NARRABRI MINE
2023 ANNUAL REVIEW

WHITEHAVEN COAL

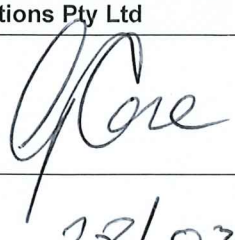
Name of Operation	Narrabri Mine
Name of Operator	Narrabri Coal Operations Pty Ltd
Development consent / Project Approval #	Project Approval 08_0144
Name of holder of development consent/project approval	Narrabri Coal Operations Pty Ltd
Mining lease #	ML 1609
Name of holder of mining lease	Narrabri Coal Pty Ltd
Water Licence #	Refer to Water Licences in Table 5
Name of holder of water licence	Narrabri Coal Pty Ltd, Narrabri Coal Australia Pty Ltd, Posco International Narrabri Investments Pty Ltd, J-Power Australia Pty Ltd, Kores Narrabri Pty Ltd and Upper Horn Investments (Australia) Pty Ltd
Forward program start date	1 January 2023
Forward program end date	31 December 2025
Rehabilitation Management Plan approval date	30 November 2023 (Approval date)
Annual Review Commencement Date	01 January 2023
Annual Review Completion Date	31 December 2023

I, Grant Case, certify that this audit report is a true and accurate record of the compliance status of the Narrabri Mine for the period 01 January 2023 to 31 December 2023, and that I am authorised to make this statement on behalf of Narrabri Coal Operations Pty Ltd.

Note.

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

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

Name of Authorised Reporting Officer	**Grant Case**
Title of Authorised Reporting Officer	**General Manager (Acting) – Narrabri Coal Operations Pty Ltd**
Signature	
Date	28/03/24

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ABBREVIATIONS

Abbreviation	Detailed Name
µg	Micrograms
ACHMP	Aboriginal Cultural Heritage Management Plan
AGE	Australasian Groundwater and Environmental
ANZECC	Australian and New Zealand Environment Conservation Council
AQMP	Air Quality Management Plan
ARRFP	Annual Rehabilitation Report and Forward Program
BC Act	Biodiversity Conservation Act 2016
Blue Book	Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004)
BMP	Biodiversity Management Plan
BOA	Biodiversity Offset Area
BOS	Biodiversity Offset Strategy
BR1	Brine Dam
CCC	Community Consultative Committee
CCS	Carbon Capture Sequestration
CEEC	Critically Endangered Ecological Communities
CF	Cut and Flit
CH4	Methane
CHPP	Coal Handling and Preparation Plant
CO2-e	Carbon Dioxide Equivalent
CRD	Cumulative Rainfall Departure
DAWE	Australian Department of Agriculture, Water and the Environment (
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DDG	Dust Deposition Gauges
DPE	NSW Department of Planning and Environment
EA	Environment Assessment
EC	Electrical Conductivity
EEC	Endangered Ecological Communities
EIS	Environmental Impact Statement
EL	Exploration Licence
EMS	Environmental Management Strategy
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	NSW Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPBC Approval	Environment Protection and Biodiversity Conservation Approval 2009/5003
EPL 12789	Environment Protection Licence 12789
EP-WMP	Extraction Plan - Water Management Plan
ESAP	Energy Savings Action Plan
ESC	Erosion and Sediment Control
FBS	Floristic-Based Subsidence
FWP	Forward Program
FY	Financial Year

Abbreviation	Detailed Name
GAB	Great Artesian Basin
GGMP	Greenhouse Gas Minimisation Plan
GHG	Greenhouse Gas
GIS	Geographical Information System
GWMP	Groundwater Management Plan
GWP	Global Warming Potential
ha	Hectares
HVAS	High Volume Air Sampler
IEA	Independent Environmental Audit
kL	Kilolitres (1kL = 1,000 L)
km	Kilometres
L	Litres
LALC	Local Aboriginal Land Council
LED	light emitting diode
LGA	Local Government Area
LMP	Landscape Management Plan
LOM	Life of Mine
LW	Longwall
MDB	Murray Darling Basin
MEG	Department of Regional NSW, Mining, Exploration and Geoscience
MEVF	Main Exhaust Ventilation Fan
ML	Mining Lease (Followed by Number)
ML	Mega Litre (Preceded by Number)
mm	millimetres
mm	Millimetres
MOD	PA 08_0144 Modification
Mt	Million Tonnes
Mtpa	Million Tonnes Per Annum
MWh	Megawatt Hour
NCOPL	Narrabri Coal Operations Pty Ltd
NDVI	Normalised Difference Vegetation Index
NGCG	Native Ground Cover Grass
NGERS	National Greenhouse and Energy Reporting Scheme
NMC	Native Midstory Cover
NMP	Noise Management Plan
NOS	Native Overstorey Cover
NPI	National Pollutant Inventory
NPS	Native Plant Species
NPW Act	National Parks and Wildlife Act 1974
NPWS	National Parks and Wildlife Services
NSC	Narrabri Shire Council
NSW	New South Wales
PA 08_0144	Project Approval 08_0144

Abbreviation	Detailed Name
PAB	Photosynthetically Active Biomass
PIRMP	Pollution Incident Response Management Plan
PM10	Particulate Matter less than 10 Micrograms
POI	Points of Interest
PTW	Permit to Work
RAPs	Registered Aboriginal Parties
RCE	Rehabilitation Cost Estimate
REA	Reject Emplacement Area
Reporting Period	1 January 2023 - 31 December 2023 (Calendar Year)
RFS	Rural Fire Service
RMP	Rehabilitation Management Plan
ROM	Run of Mine
RR	NSW Resources Regulator
SD	Sediment Dam
SoC	Statement of Commitments
SPL	Sound Power Level
SPMP	Subsidence Pond Management Plan
SSD 10269	State Significant Development (Narrabri Mine Stage 3 Extension Project)
STP	Sewerage Treatment Plan
t	Tonnes
TARP	Trigger Action Response Plan
TfNSW	Transport for NSW
TIS	Total Insoluble Solids
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
VWP	Vibrating Wire Piezometers
VZ	Vegetation Zones
WAL	Water Access Licence
WasteMP	Waste Management Plan
WHC	Whitehaven Coal Limited
WMP	Water Management Plan

1 STATEMENT OF COMPLIANCE

This Annual Review has been prepared to provide a summary of the environmental performance of the Narrabri Mine over the **Reporting Period**, 1 January 2023 to 31 December 2023. The compliance status of the Narrabri Mine against relevant approvals was assessed as at the end of the Reporting Period and is summarised in **Table 1**.

Non-compliances recorded during the Reporting Period (if applicable) were ranked according to the risk matrix included in **Table 2** and a brief description of each is provided in **Table 3** (if applicable). Further information about the non-compliances is provided in **Section 11** (if applicable). The compliance status described in this Annual Review (**Section 1** and **Section 11**) relates to the conditions of the relevant approvals listed in Table 1 during the Reporting Period.

Table 1: Statement of Compliance

Were all the conditions of the relevant approvals complied with?	Yes/No
Project Approval (**PA**) 08_0144	No*
Environment Protection Licence (**EPL**) 12789 (applicable conditions as above)	Yes
Rehabilitation Management Plan (**RMP**) and Forward Program (**FWP**)	Yes
Mining Lease (**ML**) 1609	Yes
Water Access Licence (**WAL**) 15922	Yes
WAL12833	Yes
WAL12822	Yes
WAL20131	Yes
WAL6762	Yes
WAL2671	Yes
WAL2728	Yes
WAL20152	Yes
WAL29549	Yes
WAL43017	Yes
90CA811347	Yes
90WA812891	Yes
90CA802130	Yes
90WA822539	Yes
Groundwater Monitoring Bores: 90BL254481-487, 90BL254658-663, 90BL254701, 90BL254958-967, 90BL255167-173, 90BL255216-218, 90BL255769-772, 90BL256060-064, 90BL256344 and 90BL256346	Yes
Environment Protection Biodiversity Conservation (**EPBC**) Approval 2009/5003	Yes

* Non-Compliance with Air Quality Management Plan (**AQMP**), however, consistent with PA 08_0144 air quality criteria.

Table 2: Compliance Status Key

Risk Level	Colour Code	Description
High	High	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Medium	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	Low	Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Administrative non-compliance	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)

Table 3: Non-Compliances

Relevant Approval	Cond. #	Condition Description (Summary)	Compliance Status	Comment	Where addressed in Annual Review
AQMP	N/A	Particulate Matter less than 10 Micrograms (**PM_{10}**) is required to be monitored every 6 days. NCOPL did not collect PM_{10} data from site ND10 on 23 April, 29 April, 29 May and 4 June due to mechanical failure of the High Volume Air Samplers (**HVAS**).	Administrative non-compliance	NSW Department of Planning and Environment (**DPE**) notified of non-compliance with monitoring requirement of AQMP.	**Section 6.3.2**

2 INTRODUCTION

This Annual Review has been prepared for the Narrabri Mine (**Figure 1**) and has been prepared in accordance with the *'Annual Review Guideline, Post-Approval requirements for State significant mining developments'* (NSW Government, October 2015) (Guidelines). This document has been prepared to satisfy the following requirements:

- The Annual Review requirements per PA 08_0144, Schedule 6, Condition 6; and
- The routine reporting expectations of relevant government authorities.

The Annual Review covers the period 1 January 2023 to the 31 December 2023. The Annual Review provides information on historical aspects of the Narrabri Mine, longer term trends in environmental monitoring results and relevant information on activities to be undertaken during the following Reporting Period.

2.1 PROJECT DESCRIPTION

The Narrabri Mine is an underground coal mining operation situated in the Gunnedah Coalfield. It is located approximately 25 km south-southeast of Narrabri and approximately 60km north-west of Gunnedah, within the Narrabri Shire Council (**NSC**) Local Government Area (**LGA**) in New South Wales (**NSW**). The Narrabri Mine includes an underground coal mine, a coal handling preparation plant and associated rail siding and surface infrastructure.

The Narrabri Mine Stage 1 Operations was granted approval (PA 05_0102) on 13 November 2007 under Part 3A of the *Environmental Planning and Assessment Act 1979* (**EP&A Act**). A modification to this approval was sought and granted approved in 2010 to allow for the construction of a Coal Handling and Preparation Plant (**CHPP**), ventilation shaft and other long lead time items that would ultimately form part of an expanded longwall mining operation.

The Narrabri Mine Stage 2 Operations was granted approval (PA 08_0144) on 26 July 2010 under Part 3A of the EP&A Act. Since 2010, PA 08_0144 has undergone seven modifications. PA 08_0144 permits the mining of coal up to 11 million tonnes per annum (**Mtpa**) Run of Mine (**ROM**) until 26 July 2031. The Narrabri Mine is covered by ML1609 which encompasses an area of 5,298 hectares (**ha**) for the predominant purpose of mining for coal from the Hoskissons Coal Seam.

The Narrabri Mine Stage 3 Extension Project was granted State Significant Development (**SSD**) approval (SSD-10269) on 1 April 2022. This consent has not taken effect as approval under the *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**) is required prior to Project commencement.

The Narrabri Mine is operated by Narrabri Coal Operations Pty Ltd (**NCOPL**), on behalf of the Narrabri Mine Joint Venture, which consists of 2 Whitehaven Coal Limited (**WHC**) wholly owned subsidiaries, and other joint venture partners[1].

[1] J-Power Australia Pty Ltd, Upper Horn Investments (Australia) Pty Ltd, POSCO International Narrabri Investment Pty Ltd and KORES Narrabri Pty Limited

2.2 MINE CONTACTS

The relent contacts for environmental management at the Narrabri Mine are outlined in **Table 4**.

Table 4: NCOPL Contacts

Contact	Contact Details
Grant Case General Manager (Acting)	Phone: (02) 6794 4755
Brent Baker Environmental Manager	Phone: (02) 6794 4755
Narrabri Coal Website (Copies of public notices, environmental management documents, monitoring results and other information relating to Narrabri Mine's operations)	https://whitehavencoal.com.au/our-business/our-assets/narrabri-mine/
Phone	Narrabri Mine General Enquiries: 02 6794 4755 Community Complaints Hotline: 1800 942 836

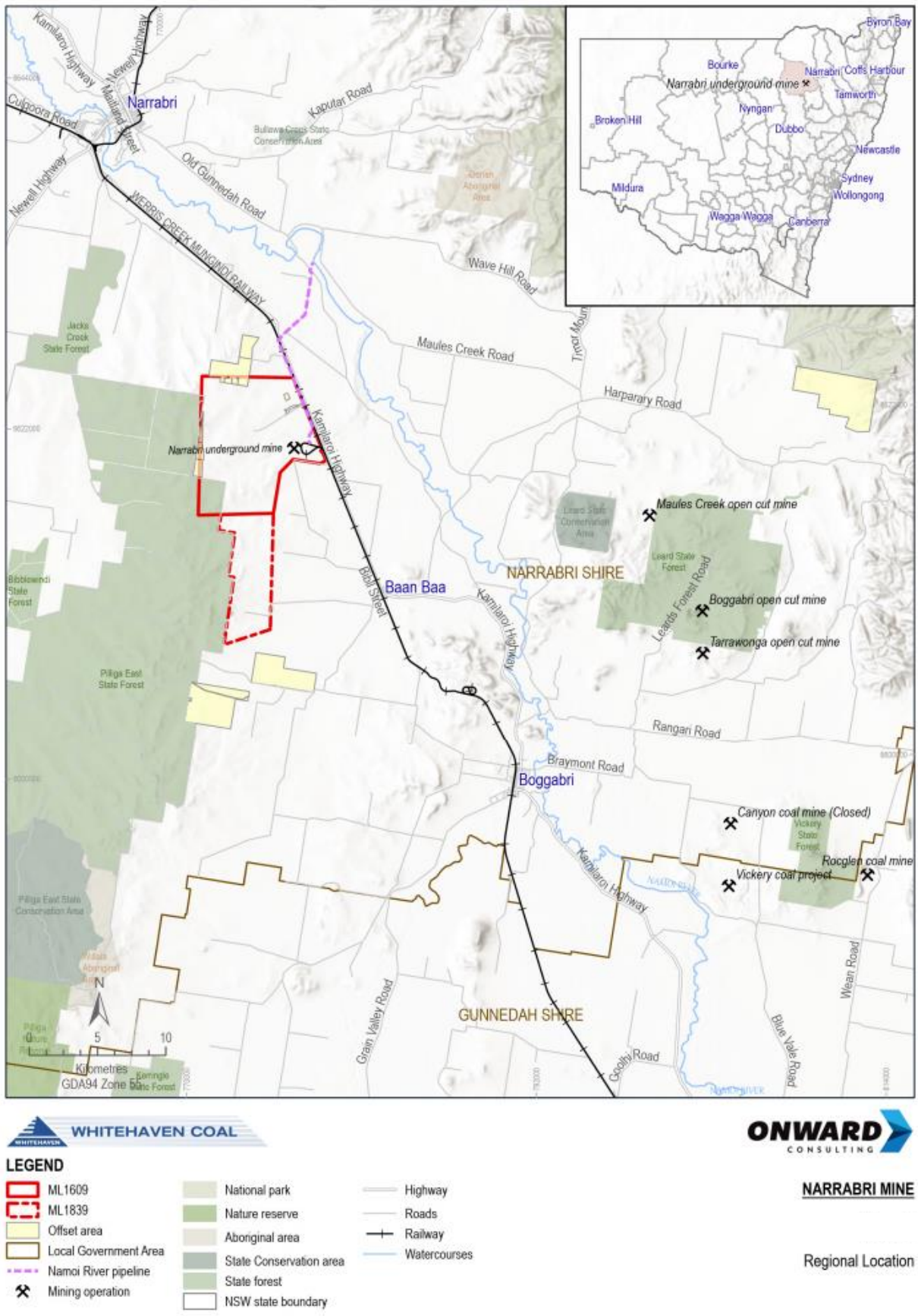


Figure 1: Regional Scale Locality Plan

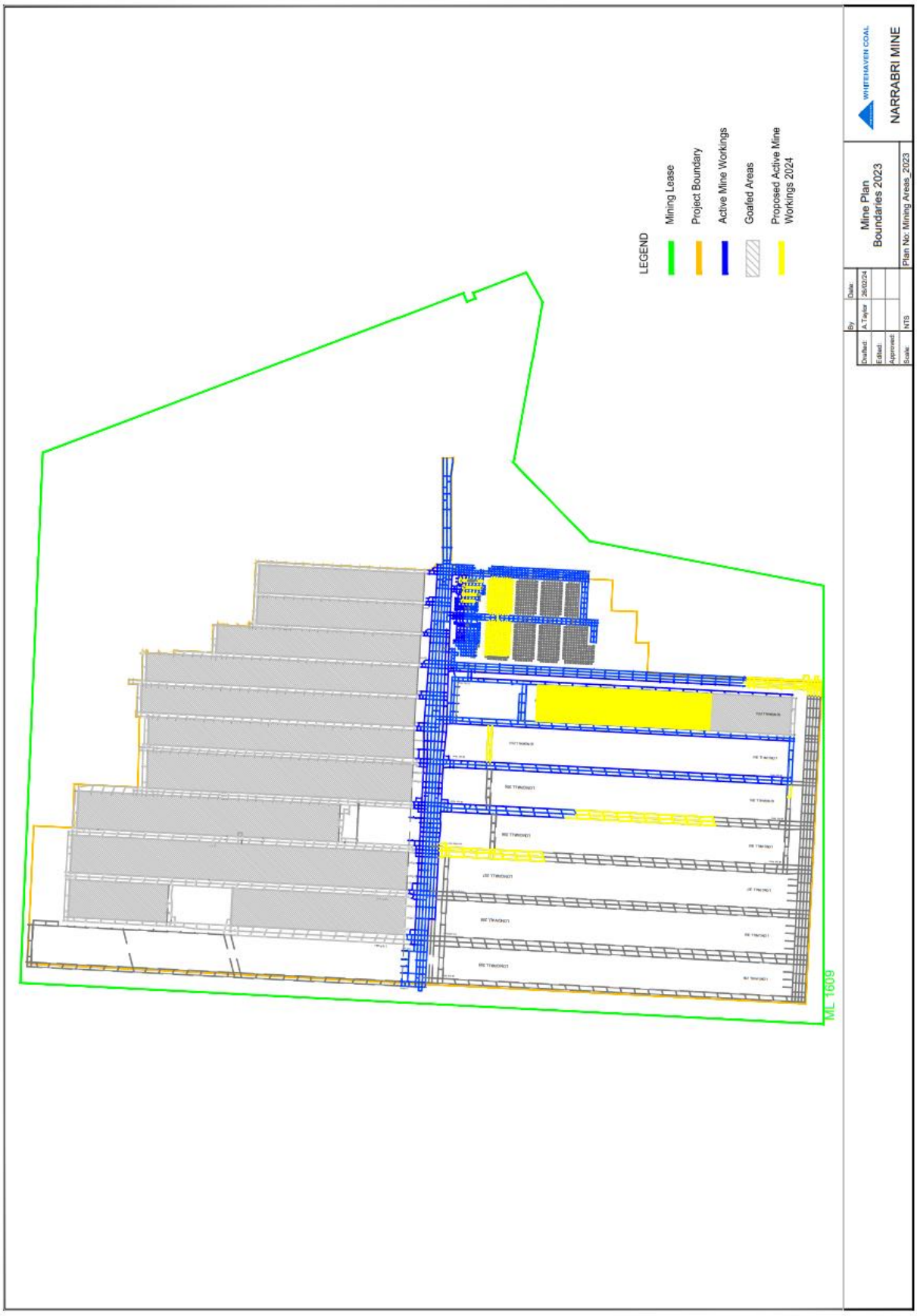


Figure 2: Local Scale Locality Plan

3 APPROVALS

Table 5 provides a summary of the key licences, leases and approvals that have been obtained (and remain active) for the Narrabri Mine to enable the construction and operation of Narrabri Mine.

Table 5: Licences, Leases and Approvals

Document	Approval Period(s)	Authority[1]
PA 08_0144 *(as modified)*	26/7/2010 – 26/7/2031*	DPE
PA 08_0144 Modification (**MOD**) 1, approved 30 March 2011	26/7/2010 – 26/7/2031	DPE
PA 08_0144 MOD2, approved 21 December 2011	26/7/2010 – 26/7/2031	DPE
PA 08_0144 MOD4, approved 22 September 2015	26/7/2010 – 26/7/2031	DPE
PA 08_0144 MOD5, approved 9 December 2015	26/7/2010 – 26/7/2031	DPE
PA 08_0144 MOD6, approved 13 January 2017	26/7/2010 – 26/7/2031	DPE
PA 08_0144 MOD7, approved 23 November 2021	26/7/2010 – 26/7/2031	DPE
EPBC Approval 2009/5003	21/1/2011 – 31/12/2040	Commonwealth Department of Climate Change, Energy, the Environment and Water (**DCCEEW**)
EPL 12789	Anniversary date: 20 February	NSW Environment Protection Authority (**EPA**)
Radiation Management Licence 5063666	Expiry date: 3/1/2025	EPA
Construction Certificate DP816020	17/10/2008 – Perpetuity	NSC
Inspection Report/Permit to Occupy No 2413	6/8/2009 – 26/7/2031	NSC
Construction Certificate DP816020	23/10/2010 – Perpetuity	NSC
RMP	Approved 16/11/2023	NSW Resources Regulator (**RR**)
FWP	1/1/2023 – 31/12/2025	RR
ML1609	18/1/2008 – 18/1/2029	RR
ML1839**	13/9/2022 – 13/9/2043	RR
Exploration Licence (**EL**) 6243	21/5/2004 – 21/5/2029	Department of Regional NSW, Mining, Exploration and Geoscience (**MEG**)
EL 9455	6/9/2022 – 6/9/2028	MEG
EL 9456	6/9/2022 – 6/9/2028	MEG

Document	Approval Period(s)	Authority[1]
XSTR100215 (Licence to Store Explosives)	20/12/2020 – 20/7/2025	SafeWork NSW
NDG037955 (Notification of Hazardous Chemicals on Premises)	23/03/2021 - Perpetuity	SafeWork NSW
WAL 6762 (Lower Namoi Regulated River Water Source (high security)) – 20 units	Continuing	Water NSW
WAL 2728 (Lower Namoi Regulated River Water Source (general security)) – 10 units	Continuing	Water NSW
WAL 20152 (Lower Namoi Regulated River Water Source (general security)) – 600 units	Continuing	Water NSW
WAL 2671 (Lower Namoi Regulated River Water Source (general security)) – 48 units	Continuing	Water NSW
WAL 12833 (Upper Namoi Zone 5 Namoi Valley Groundwater Source) – 67 units	Continuing	Water NSW
WAL 20131 (Upper Namoi Zone 5 Namoi Valley Groundwater Source) – 150 units	Continuing	Water NSW
WAL 12822 (Upper Namoi Zone 5 Namoi Valley Groundwater Source) – 43 units	Continuing	Water NSW
WAL 29549 (Gunnedah – Oxley Basin Murray Darling Basin Groundwater Source) – 818 units	Continuing	Water NSW
WAL 43017 (Gunnedah – Oxley Basin Murray Darling Basin Groundwater Source) – 403 units	Continuing	Water NSW
WAL 15922 (Southern Recharge Water Source) – 248 units	Continuing	Water NSW

Notes:

* Schedule 2, Condition 5 of PA 08_0144 provides that mining operations may be carried out until 26 July 2031. The consent continues to apply in all other respects other than the right to conduct mining operations until rehabilitation and other relevant obligations have been carried out satisfactorily.

** Operations under ML 1839 have not commenced.

1 - Authority Name as at 31 December 2023 (i.e. End of Reporting Period)

3.1 PENDING APPLICATIONS AT END OF REPORTING PERIOD

There were no pending applications as at 31 December 2023.

3.2 VARIATIONS

The following new or varied approvals were issued during the Reporting Period:

1. EPL 12789 variation was approved on 26 July 2023 to include monitoring locations associated with the construction of the brine dam.
2. RMP was approved on 16 November 2023 to include the approved rehabilitation objectives and other amendments.
3. Several Environment Management Plan's required by PA 08_0144 were approved by DPE (see **Table 6** for details).

3.3 STATUS OF MANAGEMENT PLANS

Table 6 outlines the environmental management plans and the approval status of each at the end of the Reporting Period.

Table 6: Status of NCOPL Management Plans

Management Strategy / Plan	Regulatory Approval
Aboriginal Cultural Heritage Management Plan (**ACHMP**)	3/10/2023
AQMP	24/8/2023
Biodiversity Offset Strategy (**BOS**)	16/9/2019 – formerly Australian Department of Agriculture, Water and the Environment (**DAWE**), now known as DCCEEW 25/9/2019 – DPE
Extraction Plan LW101 – LW106*	18/5/2016
Extraction Plan LW107 – LW110*	6/4/2017
Extraction Plan 201 – 202*	27/4/2022
Extraction Plan LW203 – LW206***	7/5/2023
Environmental Management Strategy (**EMS**)	13/10/2020
FWP	Lodged with RR on 5/6/2023**
Greenhouse Gas Minimisation Plan (**GGMP**), including Energy Savings Action Plan (**ESAP**)	21/12/2023
Noise Management Plan (**NMP**)	7/8/2023
Offsite Kenna Biodiversity Offset Management Plan	11/8/2014 – internal approval
Onsite Biodiversity Offset Management Plan	11/8/2014 – internal approval
Pollution Incident Response Management Plan (**PIRMP**)	7/2/2024 – internal approval
RMP	16/11/2023
Waste Management Plan (**WasteMP**)	19/10/2020
Water Management Plan (**WMP**) ^	5/4/2013

* Extraction Plans include sub-environmental management plans
** Forward Program is not subject to approval of the Secretary.
*** Conditional approval for extraction of LW203.
^ Currently under review, to be submitted for approval early 2024.

4 OPERATIONS SUMMARY

4.1 MINING OPERATIONS

Longwall

The secondary longwall (**LW**) extraction of LW110 was completed in April 2023. NCOPL commenced secondary extraction of the first panel of the 200 series longwall panels, LW203, in June 2023.

Cut and Flit (CF)

CF extraction continued in the CF201 panel. The panel completed primary extraction and commenced secondary extraction in December 2023.

Development

Underground development continued into MG204, MG205 and the 200 Mains.

Table 7 presents the production summary for the previous and current Reporting Periods and the forecast production schedule for the next Reporting Period.

Table 7: Production Summary

Material	Approved limit (Million Tonnes) (Mt)	Previous Reporting Period (actual) (Mt)	This Reporting Period (actual) (Mt)	Next Reporting Period (forecast) (Mt)
Waste Rock / Overburden	-	0	0	0
ROM Coal*	11	3.37	4.25	5.28
Reject Material	-	0.15	0.17	0.15
Saleable Product**	-	3.43	4.39	5.13

* ROM Coal is total production at the mine site. The difference between ROM Coal and final product is related to changes in stockpile volumes at the mine.
** Saleable Product is coal railed from site.

4.2 OTHER OPERATIONS

4.2.1 Exploration Activities

Five exploration boreholes were drilled from the surface into a Life of Mine (**LOM**) mains panel during the Reporting Period. The drilling was conducted in the southern part of ML1609. These boreholes confirmed the presence of a geological structure identified from a previous Reporting Period. Data acquired from these boreholes were incorporated into the geological database and model.

