provided herein.

There were no pH exceedances in 2022. ALV9L could not be sampled on several occasions due to access limitations due to flooded creek crossings in Bowmans Creek. The pH level across both systems appear to have a relatively stable trend, with some fluctuation, that has existed throughout the data collection period as shown in ***Figure 7-3*** and ***Figure 7-4***.

Table 7-10 below summarises the EC measurements of groundwater, with comparison to the applicable trigger levels. There have been numerous occasions of exceedances of the EC upper limit and lower limit (see below for details about the exceedances which triggered investigations).

Table 7-10 2022 Groundwater exceedances for EC in alluvial and shallow bedrock aquifers

Groundwater exceedances for EC (mS/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	1.34	1.40	1.13	0.75	1.53	1.58	4.94	3.22	3.02	1.35	2.83	0.99	1.40
Feb	1.18	1.27	0.93	0.69	1.42	1.39	4.87	3.25	2.9	1.27	2.71	0.74	1.27
Mar	1.24	1.26	0.91	0.72	1.34	1.49	4.97	2.70	2.93	1.17	2.78	0.81	1.19
Apr	1.21	1.29	0.92	0.62	1.37	1.50	5.14	3.42	3.06	1.01	2.56	0.78	1.12
May	1.23	1.36	0.86	0.73	1.45	1.59	5.31	3.67	3.22	1.32	2.65	0.74	1.17
Jun	1.16	1.29	0.83	0.71	1.31	1.55	4.76	3.20	2.81	1.38	2.58	0.74	1.14
Jul	1.25	1.41	0.96	0.77	1.44	1.56	5.03	3.72	3.2	0.94	2.58	0.63	1.36
Aug	1.44	1.27	0.98	0.70	1.37	1.89	5.35	3.75	3.15	1.03	2.92	0.79	1.14
Sep	1.15	1.32	0.87	0.57	1.30	2.74	4.94	3.00	2.90	1.28	2.67	0.71	1.11
Oct	1.08	1.26	0.85	0.48	1.28	4.99	4.47	2.63	2.35	1.30	2.16	0.62	1.04
Nov	1.19	1.27	0.90	0.50	1.19	7.31	5.05	3.26	2.72	1.18	2.62	0.72	1.03
Dec	1.07	1.34	0.72	0.55	2.49	7.06	5.04	2.14	2.88	1.23	2.17	0.74	1.05

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.

The requirement for an investigation has been triggered by three consecutive exceedances of EC limits across the following bores; ALV4L, ALV2L, ALV2S, ALV7S and ALV8S. The conclusions of these investigations are summarised in ***Table 7-11*** below.

Table 7-11 ITARP investigations for quality triggers completed in 2022

Month of 3rd exceedance	Month exceedance reported	Site	Conclusions
January	February	ALV2S & ALV2L	• There has not been any failure of mine water containment system. • The 2017 - 2019 drought was the most severe drought in the monitoring period and is therefore unprecedented in groundwater monitoring reference period. 2020 was a period of above average rainfall, which reduced to average rainfall in March 2021. This has resulted in recovery of groundwater levels in the alluvium and shallow bedrock systems. • EC levels at ALV2S and ALV2L are both currently below the reference period maximum. • It is not expected that there is potential for harm to the environment as the Bowmans Creek system is varying naturally in response to an increase in groundwater level and interaction with the saline shallow bedrock material. Further, EC levels are within historical ranges. • Continued exceedances of investigation trigger limits are due to the distinctly different climatic conditions of the recent years to that of the baseline/reference period which was average to above average rainfall. Hence, investigation trigger levels adopted in the WMP do not reflect the natural variability within the actual system. • 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.

Month of 3rd exceedance	Month exceedance reported	Site	Conclusions
February	March	ALV7S & ALV8S	• There has not been any failure of mine water containment system. • The 2017 - 2019 drought was the most severe drought in the monitoring period and is therefore unprecedented in groundwater monitoring reference period. 2020 was a period of above average rainfall, which reduced to average rainfall March 2021. This has resulted in recovery of groundwater levels in the alluvium and shallow bedrock systems. • In 2021, mining impacts to the shallow bedrock aquifer (ALV7S and ALV8S) were evident. However the groundwater investigations completed to date have not concluded that mining activities have resulted in impacts not approved for LCO. • Since late 2020, EC levels at ALV7S has been on a steady decline, back towards the reference period maximum. • Since late 2021, EC levels at ALV8S have declined below the 20th percentile trigger due to recharge from the fresher overlying alluvium. • 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. • Continued exceedances of investigation trigger limits at ALV7S are due to the distinctly different climatic conditions of the recent years to that of the baseline/reference period i.e. average to above average rainfall. Hence, investigation trigger levels adopted in the WMP do not reflect the natural variability within the actual system. • It is not expected that there is potential for harm to the environment as the Bowmans Creek system is varying naturally in response to an increase in groundwater level and interaction with the saline shallow bedrock material.

Month of 3rd exceedance	Month exceedance reported	Site	Conclusions
April	May	ALV2S	• There has not been any failure of mine water containment system. • EC levels at ALV2S and ALV2L are both currently below the reference period maximum. • It is not expected that there is potential for harm to the environment as the Bowmans Creek system is varying naturally in response to an increase in groundwater level and interaction with the saline shallow bedrock material. Further, EC levels are within historical ranges. • The 2017 - 2019 drought was the most severe drought in the monitoring period and is therefore unprecedented in groundwater monitoring reference period. 2020 was a period of above average rainfall, which reduced to average rainfall March 2021. This has resulted in recovery of groundwater levels in the alluvium and shallow bedrock systems. • Continued exceedances of investigation trigger limits are due to the distinctly different climatic conditions of the recent years to that of the baseline/reference period which was average to above average rainfall. Hence, investigation trigger levels adopted in the WMP do not reflect the natural variability within the actual system. • 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.

June	July	ALV2L	• There has not been any failure of mine water containment system. • The 2017-2019 drought was the most severe drought in the monitoring period and is therefore unprecedented in groundwater monitoring reference period. The recent extended period of above average rainfall has resulted in recovery of groundwater levels in the alluvium and shallow bedrock systems. • EC levels have shown a decreasing trend over the previous 6-12 months at ALV2, with ALV2 (S) dropping below the trigger in June 2022 after 25 consecutive triggers and ALV2 (L) triggering after three consecutive triggers following the March 2022 reading which was below the trigger level for the first time since mid-2020. • At ALV2 there is an upward hydraulic gradient indicating saline shallow bedrock underneath being pressurised by increasing rainfall recharge and interacting with overlying alluvium. EC levels and groundwater pressures at ALV2(L) are very similar to that of the underlying shallow bedrock ALV2(S) in this location. LCO are investigating to see if there is potentially an issue with the integrity of the bore. • Measured EC levels at ALV2 have remained relatively stable between the reference 80th%ile trigger level and maximum levels since initially exceeding in October 2019. There has been minor monthly variability and decreasing trend in EC levels indicating stabilisation during the last 12months. • Ongoing exceedances of investigation trigger limits are due to the distinctly different climatic conditions of the recent years to that of the baseline/reference period which was average to above average rainfall. Hence, investigation trigger levels adopted in the WMP do not reflect the natural variability within the actual system. • It is not expected that there is potential for harm to the environment as the system is varying naturally in response to an increase in groundwater level and interaction with the saline shallow bedrock material. • 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. Since the system is responding naturally to climatic variations, it is considered there is no potential for environmental harm.
May	June	ALV7S & ALV8S	• There has not been any failure of mine water containment system.

Month of 3rd exceedance	Month exceedance reported	Site	Conclusions
			• The 2017 - 2019 drought was the most severe drought in the monitoring period and is therefore unprecedented in groundwater monitoring reference period. 2020 was a period of above average rainfall, which reduced to average rainfall March 2021. This has resulted in recovery of groundwater levels in the alluvium and shallow bedrock systems. • In 2021, mining impacts to the shallow bedrock aquifer (ALV7S and ALV8S) were evident. However, the groundwater investigations have confirmed that these are consistent with those predicted in LCO project. • Since late 2020, EC levels at ALV7S has been on a steady decline, back towards the reference period maximum. • Since late 2021, EC levels at ALV8S have declined below the 20th percentile trigger due to recharge from the fresher overlying alluvium. • 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. • Continued exceedances of investigation trigger limits at ALV7S are due to the distinctly different climatic conditions of the recent years to that of the baseline/reference period i.e. average to above average rainfall. Hence, investigation trigger levels adopted in the WMP do not reflect the natural variability within the actual system. • It is not expected that there is potential for harm to the environment as the Bowmans Creek system is varying naturally in response to an increase in groundwater level and interaction with the saline shallow bedrock material.

Month of 3rd exceedance	Month exceedance reported	Site	Conclusions
September	October	ALV2L & ALV2S	• There has not been any failure of mine water containment system. • The 2017-2019 drought was the most severe drought in the monitoring period and is therefore unprecedented in groundwater monitoring reference period. The recent extended period of above average rainfall has resulted in recovery of groundwater levels in the alluvium and shallow bedrock systems. • LCO has undertaken an assessment on the condition of the ALV2 bores to identify any integrity issues potentially affecting the water quality results. The assessment found that that the trigger levels recorded for September and preceding months have likely been affected by higher EC water confined with the bores, rather than being representative of the target alluvium water source.

Month of 3rd exceedance	Month exceedance reported	Site	Conclusions
August	September	ALV7S & ALV8S	• There has not been any failure of mine water containment system. • The 2017 - 2019 drought was the most severe drought in the monitoring period and is therefore unprecedented in groundwater monitoring reference period. 2020 was a period of above average rainfall, which reduced to average rainfall March 2021. This has resulted in recovery of groundwater levels in the alluvium and shallow bedrock systems. • In 2021, mining impacts to the shallow bedrock aquifer (ALV7S and ALV8S) were evident. However, the groundwater investigations have confirmed that these are consistent with those predicted in LCO project. • Since late 2020, EC levels at ALV7S has generally declined steadily towards the reference period maximum. • Since late 2021, EC levels at ALV8S have declined below the 20th percentile trigger due to recharge from the fresher overlying alluvium. • 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. • Continued exceedances of investigation trigger limits at ALV7S are due to the distinctly different climatic conditions of the recent years to that of the baseline/reference period i.e. average to above average rainfall. Hence, investigation trigger levels adopted in the WMP do not reflect the natural variability within the actual system. • It is not expected that there is potential for harm to the environment as the Bowmans Creek system is varying naturally in response to an increase in groundwater level and interaction with the more saline shallow bedrock material.

Month of 3rd exceedance	Month exceedance reported	Site	Conclusions
November	December	ALV4L	• There has not been any identified failure of mine water containment system. The difference in groundwater levels and water quality between the paired bores at ALV4 indicates there is unlikely a hydraulic connection between the alluvium and the shallow Permian aquifers. • The results in ALV4 L are anomalous compared to the historical dataset. • Water quality analysis and visual inspections have not detected a link with Dam 17. • The results do not indicate that a seepage pathway has been activated between Dam 17 and the Bowmans Creek alluvium.

Month of 3rd exceedance	Month exceedance reported	Site	Conclusions
November	December	ALV8S	• There has not been any failure of mine water containment system. • The 2017 - 2019 drought was the most severe drought in the monitoring period and is therefore unprecedented in groundwater monitoring reference period. The period of 2020 - 2022 has been above average rainfall. This has resulted in recovery of groundwater levels in the alluvium and shallow bedrock systems. • In 2021, mining impacts to the shallow bedrock aquifer (ALV8S) were evident. However, ALV8 is located within the area of predicted drawdown for approved operations and investigations undertaken as part of the groundwater model review has confirmed that these are consistent with the impacts predicted in project approval, including alluvial drawdown is in line with predictions and water take from the alluvium is in line with licensing limits. • Since late 2021, EC levels at ALV8S have declined below the 20th percentile trigger due to recharge from the fresher overlying alluvium. • Backfilling of the Bayswater pit (commenced in 2021 and is near natural surface as of January 2023) lessens likelihood of leakage from creek to pit. • The results recorded at ALV8S are not consistent with the rest of the Bowmans Creek alluvium. • At this point in time, the LCO is unable to determine the mechanism for ongoing recharge from the alluvium, however there is also no evidence to support connection of the alluvium to the pit via the Permian.

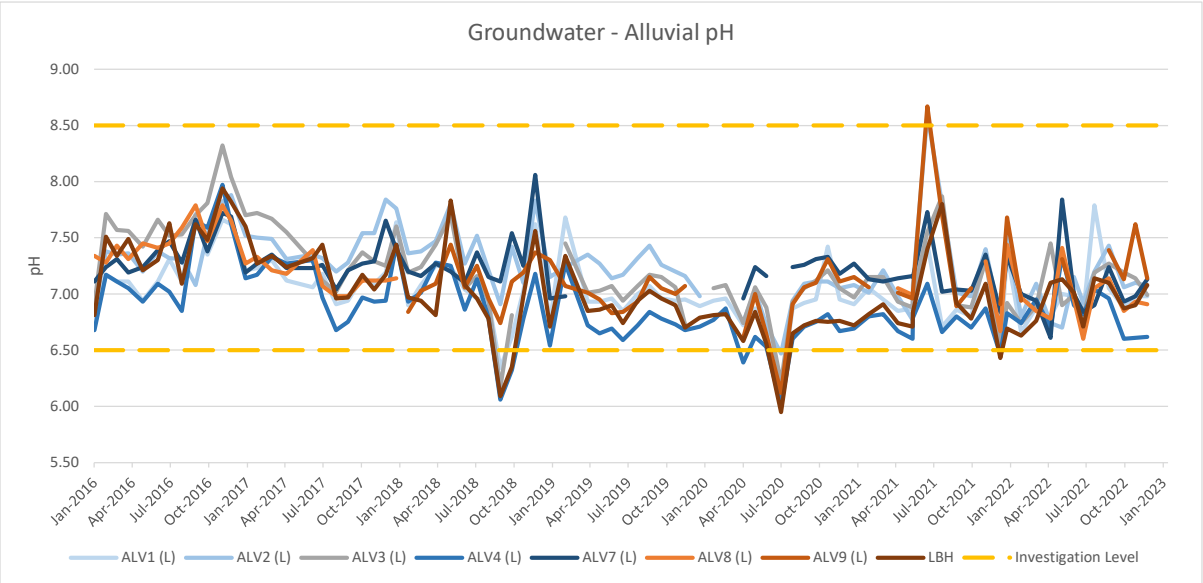

Figure 7-3 Groundwater - Alluvial pH

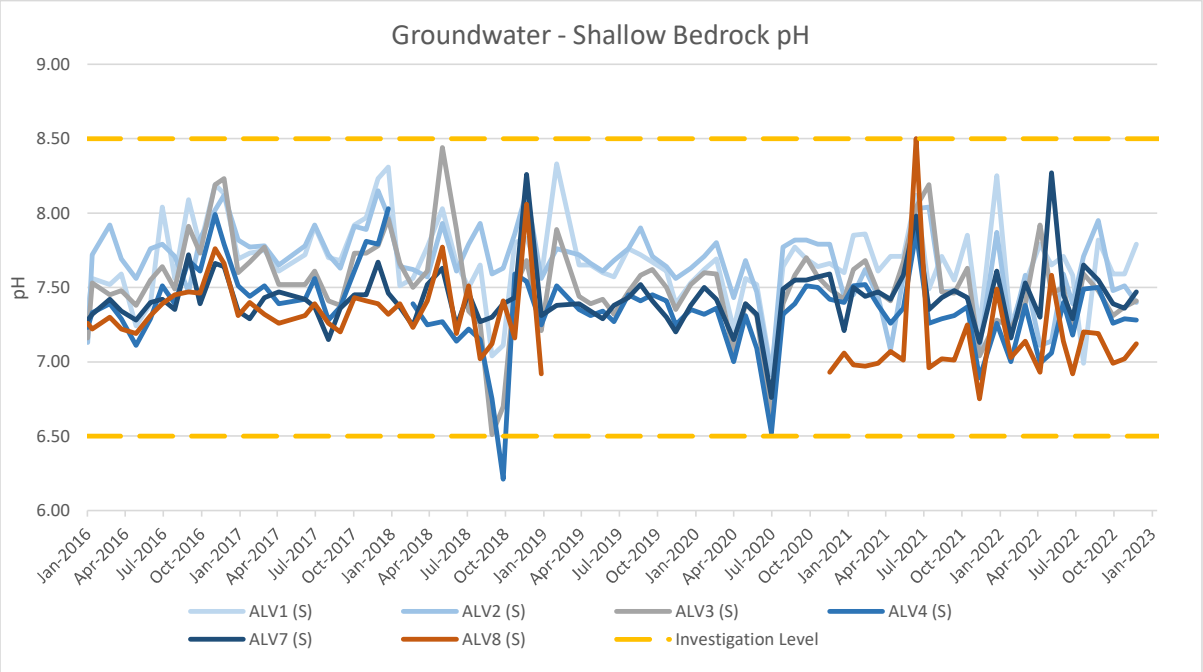

Figure 7-4 Groundwater - Shallow Bedrock pH

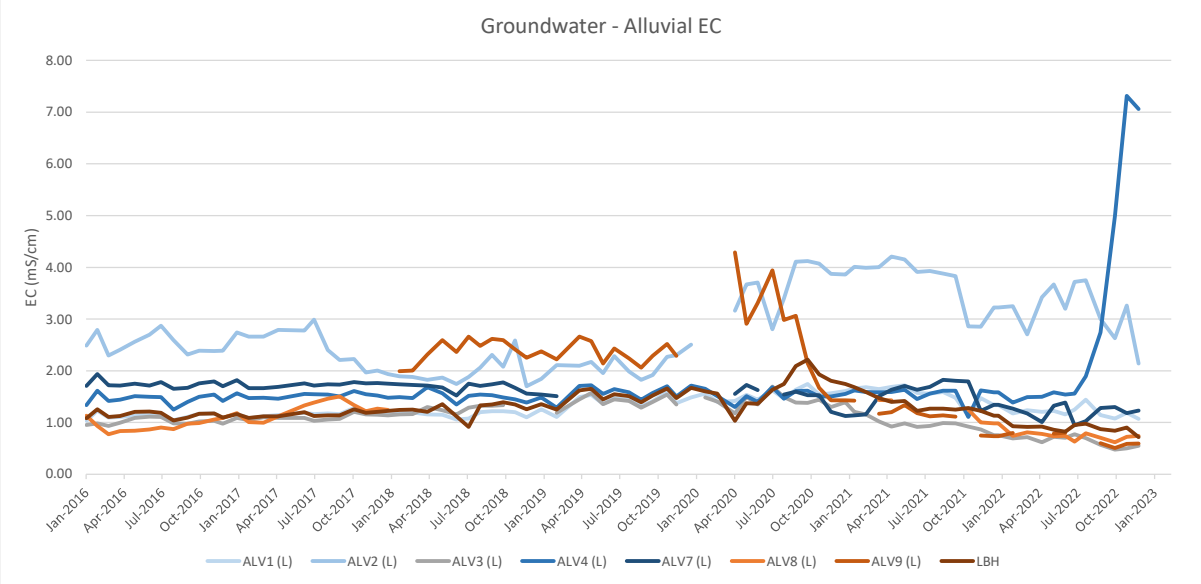

Figure 7-5 Groundwater - Alluvial Electrical Conductivity

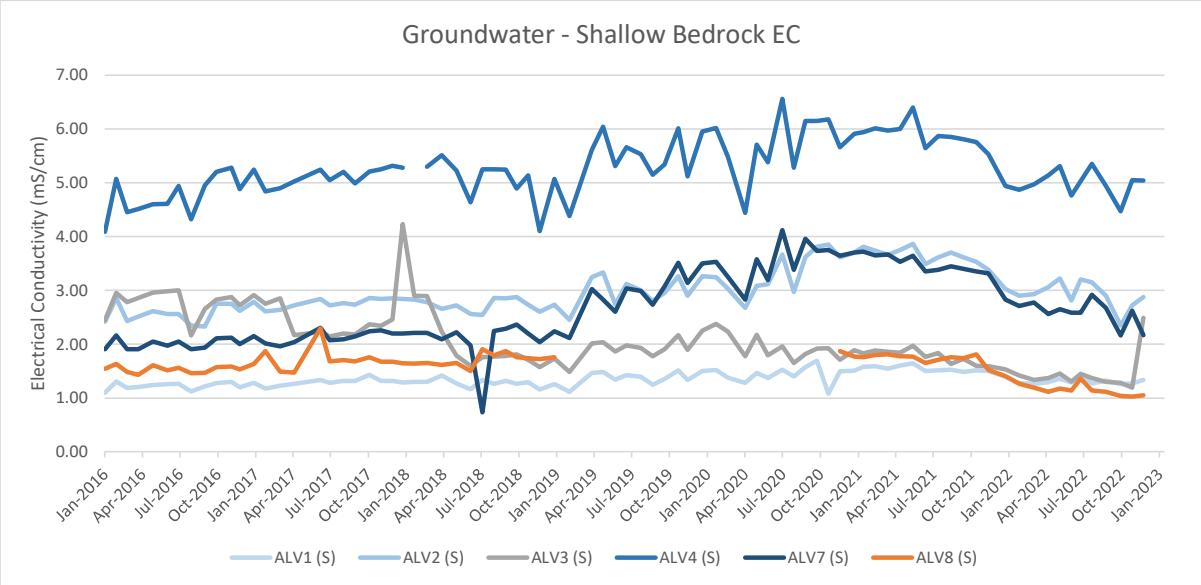

Figure 7-6 Groundwater - Shallow Bedrock Electrical Conductivity

Hard Rock Aquifer (Coal Measures)

Groundwater quality monitoring results for the hard rock aquifers during the reporting period is shown in ***Appendix D***. 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.

Water quality trends within PGW5L (overburden) have remained relatively stable over the monitoring period.

PGW5S (Pikes Gully Seam) was considered dry from March 2018 to December 2020. In January 2021, when groundwater returned to the well, the recorded pH was outside the trigger range. There was insufficient groundwater to sample in February 2021 and the following month the pH was again outside the trigger range. Since April 2021, there has been sufficient water to sample, with a pH within the trigger range. During 2022, the pH was neutral and conditions were stable throughout the year.

7.4.3.2 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 7-7*** and ***Future 7-8*** respectively.

The residual mass curve for rainfall is also presented in ***Figure 7-7*** and ***Figure 7-8***. 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 CRD 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 rainfall CRD indicates measured rainfall is greater than long-term averages. This was developed from the LCO onsite meteorological station to provide representative of conditions on site.

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 differences in propensity for recharge.

With reference to the full historical monitoring results, the synchronised 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. 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 (groundwater level trigger definition #1) for alluvial drawdown impact assessment (ALV8L & ALV9L). There were several Investigation trigger level exceedances and a Subsequent Investigation trigger exceedance (Definition 2 & 3 respectively) at ALV7S and ALV8S.

The residual mass curves for rainfall and evaporation suggest above average rainfall and below average evaporation conditions prevailed during 2022. Increase in rainfall and decrease in evaporation conditions throughout 2022 has resulted in recharge throughout the Bowmans Creek system which is demonstrated through the increase in groundwater levels for most bores from March 2020. Recently, below average rainfall conditions prevailed from November 2022. Some of the groundwater levels, such as in ALV8L, ALV8S, ALV7L and ALV7S, responded to a reduction in rainfall with a decline in groundwater levels. ALV7S and ALV8S have not fully recovered to pre-drought levels.

Table 7-12 presents recorded exceedances of groundwater level triggers during the 2022 monitoring period. ***Table 7-13*** presents a summary of the ITARP investigations completed in 2022. In accordance with the WMP, where groundwater levels continuously trigger after the initial investigation (triggered on three consecutive months) and it has been determined not to be a mining related impact, subsequent investigations occur at 12 consecutive month intervals 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 drawdown impacts.

In 2022, mining impacts to the shallow bedrock aquifer at ALV7S and ALV8S continue to be evident. However, groundwater investigations completed to date have not concluded that mining activities have resulted in impacts not approved for LCO. Refer to ***Table 7-14*** for more detail.

Table 7-12 2022 Groundwater level trigger exceedances

Groundwater level exceedances (m depth to groundwater)													
Site	ALV1L	ALV1S	LBH	ALV3L	ALV3S	ALV4L	ALV4S	ALV2L	ALV2S	ALV7L	ALV7S	ALV8L	ALV8S
Impact Assessment Criteria													
10%ile	4.97	4.75	5.05	5.7	5.99	5.56	6.28	4.8	4.67	6.75	10.21	6.96	9.03
Max	6.31	6.84	6.24	7.08	7.26	6.73	7.42	6.76	8.53	7.34	11.38	8.36	11.08
Jan	3.03	1.40	3.45	4.65	4.87	5.14	4.83	4.04	3.77	5.78	11.96	6.77	15.93
Feb	3.22	1.27	3.55	4.74	4.98	5.19	5.22	4.23	3.99	6.27	12.71	7.21	16.50
Mar	2.68	1.26	3.33	4.41	4.68	4.91	4.42	3.55	3.13	5.31	11.06	5.91	15.21
Apr	3.05	1.29	3.50	4.67	4.90	5.11	4.75	4.06	3.69	5.49	10.88	6.29	15.24
May	3.15	1.36	3.57	4.69	4.96	5.11	5.06	4.19	3.78	5.98	11.92	6.80	15.90
Jun	3.22	1.29	3.60	4.76	5.01	5.12	5.23	4.22	3.24	6.22	12.41	6.95	16.23
Jul	2.59	1.41	3.16	4.07	4.27	4.64	4.62	3.24	2.74	4.98	11.47	5.86	15.17
Aug	2.84	1.27	3.27	4.40	4.62	4.81	4.61	3.84	3.40	5.45	11.09	6.19	15.28
Sep	2.94	1.32	3.45	4.53	4.76	4.96	4.60	3.95	3.52	5.73	11.43	6.49	15.56
Oct	2.80	1.26	3.35	4.39	4.60	4.73	4.34	3.73	3.30	5.41	10.84	6.22	15.23
Nov	2.83	1.27	3.22	4.44	5.00	4.52	4.34	3.99	3.56	5.57	10.74	6.34	15.20
Dec	3.18	1.34	3.58	4.76	5.02	4.69	4.92	4.22	3.87	6.02	11.73	6.73	15.70

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

Table 7-13 Groundwater level trigger exceedances investigation summary, 2022

Month of investigation trigger	Month exceedance reported	Site	Conclusions
January	February	ALV7S ALV8S	• There has been no exceedance of the groundwater drawdown triggers (definition #1). • Groundwater levels in the alluvium aquifer at ALV7L and ALV8L have not triggered in recent months and are within or close to the baseline ranges since late 2021. • The 2017-2019 drought was the most severe drought in the monitoring period and is therefore unprecedented in groundwater monitoring reference period. • Groundwater level decline in ALV8S, and its reference bore ALV7S, was observed during previous periods of below average rainfall (including the Millennium Drought) during the reference period (prior to current open cut mining operations). • The recent extended period of above average rainfall has resulted in recovery of groundwater levels in the alluvium and shallow bedrock systems. Groundwater levels in the shallow bedrock aquifer at ALV8S, and its reference bore ALV7S, remain below the triggers of the maximum reference period though are increasing with the above average rainfall conditions since 2020. • The groundwater impact model has been updated since the Mod 5 impact assessment to reflect more available information. Both the 2018 and 2021 Groundwater Impact Model Validation assessments indicates the model is fit for purpose and remains conservative. Further, the following key points are noted: - There are no additional drawdown impacts due to mining beyond what has been approved. - The Permian groundwater units that are affected by mining activities are disconnected to the overlying alluvium. • Groundwater observations and model predictions support the understanding that the alluvium is driven by climatic variations rather than mining activities. • Continued exceedances of investigation trigger limits are due to the distinctly different climatic conditions of the recent years to that of the baseline/reference period which was average to

Month of investigation trigger	Month exceedance reported	Site	Conclusions
			above average rainfall. Hence, investigation trigger levels adopted in the WMP do not reflect the natural variability within the actual system. • Groundwater impacts to the alluvium are less than that predicted/approved. • Mining extraction has not extended beyond approved limits. Further, mining extraction is not planned to extend to the full extent of approved depths, lateral limits or through geological features (Davis creek fault) associated with modelled peak groundwater impacts. • The observations at ALV7S and ALV8S support the conclusions of the previous ITARP reports for the Bowmans Creek monitoring network, i.e. groundwater levels are the result of climatic variations rather than mining operations. • Since the system is responding naturally to climatic variations, it is considered there is no potential for environmental harm.

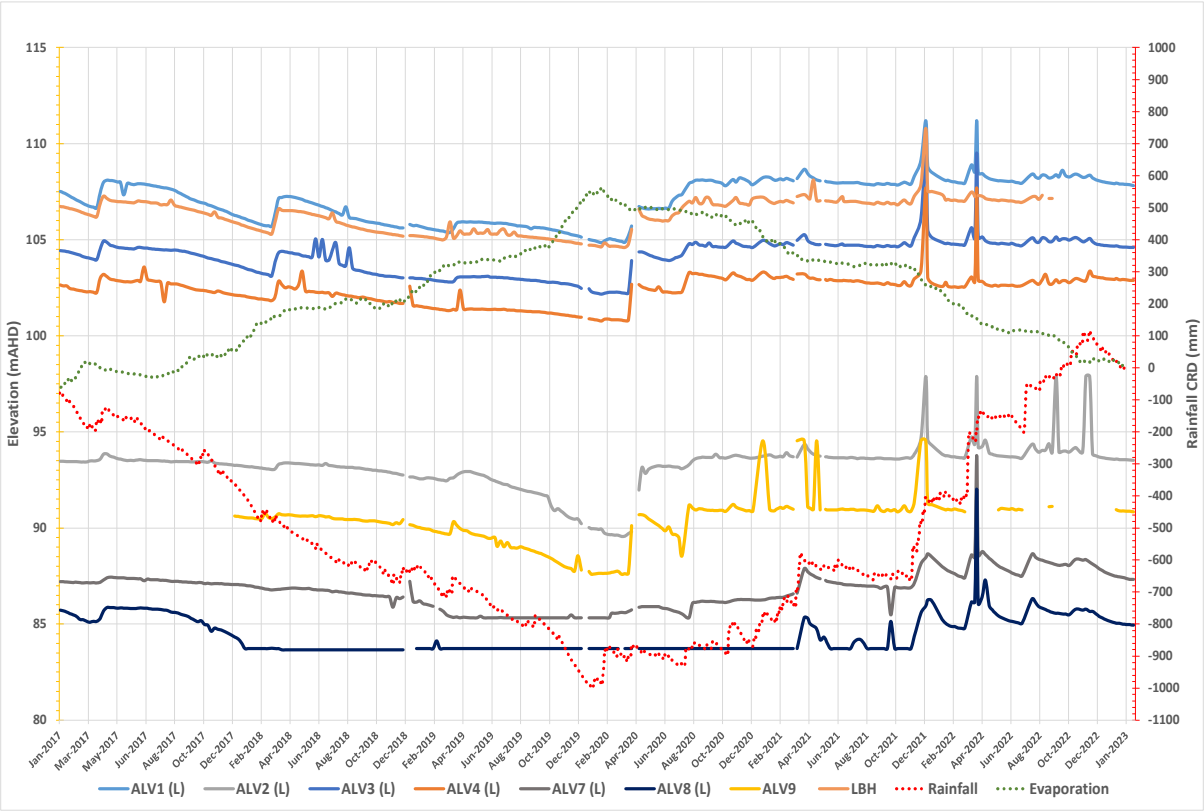

Figure 7-7 Groundwater - alluvial elevations

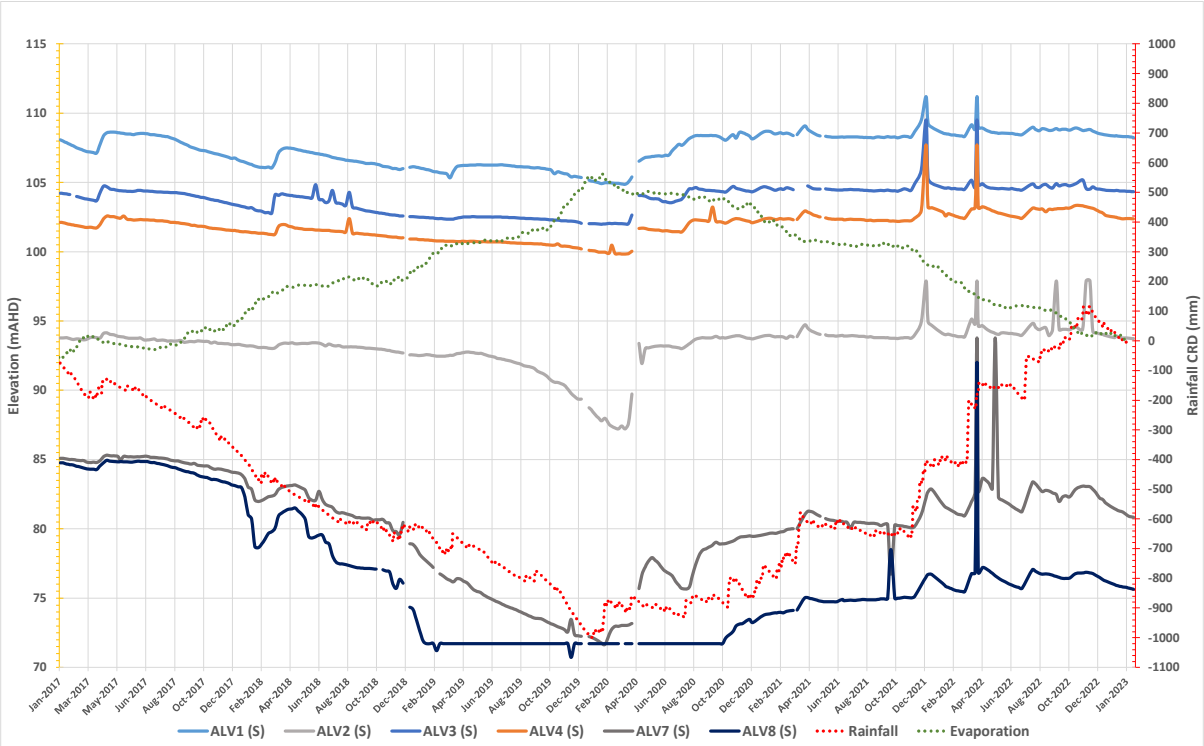

Figure 7-8 Groundwater – shallow bedrock elevations

Hard Rock Aquifer (Coal Measures)

LCO monitor several 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 7-9***. The groundwater elevations vary significantly between the piezometers monitored (except PGW5S), reflecting differences in groundwater levels between different stratigraphic layers due to recent and historical mining and dewatering operations. There are no investigation groundwater trigger levels for monitoring of these aquifers.