4.2.2 Construction

The following construction activities were undertaken during the Reporting Period:

- Construction of an alternative access track was commissioned to improve truck access for deliveries to site. The site had been previously cleared for agricultural purposes prior to the commencement of mining activities.

- Construction of the new Brine Dam (**BR1**) was completed and commissioned on 3 October 2023. In addition, construction of other surface development associated with BR1 including a Sediment Dam (**SD**), an access track and services corridors from the existing rail loop dam complex were also installed.
- Installation of an office building within the CHPP area was completed.
- Construction of the hardstand area, equipment storage areas, shaft construction plant and equipment, settlement dams, topsoil stockpiles, and a stormwater sediment dams have been completed in preparation of the planned downcast shaft installation.

4.2.3 Hours of Operation

The approved hours of operation are provided in **Table 8**.

Table 8: Hours of Operation

Activity	Hours / Days
Pit bottom area development, underground mining, gas drainage, ventilation fan operation, coal processing and handling, rail loading and transportation, and surface maintenance	24 hours / 7 days
CHPP reject disposal	24 hours / 7 days[1]
Raw materials / supply delivery	7:00am to 10:00pm / 7 days

1. Reject disposal activities will generally be restricted to 7:00am to 10:00pm, 7 days per week. However, it is possible that the proportion of reject material generated by the CHPP may exceed the predicted average 5% level for short periods. To account for these periods of elevated reject production, contingent hours of operation will be 24 hours / 7 days (when inversion conditions do not prevail).

4.3 NEXT REPORTING PERIOD

4.3.1 Mine Operations

The planned mine production for 2024 will be 5.28 Mt of ROM coal, which is expected to contain approximately 0.15 Mt of coarse reject material. Longwall extraction of LW203 will continue throughout 2024, with completion currently forecast early 2025. Development (first workings) will be carried out for MG205, MG206 and 200 Mains. There will also be production from the CF201-CF202 panel area.

4.3.2 Exploration

No exploration drilling is planned within ML1609 during 2024.

4.3.3 Construction Activities

NCOPL propose to complete the drilling of the downcast shaft located on the southern extent of LW205 during 2024.

4.3.4 Mining Fleet Upgrades

PA 08_0144 MOD 7 was approved on 23 November 2021, and allows the bord and pillar mining of longwall panels 201 and 202. Mining equipment to facilitate the bord and pillar operations that will be introduced to the project during this Reporting Period include:

- 1 x continuous miner Komatsu Joy 12CM12;
- 2 x shuttle cars;
- 2 x underground mining LHD (load haul dump) loaders;
- 2 x underground personnel transport SMVs; and
- Multi bolter.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The 2022 Annual Review identified the following actions, summarised in **Table 9**.

Correspondence was received from DPE on 24 May 2023 stating that the 2022 Annual Review report had satisfied the reporting requirements of the approval and did not include any additional corrective actions.

Action taken to address this request is summarised in **Table 9**.

Table 9: Actions Required the 2022 Annual Review

Action Required from Previous Annual Review	Requested By	Action Taken by NCOPL	Where Discussed in Annual Review
Noise: Retesting of the Main Exhaust Ventilation Fan (**MEVF**) Sound Power Level (**SPL**) measurements will be undertaken in early 2023 to determine if these actions have been successful in reducing results.	NCOPL	**Completed** NCOPL engaged an acoustic specialist to undertake testing of the MEVF SWL measurements on 27 March 2023 which determined the operational SWL of the MEVF (when tested under typical operating conditions) was 119 dBA.	**Section 6.2**
Meteorological Monitoring: Predictive meteorological software that provides forecasts specific to the Narrabri Mine location will be integrated into day-to-day operations. The software will integrate weather observations from the onsite meteorological station into regional forecasts to provide a more accurate weather forecast.	NCOPL	**Completed** NCOPL are utilising predictive meteorological software (Weather Zone) to inform day-to-day operations. The mine-owned weather station provides real-time data to the Weather Zone that integrates with forecast models to produce site-specific weather forecasts. Key personnel are provided seven-day forecasts on a daily basis that inform potential environmental risks and management measures.	**Section 6.1**
Groundwater: In June 2022, NCOPL commissioned Australasian Groundwater and Environmental (**AGE**) to undertake a full re-calibration of the Groundwater Model.	NCOPL	**In Progress** AGE provided the outcomes of the re-calibration exercise to NCOPL on 19 December 2023. Revised predictions are to be included in revisions of the WMP and Extraction Plan LW203-206 to be submitted to DPE in 2024.	**Section 7.3**
Biodiversity: Continue investigations into subsidence pond management by evaluating engineering design options and complete an environmental assessment to	NCOPL	**In Progress** NCOPL engaged WRM Water & Environment Pty Ltd to provide a conceptual design for drainage works along Pine Creek to drain 5 subsidence ponds. NCOPL assessed the environmental impacts and approval pathways and determined the works to be prohibitive.	**Section 6.5**

Action Required from Previous Annual Review	Requested By	Action Taken by NCOPL	Where Discussed in Annual Review
determine the most appropriate options for implementation.		NCOPL will reassess subsidence pond management options during 2024.	
Mine Subsidence: The integrated electronic Geographical Information System (**GIS**) based monitoring platform for environmental monitoring, including subsidence crack monitoring was introduced during 2022. The System will continue to be refined during the 2023 Reporting Period.	NCOPL	**Complete** The monitoring platform was utilised to capture environmental monitoring data, including subsidence monitoring. NCOPL will continue to use and refine the System during 2024 (where reasonable and practical).	**Section 6.10**
Surface Water Management: NCOPL to complete the construction of BR1 and associated SD7.	NCOPL	**Complete** Construction of BR1 (and SD7) was completed in October 2023.	**Section 4.2.2**
Proposed Research and Rehabilitation: The integrated electronic GIS based monitoring platform is planned to incorporate the Permit to Work (**PTW**) to replace paper-based format. The PTW system is planned to be a structured form that is required to be completed and signed by relevant NCOPL personnel prior to conducting any clearance or excavation works.	NCOPL	**In Progress** The GIS platform for PTW procedures was developed and tested in during the Reporting Period. NCOPL are aiming to implement to the PTW procedure during early 2024.	**Section 8.1.9**
Aboriginal Cultural Heritage: Fencing surrounding all known Aboriginal archaeological sites is to be upgraded to the new standard.	NCOPL	**Ongoing** NCOPL conduct annual inspections on all known Aboriginal archaeological sites. The inspections identify maintenance and/or upgrade actions for the protection of Aboriginal archaeological sites.	**Section 6.6**

6 ENVIRONMENTAL PERFORMANCE

The following sub-sections report on the environmental performance achieved during the Reporting Period and provides a summary of the environmental monitoring data compared to data predictions, trends and management measures.

Environmental monitoring locations are illustrated on **Figure 3**.

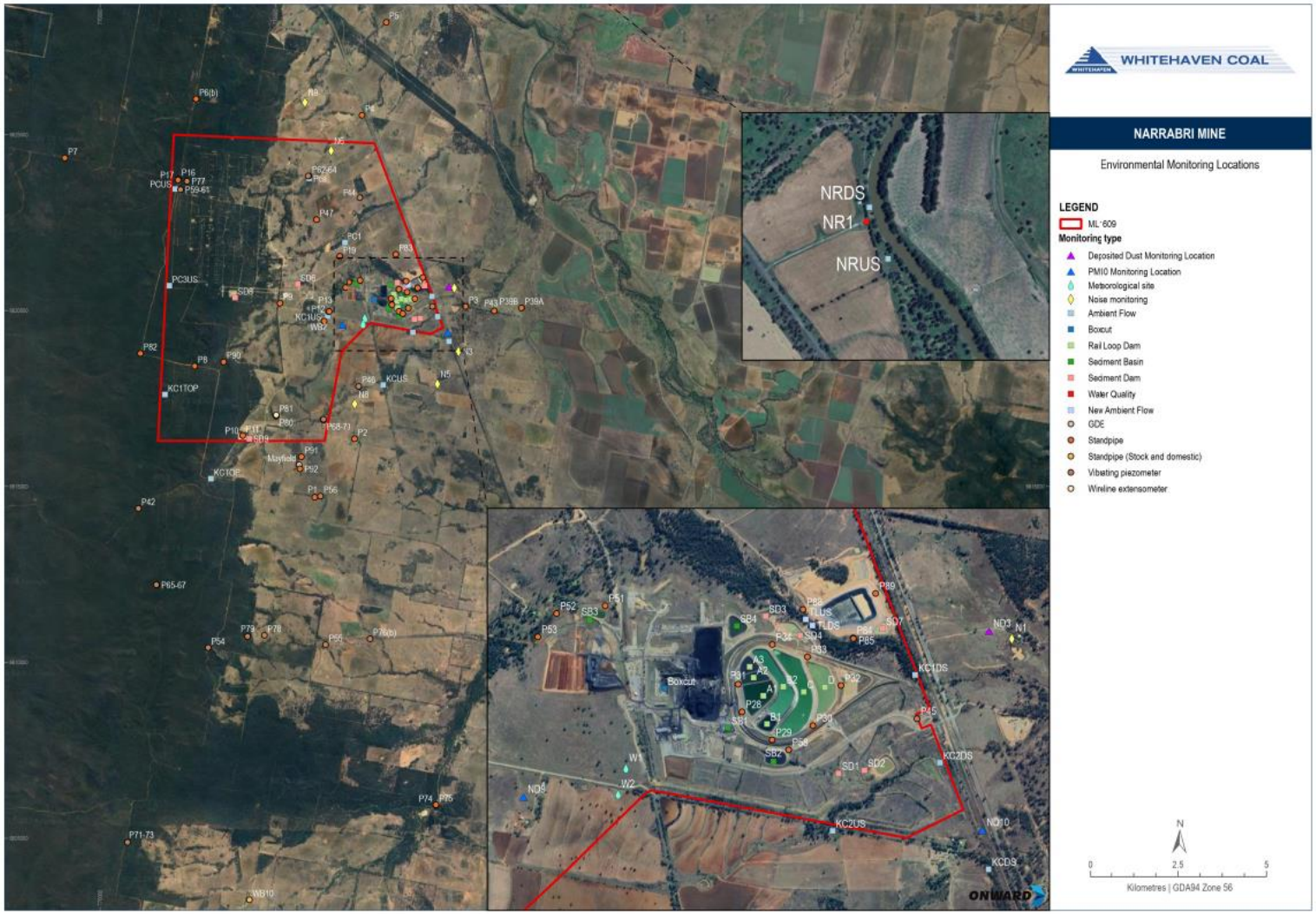


Figure 3: Environmental Monitoring Location

6.1 METEOROLOGY

6.1.1 Environmental Management

NCOPL operates a meteorological station and inversion tower in accordance with requirements of PA 08_0144 and EPL 12789 (see **Figure 3**).

Maintenance and calibration activities completed on the meteorological station and inversion tower were undertaken in February and August 2023.

6.1.2 Environmental Performance

Wind speed, wind direction, air temperature, relative humidity, solar radiation, rainfall and evapotranspiration are recorded at the meteorological station. **Appendix A** summaries the monthly meteorological conditions recorded at the Narrabri Mine weather stations for the Reporting Period.

The total rainfall for the Reporting Period was recorded at 555.4 millimetres (**mm**), which is slightly below the historical average of 579.3mm recorded from the Narrabri Airport and lower than the 1010.6mm recorded during 2022.

The minimum temperature during the Reporting Period was 3.9°C in May 2023 and the maximum temperature was 39.8°C in December 2023. The minimum temperatures recorded were slightly below historical averages while the maximum temperatures recorded were slightly above historical averages.

The predominant wind direction in the 2023 Reporting Period was south-east, which is comparable to previous Reporting Periods.

6.1.3 Activities for the Next Reporting Period

There are no additional actions planned for 2024.

6.2 NOISE

6.2.1 Environmental Management

Potential noise impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Condition 1 to 5 - noise criteria and operating conditions;
- EPL 12789 - conditions L4, M7, R4 and E2; and
- the NMP.

The Narrabri Mine noise monitoring network is illustrated in **Figure 3** and includes:

- quarterly compliance attended monitoring at locations as described in the EPL and NMP; and
- continuous unattended monitoring at 3 locations (real-time, for management purposes).

6.2.2 Environmental Performance

Attended Monitoring (Compliance)

Attended noise monitoring is conducted on a quarterly basis by an independent consultant. There were no exceedances of the noise criteria during the Reporting Period. A summary of the noise monitoring results is outlined in

Table 10.

Table 10: Noise Monitoring Summary 2023

Site ID	Site name	Criteria ($L_{Aeq(15\ minute)}$), dB(A))	Criteria ($L_{A(1\ minute-Night)}$), dB(A))	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
				27-30 March		19-21 June		11-13 September		13-15 November	
				(Mine Contribution, dB(A))[2]							
				L_{Aeq} 15 min	L_{A1}	L_{Aeq} 15 min	L_{A1}	L_{Aeq} 15 min	L_{A1}	L_{Aeq} 15 min	L_{A1}
N1	Bow Hills[1]	50	50	I/A	I/A	I/A	N/M	I/A	25	35	40
N3	Ardmona[4]	35	45	27	29	N/M	N/M	No Longer required under NMP			
N5	Oakleigh[3]	-	-	32	39	34	I/A	38	45	35	27
N6	Newhaven	35	45	I/A	40	N/M	31	29	32	32	32
N8	Haylin View[3]	-	-	39	38	34	I/A	27	49	34	39
N9	High Range[3]	-	-	26	34	25	I/A	31	33	30	35

I/A = Inaudible, N/M = Not Measurable

L_{Aeq} 15 minute = A-weighted equivalent sound pressure level, over a 15 minute period

L_{A1} = A-weighted sound pressure level exceeded for 1% of the 15 minute interval over the period from 10:00pm to 7:00am.

Note 1: A private agreement between NCO and the residents of N1 Bow Hills defines a compliance level of 50 dBA LAeq(15minute).

Note 2: Noise levels presented are the highest measured noise level under compliant weather conditions over the monitoring period.

Note 3: Property is owned by NCOPL and are not a private residence, therefore the noise criteria does not apply.

Note 4: NCOPL entered a private agreement with the landholder, removing the requirement to monitor noise at this location. Monitoring point was also removed from EPL 12789 on 7 September 2022.

Sound Power Level (SPL) Testing

SPL testing was undertaken on key mobile plant and other fixed equipment during the Reporting Period and were generally consistent with the predictions in the PA 08_0144 MOD 5 Environment Assessment (**EA**).

Comparison to Assessment Predictions

Noise monitoring results recorded during the Reporting Period were generally consistent with the predictions in the Environmental Impact Statement (**EIS**) for the Narrabri Coal Mine Stage 2 Longwall Project.

6.2.3 Activities for the Next Reporting Period

There are no proposed actions planned for 2024.

NCOPL will continue to review the NMP in accordance with PA 08_0144. If amendments to the NMP are required, NCOPL will lodge the revised NMP with relevant regulatory agencies for comment and then with the DPE for approval.

6.3 AIR QUALITY

6.3.1 Environmental Management

Potential air quality impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Condition 6 – air quality criteria;
- EPL 12789 – conditions O3, P1 and M2; and
- the AQMP.

The Narrabri Mine air quality monitoring network is illustrated in **Figure 3** and includes:

- 2 HVAS measuring PM_{10} for a 24-hour period, every 6 days; and
- 8 Dust Deposition Gauges (**DDGs**), measuring deposited dust collected monthly.

Note: Total Suspended Particulate (**TSP**) matter is inferred at a ratio of 1:2 from the measured PM_{10} data.

6.3.2 Environmental Performance

Deposited Dust

Table 11 details the annual average deposited dust monitoring results for the Reporting Period, indicating all monitoring locations are below the annual average Total Insoluble Solids (**TIS**) criteria of 4 g/m^2/month. Narrabri Mine measure compliance with the criteria with results of ND3, as all other monitoring locations are located on NCOPL owned land and are monitored for internal purposes only, therefore compliance measures do not apply.

The Reporting Period average for ND3 was 0.7 g/m^2/month and the long-term average is 1.8 g/m^2/month.

Table 11: Deposited Dust Monitoring Data Summary for the Reporting Period

Site	EPL ID No.	Property Name	PA 08_0144 Annual Average Criteria		Annual Mean Total Insoluble Solids (g/m^2/month)
			Max Increase (g/m^2/month)	Max Total (g/m^2/month)	
ND1	-	Turrabaa	2	4	**0.9**
ND2	-	Claremont	2	4	**1.6**
ND3	3	Bow Hills	2	4	**0.7**
ND4A	-	Matoppo	2	4	**1.1**
ND5	-	Willarah	2	4	**3.1**
ND6	-	Willarah	2	4	**1.3**
ND7	-	Claremont	2	4	**1.5**
ND8	-	Claremont	2	4	**1.5**

Deposited dust was generally higher during the Reporting Period than the previous Reporting Period (**Figure 4**). Higher results within the Reporting Period may be attributed to lower rainfall in 2023.

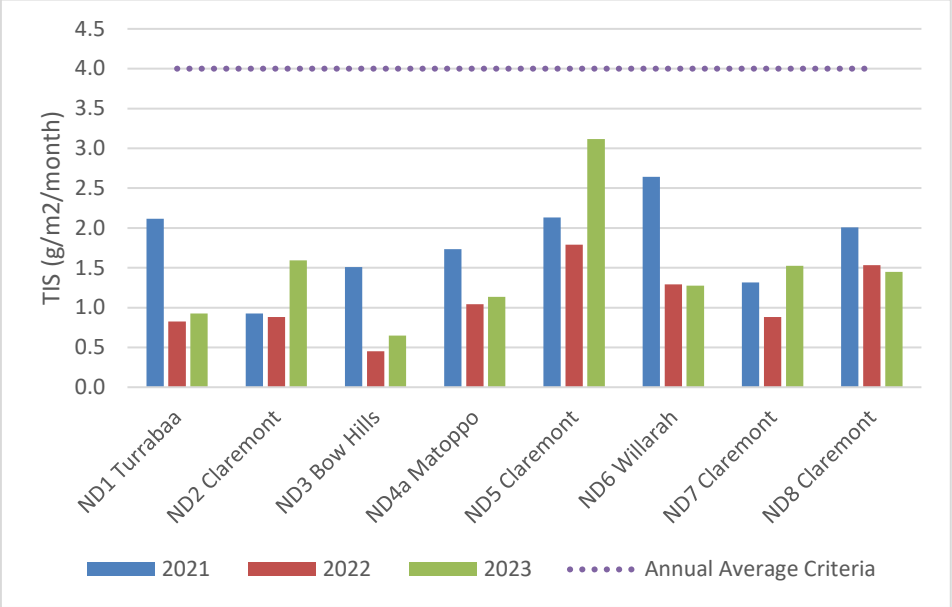


Figure 4: Deposited Dust Annual Mean 2021 - 2023

PM_{10}

During the Reporting Period there were no exceedances of the 24-hour criterion (50 µg/m³) (**Figure 5** and **Figure 6**).

Table 12 presents PM_{10} annual average monitoring results for the Reporting Period and the previous 2 years. The cumulative annual average PM_{10} concentration for the Reporting Period was below the annual average criterion (30 µg/m³) at both compliance monitoring sites.

Table 12: PM_{10} Annual Average (2021 – 2023)

Site		2021	2022	2023
ND9	µg/m³	4.66	4.29	8.67
ND10	µg/m³	5.69	4.26	9.37

The AQMP assumes an ambient background level for annual average PM_{10} at 11µg/m³, indicating that 2023 results are below the ambient background level.

Site ND10 was impacted by mechanical failure during the weeks of 23 April, 29 April, 29 May, and 4 June. The results from Site ND9 in the corresponding weeks do not show levels of concern; 26.8 µg/m³, 8.4 µg/m³, 3.8 µg/m³, and 11.9 µg/m³ respectively.

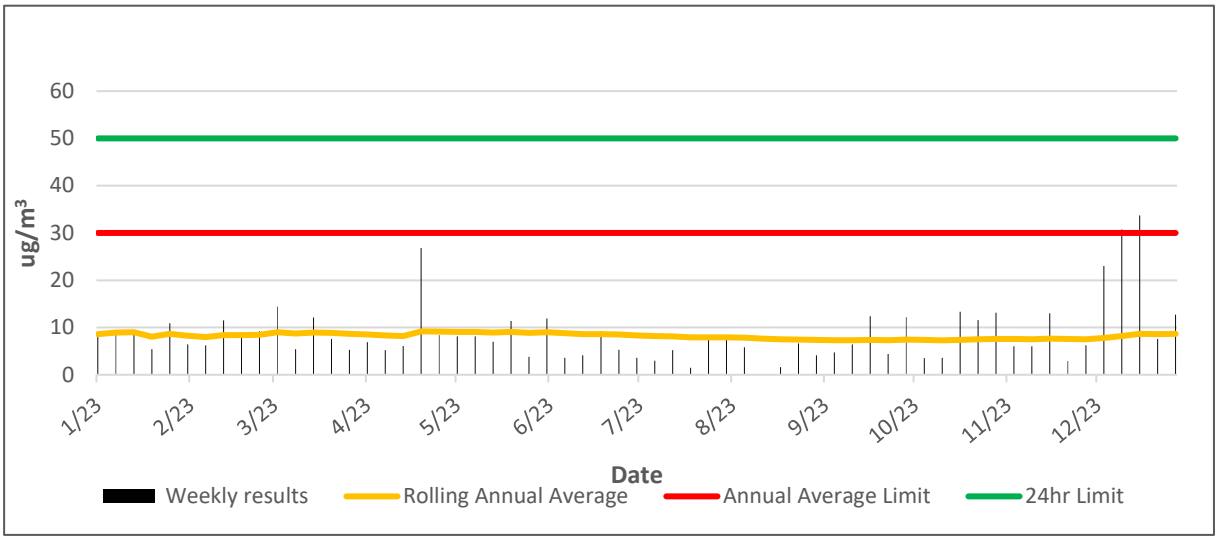


Figure 5: ND9 PM_{10} Results Including Extraordinary Weather Events

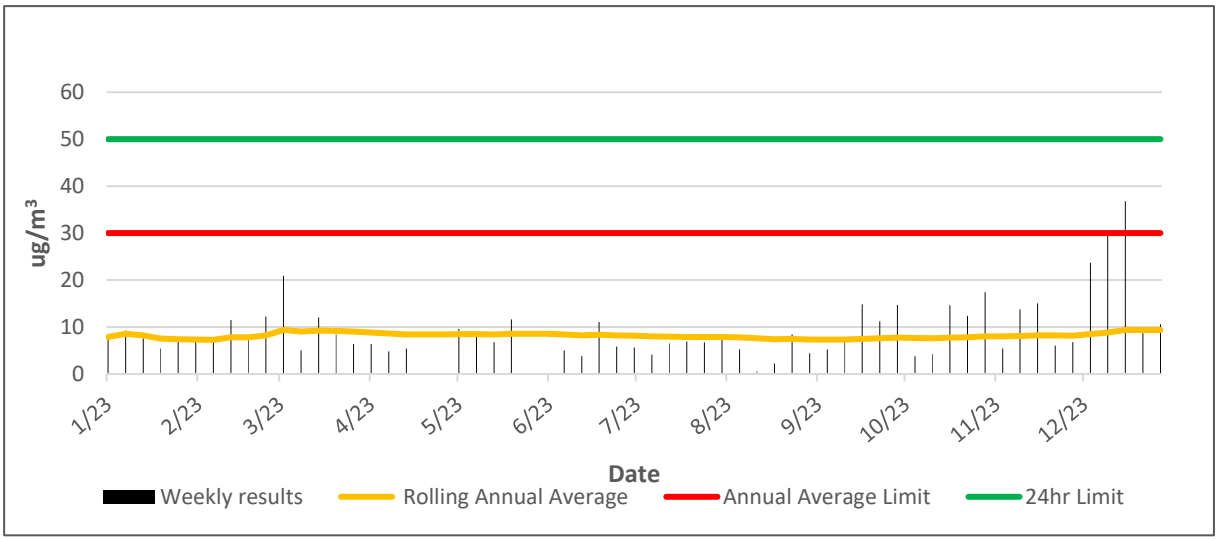


Figure 6: ND10 PM_{10} Results Including Extraordinary Weather Events

TSP

TSP is calculated at a ratio of 1:2 from the measured PM_{10} data. Therefore, based on the results in **Table 12** the calculated annual average TSP concentrations of 17.34 µg/m³ at ND9 and 18.74 µg/m³ at ND10 are both below the 90 µg/m³ annual average impact assessment TSP criterion.

Comparison to Assessment Predictions

Air quality monitoring results recorded during the Reporting Period were generally consistent with the predictions in the EIS for the Narrabri Coal Mine Stage 2 Longwall Project.

6.3.3 Activities for the Next Reporting Period

NCOPL will continue to review the AQMP in accordance with PA 08_0144. If amendments to the AQMP are required, NCOPL will lodge the revised AQMP with relevant regulatory agencies for comment and then with the DPE for approval.

6.4 GREENHOUSE GAS

6.4.1 Environmental Management

Greenhouse Gas (**GHG**) emissions at the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Conditions 30 and 32; and
- the GHGMP.

The main sources of GHG emissions considered in the GHGMP are:

- Consumption of diesel fuel – Scope 1;
- Consumption of electricity – Scope 2; and
- Fugitive emissions associated with gas drainage and ventilation – Scope 1.

6.4.2 Environmental Performance

GHG emissions are reported through participation in the National Pollutant Inventory (**NPI**) and as part of the WHC Group in the National Greenhouse and Energy Reporting Scheme (**NGERS**). The total of Scope 1 and Scope 2 GHG emissions reported for the NGERS Financial Year (**FY**) 2023 reporting year was 852,758 tonnes (**t**) Carbon Dioxide Equivalent (**CO_2-e**).

Following submission of the 2022 Annual Review NCOPL identified that the methods and input assumptions used to estimate fugitive emissions established in PA 08_0144 MOD 5 EA are no longer an appropriate measure of performance for the purpose of the Annual Review reporting requirements. The Greenhouse Gas Minimisation Plan (GHGMP) was updated during the reporting period to include contemporary methods and input assumptions used to estimate fugitive emissions. The GHGMP was prepared in consultation with the NSW Independent Expert Advisory Panel for Mining and the NSW Government Net Zero Emissions Modelling Team, and has obtained Planning Secretary approval. The GHGMP contains Scope 1 and Scope 2 GHG emissions forecast for the 5-year period covering FY23-FY27. It is to be noted the fugitive emission predictions for FY2023 in the GHGMP used a lower ROM for emission forecast than mined in FY2023, however NCOPL considers these predictions the most contemporary method for comparing emissions performance. All other emission source predictions in the GHGMP were averaged out for the entire FY2023 period.

The GHGMP prediction for total of Scope 1 and Scope 2 GHG emissions for (FY)2023 reporting year was 1,085,867 t CO_2-e. The reported emissions for NGER FY2023 are lower than the GHGMP predictions.