Figure 7-9 shows 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 bores such as 8 South (whilst available), M49 and the Middle Liddell Bore (MLB).

Piezometer PGW5S overlies the Hazeldene workings. As shown in ***Figure 7-9***, there is no groundwater level response at PGW5S due to changes in groundwater elevation in the Hazeldene monitoring locations (Haz 1 to Haz 6).

Periodic dewatering of underground workings occurs as required for mining operations. In early to mid-2019 as a drought mitigation measure, short term extraction of water from the Hazeldene underground occurred, adjacent to ALV2. Following this dewatering, groundwater pressures at ALV2 declined as the drought continued to beyond reference maximum. The decline in the ALV2 bores is expected to be at least partly related to the dewatering of Hazeldene, noting the difficulty in differentiating mining and climatic influences on water levels. There was no extraction from Hazeldene between mid 2019 and late 2021 with levels allowed to recover (see Figure 7-9 below). A sustained increase in rainfall and inflows has seen levels at both Hazeldene Underground and ALV2 recover to pre-drought levels.

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 due to dewatering activities and has now been mined through. M49 and Mount Owen 2 increased in measured levels in 2020 due to limited dewatering with a pump failure. Dewatering of the underground workings by intermittent pumping of M49 and Mount Owen 2 recommenced in December 2020 and will continue as required, with groundwater levels fluctuating between about -21 and -32 m AHD.

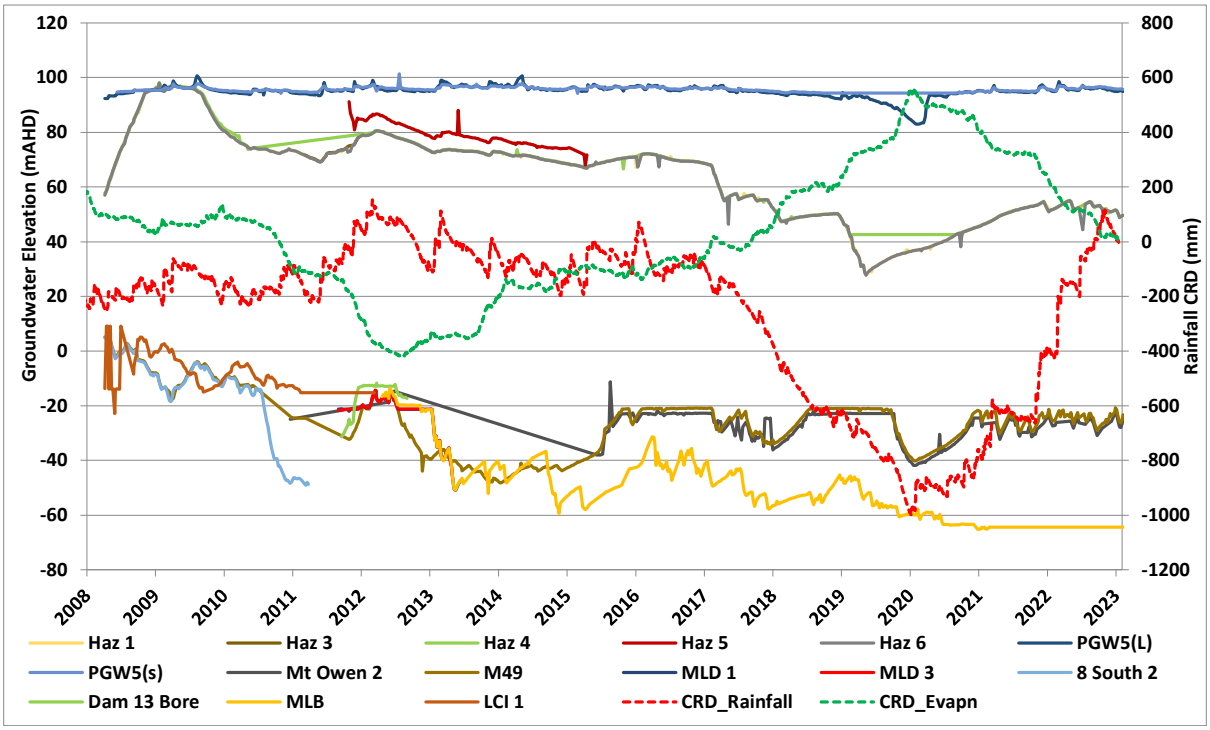

Figure 7-9 Groundwater - bedrock elevations

7.4.3.3 Groundwater Comparison to EA Predictions

With reference to the EA predictions from the groundwater assessment (SKM, 2014), this section identifies the predictions made with comparison to monitoring findings and the review of groundwater model predictions undertaken in 2021, as detailed in ***Table 7-14*** below.

Table 7-14 Groundwater impact comparison to EA predictions

Groundwater Impact Comparison to EA Predictions	
Key EA Conclusion	**Comparison to Monitoring Observations and Model Verification**
Impacts to Bowmans Creek alluvial aquifer (Quaternary Alluvium)	
Prior to 2019, the magnitude of alluvial losses estimated by the model under the proposal are similar to the leakage rates predicted for current mining operations at LCO. The estimated losses from the alluvium amount to between 30 to 40 ML/year up to 2021, and peak at 65 ML/year in 2021. In 2022, losses are predicted to reduce to approximately 50 ML/year.	Indirect or passive water take occurs where flow of water to adjacent aquifers is influenced by adjacent mining activities. For LCO, indirect water take can occur from the alluvial aquifer in Bowmans Creek if the flow of Permian water to the alluvium is reduced. The simulated indirect alluvial groundwater take in 2022 was estimated at approximately 108 ML (AGE, 2021), which is higher than the estimation from the MOD 5. LCO holds sufficient licences to account for the predicted take in AGE (2021).
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 to the Bowmans Creek alluvium due to mining the South Pit.

Groundwater Impact Comparison to EA Predictions	
Estimates of historical baseflow contributions to Bowmans Creek streamflow suggest the peak estimated loss of groundwater flow (65 ML/year) caused by the proposed modification accounts for approximately 1% to 3% of the estimated baseflow component of streamflow and <1% of median annual streamflow for Bowmans Creek.	The predicted peak annual leakage rate of 65 ML/year from the alluvium in 2021 (from MOD 5) is lower than the simulated indirect alluvial groundwater take in 2022 (peak amount) at approximately 108 ML (AGE, 2021). In 2021, the simulated indirect alluvial groundwater take presented in AGE (2021) is similar to the estimate in MOD5 (AGE, 2021).
Predicted drawdown of water tables in alluvial aquifers associated with Bowmans Creek does not exceed the 2 m trigger for more than minimum harm outlined in the NSW Aquifer Interference Policy (2012). The predicted drawdown is localised to two small areas of the estimated alluvial extents.	The 2 m trigger for alluvial bores was not exceeded in 2022. Water levels in the alluvial bores were maintained by above average rainfall conditions.
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.	There were no pH exceedances in 2022. There have been numerous exceedances of the EC investigation trigger. From the trigger investigations, the exceedances are expected to be predominantly due to climatic conditions rather than a mining related impact. However, LCO is continuing to investigate, particularly the trigger exceedances at ALV4L. Additionally, a detailed review of groundwater investigation triggers, the data collected and the monitoring network has been undertaken and submitted to DPE Water in early 2023.
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 about 5,500 ML/year. LCO currently holds extraction licenses totalling 27,000 ML/year for this water source.	The information provided in the review of groundwater model predictions undertaken in 2021 indicates that the modelled and measured extraction of hard rock aquifers is within licence limits and below the estimated peak of about 5,500 ML/year. As shown in ***Table 7-2***, the sum of passive and active takes during the reporting period was 958 ML and 1,352 ML respectively; a total of 2,310 ML.
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 mAHD. Full recovery water level in the voids is currently	Not yet triggered.

Groundwater Impact Comparison to EA Predictions	
modelled to be to 67 mAHD based on historic rainfall records.	

7.4.3.4 Review of Groundwater Model Predictions

In 2013, LCO applied to modify the DA to extend the footprint of the two onsite open pits. This modification was termed MOD5 and a numerical groundwater model of the LCO region was developed to evaluate potential groundwater impacts as part of the Environmental Assessment. The Department of Planning granted approval for MOD5 on 1 December 2014 and stipulated that the groundwater model be validated every three years by comparing measured groundwater levels to model simulated levels (Environmental Condition 3.23.v). To address this condition, a model validation review was completed in 2018 and a subsequent validation was undertaken in 2021.

The validity of the numerical model predictions were assessed by comparing observed water levels and inflows to model predictions. Overall, the model performed well compared to observed measurements. Observed declines in the ALV bores within the Bowmans Creek alluvium over the three-year period between 2018 and 2021 were generally in the order of 2 m. The model generally predicted a similar or slightly larger drawdown than was observed in several alluvial bores. The model validation review found that the model over-predicted the impacts in several alluvial wells and is considered fit-for-purpose. Generally, predicted impacts are less than or consistent with impacts predicted in MOD5 and observed impacts do not exceed the approved impacts. LCO holds a sufficient licensed quantity to account for the predicted indirect take from the Bowmans Creek alluvium.

No substantial (and detrimental) deviation from the predicted water table and pressure surfaces was seen and the model does not require additional refinement. While climate induced oscillations were observed, there were no systematic declining trends that could be attributed to mining at this stage in the monitoring data. The effect of mining is unclear because both mining and climatic conditions impact the groundwater levels, but the significant climatic variability masks the mining effects. Despite this modelling indicates that mining is having, and has had, some impact consistent with approved predicted impacts on the Bowmans Creek alluvium where mining is located in close proximity.

The numerical model generally predicts trends within the Permian coal measures or over-predicts impacts, indicating the model is conservative. The review also indicates the revised model provides a conservative estimate of direct and indirect water take. The volume of licensing held by LCO is sufficient to account for the predicted direct and indirect water take from each water source. The revised groundwater model is therefore considered suitable for ongoing use to assess impacts from the Liddell mine.

8. Rehabilitation

LCO has completed an Annual Rehabilitation Report in accordance with the requirements of the NSW Resources Regulator.

During 2022, LCO prepared a Rehabilitation Management Plan (RMP), in accordance with the NSW Resources Regulator rehabilitation reforms.

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 1 of the Rehabilitation Management Plan (RMP) 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 8-1*** 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 (BMP)***.

The overall post-mining land use goals are to:

- establish a mix of grasslands capable of supporting sustainable grazing, and native vegetation corridors to enhance habitat connectivity.
- establish a landform, natural resources and vegetation suitable for the post mining land uses and to achieve the requirements of the development consent; specifically 731ha of Central Hunter Box-Ironbark Woodland and grassland for sustainable agriculture.
- Progressive rehabilitation activities occur throughout the life of mine to allow minimisation of environmental impacts (dust emissions, habitat disruption) and maximisation of opportunities for the development of vegetation prior to mine closure.

8.2 Current Status

Rehabilitation and disturbance status of the operation as at the end of the reporting period is shown in ***Figure 8-1***. 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 RMP, as described in ***Table 8-1***.

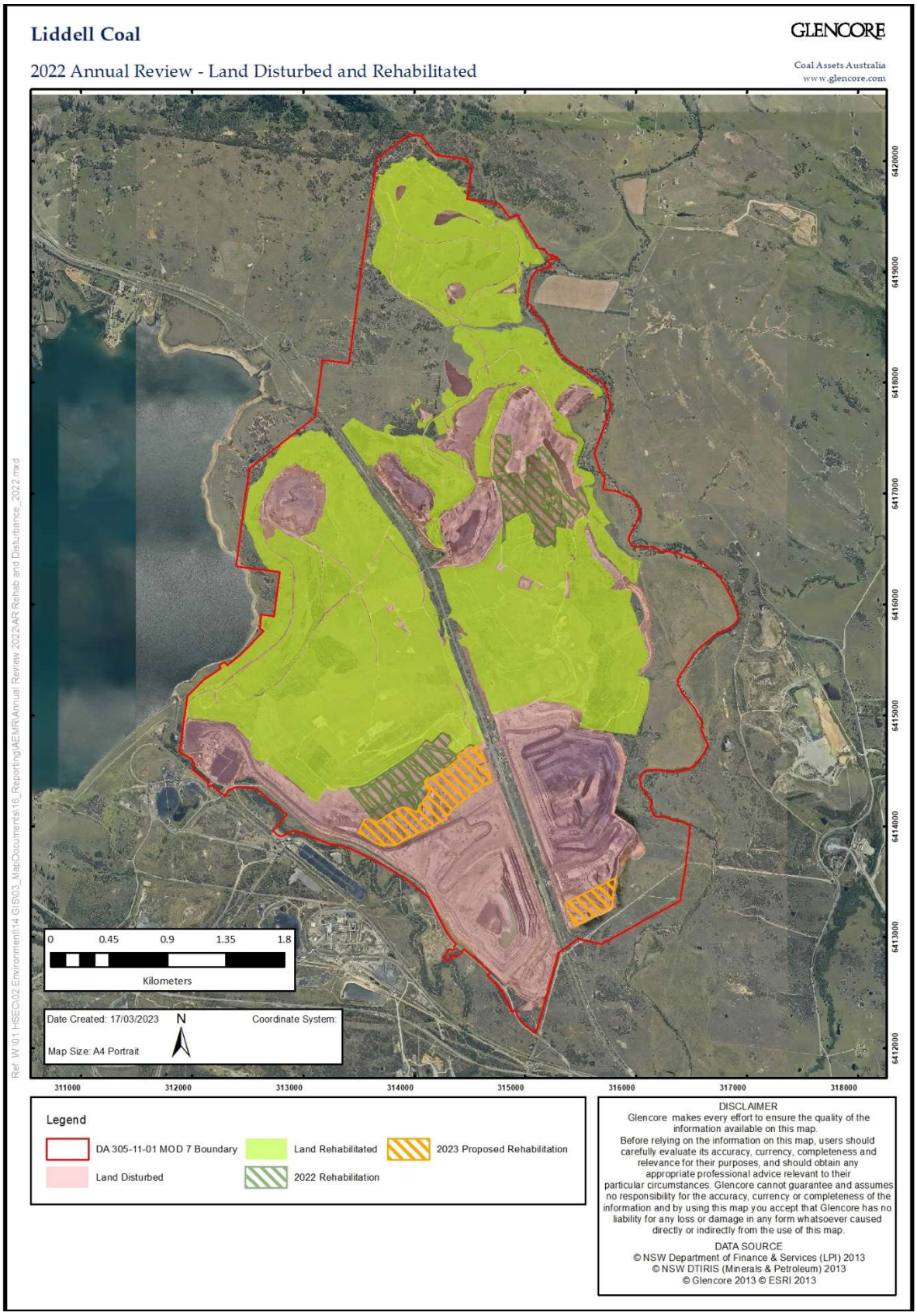

Figure 8-1 Rehabilitation completed 2022 and rehabilitation forecast

Table 8-1 2022 Rehabilitation Summary

2022 Rehabilitation Detail					
South Pit (RL 130)					
Domain	3	**Re-vegetation Date:**	December 2022	**Area:**	33 ha
Land Use: Woodland Seed/Plant Mix: Native woodland and cover crop Rehabilitation area is on the southern extent of the South Pit overburden emplacement facing south towards the New England Highway. Bulk shaping of material was completed in November 2022 with slopes generally 0 – 12 degrees, with the exception to allow uniform tie in with existing rehabilitation areas and drainage lines. Surface water drainage includes a main drain and a number of rock armoured drains all directing flow south towards the south pit void. Gypsum was applied at 10 tonne per hectare. Topsoil was placed approximately 10m either side of the rock armoured drains and in the main drain at an approximate depth of 100 mm. Topsoil was sourced from stockpiles from areas previously cleared for mining advancement. Biomix was applied at 100t/ha over the majority of the area with mulch applied to approximately 6ha at a rate of 50t/ha. Ameliorants were ripped 400 m into the soil 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 rock piles and stag trees for native fauna. Seeding was completed by drone, in three stages, following site preparation with woodland species seed mix consistent with target vegetation, Central Hunter Box Ironbark Woodland. Status at the end of 2022 was partial germination of cover crop. 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.					
Antiene Tailings Storage Facility Rehabilitation Project					
Domain	**7**	**Re-vegetation Date:**	April - December 2022	**Area:**	37 ha
Land Use: Pasture Seed/Plant Mix: Pasture and cover crop This area covers a portion of the former decommissioned Antiene Tailings Storage Facility (TSF) and Dam 4 void, partially visible from Hebden Road. Overburden capping for the TSF was won from the adjacent rehabilitation area. Shaping was completed in comprising of approximately 10 degree slopes constructed to a natural landform design. Surface water drainage includes a number of rock armoured drains directing flow to the north and east (subsequently to Dam 4). Topsoil was also won from the adjacent rehabilitation areas and applied at an approximate thickness of 100 mm. Other ameliorants applied included liquid gypsum, biosolids, biomix, fertilisers and wood fibre mulch. Surface preparation of the area included ripping to 400 mm and along the contour. Seeding was completed using a combination of hydromulch and drone application, with pasture species seed mix consistent with the RMP.					

Table 8-2 Rehabilitation status

Rehabilitation Status			
	Previous Reporting Period (Actual ha)	**This Reporting Period (Actual ha)**	**Next Reporting Period (Forecast ha)**
	2021	**2022**	**2023**
A: Total disturbance footprint – surface disturbance	1643	1643	1638
B: Total active disturbance	687	621	576
C: Rehabilitation – land preparation	36	70	45
D: Ecosystem and land use establishment	1001	1022	1067
E: Ecosystem and land use development	0	0	0
F: Rehabilitation completion	0	0	50

No rehabilitation areas onsite have been signed off against the RMP completion criteria for the purpose of formal relinquishment to date. Liddell is preparing an ESF2 Rehabilitation Completion Application for approx. 50ha of pasture rehabilitation that will be submitted in 2023.

8.2.1 RMP Rehabilitation Commitments

Table 8-3 shows the hectares put forward in the RMP for rehabilitation and disturbance, with progress to date. Within the next reporting period, LCO forecasts to complete no disturbance activities and 45 ha of rehabilitation. As per the EIS, LCO is completing rehabilitation progressively throughout the life of the operation.

Table 8-3 RMP rehabilitation status

	RMP		**Full Year Actual**		**Variance**	
	Disturbance (ha)	**Rehabilitation (ha)**	**Disturbance (ha)**	**Rehabilitation (ha)**	**Disturbance (ha)**	**Rehabilitation (ha)**
2021	0	17	0	19	0	+2
2022	0	45	0	70	0	+35
2023	0	45	-	-	-	-

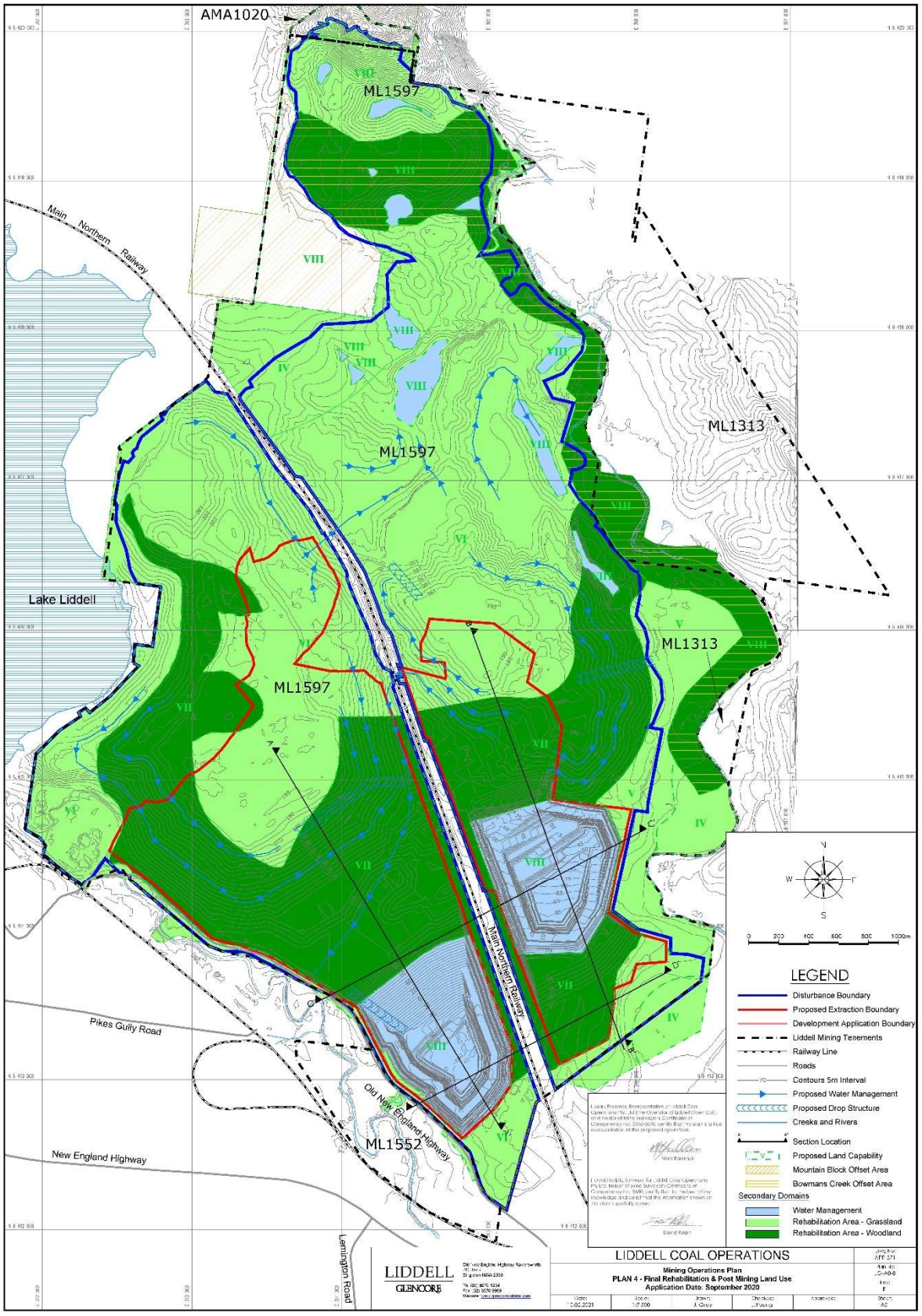

Figure 8-2 Final Rehabilitation and Post Mining Land Use

8.2.2 Tailings Emplacement Rehabilitation Strategy

Rehabilitation execution works were undertaken on Antiene Tailings Storage Facility (TSF) in line with site Tailings Rehabilitation Strategy. LCO has utilised suitable materials from surrounding overburden emplacements to construct a 1.5m cap across the tailings surface. The capping surface has been designed to be free draining to the adjacent Dam 4. Fluvial rehabilitation design has been implemented for the surrounding slopes where material has been borrowed for capping. During the reporting period the all but less than one hectare of the capping layer was completed and large areas of rehabilitation were completed. Rehabilitation activities at Antiene has also included reshaping of the Dam 4 void adjacent to the TSF to final landform.

Planning and design is also underway for Reservoir South and West TSF, with rehabilitation and capping commencing during 2022 for Reservoir South TSF and planned to commence om 2023 for Reservoir West TSF. Further details are included in ***Section 6.9.1.4***.

8.3 Detailed Mine Closure Planning

LCO coal extraction will cease in Q3 2023 and the site will transition into 'mine closure' with the continued rehabilitation of the site. Rehabilitation activities for the remaining mine life is detailed in the LCO RMP.

Detailed Mine Closure Planning (DMCP) refers to the planning of rehabilitation activities outstanding once coal extraction has been completed (e.g. decommission and rehabilitation of CHPP areas) to achieve the rehabilitation objectives. Further, consideration of the socio-economic impacts and particular stakeholder consultation is also provided for. LCO has taken a proactive approach to mine closure planning and progressive implementation of decommissioning and rehabilitation works concurrently with mining to provide for efficient delivery of the required rehabilitated landform.

Glencore Coal Assets Australia Mine Closure Planning Protocol provides for a framework for clear, well planned and executable process that will provide for a sustainable post-mining land use and ultimately allow mining tenements to be relinquished. The ***Mine Closure Planning Protocol*** meets the requirements of ***Integrated Mine Closure: Good Practice Guide (ICMM 2019)*** which is considered as international best practice for mine closure planning. As LCO approaches closure, mine closure planning is ongoing to ensure that an executable plan can be readily implemented when required to rehabilitate the site.

LCO engaged with a number of stakeholders throughout the reporting period including, but not limited to, the NSW Department of Planning Industry & Environment, NSW Resources Regulator and the Environment Protection Agency.

A summary of mine closure planning themes which underwent continued assessment during 2022 included:

- Review of risks to rehabilitation and development of treatment plans
- Refinement of the final surface landform and rehabilitation completion criteria
- Tailings rehabilitation strategy
- Groundwater regime investigation and water balance for final landform and voids
- Final landform surface water management and creek stream health
- Borehole and underground mining
- Rail pillar stability assessment
- Socio-economic impact assessment

- Provision review

To date, LCO progressed mine closure preparedness as summarised in the following:

- An Initial Closure Broad Brush Risk Assessment with risks individually assigned to a closure domain or where deemed appropriate, applied to the whole site.
- Legal and Other Obligations Register with consideration of the State/Commonwealth legislation, guidelines, standards, permits, agreements and planning requirements that are applicable to the site that require consideration when preparing the DMCP
- A Constrains and Opportunities analysis commensurate to the risks and opportunities relating to closure of the site.
- A Mine Closure Stakeholder Engagement Strategy has been prepared to ensure that all relevant internal and external stakeholders who have an interest or role in the preparation of the DMCP are consulted at the appropriate times throughout the process. It is intended that this be a "live" document that will be revised and updated at regular milestones.
- A Knowledge Base Report to define the Environmental and Socio-Economic Baseline and to provide for a systematic 'gap analysis' of information required to prepare the detailed mine closure plan. Outcomes of this gap analysis were then used to further detail the Closure Risk Assessment and scope the technical studies required.
- Technical studies and assessments to address knowledge gaps identified above to minimise risks identified in the Closure Risk Assessment. During 2022 the following key study areas were addressed:
    - Final landform water management detailed designs
    - Hydrogeological assessments focusing on confirmation of predicted drawdown in the Bowmans CK alluvium and tailings emplacement seepage
    - Final voids water balance assessment and optimisation
    - Landform erosion management
    - Demolition, waste and mineral waste management
    - Archaeological artefact management
    - Biodiversity and rehabilitation completion criteria
    - Tailings Emplacement Rehabilitation
    - Geotechnical assessments, including spontaneous combustion.

During 2022, LCO will continue to develop the DMCP by:

- Preparation of Mine Closure Plan.
- Implementation of treatments plans following risk review.
- Continuing progressive rehabilitation as mining activities complete in areas including tailings emplacements.
- Ongoing quarterly schedule briefing session with the NSW Resources Regulator updating progress and timing.
- Development of a detailed internal rehabilitation scope of works.
- Revision of the Rehabilitation Management Plan to detail activities occurring post mining.

8.4 Biodiversity Management

During 2022, LCO continued to operate in accordance with the approved RMP and BMP in regard to rehabilitation and biodiversity practices and monitoring. The detailed rehabilitation and biodiversity monitoring were completed in accordance with the RMP and BMP with the findings summarised below. **Appendix H i**ncludes a summary of the rehabilitation establishments works completed during 2022.

The BMP was updated following the 2021 annual review and the 2022 IEA recommendations. The BMP was approved by the Department of Planning and Environment in September 2022.

8.4.1 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 additional three yearly performance indicators. LCO's performance tracking towards the objectives is detailed in this section. The BMP area is defined as all land within the DA305-11-01 consent boundary; including rehabilitation areas and remnant vegetation, excluding biodiversity offset areas.

Based on the outcomes of the 2022 BMP monitoring, it appears that LCO are effectively managing their existing biodiversity values and are improving values of areas previously lacking in habitat value. LCO have been responsive to the management actions suggested in previous monitoring reports.

The key findings of the 2022 biodiversity monitoring program were as follows:

- The vegetation structure, vegetation health and habitat features have all remained in a very similar state to that at the commencement of monitoring, except:
  - WR02 which has undergone significant growth of canopy vegetation from 20cm height to approximately 8 metres in height.
  - R01 which underwent substantial defoliation during the drought and has yet to fully recover
- Canopy defoliation was observed at remnant riparian site R01 likely due to prolonged drought conditions in previous years, though appears to be recovering (albeit slowly).
- Remnant vegetation at W03 is generally in a good condition; however, some potentially problematic weed species are present in these areas, likely in response to rainfall in the lead up to monitoring.
- A decrease in native diversity at riparian site R01 was observed, which again correlates with an increase in weed coverage, likely in response to rainfall in the lead up to monitoring.
- An increase in native species diversity at rehabilitation site WR02 correlates with declines in exotic grass species, particularly Rhodes grass (*Chloris gayana*).
- Riparian remnant site R01 is dominated by introduced species which are out-competing natives, and given their prevalence over an extended period of time, are unlikely to recover to former levels without intervention.
- Fauna results at remnant sites were within the range of those observed since baseline. Fauna species diversity at rehabilitation site WR02 is continuing to steadily improve.

- There has not been a notable increase in the extent of feral species presence, however continued management of predators will increase the value of all areas for the spotted-tailed quoll (Dasyurus *maculatus*).
- The spotted-tailed quoll (*Dasyurus maculatus*) was identified for the first time in rehabilitation in 2022 and the first time at LCO since 2019. This is a promising sign for the colonisation of this species.
- Rehabilitated vegetation at WR02 is in a moderate condition (species diversity and plant health) and is on a generally positive/improving trajectory. However, could be assisted in becoming more compatible with reference vegetation by:
  - reducing weed levels/ maintaining weed management efforts and
  - increasing diversity of native flora species in the groundcover and midstorey.
- Stygofauna diversity at ALV7 and ALV9 were absent, however this was consistent with most previous monitoring events.
- Stygofauna diversity levels continue to be low at ALV2 and ALV3.
- No signs consistent with myrtle rust, Phytophthora or Chytrid fungus were identified.

As per the BMP, LCO prepare an Annual Biodiversity Monitoring Report , which documents 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 2022 Biodiversity Monitoring Report is made available on the LCO website.

8.4.2 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 developed for three years periods of the implementation of the BMP are used to assist 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 8-4*** below, based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 8-4 BMP performance indicator summary

Action/Item	Performance Indicator	Compliance	Performance Comment
Year 7 2022			
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	Inspections completed. 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	Inspections completed.
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. Pre-clearance survey identifies any weed infestations requiring further management.

Action/Item	Performance Indicator	Compliance	Performance Comment
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 cinnamomi*, myrtle rust or chytrid fungus observed during 2022 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.	Compliant	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	Pre-clearing completed throughout year as part of Ground Disturbance Permit process.

Action/Item	Performance Indicator	Compliance	Performance Comment
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. Outcomes of tree-felling process are recorded and recommendations are implemented.	Compliant	Tree-felling completed as part of Ground Disturbance Permit process.
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 relocated to the Mountain Block BOA in 2018 and has been subject to regular monitoring and maintenance. 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.

Action/Item	Performance Indicator	Compliance	Performance Comment
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. Management works will be conducted, as necessary.	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. 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 R01, W03 and WR02.
Weed Control			
Complete weed inspections of BMP area every two months to document diversity and abundance of noxious weed records. This will then inform	Inspections completed every two months, followed by implementation	Compliant	Inspections being completed as required with appropriate weed priorities actioned.

Action/Item	Performance Indicator	Compliance	Performance Comment
ongoing control actions (as needed), including timing, frequency, target species and methods to be used.	of required control methods, as required.		
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.
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.	Compliant	Inspections for feral fauna are completed every two months.
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 2022. Pest numbers appeared to be stable and low. During 2022 LCO conducted two feral cat cage trapping programs in July and October. Both programs were successful with three and four cats were trapped respectively.

Action/Item	Performance Indicator	Compliance	Performance Comment
Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register.	Compliant	Vertebrate pest control register maintained and updated throughout 2022.
Blue-billed Duck Management			
Complete habitat enhancement, maintenance and monitoring works (as required) for the blue-billed duck	Ongoing enhancement and management works within Dam 3 and two Triangle Dams. Monitoring works as required.	Partial Compliant	Habitat values for Dam 1 and Triangle dams assessed during 2022 monitoring. It was identified that this dam provides moderate habitat value. Habitat enhancement recommended however, through planting of aquatic vegetation.
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 was 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 B" conducted in 2022.
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.
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	Continue to undertake plantings that provide foraging resources, as per species list in BMP.
Grazing Management			
Stock rotation	Cattle are grazed within improved pasture areas within mine rehabilitation >3years where practical	Compliant	LCO coordinate cattle grazing and between paddocks under supervision of district agronomist.

Action/Item	Performance Indicator	Compliance	Performance Comment
	Stocked will be managed to allow pasture recovery and maintain pasture availability and sufficient groundcover.		
Bushfire Management			
Bushfire Management Plan will be implemented	Implementation of requirements of updated Bushfire Management Plan.	Compliant	Bushfire Management Plan updated in 2022. No signs of bushfire impacting biodiversity values.
Ecological Monitoring			
Undertake floristic, fauna, LFA, waterbird, nest box, stygofauna and instream/riparian monitoring program throughout LCO	Monitoring program completed and reported.	Compliant	Floristic, fauna, waterbird, nest box, stygofauna and instream/riparian monitoring program throughout LCO completed in 2022 and reported on.
Undertake annual inspections of LCO rehabilitation areas as per the RMP	Annual inspections completed	Compliant	Annual inspections of LCO rehabilitation areas completed and summary included in this Annual Review.
Native fauna presence in rehabilitation/regeneration areas	Fauna monitoring completed.	Compliant	2022 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.

Action/Item	Performance Indicator		Compliance	Performance Comment
				Increased structural and vegetation diversity in rehabilitation areas will increase native fauna diversity in these areas with time. Maintain current pest control programs. Ongoing placement of habitat features such as log and rock piles as well as small retention dams and vegetated corridors in rehabilitation areas will also increase the niche availability for native fauna colonisation.
Rehabilitation Works (RMP) – Ecosystem Establishment Phase (relevant to WR02)				
Native Ecosystem (Central Hunter Box-Ironbark Woodland)				
At least 731ha of the target native woodland vegetation (Central Hunter Box-Ironbark Woodland) is established providing habitat connectivity for the Spotted-tailed Quoll.	Distribution of Central Hunter Box-Ironbark Woodland provides for habitat connectivity across the landform.	Survey confirms 731ha of Central Hunter Box-Ironbark Woodland is established across the landform providing connectivity (native woodland corridors) between adjoining native vegetation/habitat.	Not yet compliant	Rehabilitation of native woodland areas progressing as per RMP schedule

Action/Item	Performance Indicator		Compliance	Performance Comment
Ecological Rehabilitation Objective 1 The vegetation composition of the rehabilitation is recognisable as the target plant community (Central Hunter Box-Ironbark Woodland) as described by the NSW Scientific Final Committee Determination. Note: Recognisable is defined as "Diagnostic species present for each Growth form for PCT/TEC using the scientific description of the plant community type available on Bionet.	The number of characteristic species for Central Hunter Box-Ironbark Woodland present is assessed against the NSW Scientific Committee Final Determination.	A minimum of 10 of the 38 characteristic flora species contained in the Central Hunter Grey Box – Ironbark Woodland Final Determination (NSW Scientific Committee 2010) is present in a standard 20 m x 20 m floristic sampling plot.	Progressing toward compliance	WR02 does not yet have a composition characteristic of the required PCT, however does have some key canopy and shrubs present.
Ecological Rehabilitation Objective 2 The vegetation structure of the rehabilitation is recognisable as, or is trending towards the target plant community (Central Hunter Box-Ironbark Woodland)as described by the NSW Scientific Committee Final Determination. Note: "Trending Towards the target plant community" requires use of time series data to show development for each Growth Form against benchmark value range (or successional benchmarks)	Cover of each native growth form; and of all native vascular plant species, including: -Overstorey cover -Midstorey cover - Native groundcover (grasses, shrubs, other)	Cover of all native growth forms are comparable to, or trending towards, values observed at reference sites.	Compliant	WR02 has a native canopy, midstorey and ground over present that is improving gradually.

Action/Item	Performance Indicator		Compliance	Performance Comment
Ecological Rehabilitation Objective 3 Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable	Litter cover is recorded at fixed monitoring plots in accordance with the BAM.	Litter cover is within the range observed at reference sites. The range equates to the minimum and maximum litter cover values observed during the same temporal monitoring event.	Compliant	Litter cover is being monitored and is present a WR02
	Trees and shrubs are monitored for establishment and survival of second generation individuals.	Plant recruitment is "suitable"1, 2 for sustaining the target plant community 1 Suitable means that second generation trees and shrubs are present.	Compliant	Rehabilitation monitoring is undertaken to assess tree and shrub survival and second-generation individuals
	The total cover of exotic plant species is recorded at fixed monitoring plots as per BAM. The cover and abundance of each high threat weed is	Plant competition is "suitable" for sustaining the target plant community 1 Suitable means at least 70 % of understorey	Compliant	Rehabilitation monitoring of total exotic plant species as well as cover and abundance of HTWs is recorded in accordance with BAM at rehabilitation sites

Action/Item	Performance Indicator		Compliance	Performance Comment
	separately recorded.	vegetative cover* within a standard 20 m x 20 m floristic sampling plot is native; and 'High Threat Weeds' (as defined by the BAM) account for no more than 10% of understorey vegetative cover. * Understorey vegetative cover includes the foliage cover of all flora species present below the tree canopy.		

8.4.3 Rehabilitation Monitoring Summary

LCO also conduct a detailed rehabilitation monitoring program as detailed in the RMP. 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 2022 Rehabilitation Monitoring Reports.

The overall condition of rehabilitation at LCO is moderate and generally trending towards the target. Most areas have a good ground coverage which is preventing substantial erosion. In the woodland areas, ground coverage is generally provided by non-target species and vegetation has not been established for long enough to provide substantial soil organic matter (leaf litter).

Pasture areas are typically of good height and density for grazing, which has been employed in a number of rehabilitation areas in the reporting period. LCO continue to manage exotic species throughout the rehabilitation.

8.4.3.1 Pasture Rehabilitation

The two broad pasture rehabilitation types have been established across the LCO site being the pre-2013 pasture areas that are dominated by Rhodes grass (*Chloris gayana*) and the post-2013 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. Paddocks consisting of this pasture type that have been managed through the site grazing program by grazing and over sowing have a much-improved pasture composition and structure. This has been demonstrated as an effective management process for older pastures.

The newly established pasture areas are establishing well, and older areas established using the new pasture mix may be suitable for light grazing. These pastures should be managed to maintain and increase the diversity of high-quality pasture species, increase cover and biomass and to limit the establishment of lower quality species such as Rhode's grass. Across all pasture areas, a low level of soil carbon was identified and this is a factor that will potentially limit the productivity and sustainability of pastures. Managing pastures to increase soil carbon will be a critical step in maintaining pastures that are consisted with the completion criteria with minimal inputs.

Pasture areas are generally trending towards completion criteria across the site.

8.4.3.2 Woodland Rehabilitation

Woodland rehabilitation areas are more variable and each of the woodland rehabilitation blocks face unique challenges. Most areas, however, contain suitable species in at least two vegetative layers.

Augmentation works undertaken in 2020-2021 are not yet of a sufficient age to assess, however early indications are promising with signs of early establishment of seedlings and good survival of planted species.

A major threat to woodland rehabilitation area observed has been the establishment of weed species. Dominance of weed species, particularly invasive perennial grasses, Coolatai (*Hyparrhenia hirta*) Rhodes grass (*Chloris gayana*) and kikuyu (*Cenchrus clandestinus*) and galenia (*Galenia pubescens*) continues to be a major threat to the establishment of target vegetation in Woodland rehabilitation areas.

Ongoing works including continued augmentation of mid and ground layer vegetation with species selected from target vegetation communities and weed control works will be required to continue progressing woodland rehabilitation areas towards closure criteria.

Ongoing improvements have been made to the methodology for establishing new rehabilitation. Woodland rehabilitation areas established since 2018 have included increased diversity within the seed mix and the installation of habitat features such as stag trees and water retention features. Other ongoing improvements include seeding of water retention features with aquatic species and increased weed control in establishing rehabilitation areas.

Two critical steps in progressing rehabilitation towards closure criteria will be;

- Augmentation of older rehabilitation areas through seeding and planting of species from the *Central Hunter Grey Box – Ironbark Woodland* EEC. And

Management of invasive species with the potential to out compete native species. especially weedy perennial grasses Coolatai (*Hyparrhenia hirta*) Rhodes (*Chloris gayana*) and African love grass (*Eragrostis curvula*). While continued works are required, particularly in woodland rehabilitation blocks, the commitment to adaptive management at Liddell Coal should be commended.

8.4.4 Rehabilitation Management Performance Indicators

As per the RMP, rehabilitation requires maintenance and continuous adaptive management to improve the performance of each area. Adaptive management is guided by monitoring results and appropriate actions are completed where 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 or intervention. ***Table 8-5*** below identifies the TARP elements that as having a status other than 'green'.

As per the RMP, the site progress towards the RMP performance Indictors/Completion Criteria was reviewed as part of the monitoring completed in 2022.

A rehabilitation summary of areas established during 2022 is provided in ***Table 8-1.***

Table 8-5 RMP TARP status - exceptions only

Aspect/Category	Key Element	Element Number	2022 Status	RMP Detail		Aspect/ 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 maintenance required. Ongoing 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.	LCO continue to use suitable topsoil alternatives with consideration to rehabilitation performance. During 2022, LCO utilised other topsoil alternative as biomix, and mulch to promote growth on newly established rehabilitation areas. Monitoring of success will continue.
				Response	Investigate options and alternative substrates to be able to meet future topsoil requirements Continue direct seeding on spoil where possible and approved.	

Aspect/Category	Key Element	Element Number	2022 Status	RMP Detail		Aspect/ Comment
Vegetation	Groundcover	9	Amber	Trigger	Vegetation is not on a timely trajectory of developing groundcover of diversity or density consistent with final landform and/or completion criteria.	During the 2022 monitoring event, 9 woodland sites triggered the amber TARP. Despite the success of most IEM sites, native groundcover is lacking in diversity and abundance. While the canopy and midstorey species are in excellent health generally, groundcover requires additional planting, or at the least, weed control to encourage natural regeneration. The groundcover is generally good across pasture rehabilitation areas. Selective grazing will require management as areas continue to be used for agriculture.
				Response	Review procedures where required to increase vegetation cover.	
Vegetation	Weed Presence	10	Amber	Trigger	Weeds present a risk to the establishment	During the 2022 monitoring event, 6

Aspect/Category	Key Element	Element Number	2022 Status	RMP Detail		Aspect/ Comment
					of the rehabilitation areas.	woodland areas had a high cover of weed species that pose particular risk to target vegetation establishment. This was contributed to by climatic conditions commensurate with good growing conditions, and seed availability. LCO conducts weed control in these areas and will continue to monitor revegetation performance and weed presence.
				Response	Engage weed management contractor to remove introduced species from the site.	
Vegetation	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.	5 of the 9 woodland rehabilitation areas monitored in 2022 triggered the amber TARP level. Woodland rehabilitation is broadly consistent with the target vegetation in the tree and shrub layers.

Aspect/Category	Key Element	Element Number	2022 Status	RMP Detail		Aspect/ Comment
				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.	

8.5 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 8-3** shows LCO biodiversity offset area comprising of Mountain Block, Bowmans Creek Riparian Corridor and Mitchell Hills South Offset Areas. During 2021, 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.

Four Conservation Agreements (CAs) are registered on title for the BOAs. A CA is a legal agreement under section 69 of the NPW Act for an area of land with significant conservation value. These CAs are legally binding for both current and future landholders and is registered on the land title. The CAs document:

- Conservation values present
- Management arrangements and costings
- Monitoring arrangements

Table 8-6 BOA Conservation Agreements

Agreement Name	Agreement No.	Date Executed	Date registered on title	Approximate Area
Mitchell Hills South Conservation Area	VC00505	7/05/2019	8/08/2019	40
Mountain Block Conservation Area	VC0525	13/05/2019	1/10/2019	168
Bowmans Creek Riparian Corridor	VC00506	7/05/2019	1/10/2019	183
Bowmans Creek Riparian Corridor East	VC00516	9/05/2019	6/08/2019	3

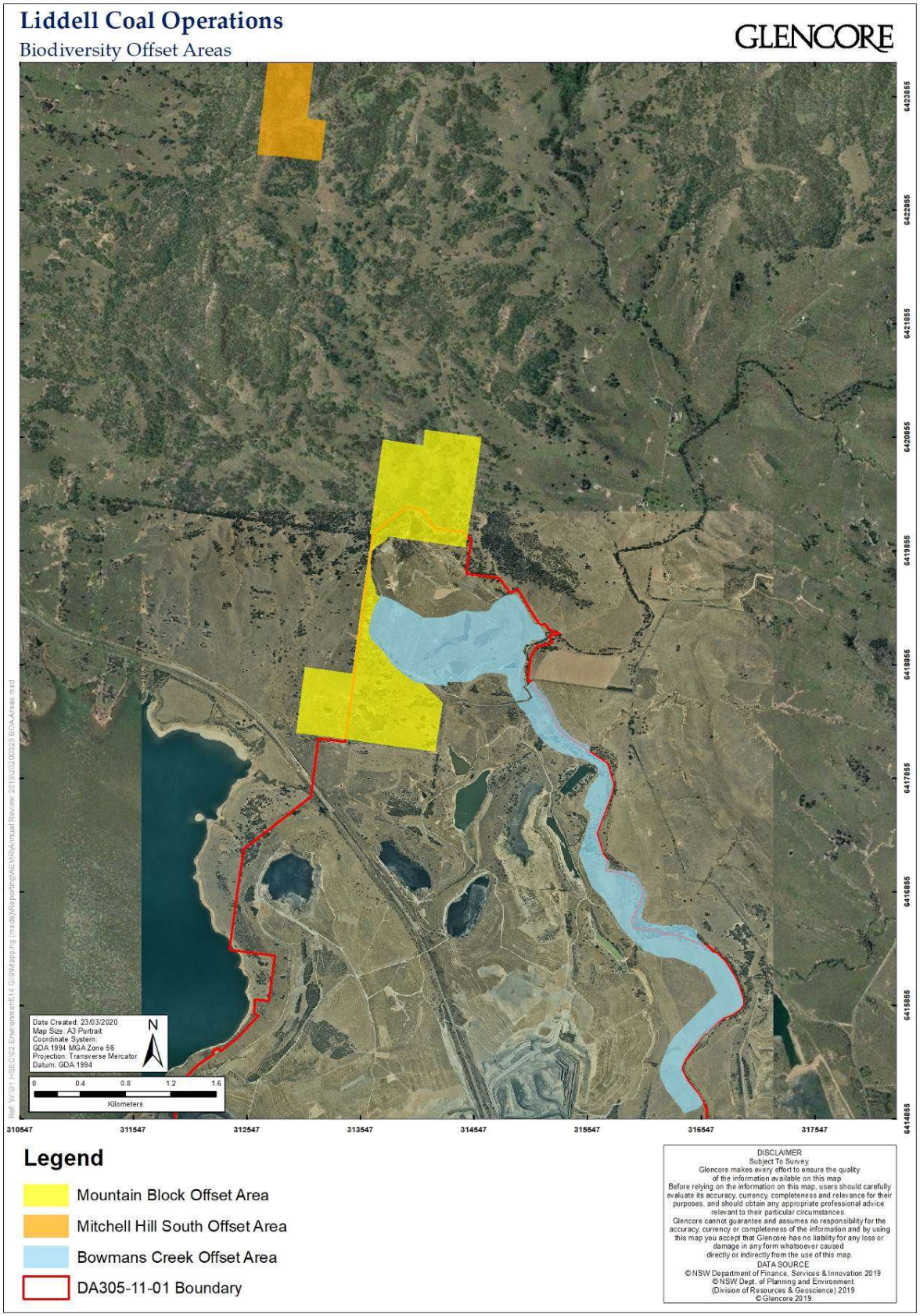

Figure 8-3 Biodiversity offset areas

8.5.1 Biodiversity Offset Monitoring Summary

During 2022, LCO completed ecological monitoring in accordance with the BOMP and various management actions relating to the performance indicators.

Key findings of the 2022 biodiversity offset monitoring program include:

- Mountain Block

  o Vegetated connectivity has strengthened between formerly disconnected or poorly connected vegetation fragments in the southern and northern paddocks.

  o Natural recruitment in this BOA is strong and gradually infilling canopy gaps.

  o Substantial revegetation works have been completed since 2018. The drought impacted survival rates, however recent works since the return of good growing conditions has seen an increase in survival and growth.

  o Habitat value has been improved for a range of hollow-dependent fauna species by the installation of 97 nest boxes. In 2022, 16% of those boxes monitored (being 38) were inhabited at the time of survey, with 47% showing signs of occupancy.

  o Vertebrate pest fauna management works continue to be completed and appear to be keeping most pest species numbers low throughout.

  o Weed control works have continued to be a focus of management actions, and on certain target species such as galenia (*Galenia pubescens*), these works are showing positive results.

  o Eroded creek lines have been subject to hydro-mulching works to stabilise actively eroding areas.

Key challenges in this BOA remain the control of exotic grasses, particularly prior to and following revegetation activities. Vertebrate pest management works will continue to be implemented, as will ongoing works to manage erosion in select creek lines in the south.

- Mitchell Hills South

  o This site could not be accessed by Umwelt in spring of 2022; however the following observations have been made in this BOA based on information collected in previous years and by other contractors:

    ▪ Natural recruitment, particularly of native shrubby vegetation has been strong in former grassland areas.

    ▪ Natural recovery of canopy species has been gradual but has been assisted in areas of former grassland in the south. This will likely require further supplementary plantings in future.

    ▪ Habitat value has been improved for a range of hollow-dependent fauna species by the installation of 75 nest boxes. These boxes were not monitored in 2022.

    ▪ Exotic species are low throughout most of this BOA, however, will require ongoing management in grasslands prior to any further revegetation activities.

Maintaining the currently low levels of weed and vertebrate pest species should be an ongoing focus of this BOA. Improving all-weather access to this BOA will be a target in 2023. This will include consultation with neighbours where access to the BOA runs through non-LCO properties.

- Bowmans Creek Riparian Corridor

  o Revegetation works undertaken during drought years in 2018 and 2019 were largely unsuccessful. However, revegetation undertaken since this time has shown greater success.

This is evident in the strengthening of the width of the riparian corridor in the central areas of this BOA.

o Habitat value has been improved for a range of hollow-dependent fauna species by the installation of 294 nest boxes. In 2022, 6% of those boxes monitored (being 189) were inhabited at the time of survey, with 33% showing signs of occupancy.

o Vertebrate pest fauna management works appear to be keeping pest numbers low throughout and should be continued.

o One cow was observed in this BOA in 2022 as a result of a damaged fence. This cow has since been removed and the fence was repaired in early 2023.

o The key threat to the recovery of vegetation in this BOA remains the management of exotic grasses, primarily that of introduced grasses in grassland areas, particularly prior to undertaking further revegetation activities.

8.5.2 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 is summarised in ***Table 8-7*** below, based on the outcomes of ecological monitoring and inspections across LCO for each year.

Table 8-7 BOMP performance indicator summary

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
Pathogen Management				
All BOAs	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.
			Mitchell Hills South could not be assessed for compatibility in 2022. Compliance = NA	
Fencing and Signage				
All BOAs	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.
			Non-compliant	Stock identified in Bowmans Creek Riparian Corridor. The fence has since been repaired and the stock removed.
			Non-compliant	An assessment made during an inspection identified a downed section of boundary fences in the west of Mitchell Hills South due to a fallen limb.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
All biodiversity offset areas	Any new fencing does not have barbed wire on upper strands and as little barbed wire generally as possible. The bottom strand will be plain wire and elevated to allow faunal passage (while maintaining cattle exclusion).	New fences are installed without barbed wire on upper strands and an elevated plain wire bottom strand.	Not applicable	No new fences installed.
All BOAs	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	Fence inspections undertaken every two months in accordance with commitments of the BOMP.
All BOAs	Information signage for the spotted-tailed quoll.	Informational signage (for the spotted-tailed quoll) is maintained.	Compliant	Signage is installed and in good condition.
Cultural Heritage				
Bowmans Creek Riparian Corridor	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 where required.
All biodiversity offset areas	Implement protocols for identification of potential cultural heritage issues,	Implement protocol.	Compliant	Implemented as per the approved ACHMP.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
	including how to avoid or mitigate impacts.			
Grazing Management				
All BOAs	All stock to be removed from BOAs	No stock grazing unless required based on monitoring results.	Compliant	No evidence of cattle grazing was evident during 2022 in Mountain Block or Mitchell Hills South BOA.
			Non-compliant	Evidence of cattle grazing evident in Bowmans Creek Riparian Creek. Fences have since been repaired.
All BOAs	Minimum bi-monthly inspections to determine presence of rogue stock and assess condition of fences.	To be completed bi-monthly.	Compliant	Cattle inspections undertaken bi-monthly in accordance with commitments of the BOMP.
All BOAs	Remove reported rogue stock and repair damaged fences.	Action and remove reported rogue stock and repair damaged fences.	Compliant	Rogue stock identified in Bowmans Creek Riparian Corridor, fences were repaired and stock removed.
Track Maintenance				
All BOAs	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.	Not applicable	To be assessed on an ongoing basis. No new tracks installed.
All BOAs	Minimum twice yearly (nominally in March and	Inspections undertaken nominally in March and September.	Compliant	Access track inspections undertaken bi-annually in accordance with commitments of the BOMP.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
	September) inspections to identify track conditions.	Action and repair track damage.		
All BOAs	Rehabilitation of unnecessary access tracks.	Tracks no longer required will be rehabilitated.	Not applicable	All tracks present are considered necessary.
Pest Management				
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 undertaken every two months in accordance with commitments of the BOMP. Feral cats, foxes and dogs were identified in low numbers in Bowmans Creek Riparian Corridor and subsequently should be key species for management in 2023.
All BOAs	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	Pest numbers appeared to be generally low and stable. Annual pest action plan developed and implemented during 2022.
All BOAs	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.	Compliant	Feral fauna identified in low numbers and not appear to be increasing in abundance. Feral dogs, foxes and feral cats were observed throughout the year and during monitoring. Further implementation of control measures to occur during 2023 as per annual action plan.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
All biodiversity offset areas	Presence of pest animals	As evidenced by monitoring, pest animal presence in revegetation/ rehabilitation areas does not pose a risk to establishment of vegetation.	Compliant	Dog, hares, black rats, house mice, rabbits, foxes, cattle, deer, feral pigs have been identified although appear to be generally low in numbers. Further control measures for these species to be implemented during 2023 as per annual action plan.
All BOAs	Develop a vertebrate pest control register to document when and where each control method is implemented.	Update and maintain vertebrate pest control register.	Compliant	Existing vertebrate pest control register implemented.
Weed Management				
All BOAs	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.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
Natural Regeneration				
Mountain Block	102. ha of grassland/ disturbed areas will be returned to target PCT.	Progressing towards establishment of 102.2 ha of target PCTs.	Compliant	LCO is on a trajectory towards establishing 102.2 ha of woodland in Mountain Block.
Mitchell Hills South	14.4 ha of grassland/disturbed areas will be returned to target PCT.	Progressing towards establishment of 14.4 ha of target PCTs.	Compliant	LCO is on a trajectory towards establishing 14.4 ha of woodland in Mitchell Hills South.
Mountain Block and Mitchell Hills South	Mapping of areas naturally regenerating and subject to revegetation works to track if natural/assisted regeneration is on track to meet final hectare goals.	Revised in ongoing monitoring works, as needed.	Compliant	Mapping of targets undertaken in Mountain Block and Bowmans Creek Riparian Corridor
			NA	Mitchell Hills South could not be assessed in 2022.
Mountain Block and Mitchell Hills South	Management of regeneration progress is responsive to monitoring outcomes.	Monitoring of regeneration areas.	Compliant	Monitoring of regeneration progress occurred in 2022 and appear to be progressing.
			NA	Mitchell Hills South could not be assessed in 2022.
Mountain Block and Mitchell Hills South	Review need for assisted regeneration where outcomes of natural regeneration is deemed lacking.	Assess progress/outcomes of natural regeneration and assess and implement assisted regeneraton measures as required.	Compliant	Natural regeneration was assessed and remains low in the southern paddocks, particularly north-west of site WR04 and east of WR04.
			NA	Mitchell Hills South could not be assessed in 2022.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
Assisted Regeneration				
Mountain Block and Mitchell Hills South	Review need for assisted regeneration where outcomes of natural regeneration is deemed lacking.	Assess progress/outcomes of natural regeneration and assess and implement assisted regeneration measures as required.	Compliant	Natural regeneration was identified in BOAs. Undertake supplementary plantings in areas of poor revegetation success (as identified in monitoring report).
Revegetation Activities				
All BOAs	Areas which have been rehabilitated should aim to be within 50 percent compatibility of their relevant PCT benchmarks (In accordance with BAM).	Revegetation Sites are progressing towards compatibility with target PCT vegetation	Non-compliant	Mountain Block revegetation site WR04 currently shows some similarity with target PCT 1691. However, is not within 50% compatibility for: • Percent Foliage Cover (PFC) of shrubs, canopy, and groundcover (other than grasses is too low). Bowmans Creek Riparian Corridor Site WR07 currently shows some similarity with target PCT 1602. However, is not within 50% compatibility for: • Indicative species present in midstorey and groundcover • Tree count • Shrub richness • Low proportion of indicative species present in groundcover.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
				• Weed species dominate groundcover. Bowmans Creek Riparian Corridor Site WR09 currently shows some similarity with target PCT 1691. However, is not within 50% compatibility for: • Indicative species present in canopy, midstorey and groundcover • PFC for canopy, midstorey and groundcover is insufficient • Weed species dominate the groundcover.
			NA	Mitchell Hills South could not be assessed in 2022.
All BOAs	More than 75% of trees are healthy and growing as indicated by long term monitoring.		Compliant	Trees in Mountain Block site WR04 were all generally healthy
			Non-compliant	Bowmans Creek Riparian Corridor Sites WR07 and WR09 currently have an insufficient number of trees present to be assessed for health. Supplementary tree plantings required.
			NA	Mitchell Hills South could not be assessed in 2022.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
All BOAs	Monitoring demonstrates second generation trees present		Compliant	Second generation trees are present in Mountain Block site WR04
			Non-compliant	No second generation trees are present in Bowmans Creek Riparian Corridor sites WR07 and WR09
			NA	Mitchell Hills South could not be assessed in 2022.
All BOAs	Areas support a vegetation structure similar to that recorded for reference sites.		Compliant	Vegetation structure in Mountain Block site WR04 is similar to that of refence sites
			Non-compliant	Vegetation structure present in Bowmans Creek Riparian Corridor Sites WR07 and WR09 are not consistent with reference sites.
			NA	Mitchell Hills South could not be assessed in 2022
All BOAs	Monitoring confirms target native fauna species are recorded utilising habitats.		Compliant	Native fauna composition of Mountain Block site WR04 is similar to that of refence sites.
			Non-compliant	Species groups present in Bowmans Creek Riparian Corridor Sites WR07 and WR09 are not consistent with reference sites. Primarily native bird and mammal diversity.
			NA	Mitchell Hills South could not be assessed in 2022.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
All BOAs	Survey confirms that 263.83 ha of woodland has been established.	Progressing towards establishment of 263.83 ha of woodland.	Compliant	LCO is on a trajectory towards establishing 263.83 ha of woodland
Rehabilitation				
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Develop detailed performance criteria for all management zone types.	Refine criteria developed based on annual monitoring of analogue sites if necessary.	Not applicable	
Bowmans Creek Riparian Corridor Mountain Block Offset Area	Implement rehabilitation / revegetation program.	Implementation of plan.	Compliant	Rehabilitation Plan is being implemented
Bowmans Creek Riparian Corridor	Positive feedback loop from monitoring results.	Feedback from monitoring is incorporated into ongoing review and improvement of plan.	Compliant	Rehabilitation Plan is being implemented.
Habitat Augmentation				
Bowmans Creek Riparian Corridor	Salvage of habitat features (particularly for the spotted-tailed quoll) such as hollow-	Suitable habitat features identified during the pre-clearing process are salvaged. Salvaged features are either re-instated into areas with low	Compliant	No clearing occurred in 2022 so no salvaged habitat trees installed in the offsets.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
	bearing trees, logs, stumps, large rocks and boulders.	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.		
All BOAs	Nest boxes present to improve habitat value for native fauna	Established nest boxes are subject to regular monitoring as identified in Section 4.3.8 and maintenance.	Compliant	Nest boxes present in all BOAs and subject to regular monitoring
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	Mitchell Hills South is generally considered to have adequate fauna habitat. Paddocks of south Mountain Block require augmentation (logs and boulder piles)
Translocation				
All BOAs	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	No translocations conducted. Orchid translocated in 2018 monitored and alive.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
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.	Non-compliant	Cattle identified along Bowmans Creek Riparian Corridor in 2022. Fencing repaired.
Seed Collection				
All BOAs	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	Seed collection occurred in 2022 across Mountain Block and Mitchell Hills South.
Erosion Sedimentation and Salinity				
Mountain Block	Control of erosion in southern paddocks	Continue hydromulching of remainder of eroded areas if trials are successful.	Compliant	2019 trial area monitored. No additional substantial erosion although limited seed strike.
Mountain Block	Monitor completed erosion works and action repairs if required.	Monitor completed erosion works and action repairs if required.	Compliant	2019 trial area monitored. No additional substantial erosion although limited seed strike.