The relevant factors identified with the emissions predictions from PA 08_0144 MOD 5 EA include:

- Contemporary emissions estimation/measurement techniques applied in current regulatory reporting methods are significantly different to the approved approach used for PA 08_0144 MOD 5 EA. The predictions of Scope 1 GHG emissions from PA 08_0144 MOD 5 EA only included emissions from diesel and fugitive methane (**CH_4**) emissions and inadvertently omitted the fugitive CO_2 emissions component from the total predicted Scope 1 emissions;
- The Global Warming Potential (**GWP**) has been updated twice since the PA 08_0144 MOD 5 EA emissions were estimated, and a CH_4 GWP of 28 was used in NCOPL's NGER FY2023 emissions calculations;
- the actual 2023 mining area is not directly comparable to the conceptual mine plan used in PA 08_0144 MOD 5 EA for the 2023 reference year due to mine sequencing and scheduling over a long-term mine planning period;
- additional gas data obtained since PA 08_0144 MOD 5 EA as part of the compliance coring program which provides more accurate gas content and composition data; and

- updates to the gas reservoir characterisation and emission models with more accurate data, based on enhanced knowledge of the underground gas environment.

The following sections detail the key contributors for the NGERS FY2023 reporting year.

Scope 1 Emissions

Scope 1 GHG emissions for the NGERS FY2023 Reporting Period were 786,802t CO_2-e; this is lower than the GHGMP total Scope 1 emission predictions of 1,012,261t CO_2-e. The breakdown of contributors to the Scope 1 emissions total is as follows:

- Fuel combustion, emissions released from combustion of:
  - Diesel oil: Approximately 3,748 kilolitres (**kL**) was consumed, equating to 10,166t CO_2-e. The diesel emissions are lower than the GHGMP prediction for FY2023 of 13,842t CO2-e.
- Fugitive emissions (including pre-drainage gas, goaf gas, ventilation exhaust gas and post-mining activities): The reported figure of 776,177t CO_2-e is an increase from the previous Reporting Period. The fugitive emissions are lower than the GHGMP prediction for FY2023 of 998,388t CO2-e.

Scope 2 Emissions

- Approximately 90,350 Megawatt Hour (**MWh**) electricity was purchased by NCOPL during the FY2023, equating to 65,956t CO_2-e GHG emissions. This is lower than the GHGMP prediction for FY2023 of 73,999t CO2-e.

Scope 2 emissions (electricity) at the Narrabri Mine have been offset by utilising a carbon neutral power utility supplier for green electricity since October 2021. Under the NGER methodology, NCOPL Scope 2 emissions are required to be reported consistent with a 'location-based method' (using relevant grid-average emission factor data). This method, however, does not take into account the emissions that are offset based on the emissions that the Narrabri Mine would be responsible for through its purchasing decisions (a 'market-based method'), such as the commercial arrangements with a carbon neutral power utility supplier for green electricity.

Decarbonisation Projects

WHC are currently investigating several decarbonisation project strategies to reduce GHG emissions and minimise environmental impact at the Narrabri Mine.

Ongoing Projects

Enclosed Flare: The project is proposes to acquire an enclosed flare system aimed at efficiently burning CH_4 above 30% concentration. This initiative is a critical move towards environmental sustainability, significantly reducing GHG emissions of the pre-drainage by converting CH_4 into CO2.

Generator Transition: NCOPL are decommissioning 2 diesel generators at the concrete batch plant and maintenance workshop, transitioning to grid power instead. This change will significantly reduce carbon emissions and embracing more sustainable energy solutions.

Sealing of the Northern Area (LW101 - LW110): NCOPL propose seal the Northern Area 100s to reduce fugitive emissions escaping from the northern Goafs. By sealing Goaf Areas, the initiative directly contributes to reducing GHG emissions. NCOPL have sealed the LW107 (as a pilot) to evaluate the effectiveness of this approach in GHG emissions reduction. The preliminary data is promising, however, NCOPL will continue to monitor the data during 2024.

Hydrobe: WHC is exploring other techniques for reducing Scope 1 emissions, including supporting and investing in Hydrobe's proprietary technology. This innovative process uses microbial algae and bacteria to transform CO_2 emissions into valuable commodities, such as fertiliser and green hydrogen, offering a unique solution to CO_2 mitigation without generating additional GHG emissions.

Concept Studies

Gas Separation: NCOPL are reviewing a concept study on a gas separation, focusing on the pre-drainage gas that aims to divide emissions into CH_4 for power generation and high-grade CO_2 for storage or use.

Algae Farm: WHC concept study entails the creation of a 10-hectare Open Race Pond Algae Farm. The objective of this initiative is to cultivate *Nannochloropsis* algae for the production of biofuels and omega-3 oils, representing an effective and sustainable strategy for reducing carbon footprints.

Miscanthus Farm: A concept study was developed to establish a pilot miscanthus farm for the production of biomass briquettes, aiming to offer sustainable fuel alternatives to clients. This initiative targets reducing CO_2 levels in the atmosphere through plant growth and mitigating carbon emissions from coal-fired power stations, thereby facilitating the transition to lower emission intensities.

Solar Farm: NCOPL concept study for a solar farm facility is proposed to supply Narrabri Coal green energy. This initiative aims to significantly reduce Scope 2 emissions.

Carbon Capture Sequestration (**CCS**): The process of CCS involves capturing CO_2 emissions generated by industrial activities, specifically in the case of the Narrabri Mine, this refers to the gas originating from pre-drainage, and storing it underground to prevent its release into the atmosphere. NCOPL has conducted studies on CCS, exploring the feasibility of storing CO_2 in deeper seams and evaluating the technical suitability of various geological settings.

6.4.3 Activities for the Next Reporting Period

NCOPL have developed a decarbonisation pathway to identify other GHG emissions abatement measures for all fugitive emissions. This is a three-phased approach which has been developed to ensure that all abatement opportunities are identified and screened, with financial and technical analysis applied to prioritise the pathway, in order to implement the most appropriate and feasible abatement measure/s. NCOPL will progress this project during the reporting period in accordance with the approved GGMP.

NCOPL has commenced work to reduce energy use from the operations with a number of opportunities under assessment. A monitoring program will be implemented to assess the effectiveness of measures to reduce energy use on site, as outlined in the GGMP.

6.5 BIODIVERSITY AND LAND MANAGEMENT

6.5.1 Environmental Management

Biodiversity and land impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 3, Condition 4, and Schedule 5, Conditions 1 to 7;
- The Narrabri Mine Extraction Plan and relevant sub-plans, including the Biodiversity Management Plan (**BMP**);
- the Narrabri Mine Landscape Management Plan (**LMP**);
- Subsidence Pond Management Plan (**SPMP**)
- the BOS; and
- the RMP.

NCOPL Biodiversity Offset Area (**BOA**) properties are shown at a regional scale in **Figure 7**. To meet these BOS approval requirements; WHC established the Kenna BOA (**Figure 8**) and the Onsite BOA (which consists of the Greylands, Omeo, Rosevale, Greylands Road, Kurrajong Park and West Haven properties) (**Figure 9**).

The Narrabri Mine Stage 1 and 2 BOS (Eco Logical Australia, 2014 and revised 2019) confirmed the ability of these properties to meet “like for like or better” and “maintain or improve” conservation outcomes and outlined that the NCOPL BOA covers an area of native vegetation greater than 1,243ha from the Kenna BOA and greater than 422ha from the Onsite BOA.

Furthermore, up to 1,168 ha of woodland vegetation that was subject to subsidence impacts at the Narrabri Mine will also be established as the “future” BOA, adjoining the Onsite BOA to be progressed at the end of mine life, resulting in an overall BOS of 2,833ha.

NCOPL implemented various programs during the Reporting Period to manage and mitigate impacts of the Narrabri Mine, including (but not limited to):

- Weed monitoring and inspections;
- Feral animal monitoring, inspections and control;
- Flora and Fauna monitoring; and
- Ground maintenance and land monitoring.

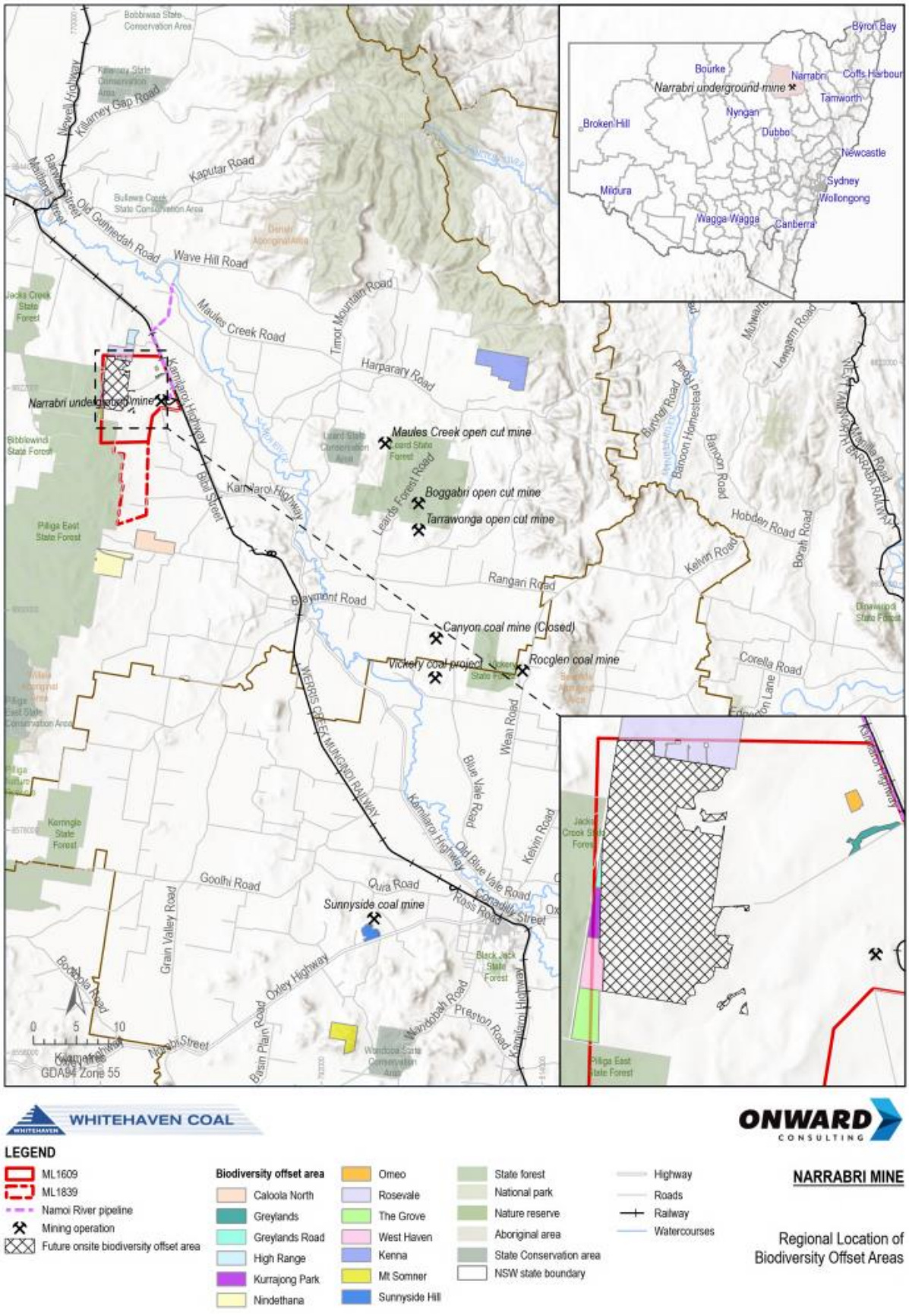


Figure 7: Regional Location of BOA's

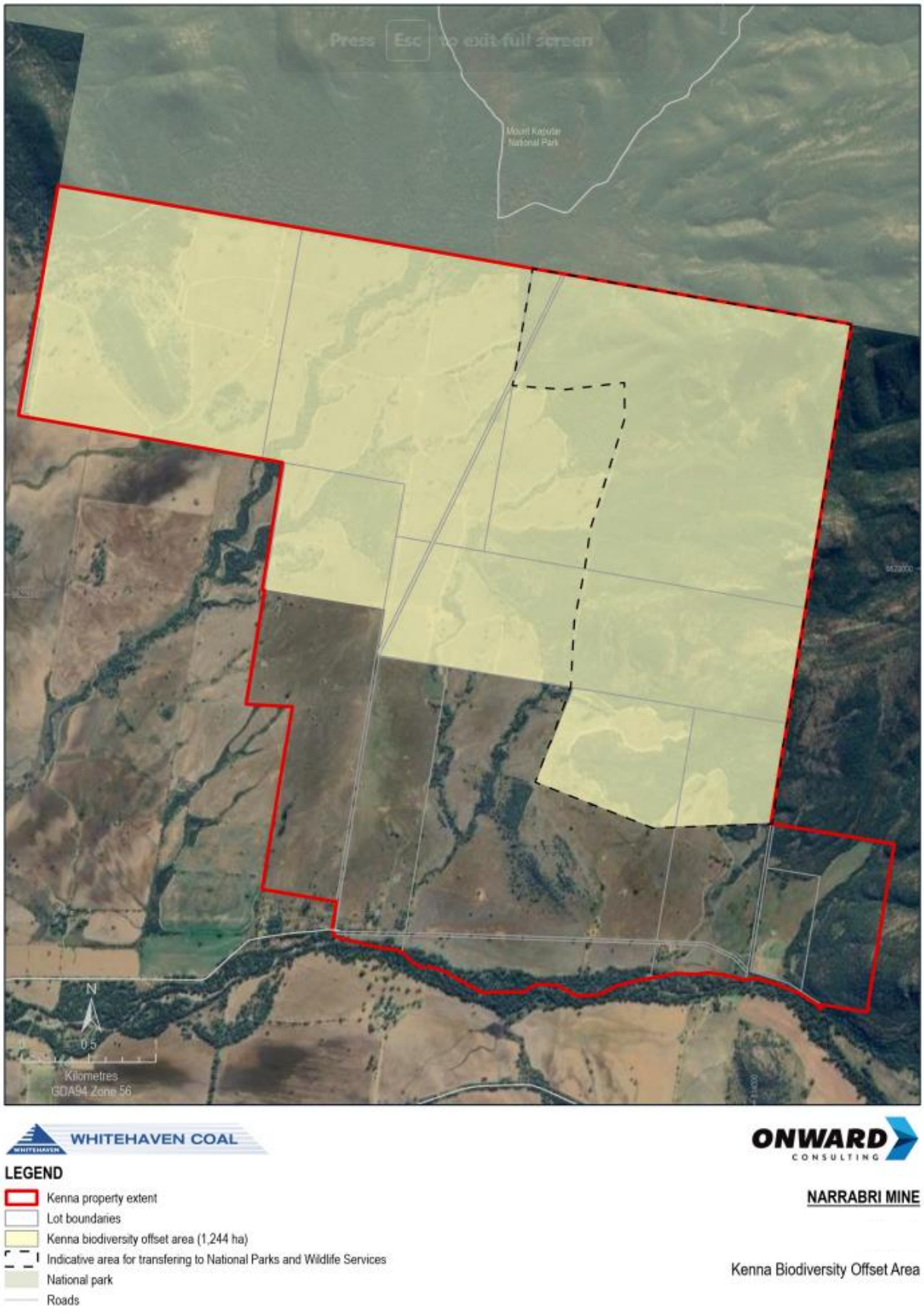


Figure 8: Kenna BOA

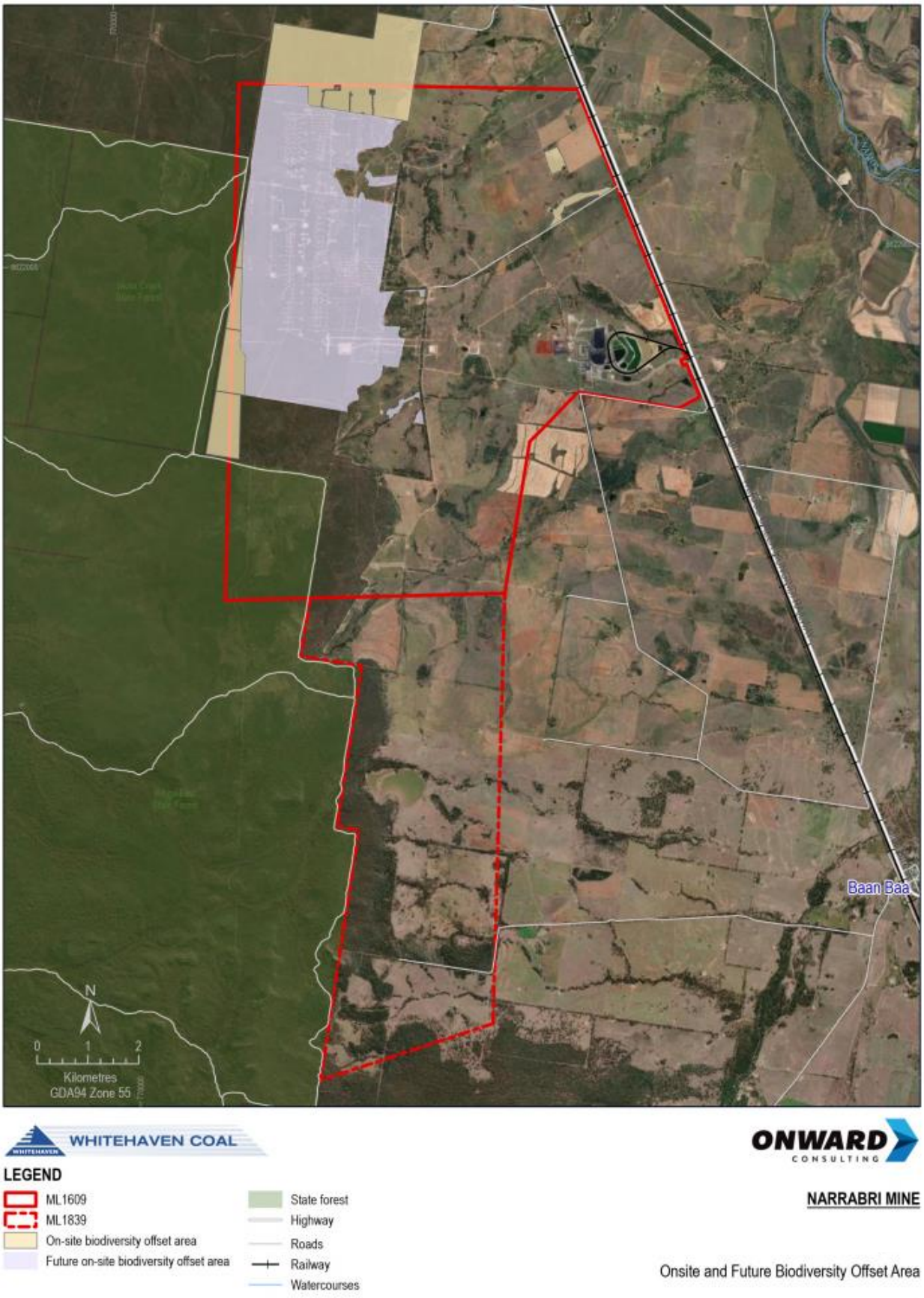


Figure 9: Onsite and Future BOA

6.5.2 Environmental Performance and BOMP Implementation

6.5.2.1 Mine Site Environmental Performance

Weed Management

Weed management programs were implemented at Narrabri Mine during 2023. Weed management consists of spot spraying programs periodically throughout the year when conditions are favourable. Locations requiring management are identified through:

- Weed management mapping supported by the ArcGIS software application 'Field Maps';
- Ecological monitoring reports and locations of listed weed species.

Weed control in the pastoral areas is planned to be managed by landholder management and pasture improvement (or as recommended in subsequent monitoring reports). Weeds targeted in the Reporting Period include African Boxthorn, Common Pear and Mother of Millions.

Feral Animals

NCOPL undertook 2 vertebrate animal control programs at Narrabri Mine in Summer and Spring 2023 targeting both feral pigs and foxes (Summer only).

The Summer program results are below;

- Feral pigs
    - 3 sites were setup across site;
    - A total of 30 pigs were successfully baited.
- Foxes
    - 44 baits were presented at 22 stations set up across site;
    - A total of 23 foxes were successfully baited.

Motion sensors were used to record the number of foxes eating the baits.

The Spring program results are below;

- Feral pigs
    - 2 sites were setup across site;
    - A total of 24 pigs were successfully baited.

Appropriately qualified and experienced feral animal contractors (appropriate feral animal management qualifications and pesticide accreditation where relevant) were engaged to undertake feral animal control works for WHC.

Annual Extraction Plan Monitoring

The results of annual biodiversity and land management monitoring was undertaken during the Reporting Period, as required by the Extraction Plan, are summarised in

Table 13 and **Table 14**.

Table 13: Biodiversity Management Plan 2023 Monitoring Results

Performance Measures	BMP Performance Criteria	2023 Results
LW101-106		
Woodland and riparian vegetation composition and health	Clearing does not exceed the allowable limit of the Project Approval	Clearing does not exceed the approved disturbance limits approved under the Project Approval 08_0144.
	Less than 10% change in floristic composition (relative to natural variation found in control areas)	**Achieved** Despite the decrease in composition of the riparian sites since baseline surveys exceeding the 10% threshold outlined in the performance criteria, when compared to 2020, all sites showed a positive compositional change except for a control site. This indicates that the sites may have stabilised and are trending towards pre-mining conditions. In accordance with previous monitoring reports, performance criteria is assessed against the most recent prior monitoring result.
	Less than 10% increase in exotic species numbers and cover	**Achieved** Less than 10% increase in exotic species richness and exotic ground cover
	Identified areas of Normalised Difference Vegetation Index (**NDVI**) change (greater than 1 standard deviation from the mean change and greater than 0.1ha in area) investigated in the field to determine the source of the change. Site specific management report prepared, and recommendations implemented where necessary.	**Ongoing** Remote sensing was the key method used in 2023 to assess changes in vegetation. As for the LMP parameters, areas of significant decrease since 2012 are largely associated with surface ponding, correlating with a decline in plant health.
	Weed species are identified and managed according to the weed management measures provided in the RMP.	**Ongoing** It is recommended to adopt an opportunistic and continual assessment approach to document any significant weed outbreaks.
	No increase in feral animal presence	**Ongoing** Monitoring results indicates that feral species remain present in low numbers consistent with the general landscape and continued management in accordance with the RMP is required (discussed above in **Section 6.5.2.1**).
Terrestrial fauna habitat for	Fauna populations located within these habitats do not experience adverse impacts, including reduction in habitat	**Not assessed** Review of previous years' monitoring results indicates that fauna occurrences are relatively low for species

Performance Measures	BMP Performance Criteria	2023 Results
threatened species	area, hollow-bearing trees and woody debris	other than birds, and variability between control and impacts sites year to year hasn't identified any trends (increases or decreases in fauna records). Fauna habitat is assessed similarly to vegetation, indicating that the primary contributor to any decreases is subsidence ponding affecting plant health, particularly trees.
	Fauna records decrease by greater than 10% (relative to natural variation found in control areas)	
LW107-LW110		
Woodland and riparian vegetation health and habitat value	Areas of NDVI change greater than 1 standard deviation from the mean change and greater than 0.1 ha in area.	**Achieved** The majority of significant decreases in photosynthetically active biomass (**PAB**) throughout the site can be attributed to the clearing of vegetation for mining compounds, tracks, and infrastructure. Significant decreases in PAB were identified previously from NDVI change within woodland areas towards the south of LW107 which may indicate a decline in canopy health. Site investigation confirmed regression and found no conclusive correlation with subsidence. It is recommended to increase the extent of the PAB change analysis to assess non-undermined areas to confirm trends are not beyond natural variation.
	Canopy dieback is not substantially greater than that observed during baseline traverses and considered beyond natural seasonal dieback and natural variation due to weather.	**Achieved** Canopy dieback has been more pronounced in some areas of longwalls than others, largely to the south of LW107. Despite this, certain canopy health parameters show a positive trend indicating regression is either stabilising or improving towards pre-mining conditions. It is recommended to continue monitoring above LW107 remotely in accordance with methods outlines in the BMP. Monitoring of LW109 sites can be scaled back or ceased. LW110 monitoring should continue in accordance with the BMP.
	Data does not indicate declining trend in vegetation and habitat conditions	**Achieved** Habitat complexity has increased over all longwalls, and vegetation conditions are comparable to control (Pillar) sites.

Performance Measures	BMP Performance Criteria	2023 Results
	Less than 10% increase in weed cover in impact quadrats in comparison to control quadrats.	**Achieved** Exotic species percentage cover has historically remained below 1% across Floristic-Based Subsidence (**FBS**) sites in previous monitoring years to 2023, with no markable increase in weed cover being recorded across FBS sites. Continued control of priority weed *Opuntia stricta* (Prickly pear) at site 8 is recommended. This species was not recorded during 2023 monitoring at all remaining sites where it was noted previously. It's occurrence can be reviewed in subsequent FBS monitoring.
	Clearing does not exceed the estimated area of clearing assessed by the EIS and as updated in PA 08_0144 MOD 5 EA for infrastructure above LW107 to LW110.	Clearing does not exceed the approved disturbance limits approved under the Project Approval 08_0144.

Performance Measures	BMP Performance Criteria	2023 Results
CF201-CF02		
To minimize the clearing and disturbance of vegetation above the mining area	Areas of NDVI change no greater than 1 standard deviation from the mean change and no greater than 0.1ha in area	**Achieved** Areas with a decrease in PAB can be attributed to the clearing of vegetation for mining activities including the construction of tracks and infrastructure such as vents. Increases in PAB are predominantly within woodland and riparian forest communities. It is unlikely the decreases are subsidence related.
	Canopy dieback is not substantially greater than that observed during baseline traverses and considered beyond natural seasonal dieback and natural variation due to weather.	**Ongoing** PAB increases since pre-mining over woodland and riparian areas indicate that there is no significant canopy dieback.
	Data does not indicate declining trend in vegetation and habitat conditions.	**Ongoing** PAB increases since pre-mining over woodland and riparian areas indicate that there is no declining trend in vegetation conditions.
	Less than 10% increase in weed cover in impact quadrats in comparison to control quadrats.	**Achieved** Exotic species percentage cover is 1% or less across all FBS sites in 2023. Control of priority weed Opuntia stricta at FBS sites 75, 76 and 77 as well as, *Lycium ferocissimum* at sites 71 and 72 is recommended. To be reviewed in subsequent FBS monitoring.
	Clearing does not exceed the estimated area of clearing assessed by the EIS and as updated in PA 08_0144 MOD 5 EA.	Clearing does not exceed the approved disturbance limits approved under the Project Approval 08_0144.