Relevant Offset Area	Action	2022 Performance Indicator	Compliance	Performance Comment
Bushfire Management				
All BOAs	Bushfire Management Plan implementation	Implementation of requirements of updated Bushfire Management Plan.	Compliant	Bushfire Management Plan implemented.
Monitoring				
All BOAs	Undertake floristic, fauna, LFA and nest box monitoring program	Monitoring program completed and reported	Compliant	Monitoring program completed. Summary of monitoring provided in ***Section 8.5.1***.
All BOAs	Undertake annual inspections of LCO rehabilitation and active regeneration areas	Annual inspections completed	Compliant	Monitoring program completed. Summary of monitoring provided in ***Section 8.5.1***.
All BOAs	Native fauna presence in rehabilitation/regeneration areas	Fauna monitoring completed	Compliant	Monitoring program completed. Summary of monitoring provided in ***Section 8.5.1***

8.6 Indirect Offset Management

8.6.1 Background

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 305-11-01 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 NSW Biodiversity Conservation Division (BCD) Saving Our Species Project Species Action Statement.

An Indirect Offset Plan (IOP) was prepared to satisfy the conditions of the State and Commonwealth approvals relating to this financial contribution. The approved IOP specifies how the $243,000 indirect offset (by way of financial contribution) would be used to support recovery actions for the quoll.

Three recovery projects were identified and implemented under the IOP as follows:

1. Develop software to allow identification of individual quolls from camera trap images.
2. Development of standard camera trapping protocol based on project above. Implement cross tenure monitoring program (Royal National Park, Wollemi National Park and Middle Foy Brook Area) integrating live trapping, camera trapping, population viability and genetic analysis.
3. Trap and track (using telemetry collars or camera trapping) 6 female quolls for 3 years. Assess habitat use by female spotted-tailed quolls.

An *Indirect Offset Outcomes Report* was published on 30 June 2022 via *https://www.glencore.com.au/operations-and-projects/coal/current-operations/liddell-coal-operations/reporting-documents* . This report documents the outcomes and contribution to spotted-tailed-quoll conservation realised from funding each project.

8.6.2 Project Tasks

A brief description of each project is provided in the following sections. Project work and funding was carried out over a 5yr period, nominally FY2016/17, FY2017/18, FY2018/19, FY2019/20 and FY2020/21. A 12-month period has followed with assessment of results and findings ready for publication by end June 2022 in line with approval requirements.

8.6.3 Task 1 – Development of Individual Recognition Software for Quolls

Task 1 involved the development and sharing of computer software that enables the identification of individual quolls from remote camera data. Further information regarding Task 1 can be sourced in the IOP.

A research agreement was developed and executed on the 23 June 2016 with Invasive Animals Limited (IAL) to undertake the Project. IAL subsequently enlisted the services of Dr Greg Falzon (Delves Falzon Pty Ltd) to develop the software, referred to as the Quoll Identification Toolkit (QIT)..

The intial build was completed 30 June 2017. The software then underwent an extensive user testing and refinement phase. In 2020 it was reported that the QIT was ready for release in a MATLAB™ format, with further work completed in 2021 to a standalone software format to allow distribution as freeware.

The QIT is now ready and available, including a user manual. The software is available for download via the PestSmart resource library operated by Centre for Invasive Species Solutions (CISS) (formerly IAL). The QIT can be accessed at *https://pestsmart.org.au/resources/?title=quoll-identification-software-toolkit* .

8.6.4 Task 2 – Task 2 Surveying/Monitoring STQ Populations

A research agreement was developed and executed on the 4 April 2018 with the University of New England (UNE) to undertake the Project with a PhD candidate selected and appointed to run the project. In short, the project focused on the development of survey and monitoring techniques of Spotted-tailed quoll populations by implementing a draft camera trapping protocol (based on previous research) for testing and refinement. Camera trapping grids were established (lured camera trap stations) at three sites over four years within Middle Foy Brook offset areas, Mt Royal National Park, and Wollemi National Park. The program was integrated with live trapping to gain further population viability and genetic data.

Following completion of field work in 2021, UNE have prepared a report including a series of scientific papers addressing the IOP objective within the published report.

8.6.5 Task 3 - Assess Habitat Use by Female STQ

As mentioned above, UNE were also engaged to complete this project under research agreement in 2018. Implementation of Task 3 at the Liddell Site was successful capturing, and fitting telemetry tracking collars on 6 female quolls from the Liddell Coal/Middle Foy Brook site. Unfortunately, the GPS/VHF collars proved unreliable, with GPS data only collected for two female quolls. As as a consequence, the camera trapping was expanded as an alternative means to assess habitat use by female quolls.

Following completion of field work in 2021, UNE have prepared a report including a series of scientific papers addressing the IOP objective within the published report.

8.6.6 Funding Summary

Over the course of five years (2016-2021), LCO has committed a total of $243,000 to research partners IAL and UNE in acordance with the objectives of the IOP. ***Table 8-8*** summarises the yearly payments.

Table 8-8 IOP Funding Summary

Payment To	Date	Amount (AU$ excluding GST)	Cumulative commitment ($)
Project 1:			
Invasive Animals Limited	30/06/2016	50,000	50,000
Invasive Animals Limited	16/12/2016	18,000	68,000
Invasive Animals Limited	30/06/2017	12,000	**80,000**
Project 2 and 3:			
University of New England	11/05/2018	61,000	61,000
University of New England	30/06/2019	28,773	89,773
University of New England	30/04/2020	11,050	100,823
University of New England	30/10/2020	25,618	126,441
University of New England	24/09/2021	11,082	137,523
University of New England	Awaiting invoice	26,424	**163,947**
IOP Total Funding			**243,947**

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 on the LCO public website.

No complaints were received during the reporting period. An annual comparison of the complaints received at LCO since 2008 is shown in ***Figure 9-1.***

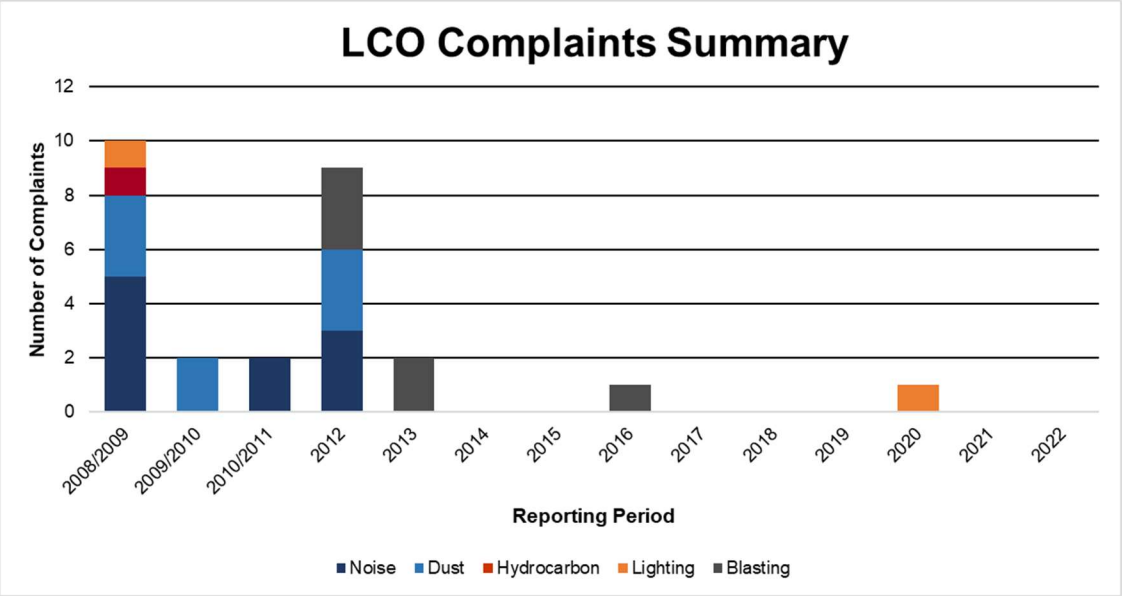

Figure 9-1 Complaints summary

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. During the reporting period, CCC meetings were held on:

- 18th May 2022
- 29th November 2022

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 organisations and charities listed in ***Table 9-1***.

Table 9-1 Community investment program recipients

Community Investment Projects	
Fire and Rescue NSW	Mark Hughes Foundation
Singleton Arts and Theatrical Society	Salvation Army Christmas Appeal
Singleton Neighbourhood Centre	Little Wings
Lake Liddell Recreation Area	Singleton Public School
Hunter Valley Fly Fishing Club	Muswellbrook Public School
Northern NSW Helicopter Rescue Service	Muswellbrook South Public School
Singleton Mountain Bike Club	Muswellbrook High School
Upper Hunter Conservatorium of Music	Muswellbrook Pre-school Kindergarten
Witmore Limited	

10. Independent Audit

The last independent environmental audit undertaken for the Department of Planning & Environment was for the period of 07 February 2019 to 08 February 2022. The audit was completed over the period of 8 – 11 February 2022 by AECOM.

The audit assessed compliance against Development Consent DA 305-11-01 (as modified) and 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 10-1.***

Table 10-1 Summary of 2022 independent environmental audit non-compliances, opportunities for improvement and actions to address

Source	Requirement	Risk Level	Finding
DA-305-11-01			
Non-Compliances			
SH1, C2b	The Applicant must: comply with the conditions of this consent	Low	A detailed review of compliance was conducted against LCO's Project Approval (PA) 305-11-01. The results from that review are included in this checklist. As a number of non-compliances were identified against DA 305-11-01 this condition is found to be non-compliant. No recommendation is required. Refer to non-compliances detailed below fo details of the identified non-compliances. *Recommendation – Not required, refer to individual non-compliances.*
S3, C4	Impact Assessment Criteria The Applicant must ensure that blasts on site do not exceed the criteria in Table 2.	Low	LCO failed to record vibration data at Newdell Substation on 26 October 2021. The reporting failure was due to the cord connecting the vibration monitoring being severed by ground maintenance not associated with LCO's activities. LCO notified the Department of the failure to report and stated that this will be reported as a non-compliance in the 2021 Annual Review (which was in preparation at the time of the audit). On the basis that LCO failed to record blast vibration data in one instance during the audit period a non-compliance has been made against this condition. LCO had rectified the damaged monitor and additional delineation of the vibration monitoring equipment was added, in consultation with Ausgrid, to prevent this from reoccurring.

Source	Requirement	Risk Level	Finding
			Recommendation - No recommendation for improvement has been applied in relation to this non- compliance as LCO's response and implemented actions were considered adequate.
S3, C19	Air Quality Monitoring The Applicant must update and subsequently implement the Air Quality Monitoring Program for the development to the satisfaction of the Secretary.	Low	During the audit period LCO failed to meet data collection targets are defined in the AQMMP on a number of occasions as detailed in the DA 302-11-01 audit checklist against Schedule 3, Condition 19. Section 4.4 of the AQMMP states that LCO continue to work towards achieving a 100% data completeness for compliance dust deposition and HVAS monitoring stations and 90% data availability for real-time monitors. Data availability objectives are further defined in Sections 4.11.3.5. In addition, the AMMP defines the data completeness criterion for the purpose of calculating period averages for TEOMs, dust gauges and HVAS to be 75%. A non-compliance has been found with regards to the implementation of the AQMMP. As LCO failed to capture data in accordance with the data completeness targets defined in the AQMMP this condition is found to be non-compliant. *Recommendation: No recommendation required*
S5, C5	Within 6 weeks of completing this audit, or as otherwise agreed by the Secretary, the Applicant must submit a copy of the audit report to the Secretary with a response to any recommendations contained in the audit report.	Administrative	The Department requested a copy of the audit report be submitted within 6 weeks of the audit inspection date. The 2019 IEA site inspection was conducted on 04-07 February 2019. The IEA report was therefore due for submission before the 21 March 2019. This non-compliance was an administrative error that is unlikely to be repeated. LCO have an action in the compliance monitoring database

Source	Requirement	Risk Level	Finding
			CMO to submit the IEA report before the 26 April 2022. On this basis no recommendation for improvement is deemed to be required. *Recommendation: No recommendation required*
EPL 2094			
Non-compliances			
O5.1	Waste Management The Licensee is authorised to dispose of heavy Plant-tyre waste generated on the premises, in the pit. The Licensee must: a) ensure that heavy Plant waste tyres are re-used on the premises as much as practical; b) ensure that heavy Plant waste tyres are laid flat with a maximum of 10 tyres per site and a minimum distance of 10m between sites; c) ensure that any surplus heavy Plant waste tyres can be emplaced by being spread out on the pit-floor and buried as deep as practical, but, covered by at least 20m of inert material beneath any final rehabilitated surface; d) place heavy Plant waste tyres at least 10m away from coarse reject material or	Low	The maximum number of 10 tyres per disposal site was exceeded at 5 disposal sites on 2 occasions during the audit period including 3 March 2021 and 15 June 2021. Details include the following: • 3 sites were identified with 11 tyres • 1 site was identified with 12 tyres • 1 site was identified with 14 tyres LCO reported the exceedance as a non-compliance in the 2020-2021 Annual Return and will report the non-compliance in the 2021 Annual Review, which was in preparation at the time of the audit. *2022-REC-01: LCO to develop and implement a tyre disposal checklist.*

Source	Requirement	Risk Level	Finding
	tailings emplacement areas; e) not place any heavy Plant waste tyres near heated material or carbonaceous material; and f) not place any heavy Plant waste tyres in an area likely to leach to any water-course.		
M2.2	Air Monitoring Requirements POINT 9,10,11,12 Pollutant | Units of measure | Frequency | Sampling Method PM10 | micrograms per cubic metre | Continuous | Special Method 1	Low	This condition is found to be non-compliant on the basis that LCO failed to achieve statistically valid samples (which require a minimum 75% data availability for a 24 hour period) in the following instances: 2019 • Monitoring Point 9 / SX38-D3: (8 dates in 2019), Annual data availability in 2019 was 98.4% • Monitoring Point 10 / SX38-D4: (2 dates in 2019), Annual data availability in 2019 was 99.3% • Monitoring Point 11 / SX38-D5: (21 dates in 2019), Annual data availability in 2019 was 95.5% • Monitoring Point 12 / SX38-D6: (12 dates in 2019), Annual data availability in 2019 was 97.9% 2020 • Monitoring Point 9 / SX38-D3: (8 dates in 2020), Annual data availability in 2020 was 98.4% • Monitoring Point 10 / SX38-D4: (11 dates in 2020), Annual data availability in 2020 was 98.0%

Source	Requirement	Risk Level	Finding
			• Monitoring Point 11 / SX38-D5: (17 dates in 2020), Annual data availability in 2020 was 97.4% • Monitoring Point 12 / SX38-D6: (25 dates in 2020), Annual data availability in 2020 was 94.9% 2021 • Monitoring Point 9 / SX38-D3: (20 dates in 2021), Annual data availability in 2021 was 96.5% • Monitoring Point 10 / SX38-D4: (14 dates in 2021), Annual data availability in 2021 was 98.5% • Monitoring Point 11 / SX38-D5: (13 dates in 2021), Annual data availability in 2021 was 98.7% • Monitoring Point 12 / SX38-D6: (12 dates in 2021), Annual data availability in 2021 was 99.0% 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 that an average concentration can only be valid if it is based on at least 75% of the expected samples in the averaging period. However it is not clear whether this approach has been fully adopted by the EPA. In July 2019 LCO sought clarification from the EPA on an appropriate data availability target for continuous monitoring to factor in a reasonable period of monitor downtime. At the time of the audit LCO had not received a response from the EPA and continue to report EBAM availability for transparency.

Source	Requirement	Risk Level	Finding
			The evidence reviewed indicates that LCO continues to implement measures to address data failures within its control to the extent practicable. This includes operation of an extensive maintenance program and actions to minimise the occurrence of equipment failures, as detailed in the 2019 IEA report. Despite the above instances in which the four EBAM boundary monitors failed to achieve PM10 daily availability greater than 75%, the overall valid data availability for each unit remained above 94% for all units across the audit period. This condition is found to be non-compliant however based on the actions taken by LCO no recommendation is considered to be necessary. *Recommendation: No recommendation required*
M2.3	Water and / or Land Monitoring Requirements POINT 6 **Pollutant** / **Units of measure** / **Frequency** / **Sampling Method** Conductivity / microsiemens per centimetre / Continuous during discharge / A probe designed to measure the range 0 to 10,000 uS/cm pH / pH / Daily when wastes discharged / Grab sample Total suspended solids / milligrams per litre / Daily when wastes discharged / Grab sample Turbidity / nephelometric turbidity units / Continuous during discharge / In line instrumentation	Low	Monitoring Point 6 (HRSTS discharge point) failed to monitor turbidity continuously during discharge in accordance with Condition M2.3 due to equipment error between 20/3/21 and 22/3/21. The failure to report was attributed to an equipment error associated with the monitoring sensor. LCO replaced the monitoring sensor and installed a replacement sonde on 22 March 2021. LCO conduct Bi-monthly maintenance on the HRSTS water quality meter. Given the equipment has been repaired and maintenance occurring in accordance with the WMP and manufacturer recommendations no recommendation for improvement has been made. *Recommendation: No recommendation required*
Mining Leases			

Source	Requirement	Risk Level	Finding
No non-compliances in relation to Mining Lease conditions were identified during the audit period.			

Table 10-2 2022 IEA Recommendation and Opportunity for Improvement

Reference	Finding	Action Taken
Recommendations		
2022-REC-01	LCO to develop and implement a tyre disposal checklist	Action to develop and implement checklist completed July 2022
2022-REC-02	It is recommended that there is a review of the groundwater investigation triggers, as already proposed by LCO in the September and December 2021 Groundwater Investigation Trigger Reports. In particular LCO should conduct a trigger assessment in the areas of predicted impact. Monitoring data should be reviewed against rainfall data to ensure that the exceedances are climatic driven and not due to mining activities.	A report including these recommendations was prepared and submitted January 2023
2022-REC-03	LCO to action recommendations made by NRAR in 2021 with regards to groundwater investigations conducted on site. In particular the following to be addressed: • statistical analysis of salt/metal concentrations in shallow groundwater and rainfall occurrence at all TARP exceedance monitoring sites from 2018 forward investigating and reporting on risks to ecological receptors of sustained elevated salinity/metals concentrations in shallow groundwater and devise practical mitigation strategies that could manage such risk.	A report including these recommendations was prepared and submitted January 2023
Opportunity for Improvement		

Reference	Finding	Action Taken
2022-OFI-01	It is suggested Table 11-1 of the future Annual Reviews (LCO Incidents and non-compliances) clearly identify which is an incident and which is a non-compliance.	Table 11 updated in 2022 Annual Review
2022-OFI-02	It is suggested LCO included reference to SX38-D5 in Table 4-5 of the AQMMP.	AQMMP Table 4-5 updated with correct reference to SX38-D5, approved by DPE 15/09/2022
2022-OFI-03	It is suggested LCO better outline in the BMP and BOMP how biodiversity management and monitoring of the Mountain Block MOD 7 Area is being undertaken at this time.	Removed from BMP Section 3.4 and 4.19 Mod 7 area management and transferred to Section 1.13 of BOMP, both approved by DPE 16/09/2022
2022-OFI-04	It is suggested LCO, in the next revision of the blast management plan, clearly state which EPL monitoring point each blast monitoring site is referring to.	Figure 3-1 of the Blast Management Plan updated to include EPL monitoring point reference, approved by DPE 16/09/2022
2022-OFI-05	It is suggested LCO add to the BOMP a monitoring point in the MOD 7 offset area to enable monitoring against the offset objectives.	Monitoring point from Mod 7 offset added to BOMP (Figure 3-2), approved by DPE 15/09/2022
2022-OFI-06	It is suggested LCO continue trialling strategies for more frequent trapping to control feral cats on site.	Two trapping programs were conducted in 2022. Refer to Section 8.4 of the 2022 Annual Review

Reference	Finding	Action Taken
2022-OFI-07	It is suggested LCO review the actions reported against topsoil availability to ensure they reflect current practices. For example, reference to Organic Growth Medium (OGM) should be removed if this is not being considered as an alternative to manage the risk of topsoil availability on site.	Section 8.4.4 of 2022 Annual Review updated to remove the reference to OGM

11. Incidents and Non-Compliances During the Reporting Period

During the reporting period LCO had three incidents and a number of non-compliances which are outlined below in ***Table 11-1 and Table 11-2***

Table 11-1 - 2022 LCO incidents

Approval	Condition Reference	Condition Description	Description	Action taken
DA 305-11-01	Schedule 3 Condition 19	Continuous air quality monitoring for PM10 and TSP	Monitoring units HVAS 12 and 21 failed to monitor PM10 on 03/02/2022. Monitoring unit 11 failed to monitor TSP on 03/02/2022	PM10 monitoring occurred at the same location using another compliance monitor. Re-training of field technician.
DA 305-11-01	Schedule 3 Condition 11(c)	Monitor and report on compliance with the relevant blasting conditions	Chain of Ponds Inn failed to monitor blast vibration for 3 blast events (13/09/2022, 14/09/2022 and 20/09/2022)	New cable installed
EPL 2094	Condition M2.3 Condition M7 Condition M9.1	Continuous monitoring during HRSTS discharge. Continuously operate and maintain communication equipment during HRSTS discharge	Monitoring Point 6 (HRSTS discharge point) failed to monitor continuously during discharge in due to a data recording issue between 22/10/2022 to 23/10/2022.	A soon as LCO were aware of a data recording issue from the water quality monitoring sensor, action was taken to cease the discharge to allow further checks in consultation with an external monitoring technician and Water NSW. Equipment repaired.

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

Table 11-2 - 2022 LCO non-compliances

Approval	Condition Reference	Condition Description	Description	Action taken
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Monitoring Point 9 failed to achieve PM10 data availability greater than 75% on 15 dates throughout the reporting period due to hardware failures (15/02/2022, 18/02/2022, 01/04/2022, 26/05/2022, 27/05/2022, 07/06/2022, 09/06/2022, 23/06/2022, 24/06/2022, 04/07/2022, 08/07/2022, 21/07/2022, 22/07/2022, 06/12/2022).	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 19 dates throughout the reporting period due to hardware failures (08/02/2022, 02/04/2022, 03/04/2022, 05/04/2022, 06/04/2022, 01/05/2022, 14/05/2022 – 16/05/2022, 25/05/2022 – 27/05/2022, 14/06/2022, 02/07/2022 – 04/07/2022, 08/07/2022, 09/07/2022, 13/07/2022).	Hardware failures were actioned and repaired by suitably qualified technicians.
EPL 2094	Condition M2.2	Continuous air quality monitoring for PM10	Monitoring Point 11 failed to achieve PM10 data availability greater than 75% on 9 dates throughout the reporting period due to planned maintenance and hardware failures (07/03/2022 – 10/03/2022, 01/04/2022, 04/07/2022, 07/07/2022, 21/07/2022, 22/07/2022).	Hardware failures were actioned and repaired by suitably qualified technicians.
EPL 2094	Condition M2.2	Continuous air quality	Monitoring Point 12 failed to achieve PM10	Hardware failures were actioned and repaired

Approval	Condition Reference	Condition Description	Description	Action taken
		monitoring for PM10	data availability greater than 75% on 9 dates throughout the reporting period due to planned maintenance and hardware failures (16/05/2022, 31/05/2022, 01/06/2022, 02/06/2022, 04/07/2022 – 08/07/2022).	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 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 during 2023, with final coal expected in Q3 2023. No further clearing for mining progression is required.
- LCO will continue detailed mine closure planning as outlined and transition into mine closure following last coal.
- Implementation of tailings dam capping and rehabilitation works for the Antiene TSF and Reservoir TSFs will continue during 2023.
- ***Section 6.2.1.6*** discussed the Chain of Ponds Inn and the implementation of stabilisation measures in accordance with the COPI Strategy. Once blasting has moved beyond the control zone LCO will seek to finalise management commitments in consultation with the building owner, Heritage NSW and DPE.
- ***Section 6.10.1*** discussed continuing transfer of tailings through pipeline to Mt Owen Complex (West Pit) as approved by DA305-11-01 Mod 6.
- ***Section 8.4*** identifies the rehabilitation biodiversity and offset monitoring results and 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, particularly in Bowman's Creek Riparian Corridor.
- ***Section 8*** outlined the current status of rehabilitation areas, monitoring results and management actions completed during 2022. LCO will continue to implement the BMP and RMP 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; and
  - Continue to implement grazing strategy throughout South Cut pasture rehabilitation to further develop pasture rehabilitation.
  - Propose selected pasture rehabilitation at the South Cut for certification

- ***Section 8.5*** outlined the current status of offset areas, monitoring results and management actions completed during 2021. 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;
  - Continue to conduct maintenance works such as targeted feral fauna and flora management;
  - Continued implementation of active regeneration works in all offset areas; and

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 2021 Biodiversity Monitoring Report. Prepared for Liddell Coal Operations Pty. Ltd

Umwelt 2021 Biodiversity Offset Monitoring Report Prepared for Liddell Coal Operations Pty Ltd

Umwelt 2021 Annual Rehabilitation Monitoring Report Prepared for Liddell Coal Operations Pty Ltd

Umwelt 2021 Conservation Agreement Monitoring Report Prepared for Liddell Coal Operations Pty Ltd

Future Harvest 2021 Annual Rehabilitation Monitoring Report Liddell Coal Operations**

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

LCO (2021) Noise Monitoring Management Plan*

LCO (2021) Spontaneous Combustion Management Plan**

LCO (2021) Air Quality Management and Monitoring Program*

LCO (2020) Land Clearing and Topsoil Stripping Procedure**

LCO (2020) Liddell Dust Management TARP**

LCO (2020) Waste Management Plan**

LCO (2021) Environmental Management Strategy*

LCO (2021) Aboriginal Cultural Heritage Management Plan*

LCO (2021) Water Management Plan*

LCO (2021) Blast Management Strategy – Chain of Ponds Inn*

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

Hansen Bailey (2018) Liddell Coal Operations Environmental Assessment Modification 7 to DA 305-11-01

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

**LCO document not publicly available

Appendix A - Train Haulage Summary

Glencore Coal

COAL RECEIVALS

Report Period 01/01/2022 12:00 am to 31/12/2022 12:00 am

CoalMan Site : Liddell Coal Marketing Pty Ltd

Freight Company	Depart Mine	Train No	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	
Genesee Wyoming Australia	1 January 2022	LD282	Corona Brave	2 January 2022						9,209.82						9,209.82
		LD382	Asian Pioneer	1 January 2022						2,688.05				6,301.39		8,989.44
		Summary of Saturday 01 January 2022								11,897.87				6,301.39		18,199.26
	2 January 2022	LD364	Corona Brave	2 January 2022						9,232.79						9,232.79
		Summary of Sunday 02 January 2022								9,232.79						9,232.79
	3 January 2022	LD108	Corona Brave	3 January 2022						9,203.24						9,203.24
		LD304	Corona Brave	4 January 2022				9,132.17								9,132.17
		LD324	Corona Brave	3 January 2022						9,239.42						9,239.42
		Summary of Monday 03 January 2022						9,132.17		18,442.66						27,574.83
	5 January 2022	LD364	Corona Brave	5 January 2022				2,143.39						6,803.05		8,946.44
		Summary of Wednesday 05 January 2022						2,143.39						6,803.05		8,946.44
	6 January 2022	LD162	Christianna	6 January 2022										8,941.79		8,941.79
		Summary of Thursday 06 January 2022												8,941.79		8,941.79
	7 January 2022	LD250	Christianna	7 January 2022										8,965.84		8,965.84
		Summary of Friday 07 January 2022												8,965.84		8,965.84
	8 January 2022	LD340	Christianna	8 January 2022										9,023.99		9,023.99
		Summary of Saturday 08 January 2022												9,023.99		9,023.99
	9 January 2022	LD364	Cape Garnet	9 January 2022						9,300.67						9,300.67
		Summary of Sunday 09 January 2022								9,300.67						9,300.67
	10 January 2022	LD290	Cape Garnet	11 January 2022				9,293.79								9,293.79
		Summary of Monday 10 January 2022						9,293.79								9,293.79
	11 January 2022	LD130	Cape Garnet	11 January 2022	4,154.80									5,004.00		9,158.80

Freight Company	Depart Mine	Train No	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	
		LD256	Cape Garnet	11 January 2022										8,996.74		8,996.74
		LD344	Cape Garnet	11 January 2022							9,426.99					9,426.99
		Summary of Tuesday 11 January 2022			4,154.80						9,426.99			14,000.74		27,582.53
	12 January 2022	LD102	Cape Garnet	12 January 2022						6,947.21				2,297.38		9,244.59
		LD290	Asahi Maru	13 January 2022						9,305.68						9,305.68
		Summary of Wednesday 12 January 2022								16,252.89				2,297.38		18,550.27
	13 January 2022	LD264	Asahi Maru	14 January 2022										9,074.01		9,074.01
		LD294	Asahi Maru	14 January 2022							9,306.96					9,306.96
		LD358	Asahi Maru	13 January 2022							9,246.72					9,246.72
		Summary of Thursday 13 January 2022									18,553.68			9,074.01		27,627.69
	15 January 2022	LD364	Corona Xanadu	15 January 2022						9,183.16						9,183.16
		Summary of Saturday 15 January 2022								9,183.16						9,183.16
	16 January 2022	LD254	Taihakusan	17 January 2022			0.00				9,298.24					9,298.24
		LD268	Taihakusan	16 January 2022			9,176.40									9,176.40
		LD368	Taihakusan	16 January 2022							9,257.04					9,257.04
		Summary of Sunday 16 January 2022					9,176.40				18,555.28					27,731.68
	17 January 2022	LD184	Pacific Opal	17 January 2022						9,345.00						9,345.00
		LD260	Pacific Opal	18 January 2022						9,267.19						9,267.19
		LD294	Corona Xanadu	17 January 2022	9,067.06											9,067.06
		LD352	Corona Xanadu	17 January 2022	3,142.46					6,132.31						9,274.77
		Summary of Monday 17 January 2022			12,209.52					24,744.50						36,954.02
	18 January 2022	LD114	Asahi Maru	18 January 2022										8,905.64		8,905.64
		LD240	Hokuriku Maru	18 January 2022	9,153.48											9,153.48
		LD344	Taho America	18 January 2022	2,142.04					7,151.88						9,293.92
		Summary of Tuesday 18 January 2022			11,295.52					7,151.88				8,905.64		27,353.04
	19 January 2022	LD348	Asahi Maru	19 January 2022						4,573.27				4,646.13		9,219.40

Freight Company	Depart Mine	Train No	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 19 January 2022								4,573.27				4,646.13		9,219.40
	21 January 2022	LD190	Anikitos	21 January 2022	9,099.84											9,099.84
		LD278	Awajisan Maru	22 January 2022	9,124.87											9,124.87
		LD354	Awajisan Maru	21 January 2022										9,157.44		9,157.44
		Summary of Friday 21 January 2022			18,224.71									9,157.44		27,382.15
	22 January 2022	LD332	Anikitos	23 January 2022	0.00									9,025.47		9,025.47
		Summary of Saturday 22 January 2022			0.00									9,025.47		9,025.47
	26 January 2022	LD356	New Champ	26 January 2022					9,100.86							9,100.86
		Summary of Wednesday 26 January 2022							9,100.86							9,100.86
	27 January 2022	LD140	Awajisan Maru	28 January 2022						9,321.16						9,321.16
		Summary of Thursday 27 January 2022								9,321.16						9,321.16
	29 January 2022	LD322	Saiko	29 January 2022	7,530.85				1,624.94							9,155.79
		Summary of Saturday 29 January 2022			7,530.85				1,624.94							9,155.79
	31 January 2022	LD148	Orange Truth	31 January 2022			9,204.00									9,204.00
		Summary of Monday 31 January 2022					9,204.00									9,204.00
	1 February 2022	LD292	Orange Truth	2 February 2022				8,799.70								8,799.70
		Summary of Tuesday 01 February 2022						8,799.70								8,799.70
	2 February 2022	LD342	Orange Truth	2 February 2022				9,002.00								9,002.00
		Summary of Wednesday 02 February 2022						9,002.00								9,002.00
	3 February 2022	LD306	Orange Truth	3 February 2022				2,615.72				6,717.22				9,332.94
		Summary of Thursday 03 February 2022						2,615.72				6,717.22				9,332.94
	5 February 2022	LD106	Coral Crystal	5 February 2022			2,937.84		6,234.96							9,172.80
		LD366	Coral Crystal	5 February 2022			9,096.70									9,096.70
		Summary of Saturday 05 February 2022					12,034.54		6,234.96							18,269.50
	6 February 2022	LD324	Zonda	6 February 2022			6,876.55	2,292.52								9,169.07
		Summary of Sunday 06 February 2022					6,876.55	2,292.52								9,169.07
	7 February 2022	LD166	Zonda	7 February 2022				9,074.02								9,074.02

Freight Company	Depart Mine	Train No	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 07 February 2022						9,074.02								9,074.02
	16 February 2022	LD118	New Ascent	16 February 2022				7,197.77		1,827.50						9,025.27
		Summary of Wednesday 16 February 2022						7,197.77		1,827.50						9,025.27
	17 February 2022	LD254	New Ascent	17 February 2022				6,358.16				2,782.84				9,141.00
		LD326	Cape Cosmos	17 February 2022				9,021.60								9,021.60
		Summary of Thursday 17 February 2022						15,379.76				2,782.84				18,162.60
	18 February 2022	LD102	Great Tang	18 February 2022										8,934.13		8,934.13
		LD260	Great Tang	19 February 2022				4,460.92						4,504.04		8,964.96
		Summary of Friday 18 February 2022						4,460.92						13,438.17		17,899.09
	19 February 2022	LD300	Heng Yuan	20 February 2022						9,343.06						9,343.06
		Summary of Saturday 19 February 2022								9,343.06						9,343.06
	20 February 2022	LD202	Cape Cosmos	20 February 2022				5,720.40				3,568.94				9,289.34
		LD276	Great Tang	21 February 2022				9,154.29								9,154.29
		LD356	Great Tang	20 February 2022										8,786.49		8,786.49
		Summary of Sunday 20 February 2022						14,874.69				3,568.94		8,786.49		27,230.12
	21 February 2022	LD106	Heng Yuan	21 February 2022				9,001.93								9,001.93
		Summary of Monday 21 February 2022						9,001.93								9,001.93
	24 February 2022	LD142	Nikiland	24 February 2022						9,374.97						9,374.97
		Summary of Thursday 24 February 2022								9,374.97						9,374.97
	27 February 2022	LD208	Tsukuba Maru	27 February 2022						9,373.47						9,373.47
		LD354	Tsukuba Maru	27 February 2022						9,270.28						9,270.28
		Summary of Sunday 27 February 2022								18,643.75						18,643.75
	1 March 2022	LD120	Cape Garnet	1 March 2022						9,282.69						9,282.69
		Summary of Tuesday 01 March 2022								9,282.69						9,282.69
	2 March 2022	LD210	Cape Garnet	2 March 2022						9,378.86						9,378.86
		LD322	Cape Garnet	3 March 2022				9,138.88								9,138.88
		Summary of Wednesday 02 March 2022						9,138.88		9,378.86						18,517.74
	3 March 2022	LD148	Tsukuba Maru	3 March 2022						6,028.37		3,265.20				9,293.57
		LD278	Cape Garnet	4 March 2022						9,288.39						9,288.39

Freight Company	Depart Mine	Train No	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 03 March 2022								15,316.76		3,265.20				18,581.96
	4 March 2022	LD120	Cape Garnet	4 March 2022						9,204.51						9,204.51
		LD236	Cape Garnet	4 March 2022				8,182.30		992.12						9,174.42
		Summary of Friday 04 March 2022						8,182.30		10,196.63						18,378.93
	13 March 2022	LD274	Century Wave	14 March 2022						7,320.19		2,112.04				9,432.23
		Summary of Sunday 13 March 2022								7,320.19		2,112.04				9,432.23
	14 March 2022	LD106	Lavinia Oldendorff	14 March 2022										9,184.08		9,184.08
		LD194	Lavinia Oldendorff	14 March 2022										9,284.63		9,284.63
		Summary of Monday 14 March 2022												18,468.71		18,468.71
	15 March 2022	LD314	Lavinia Oldendorff	16 March 2022										8,923.23		8,923.23
		Summary of Tuesday 15 March 2022												8,923.23		8,923.23
	18 March 2022	LD144	Hisui Horizon	18 March 2022						9,286.66						9,286.66
		LD240	Hisui Horizon	18 March 2022								3,291.52		5,582.01		8,873.53
		Summary of Friday 18 March 2022								9,286.66		3,291.52		5,582.01		18,160.19
	22 March 2022	LD196	Orange Truth	22 March 2022										8,631.94		8,631.94
		Summary of Tuesday 22 March 2022												8,631.94		8,631.94
	23 March 2022	LD110	Orange Truth	23 March 2022						2,060.25				6,886.02		8,946.27
		LD250	Orange Truth	23 March 2022								4,610.59		4,479.87		9,090.46
		Summary of Wednesday 23 March 2022								2,060.25		4,610.59		11,365.89		18,036.73
	25 March 2022	LD166	Orange Truth	25 March 2022						3,724.27				5,610.69		9,334.96
		Summary of Friday 25 March 2022								3,724.27				5,610.69		9,334.96
	26 March 2022	LD190	NSU Quest	26 March 2022										8,895.00		8,895.00
		LD338	Orange Truth	26 March 2022								4,767.40		4,634.67		9,402.07
		Summary of Saturday 26 March 2022										4,767.40		13,529.67		18,297.07
	27 March 2022	LD356	Orange Truth	27 March 2022								2,073.70		6,916.49		8,990.19
		Summary of Sunday 27 March 2022										2,073.70		6,916.49		8,990.19
	29 March 2022	LD382	Yue Shan	29 March 2022										8,697.31		8,697.31
		Summary of Tuesday 29 March 2022												8,697.31		8,697.31
	30 March 2022	LD366	Yue Shan	30 March 2022										8,759.09		8,759.09
		Summary of Wednesday 30 March 2022												8,759.09		8,759.09
	1 April 2022	LD158	Yue Shan	1 April 2022			6,259.78							3,051.33		9,311.11
		Summary of Friday 01 April 2022					6,259.78							3,051.33		9,311.11
	2 April 2022	LD158	Corona Triton	2 April 2022										8,780.50		8,780.50
		LD240	Bali	2 April 2022										8,923.40		8,923.40
		LD294	Corona Triton	3 April 2022										8,771.09		8,771.09

Freight Company	Depart Mine	Train No	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 02 April 2022												26,474.99		26,474.99
	3 April 2022	LD150	Bali	3 April 2022										8,811.57		8,811.57
		Summary of Sunday 03 April 2022												8,811.57		8,811.57
	4 April 2022	LD314	Bali	4 April 2022										8,782.43		8,782.43
		Summary of Monday 04 April 2022												8,782.43		8,782.43
	5 April 2022	LD302	Bali	5 April 2022										8,705.07		8,705.07
		Summary of Tuesday 05 April 2022												8,705.07		8,705.07
	9 April 2022	LD106	FPMC B 103	9 April 2022										8,887.87		8,887.87
		LD220	FPMC B 103	9 April 2022										8,841.00		8,841.00
		Summary of Saturday 09 April 2022												17,728.87		17,728.87
	10 April 2022	LD104	FPMC B 103	10 April 2022			4,846.54							4,088.14		8,934.68
		Summary of Sunday 10 April 2022					4,846.54							4,088.14		8,934.68
	11 April 2022	LD150	Venus Heritage	11 April 2022										8,846.46		8,846.46
		Summary of Monday 11 April 2022												8,846.46		8,846.46
	12 April 2022	LD160	Cape Verde	12 April 2022			9,247.54									9,247.54
		Summary of Tuesday 12 April 2022					9,247.54									9,247.54
	13 April 2022	LD114	Asahi Maru	13 April 2022										8,845.83		8,845.83
		LD274	Cape Verde	14 April 2022		9,296.03								0.00		9,296.03
		Summary of Wednesday 13 April 2022				9,296.03								8,845.83		18,141.86
	14 April 2022	LD130	Asahi Maru	14 April 2022		4,739.46								4,347.17		9,086.63
		Summary of Thursday 14 April 2022				4,739.46								4,347.17		9,086.63
	15 April 2022	LD216	United Eternity	15 April 2022		4,754.60								4,354.47		9,109.07
		Summary of Friday 15 April 2022				4,754.60								4,354.47		9,109.07
	16 April 2022	LD162	United Eternity	16 April 2022		9,251.68										9,251.68
		Summary of Saturday 16 April 2022				9,251.68										9,251.68
	17 April 2022	LD222	Welprofit	17 April 2022	9,081.08											9,081.08
		Summary of Sunday 17 April 2022			9,081.08											9,081.08
	18 April 2022	LD352	Welprofit	19 April 2022	8,977.00											8,977.00
		Summary of Monday 18 April 2022			8,977.00											8,977.00
	20 April 2022	LD104	BBG Bright	20 April 2022		2,974.49								6,147.28		9,121.77
		Summary of Wednesday 20 April 2022				2,974.49								6,147.28		9,121.77
	21 April 2022	LD104	Seagem	21 April 2022		0.00								9,124.00		9,124.00
		Summary of Thursday 21 April 2022				0.00								9,124.00		9,124.00
	23 April 2022	LD130	China Steel Team	23 April 2022										8,987.54		8,987.54

Freight Company	Depart Mine	Train No	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	
		LD182	China Steel Team	23 April 2022	9,158.81											9,158.81
		LD240	Cape Cosmos	23 April 2022	8,128.43									963.32		9,091.75
		Summary of Saturday 23 April 2022			17,287.24									9,950.86		27,238.10
	24 April 2022	LD104	China Steel Team	24 April 2022	9,119.47											9,119.47
		LD150	China Steel Team	24 April 2022										9,039.54		9,039.54
		Summary of Sunday 24 April 2022			9,119.47									9,039.54		18,159.01
	25 April 2022	LD294	China Steel Team	26 April 2022	9,051.43											9,051.43
		Summary of Monday 25 April 2022			9,051.43											9,051.43
	29 April 2022	LD250	Orange Truth	30 April 2022	9,335.55											9,335.55
		LD310	Orange Truth	30 April 2022						9,287.99						9,287.99
		Summary of Friday 29 April 2022			9,335.55					9,287.99						18,623.54
	30 April 2022	LD184	Orange Truth	30 April 2022		9,408.75										9,408.75
		LD252	Orange Truth	30 April 2022						4,315.68				5,040.31		9,355.99
		Summary of Saturday 30 April 2022				9,408.75				4,315.68				5,040.31		18,764.74
	1 May 2022	LD112	Shin Sanyo Maru	1 May 2022	9,282.39											9,282.39
		Summary of Sunday 01 May 2022			9,282.39											9,282.39
	2 May 2022	LD106	Shin Sanyo Maru	2 May 2022	9,199.08											9,199.08
		LD190	JP Caretta	2 May 2022										9,103.15		9,103.15
		LD278	JP Caretta	3 May 2022			2,184.74							6,962.14		9,146.88
		LD314	Calypso Island	2 May 2022						9,403.34						9,403.34
		Summary of Monday 02 May 2022			9,199.08		2,184.74			9,403.34				16,065.29		36,852.45
	6 May 2022	LD296	Orange Truth	7 May 2022			9,165.70									9,165.70
		Summary of Friday 06 May 2022					9,165.70									9,165.70
	7 May 2022	LD344	Orange Truth	7 May 2022			9,225.54									9,225.54
		Summary of Saturday 07 May 2022					9,225.54									9,225.54
	10 May 2022	LD122	Santa Cruz	10 May 2022										9,051.25		9,051.25
		LD166	Santa Cruz	10 May 2022	9,283.56											9,283.56
		LD302	Santa Cruz	11 May 2022										9,039.62		9,039.62
		Summary of Tuesday 10 May 2022			9,283.56									18,090.87		27,374.43
	11 May 2022	LD132	Maria G.O.	11 May 2022						9,319.62						9,319.62
		LD202	Maria G.O.	11 May 2022	9,100.60											9,100.60
		LD260	Maria G.O.	12 May 2022		9,371.95										9,371.95
		Summary of Wednesday 11 May 2022			9,100.60	9,371.95				9,319.62						27,792.17

Freight Company	Depart Mine	Train No	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	
	12 May 2022	LD152	Maria G.O.	12 May 2022						4,691.31				4,628.28		9,319.59
		LD272	Maria G.O.	12 May 2022		5,494.38								3,825.75		9,320.13
		Summary of Thursday 12 May 2022				5,494.38				4,691.31				8,454.03		18,639.72
	13 May 2022	LD180	Bulk Seoul	13 May 2022						9,363.10						9,363.10
		Summary of Friday 13 May 2022								9,363.10						9,363.10
	14 May 2022	LD286	Bulk Seoul	14 May 2022	9,300.19											9,300.19
		LD366	Bulk Seoul	14 May 2022	1,026.18	996.59										2,022.77
		Summary of Saturday 14 May 2022			10,326.37	996.59										11,322.96
	15 May 2022	LD160	Bulk Seoul	15 May 2022	4,691.88	4,527.13										9,219.01
		Summary of Sunday 15 May 2022			4,691.88	4,527.13										9,219.01
	16 May 2022	LD120	New Dedication	16 May 2022						9,272.20						9,272.20
		LD192	New Dedication	16 May 2022						9,333.90						9,333.90
		LD354	Bulk Seoul	16 May 2022		4,200.60								5,060.61		9,261.21
		Summary of Monday 16 May 2022				4,200.60				18,606.10				5,060.61		27,867.31
	17 May 2022	LD130	Corona Kingdom	17 May 2022		3,564.22				5,898.18						9,462.40
		LD326	Corona Kingdom	17 May 2022		4,633.34				4,695.06						9,328.40
		Summary of Tuesday 17 May 2022				8,197.56				10,593.24						18,790.80
	18 May 2022	LD132	Oceanic Power	18 May 2022			9,170.94									9,170.94
		LD248	Oceanic Power	18 May 2022		9,255.97										9,255.97
		LD304	Oceanic Power	19 May 2022		1,360.45	7,803.41									9,163.86
		Summary of Wednesday 18 May 2022				10,616.42	16,974.35									27,590.77
	19 May 2022	LD108	Sincere Pisces	19 May 2022						9,428.67						9,428.67
		LD250	Oceanic Power	19 May 2022	960.12		8,242.52									9,202.64
		Summary of Thursday 19 May 2022			960.12		8,242.52			9,428.67						18,631.31
	20 May 2022	LD130	Oceanic Power	20 May 2022	9,237.10											9,237.10
		LD208	Sincere Pisces	20 May 2022						9,353.01						9,353.01
		LD380	Minami	20 May 2022						9,359.74						9,359.74
		Summary of Friday 20 May 2022			9,237.10					18,712.75						27,949.85
	21 May 2022	LD142	NSU Keystone	21 May 2022	5,968.16					3,347.49						9,315.65
		LD314	Oceanic Power	22 May 2022	4,699.39					4,619.38						9,318.77
		Summary of Saturday 21 May 2022			10,667.55					7,966.87						18,634.42
	27 May 2022	LD248	Pan Bicorn	27 May 2022											9,036.94	9,036.94
		Summary of Friday 27 May 2022													9,036.94	9,036.94
	28 May 2022	LD140	Pan Bicorn	28 May 2022											9,107.61	9,107.61
		LD184	King Loong	29 May 2022				9,143.75								9,143.75

Freight Company	Depart Mine	Train No	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 28 May 2022						9,143.75							9,107.61	18,251.36
	30 May 2022	LD214	Pan Bicorn	30 May 2022											9,027.70	9,027.70
		Summary of Monday 30 May 2022													9,027.70	9,027.70
	31 May 2022	LD262	Ototachibana	31 May 2022				9,380.01								9,380.01
		LD334	Poro Nupuri Maru	31 May 2022											9,038.21	9,038.21
		Summary of Tuesday 31 May 2022						9,380.01							9,038.21	18,418.22
	1 June 2022	LD286	Pan Bicorn	2 June 2022											9,084.64	9,084.64
		LD372	Ototachibana	1 June 2022				1,698.27		7,539.83						9,238.10
		Summary of Wednesday 01 June 2022						1,698.27		7,539.83					9,084.64	18,322.74
	3 June 2022	LD148	Yu Hong	3 June 2022				9,228.48								9,228.48
		LD250	Berge Olympus	4 June 2022	9,265.15											9,265.15
		LD364	Berge Olympus	3 June 2022	9,141.70											9,141.70
		Summary of Friday 03 June 2022			18,406.85			9,228.48								27,635.33
	4 June 2022	LD200	Berge Olympus	5 June 2022											9,171.88	9,171.88
		LD364	Berge Olympus	4 June 2022	9,208.10											9,208.10
		Summary of Saturday 04 June 2022			9,208.10										9,171.88	18,379.98
	5 June 2022	LD230	Berge Olympus	5 June 2022	9,289.17					0.00						9,289.17
		LD386	Berge Olympus	5 June 2022	1,340.90					8,018.38						9,359.28
		Summary of Sunday 05 June 2022			10,630.07					8,018.38						18,648.45
	7 June 2022	LD254	Asahi Maru	8 June 2022				9,169.28								9,169.28
		Summary of Tuesday 07 June 2022						9,169.28								9,169.28
	9 June 2022	LD168	Asahi Maru	9 June 2022				9,140.88								9,140.88
		LD214	Asahi Maru	9 June 2022				9,177.15								9,177.15
		Summary of Thursday 09 June 2022						18,318.03								18,318.03
	10 June 2022	LD130	Asahi Maru	10 June 2022				9,072.76								9,072.76
		LD160	Asahi Maru	10 June 2022				5,185.84		4,025.12						9,210.96
		LD198	NBA Monet	10 June 2022				9,119.78								9,119.78
		Summary of Friday 10 June 2022						23,378.38		4,025.12						27,403.50
	11 June 2022	LD106	NBA Monet	11 June 2022				9,071.38								9,071.38
		LD184	Asahi Maru	11 June 2022						9,411.74						9,411.74
		Summary of Saturday 11 June 2022						9,071.38		9,411.74						18,483.12
	12 June 2022	LD104	Corona Brave	12 June 2022				9,135.97								9,135.97
		Summary of Sunday 12 June 2022						9,135.97								9,135.97

Freight Company	Depart Mine	Train No	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	
	19 June 2022	LD102	Kashima Maru	19 June 2022				9,113.02								9,113.02
		LD240	Kashima Maru	19 June 2022				8,992.76								8,992.76
		LD324	Kashima Maru	20 June 2022				9,134.48								9,134.48
		Summary of Sunday 19 June 2022						27,240.26								27,240.26
	20 June 2022	LD160	New Ascent	20 June 2022				9,112.88								9,112.88
		LD214	Kashima Maru	20 June 2022						9,327.22						9,327.22
		Summary of Monday 20 June 2022						9,112.88		9,327.22						18,440.10
	21 June 2022	LD104	New Ascent	21 June 2022				5,173.84		4,029.93						9,203.77
		LD326	New Ascent	21 June 2022				9,099.48								9,099.48
		Summary of Tuesday 21 June 2022						14,273.32		4,029.93						18,303.25
	24 June 2022	LD126	Golden Courage	24 June 2022				9,032.76								9,032.76
		Summary of Friday 24 June 2022						9,032.76								9,032.76
	25 June 2022	LD130	Golden Courage	25 June 2022			9,361.46									9,361.46
		LD356	Golden Courage	25 June 2022				9,152.75								9,152.75
		Summary of Saturday 25 June 2022					9,361.46	9,152.75								18,514.21
	26 June 2022	LD102	Corona Dynamic	26 June 2022				9,012.46								9,012.46
		LD306	Ishizuchi II	27 June 2022			9,277.26									9,277.26
		Summary of Sunday 26 June 2022					9,277.26	9,012.46								18,289.72
	27 June 2022	LD168	Corona Dynamic	27 June 2022			9,248.55									9,248.55
		Summary of Monday 27 June 2022					9,248.55									9,248.55
	28 June 2022	LD240	Jin Mei	28 June 2022										8,642.62		8,642.62
		Summary of Tuesday 28 June 2022												8,642.62		8,642.62
	29 June 2022	LD166	Navios Uranus	29 June 2022			918.24	8,189.74								9,107.98
		LD286	Navios Uranus	29 June 2022			9,381.48									9,381.48
		LD342	Jin Mei	29 June 2022				8,018.01						903.79		8,921.80
		Summary of Wednesday 29 June 2022					10,299.72	16,207.75						903.79		27,411.26
	30 June 2022	LD112	Navios Uranus	30 June 2022			9,221.96									9,221.96
		LD354	Navios Uranus	30 June 2022			9,255.55									9,255.55
		Summary of Thursday 30 June 2022					18,477.51									18,477.51
	1 July 2022	LD104	Jin Mei	1 July 2022			9,230.95									9,230.95
		Summary of Friday 01 July 2022					9,230.95									9,230.95
	2 July 2022	LD182	First Penguin	2 July 2022			9,272.80									9,272.80
		LD258	First Penguin	3 July 2022			9,379.41									9,379.41
		Summary of Saturday 02 July 2022					18,652.21									18,652.21

Freight Company	Depart Mine	Train No	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	
	3 July 2022	LD186	Cemtex Innovation	3 July 2022			9,449.63									9,449.63
		Summary of Sunday 03 July 2022					9,449.63									9,449.63
	5 July 2022	LD300	First Penguin	5 July 2022			4,681.43								4,757.72	9,439.15
		Summary of Tuesday 05 July 2022					4,681.43								4,757.72	9,439.15
	18 July 2022	LD382	Cemtex Innovation	18 July 2022			9,238.74									9,238.74
		Summary of Monday 18 July 2022					9,238.74									9,238.74
	20 July 2022	LD146	Potina	20 July 2022	9,241.17											9,241.17
		LD306	Potina	20 July 2022	9,228.39											9,228.39
		Summary of Wednesday 20 July 2022			18,469.56											18,469.56
	21 July 2022	LD276	Potina	21 July 2022	9,282.19											9,282.19
		Summary of Thursday 21 July 2022			9,282.19											9,282.19
	23 July 2022	LD382	Potina	23 July 2022	9,061.59											9,061.59
		Summary of Saturday 23 July 2022			9,061.59											9,061.59
	24 July 2022	LD220	Cape Ace	24 July 2022			8,888.15									8,888.15
		LD378	Potina	24 July 2022	8,825.98											8,825.98
		Summary of Sunday 24 July 2022			8,825.98		8,888.15									17,714.13
	27 July 2022	LD228	Cape Ace	27 July 2022	8,924.30											8,924.30
		LD308	Cape Ace	28 July 2022	4,083.96										5,219.41	9,303.37
		Summary of Wednesday 27 July 2022			13,008.26										5,219.41	18,227.67
	28 July 2022	LD126	Scarlet Cardinal	28 July 2022			9,157.25									9,157.25
		Summary of Thursday 28 July 2022					9,157.25									9,157.25
	29 July 2022	LD112	Scarlet Cardinal	29 July 2022			9,046.46									9,046.46
		LD332	Scarlet Cardinal	29 July 2022			9,123.19									9,123.19
		Summary of Friday 29 July 2022					18,169.65									18,169.65
	30 July 2022	LD120	Scarlet Cardinal	30 July 2022			9,094.70									9,094.70
		LD274	Cape Ace	30 July 2022	9,293.81											9,293.81
		LD322	Scarlet Cardinal	30 July 2022			9,052.79									9,052.79
		Summary of Saturday 30 July 2022			9,293.81		18,147.49									27,441.30
	31 July 2022	LD176	Energy Primavera	31 July 2022						9,464.97						9,464.97
		LD270	Energy Primavera	1 August 2022						9,359.90						9,359.90
		Summary of Sunday 31 July 2022								18,824.87						18,824.87

Freight Company	Depart Mine	Train No	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	
	1 August 2022	LD192	Energy Primavera	1 August 2022										8,911.97		8,911.97
		LD228	Energy Primavera	2 August 2022			9,184.78									9,184.78
		Summary of Monday 01 August 2022					9,184.78							8,911.97		18,096.75
	2 August 2022	LD120	Energy Primavera	2 August 2022			6,029.68							2,958.89		8,988.57
		LD226	Energy Primavera	2 August 2022			4,900.56							4,107.18		9,007.74
		LD282	Scarlet Cardinal	3 August 2022						9,306.20						9,306.20
		Summary of Tuesday 02 August 2022					10,930.24			9,306.20				7,066.07		27,302.51
	7 August 2022	LD116	RB Mya	7 August 2022	9,421.74											9,421.74
		LD294	PRT Dream	8 August 2022						9,315.13						9,315.13
		Summary of Sunday 07 August 2022			9,421.74					9,315.13						18,736.87
	8 August 2022	LD150	RB Mya	8 August 2022	9,320.90											9,320.90
		LD184	RB Mya	8 August 2022			9,053.73									9,053.73
		LD360	RB Mya	8 August 2022						9,309.75						9,309.75
		Summary of Monday 08 August 2022			9,320.90		9,053.73			9,309.75						27,684.38
	9 August 2022	LD222	RB Mya	10 August 2022	9,294.98		0.00									9,294.98
		LD330	RB Mya	9 August 2022			9,002.55									9,002.55
		Summary of Tuesday 09 August 2022			9,294.98		9,002.55									18,297.53
	10 August 2022	LD150	S'Hail Al Rayan	10 August 2022										8,820.70		8,820.70
		LD240	RB Mya	10 August 2022	0.00		9,098.86									9,098.86
		LD310	RB Mya	10 August 2022			8,972.74									8,972.74
		Summary of Wednesday 10 August 2022			0.00		18,071.60							8,820.70		26,892.30
	11 August 2022	LD168	Tachibana II	11 August 2022											9,330.88	9,330.88
		LD262	Tachibana II	12 August 2022						2,784.93					6,439.61	9,224.54
		LD334	Taiyo	11 August 2022						9,374.48						9,374.48
		LD376	RB Mya	11 August 2022	9,253.13											9,253.13
		Summary of Thursday 11 August 2022			9,253.13					12,159.41					15,770.49	37,183.03
	15 August 2022	LD144	Malena	15 August 2022			9,035.36									9,035.36
		LD214	Malena	15 August 2022			8,981.00									8,981.00

Freight Company	Depart Mine	Train No	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
					Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD294	S'Hail Al Rayan	15 August 2022	1,959.44									3,401.58	3,771.07	9,132.08
		Summary of Monday 15 August 2022			1,959.44		18,016.36							3,401.58	3,771.07	27,148.44
	16 August 2022	LD208	Malena	16 August 2022			8,986.53									8,986.53
		LD344	Malena	16 August 2022						9,328.16						9,328.16
		Summary of Tuesday 16 August 2022					8,986.53			9,328.16						18,314.69
	17 August 2022	LD190	Malena	17 August 2022						9,321.34						9,321.34
		Summary of Wednesday 17 August 2022								9,321.34						9,321.34
	18 August 2022	LD222	Malena	18 August 2022									9,250.74			9,250.74
		LD370	Malena	18 August 2022						9,420.00						9,420.00
		Summary of Thursday 18 August 2022								9,420.00			9,250.74			18,670.74
	19 August 2022	LD368	Malena	19 August 2022						9,354.14						9,354.14
		Summary of Friday 19 August 2022								9,354.14						9,354.14
	20 August 2022	LD184	Corona Xanadu	20 August 2022								7,727.29	1,767.57			9,494.86
		Summary of Saturday 20 August 2022										7,727.29	1,767.57			9,494.86
	21 August 2022	LD102	Climate Respect	21 August 2022						9,310.81						9,310.81
		LD216	Cape Harmony	21 August 2022			8,108.20						1,030.08			9,138.28
		Summary of Sunday 21 August 2022					8,108.20			9,310.81			1,030.08			18,449.09
	24 August 2022	LD174	Corona Xanadu	24 August 2022						9,330.30						9,330.30
		Summary of Wednesday 24 August 2022								9,330.30						9,330.30
	1 September 2022	LD104	Frontier Jacaranda	1 September 2022			8,949.35									8,949.35
		Summary of Thursday 01 September 2022					8,949.35									8,949.35
	2 September 2022	LD102	Yun Tong	2 September 2022						9,296.28						9,296.28
		LD154	Yun Tong	2 September 2022						9,311.58						9,311.58
		LD230	Buenos Aires	2 September 2022						9,452.81						9,452.81
		LD290	Frontier Jacaranda	3 September 2022						9,253.22						9,253.22
		Summary of Friday 02 September 2022								37,313.89						37,313.89

Freight Company	Depart Mine	Train No	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	
	3 September 2022	LD262	Corona Ace	3 September 2022						9,372.56						9,372.56
		Summary of Saturday 03 September 2022								9,372.56						9,372.56
	4 September 2022	LD168	Yuyo	4 September 2022						9,337.30						9,337.30
		Summary of Sunday 04 September 2022								9,337.30						9,337.30
	5 September 2022	LD276	Yuyo	5 September 2022			4,033.73			5,197.08						9,230.81
		LD320	Pedhoulas Cherry	6 September 2022				9,383.31								9,383.31
		Summary of Monday 05 September 2022					4,033.73	9,383.31		5,197.08						18,614.12
	7 September 2022	LD308	Pedhoulas Cherry	8 September 2022				9,368.78								9,368.78
		Summary of Wednesday 07 September 2022						9,368.78								9,368.78
	8 September 2022	LD378	NSU Sirius	8 September 2022				9,362.71								9,362.71
		Summary of Thursday 08 September 2022						9,362.71								9,362.71
	9 September 2022	LD314	NSU Sirius	9 September 2022				9,383.50								9,383.50
		Summary of Friday 09 September 2022						9,383.50								9,383.50
	15 September 2022	LD104	Ototachibana	15 September 2022			9,072.18									9,072.18
		LD252	Ototachibana	16 September 2022						9,395.07						9,395.07
		Summary of Thursday 15 September 2022					9,072.18			9,395.07						18,467.25
	16 September 2022	LD174	Ototachibana	16 September 2022				9,468.99								9,468.99
		LD284	Corona Joyful	16 September 2022				9,403.56								9,403.56
		Summary of Friday 16 September 2022						18,872.55								18,872.55
	17 September 2022	LD116	Oratorio	17 September 2022				9,372.86								9,372.86
		LD182	Ototachibana	17 September 2022						9,278.00						9,278.00
		LD254	Oratorio	17 September 2022									9,199.00			9,199.00
		LD282	Oratorio	18 September 2022				9,287.00								9,287.00
		LD344	Corona Joyful	17 September 2022									9,094.07			9,094.07
		Summary of Saturday 17 September 2022						18,659.86		9,278.00			18,293.07			46,230.93
	18 September 2022	LD130	Shin Sekiyo	18 September 2022						9,473.06						9,473.06