Performance Measures	BMP Performance Criteria	2023 Results
Threatened fauna populations and habitat are maintained	Threatened fauna and their habitat do not experience adverse impacts including reduction in habitat area, hollow-bearing trees and woody debris	**Ongoing** Habitat features were recorded for the first time during the 2023 monitoring period. It is recommended to continue FBS monitoring to assess any impact to habitat area, hollow-bearing trees, and woody debris. Terrestrial fauna monitoring in 2023 has confirmed the presence of both pest animals and threatened microbat and bird species. It is recommended to continue fauna monitoring in 2024 in accordance with the BMP and the recommendations of this report to monitor any changes in both pest and threatened species occurrence
LW203-LW206		
No vegetation clearance outside of approved areas	No vegetation is cleared outside or approved area. No unauthorised ground disturbance (i.e. without a PTW).	All clearing activities were carried out under the approved PTW process. Clearing does not exceed the approved disturbance limits approved under the Project Approval 08_0144.
No ongoing or significant (>50 mm) surface cracking, erosion, slumping, or ponding impacting native vegetation. Surface cracks >50 mm are remediated within 2 months of identification or when safe to do so.	Surface cracking, erosion, slumping and/or ponding determined during subsidence monitoring.	**Ongoing** No significant surface cracks or erosion was detected during subsidence monitoring.
	Surface crack remediation and stabilisation works conducted.	**Ongoing** Subsidence crack monitoring was undertaken and where cracks identified rehabilitation was completed.
	FBS monitoring determines no impact on native vegetation.	**Achieved** FBS vegetation monitoring in 2023 recorded varied results with little indication of the association between the subsidence zone above LW203 and overall vegetation condition of the site.
	No decline in vegetation health within ponded areas.	**Achieved** No ponded areas identified. Areas with a decrease in PAB can be attributed to the clearing of vegetation for mining activities including the construction of tracks and infrastructure such as vents or drier conditions in grassland.

Performance Measures	BMP Performance Criteria	2023 Results
High Threat Weeds identified during monitoring have been controlled.	High Threat Weeds are controlled determined by biannual weed monitoring.	**Ongoing** Exotic species percentage cover is 1% or less across FBS sites in 2023. Control of priority weed *Opuntia stricta* at FBS sites 87 as well as, *Lycium ferocissimum* at sites 83 and 85 is recommended. To be reviewed in subsequent FBS monitoring.
Pest animals identified during monitoring have been controlled.	Pest animals are controlled determined by biannual monitoring.	**Ongoing** Terrestrial fauna monitoring in 2023 has confirmed the presence of both pest animals and threatened microbat and bird species. As none of these species are susceptible to subsidence impacts and BMP contains no scope to continue monitoring, fauna monitoring can be scaled back or ceased.

Table 14: Land Management Plan 2023 Monitoring Results

Performance Measures	Performance Criteria	2023 Results
LW101-LW106		
Surface Cracking		
Surface cracking inspection	Permanent cracks (which do not self-close within 1 month of longwall face passing) are remediated as soon as practicably possible (and safe to do so) Surface cracking is remediated to prevent erosion and slope instability issues within 6 months of each longwall pass.	**Achieved** All known subsidence cracks have been remediated. Subsidence has stabilised over LW101 - 106.
Topographic form (Lidar)		
Landscape morphology	Subsidence across landscape does not exceed subsidence predictions for LW101 to LW106.	**Achieved, no longer required.** Subsidence monitoring program completed for LW101 to LW106.
Creek lines	No identifiable change in overall drainage pattern.	**Achieved** No change identified.
Multi-spectral image analysis		
Groundcover (multi-spectral images – erosion and pasture cover)	Identified areas of NDVI change (greater than 1 standard deviation from the mean change) investigated in the field to determine the source of the change.	**Ongoing** Assessments of NDVI change between 2012 and 2023, and 2022 and 2023, were completed. Areas of significant decrease since 2012, which have been consistently associated with surface ponding are correlating with a decline in plant health. Long-term management options for areas of subsidence ponding are being reviewed.
Pasture		
Pasture biomass	Less than 20% reduction in pasture biomass in impact zones in comparison to control zones	**Ongoing** NDVI change is considered a more accurate assessment of increases or reductions in biomass and has therefore been used to assess and monitor pasture parameters in 2023. NDVI change analysis identified multiple areas of decreases associated with surface ponding, correlating with declining plant health.
Weed species	Weed species identified and managed according to the weed management measures provided in the Rehabilitation Management Plan	**Ongoing** Routine inspections and weed control programs are undertaken throughout the year. It is recommended to adopt an

Performance Measures	Performance Criteria	2023 Results
Weed cover	Less than 10% increase in weed cover in impact zones in comparison to the control zone	opportunistic and continual assessment approach to document any significant weed outbreaks, decline in pasture and identify rehabilitation issues as identified by mine staff and contractors.
Creek stability and condition		
Field survey of creek stability and condition	Less than 20% increase in creek erosion (bank and bed) in comparison to control. Less than 20% increase in cross sectional area in comparison to control cross sectional area (unless stabilisation works have been undertaken).	**Achieved** Cross sectional measurements of 29 creek-line points were undertaken, comparing levels from 2014, 2017 and 2020 (post-mining). The 29 points measured are consistent with the LiDAR analysis undertaken for the site in 2023, and in include 12 control sites and 17 impact sites. There is no notable increase to erosion at any of the cross-sectional points analysed. This monitoring can cease.
LW107-LW110		
Surface cracking		
Surface cracking Inspection	Permanent cracks (which do not self-close within 1 month of longwall face passing) are remediated as soon as practicably possible (and safe to do so).	**Achieved** One notable crack was recorded in the 2023 period above LW109 however this appeared to be self-remediating.
	Surface cracking is remediated to prevent erosion and slope instability issues within 6 months of mining of each longwall.	All known subsidence cracks identified within past monitoring reports that occur over LW107, LW108 and LW109 have been remediated since undermining was completed. LW110 was due for completion in 2023 – routine inspections will continue to be carried out to identify cracks.
Topographic form (Lidar)		
Landscape morphology	Subsidence across the landscape does not exceed subsidence predictions for LW107 to LW110.	**Achieved** Subsidence measurements are within predicted values.
Creek lines	Change to overall drainage pattern is not more than predicted.	**Achieved** PAB increased over time at all Points of Interest (**POI**) sites indicating no further creek bank erosion.

Performance Measures	Performance Criteria	2023 Results
Groundcover (multi-spectral images – erosion and pasture cover)	Identified areas of NDVI change (greater than 1 standard deviation from the mean change) investigated in the field to determine the source of the change.	**Achieved** Assessment of NDVI change between 2014 and 2023, and 2022 and 2023, were completed. As discussed, decreases for pasture areas likely due to dry and timing.
CF201-CF202		
Surface cracking	Permanent cracks (which do not self-close within 1 month of longwall face passing) are remediated as soon as practicably possible (and safe to do so). Surface cracking that does not self-correct will be remediated to prevent erosion and slope instability issues within 1 month after mining.	**Ongoing** No subsidence cracks were recorded in the 2023 period. The bord and pillar mining operations are still undergoing first workings, and as such no subsidence movement measurable at the surface.
Landscape morphology	Subsidence across the landscape does not exceed subsidence predictions for CF201 and CF202.	**Achieved** Subsidence monitoring did not record movement.
Creek lines	Change to overall drainage pattern is not more than predicted.	**Ongoing** PAB increased since pre-mining conditions along creek lines indicating no creek bank erosion.
Groundcover (multi-spectral images – erosion and pasture cover)	Identified areas of NDVI change (greater than 1 standard deviation from the mean change) investigated in the field to determine the source of the change. Site specific management report prepared, and recommendations implemented where necessary.	**Achieved** Assessment of NDVI change between 2021 and 2023 were completed. Significant PAB decreases in pasture/grassland occurred along the entire width of the longwall and extending onto non-undermined areas indicating that the decreases are not subsidence related.
LW203 - LW206		
Surface cracking	Surface cracks are remediated within 2 months of identification or when safe to do so.	**Achieved** Monitoring for subsidence cracks undertaken in accordance with Extraction Plan and cracks remediated when identified.
Landscape morphology	Detected alteration in topography/landscape morphology within normal range compared to baseline data.	**Not assessed** To be conducted after next LiDAR monitoring cycle (2026)

Performance Measures	Performance Criteria	2023 Results
Creek lines	Change to overall drainage pattern is not more than predicted and detected alteration in channel dimensions or processes within normal range compared to baseline data.	**Achieved** PAB increased since pre-mining conditions (where relevant) along creek lines indicating no creek bank erosion.

Subsidence Pond Monitoring

Routine inspections were carried out by NCOPL during the Reporting Period.

Water quality monitoring results for subsidence ponds indicated a slight increase in Electrical Conductivity (**EC**) at LW101 and LW109; as of March 2024, all subsidence ponds are dry. The 2023 subsidence pond water quality monitoring results are found in **Appendix H**.

Biodiversity monitoring identified:

- NDVI analysis in 2023 identified a continued decline in PAB which can be attributed to a combination of inundation and increases in groundcover from foliage cover loss from trees deaths. This is in line with vegetation monitoring which has confirmed continued foliage cover decline within these areas and historic weather data showing above average rainfall for 3 years.
- Water bird species continue to be recorded at the pond above LW101. The pond continues to provide intermittent aquatic habitat for these birds.
- No frogs were recorded in 2023.

NCOPL will continue to review long-term management options for areas of subsidence ponding during 2024.

Pre-Clearing and Clearing Surveys

During the Reporting Period the mine has undertaken clearing to facilitate surface disturbance activities. The ecological works for the clearing consisted of the following activities;

- Fauna and flora Pre-clearing Surveys;
- Clearance Supervision; and
- Post-felling inspections.

Prior to the commencement of any disturbance activities the limits of clearing are surveyed and physically marked with flagging tape. Targeted threatened flora surveys were conducted prior to clearing activities commencing with all threatened flora identified during these surveys recorded and their locations mapped using hand held GPS units.

Fauna pre-clearance surveys were also conducted and consisted of identifying, marking and documenting suitable fauna habitat features. These features generally include nests, large woody debris and trees bearing hollows, which have the potential to support species such as bats, gliders, possums, reptiles and birds. All trees with habitat features are felled following a clearing protocol and is done in the presence of a suitably qualified Ecologist. All trees identified as having habitat features were recorded using a hand-held GPS unit.

Fauna was occasionally encountered during clearing works undertaken during the Reporting Period, including species of birds, mammals and reptiles. No fauna or their habitats were significantly impacted

during clearing works. None of the species recorded were listed as threatened under the BC Act or the EPBC Act. No threatened flora was encountered during clearing works.

6.5.2.2 BOS Environmental Performance

Offset Security Management

As of 16 July 2021; WHC have successfully registered seven Conservation Agreements on the land titles for the seven BOA as required per the BOS. The Conservation Agreements were secured under Part 4 Division 12 of the NSW *National Parks and Wildlife Act 1974* (**NPW Act**) and Part 5 Division 3 of the *Biodiversity Conservation Act 2016* (**BC Act**) in accordance with EPBC Approval Conditions 2a and 2b and PA 08_0144, Schedule 5 Condition 7.

WHC will consult with National Parks and Wildlife Services (**NPWS**) regarding previous interests from NPWS for the NCOPL BOA's to be transferred to the National Park Estate.

Weather Summary of Narrabri Mine BOA's

Regionally central meteorological station to the BOA's is the Gunnedah Pool site (BOM 2023) which has recorded highly variable rainfall over the last 5 years; from the driest on record in 140 years of 237mm in 2019, followed by above average rainfall years in 2020, 2021 and 2022 of 833 millimetres (**mm**), 990mm and 860mm respectively (resulting in numerous major flooding events of the Namoi River). In 2023, the Gunnedah Pool site recorded 496mm, being below annual average rainfall of 615mm.

WHC maintains 3 meteorological stations across the NCOPL BOA's, with a summary of weather conditions experienced during the Reporting Period:

- Kenna - Maximum monthly average temperature was 35°C in December 2023; minimum monthly average temperature was 5°C in May 2023; and annual temperature ranges were 0°C to 41°C in 2023. The total annual rainfall in 2023 was 454mm with the maximum in March (130mm) and minimum in May (0mm).
- Rosevale - Maximum monthly average temperature was 34°C in December 2023; minimum monthly average temperature was 2°C in May 2023; and annual temperature ranges were -5°C to 39°C in 2023. The total annual rainfall in 2023 was 400mm with the maximum in March (114mm) and minimum in May (1mm).
- Caloola North - Maximum monthly average temperature was 35°C in February 2023; minimum monthly average temperature was 2°C in May 2023; and annual temperature ranges were -5°C to 40°C in 2023. The total annual rainfall in 2023 was 484mm with the maximum in December (154mm) and minimum in May (0mm).

Infrastructure Management

During the Reporting Period, a total of 5.3 kilometres (**km**) of new or repaired fencing (fauna friendly) was constructed along the perimeter of the NCOPL BOA's including of Kenna, Omeo, Caloola North and Nindethana as well as maintenance of signage and gates undertaken as required to continue to restrict unauthorised access and minimise livestock incursion. Additionally, 3.3km of redundant internal fences were deconstructed from NCOPL BOA's including Omeo, Caloola North and Nindethana. Any remaining derelict assets/infrastructure items will continue to be assessed, removed and remediated as required prior to potential transfer of certain NCOPL BOA's to the National Park Estate.

Seed Management

The routine seed assessments on the NCOPL BOA's aims to identify on a seasonal basis the life cycle stage and development of native plants to identify what, where, when and how to target appropriate resources to collect seed for future revegetation programs. A total of 3 species were collected resulting in 2.0kg of local provident seed from across the Kenna and Rosevale biodiversity properties that was incorporated with other local and regionally provident seed sourced by reputable seed collectors as part of the WHC group wide revegetation planning. A local revegetation provider was engaged to propagate the seed to produce Box Gum and other non-Endangered Ecological Communities (**EEC**) / non-Critically Endangered Ecological Communities (**CEEC**) Woodland overstorey species seedlings required for the completed 2023 revegetation program as well as planning for the 2024 revegetation program for the NCOPL BOA's.

Revegetation Management

The NCOPL BOA's revegetation strategy focuses on restoration and revegetation of previously cleared non-native grassland and derived native grasslands and assisting natural regeneration in better quality woodland areas. During the Reporting Period, revegetation ground preparation utilised tractors augering holes (to a depth >0.3m) to relieve compaction, improve permeability and infiltration to increase sub-surface soil moisture for planting. The overstorey revegetation program was undertaken between January and May 2023 and October-November 2023 with 7600 hiko seedlings of Box-Gum and other Woodland species planted over 101ha on the Kenna, Omeo, Rosevale and Caloola North BOA's. Routine tree watering and maintenance activities post planting have been successful to ensure that over 72% survival has been achieved for the NCOPL BOA's which is commensurate with the target Woodland vegetation structure.

Heritage Management

During the Reporting Period, annual heritage inspections were completed on the 35 known heritage sites (Aboriginal archaeological) within the NCOPL BOA's. Heritage sites were maintained with 2.75km of demarcation fencing around the perimeter and signage to mitigate access and inadvertent disturbance.

During the Reporting Period, 20 new heritage sites (Aboriginal archaeological) were identified on the Kenna and Nindethana BOA's resulting an additional 1.3km of new fencing being completed.

Habitat Management

During the Reporting Period, habitat augmentation was undertaken with 168 coarse woody debris piles installed on the Caloola North BOA. This brings the total habitat augmentation constructed since 2021 on NCOPL BOA's to 14 nest boxes and 168 coarse woody debris piles.

Weed Management

WHC coordinated weed monitoring/inspections across NCOPL BOA's in February, June, August and November 2023. The priority weeds identified included Prickly Pear and African Box Thorn, as well as a range of broadleaf weeds within revegetation areas.

During the Reporting Period, WHC implemented a weed control program across 64ha being treated, targeting primarily broadleaf weeds within revegetation areas and along fire-break tracks as required within the Kenna, Omeo and Caloola North BOA's.

Weed control works for WHC were conducted by qualified and experienced contractors with AQF3 accreditation or higher for herbicide use.

Pest Animals Management

WHC is implementing a consistent pest animal management approach across the Narrabri BMA, using a grid-based motion detection camera monitoring program and observations. The program focuses on high detection areas like Feral Pigs and Goats, while other species have scarce detection levels. In 2023, WHC implemented a pest animal control program using 1080 canid pest ejectors, Hoggone baits, and trapping programs. The program resulted in 97 canid pest ejectors triggered from 363 deployed and 850 Hoggone baits consumed from 2226 laid across the NCOPL BOA's. A further 50 Feral Pigs were trapped and removed from the NCOPL BOA's. Feral Goat mustering continued resulting in 48 Goats being captured and sold to an abattoir.

Soil & Erosion Management

Annual inspections of unsealed fire-break tracks and associated drainage structures across the NCOPL BOA's to review appropriate Erosion and Sediment Control (**ESC**) measures required in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004)* (**the Blue Book**). A total of 14 observations were recorded with 6 locations requiring targeted additional track maintenance to mitigate further erosion and sedimentation. The remaining tracks/drainage structures are maintained during routine WHC track maintenance program.

In addition, known erosion sites are subject to a separate annual inspection process and updates to the WHC erosion register. During the Reporting Period, monitoring or remediation actions and investigations commensurate to the risk were undertaken for the erosion sites identified within NCOPL BOA's.

Grazing Management

NCOPL BOA's continued to be destocked with no strategic grazing occurring during the Reporting Period. There were 15 instances of stock incursion during the Reporting Period; with stock on each occasion retrieved and fencing repaired as required.

Bushfire Management

The NCOPL BOA's annual fuel load monitoring was undertaken between September and November 2023 as part of the planning and assessment of bushfire hazard and ecological burn program for 2024; with the results indicating moderate to high overall fuel loads present.

During the Reporting Period there were 2 bushfires of low to moderate intensity caused by lighting strikes, resulting in 758.4ha burnt on the Kenna and Nindethana BOA's. WHC undertook 1 controlled ecological burn in May 2023, with 9.6ha burnt with low intensity on the Omeo BOA. WHC also undertook other fire management controls, including track maintenance of approximately 82.2km across the NCOPL BOA's.

WHC maintains regular communications with the Namoi-Gwydir Zone Rural Fire Service (**RFS**) teams around planning of WHC BOA ecological burn programs, as well as contact points in case of emergency. WHC engages a specialist firefighting contractor during the fire season to respond to any fires on WHC owned land, including BOA's.

Threatened Flora Management

During the Reporting Period, threatened flora inspections were completed of the known threatened flora site for *Tylophora linearis* within the NCOPL BOA's maintained with demarcation fencing around the site perimeter and signage to mitigate access and inadvertent disturbance. During the Reporting Period, a new threatened flora site was transplanted with *Bertya opponens* seedlings on the Rosevale BOA as

well as new species polygons identified on Caloola North, High Range and Rosevale to be established as threatened flora sites in 2024.

Monitoring Program

During the Reporting Period, the ecological monitoring program of the NCOPL BOA's included:

- Winter bird surveys that were undertaken in July and August 2023;
- Spring flora monitoring of 43 plots across 8 Vegetation Zones (**VZs**) undertaken between October and December 2023; and
- Annual fauna monitoring at 26 bird monitoring sites, herpetofauna surveys had 11 "offsite" and 12 "onsite" active forage monitoring sites plus "onsite" trap / funnel trap sites and microbat surveys had 14 echolocation sites undertaken between January and December 2023.

During the winter bird surveys, 1 threatened species (Speckled Warbler) was recorded.

During spring flora monitoring:

- One VZ was recorded as meeting or exceeding completion criteria for all 4 biometrics.
- Native Plant Species (**NPS**) richness completion criteria (NPS benchmark for relevant biometric vegetation communities) was met or exceeded at 5 out of 8 VZs.
- Native Overstorey Cover (**NOS**) completion criteria (minimum NOS benchmark for relevant biometric vegetation communities) was met or exceeded at 3 out of 8 VZs.
- Native Midstorey Cover (**NMS**) completion criteria (minimum NMS benchmark for relevant biometric vegetation communities) was met or exceeded at 3 out of 8 VZs.
- Native Ground Cover Grass (**NGCG**) completion criteria (minimum NGCG benchmark for relevant biometric vegetation communities) was met or exceeded at all 8 VZs.

Comparison of individual plot data shows that:

- NPS decreased from 32 out of 43 plots last year to 28 out of 43 plots meeting or exceeding completion criteria in 2023.
- NOS increased from 14 out of 43 plots last year to 17 out of 43 plots meeting or exceeding the completion criteria in 2023.
- NMS decreased from 24 out of 43 plots last year to 18 out of 43 plots meeting or exceeding the completion criteria in 2023.
- NGCG increased from 37 out of 43 plots last year to 41 out of 43 plots meeting or exceeding the completion criteria in 2023.

Apart of the annual fauna monitoring program were standardised bird surveys across 26 survey sites resulting in 78 bird species being recorded with site level species richness values ranging from 1 to 28. In 2022, 72 bird species were detected, and 73 species were detected in 2021. Bird richness across woodland habitats was 54 species from 7 remnant woodland sites (average = 15.4; range 6 to 28), 25 species in 8 revegetation sites (average = 5.6; range 1 to 10), and 49 species in 7 naturally regenerating sites (average = 14.28; range 9 to 20).

During echolocation and harp trap surveys, a total of 18 microbat species were detected across 15 sites, including 3 threatened species listed under the BC Act. Microbat richness across woodland habitats was 18 species detected in remnant woodland sites (average 13, range 9 - 15), 16 species in naturally regenerating sites (average = 12.33, range 9 - 14) and 16 species in revegetation sites (average 11.33, range 6 - 16).

Diurnal herpetofauna "offsite" surveys identified 20 reptile species during 2023 with site species richness between 0 and 14. Habitat type species richness averaged 16 species detected in remnant woodland

sites (average = 6.25; range 7 - 13), 2 species in revegetation sites (average = 1; range 0 - 2), and 12 species in naturally regenerating sites (average = 4.5; range 3 - 7).

Diurnal herpetofauna “onsite” surveys pitfall trap / funnel trap survey program identified 24 species during 2023 with site species richness between 5 and 11. Habitat type species richness averaged 19 species detected in remnant woodland sites (average = 9.5; range 7 - 11), 10 species in revegetation sites (average = 6.5; range 6 - 7), and 10 species in naturally regenerating sites (average = 6; range 5 - 7).

The active forage program identified 16 species during 2023 with site species richness between 0 and 8. Habitat type species richness averaged 14 species detected in remnant woodland sites (average = 4.6; range 2 - 8), 0 species in revegetation sites, and 5 species in naturally regenerating sites (average = 2.7; range 2 - 3).

6.5.3 Activities for the Next Reporting Period

NCOPL will continue to review the monitoring requirements in the BMP, LMP, SPMP, BOS and RMP and implement actions, as required. If amendments to any of the above are required, NCOPL will lodge the revised Plans with relevant regulatory agencies for comment and then with the DPE / DCCEEW for approval.

NCOPL will continue to review management options for areas of subsidence ponding during 2024.

6.6 ABORIGINAL CULTURAL HERITAGE

6.6.1 Environmental Management

Aboriginal Cultural Heritage is managed in accordance with:

- PA 08_0144, Schedule 4, Condition 23;
- PA 08_0144 Statement of Commitments (**SoC**); and
- the ACHMP.

6.6.2 Environmental Performance

Archaeological Salvage Program

During the Reporting Period, NCOPL discovered a previously unidentified aboriginal cultural artefact scatter located north of an existing AHIMS site while undertaking a pre-disturbance survey. NCOPL engaged a qualified archaeologist and with the assistance of 2 representatives from the Narrabri Local Aboriginal Land Council (**LALC**), undertook a detailed review and successfully salvaged 149 artefacts (site name Westhaven AS1 – 19-6-0200).

Fencing Program

NCOPL have continued to upgrade and/or install new fencing to protect known Aboriginal artefact sites during the Reporting Period

Ongoing Consultation

NCOPL maintains regular contact with a representative of the Registered Aboriginal Parties (**RAPs**) in order to ensure appropriate cultural heritage supervision is available for planned surface disturbance activities.

Previously Unidentified Sites

No new sites were recorded during the Reporting Period.

6.6.3 Activities for the Next Reporting Period

NCOPL will continue to install and/or upgrade fencing surrounding all registered sites to the new standard during the next Reporting Period.

NCOPL will continue to review the ACHMP in accordance with PA 08_0144. If amendments to the ACHMP are required, NCOPL will lodge the revised ACHMP with relevant regulatory agencies for comment and then with the DPE for approval.

6.7 TRANSPORT

6.7.1 Environmental Management

Traffic impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Conditions 25 to 27; and
- Narrabri Mine Shuttle Bus Traffic Control Protocol (when triggered).

6.7.2 Environmental Performance

The portion of Greylands Road that traverses Narrabri Mine has been purchased by NCOPL and is no longer accessible to the public.

Scratch Road, located in the western portion of ML1609 has not been utilised to construct mining related infrastructure and as such, no agreement has been developed with NSC.

Prior to commencement of PA 08_0144, NCOPL constructed the intersection to the Narrabri Mine along the Kamilaroi Highway in consultation with both NSC and Transport for NSW (**TfNSW**). TfNSW has advised NCOPL that the ongoing maintenance of the intersection is the responsibility of TfNSW.

The Narrabri Mine Shuttle Bus Traffic Control Protocol has been implemented, however, the current workforce engaged for the bord and pillar mining operations approved by the PA 08_0144 MOD7 are less than the predicted levels of 15 per shift.

6.7.1 Activities for the Next Reporting Period

NCOPL will continue to monitor the workforce numbers of the bord and pillar mining operations.

6.8 WASTE MANAGEMENT

6.8.1 Environmental Management

NCOPL aims to implement all reasonable and feasible measures to minimise waste and ensure it is appropriately stored, handled and disposed. Waste materials at Narrabri Mine are generally managed in accordance with:

- PA 08_0144, Schedule 4, Condition 33;
- the WasteMP; and
- the PIRMP.

Narrabri Mine waste streams generally include general waste, underground waste, oil & greases, recyclables (steel and paper/cardboard), drill cuttings and effluent.

6.8.2 Environmental Performance

During the Reporting Period, NCOPL engaged a licenced contractor to transport waste from the Narrabri Mine to a licenced facility. NCOPL produced a approximately 1,834t of general waste. In addition, NCOPL produced recyclable material, consisting of approximately 11t of cardboard/paper, 210t of timber and 230t of steel, including approximately 69,900 Litres (**L**) of used oils. These figures are comparable to the previous 2 years, as shown in Figure 10.

Effluent from the sewage and ablutions facilities at the Narrabri Mine is managed through from a Sewage Treatment Plant (**STP**) with a continuous extended aeration process. During the STP process, a waste product (sludge) is collected weekly and transported by a licensed contractor. During the Reporting Period, a total of 512,500L was collected and transported off-site, which was lower than 2022 quantities.

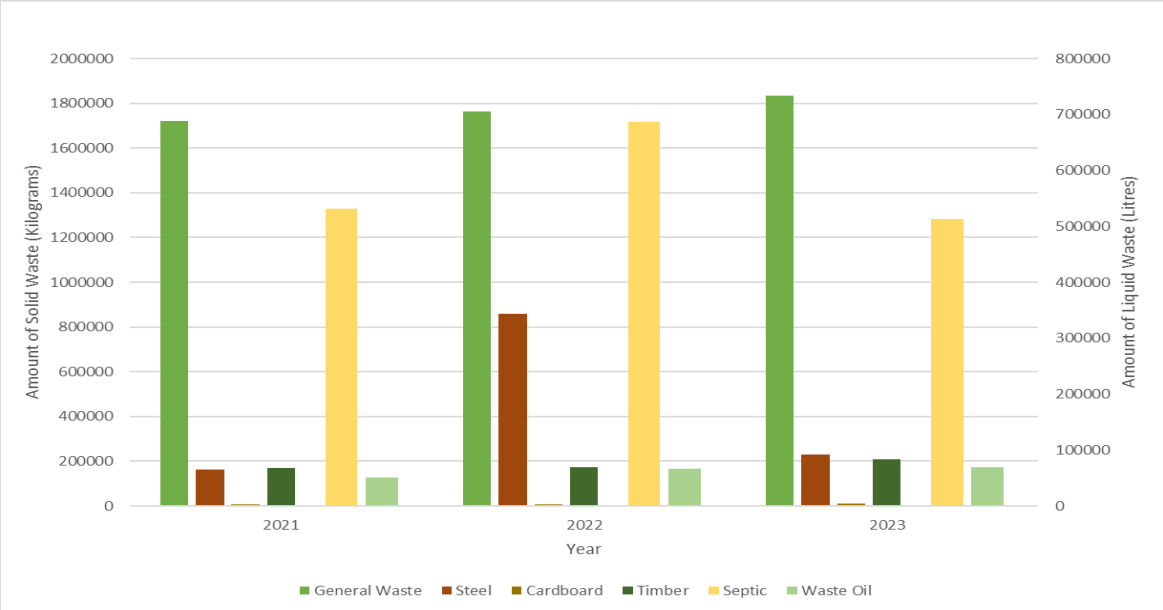


Figure 10: Comparison of Waste Streams Previous 3 Years

6.8.3 Activities for the Next Reporting Period

NCOPL will continue to monitor wastes on a regular basis to effectively manage waste generated by the operation and maximise re-use and recycling opportunities.

6.9 VISUAL & LIGHTING

6.9.1 Environmental Management

Visual amenity and lighting impacts associated with the Narrabri Mine are managed in accordance with:

- PA 08_0144, Schedule 4, Conditions 28 and 29; and
- PA 08_0144 SoC

As required by the SoC, the mine must not impact the Siding Springs Observatory, by following the Dark Sky Planning Guideline.

6.9.2 Environmental Performance

NCOPL installed additional light emitting diode (**LED**) lighting at the Narrabri Mine car parks during the Reporting Period. No community complaints were received during the Reporting Period relating to the visual amenity or lighting associated with Narrabri Mine.

6.9.3 Activities for the Next Reporting Period

NCOPL will continue to manage visual and lighting impacts from Narrabri Mine during 2024.

6.10 MINE SUBSIDENCE

6.10.1 Environmental Management

Potential mine subsidence impacts associated with the Narrabri Mine are managed in accordance with the Subsidence Monitoring Programs outlined in PA 08_0144 Schedule 3, Condition 4 (g), notably:

- Extraction Plan LW107-LW110;
- Extraction Plan CF201-202; and
- Extraction Plan LW203-206.

6.10.2 Environmental Performance

Subsidence monitoring was conducted in accordance with the approved Extraction Plans. Subsidence remained within predicted ranges for all matter except maximum compressive strain and maximum total tensile strain for Line H above LW108 (**Table 15**).

Subsidence monitoring lines above LW106 and LW107 were removed from Extraction Plan LW101-106 and LW107-LW110 following an amendment which was previously approved.

Telecommunications Infrastructure

No telecommunications infrastructure exists within the approved Extraction Plan areas.

Public Roads

There are no public roads within the active mining area.

Land Surface

There have been rehabilitation activities of subsidence cracks across the active subsidence areas and previously subsided longwall panels. An electronic GIS based monitoring platform for subsidence crack monitoring is utilised to record the size and location of subsidence related cracking, rehabilitation records and inspection areas.

Buildings and Other Structures

No buildings or sheds were undermined during the Reporting Period.

Water Storage Dams and Contour Banks

No subsidence related impacts were identified following monitoring.

Fences and Gates

NCOPL has excluded all stock from the active mining area.

Mine Infrastructure

No subsidence related impacts were identified following monitoring.

6.10.3 Comparison Against Predictions

NCOPL has monitored for subsidence movement in accordance with the approved Extraction Plans. The table below outlines the maximum subsidence parameters recorded as part of the subsidence monitoring program and a comparison with the maximum predicted subsidence parameters as outlined in the Extraction Plan.

- The maximum subsidence measurement of Line H 2.64m was within the predicted value of 2.75m

- The maximum subsidence measurement of Line I 2.43m is within the predicted value of 2.75m
- The maximum tilt measurements recorded of 20mm/m (LW110) and 31mm/m (LW109) were within the predicted values (29mm/m and 33mm/m respectively).
- The maximum tensile and compressive strain measurements for LW108 of 16.8 mm/m exceeds predicted values of 10 mm/m on Line H. Line H measurements of -8 mm/m to 8.9 mm/m were within predicted values above LW109 (-10 mm/m to 9 mm/m predicted) as were Line I measurements of -9 mm/m to 7 mm/m above LW110 (-9 mm/m to 7 mm/m predicted).

No mine emergency response procedures were activated because of subsidence during the Reporting Period.

6.10.4 Activities for the Next Reporting Period

NCOPL will continue subsidence monitoring and repair programs as required by the Extraction Plan. NCOPL will continue to review the Extraction Plans in accordance with PA 08_0144. If amendments to the Exaction Plans (or sub-Plans) are required, NCOPL will lodge the revised Extraction Plans with relevant regulatory agencies for comment and then with the DPE for approval.

Table 15: Subsidence Parameters – Predicted and Measured

Longwall Panels (LW)		
	Maximum Predicted Extraction Plan	**Maximum Measured**
Line 101 – Centre of LW101 – Monitoring has ceased		
Line 102 – Centre of LW102 – Monitoring has ceased		
Line 103 – Centre of LW103 – Northern – Monitoring has ceased		
Line 103 – Centre of LW103 – Southern – Monitoring has ceased		
Line 104 – Centre of LW104 – Northern – Monitoring has ceased		
Line 104 – Centre of LW104 – Southern – Monitoring has ceased		
Line 105 – Centre of LW105 – Northern – Monitoring has ceased		
Line 105 – Centre of LW105 – Southern – Monitoring has ceased		
Line 106 – Centre of LW106 – Northern – Being closed out		
Line 107 – Centre of LW107 – Northern – Monitoring has ceased		
Line 108 (monitoring has ceased)		
Line 108 – Southern		
Line A – Cross Panel Survey Line – Being closed out		
Line B – Pine Creek Tributary 1 – Monitoring has ceased		
Line D – Pine Creek– Monitoring has ceased		
Line E – Pine Creek Tributary 1 Crossline 1 – Monitoring has ceased		
Line F – Pine Creek Tributary 1 Crossline 2 – Monitoring has ceased		
Line G – Pine Creek Tributary 1 Crossline 3 – Monitoring has ceased		
Line H – Cross Panel Survey Line (measured 08/01/2024) (LW203) H55-156		
Subsidence (m)	2.75	2.67
Tilt (mm/m)	27- 53	20 - 31
Tensile Strain (mm/m)	7 – 20^	9 – 17
Compressive Strain (mm/m)	9 – 24^	8 - 9
Line I – Cross Panel Survey Line (measured 04/01/2024) (LW203)		
Subsidence (m)	2.75	2.43
Tilt (mm/m)	27 - 53	20
Tensile Strain (mm/m)	7 – 20^	7
Compressive Strain (mm/m)	9 – 24^	9
Line J – Cross Panel Survey Line (measured 04/01/2024) (LW203)		
Subsidence (m)	2.75	0 Nil (not undermined)
Tilt (mm/m)	27 - 53	0
Tensile Strain (mm/m)	7 – 20^	0

Longwall Panels (LW)		
	Maximum Predicted Extraction Plan	**Maximum Measured**
Compressive Strain (mm/m)	9 – 24^	0
Line K –Survey Line (measured 09/01/2024) (CF201)		
Subsidence (m)	1.77	0 Nil (not undermined)
Tilt (mm/m)	36	0
Tensile Strain (mm/m)	7 - 33	0
Compressive Strain (mm/m)	7 - 31	0
Line L – Cross Panel Survey Line (measured 09/01/2024) (CF201)		
Subsidence (m)	1.77	0 Nil (not undermined)
Tilt (mm/m)	36	0
Tensile Strain (mm/m)	7 - 33	0
Compressive Strain (mm/m)	7 - 31	0

7 WATER MANAGEMENT

7.1 WATER SUPPLY

Table 16 summarises the water licences held by NCOPL to account for indirect take associated with mining, and water usage for operational purposes, during the Reporting Period. All water take for the Reporting Period is below current licence entitlements.

Table 16: Narrabri Mine Water Take

Water Sharing Plan	Water Source/ Licence category	Water Access Licence	Allocation (Unit Shares)	Annual Use Limit	Active (Pumped) Take	Indirect Take[2]	Total Take
Namoi Alluvial Groundwater Sources Order 2020	Upper Namoi Zone 5 Groundwater Source	WAL 12833	67	134	79	-	79
		WAL 20131	150	300	0	-	
		WAL 12822	43	86	n/a[1]	0	
NSW Great Artesian Basin (**GAB**) Groundwater Sources 2020	GAB Southern Recharge Groundwater Source	WAL15922	248	322.4	n/a[1]	6	6
NSW Murray Darling Basin (**MDB**) Porous Rock Groundwater Sources Order 2020	Gunnedah Oxley Basin MDB Groundwater Source	WAL 29549	818	1,526.3	n/a[1]	504	504
		WAL43017	403				
Upper Namoi and Lower Namoi Regulated Water Sources 2016	Lower Namoi Regulated River Water Source Regulated River (High Security)	WAL 6762	20	20	0	-	0
	Lower Namoi Regulated River Water Source Regulated River (General Security)	WAL 2671	48	60	60	-	487.5
		WAL 2728	10	12.5	n/a[1]	0	
		WAL 20152	600	750	427.5	-	

[1] No active pumping for water usage purposes, Water Access Licence's have been assigned to miscellaneous work approvals to account for indirect take from the individual water sources as a result of mining impacts.

[2] Predicted maximum indirect take during 2023 from *Narrabri Coal Mine Groundwater Model- Re-calibration Stage 2 MOD7, AGE 2024*.

* All units in Mega Litres (**ML**)

7.2 SURFACE WATER MANAGEMENT

7.2.1 Environmental Management

The Narrabri Mine surface water management system is managed in accordance with:

- PA 08_0144, Schedule 4, Conditions 10 to 17;
- EPL 12789 Conditions P1, L1, L2 and M2;
- the WMP; and

- the Extraction Plan – Water Management Plan (EP–WMP) prepared to satisfy the requirements of PA 08_0144, Schedule 3, Condition 4.

Surface water monitoring is conducted at locations within and surrounding Narrabri Mine as shown in **Figure 3**.

Activities in 2023

The Narrabri Mine Water Balance Model 2021 identified the requirement for additional brine storage capacity. The construction of BR1 (and associated infrastructure) was commissioned in October 2023. SD7 was constructed to manage stormwater from the BR1 construction area and ongoing sediment control from the catchment.

Sediment dam SD9 was constructed for managing surface water runoff from ventilation shaft construction site located on the southern boundary of ML1609.

7.2.2 Environmental Performance

Surface Water Quality

NCOPL undertakes surface water monitoring of creeks and tributaries during flow events, as detailed in the WMP. During the Reporting Period, NCOPL recorded 1 flow event at the "KCUS" monitoring point on 30 March 2023. All other monitoring points were unable to be sampled due to nil flow. Surface water and ambient flow monitoring results are presented in **Appendix E** and **Appendix G** respectively.

Wet Weather Discharge Monitoring

Narrabri Mine recorded 62.2mm rainfall from 28 to 29 March 2023. NCOPL commenced discharging water from EPL 12789 licence point 18 (SD7) on 30 March 2023 following the rainfall trigger. In accordance with EPL12789, the discharge and ambient monitoring points were routinely sampled with results presented in **Table 17**.

Table 17: Controlled Discharge Monitoring

Location	Date	5 day Rolling Rainfall Total (mm)	pH (field)	Oil and Grease[1] (mg/L)	Total Suspended Solids[1] (TSS) (mg/L)
	EPL Criteria	N/A	6.5 - 8.5	10	50
SD7	30 March 23	62.2	8.25	<5	3350[2]
	31 March 23		7.68	-	-
	1 April 23		7.62	-	-
	2 April 23		7.64	-	-
KCUS	30 March 23		7.45	<5	72

[1]Oil and Grease and TSS are determined via lab analysis, while pH is measured in situ in the field. Lab analysis is undertaken at the frequency specified by EPL 12789, Condition M2.4

[2]EPL12789 Condition L2.5 (a), TSS concentration limits are permitted to be exceeded for water discharged following rainfall measured at the premises that exceeds 38.4mm over any consecutive 5 day period.

Subsidence Surface Water Impacts

Subsidence surface water impacts are outlined in **Section 6.5.2**. (Subsidence Pond Monitoring) of this Report. Results of the subsidence ponding water quality sampling conducted during the Reporting Period are presented in **Appendix H**.

Brine & Raffinate Management

No raffinate was discharged to the Namoi River during the Reporting Period.

7.2.3 Activities for the Next Reporting Period

NCOPL will update and lodge a revised WMP to include a revised Site Water Balance in 2024.

NCOPL will continue to review the monitoring requirements in the WMP and implement actions, as required. If any new amendments are identified, NCOPL will lodge the revised Plans with relevant regulatory agencies for comment and approval.

7.3 GROUNDWATER MANAGEMENT

7.3.1 Environmental Management

The Narrabri Mine groundwater management system is managed in accordance with:

- PA 08_0144, Schedule 4, Condition 18;
- EPL 12789 Conditions P1, L1, L2 and M2;
- the WMP (including the groundwater management plan (**GWMP**)); and
- the Extraction Plans – Water Management Plan (EP–WMP) prepared to satisfy the requirements of PA 08_0144, Schedule 3, Condition 4.

Activities in 2023

During the Reporting Period, the groundwater monitoring network was expanded with the installation of 17 groundwater monitoring bores and 10 multi-level Vibrating Wire Piezometers (**VWP**). The network expansion will serve ongoing groundwater monitoring as the Narrabri Mine continues to progress through longwall panels 203 to 209. An additional 5 bores were installed during the construction of BR1 to monitor for dam liner integrity. NCOPL installed new dataloggers with satellite telemetry to the existing VWP sites (P42, P44, P45, P46 P54, P55 and P56) to be consistent with the new VWPs.

Groundwater monitoring is conducted at locations within and surrounding Narrabri Mine as shown in **Figure 3** and outlined in **Table 18**.

Table 18: Groundwater Monitoring Summary

Location	Parameters	Frequency
Standpipes P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P16, P17, P19, P39a, P39b, P43, P47, P51, P52, P53, P58, WB2, WB3a, WB3b, WB4, WB5a, WB5b, WB6a, WB6b, and WB7 New standpipes P6B, P59, P60, P62, P63R, P65, P66, P68, P69, P71, P72, P74, P75, P82, P90, P91, and P92	Water level EC pH TDS Metals Anions and Cations	Quarterly (Water level, EC, pH) Annually (full water quality)
Pit top water storage standpipes P28, P29, P30, P31, P32, P33, P34, and P58 New brine dam standpipes P83, P84, P85, P88, and P89	In accordance with EPL: Water level, EC, pH, Anions and Cations Brine dam standpipe sampling to include	Quarterly Brine dam standpipes to be sampled monthly for first 4 months after initial use of the dam.

Location	Parameters	Frequency
	dissolved and total metals.	
VWPs P42, P44, P45, P46, P54, P55 and P56 New VWPs P61, P64, P67, P70, P73, P76, P77, P78, P79, and P80	Water pressure (level)	Daily (telemetry)
Mine water pumped into and out of the mine (Box Cut)	EC pH TDS Metals Anion and Cations Flow	Monthly (full water quality and flow)

Work commenced on revision to the Stage 2 Water Management Plan to update the (2013) version to include contemporary requirements and expectations resulting from consultation with government agencies on the Narrabri Mine Stage 3 Extension Project (**SSD 10269**). The revised (Stage 2) WMP is expected to be submitted for approval early 2024.

Improvements to review of monitoring results was implemented during 2023, with hydrogeological consultants AGE engaged to provide detailed Quarterly Groundwater Monitoring review reports.

7.3.2 Environmental Performance

Annual Hydrogeological Review

An annual hydrogeological review was undertaken by AGE for the period 1 January 2023 to 31 December 2023. The results of the review are summarised below. Groundwater monitoring results for the Reporting Period are provided in **Appendix F** as required by the WMP.

Groundwater Levels

Rainfall patterns over the past few years have been highly variable with an extended below average rainfall period occurring from early 2017 through to early 2020 followed by significant increase in rainfall between 2020 and late 2023 before declining again. The annual review employs the standard technique for assessing groundwater level trends by comparing water level hydrographs with the Cumulative Rainfall Departure (**CRD**). The CRD can be uses to assess if changes in groundwater levels are correlated with climatic conditions or other factors such as resource extraction, mining, irrigation etc.

Groundwater level data from the monitoring bores screened in the Namoi River Alluvium show no impact from mining activities during the Reporting Period.

Pilliga sandstone monitoring bore groundwater levels have remained steady since 2012, with no impacts from mining activities and consistent with the groundwater model predictions.

Monitoring bore P9, which is installed in the Purlawaugh Formation and located near the central mains on longwall 203, was impacted by the progression of mining towards the bore in 2015. Since then, groundwater levels have been steadily declining at a consistent rate of approximately 0.3m per year, with a slight increasing trend observed in 2023. The groundwater level in P9 is above the modelled maximum predicted drawdown level. Monitoring bores P11 and P16, screened in the Purlawaugh Formation and the Garrawilla Volcanics respectively, have been impacted by mining. No recovery of groundwater level has occurred during the above average periods of rainfall recorded in 2020 to 2022 and the consistent decline in P11 began at the start of operations on LW103. Groundwater levels at P11, which is located at the southern edge of longwall 206, remains 11.7 m above maximum predicted

drawdown level. Bore P16 is located on the western edge of longwall 111, recorded water level reductions are stepped, these steps coincide with commencement of mining of LW107, LW108, LW109, LW110A. Water levels at P16 are currently 14.4m below the maximum predicted drawdown.

It should be noted that in addition to mining impacts, groundwater levels in the area will be affected by climatic conditions and also by other stresses, which include unmetered extraction for general agricultural purposes. Hence some part of the groundwater level decline observed at P9, P11 and P16 may be related to other factors. Nevertheless, mining induced drawdown is considered likely to be the dominant cause of declining groundwater levels at P9 and P16. On the other hand, groundwater levels at P11 have only recently dropped below pre-mining levels and the fact that this bore is more than 5 km from active longwall panels suggests that the declining groundwater levels at this location may be a lagged response to the dry conditions which prevailed until 2020 or reflect local groundwater extraction for agricultural purposes. Groundwater levels in monitoring bores outside the mine lease (i.e., P1 – P7) show no impacts of mining activities.

Groundwater monitoring bores installed near the rail loop and Reject Emplacement Area (**REA**) all experienced fluctuations congruent with fluctuation in average rainfall.

Groundwater Quality

EC is an important analyte used to assess trends and potential unexpected impacts on the groundwater environment. It is acknowledged that with the implementation of the revised Stage 2 GWMP, the Trigger Action Response Plan (**TARP**) will provide a more robust statistical method of analysis for trigger levels of specific water quality parameters.

Nine standpipe monitoring bores recorded EC field or laboratory exceedances in 2023. These bores were screened in the Pamboola Formation (P5), the Purlawaugh Formation (P8, P9 and P11), Garrawilla Volcanics (P13, P47, and P53), the Watermark Formation (P39A, P43) and in Namoi River Alluvium (P39B and WB3a). Of the bores recording EC exceedances, only bores P8 and P39B appear to have a consistent increasing trend. Four bores reported exceeding the 97.5th percentile trigger for dissolved metals and to a lesser degree utrients and major anions and cations in 2023. Exceedances recorded in 2023 occurred in bores screened in the Purlawaugh Formation (P8 and P11), Garrawilla Volcanics (P13) and the Napperby Formations (P10). P13 appears to have a fluctuating trend with spikes in chloride and magnesium occurring during periods of a reduction in rainfall. Bores P8, P11, and P10 have an overall increasing trend with localised spikes in data or periods of flattening some of which coincide with periods of high or low rainfall. Bores with an observable upward trend will need to be fully understood, which will occur when the analysis for the new trigger exceedance methodology is applied in the revised WMP.

Compensatory Water Supply

No compensatory water has been required as no privately-owned water supplies have been affected.

7.3.3 Activities for the Next Reporting Period

In June 2022, NCOPL commissioned AGE to undertake a full re-calibration of the Groundwater Model. A draft report on the recalibration was provided to NCOPL in December 2023 with subsequent minor revisions required. The final groundwater model recalibration report will be completed in 2024 and incorporated into the revision of the site WMP and EP–WMP for LW203-206 for submission to DPE.

7.4 SITE WATER BALANCE

Surface water

Table 19 presents an estimate of the volume of stored water at the beginning and end of the Reporting Period (i.e. calendar year). NCOPL pumped 566.5ML into Dam D from Namoi Alluvium or the Namoi River water sources via approved WAL's during the Reporting Period (i.e. calendar year). NCOPL also utilised water from sediment basins for mine supply. The site water balance has been reviewed following the 2023 Reporting Period and includes forecast simulation of the key inflows and outflows for the next 5-year period. The water balance model results show that (for the period 2024-2029) there were no spills from A1, A2, A3, B2, C or BR1 into the receiving environment for any of the climatic conditions assessed. The SB dams would be sufficiently managed during operations as to prevent uncontrolled spills to the receiving environment.

Table 19: Stored Water

	Volumes Held (ML)		Capacity at the end of the Reporting Period (ML)
	Start of Reporting Period	At End of Reporting Period	
Raw Water (Dam D and B1 in Rail loop)	87.8	123.9	82.4
Dirty Water (in Sediment Dams and Basins SD1-SD8 and SB1-SB4)	94.6	83.3	117.9
Rail Loop Dams (A1-A3, B2 and C)	474.1	332.7	309
Brine Dam (BR1)	-	185.7	279
* Additional 40ML of storage in containment bund in rail loop.			

Groundwater Inflows

Table 16 summarises the water licences held by NCOPL to account for indirect take associated with mining, and water usage for operational purposes, during the Reporting Period. All water take for the Reporting Period is below current licence entitlements. Information on actual groundwater inflows is inferred from monitoring of the volume of water pumped underground and the volume of water returned via the box-cut dewatering pump. The calculated water take utilising inputs and losses of water within the mine are represented by the waterfall chart (**Figure 11**).

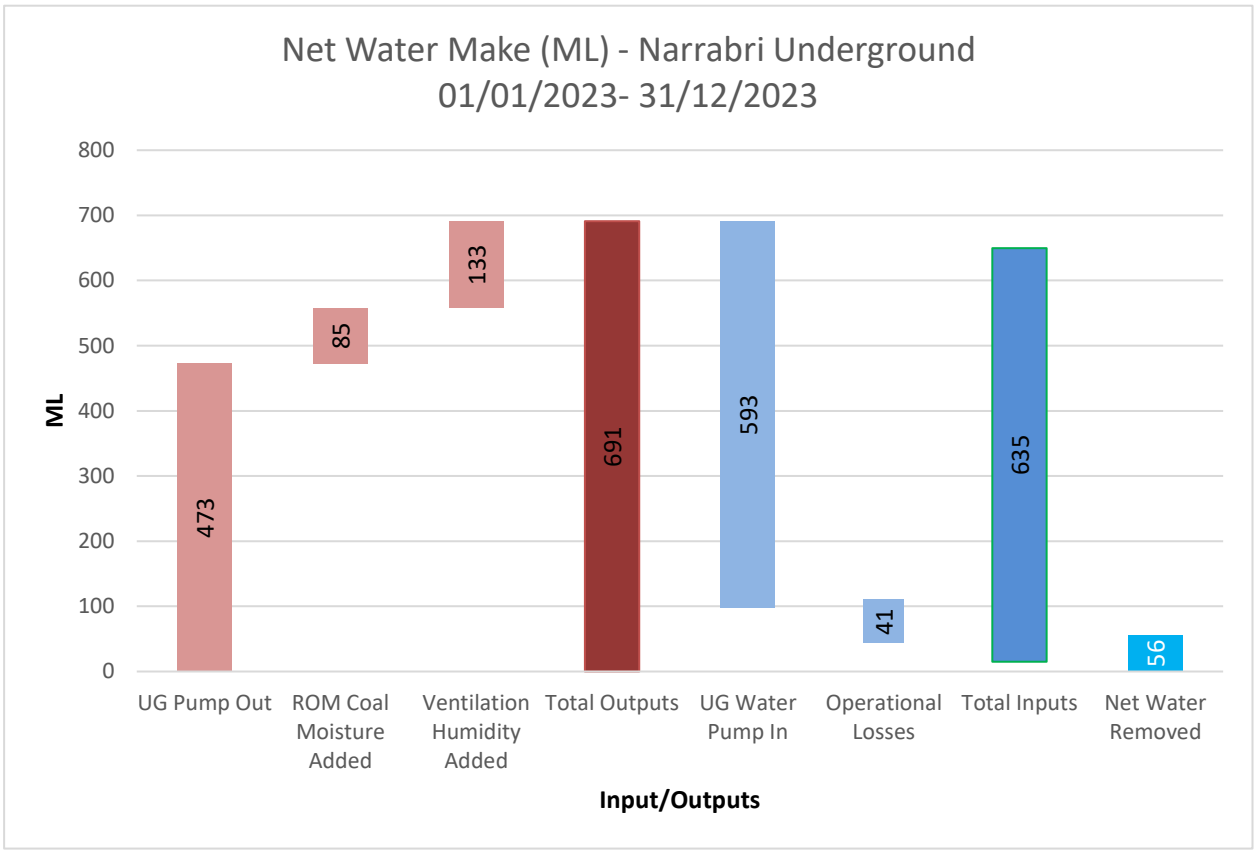


Figure 11: Waterfall Chart – Water Inputs/Outputs for Reporting Period

8 REHABILITATION

Narrabri Mine rehabilitation works are managed in accordance with:

- PA 08_0144, Schedule 5, Condition 4;
- EPBC Approval 2009/5003, Condition 5;
- PA 08_0144 SoC;
- FWP;
- RMP; and
- Standard mining lease conditions, Division 1 (4-6), Division 2 (7), Division 3 (10 and 12).

The Rehabilitation Objectives for Narrabri Colliery (official name given by RR) were approved by the RR on October 18, 2023. The objectives and other updates were then added to the RMP. The Annual Rehabilitation Report and Forward Program (**ARRFP**), as required by the *NSW Mining Regulation 2016* (**Mining Regs**), has been prepared and submitted to the RR.

Section 8.1 provides an overview of the rehabilitation practices that were conducted during the Reporting Period.

8.1 REHABILITATION PERFORMANCE DURING THE REPORTING PERIOD

8.1.1 Status of Mining and Rehabilitation

Rehabilitation activities were undertaken over the disturbed areas above LW108-110 during the Reporting Period, with approximately 17ha being rehabilitated. Rehabilitation activities undertaken during the Reporting Period included:

- Decommissioning drill holes;
- Filling in sumps associated with drilling activities;
- Grading landforms and re-spreading topsoil/subsoil; and
- Weed management.

8.1.2 Post Rehabilitation Land Uses

Narrabri Mine final land use requirements is outlined in *Table 2-1* of the RMP.