Freight Company	Depart Mine	Train No	Vessel Name	Arrive Port	LID10	LID10.5	LID11	LID12	LID12.5	LID14	LID14.5	LID22	LID8	LID9	LID9.5	Total
					Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	
		LD252	Oratorio	18 September 2022									9,190.00			9,190.00
		LD306	Oratorio	19 September 2022				9,379.67								9,379.67
		Summary of Sunday 18 September 2022						9,379.67		9,473.06			9,190.00			28,042.73
	19 September 2022	LD216	Hui Xiu Hai	19 September 2022						9,335.58						9,335.58
		Summary of Monday 19 September 2022								9,335.58						9,335.58
	20 September 2022	LD190	Hui Xiu Hai	20 September 2022						9,367.27						9,367.27
		LD386	Oratorio	20 September 2022						9,388.98						9,388.98
		Summary of Tuesday 20 September 2022								18,756.25						18,756.25
	22 September 2022	LD336	Hui Xiu Hai	22 September 2022						9,345.76						9,345.76
		Summary of Thursday 22 September 2022								9,345.76						9,345.76
	24 September 2022	LD108	Sunny Eternity	24 September 2022				9,320.78								9,320.78
		Summary of Saturday 24 September 2022						9,320.78								9,320.78
	25 September 2022	LD268	Corona Splendor	26 September 2022									9,163.60			9,163.60
		Summary of Sunday 25 September 2022											9,163.60			9,163.60
	26 September 2022	LD116	Sunny Eternity	26 September 2022				6,775.49					2,459.30			9,234.79
		LD214	Corona Splendor	26 September 2022				6,836.32					2,356.39			9,192.71
		Summary of Monday 26 September 2022						13,611.81					4,815.69			18,427.50
	29 September 2022	LD346	Corona Splendor	29 September 2022				3,995.75					5,258.06			9,253.81
		Summary of Thursday 29 September 2022						3,995.75					5,258.06			9,253.81
	2 October 2022	LD346	Kriti Warrior	2 October 2022										8,922.19		8,922.19
		Summary of Sunday 02 October 2022												8,922.19		8,922.19
	3 October 2022	LD188	Cape Verde	3 October 2022				9,107.18								9,107.18
		LD272	Cape Verde	4 October 2022				9,002.80								9,002.80
		LD346	Kriti Warrior	3 October 2022				9,114.59								9,114.59
		Summary of Monday 03 October 2022						27,224.57								27,224.57
	4 October 2022	LD220	Cape Verde	4 October 2022				1,149.65		8,204.29						9,353.94
		Summary of Tuesday 04 October 2022						1,149.65		8,204.29						9,353.94

Freight Company	Depart Mine	Train No	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	
	14 October 2022	LD288	Linda Fortune	15 October 2022	9,205.59											9,205.59
		Summary of Friday 14 October 2022			9,205.59											9,205.59
	16 October 2022	LD226	Linda Fortune	16 October 2022	9,072.97											9,072.97
		LD274	Linda Fortune	17 October 2022				9,292.76								9,292.76
		Summary of Sunday 16 October 2022			9,072.97			9,292.76								18,365.73
	17 October 2022	LD132	Santa Isabel	17 October 2022				9,291.79								9,291.79
		LD214	Santa Isabel	17 October 2022	9,183.30											9,183.30
		LD278	Santa Isabel	18 October 2022				9,185.34								9,185.34
		Summary of Monday 17 October 2022			9,183.30			18,477.13								27,660.43
	18 October 2022	LD122	Santa Isabel	18 October 2022	9,207.39											9,207.39
		LD246	Santa Isabel	19 October 2022				9,086.71								9,086.71
		Summary of Tuesday 18 October 2022			9,207.39			9,086.71								18,294.10
	19 October 2022	LD108	Pacific Opal	19 October 2022				9,169.71								9,169.71
		LD178	Pacific Opal	19 October 2022						9,400.18						9,400.18
		LD308	NSU Welfare	20 October 2022				9,208.50								9,208.50
		LD324	Santa Isabel	19 October 2022				9,086.94								9,086.94
		Summary of Wednesday 19 October 2022						27,465.15		9,400.18						36,865.33
	20 October 2022	LD158	NSU Welfare	20 October 2022				9,197.56								9,197.56
		LD320	NSU Welfare	21 October 2022				9,353.16								9,353.16
		Summary of Thursday 20 October 2022						18,550.72								18,550.72
	21 October 2022	LD366	NSU Welfare	21 October 2022				9,147.11								9,147.11
		Summary of Friday 21 October 2022						9,147.11								9,147.11
	22 October 2022	LD106	Guo Yuan 86	22 October 2022				9,319.90								9,319.90
		Summary of Saturday 22 October 2022						9,319.90								9,319.90
	24 October 2022	LD124	Guo Yuan 86	24 October 2022				9,258.31								9,258.31
		Summary of Monday 24 October 2022						9,258.31								9,258.31

Freight Company	Depart Mine	Train No	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	
	25 October 2022	LD240	Bulk Carina	26 October 2022										8,766.00		8,766.00
		LD316	Guo Yuan 86	26 October 2022						9,411.00						9,411.00
		Summary of Tuesday 25 October 2022								9,411.00				8,766.00		18,177.00
	26 October 2022	LD260	NSU Welfare	27 October 2022										8,737.00		8,737.00
		LD364	Bulk Carina	26 October 2022	9,221.00											9,221.00
		Summary of Wednesday 26 October 2022			9,221.00									8,737.00		17,958.00
	31 October 2022	LD102	Guo Yuan 86	31 October 2022				3,442.40		5,814.82						9,257.22
		LD150	Oratorio	31 October 2022				9,331.22								9,331.22
		Summary of Monday 31 October 2022						12,773.62		5,814.82						18,588.44
	1 November 2022	LD128	Oratorio	1 November 2022				9,337.08								9,337.08
		LD252	Oratorio	1 November 2022				9,343.10								9,343.10
		Summary of Tuesday 01 November 2022						18,680.18								18,680.18
	2 November 2022	LD112	Metis Horizon	2 November 2022	9,046.00											9,046.00
		Summary of Wednesday 02 November 2022			9,046.00											9,046.00
	4 November 2022	LD168	Metis Horizon	4 November 2022						9,442.00						9,442.00
		LD288	Taihakusan	5 November 2022						9,107.82						9,107.82
		Summary of Friday 04 November 2022								18,549.82						18,549.82
	5 November 2022	LD168	Metis Horizon	5 November 2022	9,244.19											9,244.19
		LD276	Taihakusan	6 November 2022						9,379.42						9,379.42
		LD330	Oratorio	5 November 2022						9,387.92						9,387.92
		Summary of Saturday 05 November 2022			9,244.19					18,767.34						28,011.53
	6 November 2022	LD164	Metis Horizon	6 November 2022	2,029.93					7,172.66						9,202.59
		LD262	NSU Sirius	7 November 2022	9,283.99											9,283.99
		LD296	Taihakusan	6 November 2022				8,976.99								8,976.99
		Summary of Sunday 06 November 2022			11,313.92			8,976.99		7,172.66						27,463.57
	7 November 2022	LD380	NSU Sirius	7 November 2022	9,154.62											9,154.62

Freight Company	Depart Mine	Train No	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 07 November 2022			9,154.62											9,154.62
	9 November 2022	LD286	NSU Sirius	10 November 2022	1,712.21					7,641.18						9,353.39
		Summary of Wednesday 09 November 2022			1,712.21					7,641.18						9,353.39
	14 November 2022	LD150	Bellina Colossus	14 November 2022			8,909.00									8,909.00
		Summary of Monday 14 November 2022					8,909.00									8,909.00
	15 November 2022	LD142	Bellina Colossus	15 November 2022			8,985.39									8,985.39
		LD368	Suoh Pacific	15 November 2022						9,427.88						9,427.88
		Summary of Tuesday 15 November 2022					8,985.39			9,427.88						18,413.27
	18 November 2022	LD114	Grand Century	18 November 2022			9,003.98									9,003.98
		Summary of Friday 18 November 2022					9,003.98									9,003.98
	20 November 2022	LD320	NSU Responsibility	21 November 2022				9,223.43								9,223.43
		Summary of Sunday 20 November 2022						9,223.43								9,223.43
	21 November 2022	LD174	NSU Obelisk	21 November 2022				9,015.20								9,015.20
		LD248	NSU Obelisk	22 November 2022				9,149.99								9,149.99
		Summary of Monday 21 November 2022						18,165.19								18,165.19
	25 November 2022	LD286	NSU Obelisk	26 November 2022						9,373.02						9,373.02
		Summary of Friday 25 November 2022								9,373.02						9,373.02
	26 November 2022	LD124	NSU Obelisk	26 November 2022	9,388.19											9,388.19
		LD194	NSU Responsibility	26 November 2022			0.00	9,129.02								9,129.02
		LD288	NSU Responsibility	27 November 2022						9,408.79						9,408.79
		LD380	NSU Obelisk	26 November 2022			9,087.82									9,087.82
		Summary of Saturday 26 November 2022			9,388.19		9,087.82	9,129.02		9,408.79						37,013.82
	27 November 2022	LD160	NSU Obelisk	27 November 2022			2,117.37			7,268.43						9,385.80
		LD204	Paragon	27 November 2022						9,433.90						9,433.90
		Summary of Sunday 27 November 2022					2,117.37			16,702.33						18,819.70
	28 November 2022	LD106	Paragon	28 November 2022				9,273.80								9,273.80

Freight Company	Depart Mine	Train No	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	
		LD216	Paragon	28 November 2022				9,095.02								9,095.02
		LD246	Paragon	29 November 2022				9,158.48								9,158.48
		Summary of Monday 28 November 2022						27,527.30								27,527.30
	29 November 2022	LD250	Paragon	29 November 2022			4,301.31			4,830.28						9,131.59
		Summary of Tuesday 29 November 2022					4,301.31			4,830.28						9,131.59
	30 November 2022	LD174	Corona Optimum	30 November 2022						9,351.82						9,351.82
		Summary of Wednesday 30 November 2022								9,351.82						9,351.82
	1 December 2022	LD124	Corona Optimum	1 December 2022						9,346.68						9,346.68
		Summary of Thursday 01 December 2022								9,346.68						9,346.68
	2 December 2022	LD172	Honorship	2 December 2022				9,234.41								9,234.41
		Summary of Friday 02 December 2022						9,234.41								9,234.41
	3 December 2022	LD106	CMB Medoc	3 December 2022						9,401.28						9,401.28
		LD320	Honorship	3 December 2022				4,730.40		4,590.02						9,320.42
		Summary of Saturday 03 December 2022						4,730.40		13,991.30						18,721.70
	4 December 2022	LD110	Blue Lhotse	4 December 2022				9,115.81								9,115.81
		LD246	Blue Lhotse	4 December 2022						9,312.62						9,312.62
		LD332	Honorship	4 December 2022				0.00		9,343.21						9,343.21
		Summary of Sunday 04 December 2022						9,115.81		18,655.83						27,771.64
	5 December 2022	LD130	Blue Lhotse	5 December 2022						9,347.20						9,347.20
		Summary of Monday 05 December 2022								9,347.20						9,347.20
	7 December 2022	LD154	Blue Lhotse	7 December 2022				4,729.69		4,606.11						9,335.80
		Summary of Wednesday 07 December 2022						4,729.69		4,606.11						9,335.80
	9 December 2022	LD150	Blue Lhotse	9 December 2022										8,907.21		8,907.21
		Summary of Friday 09 December 2022												8,907.21		8,907.21
	12 December 2022	LD220	NC Sapphire	12 December 2022				9,221.39								9,221.39
		Summary of Monday 12 December 2022						9,221.39								9,221.39
	13 December 2022	LD322	NC Sapphire	13 December 2022				9,240.02								9,240.02

Freight Company	Depart Mine	Train No	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 13 December 2022						9,240.02								9,240.02
	16 December 2022	LD130	Es Sakura	16 December 2022						9,421.08						9,421.08
		Summary of Friday 16 December 2022								9,421.08						9,421.08
	17 December 2022	LD152	Es Sakura	17 December 2022				9,128.00								9,128.00
		LD210	Es Sakura	17 December 2022				9,241.82								9,241.82
		LD352	Xing Huan Hai	17 December 2022						9,509.99						9,509.99
		LD378	Xing Huan Hai	17 December 2022						9,353.00						9,353.00
		Summary of Saturday 17 December 2022						18,369.82		18,862.99						37,232.81
	18 December 2022	LD164	Es Sakura	18 December 2022				9,138.80								9,138.80
		LD248	Es Sakura	18 December 2022				9,069.94								9,069.94
		LD356	Es Sakura	18 December 2022				9,210.00								9,210.00
		Summary of Sunday 18 December 2022						27,418.74								27,418.74
	19 December 2022	LD156	Xing Huan Hai	19 December 2022			1,038.89			8,470.50						9,509.39
		LD272	Es Sakura	20 December 2022				5,862.52		3,313.42						9,175.94
		Summary of Monday 19 December 2022					1,038.89	5,862.52		11,783.92						18,685.33
	28 December 2022	LD216	MSXT Emily	28 December 2022				9,276.00								9,276.00
		Summary of Wednesday 28 December 2022						9,276.00								9,276.00
	29 December 2022	LD228	MSXT Emily	29 December 2022				3,240.17		6,008.51						9,248.68
		Summary of Thursday 29 December 2022						3,240.17		6,008.51						9,248.68
	30 December 2022	LD188	Santa Isabel	30 December 2022										8,964.19		8,964.19
		LD334	Sun Master	30 December 2022				9,226.14								9,226.14
		Summary of Friday 30 December 2022						9,226.14						8,964.19		18,190.33
	31 December 2022	LD162	Sakura Century	31 December 2022				9,266.88								9,266.88
		LD256	Sakura Century	31 December 2022				9,030.34								9,030.34
		LD338	Santa Isabel	31 December 2022										8,963.79		8,963.79
		LD372	Sakura Century	31 December 2022				9,330.48								9,330.48

Freight Company	Depart Mine	Train No	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 31 December 2022						27,627.70						8,963.79		36,591.49
	Summary of Genesee Wyoming Australia				430,201.79	83,829.65	422,571.21	815,224.58	16,960.76	867,761.02	46,535.95	40,916.74	58,768.80	497,868.76	83,985.67	3,364,624.94
Pacific National	28 January 2022	LD178	Saiko	28 January 2022					8,440.60							8,440.60
		Summary of Friday 28 January 2022							8,440.60							8,440.60
	29 January 2022	LD108	Saiko	29 January 2022					8,976.00							8,976.00
		LD164	Saiko	29 January 2022			4,016.94			5,079.26						9,096.20
		LD294	Saiko	30 January 2022			5,079.25					3,923.75				9,003.00
		Summary of Saturday 29 January 2022					9,096.19		8,976.00	5,079.26		3,923.75				27,075.20
	30 January 2022	LD220	Orange Truth	30 January 2022			9,029.60									9,029.60
		LD222	Taiyo	31 January 2022				8,865.00								8,865.00
		Summary of Sunday 30 January 2022					9,029.60	8,865.00								17,894.60
	31 January 2022	LD306	Kiyo	31 January 2022					8,737.60							8,737.60
		Summary of Monday 31 January 2022							8,737.60							8,737.60
	Summary of Pacific National						18,125.79	8,865.00	26,154.20	5,079.26		3,923.75				62,148.00
Summary of Liddell Coal Marketing Pty Ltd					430,201.79	83,829.65	440,697.00	824,089.58	43,114.96	872,840.28	46,535.95	44,840.49	58,768.80	497,868.76	83,985.67	3,426,772.94
Grand Total					430,201.79	83,829.65	440,697.00	824,089.58	43,114.96	872,840.28	46,535.95	44,840.49	58,768.80	497,868.76	83,985.67	3,426,772.94

COAL UNLOADED DELTA

Freight Company	Depart Mine	Train No	Vessel Name	Arrive Port	LID14 Quantity	Total
Genesee Wyoming Australia	31 December 2021	LD296	Asian Pioneer	1 January 2022	9,376.77	9,376.77
		Summary of Friday 31 December 2021			9,376.77	9,376.77
	Genesee Wyoming Australia TOTAL				9,376.77	9,376.77
Grand Total					9,376.77	9,376.77

Coal Receivals total	3,426,772.94
Coal Unloaded delta Total:	9,376.77
Adj Total:	3,436,149.71

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Appendix B - Meteorological Summary

Meteorological Summary			
Date Sampled	Average Air Temperature at 2m (°C)	Average Air Temperature at 10m (°C)	Daily Rain (mm)
1/01/2022	22.5	22.5	0
2/01/2022	24.2	24.1	0
3/01/2022	22.9	22.7	0
4/01/2022	22.7	22.5	0
5/01/2022	22.4	22.4	10.4
6/01/2022	24.9	24.7	0
7/01/2022	26	25.8	0.4
8/01/2022	25.2	25.2	22.8
9/01/2022	24.2	24.1	0.8
10/01/2022	25	24.9	0
11/01/2022	23.7	23.6	3.2
12/01/2022	23	22.9	0
13/01/2022	23.2	23	0
14/01/2022	23	23	0
15/01/2022	24.5	24.7	0.4
16/01/2022	25.1	24.9	0
17/01/2022	26.3	26.1	0.4
18/01/2022	23.5	23.6	1
19/01/2022	19.5	19.5	19.6
20/01/2022	19.8	19.7	1.2
21/01/2022	20.5	20.4	0
22/01/2022	20.2	20.2	0.2

Meteorological Summary			
23/01/2022	21	20.9	0
24/01/2022	21.6	21.5	0.2
25/01/2022	21.9	21.8	0
26/01/2022	21.9	21.8	0
27/01/2022	22.4	22.2	0
28/01/2022	24.7	24.5	0
29/01/2022	25	24.8	0
30/01/2022	24.5	24.3	0
31/01/2022	24.9	24.7	0
1/02/2022	27.2	27.1	0
2/02/2022	22.9	22.9	5.2
3/02/2022	19.2	19.1	1.4
4/02/2022	17.8	17.7	3.8
5/02/2022	18.6	18.4	5.2
6/02/2022	18.8	18.7	2.8
7/02/2022	19.2	19	0.2
8/02/2022	19.6	19.6	1.6
9/02/2022	22.6	22.7	0
10/02/2022	25.4	25.6	0
11/02/2022	21.1	21	7
12/02/2022	20.4	20.3	1.4
13/02/2022	20.8	20.6	0.2
14/02/2022	21.3	21.4	0
15/02/2022	22	22	0
16/02/2022	21.8	21.8	0
17/02/2022	24.8	24.9	3.8
18/02/2022	25.1	24.9	2.8

Meteorological Summary			
19/02/2022	21.3	21.3	19.8
20/02/2022	23.1	23.2	0
21/02/2022	25.3	25.3	2.4
22/02/2022	21.8	21.8	1
23/02/2022	22.8	22.6	0
24/02/2022	22.6	22.6	11.8
25/02/2022	23.2	23.1	5.2
26/02/2022	21.2	21.1	1.4
27/02/2022	21.8	21.7	0.6
28/02/2022	21.5	21.4	0
1/03/2022	20.7	20.5	2.8
2/03/2022	21.5	21.3	2.4
3/03/2022	20.9	20.9	14.2
4/03/2022	22.8	22.8	10.8
5/03/2022	23.8	23.8	0
6/03/2022	21.7	21.7	87.6
7/03/2022	21.7	21.7	51.6
8/03/2022	20	20	61.8
9/03/2022	20.5	20.6	5.6
10/03/2022	18.9	18.9	0
11/03/2022	18.9	19.1	0
12/03/2022	19.4	19.4	0
13/03/2022	18.6	18.8	0
14/03/2022	19.7	19.8	0.2
15/03/2022	19.7	19.4	4.4
16/03/2022	20.8	20.8	0
17/03/2022	21.5	21.6	0.2

Meteorological Summary			
18/03/2022	21.8	21.7	0
19/03/2022	19	19.2	4.2
20/03/2022	19.9	20	0.2
21/03/2022	19.4	19.7	0
22/03/2022	21.8	22.1	0
23/03/2022	23.3	23.3	13.8
24/03/2022	18.1	18.1	29.8
25/03/2022	18.2	18.2	0.4
26/03/2022	18	18	32.6
27/03/2022	18.4	18.3	3.8
28/03/2022	20.2	20.2	1.4
29/03/2022	19.6	19.6	26.4
30/03/2022	19.9	20	8.6
31/03/2022	18.5	18.5	1.6
1/04/2022	16.7	16.8	0
2/04/2022	18	18.2	0.2
3/04/2022	18.8	18.9	0
4/04/2022	20.8	21	0
5/04/2022	20	20.2	0
6/04/2022	19.5	19.5	0
7/04/2022	18.2	18.2	10.4
8/04/2022	19.4	19.3	1.2
9/04/2022	19.7	19.6	0
10/04/2022	19.9	20	0
11/04/2022	21.3	21.5	0
12/04/2022	19.4	19.5	0
13/04/2022	16.8	16.8	1.6

Meteorological Summary			
14/04/2022	17.1	17.2	0
15/04/2022	17.1	17.5	0.2
16/04/2022	16.8	17.4	0
17/04/2022	17	17.6	0
18/04/2022	18.6	19.2	0.2
19/04/2022	20.3	20.5	3.4
20/04/2022	18.4	18.3	0
21/04/2022	16.8	16.7	0
22/04/2022	15.5	14.7	5.6
23/04/2022	16	16	0.2
24/04/2022	16.2	16.2	0.2
25/04/2022	15.8	16.1	0
26/04/2022	16.2	16.2	0
27/04/2022	16.5	16.4	4.6
28/04/2022	18.3	18.4	2.2
29/04/2022	20.9	21.1	0
30/04/2022	18.2	18.4	6
1/05/2022	14.8	14.8	0.2
2/05/2022	15.2	15.4	0.2
3/05/2022	15.3	16	0
4/05/2022	17.8	18	0
5/05/2022	18.5	18.5	1.8
6/05/2022	15.4	15.2	0
7/05/2022	13	12.9	0
8/05/2022	12.3	12.7	0
9/05/2022	12.8	13.3	0
10/05/2022	16.2	16.1	0

Meteorological Summary			
11/05/2022	16.5	16.5	1.6
12/05/2022	17.2	17.2	5.2
13/05/2022	17.9	17.9	8
14/05/2022	19.7	19.8	0.4
15/05/2022	20.1	20.1	0
16/05/2022	19.1	19	0
17/05/2022	16	15.9	0
18/05/2022	14.6	14.5	0
19/05/2022	12.1	12.3	0
20/05/2022	10.9	11.3	1.6
21/05/2022	13.7	13.7	0.4
22/05/2022	13.3	13.4	4.4
23/05/2022	13.9	13.9	0.8
24/05/2022	13.7	13.7	0
25/05/2022	13.5	13.7	0.2
26/05/2022	14	14.5	0
27/05/2022	14.4	14.6	0
28/05/2022	14.9	14.9	0.2
29/05/2022	13.2	13	0
30/05/2022	12.8	12.8	5.4
31/05/2022	12.4	12.3	3.6
1/06/2022	10.5	10.4	0
2/06/2022	9.47	9.67	0
3/06/2022	8.76	8.7	6.4
4/06/2022	11.7	11.6	0.2
5/06/2022	11.8	11.7	0
6/06/2022	12.3	12.2	1.2

Meteorological Summary			
7/06/2022	11.5	11.4	0
8/06/2022	9.84	9.72	0
9/06/2022	10.6	10.4	0
10/06/2022	11.8	11.7	0
11/06/2022	11.6	11.5	0
12/06/2022	11.1	11	0
13/06/2022	10	10.3	0
14/06/2022	9.57	9.85	0
15/06/2022	12	12	0
16/06/2022	13.9	13.9	0
17/06/2022	12.9	13.1	0
18/06/2022	12.2	12.3	0
19/06/2022	13.1	13.4	0.2
20/06/2022	12.2	12.7	1
21/06/2022	13.1	13	1.2
22/06/2022	12.5	12.6	0
23/06/2022	11.4	11.4	0
24/06/2022	13.2	13.2	0
25/06/2022	13.2	13.1	0
26/06/2022	12.8	12.9	0
27/06/2022	11.9	12	0
28/06/2022	9.96	10.3	0
29/06/2022	11.7	11.8	0
30/06/2022	13.1	13.1	0
1/07/2022	11.1	11.4	0
2/07/2022	11.9	11.9	5.6
3/07/2022	12.7	12.6	42.2

Meteorological Summary			
4/07/2022	12.3	12.2	30
5/07/2022	13.9	13.9	42.8
6/07/2022	13.7	13.8	26.6
7/07/2022	13.8	13.8	6
8/07/2022	10.4	10.3	0
9/07/2022	10.8	10.8	0
10/07/2022	8.95	8.95	5.8
11/07/2022	10.9	11.3	0.2
12/07/2022	9.68	9.68	3.2
13/07/2022	10.6	10.5	0
14/07/2022	10.7	10.9	0
15/07/2022	9.37	9.48	0
16/07/2022	10.5	10.5	0
17/07/2022	15.3	15.2	0
18/07/2022	12.8	12.9	0
19/07/2022	8.26	8.45	1
20/07/2022	10.6	10.7	0
21/07/2022	12.2	12.2	0
22/07/2022	12.7	12.8	1.2
23/07/2022	11.9	12.3	0.2
24/07/2022	11.5	11.9	0
25/07/2022	10.8	11.1	0.4
26/07/2022	12.2	12.2	3.2
27/07/2022	11.5	11.3	0
28/07/2022	11.9	11.9	0
29/07/2022	11.5	11.7	0
30/07/2022	8.54	9.26	0

Meteorological Summary			
31/07/2022	10.2	10.6	0.2
1/08/2022	12.4	12.6	4.2
2/08/2022	12.6	12.8	0
3/08/2022	15.3	15.6	0
4/08/2022	16.8	17.3	31.2
5/08/2022	17.3	17.3	0.8
6/08/2022	14.7	14.7	0.6
7/08/2022	11.7	11.7	1.2
8/08/2022	11	11.1	0.8
9/08/2022	10.7	11	0.2
10/08/2022	11.8	12	0
11/08/2022	11.8	12.1	0
12/08/2022	12.5	12.5	14.6
13/08/2022	13	13	4.8
14/08/2022	11.7	11.5	0
15/08/2022	12.9	12.8	0
16/08/2022	12.3	12.2	0
17/08/2022	12.3	12.3	0
18/08/2022	14.4	14.3	0
19/08/2022	15.2	15.2	0
20/08/2022	13	12.9	0
21/08/2022	12.6	13.1	0
22/08/2022	13.4	13.5	0
23/08/2022	13.9	13.9	8.4
24/08/2022	10.7	10.5	5.4
25/08/2022	12.1	12.2	0
26/08/2022	12.3	12.6	0

Meteorological Summary			
27/08/2022	13.6	13.7	0
28/08/2022	14.5	14.7	0
29/08/2022	13.9	14.1	0.6
30/08/2022	16.5	16.8	0
31/08/2022	14.8	14.9	0
1/09/2022	14.8	15	0
2/09/2022	13.4	13.5	7.2
3/09/2022	11	11	9.2
4/09/2022	12.1	12.2	1.4
5/09/2022	12.7	12.8	0.2
6/09/2022	12.2	12.4	0
7/09/2022	12.3	12.6	0
8/09/2022	14.7	15	0
9/09/2022	15.4	15.6	2.8
10/09/2022	15.6	15.5	1.4
11/09/2022	15.1	14.9	0
12/09/2022	14.8	14.7	0
13/09/2022	13.3	13.2	3
14/09/2022	13	12.9	0.2
15/09/2022	12.7	12.7	18.4
16/09/2022	17.2	17.1	9.2
17/09/2022	17.7	17.8	0.2
18/09/2022	17.1	17	0
19/09/2022	17.1	17	0
20/09/2022	14.9	15	0
21/09/2022	14.5	14.6	6.4
22/09/2022	15.4	15.4	13.8

Meteorological Summary			
23/09/2022	16.4	16.2	0.4
24/09/2022	16.7	16.8	3.2
25/09/2022	16.5	16.5	0
26/09/2022	15.2	15.6	0
27/09/2022	16.1	16.3	0
28/09/2022	16.7	16.6	2.8
29/09/2022	14.8	14.7	4.2
30/09/2022	14.6	14.6	1.8
1/10/2022	13.5	13.4	0.4
2/10/2022	13	13.1	0.6
3/10/2022	12.8	13.1	0.2
4/10/2022	15.4	15.7	0
5/10/2022	13.9	14	10
6/10/2022	15.5	15.4	1
7/10/2022	15.3	15.2	21.4
8/10/2022	18.5	18.6	18.2
9/10/2022	14.3	14.2	3.8
10/10/2022	14.5	14.3	0
11/10/2022	14.8	14.9	0
12/10/2022	15.4	15.4	0
13/10/2022	16.9	17	0
14/10/2022	18.3	18.4	3.4
15/10/2022	17.2	17.2	0
16/10/2022	17.2	17.4	0
17/10/2022	17.1	16.9	0
18/10/2022	17.9	17.7	0
19/10/2022	18.4	18.4	12.2

Meteorological Summary			
20/10/2022	18.5	18.5	14.2
21/10/2022	19.1	19	11
22/10/2022	19.7	19.7	4.4
23/10/2022	19.5	19.5	3.2
24/10/2022	19	18.9	0
25/10/2022	20.6	20.5	1.6
26/10/2022	22.9	22.8	0
27/10/2022	21.6	21.6	5.4
28/10/2022	19.5	19.4	0
29/10/2022	19.5	19.3	0
30/10/2022	18.8	18.7	0
31/10/2022	20.3	20.5	9.8
1/11/2022	18.1	18	34.2
2/11/2022	13.4	13.2	0
3/11/2022	15.2	15.1	0
4/11/2022	15.4	15.4	0
5/11/2022	16.5	16.5	0
6/11/2022	17.4	17.5	0
7/11/2022	17.5	17.4	0.6
8/11/2022	17.2	17.3	0
9/11/2022	17.6	17.6	0
10/11/2022	17.6	17.6	0
11/11/2022	17.5	17.7	0
12/11/2022	20.6	20.5	4
13/11/2022	19.1	19.2	20
14/11/2022	22.8	22.7	15.4
15/11/2022	20.3	20.2	0

Meteorological Summary			
16/11/2022	16	15.8	0
17/11/2022	15	14.9	0
18/11/2022	16	16.2	0
19/11/2022	19.5	19.6	0
20/11/2022	23.4	23.3	0.2
21/11/2022	20.3	20.1	0
22/11/2022	17.2	16.9	0
23/11/2022	20.1	19.9	0
24/11/2022	21.3	21	0
25/11/2022	21.3	21.2	0
26/11/2022	19.4	19.5	0
27/11/2022	22.7	22.8	3.4
28/11/2022	21.4	21.2	0.2
29/11/2022	20.3	20.1	0
30/11/2022	18.5	18.2	0
1/12/2022	17.3	17.2	0
2/12/2022	18.1	17.8	0.4
3/12/2022	18.8	18.6	0
4/12/2022	18.5	18.6	0
5/12/2022	23.6	23.7	0
6/12/2022	22.7	22.4	0
7/12/2022	19.8	20	0.2
8/12/2022	20.1	19.9	0.2
9/12/2022	16.9	16.9	0
10/12/2022	17.9	17.6	0
11/12/2022	22.9	22.9	0
12/12/2022	23.7	23.8	16.4

Meteorological Summary			
13/12/2022	20.7	20.5	0
14/12/2022	19.7	19.6	0
15/12/2022	18.1	17.8	0
16/12/2022	16.8	16.4	0
17/12/2022	17.2	17	0
18/12/2022	16.1	15.9	0.2
19/12/2022	16.5	16.3	0.4
20/12/2022	16.6	16.5	0
21/12/2022	17.7	17.6	0
22/12/2022	18.4	18.5	1
23/12/2022	21.4	21.3	0.2
24/12/2022	24.6	24.4	7.2
25/12/2022	25.9	25.5	0
26/12/2022	25.7	25.7	0
27/12/2022	23.4	23.2	0
28/12/2022	24.8	24.6	0
29/12/2022	22.8	22.8	0
30/12/2022	23.2	22.8	0
31/12/2022	23.3	22.9	0