8.1.3 Rehabilitation Performance Indicators

The rehabilitation completed for 2022 (previous Reporting Period), 2023 (this Reporting Period) and the predicted rehabilitation activities for 2024 is summarised in **Table 20**. **Figure 12** and **Figure 13** shows the status of rehabilitation at the Narrabri Mine.

Table 20: Rehabilitation Status

Mine Area Type*	Previous Reporting Period 2022 (Actual)	This Reporting Period 2023 (Actual) **	Next Reporting Period 2024 (Forecast) **
A. Total Mine Footprint	438[1]	509	523
B. Total Active Disturbance	268[2]	329	333
C. Land Being Prepared for Rehabilitation	28	22	22
D. Land Under Active Rehabilitation	141[3]	158	168
E. Completed Rehabilitation	0	0	0

Notes: * Data reported to align with definitions in the Annual Review Guideline (DPE, 2015).

** Data sourced from ARRFP

1. 2022 Annual Review reported 449 ha; however, recalculated to be 438 ha in accordance with the Annual Rehabilitation Report 2022.
2. 2022 Annual Review reported 278 ha; however, recalculated to be 268 ha in accordance with the Annual Rehabilitation Report 2022.
3. 2022 Annual Review reported 143 ha; however, recalculated to be 141 ha in accordance with the Annual Rehabilitation Report 2022.

8.1.4 Rehabilitation Risks

The NSW *Mining Act 1992* requires the Leaseholder to conduct a rehabilitation risk assessment and implement measures to eliminate, minimise or mitigate the risks in accordance with the *Guideline: Rehabilitation Risk Assessment*. NCOPL maintain a register for the rehabilitation risk assessment, of which, no new risks were identified during the Reporting Period.

8.1.5 Decommissioning and Demolition Activities

Decommissioning activities were undertaken during the Reporting Period included:

- Reclaiming of gas drainage infrastructure, e.g. poly pipe;
- Cementing and rehabilitation of boreholes; and
- Dilapidated houses (and associated infrastructure) on mine-owned land that are were longer required or that have been adversely affected by subsidence.

8.1.6 Other Rehabilitation Activities

NCOPL operates a groundwater monitoring network in accordance with the WMP. The groundwater monitoring network is reviewed and revised as mining progresses, resulting in a number of bores becoming obsolete once mining progresses through the area.

Table 21 shows a list of groundwater monitoring bores that have become obsolete due to mine progression. The bores have been sealed with cement grout and decommissioned in accordance with the requirements of '*Minimum Construction Requirements for Water Bores in Australia'*. NCOPL requested notification of these licences being relinquished within the 2022 Reporting Period. NCOPL received confirmation that the bores were cancelled by NSW DCCEEW Water during the Reporting Period.

Table 21: Decommissioned Monitoring Bores

Narrabri Coal ID	Groundwater Works Number	Bore licence ID	Easting	Northing	Elevation (mAHD)	Screen Depth	Grouted to surface
P14	GW968637	90BL254661	775221	6622816	277.41	72-78	YES
P15	GW968638	90BL254961	775221	6622818	277.41	24-30	YES
P18		90BL254662	776826	6621802	270.9	143-146	YES
P20	GW968643	90BL254964	776482	6621837	272.94	159-162	YES
P21	GW969508	90BL254965	776851	6620363	275	160	YES
P22	GW969509	90BL254966	776744.9	6620406	274.12	165	YES
P23(NC175CR)	GW969510	90BL254967	776226.1	6620693	286.04	188	YES
P24(NC179)	GW969642	90BL254701	776674.9	6621043	277.60	180	YES
P25	GW969661	90BL255167	776702.5	6620327	270	165	YES
P26	GW969973	90BL255168	776537.1	6620528	275.41	176	YES
P27	GW969974	90BL255169	776539.6	6620485	275.35	176	YES
P35	GW969937	90BL255769	776429.5	6620348	278.71	173	YES
P36	GW969936	90BL255770	776329.4	6620442	281.5	176	YES
P37	GW969934	90BL255771	776474.1	6620492	277.38	177	YES
P38	GW969933	90BL255772	776385.1	6621640	274.16	153.5	YES
P40		90BL256064	772814.7	6620823	321.22	360	YES
P48		90BL256293	775295.7	6623039	276.00	194.5	YES
P50		90BL256289	775724.6	6620655		15-60	YES
P57		90BL256042	773895.5	6624092	302.81	180	YES

8.1.7 Departmental Sign-off of Rehabilitated Areas

Departmental sign-off was not requested during the Reporting Period.

8.1.8 Monitoring

Rehabilitation monitoring results are outlined in **Section 6.5**. Additionally, NCOPL undertake routine inspections of roads and creeks impacted by mine subsidence, water management structures, soil stockpiles and seeded areas for evidence of instability/erosion and/or poor germination and borehole sealing.

8.1.9 Trials, Research Projects and Initiatives

During the Reporting Period, NCOPL engaged specialist consultants to assist with the implementation of an electronic GIS based monitoring platform. The system has been built and is currently being tested and refined. Testing is expected to continue throughout 2024.

8.2 ACTIVITIES FOR THE NEXT REPORTING PERIOD

Rehabilitation activities for 2024 will be carried out generally in accordance with the FWP and RMP subject to operational progress.

NCOPL will continue removing houses and associated infrastructure on mine-owned land that are no longer required or that have been affected by subsidence.

NCOPL will continue the staged rehabilitation of the REA in accordance with the *REA Capping Assessment and Closure Design*.

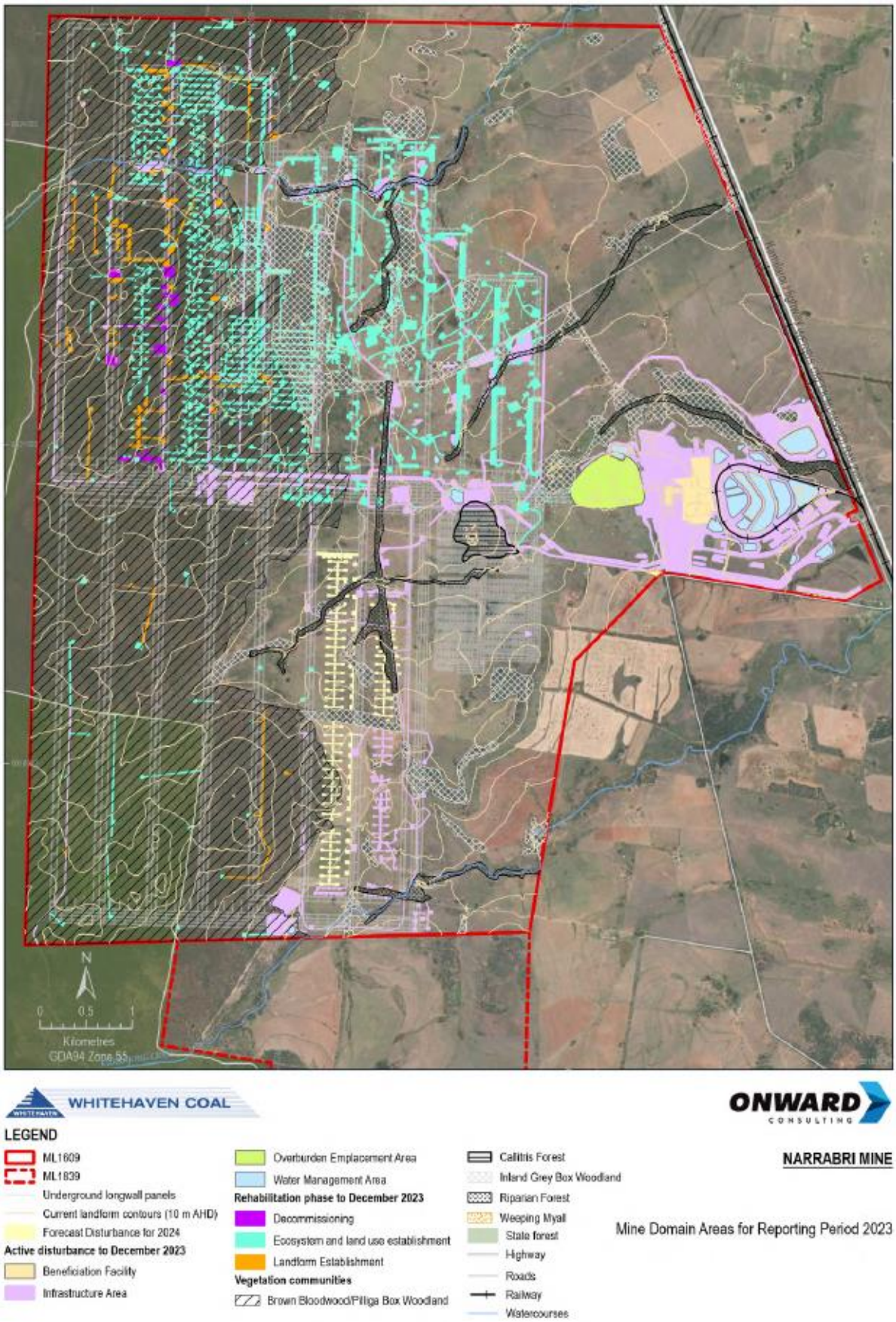


Figure 12: Mine Domains Reporting Period 2023

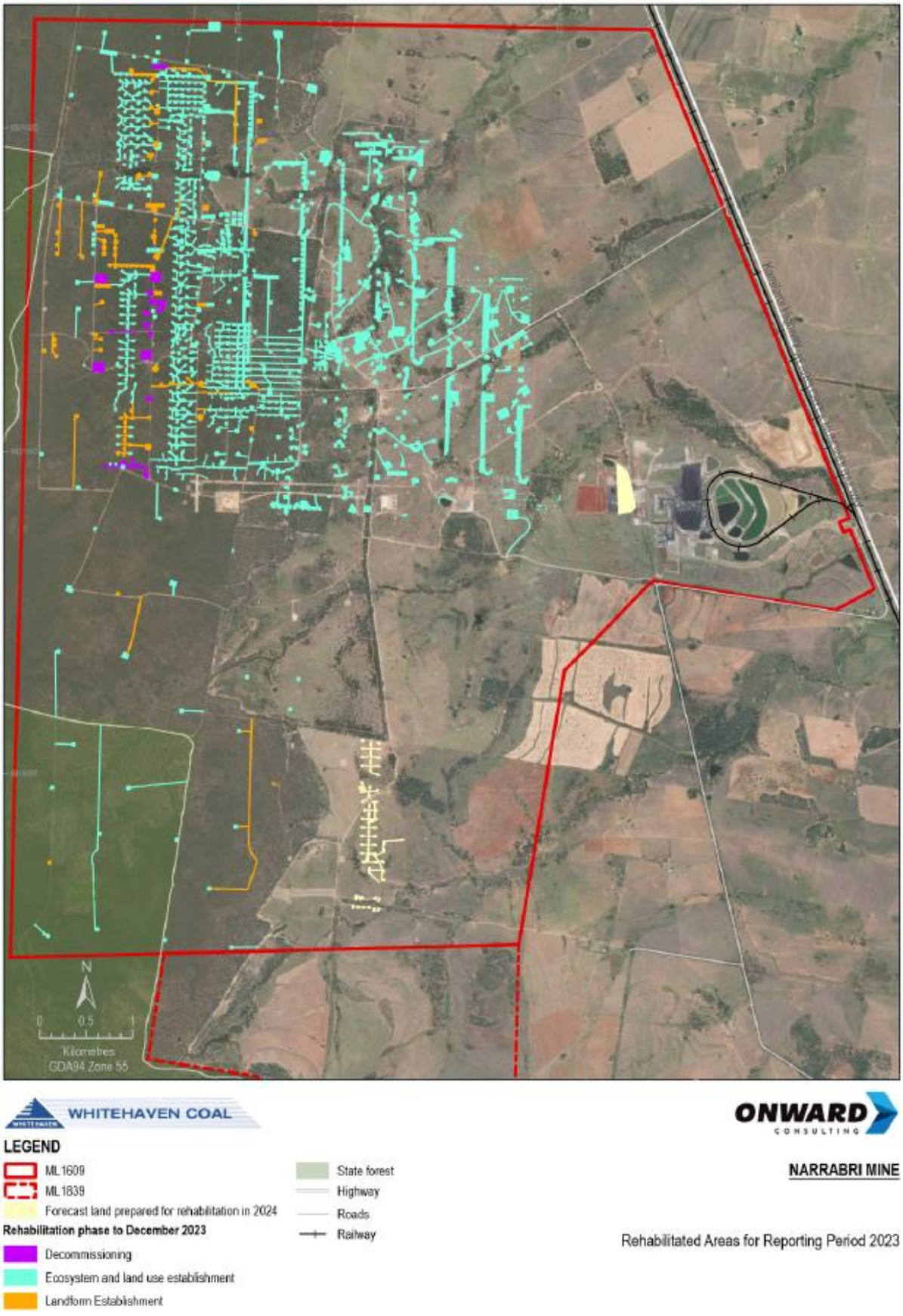


Figure 13: Rehabilitated Areas, Reporting Period 2023

9 COMMUNITY

Social impacts and opportunities associated with the Narrabri Mine are managed in accordance with PA 08_0144 and the SoC.

9.1 COMMUNITY ENGAGEMENT

NCOPL undertook a range of engagement activities during 2023:

- Narrabri Mine Community Consultative Committee (**CCC**) meetings. The CCC comprises representatives of NCOPL, NSC and the local community. The meetings were held in March, June, September and December 2023. Minutes of each of these meetings are available at the WHC website.
- Near neighbour consultation regarding impacts, address any potential concerns and other interactions.

In addition, general information relating to Narrabri Mine is available:

- On the WHC website;
- The annual sustainability report; and
- At other consultation meetings as required with neighbours and a range of stakeholders including government and non-government agencies. WHC meets regularly with the NSC and is a regular attendee at the Narrabri and Boggabri Business Chamber meetings.

9.2 COMMUNITY CONTRIBUTIONS & INITIATIVES

In addition to attending functions, WHC and NCOPL also contributed to the community by providing financial support to the Narrabri community and sponsorship to various community events and initiatives during the Reporting Period including:

- Australian Whip crackers & Plaiters Association
- Black ‘n’ Blue Boxing
- Boggabri & District Rugby League Football Club Inc.
- Boggabri Community Church
- Boggabri Golf Club
- Boggabri Gunnedah Gun club
- Boggabri Public School
- Boggabri Rugby League Football Club
- Boggabri Women's Shed Inc
- Boggabri-Gunnedah Gun Club/Gunnedah Sporting Clays
- Boggy Ninja
- Cancer Council
- Carroll Community Bus Incorporated
- Cougar Warriors
- CrossFit Gunnedah
- Dorothea Mackellar Poetry Awards
- Eulah Creek Recreation Reserve Trust
- Gomeroi Allstars
- Gomeroi Roos
- Gunnedah Business Chamber
- Gunnedah Bulldogs AFL
- Gunnedah Can Assist
- Gunnedah Family & Children’s Services Incorporated
- Gunnedah Filipino Australia Community
- Gunnedah High School
- Gunnedah Junior Rugby Club
- Gunnedah Meals on Wheels
- Gunnedah Ministers Fraternal
- Gunnedah PCYC
- Gunnedah Crime Prevention & Community Safety Conference
- Gunnedah Shire Council

- Gunnedah South Public School P&C Association
- Gunnedah Swimming
- Lil Achievers
- Lions Club of Gunnedah
- Maules Creek Campdraft and Junior Rodeo 2023
- Movember Foundation
- Multicultural Women's Association Inc
- Naidoc Week Committee Incorporated
- Namoi Women's Shed Incorporated
- Narrabri Business Chamber
- Narrabri & District Community Aid Service Incorporated
- Narrabri Arts Eisteddfod Inc
- Narrabri district Junior Rugby League Club
- Narrabri Dolphins Water Polo Club Incorporated
- Narrabri High School
- Narrabri Industrial Network
- Narrabri Men's Shed Inc
- Narrabri RSL
- Narrabri Rugby League Football Club
- Narrabri Shire Community Radio Inc
- Narrabri Shire Council
- Nosh Narrabri Committee
- Plains of Plenty
- Presbyterian Social Service
- Rotary Club Gunnedah West
- Rotary Club Narrabri
- Salvation Army Gunnedah
- St Xaviers Narrabri
- The Combined Catholic Schools P&F
- Wean Amateur Picnic Race Club Inc.
- Wee Waa & District Historical Society Inc
- Wee Waa Local Aboriginal Land Council
- Wee Waa Community Band Inc.
- Wee Waa Show Society Inc.
- Clontarf Foundation
- Winanga-Li Aboriginal Child and Family Centre

9.3 COMMUNITY COMPLAINTS

NCOPL maintains a designated complaints line (1800 942 836). In the event of a complaint, details pertaining to the complainant, complaint and action taken are recorded on a complaint register. The complaints register is available on the WHC website.

During the Reporting Period, NCOPL received 3 community complaints.

9.3.1 Complaint Trends

Three community complaints were received during the Reporting Period which is an increase from no complaints received during 2022 (**Figure 14**).

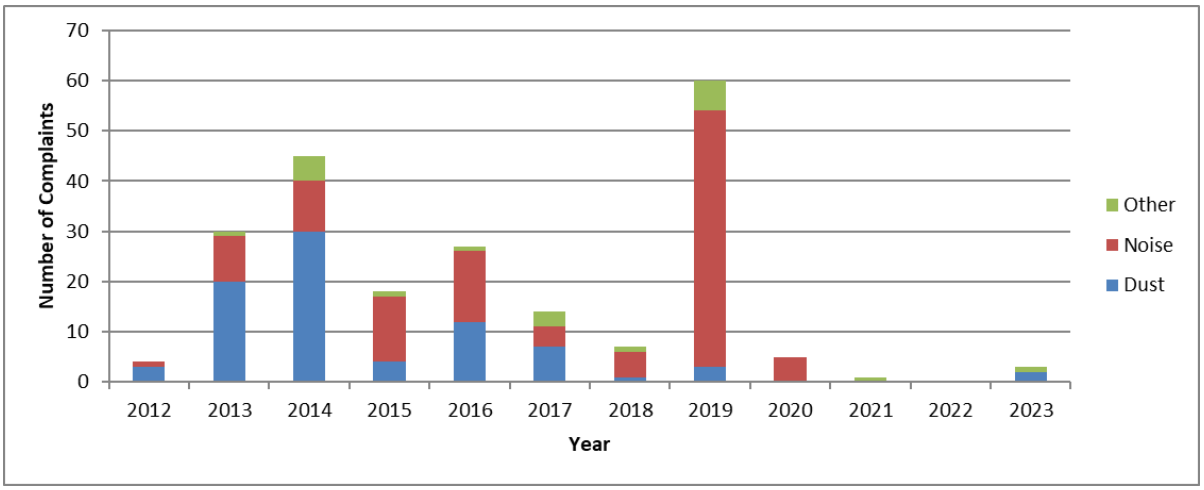


Figure 14: Complaints Trend Since Commencement of Operations

9.4 ACTIVITIES FOR THE NEXT REPORTING PERIOD

NCOPL will also continue to meet with NSC and the Narrabri Business Chamber regularly and support the Narrabri Shire Community through the Community Investment Committee.

10 INDEPENDENT AUDIT

10.1 INDEPENDENT ENVIRONMENTAL AUDIT

The NCOPL 3-yearly Independent Environmental Audit (**IEA**) was undertaken in 2022 in accordance with PA 08_0144, Schedule 6, Condition 7. The IEA covered the period from the 5 December 2019 to 8 December 2022. Four non-compliances were identified (1 duplicate) against conditions outlined in PA 08_0144 and 1 non-compliance against the implementation of 1 Environmental Management Plan. **Table 22** summarises the non-compliances and relevant recommendations from the auditor.

In accordance with PA 08_0144, Schedule 6, Condition 7, the next IEA will be commissioned by 13 September 2025.

Table 22: 2022 Independent Environmental Audit (IEA) – Non-Conformance Actions Summary

Plan	Condition	Response/Action	Status
PA 08_0144	Schedule 4, Condition 1	Reported non-compliance (duplicate). NCOPL will continue to implement the NMP. Improvement opportunities will be reported in the relevant Annual Review.	Completed
EPL12789	L4.1		
PA 08_0144	Schedule 4, Condition 30	It is recommended the ESAP is reviewed and updated to consider actual production data since 2013 and work currently underway to review GHG emissions. NCOPL revised the GGMP, which now includes the ESAP, approved by DPE on 21/12/2023. NCOPL will continue to implement the GGMP.	Completed
PA 08_0144	Schedule 6, Condition 4	Reported non-compliance (associated with late reporting of groundwater drawdown trigger exceedance). NCOPL have amended groundwater sampling field sheets to include drawdown trigger levels to prompt notification of NCOPL immediately.	Completed
SoC	9.18	NCOPL received approval from DPE for the ACHMP on 3 October 2023. NCOPL have updated the Narrabri Mine training package to include conditions required by the ACHMP.	Completed

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

11.1 NON-COMPLIANCES

The compliance status of the Narrabri Mine against relevant approvals during the Reporting Period was assessed in **Section 1** as at the end of the Reporting Period (i.e. 31 December 2023). Further details of any non-compliance and actions undertaken or proposed for the following Reporting Period is summarised in **Table 23**.

Table 23: Non-Compliance Details and Proposed Action Plan

Non – Compliance Summary	Cause / Details	Action Taken to Ensure Compliance
Non-compliance with monitoring requirement of AQMP.	PM_{10} is required to be monitored every 6 days. NCOPL did not collect PM_{10} data from site ND10 on 23 April, 29 April, 29 May and 4 June due to mechanical failure of the HVAS.	NCOPL replaced the HVAS at ND10 on 9 June 2023. DPE was notified of the non-compliance.

11.2 REPORTABLE INCIDENTS OR EXCEEDANCES

NCOPL did not trigger any exceedances or incidents during the Reporting Period as outlined in the PA 08_0144 definitions.

11.3 REGULATORY ACTIONS

Whilst not within the Reporting Period, NCOPL received an official warning letter from DPE dated 17/1/2024 regarding failure to implement actions outlined in the ESAP. NCOPL have reviewed the GGMP (which now includes the ESAP) during the Reporting Period. The GGMP was approved by DPE on 21/12/2023.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

A summary of key environmental management activities proposed for 2024 is presented in **Table 24**. Progress against these activities will be reported in the 2024 Annual Review.

Table 24: Environment Management Activities Proposed for 2024

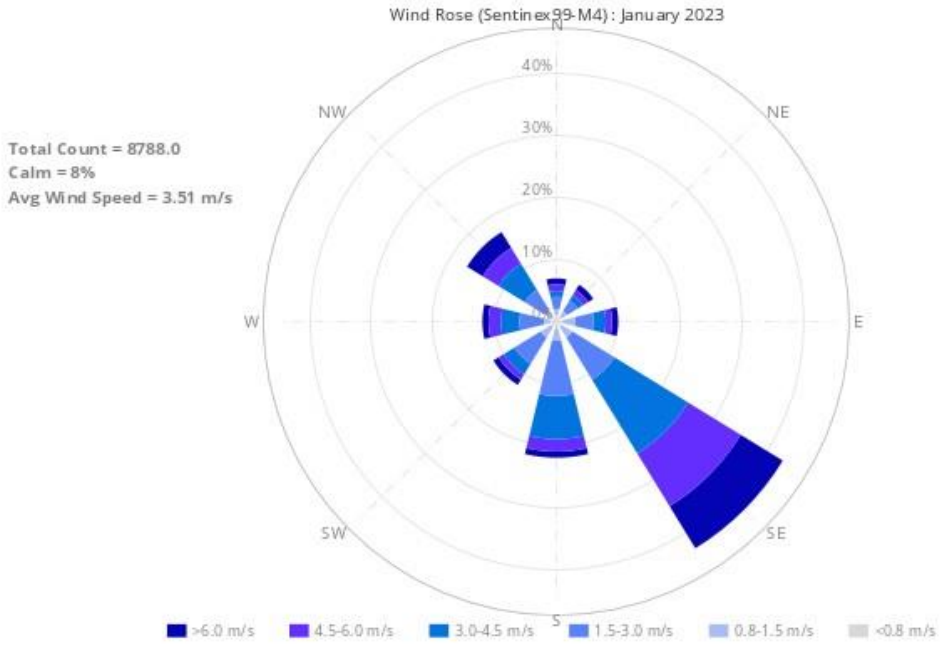
Area / Issue	Actions Proposed	Timeline for Implementation
Air Quality	Installation and commissioning of new real time Air Quality monitoring network	Prior to commencement of Stage 3 Project Approval
Subsidence Pond Monitoring	Conduct review of Subsidence Pond monitoring programme to reflect contemporary conditions contained within the Extraction Plan LW203-LW206.	To be progressed during 2024
Management Plans	Seek continuation approval of Extraction Plan LW203-206	3 months prior to commencement of mining LW204 (circa March 2025)
Management Plans	Update WMP.	Submit to DPE in 2024
Systems	Finalise the implementation of the electronic PTW procedure.	Early 2024
Rehabilitation	REA rehabilitation to be undertaken in accordance with the *REA Capping Assessment and Closure Design*.	To be progressed during 2024
Greenhouse Gas Emissions	Implement the greenhouse gas abatement research projects and progress with decarbonisation pathway as per the GGMP.	To be progressed during 2024
Rehabilitation	Review rehabilitation risk assessment and Rehabilitation Cost Estimate (**RCE**)	July 2024

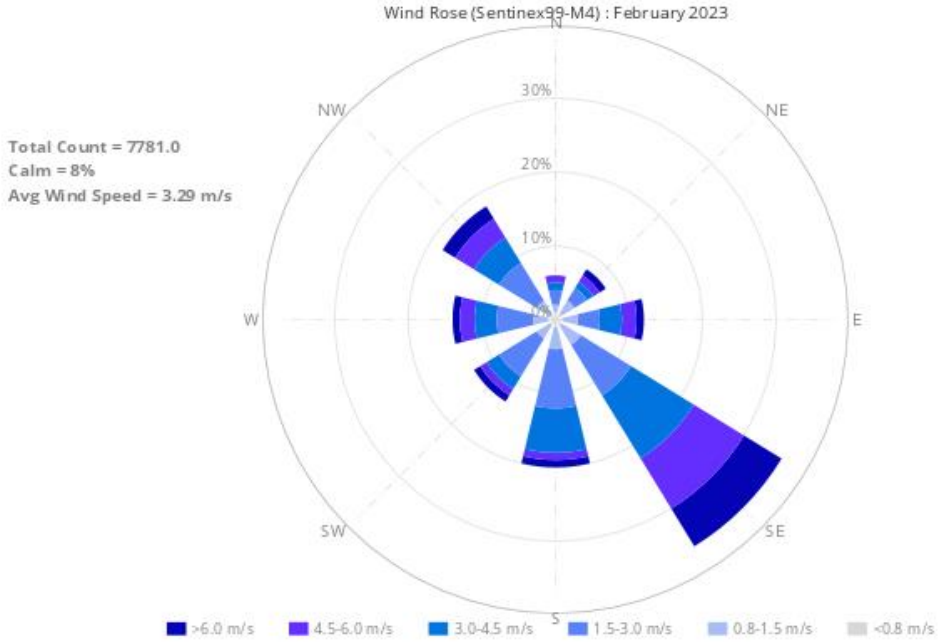
Appendix A – *Meteorological Monitoring*

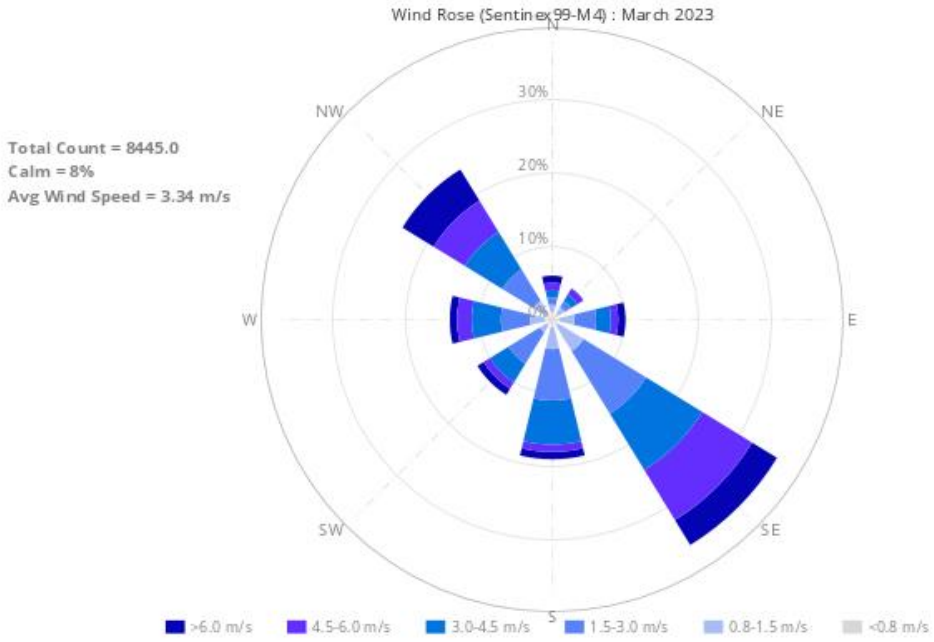
Table A1: Summary of Meteorological Conditions 2023

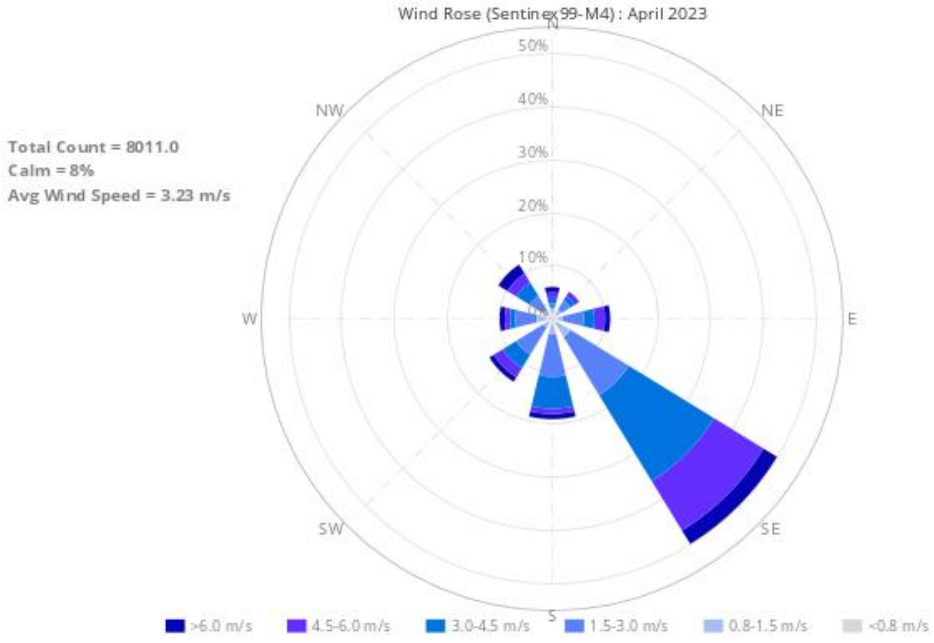
Month	Rain (mm)	Cumulative Rainfall (mm)	Rainfall Days (>1mm)	2m Temperature (˚C)			Wind		Inversion Conditions[1]
				Min	Mean	Max	Av. Speed (m/s)	Predominant Direction	% of Evening/Night Time Period[2] (%)
Jan-23	24.2	24.2	4	18.0	26.0	34.2	2.5	SE	74.6
Feb-23	5.2	29.4	2	17.4	25.7	34.2	2.3	SE	75.3
Mar-23	136.8	166.2	6	17.5	24.3	32.1	2.2	S	77.7
Apr-23	33.4	199.6	2	10.9	17.4	24.5	2.6	SE	82.5
May-23	0.4	200	0	3.9	11.9	20.7	1.9	SE	97.9
Jun-23	40	240	6	4.3	10.9	18.6	1.6	SE	92.8
Jul-23	11.8	251.8	1	4.3	11.2	19.0	1.9	SE	95.7
Aug-23	14	265.8	2	6.2	14.0	22.7	1.9	SE	96.8
Sep-23	8.8	274.6	1	8.9	17.9	26.6	2.3	SE	54.6
Oct-23	38	312.6	3	11.2	20.3	28.6	3.3	NW	67.9
Nov-23	110.8	423.4	10	16.2	22.9	30.6	2.2	SE	65.9
Dec-23	132	555.4	7	18.2	26.3	34.8	2.4	NW	72.2

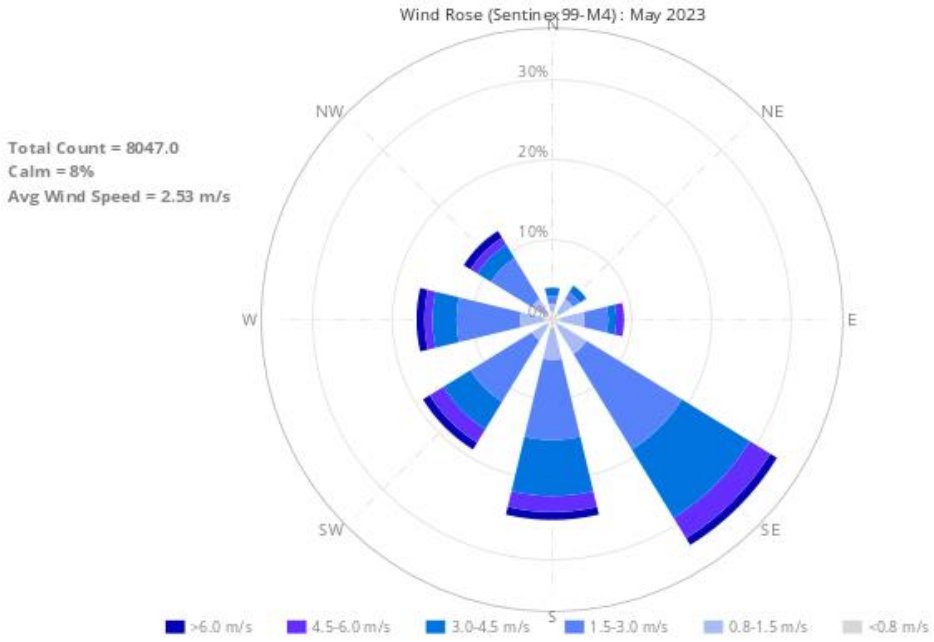
1. Inversion conditions are calculated from measurements recorded by the site 60m Inversion Tower. Inversions occur during E, F and G stability categories (these categories represent weak, moderate and strong inversion conditions).
2. Evening and night period generally includes 6pm-7am

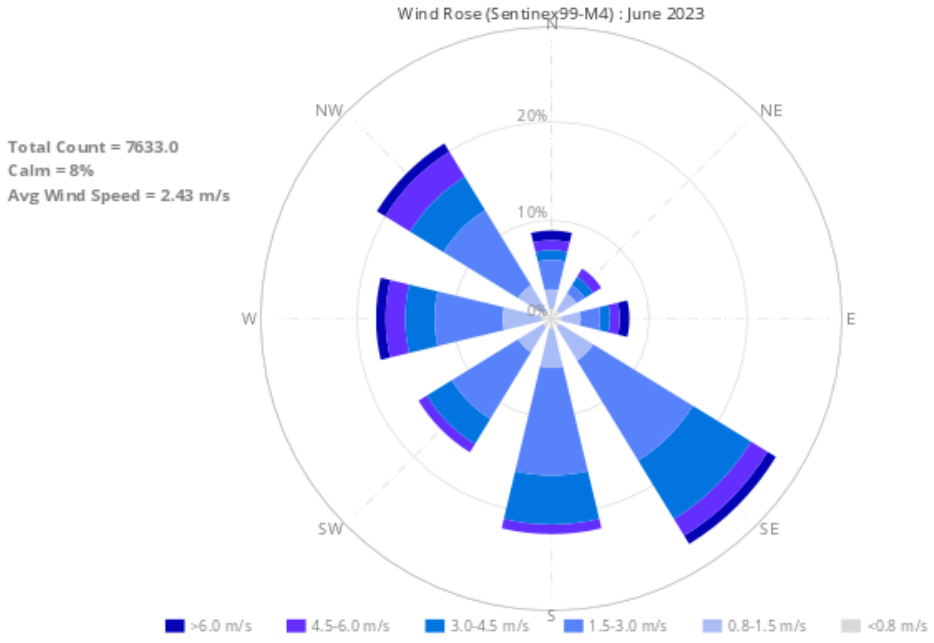

Wind Rose (Sentinex99-M4) : January 2023
Total Count = 8788.0
Calm = 8%
Avg Wind Speed = 3.51 m/s
N
NE
E
SE
S
SW
W
NW
40%
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s

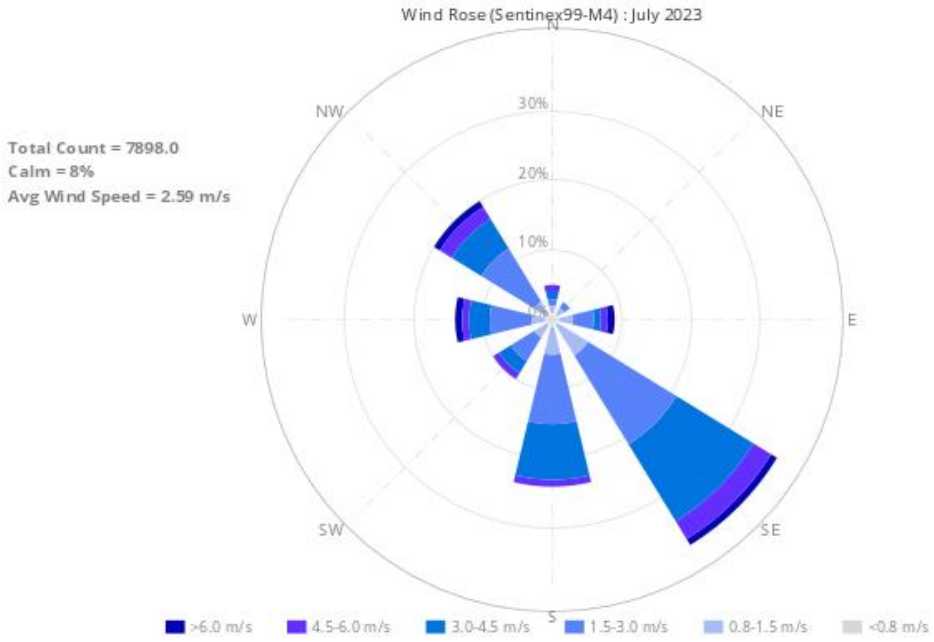

Wind Rose (Sentinex99-M4) : February 2023
Total Count = 7781.0
Calm = 8%
Avg Wind Speed = 3.29 m/s
N
NE
E
SE
S
SW
W
NW
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s

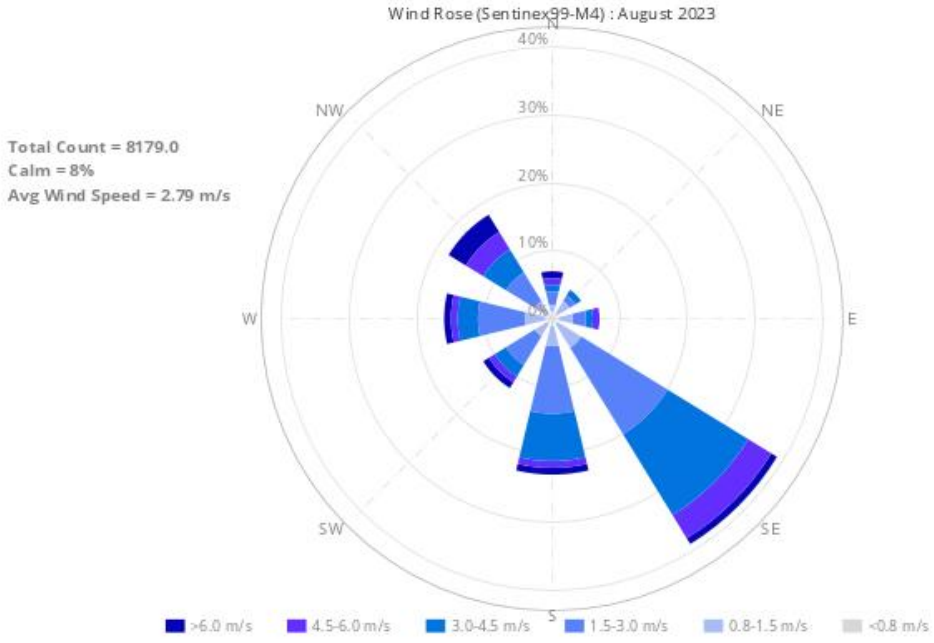

Wind Rose (Sentinex99-M4) : March 2023
Total Count = 8445.0
Calm = 8%
Avg Wind Speed = 3.34 m/s
N
NE
E
SE
S
SW
W
NW
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s

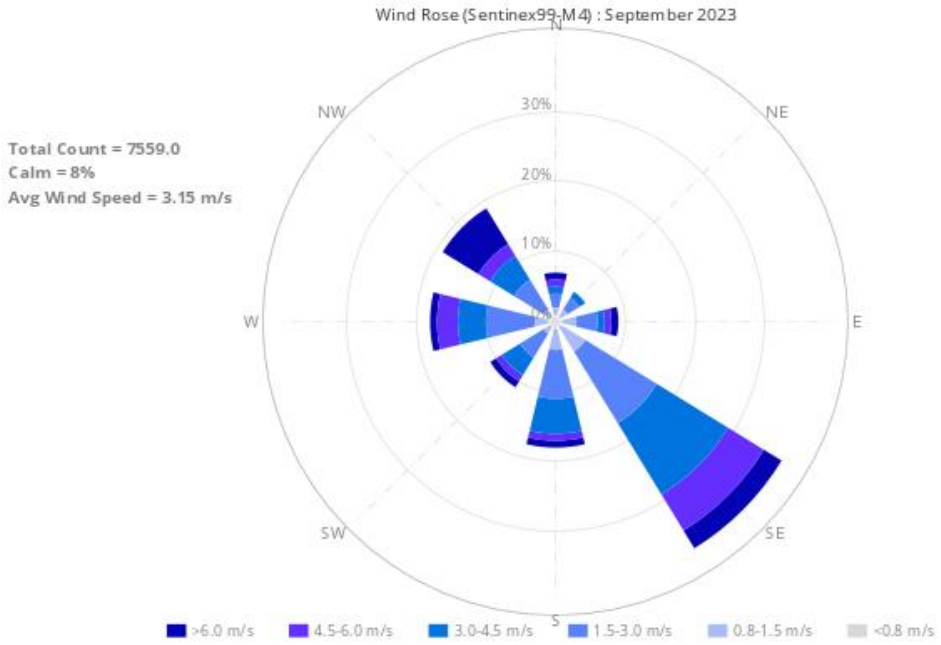

Wind Rose (Sentinex99-M4) : April 2023
Total Count = 8011.0
Calm = 8%
Avg Wind Speed = 3.23 m/s
N
NE
E
SE
S
SW
W
NW
50%
40%
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s

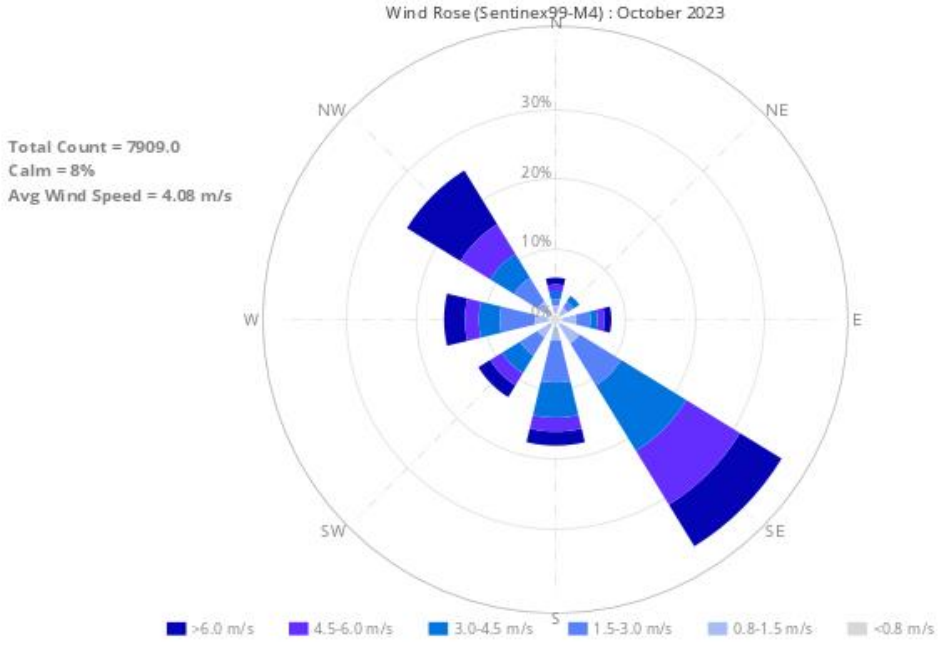

Wind Rose (Sentinex99-M4) : May 2023
Total Count = 8047.0
Calm = 8%
Avg Wind Speed = 2.53 m/s
N
NE
E
SE
S
SW
W
NW
30%
20%
10%
0%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s

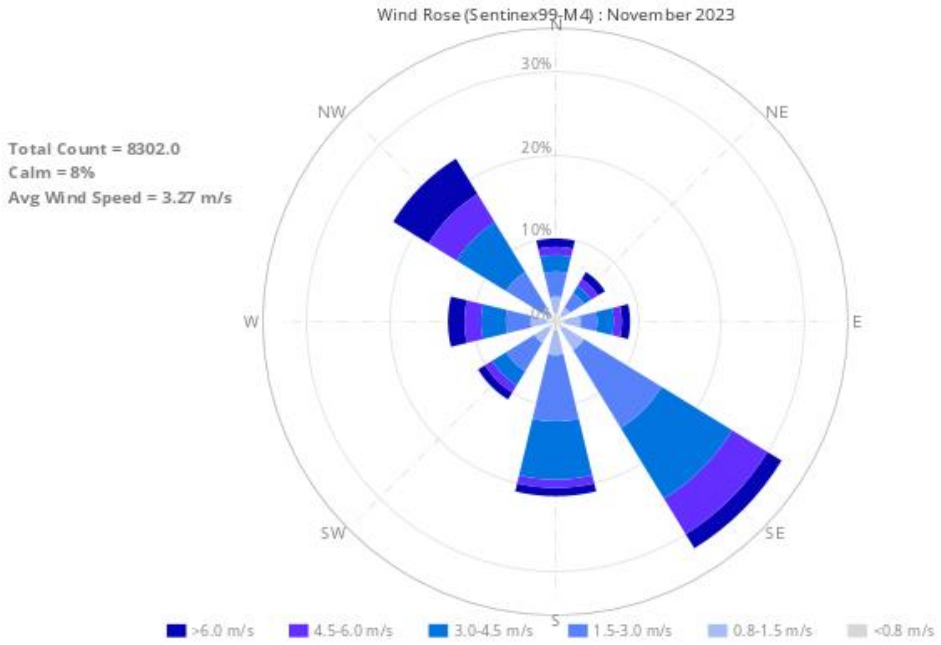

Wind Rose (Sentinex99-M4) : June 2023
Total Count = 7633.0
Calm = 8%
Avg Wind Speed = 2.43 m/s
N
NE
E
SE
S
SW
W
NW
20%
10%
0%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s

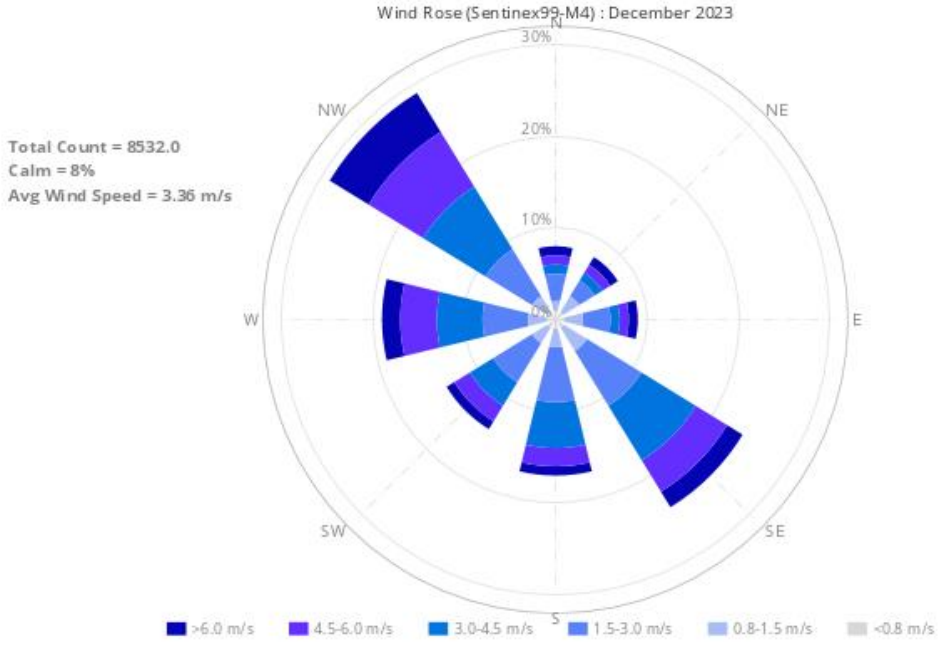

Wind Rose (Sentinex99-M4) : July 2023
Total Count = 7898.0
Calm = 8%
Avg Wind Speed = 2.59 m/s
N
NE
E
SE
S
SW
W
NW
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s


Wind Rose (Sentinex99-M4) : August 2023
Total Count = 8179.0
Calm = 8%
Avg Wind Speed = 2.79 m/s
N
NE
E
SE
S
SW
W
NW
40%
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s


Wind Rose (Sentinex99-M4) : September 2023
Total Count = 7559.0
Calm = 8%
Avg Wind Speed = 3.15 m/s
N
NE
E
SE
S
SW
W
NW
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s


Wind Rose (Sentinex99-M4) : October 2023
Total Count = 7909.0
Calm = 8%
Avg Wind Speed = 4.08 m/s
N
NE
E
SE
S
SW
W
NW
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s


Wind Rose (Sentinex99-M4) : November 2023
Total Count = 8302.0
Calm = 8%
Avg Wind Speed = 3.27 m/s
N
NE
E
SE
S
SW
W
NW
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s


Wind Rose (Sentinex99-M4) : December 2023
Total Count = 8532.0
Calm = 8%
Avg Wind Speed = 3.36 m/s
N
NE
E
SE
S
SW
W
NW
30%
20%
10%
>6.0 m/s
4.5-6.0 m/s
3.0-4.5 m/s
1.5-3.0 m/s
0.8-1.5 m/s
<0.8 m/s

Appendix B – *Flora Species List*

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Abutilon oxycarpum	Straggly Lantern-bush	Native												X											1
Acacia burrowii	Burrow's Wattle	Native		X		X	X	X	X	X										X		X		X	9
Acacia deanei	Green Wattle	Native								X		X		X		X	X				X			X	7
Acacia deanei subsp. deanei	Deane's Wattle	Native																				X			1
Acacia gladiiformis	Sword Wattle	Native																			X				1
Acacia ixiophylla		Native																						X	1
Acacia leiocalyx		Native												X											1
Acacia leiocalyx subsp. leiocalyx	Curracabah	Native	X	X	X	X	X	X	X	X											X	X			10
Acacia neriifolia	Silver Wattle	Native		X																				X	2
Acacia penninervis	Mountain Hickory	Native	X		X		X	X													X				5
Acacia pilligaensis	Pilliga Wattle	Native																		X					1
Acacia spp.	Wattle	Native																					X		1
Actinotus helianthi	Flannel Flower	Native	X		X																				2
Alectryon oleifolius	Western Rosewood	Native															X						X		2
Allocasuarina diminuta		Native	X		X																X			X	4
Allocasuarina luehmannii	Bulloak	Native								X		X													2
Alphitonia excelsa	Red Ash	Native		X		X	X								X							X		X	6
Alstonia constricta	Quinine Bush	Native					X																		1
Alternanthera nana	Hairy Joyweed	Native																	X						1
Amyema spp.	Mistletoe	Native																		X			X		2
Aristida caput-medusae	Many-headed Wiregrass	Native				X	X			X										X		X		X	6
Aristida jerichoensis	Jericho Wiregrass	Native						X													X				2
Aristida personata		Native				X	X		X	X										X	X				6

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Aristida ramosa	Purple Wiregrass	Native									X	X			X	X						X	X		6
Aristida spp.		Native					X				X	X	X	X		X	X			X	X	X		X	11
Arthropodium minus	Small Vanilla Lily	Native													X										1
Aster subulatus	Wild Aster	Exotic									X														1
Atalaya hemiglauca	Whitewood	Native												X											1
Austrostipa scabra	Speargrass	Native					X			X			X	X	X	X	X						X	X	9
Austrostipa setacea	Corkscrew Grass	Native													X										1
Austrostipa spp.		Native																		X		X			2
Austrostipa verticillata	Slender Bamboo Grass	Native					X			X						X	X		X	X					6
Bertya gummifera		Native																						X	1
Bertya opponens	Coolabah Bertya	Native		X		X	X															X		X	5
Bidens pilosa	Cobbler's Pegs	High Threat													X										1
Boerhavia dominii	Tarvine	Native																X					X		2
Boronia glabra	Sandstone Boronia	Native			X		X														X				3
Boronia occidentalis		Native			X	X	X	X													X				5
Bothriochloa spp.	Redgrass, Bluegrass	Native										X		X									X		3
Brachychiton populneus	Kurrajong	Native													X		X			X					3
Breynia oblongifolia	Coffee Bush	Native													X										1
Brunoniella australis	Blue Trumpet	Native								X					X			X	X			X	X	X	7
Bryophyllum delagoense	Mother of millions	High Threat														X	X								2
Bulbine semibarbata	Wild Onion	Native													X										1
Callitris endlicheri	Black Cypress Pine	Native						X	X												X				3
Callitris glaucophylla	White Cypress Pine	Native				X						X	X	X	X	X				X	X	X	X	X	11