Appendix C - Air Quality Monitoring Results

Depositional Dust Compliance Monitoring Results					
Month	**Criteria**	**D55**		**D62**	
	Annual Average *(g/m²/month)*	Insoluble Solids *(g/m²/month)*	Annual Rolling Average *(g/m²/month)*	Insoluble Solids *(g/m²/month)*	Annual Rolling Average *(g/m²/month)*
Jan-22	4	2.3	2.7	1.0	2.1
Feb-22	4	1.9	2.5	2.2	2.2
Mar-22	4	7.0	2.7	2.7	2.3
Apr-22	4	1.6	2.6	2.6	2.4
May-22	4	10.4	3.0	2.7	2.4
Jun-22	4	2.9	3.2	0.9	2.5
Jul-22	4	0.8	3.0	0.6	2.5
Aug-22	4	1.7	2.9	0.5	2.2
Sep-22	4	0.4	2.8	0.3	2.0
Oct-22	4	1.2	2.8	0.9	1.5
Nov-22	4	1.5	2.8	0.9	1.4
Dec-22	4	1.7	2.8	1.8	1.4

Notes:
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 ($\mu g/m^3$)	Annual Rolling Average ($\mu g/m^3$)	TSP ($\mu g/m^3$)	Annual Rolling Average ($\mu g/m^3$)	Annual Rolling Average ($\mu g/m^3$)
4/01/2022	29	26	44	36	90
10/01/2022	44	26	63	36	90
16/01/2022	36	26	57	36	90
22/01/2022	23	25	33	35	90
28/01/2022	55	25	99	36	90
3/02/2022	Invalid	25	35.4	35	90
9/02/2022	27.9	24	52.4	34	90
15/02/2022	32.6	25	57.0	35	90
21/02/2022	43.5	25	34.4	35	90
27/02/2022	29.4	25	38.5	35	90
5/03/2022	22.7	25	28.7	35	90
11/03/2022	25.5	25	32.9	35	90
17/03/2022	28.8	25	45.5	35	90
23/03/2022	57.8	25	51.0	35	90
29/03/2022	7.6	24	8.7	34	90
4/04/2022	15.5	24	28.7	34	90
10/04/2022	28.3	24	46.1	34	90
16/04/2022	17.6	24	33.8	34	90
22/04/2022	12.6	24	18.9	34	90
28/04/2022	22.5	24	21.8	34	90
4/05/2022	3.1	24	26.6	33	90
10/05/2022	17	23	41.1	33	90

High Volume Air Sampling Compliance Monitoring Results – TSP					
16/05/2022	11.8	23	20.1	33	90
22/05/2022	17.7	23	22.5	33	90
28/05/2022	7	23	21.9	33	90
3/06/2022	6.4	23	15.2	33	90
9/06/2022	7.4	23	10.3	33	90
15/06/2022	20.9	22	32.8	32	90
21/06/2022	13.5	22	23.9	32	90
27/06/2022	21.9	22	42.3	32	90
3/07/2022	6.2	22	10.2	32	90
9/07/2022	7.1	22	10.2	32	90
15/07/2022	8.9	21	15.6	32	90
21/07/2022	12.7	21	26.5	32	90
27/07/2022	10.8	21	15.2	31	90
2/08/2022	5.6	21	14.7	31	90
8/08/2022	13.3	21	20.1	31	90
14/08/2022	2.3	21	5.3	31	90
20/08/2022	11.4	21	15.0	31	90
26/08/2022	14.2	21	25.6	31	90
1/09/2022	21.0	21	20.8	31	90
7/09/2022	17.7	21	55.4	31	90
13/09/2022	26.2	21	27.7	31	90
19/09/2022	15.3	21	17.0	31	90
25/09/2022	10.9	21	17.0	31	90
1/10/2022	28.5	21	30.5	31	90
7/10/2022	19.8	21	17.6	31	90
13/10/2022	30.3	21	61.1	32	90
19/10/2022	20.9	21	17.3	31	90

High Volume Air Sampling Compliance Monitoring Results – TSP					
25/10/2022	11.7	21	16.7	31	90
31/10/2022	29.5	22	41.9	31	90
6/11/2022	28.4	22	33.5	31	90
12/11/2022	26.5	22	29.1	31	90
18/11/2022	11.0	21	38.8	31	90
24/11/2022	38.6	21	38.6	32	90
30/11/2022	32.5	22	41.2	32	90
6/12/2022	50.6	22	62.5	33	90
12/12/2022	23.5	22	27.2	33	90
18/12/2022	11.4	22	14.8	32	90
24/12/2022	15.7	22	22.6	32	90
30/12/2022	26.2	22	41.8	32	90

High Volume Air Sampling Compliance Monitoring Results – PM_{10}					
Date	Scrivens (HVAS 12)		Antiene (HVAS 21)		Criteria
	PM_{10} *(µg/m³)*	Annual Rolling Average *(µg/m³)*	PM_{10} *(µg/m³)*	Annual Rolling Average *(µg/m³)*	Annual Rolling Average *(µg/m³)*
4-Jan-22	8	11	15	14	30
10-Jan-22	17	11	22	14	30
16-Jan-22	16	10	22	14	30
22-Jan-22	7	10	12	13	30
28-Jan-22	13	10	21	13	30
3-Feb-22	Invalid	10	Invalid	13	30
9-Feb-22	11.7	10	17.0	13	30
15-Feb-22	10.7	10	19.5	13	30
21-Feb-22	12.8	10	13.6	13	30
27-Feb-22	8.4	10	11.0	13	30
5-Mar-22	10.1	10	12.6	13	30
11-Mar-22	10.6	9	15.2	13	30
17-Mar-22	9.8	9	20.5	13	30
23-Mar-22	24.3	10	24.2	13	30
29-Mar-22	4.8	9	4.8	13	30
4-Apr-22	6.3	9	15.1	13	30
10-Apr-22	10.4	9	19.2	13	30
16-Apr-22	7.7	9	17.4	13	30
22-Apr-22	7.4	9	7.8	13	30
28-Apr-22	15.1	9	14.5	13	30
4-May-22	5.9	9	14.8	13	30
10-May-22	6.6	9	10.8	13	30
16-May-22	6.8	9	12.5	13	30

High Volume Air Sampling Compliance Monitoring Results – PM_{10}					
22-May-22	5.5	9	7.0	13	30
28-May-22	3.4	9	15.7	13	30
3-Jun-22	2.9	9	9.3	13	30
9-Jun-22	1.9	9	3.7	13	30
15-Jun-22	6.6	9	15.3	13	30
21-Jun-22	8.8	9	17.5	13	30
27-Jun-22	8.7	9	18.1	13	30
3-Jul-22	3.1	9	6.1	13	30
9-Jul-22	3.0	8	6.1	13	30
15-Jul-22	3.2	8	8.8	13	30
21-Jul-22	4.2	8	8.0	13	30
27-Jul-22	4.5	8	6.7	13	30
2-Aug-22	2.0	8	8.1	13	30
8-Aug-22	4.2	8	8.9	13	30
14-Aug-22	0.0	8	1.9	12	30
20-Aug-22	3.4	8	6.2	12	30
26-Aug-22	3.6	8	10.1	12	30
1-Sep-22	11.7	8	9.7	13	30
7-Sep-22	3.8	8	11.1	12	30
13-Sep-22	6.1	8	7.8	12	30
19-Sep-22	4.5	8	6.7	12	30
25-Sep-22	2.8	8	6.4	12	30
1-Oct-22	8.5	8	8.2	12	30
7-Oct-22	7.2	8	4.7	12	30
13-Oct-22	9.6	8	15.0	12	30
19-Oct-22	7.6	8	7.0	12	30
25-Oct-22	4.7	8	10.3	12	30

High Volume Air Sampling Compliance Monitoring Results – PM_{10}					
31-Oct-22	8.5	8	12.2	12	30
6-Nov-22	6.7	8	10.2	12	30
12-Nov-22	11.2	8	13.4	12	30
18-Nov-22	8.0	8	11.9	12	30
24-Nov-22	10.0	8	13.3	12	30
30-Nov-22	12.8	8	15.1	12	30
6-Dec-22	17.6	8	20.9	12	30
12-Dec-22	9.6	8	10.8	12	30
18-Dec-22	3.0	8	4.4	12	30
24-Dec-22	5.8	8	9.0	12	30
30-Dec-22	10.2	8	14.2	12	30

Appendix D - Groundwater Monitoring Results

Water Quality – Groundwater Monthly Monitoring Results																		
Month	ALV1 Large						ALV1 Small						ALV2 Large					
	pH	EC (mS/cm)[1]	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity
Jan-22	7.36	1.34	3.03	Orange	Nil	Slight	8.25	1.40	2.61	Colourless	Yes	Clear	7.51	3.22	4.04	Colourless	Nil	Clear
Feb-22	6.66	1.18	3.22	Orange	Nil	Slight	7.24	1.27	2.83	Colourless	Nil	Clear	6.80	3.25	4.23	Colourless	Nil	Clear
Mar-22	6.88	1.24	2.68	Brown	Yes	Turbid	7.53	1.26	2.16	Colourless	Nil	Clear	7.09	2.70	3.55	Colourless	Nil	Clear
Apr-22	6.80	1.21	3.05	Orange	Nil	Clear	7.79	1.29	2.57	Colourless	Nil	Clear	6.74	3.42	4.06	Colourless	Nil	Clear
May-22	7.00	1.23	3.15	Orange	Nil	Clear	7.65	1.36	2.65	Colourless	Nil	Clear	6.70	3.67	4.19	Colourless	Nil	Clear
Jun-22	6.98	1.16	3.22	Light Brown	Yes	Turbid	7.71	1.29	2.73	Colourless	Yes	Clear	7.15	3.20	4.22	Colourless	Nil	Clear
Jul-22	6.82	1.25	2.59	Orange	Nil	Slight	7.58	1.41	2.07	Colourless	Nil	Clear	6.92	3.72	3.24	Colourless	Nil	Clear
Aug-22	7.79	1.44	2.84	Colourless	Nil	Clear	6.99	1.27	2.32	Orange	Nil	Turbid	7.20	3.75	3.84	Colourless	Nil	Clear
Sep-22	7.05	1.15	2.94	Orange	Nil	Slight	7.82	1.32	2.42	Colourless	Nil	Clear	7.43	3.00	3.95	Brown	Nil	Slight
Oct-22	6.88	1.08	2.80	Orange	Nil	Turbid	7.59	1.26	2.27	Grey	Nil	Slight	7.06	2.63	3.73	Colourless	Nil	Clear
Nov-22	6.98	1.19	2.83	Brown	Nil	Turbid	7.59	1.27	2.38	Colourless	Nil	Clear	7.10	3.26	3.99	Colourless	Nil	Clear
Dec-22	6.98	1.07	3.18	Orange	Nil	Turbid	7.79	1.34	2.73	Colourless	Nil	Clear	7.07	2.14	4.22	Colourless	Nil	Clear

Water Quality – Groundwater Monthly Monitoring Results																		
Month	ALV2 Small						ALV3 Large						ALV3 Small					
	pH	EC (mS/cm)[1]	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity
Jan-22	7.87	3.02	3.77	Grey	Nil	Slight	6.92	0.75	4.65	Grey	Nil	Slight	7.28	1.53	4.87	Grey	Yes	Turbid
Feb-22	7.19	2.9	3.99	Colourless	Nil	Slight	6.74	0.69	4.74	Colourless	Nil	Clear	7.23	1.42	4.98	Colourless	Nil	Clear
Mar-22	7.58	2.93	3.13	Grey	Nil	Slight	6.89	0.72	4.41	Colourless	Nil	Clear	7.39	1.34	4.68	Colourless	Nil	Clear
Apr-22	7.11	3.06	3.69	Grey	Yes	Clear	7.45	0.62	4.67	Colourless	Nil	Clear	7.92	1.37	4.90	Colourless	Yes	Clear
May-22	7.14	3.22	3.78	Colourless	Yes	Clear	6.90	0.73	4.69	Grey	Nil	Clear	7.46	1.45	4.96	Grey	Nil	Clear
Jun-22	7.59	2.81	3.24	Colourless	Yes	Clear	6.99	0.71	4.76	Grey	Yes	Slight	7.50	1.31	5.01	Colourless	Yes	Clear
Jul-22	7.39	3.2	2.74	Colourless	Nil	Clear	6.80	0.77	4.07	Colourless	Nil	Clear	7.20	1.44	4.27	Colourless	Nil	Clear
Aug-22	7.71	3.15	3.40	Colourless	Nil	Clear	7.19	0.70	4.40	Colourless	Nil	Clear	7.59	1.37	4.62	Colourless	Yes	Clear
Sep-22	7.95	2.9	3.52	Colourless	Nil	Clear	7.27	0.57	4.53	Colourless	Nil	Clear	7.48	1.30	4.76	Colourless	Nil	Clear
Oct-22	7.48	2.35	3.30	Colourless	Nil	Clear	7.19	0.48	4.39	Colourless	Nil	Slight	7.31	1.28	4.60	Grey	Nil	Slight
Nov-22	7.51	2.72	3.56	Colourless	Nil	Clear	7.14	0.50	4.44	Colourless	Nil	Clear	7.37	1.19	5.00	Colourless	Nil	Clear
Dec-22	7.40	2.88	3.87	Colourless	Nil	Slight	6.99	0.55	4.76	Colourless	Nil	Clear	7.41	2.49	5.02	Grey	Nil	Slight

Water Quality – Groundwater Monthly Monitoring Results																		
Month	ALV4 Large						ALV4 Small						PGW5 Large					
	pH	EC (mS/cm)[1]	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity
Jan-22	6.83	1.58	5.14	Grey	Nil	Turbid	7.26	4.94	4.83	Grey	Nil	Turbid	7.23	4.81	10.33	Colourless	Nil	Clear
Feb-22	6.74	1.39	5.19	Grey	Nil	Slight	7.00	4.87	5.22	Colourless	Nil	Clear	6.98	4.73	11.00	Grey	Nil	Slight
Mar-22	6.95	1.49	4.91	Grey	Yes	Turbid	7.38	4.97	4.42	Grey	Yes	Slight	7.22	5.24	8.58	Colourless	Nil	Clear
Apr-22	6.70	1.50	5.11	Brown	Nil	Slight	6.99	5.14	4.75	Grey	Nil	Clear	6.91	5.28	10.21	Colourless	Nil	Clear
May-22	7.34	1.59	5.11	Grey	Nil	Slight	7.06	5.31	5.06	Grey	Nil	Slight	6.92	5.49	10.45	Colourless	Nil	Clear
Jun-22	6.90	1.55	5.12	Light Brown	Yes	Turbid	7.40	4.76	5.23	Colourless	Yes	Clear	7.36	5.05	10.46	Colourless	Nil	Clear
Jul-22	6.82	1.56	4.64	Brown	Nil	Slight	7.18	5.03	4.62	Colourless	Nil	Clear	7.17	5.72	8.20	Colourless	Nil	Clear
Aug-22	7.04	1.89	4.81	Brown	Nil	Slight	7.49	5.35	4.61	Colourless	Nil	Clear	7.43	5.59	9.79	Colourless	Nil	Clear
Sep-22	6.96	2.74	4.96	Brown	Nil	Slight	7.50	4.94	4.60	Colourless	Nil	Clear	7.52	5.09	9.97	Colourless	Nil	Clear
Oct-22	6.60	4.99	4.73	Brown	Nil	Slight	7.26	4.47	4.34	Colourless	Nil	Clear	7.31	4.22	9.28	Colourless	Nil	Clear
Nov-22	6.61	7.31	4.52	Brown	Nil	Slight	7.29	5.05	4.34	Colourless	Nil	Clear	7.38	5.17	9.93	Brown	Nil	Slight
Dec-22	6.62	7.06	4.69	Grey	Nil	Clear	7.28	5.04	4.92	Grey	Nil	Turbid	7.51	4.55	10.36	Colourless	Nil	Clear

Water Quality – Groundwater Monthly Monitoring Results																		
Month	PGW5 Small						ALV7 Large						ALV7 Small					
	pH	EC (mS/cm)[1]	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity
Jan-22	6.83	4.76	10.07	Brown	Nil	Slight	7.34	1.35	5.78	Grey	Nil	Turbid	7.61	2.83	11.96	Grey	Nil	Slight
Feb-22	6.72	5.21	10.50	Colourless	Nil	Clear	7.00	1.27	6.27	Grey	Nil	Slight	7.16	2.71	12.71	Grey	Yes	Slight
Mar-22	6.98	5.58	8.99	Brown	Yes	Turbid	6.94	1.17	5.31	Brown	Nil	Turbid	7.53	2.78	11.06	Grey	Yes	Slight
Apr-22	6.55	5.51	9.72	Brown	Nil	Slight	6.61	1.01	5.49	Grey	Nil	Slight	7.30	2.56	10.88	Grey	Nil	Clear
May-22	6.63	5.66	9.97	Brown	Nil	Slight	7.84	1.32	5.98	Grey	Nil	Slight	8.27	2.65	11.92	Grey	Nil	Slight
Jun-22	7.11	5.30	10.04	Brown	Yes	Turbid	7.00	1.38	6.22	Light Brown	Nil	Turbid	7.45	2.58	12.41	Colourless	Yes	Clear
Jul-22	6.85	5.73	8.93	Brown	Nil	Slight	6.84	0.94	4.98	Colourless	Nil	Clear	7.29	2.58	11.47	Colourless	Yes	Clear
Aug-22	7.05	5.88	9.46	Brown	Nil	Slight	6.90	1.03	5.45	Brown	Nil	Slight	7.65	2.92	11.09	Colourless	Nil	Clear
Sep-22	7.17	5.29	9.51	Brown	Yes	Slight	7.24	1.28	5.73	Grey	Nil	Slight	7.55	2.67	11.43	Colourless	Nil	Clear
Oct-22	6.87	4.57	9.10	Grey	Nil	Slight	6.93	1.30	5.41	Grey	Nil	Slight	7.39	2.16	10.84	Grey	H2S	Slight
Nov-22	6.88	4.90	9.36	Brown	Nil	Slight	6.98	1.18	5.57	Colourless	Nil	Clear	7.36	2.62	10.74	Colourless	H2S	Clear
Dec-22	7.17	4.69	9.64	Brown	Nil	Slight	7.13	1.23	6.02	Colourless	Nil	Clear	7.47	2.17	11.73	Grey	Nil	Slight

Water Quality – Groundwater Monthly Monitoring Results																		
Month	ALV8 Large						ALV8 Small						ALV9 Large					
	pH	EC (mS/cm)[1]	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity	pH	EC (mS/cm)	Depth to Water (m)	Colour	Odour	Turbidity
Jan-22	7.44	0.99	6.77	Grey	Nil	Slight	7.49	1.40	15.93	Grey	Nil	Slight	7.68	0.74	3.53	Brown	Nil	Turbid
Feb-22	6.97	0.74	7.21	Brown	Nil	Slight	7.03	1.27	16.50	Grey	Nil	Slight	6.94	0.80	3.56	Brown	Nil	Turbid
Mar-22	6.85	0.81	5.91	Grey	Nil	Turbid	7.14	1.19	15.21	Grey	Nil	Turbid						
Apr-22	6.78	0.78	6.29	Colourless	Nil	Clear	6.93	1.12	15.24	Grey	Nil	Clear						
May-22	7.41	0.74	6.80	Grey	Nil	Clear	7.58	1.17	15.90	Grey	Nil	Clear	7.31	0.79	3.51	Brown	Nil	Slight
Jun-22	6.95	0.74	6.95	Light Brown	Nil	Turbid	7.14	1.14	16.23	Colourless	Yes	Slight	6.97	0.81	3.56	Brown	Nil	Turbid
Jul-22	6.60	0.63	5.86	Colourless	Nil	Clear	6.92	1.36	15.17	Colourless	Nil	Clear						
Aug-22	7.05	0.79	6.19	Colourless	Nil	Clear	7.20	1.14	15.28	Colourless	Nil	Clear						
Sep-22	7.14	0.71	6.49	Colourless	Nil	Clear	7.19	1.11	15.56	Colourless	Nil	Clear	7.39	0.60	3.36	Colourless	Nil	Clear
Oct-22	6.85	0.62	6.22	Colourless	Nil	Clear	6.99	1.04	15.23	Colourless	Nil	Clear	7.13	0.51	3.29	Grey	Nil	Turbid
Nov-22	6.93	0.72	6.34	Colourless	Nil	Clear	7.02	1.03	15.20	Colourless	Nil	Clear	7.62	0.59	2.89	Colourless	Nil	Clear
Dec-22	6.91	0.74	6.73	Colourless	Nil	Clear	7.12	1.05	15.70	Grey	Nil	Slight	7.14	0.59	3.55	Grey	Nil	Slight

Water Quality – Groundwater Monthly Monitoring Results						
Month	LBH					
	pH	EC (mS/cm)[1]	Depth to Water (m)	Colour	Odour	Turbidity
Jan-22	6.69	1.13	3.45	Colourless	Yes	Clear
Feb-22	6.63	0.93	3.55	Colourless	Nil	Clear
Mar-22	6.76	0.91	3.33	Grey	Nil	Slight
Apr-22	7.10	0.92	3.50	Grey	Nil	Slight
May-22	7.13	0.86	3.57	Colourless	Nil	Clear
Jun-22	7.01	0.83	3.60	Grey	Nil	Slight
Jul-22	6.71	0.96	3.16	Colourless	Nil	Clear
Aug-22	7.14	0.98	3.27	Grey	Nil	Slight
Sep-22	7.10	0.87	3.45	Colourless	Nil	Clear
Oct-22	6.87	0.85	3.35	Colourless	Nil	Slight
Nov-22	6.90	0.90	3.22	Colourless	Nil	Clear
Dec-22	7.08	0.72	3.58	Colourless	Nil	Clear

Notes: mS/cm - millisiemens per centimetre (electrical conductivity)

Appendix E - Blast Monitoring Results

Date	Time	Blast Location	Monitoring Point							
			Burlings		Scrivens		Chain of Ponds		Substation	
			Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Overpressure
			mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL
4/01/2022	13:04:05	Entrance Pit	93.8	0.27	95.0	0.11	103.9	2.26	101.9	2.38
11/01/2022	13:06:36	Entrance Pit	94.4	0.18	96.3	0.10	100.9	1.83	102.9	1.81
14/01/2022	12:28:59	Entrance Pit	84.0	0.03	90.9	0.05	107.3	0.53	104.5	0.19
17/01/2022	15:45:33	Entrance Pit	82.5	0.18	90.1	0.08	100.3	0.59	101.7	0.47
21/01/2022	12:28:35	Entrance Pit	93.3	0.07	99.0	0.03	100.2	0.36	99.8	0.30
25/01/2022	15:30:07	Entrance Pit	92.4	0.11	100.7	0.08	112.9	1.06	109.0	0.97
28/01/2022	12:29:16	Entrance Pit	90.2	0.05	99.4	0.06	103.8	0.32	104.9	0.26
1/02/2022	15:38:38	Entrance Pit	110.4	0.07	90.6	0.05	105.1	1.10	101.9	0.44
7/02/2022	15:42:11	Entrance Pit	113.6	0.11	99.6	0.04	106.1	1.01	104.1	0.52
8/02/2022	15:42:11	South Pit	91.4	0.08	94.9	0.05	116.6	7.10	114.2	2.79

Date	Time	Blast Location	Monitoring Point							
			Burlings		Scrivens		Chain of Ponds		Substation	
			Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Overpressure
			mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL
11/02/2022	12:25:26	Entrance Pit	93.0	0.16	99.9	0.07	103.7	1.06	104.8	1.34
14/02/2022	15:32:10	Entrance Pit	85.4	0.05	95.1	0.03	104.6	0.83	101.5	0.43
15/02/2022	12:59:44	Entrance Pit	95.1	0.03	102.5	0.04	110.2	0.37	106.4	0.15
16/02/2022	15:24:35	South Pit	87.5	0.04	87.7	0.03	116.9	9.99	111.6	1.75
24/02/2022	15:30:11	South Pit	98.9	0.09	87.6	0.05	118.4	13.87	112.9	3.10
2/03/2022	16:32:49	Entrance Pit	102.9	0.16	99.8	0.08	100.5	1.06	101.1	0.81
8/03/2022	15:25:25	Entrance Pit	83.7	0.13	92.0	0.23	109.4	0.61	109.5	0.53
15/03/2022	15:30:48	Entrance Pit	97.3	0.10	93.0	0.06	101.1	1.07	102.5	0.82
17/03/2022	13:03:01	Entrance Pit	93.1	0.10	91.3	0.09	100.2	0.65	99.8	0.78
21/03/2022	13:02:09	Entrance Pit	88.1	0.12	93.4	0.05	102.5	0.57	101.5	0.77
23/03/2022	15:26:49	Entrance Pit	86.5	0.12	93.2	0.05	103.5	2.04	99.2	1.06
26/03/2022	11:55:49	Entrance Pit	102.0	0.17	94.6	0.09	101.8	1.39	99.9	1.06
28/03/2022	15:28:04	Entrance Pit	82.7	0.07	97.2	0.03	104.6	0.29	66.8	0.33

Date	Time	Blast Location	Monitoring Point							
			Burlings		Scrivens		Chain of Ponds		Substation	
			Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Overpressure
			mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL
5/04/2022	13:03:56	Entrance Pit	84.8	0.39	93.7	0.16	99.0	1.60	99.5	2.66
7/04/2022	12:50:11	Entrance Pit	89.4	0.10	92.5	0.05	100.6	0.51	99.1	0.34
12/04/2022	12:52:37	Entrance Pit	98.3	0.15	91.1	0.07	106.9	0.93	104.4	0.86
14/04/2022	15:31:55	Entrance Pit	94.3	0.09	107.1	0.05	107.0	0.77	104.8	0.63
21/04/2022	12:55:42	South Pit	95.0	0.17	93.1	0.14	118.6	5.49	117.9	2.15
22/04/2022	13:10:13	South Pit	99.7	0.02	98.4	0.02	114.0	0.74	112.7	0.19
27/04/2022	12:55:08	Entrance Pit	82.5	0.04	90.0	0.03	97.4	0.34	97.6	0.36
2/05/2022	15:30:28	South Pit	86.3	0.10	87.5	0.03	114.0	5.79	113.4	1.34
3/05/2022	15:31:12	Entrance Pit	85.4	0.03	96.1	0.03	108.7	0.49	103.0	0.21
9/05/2022	13:04:29	Entrance Pit	96.7	0.08	94.1	0.06	103.3	0.60	98.1	0.60
9/05/2022	13:05:32	Entrance Pit	91.9	0.20	92.4	0.09	102.0	1.15	99.9	1.06
12/05/2022	13:08:30	Entrance Pit	90.5	0.28	94.6	0.26	99.9	1.46	99.0	1.20
19/05/2022	13:08:59	Entrance Pit	88.9	0.10	98.9	0.05	106.8	0.55	100.4	0.66

Date	Time	Blast Location	Monitoring Point							
			Burlings		Scrivens		Chain of Ponds		Substation	
			Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Overpressure
			mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL
20/05/2022	09:06:12	South Pit	100.8	0.34	94.8	0.10	114.6	5.26	114.7	2.47
24/05/2022	13:12:30	Entrance Pit	85.8	0.15	90.7	0.08	98.6	0.84	95.6	0.97
27/05/2022	13:09:13	Entrance Pit	87.2	0.07	95.8	0.04	104.2	0.61	104.6	0.57
2/06/2022	12:59:58	Entrance Pit	84.0	0.21	90.0	0.09	101.6	1.26	99.3	1.42
2/06/2022	13:01:32	Entrance Pit	91.9	0.04	97.9	0.03	86.1	0.09	105.5	0.33
3/06/2022	12:29:44	Entrance Pit	97.3	0.03	85.7	0.02	94.2	0.25	96.7	0.26
8/06/2022	13:36:03	Entrance Pit	111.9	0.30	101.5	0.10	108.5	1.91	104.2	2.45
8/06/2022	13:37:49	Entrance Pit	102.8	0.05	100.1	0.03	110.5	1.01	107.0	0.35
14/06/2022	15:35:59	South Pit	83.7	0.04	86.7	0.03	111.9	5.18	109.6	1.08
17/06/2022	12:29:11	Entrance Pit	83.5	0.09	92.4	0.06	98.7	0.95	96.6	0.57
21/06/2022	13:15:12	Entrance Pit	91.5	0.19	95.0	0.08	102.6	1.61	101.7	1.62
28/06/2022	15:27:39	Entrance Pit	92.4	0.20	97.1	0.07	108.9	1.30	106.2	2.22
13/07/2022	13:08:02	South Pit	97.3	0.03	88.3	0.02	113.0	0.90	108.7	0.35

Date	Time	Blast Location	Monitoring Point							
			Burlings		Scrivens		Chain of Ponds		Substation	
			Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Overpressure
			mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL
15/07/2022	12:32:09	Entrance Pit	86.7	0.10	95.2	0.05	102.5	1.00	100.9	0.76
21/07/2022	12:25:50	Entrance Pit	99.3	0.18	102.2	0.06	107.3	1.27	105.5	0.90
25/07/2022	12:58:34	Entrance Pit	86.0	0.20	97.7	0.07	105.6	1.30	102.7	2.13
27/07/2022	12:24:56	Entrance Pit	101.1	0.04	91.4	0.02	101.6	0.42	99.6	0.29
29/07/2022	12:23:59	Entrance Pit	83.0	0.12	92.4	0.07	97.7	0.64	99.1	0.53
1/08/2022	15:29:08	Entrance Pit	90.3	0.14	92.7	0.06	101.3	0.86	100.2	0.69
4/08/2022	12:56:21	Entrance Pit	80.3	0.17	91.7	0.10	103.2	0.96	99.8	0.91
5/08/2022	09:31:36	Entrance Pit	88.6	0.07	95.8	0.08	105.4	0.61	105.9	0.52
11/08/2022	15:29:39	South Pit	91.6	0.06	92.2	0.04	115.1	8.85	112.7	1.62
15/08/2022	15:29:42	Entrance Pit	96.3	0.12	86.4	0.07	95.0	0.50	95.5	0.53
17/08/2022	13:03:52	Entrance Pit	81.0	0.17	88.9	0.06	99.6	0.99	95.8	1.17
19/08/2022	09:08:10	South Pit	91.5	0.02	91.9	0.02	114.7	2.20	112.1	0.36
24/08/2022	09:31:30	South Pit	97.7	0.02	93.7	0.03	115.6	1.53	112.1	0.41

Date	Time	Blast Location	Monitoring Point							
			Burlings		Scrivens		Chain of Ponds		Substation	
			Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Overpressure
			mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL
25/08/2022	13:04:58	Entrance Pit	87.3	0.02	96.2	0.03	101.0	0.29	100.4	0.19
29/08/2022	13:09:03	South Pit	90.3	0.15	93.6	0.10	123.1	7.42	113.9	1.76
2/09/2022	12:26:00	Entrance Pit	87.5	0.18	94.7	0.17	104.0	0.93	101.4	0.82
5/09/2022	13:06:26	South Pit	91.9	0.05	94.4	0.04	112.9	3.37	109.2	0.84
7/09/2022	12:56:19	Entrance Pit	86.8	0.09	91.9	0.05	104.2	0.96	100.2	0.61
8/09/2022	15:29:16	South Pit	87.8	0.06	91.2	0.04	120.0	6.10	115.9	1.91
13/09/2022	09:00:35	Entrance Pit	91.7	0.04	93.5	0.03	103.7	0.10*	102.8	0.33
14/09/2022	15:31:00	South Pit	95.3	0.06	90.4	0.04	117.2	0.09*	113.9	1.33
20/09/2022	13:06:05	Entrance Pit	89.4	0.46	96.0	0.07	104.7	0.09*	104.4	0.21
20/09/2022	13:17:40	South Pit	100.3	0.17	94.8	0.09	116.3	0.09*	114.9	1.30
26/09/2022	13:34:33	Entrance Pit	88.2	0.19	99.7	0.08	111.4	1.66	107.6	2.38
30/09/2022	12:27:59	Entrance Pit	100.4	0.17	102.1	0.09	101.5	1.01	101.8	0.70
6/10/2022	13:02:38	Entrance Pit	95.7	0.18	98.5	0.09	101.4	1.91	100.9	1.86

Date	Time	Blast Location	Monitoring Point							
			Burlings		Scrivens		Chain of Ponds		Substation	
			Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Overpressure
			mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL
10/10/2022	12:58:34	Entrance Pit	98.6	0.07	96.4	0.05	104.0	0.24	102.8	0.20
14/10/2022	09:03:56	Entrance Pit	104.7	0.15	104.3	0.09	108.3	2.14	102.2	1.32
18/10/2022	15:32:04	South Pit	97.7	0.13	93.3	0.09	116.4	9.07	113.2	1.77
18/10/2022	15:33:06	South Pit	87.2	0.06	85.0	0.03	109.5	14.95	107.3	2.00
24/10/2022	15:27:42	South Pit	90.0	0.07	98.1	0.05	119.1	9.50	118.4	2.32
28/10/2022	14:20:56	South Pit	112.7	0.15	112.4	0.09	112.9	5.60	109.7	2.10
3/11/2022	09:01:37	Entrance Pit	107.3	0.13	91.9	0.06	104.8	0.68	102.0	0.84
4/11/2022	12:48:03	Entrance Pit	81.9	0.04	94.1	0.03	103.1	0.29	95.8	0.26
9/11/2022	13:13:31	South Pit	99.7	0.11	93.9	0.07	102.2	0.50	100.0	0.29
8/11/2022	13:11:00	Entrance Pit	94.1	0.06	97.0	0.03	117.6	5.01	116.6	1.57
15/11/2022	13:02:47	South Pit	94.7	0.07	97.1	0.07	115.8	2.00	108.4	1.49
16/11/2022	12:54:45	Entrance Pit	90.8	0.10	88.5	0.06	100.3	0.82	100.1	0.71
18/11/2022	15:28:09	Entrance Pit	95.2	0.11	95.2	0.09	100.8	1.37	98.5	0.81

Date	Time	Blast Location	Monitoring Point							
			Burlings		Scrivens		Chain of Ponds		Substation	
			Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Over pressure	Ground Vibration	Overpressure
			mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL
24/11/2022	13:00:07	Entrance Pit	92.0	0.03	96.6	0.03	101.9	0.58	100.1	0.16
24/11/2022	12:58:48	Entrance Pit	95.6	0.19	89.1	0.13	98.6	0.82	96.8	0.53
7/12/2022	09:04:58	Entrance Pit	89.0	0.14	95.2	0.10	96.9	1.23	95.7	1.37
8/12/2022	12:57:38	Entrance Pit	102.1	0.03	102.0	0.03	106.6	0.32	103.0	0.19

* Failure to monitor

Appendix F - Hunter River Salinity Trading Scheme

Table below shows water quality and quantity results for discharges that took place under the Hunter River Salinity Trading Scheme during the reporting period.

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
Block ID	Total allowable discharge	Start		Finish		Volume discharged	Mean EC	Salt load	pH	TSS	Number of credits held
(1 block / line)	*Tonnes*	*Time*	*Date*	*Time*	*Date*	*ML*	*ms/cm*	*Tonnes*	*-*	*mg/L*	
2022-012	940	14:55	11/01/22	19:30	11/01/22	3.69	5,980	13.38	8.6	16	229
2022-013	724	19:30	11/01/22	19:30	12/01/22	19.60	6,033	70.93	8.6	5	229
2022-014	1,103	19:30	12/01/22	19:30	13/01/22	20.66	6,106	75.68	8.6	6	85
2022-015	875	19:30	13/01/22	19:30	14/01/22	20.57	6,156	76.01	8.6	6	167
2022-016	677	19:30	14/01/22	19:30	15/01/22	25.49	6,202	94.84	8.6	7	326
2022-017	599	19:30	15/01/22	16:00	16/01/22	16.34	6,158	60.05	8.6	6	326
2022-020	392	10:45	19/01/22	19:30	19/01/22	4.68	6,133	16.73	8.6	6	326
2022-021	380	19:30	19/01/22	19:30	20/01/22	20.72	6,131	76.42	8.6	<5	326
2022-022	684	19:30	20/01/22	19:15	21/01/22	36.29	6,129	132.88	8.6	<5	247

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-023	555	7:40	22/01/22	19:30	22/01/22	9.07	6,122	33.55	8.6	10	331
2022-024	665	19:30	22/01/22	19:30	23/01/22	19.43	6,116	71.28	8.6	<5	331
2022-025	731	19:30	23/01/22	19:30	24/01/22	26.07	6,090	95.46	8.6	16	331
2022-026	594	19:30	24/01/22	19:30	25/01/22	24.96	6,071	90.61	8.6	<5	331
2022-027	436	19:30	25/01/22	16:10	26/01/22	17.59	6,041	63.50	8.6	15	331
2022-064	1,948	15:40	4/03/22	19:30	4/03/22	1.05	5,795	3.54	8.7	<5	70
2022-065	1,931	19:30	4/03/22	19:30	5/03/22	21.11	5,083	64.50	8.7	<5	70
2022-066	9,146	19:30	5/03/22	19:30	6/03/22	34.22	6,076	124.90	8.7	8	70
2022-067	3,013	19:30	6/03/22	19:30	7/03/22	34.80	5,025	105.32	8.7	18	28
2022-068	Flood	19:30	7/03/22	19:30	8/03/22	36.32	3,648	79.83	8.7	35	25
2022-069	Flood	19:30	8/03/22	19:30	9/03/22	39.09	2,826	66.21	8.7	45	70
2022-070	Flood	19:30	9/03/22	19:30	10/03/22	40.01	2,809	67.42	8.7	19	70
2022-071	Flood	19:30	10/03/22	19:30	11/03/22	40.23	2,760	66.63	8.7	22	70
2022-072	6,401	19:30	11/03/22	19:30	12/03/22	40.08	2,506	60.20	8.6	25	20
2022-073	2,669	19:30	12/03/22	19:30	13/03/22	41.30	2,089	51.66	8.6	17	45
2022-074	2,361	19:30	13/03/22	19:30	14/03/22	36.79	2,071	45.91	8.7	15	50

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-075	1,761	19:30	14/03/22	19:30	15/03/22	36.23	2,912	63.27	8.7	15	60
2022-076	1,284	19:30	15/03/22	19:30	16/03/22	35.03	2,867	60.25	8.7	15	105
2022-077	1,197	19:30	16/03/22	19:30	17/03/22	35.20	3,005	63.80	8.7	14	105
2022-078	1,052	19:30	17/03/22	19:30	18/03/22	35.71	3,273	70.10	8.7	14	95
2022-079	826	19:30	18/03/22	19:30	19/03/22	35.89	3,379	72.79	8.7	17	150
2022-080	621	19:30	19/03/22	19:30	20/03/22	35.99	3,342	72.14	8.6	10	229
2022-081	555	19:30	20/03/22	19:30	21/03/22	36.12	3,231	70.01	8.6	10	229
2022-082	571	19:30	21/03/22	19:30	22/03/22	36.36	3,197	69.78	8.6	9	229
2022-083	475	19:30	22/03/22	19:30	23/03/22	36.48	3,278	71.68	8.6	8	229
2022-084	2,358	19:30	23/03/22	19:30	24/03/22	27.85	2,703	44.94	8.6	7	284
2022-085	1,219	19:30	24/03/22	19:30	25/03/22	16.96	2,295	28.88	8.6	10	234
2022-086	2,620	19:30	25/03/22	19:30	26/03/22	40.22	4,209	101.20	8.6	9	234
2022-087	3,364	19:30	26/03/22	19:30	27/03/22	40.34	4,178	101.16	8.7	<5	115
2022-088	2,711	19:30	27/03/22	19:30	28/03/22	40.56	4,253	103.14	8.7	8	110
2022-089	1,981	19:30	28/03/22	19:30	29/03/22	36.79	4,187	91.95	8.7	8	75
2022-090	4,184	19:30	29/03/22	19:30	30/03/22	48.50	3,903	113.60	8.7	<5	120

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-091	4,520	19:30	30/03/22	19:30	31/03/22	48.59	3,754	109.52	8.7	7	70
2022-092	3,144	19:30	31/03/22	19:30	1/04/22	47.48	4,485	127.32	8.7	9	70
2022-093	2,757	19:30	1/04/22	19:30	2/04/22	45.83	4,317	118.92	8.7	8	70
2022-094	2,312	19:30	2/04/22	19:30	3/04/22	46.79	4,048	113.74	8.7	9	90
2022-095	1,352	19:30	3/04/22	19:30	4/04/22	47.19	4,625	131.02	8.7	10	120
2022-096	1,423	19:30	4/04/22	19:30	5/04/22	48.08	5,073	146.33	8.7	14	150
2022-097	1,200	19:30	5/04/22	19:30	6/04/22	44.43	5,081	135.40	8.7	10	160
2022-098	928	19:30	6/04/22	19:30	7/04/22	47.29	5,080	144.25	8.7	14	234
2022-099	764	19:30	7/04/22	19:30	8/04/22	48.48	5,076	148.11	8.6	8	234
2022-100	2,123	19:30	8/04/22	19:30	9/04/22	47.34	5,167	146.78	8.6	14	331
2022-101	2,942	19:30	9/04/22	19:30	10/04/22	47.15	5,247	148.40	8.6	8	331
2022-102	1,609	19:30	10/04/22	18:00	11/04/22	41.28	5,239	129.18	8.6	8	331
2022-106	986	9:45	15/04/22	19:30	15/04/22	9.12	5,229	28.82	8.6	11	331
2022-107	787	19:30	15/04/22	19:30	16/04/22	23.67	5,340	75.84	8.6	8	331
2022-108	879	19:30	16/04/22	19:30	17/04/22	23.51	5,534	78.06	8.6	8	331
2022-109	787	19:30	17/04/22	19:30	18/04/22	21.34	5,703	73.04	8.6	10	331

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-110	618	19:30	18/04/22	15:10	19/04/22	16.78	5,736	57.50	8.6	6	331
2022-186	2755	12:25	4/07/22	19:30	4/07/22	5.76	6,306	21.84	8.6	58	60
2022-187	11782	19:30	4/07/22	19:30	5/07/22	25.23	5,882	88.81	8.6	44	60
2022-188	Flood	19:30	5/07/22	19:30	6/07/22	43.95	5,428	143.16	8.7	24	60
2022-189	5988	19:30	6/07/22	19:30	7/07/22	44.02	4,918	129.91	8.7	18	60
2022-190	Flood	19:30	7/07/22	19:30	8/07/22	41.51	4,539	113.26	8.7	18	60
2022-191	Flood	19:30	8/07/22	19:30	9/07/22	42.11	4,833	122.12	8.7	17	60
2022-192	7535	19:30	9/07/22	19:30	10/07/22	42.24	4,859	123.13	8.7	11	60
2022-193	3908	19:30	10/07/22	19:30	11/07/22	42.16	5,057	127.96	8.7	14	60
2022-194	3385	19:30	11/07/22	19:30	12/07/22	42.22	5,273	133.57	8.6	<5	60
2022-195	3165	19:30	12/07/22	19:30	13/07/22	41.94	5,385	135.54	8.5	10	60
2022-196	2094	19:30	13/07/22	19:30	14/07/22	39.39	5,141	121.64	8.5	13	100
2022-197	1430	19:30	14/07/22	19:30	15/07/22	24.96	4,840	72.47	8.5	13	75
2022-198	1265	19:30	15/07/22	19:30	16/07/22	25.09	4,655	70.09	8.6	17	199
2022-199	1050	19:30	16/07/22	19:30	17/07/22	31.97	4,287	79.91	8.6	21	150
2022-200	1047	19:30	17/07/22	19:30	18/07/22	42.37	3,974	101.04	8.6	23	269

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-201	987	19:30	18/07/22	19:30	19/07/22	38.66	5,666	131.51	8.6	22	199
2022-202	731	19:30	19/07/22	19:30	20/07/22	25.10	5,564	83.80	8.6	16	160
2022-203	620	19:30	20/07/22	19:30	21/07/22	25.24	5,498	83.25	8.6	16	199
2022-204	768	19:30	21/07/22	19:30	22/07/22	25.13	5,449	82.16	8.6	13	199
2022-205	729	19:30	22/07/22	19:25	23/07/22	22.98	5,526	76.21	8.6	11	199
2022-208	473	17:00	26/07/22	19:30	26/07/22	2.45	5,546	8.15	8.6	36	199
2022-209	619	19:30	26/07/22	19:30	27/07/22	24.17	5,505	79.84	8.6	13	199
2022-210	646	19:30	27/07/22	19:30	28/07/22	23.30	5,450	76.20	8.8	10	199
2022-211	480	19:30	28/07/22	19:10	29/07/22	21.73	5,532	72.13	8.6	14	269
2022-219	8915	8:10	6/08/22	19:30	6/08/22	17.78	5,499	58.67	8.6	10	60
2022-220	2428	19:30	6/08/22	19:30	7/08/22	40.09	5,520	132.79	8.6	36	130
2022-221	2405	19:30	7/08/22	19:30	8/08/22	40.27	5,524	133.47	8.6	22	129
2022-222	1626	19:30	8/08/22	19:30	9/08/22	21.77	5,518	72.09	8.6	8	60
2022-223	1285	19:30	9/08/22	19:30	10/08/22	21.83	5,498	72.03	8.6	7	75
2022-224	989	19:30	10/08/22	19:30	11/08/22	21.61	5,493	71.23	8.6	7	95
2022-225	746	19:30	11/08/22	19:30	12/08/22	21.67	5,482	71.26	8.6	6	125

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-226	642	19:30	12/08/22	19:30	13/08/22	21.76	5,395	70.43	8.5	16	140
2022-227	582	19:30	13/08/22	19:30	14/08/22	21.61	5,370	69.64	8.6	18	269
2022-228	571	19:30	14/08/22	19:30	15/08/22	21.98	5,475	72.21	8.6	16	269
2022-229	2489	19:30	15/08/22	19:30	16/08/22	22.00	5,575	73.58	8.6	9	40
2022-230	2225	19:30	16/08/22	19:30	17/08/22	22.04	5,537	73.21	8.6	18	45
2022-231	1717	19:30	17/08/22	19:30	18/08/22	21.54	5,593	72.30	8.6	11	60
2022-232	1334	19:30	18/08/22	19:30	19/08/22	36.79	5,207	114.29	8.5	11	140
2022-233	1213	19:30	19/08/22	19:30	20/08/22	40.46	5,758	139.79	8.6	12	155
2022-234	748	19:30	20/08/22	19:30	21/08/22	40.63	5,880	143.37	8.5	12	269
2022-235	720	19:30	21/08/22	19:30	22/08/22	40.56	5,945	144.67	8.5	12	269
2022-236	792	19:30	22/08/22	19:30	23/08/22	40.85	5,980	146.58	8.5	12	269
2022-237	762	19:30	23/08/22	19:30	24/08/22	41.02	5,719	140.72	8.5	37	269
2022-238	717	19:30	24/08/22	19:30	25/08/22	39.39	5,804	137.14	8.6	17	269
2022-239	335	19:30	25/08/22	19:30	26/08/22	21.65	5,881	76.37	8.5	14	269
2022-240	444	19:30	26/08/22	19:30	27/08/22	21.93	5,934	78.09	8.5	14	269
2022-241	816	19:30	27/08/22	19:30	28/08/22	21.96	5,971	78.68	8.6	13	269

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-242	713	19:30	28/08/22	19:30	29/08/22	24.87	6,007	89.63	8.6	13	269
2022-243	685	19:30	29/08/22	19:30	30/08/22	40.71	6,025	147.19	8.5	15	269
2022-244	703	19:30	30/08/22	19:30	31/08/22	38.33	6,042	138.92	8.5	15	269
2022-245	516	19:30	31/08/22	19:30	1/09/22	21.22	5,749	73.19	8.6	15	269
2022-246	359	19:30	1/09/22	17:25	2/09/22	19.25	6,001	69.30	8.6	13	269
2022-253	750	19:45	8/09/22	19:30	9/09/22	33.64	5,995	120.92	8.5	10	269
2022-254	583	19:30	9/09/22	19:30	10/09/22	12.99	5,978	46.59	8.5	13	269
2022-255	431	19:30	10/09/22	19:30	11/09/22	20.70	5,953	73.93	8.6	14	269
2022-256	640	19:30	11/09/22	19:30	12/09/22	20.53	5,962	73.46	8.6	14	269
2022-257	744	19:30	12/09/22	19:30	13/09/22	20.76	5,965	74.28	8.6	11	130
2022-258	669	19:30	13/09/22	16:15	14/09/22	17.53	5,951	62.60	8.6	7	140
2022-261	495	20:30	16/09/22	19:30	17/09/22	19.91	5,785	69.10	8.6	11	199
2022-262	447	19:30	17/09/22	19:30	18/09/22	20.74	5,830	72.55	8.6	18	199
2022-263	618	19:30	18/09/22	19:30	19/09/22	20.59	5,880	72.66	8.6	12	199
2022-264	1286	19:30	19/09/22	19:30	20/09/22	20.67	5,957	73.86	8.5	12	70
2022-265	1521	19:30	20/09/22	19:30	21/09/22	20.71	5,964	74.09	8.5	7	60

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-266	1088	19:30	21/09/22	19:30	22/09/22	20.99	5,936	74.77	8.5	74	85
2022-267	459	19:30	22/09/22	19:30	23/09/22	20.97	5,828	73.32	8.6	14	199
2022-268	2380	19:30	23/09/22	19:30	24/09/22	22.20	5,818	77.47	8.6	17	120
2022-269	2845	19:30	24/09/22	19:30	25/09/22	28.85	5,675	97.97	8.5	15	199
2022-270	1935	19:30	25/09/22	19:30	26/09/22	36.67	5,494	120.31	8.6	14	99
2022-271	1668	19:30	26/09/22	19:30	27/09/22	21.00	5,753	72.48	8.5	12	60
2022-272	824	19:30	27/09/22	16:35	28/09/22	17.32	5,554	57.72	8.5	17	115
2022-273	700	9:20	29/09/22	19:30	29/09/22	7.82	5,569	26.12	8.6	18	199
2022-274	1005	19:30	29/09/22	19:30	30/09/22	19.52	5,538	64.86	8.6	18	95
2022-275	789	19:30	30/09/22	19:30	1/10/22	20.02	5,544	66.60	8.5	16	199
2022-276	650	19:30	1/10/22	19:30	2/10/22	20.11	5,623	67.83	8.5	16	199
2022-277	667	19:30	2/10/22	19:30	3/10/22	20.48	5,721	70.29	8.5	16	199
2022-278	777	19:30	3/10/22	19:30	4/10/22	20.68	5,791	71.87	8.5	12	199
2022-279	903	19:30	4/10/22	19:30	5/10/22	19.06	5,881	67.26	8.5	15	199
2022-280	786	19:30	5/10/22	19:30	6/10/22	18.89	5,745	65.11	8.5	15	115
2022-281	755	19:30	6/10/22	19:30	7/10/22	18.95	5,577	63.42	8.5	<5	120

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-282	685	19:30	7/10/22	19:30	8/10/22	19.34	3,712	43.15	8.5	17	130
2022-283	1037	19:30	8/10/22	19:30	9/10/22	19.94	5,047	60.37	8.5	33	85
2022-284	2598	19:30	9/10/22	19:30	10/10/22	20.07	4,833	58.22	8.6	19	32
2022-285	Flood	19:30	10/10/22	19:30	11/10/22	29.80	4,347	75.77	8.6	14	60
2022-286	6880	19:30	11/10/22	19:30	12/10/22	21.16	4,892	62.07	8.6	20	60
2022-287	3492	19:30	12/10/22	19:30	13/10/22	22.51	4,984	67.32	8.7	15	60
2022-288	2235	19:30	13/10/22	19:30	14/10/22	22.39	5,051	67.85	8.7	20	60
2022-289	1678	19:30	14/10/22	19:30	15/10/22	22.41	5,194	69.83	8.6	16	60
2022-290	1758	19:30	15/10/22	19:30	16/10/22	22.35	5,232	70.15	8.6	20	60
2022-223	1285	19:30	9/08/22	19:30	10/08/22	21.83	5,498	72.03	8.6	7	75
2022-224	989	19:30	10/08/22	19:30	11/08/22	21.61	5,493	71.23	8.6	7	95
2022-225	746	19:30	11/08/22	19:30	12/08/22	21.67	5,482	71.26	8.6	6	125
2022-226	642	19:30	12/08/22	19:30	13/08/22	21.76	5,395	70.43	8.5	16	140
2022-227	582	19:30	13/08/22	19:30	14/08/22	21.61	5,370	69.64	8.6	18	269
2022-228	571	19:30	14/08/22	19:30	15/08/22	21.98	5,475	72.21	8.6	16	269
2022-229	2489	19:30	15/08/22	19:30	16/08/22	22.00	5,575	73.58	8.6	9	40

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-230	2225	19:30	16/08/22	19:30	17/08/22	22.04	5,537	73.21	8.6	18	45
2022-231	1717	19:30	17/08/22	19:30	18/08/22	21.54	5,593	72.30	8.6	11	60
2022-232	1334	19:30	18/08/22	19:30	19/08/22	36.79	5,207	114.29	8.5	11	140
2022-233	1213	19:30	19/08/22	19:30	20/08/22	40.46	5,758	139.79	8.6	12	155
2022-234	748	19:30	20/08/22	19:30	21/08/22	40.63	5,880	143.37	8.5	12	269
2022-235	720	19:30	21/08/22	19:30	22/08/22	40.56	5,945	144.67	8.5	12	269
2022-236	792	19:30	22/08/22	19:30	23/08/22	40.85	5,980	146.58	8.5	12	269
2022-237	762	19:30	23/08/22	19:30	24/08/22	41.02	5,719	140.72	8.5	37	269
2022-238	717	19:30	24/08/22	19:30	25/08/22	39.39	5,804	137.14	8.6	17	269
2022-239	335	19:30	25/08/22	19:30	26/08/22	21.65	5,881	76.37	8.5	14	269
2022-240	444	19:30	26/08/22	19:30	27/08/22	21.93	5,934	78.09	8.5	14	269
2022-241	816	19:30	27/08/22	19:30	28/08/22	21.96	5,971	78.68	8.6	13	269
2022-242	713	19:30	28/08/22	19:30	29/08/22	24.87	6,007	89.63	8.6	13	269
2022-243	685	19:30	29/08/22	19:30	30/08/22	40.71	6,025	147.19	8.5	15	269
2022-244	703	19:30	30/08/22	19:30	31/08/22	38.33	6,042	138.92	8.5	15	269
2022-245	516	19:30	31/08/22	19:30	1/09/22	21.22	5,749	73.19	8.6	15	269

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-246	359	19:30	1/09/22	17:25	2/09/22	19.25	6,001	69.30	8.6	13	269
2022-253	750	19:45	8/09/22	19:30	9/09/22	33.64	5,995	120.92	8.5	10	269
2022-254	583	19:30	9/09/22	19:30	10/09/22	12.99	5,978	46.59	8.5	13	269
2022-255	431	19:30	10/09/22	19:30	11/09/22	20.70	5,953	73.93	8.6	14	269
2022-256	640	19:30	11/09/22	19:30	12/09/22	20.53	5,962	73.46	8.6	14	269
2022-257	744	19:30	12/09/22	19:30	13/09/22	20.76	5,965	74.28	8.6	11	130
2022-258	669	19:30	13/09/22	16:15	14/09/22	17.53	5,951	62.60	8.6	7	140
2022-261	495	20:30	16/09/22	19:30	17/09/22	19.91	5,785	69.10	8.6	11	199
2022-262	447	19:30	17/09/22	19:30	18/09/22	20.74	5,830	72.55	8.6	18	199
2022-263	618	19:30	18/09/22	19:30	19/09/22	20.59	5,880	72.66	8.6	12	199
2022-264	1286	19:30	19/09/22	19:30	20/09/22	20.67	5,957	73.86	8.5	12	70
2022-265	1521	19:30	20/09/22	19:30	21/09/22	20.71	5,964	74.09	8.5	7	60
2022-266	1088	19:30	21/09/22	19:30	22/09/22	20.99	5,936	74.77	8.5	74	85
2022-267	459	19:30	22/09/22	19:30	23/09/22	20.97	5,828	73.32	8.6	14	199
2022-268	2380	19:30	23/09/22	19:30	24/09/22	22.20	5,818	77.47	8.6	17	120
2022-269	2845	19:30	24/09/22	19:30	25/09/22	28.85	5,675	97.97	8.5	15	199

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-270	1935	19:30	25/09/22	19:30	26/09/22	36.67	5,494	120.31	8.6	14	99
2022-271	1668	19:30	26/09/22	19:30	27/09/22	21.00	5,753	72.48	8.5	12	60
2022-272	824	19:30	27/09/22	16:35	28/09/22	17.32	5,554	57.72	8.5	17	115
2022-273	700	9:20	29/09/22	19:30	29/09/22	7.82	5,569	26.12	8.6	18	199
2022-274	1005	19:30	29/09/22	19:30	30/09/22	19.52	5,538	64.86	8.6	18	95
2022-275	789	19:30	30/09/22	19:30	1/10/22	20.02	5,544	66.60	8.5	16	199
2022-276	650	19:30	1/10/22	19:30	2/10/22	20.11	5,623	67.83	8.5	16	199
2022-277	667	19:30	2/10/22	19:30	3/10/22	20.48	5,721	70.29	8.5	16	199
2022-278	777	19:30	3/10/22	19:30	4/10/22	20.68	5,791	71.87	8.5	12	199
2022-279	903	19:30	4/10/22	19:30	5/10/22	19.06	5,881	67.26	8.5	15	199
2022-280	786	19:30	5/10/22	19:30	6/10/22	18.89	5,745	65.11	8.5	15	115
2022-281	755	19:30	6/10/22	19:30	7/10/22	18.95	5,577	63.42	8.5	<5	120
2022-282	685	19:30	7/10/22	19:30	8/10/22	19.34	3,712	43.15	8.5	17	130
2022-283	1037	19:30	8/10/22	19:30	9/10/22	19.94	5,047	60.37	8.5	33	85
2022-284	2598	19:30	9/10/22	19:30	10/10/22	20.07	4,833	58.22	8.6	19	32
2022-285	Flood	19:30	10/10/22	19:30	11/10/22	29.80	4,347	75.77	8.6	14	60

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-286	6880	19:30	11/10/22	19:30	12/10/22	21.16	4,892	62.07	8.6	20	60
2022-287	3492	19:30	12/10/22	19:30	13/10/22	22.51	4,984	67.32	8.7	15	60
2022-288	2235	19:30	13/10/22	19:30	14/10/22	22.39	5,051	67.85	8.7	20	60
2022-289	1678	19:30	14/10/22	19:30	15/10/22	22.41	5,194	69.83	8.6	16	60
2022-290	1758	19:30	15/10/22	19:30	16/10/22	22.35	5,232	70.15	8.6	20	60
2022-291	1229	19:30	16/10/22	19:30	17/10/22	21.48	5,299	68.32	8.6	16	75
2022-292	1479	19:30	17/10/22	7:30	18/10/22	10.81	5,351	34.69	8.5	18	60
2022-293	1313	13:30	19/10/22	16:15	19/10/22	2.12	5,560	7.09	8.5	11	75
2022-294	1208	10:05	20/10/22	19:30	20/10/22	7.74	5,610	26.06	8.5	12	78
2022-295	12247	19:30	20/10/22	19:30	21/10/22	19.57	5,576	65.49	8.6	11	95
2022-296	10170	19:30	21/10/22	19:30	22/10/22	24.71	5,449	81.15	8.6	14	160
2022-297	Flood	19:30	22/10/22	11:15	23/10/22	10.18	5,710	34.87	8.5	10	60
2022-299	8713	9:30	25/10/22	19:30	25/10/22	6.52	5,568	21.79	8.5	26	60
2022-300	5806	19:30	25/10/22	19:30	26/10/22	21.20	5,606	71.32	8.6	11	60
2022-301	3156	19:30	26/10/22	19:30	27/10/22	31.21	5,645	105.71	8.6	16	60
2022-302	3629	19:30	27/10/22	19:30	28/10/22	30.98	5,689	105.75	8.5	6	60

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-303	2779	19:30	28/10/22	19:30	29/10/22	30.78	5,778	106.73	8.5	10	60
2022-304	1968	19:30	29/10/22	19:30	30/10/22	30.72	5,828	107.42	8.5	9	70
2022-305	1836	19:30	30/10/22	19:30	31/10/22	30.73	5,907	108.91	8.5	8	78
2022-306	1567	19:30	31/10/22	19:30	1/11/22	30.69	5,752	105.92	8.6	60	90
2022-307	6416	19:30	1/11/22	19:30	2/11/22	30.88	5,737	106.31	8.6	9	82
2022-308	4790	19:30	2/11/22	19:30	3/11/22	31.15	5,780	108.04	8.6	12	60
2022-309	5067	19:30	3/11/22	19:30	4/11/22	31.54	5,792	109.62	8.6	11	60
2022-310	3644	19:30	4/11/22	19:30	5/11/22	31.64	5,776	109.64	8.6	12	60
2022-311	2515	19:30	5/11/22	19:30	6/11/22	31.47	5,710	107.81	8.6	10	60
2022-312	1754	19:30	6/11/22	19:30	7/11/22	31.62	5,735	108.82	8.6	9	80
2022-313	1631	19:30	7/11/22	19:30	8/11/22	31.60	5,956	112.91	8.6	33	85
2022-314	1471	19:30	8/11/22	19:30	9/11/22	23.23	5,938	82.82	8.6	8	95
2022-315	1003	19:30	9/11/22	19:30	10/11/22	14.00	5,872	49.33	8.6	10	70
2022-316	879	19:30	10/11/22	19:30	11/11/22	13.97	5,864	49.15	8.6	7	80
2022-317	1034	19:30	11/11/22	18:00	12/11/22	29.59	5,858	103.99	8.6	13	199
2022-318	813	19:50	12/11/22	19:30	13/11/22	31.36	5,854	110.13	8.6	12	199

RIVER REGISTER INFORMATION		DISCHARGE RECORD							LAB RESULTS		CREDIT REGISTER INFORMATION
2022-319	707	19:30	13/11/22	19:30	14/11/22	31.75	5,740	109.29	8.6	38	199
2022-320	2775	19:30	14/11/22	19:30	15/11/22	31.79	5,749	109.65	8.6	16	199
2022-321	4078	19:30	15/11/22	19:30	16/11/22	31.76	5,738	109.35	8.6	12	150
2022-322	3156	19:30	16/11/22	19:30	17/11/22	31.87	5,756	110.07	8.6	14	45
2022-323	2560	19:30	17/11/22	19:30	18/11/22	31.95	5,748	110.19	8.6	12	60
2022-324	2372	19:30	18/11/22	19:30	19/11/22	31.61	5,908	112.06	8.6	12	199
2022-325	1324	19:30	19/11/22	19:30	20/11/22	31.32	6,063	113.96	8.6	15	199
2022-326	1062	19:30	20/11/22	19:30	21/11/22	31.22	6,210	116.30	8.6	11	199
2022-327	866	19:30	21/11/22	19:30	22/11/22	31.47	6,334	119.61	8.5	15	199
2022-328	802	19:30	22/11/22	19:30	23/11/22	28.27	6,330	107.58	8.6	10	199
2022-329	627	19:30	23/11/22	19:30	24/11/22	13.75	6,247	51.56	8.6	22	130
2022-330	490	19:30	24/11/22	19:30	25/11/22	12.88	6,241	48.25	8.7	12	199
2022-331	412	19:30	25/11/22	16:10	26/11/22	9.35	6,045	33.97	8.7	13	199

GLENCORE