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Calochilus robertsonii	Purplish Beard Orchid	Native																				X			1
Calotis cuneifolia	Purple Burr-Daisy	Native																		X					1
Calotis lappulacea	Yellow Burr-daisy	Native													X			X	X						3
Calytrix tetragona	Common Fringe-myrtle	Native	X		X				X											X	X				5
Capparis mitchellii	Native Orange	Native																X							1
Carex inversa	Knob Sedge	Native													X								X		2
Carex spp.		Native									X														1
Carthamus lanatus	Saffron Thistle	High Threat											X										X		2
Cassinia spp.		Native																						X	1
Cassytha glabella		Native	X	X	X																				3
Casuarina cristata	Belah	Native												X		X	X								3
Cenchrus ciliaris	Buffel Grass	High Threat															X								1
Centaurea spp.	Thistle	Exotic									X														1
Centaurium erythraea	Common Centaury	Exotic																					X		1
Centaurium spp.		Exotic													X										1
Chamaesyce drummondii	Caustic Weed	Native																					X		1
Cheilanthes distans	Bristly Cloak Fern	Native													X										1
Cheilanthes sieberi	Rock Fern	Native		X		X	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	18
Chenopodiaceae indeterminate	Salt-bushes	Exotic																	X						1
Chloanthes parviflora		Native	X	X	X			X	X																5
Chloris spp.		Native															X								1
Chloris truncata	Windmill Grass	Native											X										X		2

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Chloris ventricosa	Tall Chloris	Native													X	X							X		3
Chondrilla juncea	Skeleton Weed	Exotic									X														1
Chrysocephalum apiculatum	Common Everlasting	Native																		X			X		2
Chrysocephalum semipapposum	Clustered Everlasting	Native																		X	X	X			3
Cleistochloa rigida		Native	X	X	X				X																4
Commelina cyanea	Native Wandering Jew	Native													X										1
Convolvulus spp.		Native											X						X				X		3
Conyza bonariensis	Flaxleaf Fleabane	Exotic															X								1
Conyza spp.		Exotic								X			X		X										3
Corymbia trachyphloia	White Bloodwood	Native	X		X	X	X	X	X											X	X				8
Crinum flaccidum	Darling Lily	Native													X										1
Cryptandra spp.		Native																						X	1
Cymbopogon refractus	Barbed Wire Grass	Native					X			X	X	X	X	X	X	X	X			X	X	X	X	X	14
Cynodon dactylon	Common Couch	Native											X												1
Cynoglossum australe		Native													X										1
Cyperus eragrostis	Umbrella Sedge	High Threat															X								1
Cyperus fulvus	Sticky Sedge	Native																					X		1
Cyperus gracilis	Slender Flat-sedge	Native													X			X	X				X		4
Dampiera adpressa	Purple Beauty Bush	Native	X	X	X			X	X																5
Daucus glochidiatus	Native Carrot	Native													X								X		2
Denhamia cunninghamii		Native								X								X				X		X	4
Desmodium varians	Slender Tick-trefoil	Native													X										1

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Dianella revoluta	Blueberry Lily	Native								X					X						X	X		X	5
Dichanthium sericeum	Queensland Bluegrass	Native											X		X										2
Dichelachne micrantha	Shorthair Plumegrass	Native													X										1
Dichondra sp. A	Kidney Weed	Native																					X		1
Dichondra sp. Inglewood		Native									X	X	X		X									X	5
Digitaria breviglumis		Native				X																			1
Digitaria spp.		Native		X			X	X							X	X				X	X		X		8
Dodonaea falcata		Native	X		X		X	X	X																5
Dodonaea viscosa	Sticky Hop-bush	Native				X	X								X					X	X			X	6
Dodonaea viscosa subsp. angustifolia		Native																				X			1
Dodonaea viscosa subsp. mucronata		Native															X								1
Echium plantagineum	Patterson's Curse	Exotic										X													1
Echium spp.		Exotic									X														1
Einadia nutans	Climbing Saltbush	Native																	X						1
Einadia spp.		Native																				X			1
Enneapogon gracilis	Slender Nineawn	Native																					X		1
Enteropogon acicularis	Curly Windmill Grass	Native											X				X						X		3
Epaltes australis	Spreading Nut-heads	Native										X	X												2
Eragrostis alveiformis		Native											X												1
Eragrostis brownii	Brown's Lovegrass	Native								X		X		X	X	X				X	X	X			8
Eragrostis curvula	African Lovegrass	High Threat										X	X			X									3
Eragrostis lacunaria	Purple Lovegrass	Native					X			X		X		X					X	X	X		X		8

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Eragrostis leptostachya	Paddock Lovegrass	Native										X			X	X	X								4
Eragrostis megalosperma		Native								X															1
Eragrostis parviflora	Weeping Lovegrass	Native													X										1
Eragrostis spp.		Native									X		X	X	X	X		X					X		7
Eremophila mitchellii	Budda	Native																X	X						2
Eriochloa spp.		Native												X											1
Eucalyptus albens	White Box	Native																					X		1
Eucalyptus chloroclada	Dirty Gum	Native																		X	X				2
Eucalyptus crebra	Narrow-leaved Ironbark	Native																				X	X		2
Eucalyptus dealbata	Tumbledown Red Gum	Native													X										1
Eucalyptus dwyeri	Dwyer's Red Gum	Native	X	X	X		X																		4
Eucalyptus fibrosa	Red Ironbark	Native	X	X	X	X	X	X	X	X										X	X	X		X	12
Eucalyptus microcarpa	Western Grey Box	Native										X					X	X							3
Eucalyptus pilligaensis	Narrow-leaved Grey Box	Native								X						X	X	X	X			X			6
Eucalyptus spp.		Native									X		X	X											3
Euchiton sphaericus	Star Cudweed	Native													X										1
Euphorbia drummondii	Caustic Weed	Native												X											1
Evolvulus alsinoides	Bindweed	Native								X															1
Evolvulus alsinoides var. decumbens		Native													X										1
Exocarpos cupressiformis	Cherry Ballart	Native																			X				1
Exocarpos spp.		Native		X																					1
Fimbristylis spp.		Native													X										1
Gahnia aspera	Rough Saw-sedge	Native								X										X	X	X		X	5

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Gamochaeta spp.		Exotic													X										1
Geijera parviflora	Wilga	Native								X							X	X	X			X	X		6
Glandularia aristigera	Mayne's Pest	Exotic									X	X	X	X		X	X								6
Glossocardia bidens	Cobbler's Tack	Native																					X		1
Glycine clandestina	Twining glycine	Native										X								X				X	3
Glycine spp.		Native										X			X	X		X	X					X	6
Glycine tabacina	Variable Glycine	Native													X		X	X				X	X		5
Gonocarpus elatus		Native	X	X	X	X	X	X	X	X										X	X	X		X	12
Goodenia cycloptera	Cut-leaf Goodenia	Native																		X					1
Goodenia glabra	Smooth Goodenia	Native																		X					1
Goodenia rotundifolia		Native	X	X	X	X		X	X												X			X	8
Grevillea floribunda subsp. floribunda	Seven Dwarfs Grevillea	Native																			X				1
Haloragis heterophylla	Variable Raspwort	Native													X										1
Hardenbergia violacea	False Sarsaparilla	Native																			X				1
Harmogia densifolia		Native	X		X																				2
Hibbertia circumdans		Native	X	X	X				X																4
Hibbertia covenyana		Native	X		X																				2
Hibiscus sturtii	Hill Hibiscus	Native								X				X								X			3
Homoranthus flavescens		Native				X	X													X	X	X			5
Hovea apiculata		Native																			X				1
Hyparrhenia hirta	Coolatai Grass	High Threat										X													1
Hypericum gramineum	Small St John's Wort	Native													X								X		2
Hypochaeris glabra	Smooth Catsear	Exotic												X	X										2

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Hypochaeris spp.		Exotic									X														1
Indigofera adesmiifolia	Tick Indigo	Native																				X		X	2
Indigofera australis	Australian Indigo	Native																				X			1
Jasminum suavissimum		Native															X								1
Juncus spp.		Native										X													1
Leiocarpa spp.		Native																					X		1
Lepidosperma laterale	Variable Sword-sedge	Native			X																X				2
Leptochloa asthenes		Native								X					X								X		3
Lomandra filiformis		Native			X		X			X											X				4
Lomandra filiformis subsp. coriacea	Wattle Matt-rush	Native													X										1
Lomandra longifolia	Spiny-headed Mat-rush	Native															X								1
Lomandra multiflora	Many-flowered Mat-rush	Native																				X			1
Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush	Native					X			X							X			X	X			X	6
Lomandra spp.	Mat-rush	Native														X	X		X						3
Lycium ferocissimum	African Boxthorn	High Threat																	X						1
Lysimachia arvensis	Scarlet Pimpernel	Exotic									X	X	X	X	X								X		6
Macrozamia glaucophylla		Native																		X					1
Maireana enchylaenoides	Wingless Fissure-weed	Native														X	X		X				X		4
Maireana microphylla	Small-leaf Bluebush	Native											X	X		X		X							4
Marsdenia viridiflora subsp. viridiflora	Native Pear	Native																X			X				2
Medicago minima	Woolly Burr Medic	Exotic											X												1
Medicago truncatula	Barrel Medic	Exotic									X		X												2

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Melaleuca uncinata	Broombush	Native																						X	1
Melichrus erubescens	Ruby Urn Heath	Native							X																1
Melichrus urceolatus	Urn Heath	Native	X	X	X	X														X	X				6
Microlaena stipoides	Weeping Grass	Native								X					X							X			3
Micromyrtus sessilis		Native													X										1
Misopates orontium	Lesser Snapdragon	Exotic													X										1
Notelaea microcarpa	Native Olive	Native																				X	X		2
Notelaea microcarpa var. microcarpa		Native													X										1
Olearia decurrens	Clammy Daisy-bush	Native								X															1
Olearia ramulosa	Twiggy Daisy-bush	Native																			X				1
Opuntia aurantiaca	Tiger Pear	High Threat														X									1
Opuntia spp.		Exotic																X	X				X		3
Opuntia stricta	Common Prickly Pear	Exotic								X			X		X	X	X	X		X					7
Oxalis spp.		Native									X				X										2
Panicum effusum	Hairy Panic	Native										X		X	X	X	X						X		6
Panicum simile	Two-colour Panic	Native					X														X				2
Panicum spp.	Panicum	Native				X				X										X		X	X	X	6
Parsonsia eucalyptophylla	Gargaloo	Native					X											X					X		3
Paspalidium caespitosum	Brigalow Grass	Native																	X						1
Paspalidium constrictum	Knottybutt Grass	Native															X	X	X						3
Paspalidium gracile	Slender Panic	Native																X							1
Paspalidium spp.		Native				X	X			2					X	X			X	X	X	X	X	X	11
Persoonia sericea		Native	X		X																				2

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Petrorhagia dubia		Exotic										X													1
Petrorhagia nanteuilii	Proliferous Pink	Exotic													X										1
Phebalium squamulosum		Native	X		X	X	X	X	X															X	7
Philotheca ciliata		Native	X	X	X	X	X	X	X	X										X	X	X		X	12
Phyllanthus virgatus	Wiry Spurge	Native									X		X		X			X	X						5
Platysace ericoides		Native		X					X																2
Poa sieberiana	Snowgrass	Native													X										1
Poaceae indeterminate	Grasses, reeds and bamboos	Exotic									X						X	X	X				X		5
Pomax umbellata	Pomax	Native	X	X	X			X	X												X			X	7
Portulaca bicolor var. rosea		Native													X										1
Portulaca filifolia	Slender Pigweed	Native													X										1
Portulaca spp.		Native																					X		1
Prostanthera ringens	Gaping Mint-bush	Native																						X	1
Psydrax oleifolia		Native																				X			1
Rostellularia adscendens	Pink Tongues	Native																X							1
Rumex brownii	Swamp Dock	Native									X	X													2
Rytidosperma bipartitum	Wallaby Grass	Native																					X		1
Rytidosperma spp.		Native												X	X										2
Schkuhria pinnata var. abrotanoides	Dwarf Marigold	Exotic												X											1
Schoenus spp.		Native						X																	1
Sclerolaena birchii	Galvinized Burr	Native												X									X		2
Scutellaria humilis	Dwarf Skullcap	Native													X										1
Senecio spp.	Groundsel, Fireweed	Native													X							X			2

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Senna artemisioides subsp. zygophylla		Native																		X					1
Seringia collina		Native					X																		1
Setaria parviflora		Exotic										X													1
Sida corrugata	Corrugated Sida	Native												X				X	X				X		4
Sida cunninghamii	Ridge Sida	Native															X	X				X		X	4
Sida hackettiana	Golden Rod, Spiked Sida, Queensland Hemp	Native											X												1
Sida rhombifolia	Paddy's Lucerne	Exotic															X								1
Sida spinosa		Exotic									X		X										X		3
Sida spp.		Native					X			X		X			X	X		X					X		7
Sigesbeckia australiensis		Native													X										1
Solanum esuriale	Quena	Native																					X		1
Solanum ferocissimum	Spiny Potato-bush	Native				X	X			X												X		X	5
Solanum jucundum		Native				X	X			X											X	X		X	6
Solanum parvifolium subsp. parvifolium	Nightshade	Native								X						X	X	X	X	X					6
Solanum spp.		Native												X											1
Solenogyne bellioides	Solengyne	Native													X										1
Sonchus oleraceus	Common Sowthistle	Exotic									X														1
Sporobolus creber	Slender Rat's Tail Grass	Native									X	X	X	X	X	X	X						X		8
Stackhousia monogyna	Creamy Candles	Native																X							1
Stackhousia viminea	Slender Stackhousia	Native													X										1
Swainsona galegifolia	Smooth Darling Pea	Native													X										1
Themeda avenacea	Native Oatgrass	Native																		X					1

Scientific Name	Common Name	Native Exotic HTE	AMBS-1	AMBS-2	GRY-1	ROV-1	ROV-2	ROV-3	ROV-4	ROV-5	ROV-6	ROV-7	ROV-8	ROV-9	S-10	S-12	S-12-Rep	S-13	S-13-Rep	S-16	S-16-Rep	S-19-Rep	S-5	WEH-1	Grand Total
Themeda triandra		Native														X									1
Thyridolepis mitchelliana	Mulga Mitchell Grass	Native				X	X																		2
Trifolium campestre	Hop Clover	Exotic													X										1
Tripogon loliiformis	Fiveminute Grass	Native													X										1
Triptilodiscus pygmaeus	Common Sunray	Native													X										1
Tylophora linearis		Native																X				X			2
Urochloa foliosa		Native																X							1
Verbena gaudichaudii	Verbena	Native									X														1
Vernonia cinerea		Native								X												X			2
Vittadinia dissecta		Native								X										X					2
Vittadinia muelleri		Native											X		X								X		3
Vittadinia spp.	Fuzzweed	Native											X				X		X						3
Vulpia spp.	Rat's-tail Fescue	Exotic													X					X					2
Wahlenbergia communis	Tufted Bluebell	Native											X	X											2
Wahlenbergia gracilis	Sprawling Bluebell	Native											X												1
Wahlenbergia spp.	Bluebell	Native									X			X	X										3
Wurmbea dioica subsp. dioica	Early Nancy	Native																					X		1
Wurmbea spp.		Native													X										1
Grand Total			**23**																						**2**

Appendix C – *Photo Monitoring Points*

Greylands

Photo Point	Plot ID	Easting/Northing GDA 94 MGA 55	Photo bearing	Vegetation Community Represented
S12 Rep	S12 Rep	777944/6622967	West	PCT 88 Pilliga Box- White Cypress - Buloke shrubby woodland in the Brigalow Belt South Bioregion - moderate condition
		777892/6622974	East	

Floristic Monitoring Site 12 REP (S12 Rep)

(S12Rep) Start of transect- facing west (2023)

(S12Rep) End of transect – facing east (2023)

Omeo

Photo Point	Plot ID	Easting/Northing GDA 94 MGA 55	Photo bearing	Vegetation Community Represented
S13	S13	777504/6623536	West	PCT 81 Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion – moderate condition
		777455/6623552	East	
S13 Rep	S13 Rep	777518/6623447	West	PCT 81 Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion – moderate condition
		777460/6623460	East	

Floristic Monitoring Site 13 (S13)

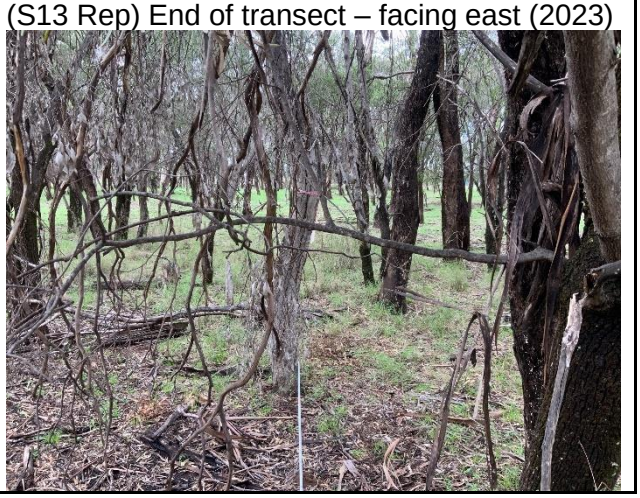
(S13) Start of transect- facing west (2023)

(S13) End of transect – facing east (2023)

Floristic Monitoring Site 13 REP (S13 Rep)

(S13 Rep) Start of transect- facing west (2023)

(S13 Rep) End of transect – facing east (2023)



Greylands Road

Photo Point	Plot ID	Easting/Northing GDA 94 MGA 55	Photo bearing	Vegetation Community Represented
S14	GRY1	772042/6622013	SW	PCT 406: White Bloodwood - Motherumbah - Red Ironbark shrubby sandstone hill woodland / open forest mainly in east Pilliga forests
		772002/6621987	NE	

Floristic Monitoring Site 14 (S14)

(S14) Start of transect- facing south-west (2023)

(S14) End of transect – facing north-east (2023)

West Haven

Photo Point	Plot ID	Easting/Northing GDA 94 MGA 55	Photo bearing	Vegetation Community Represented
S14 Rep	WEH1	772007/6620721	West	PCT 404 Red Ironbark – White Bloodwood +/- Burrows Wattle heathy woodland on sandy soil in the Pilliga forests – good condition
		771956/6620721	East	

Floristic Monitoring Site (S14 REP)

(S14 Rep) Start of transect- facing west (2023)	(S14 Rep) End of transect – facing east (2023)


BIODIVERSITY OFFSET AREA

Rosevale

Photo Point	Plot ID	Easting/Northing GDA 94 MGA 55	Photo bearing	Vegetation Community Represented
S15	ROV6	774822/6624361	NE	PCT 619 Derived Wire Grass grassland of the NSW Brigalow Belt South Bioregion and Nandewar Bioregion
		774865/ 6624384	SW	
S15 Rep	ROV7	775169/6625904	NE	PCT 619 Derived Wire Grass grassland of the NSW Brigalow Belt South Bioregion and Nandewar Bioregion
		775209/ 6625942	SW	
S16	S16	774550/6624448	West	PCT 409 Dirty (Baradine) Gum - White Bloodwood - White Cypress Pine - Motherumbah shrubby woodland on sandy soils in the Pilliga Scrub and surrounding region, Brigalow Belt South Bioregion – good condition
		774512/ 6624457	East	
S16 Rep	S16 Rep	774579/6624563	NE	PCT 401 Rough-barked Apple- Blakely's Red Gum – Black Cypress Pine woodland on sandy flats, mainly in the Pilliga Scrub region – good condition
		774610/ 6624602	SW	
S17	ROV1	774876/6625271	NW	PCT 404 Red Ironbark – White Bloodwood +/- Burrows Wattle heathy woodland on sandy soil in the Pilliga forests – good condition
		774843/ 6625302	SE	
S17 Rep	ROV2	774785/ 6624729	SW	PCT 406 White Bloodwood - Motherumbah - Red Ironbark shrubby sandstone hill woodland / open forest mainly in east Pilliga forests – good condition
		774738/ 6624717	NE	
S18	ROV3	773697/ 6625385	SE	PCT 404 Red Ironbark – White Bloodwood +/- Burrows Wattle heathy woodland on sandy soil in the Pilliga forests – moderate condition
		773739/ 6625364	NW	
S18 Rep	ROV4	773626/ 6625135	ENE	PCT 406 White Bloodwood - Motherumbah - Red Ironbark shrubby sandstone hill woodland / open forest mainly in east Pilliga forests – moderate condition
		773678/ 6625141	WSW	
S19	ROV5	774783/ 6625874	NW	PCT 404 Red Ironbark – White Bloodwood +/- Burrows Wattle heathy woodland on sandy soil in the Pilliga forests – good condition
		774748/ 6625907	SE	
S19 Rep	S19 Rep	774451/ 6625857	SE	PCT 404 Red Ironbark – White Bloodwood +/- Burrows Wattle heathy woodland on sandy soil in the Pilliga forests – good condition
		774492/ 6625835	NW	

Floristic Monitoring Site (S15)

(S15) Start of transect- facing NE (2023)

(S15) End of transect – facing SW (2023)

Floristic Monitoring Site (S15 Rep)

(S15 Rep) Start of transect- facing NE (2023)

(S15 Rep) End of transect – facing SW (2023)

Floristic Monitoring Site (S16)

(S16) Start of transect- facing west (2023)

(S16) End of transect – facing east (2023)

Floristic Monitoring Site (S16 Rep)

(S16 Rep) Start of transect- facing NE (2023)

(S16 Rep) End of transect – facing SW (2023)

Floristic Monitoring Site (S17)

(S17) Start of transect- facing NW (2023)

(S17) End of transect – facing SE (2023)

Floristic Monitoring Site (S17 Rep)

(S17 Rep) Start of transect- facing SW (2023)

(S17 Rep) End of transect – facing NE (2023)

Floristic Monitoring Site 18 (S18)

(S18) Start of transect- facing SE (2023)

(S18) End of transect – facing NW (2023)

Floristic Monitoring Site 18 Rep (S18 Rep)

(S18 Rep) Start of transect- facing ENE(2023)

(S18 Rep) End of transect – facing WSW (2023)

Floristic Monitoring Site 19 (S19)

(S19) Start of transect- facing NW (2023)

(S19) End of transect – facing SE (2023)

Floristic Monitoring Site 19 Rep (S19 Rep)

(S19 Rep) Start of transect- facing SE (2023)	(S19 Rep) End of transect – facing NW (2023)
	

Kurrajong Park

Photo Point	Plot ID	Easting/Northing GDA 94 MGA 55	Photo bearing	Vegetation Community Represented
MP1	AMBS1	772041/6621848	SSW	PCT 406 White Bloodwood - Motherumbah - Red Ironbark shrubby sandstone hill woodland / open forest mainly in east Pilliga forests
		772014/6621800	NNE	
MP2	AMBS2	772013/6621505	SSW	PCT 404 Red Ironbark - White Bloodwood +/- Burrows Wattle heathy woodland on sandy soil in the Pilliga forests
		771989/6621452	NNE	

Floristic Monitoring Site MP1

(MP1) Start of transect- facing SSW (2023)

(MP1) End of transect – facing NNE (2023)

Floristic Monitoring Site MP2

(MP2) Start of transect- facing SSW (2023)

(MP2) End of transect – facing NNE (2023)

Appendix D – *Fauna Species List*

Rosevale														
Species	**RVL-PIT-01**	**RVL-PIT-02**	**RVL-PIT-04**	**RVL-PIT-05**	**RVL-PIT-06**	**ROS-AF-01**	**ROS-AF-02**	**ROS-AF-03**	**ROS-AF-04**	**ROS-AF-05**	**ROS-AF-06**	**ROS-AF-07**	**ROS-AF-08**	**Total**
Anilios proximus					1									**1**
Carlia vivax	2													**2**
Ctenotus robustus				1	1							1		**3**
Demansia psammophis			1											**1**
Diporiphora nobbi		1	1	1	1	1	1		1					**7**
Lerista punctatovittata	1	2	5	2	2	1								**13**
Lerista timida		1		1	2	1			1		1			**7**
Limnodynastes fletcheri	2	18												**20**
Limnodynastes tasmaniensis	3	16			7									**26**
Limnodynastes terraereginae			2		2									**4**
Lygisaurus foliorum				1										**1**
Menetia greyii	2				2									**4**
Morethia boulengeri				2	1		5	2		3	1	2		**16**
Neobatrachus sudelli	2													**2**
Pseudomys pilligaensis					1									**1**
Sminthopsis murina		1												**1**
Strophurus williamsi		1	6	1	1									**9**
Amphibolurus muricatus										1				**1**
Chelodina longicollis													1	**1**
Cryptoblepharus pannosus								1						**1**
Ctenotus allotropes											1			**1**
Delma tincta											1			**1**
Egernia striolata												1		**1**
Heteronotia binoei								3			1			**4**
Litoria rubella									2			1		**3**
Pseudechis guttatus											1			**1**
Total	**12**	**40**	**15**	**9**	**21**	**3**	**6**	**6**	**4**	**4**	**6**	**5**	**1**	**132**

High Range								
Species Name	**HRA-PIT-01**	**HRA-PIT-02**	**HRA-PIT-03**	**HIR-AF-01**	**HIR-AF-02**	**HIR-AF-03**	**HIR-AF-04**	**Total**
Brachyurophis australis			1					**1**
Cryptoblepharus pannosus	1	1			1	2	3	**8**
Ctenotus allotropis			1		1			**2**
Ctenotus robustus		1	1				1	**3**
Diplodactylus vittatus	1		1					**2**
Diporiphora nobbi	2		2			1		**5**
Egernia striolata						2		**2**
Furina diadema						1		**1**
Heteronotia binoei		2	1					**3**
Lerista punctatovittata	4	3						**7**
Lerista timida	2	2	3			1		**8**
Limnodynastes terraereginae	1							**1**
Litoria rubella						3		**3**
Lygisaurus foliorum		1				8		**9**
Menetia greyii			1					**1**
Morethia boulengeri	2	1	1			2		**6**
Platyplectrum ornatum			2					**2**
Pseudomys pilligaensis		1						**1**
Strophurus williamsi		1						**1**
Tiliqua scincoides				1				**1**
Varanus gouldii		1		1				**2**
Total	**13**	**14**	**14**	**2**	**2**	**20**	**4**	**69**

Appendix E – *Surface Water Monitoring*

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
A1	24 January 2023	6308	<5	9.23	145	330	
	22 February 2023	6967	<5	9.14	19	17	
	21 March 2023	5183	6	9.19	18	27	
	18 April 2023	5544	<5	9.08	17	20	
	23 May 2023	5180	<5	9.15	12	14	
	20 June 2023	5274	<5	9.25	12	17	
	24 July 2023	4988	<5	9.04	12	10	
	23 August 2023	5644	<5	8.95	14	6	
	15 September 2023	5570	<5	8.7	11	14	
	18 October 2023	5906	<5	8.78	10	10	
	30 November 2023	5689	<5	9.07	7	5	
	12 December 2023	5770	<5	9.06	2	17	
A2	24 January 2023	45330	<5	9.66	302	74	
	22 February 2023	46230	<5	9.6	82	92	
	21 March 2023	–	–	–	–	–	Too Low to Sample
	18 April 2023	5696	6	9.19	24	59	
	23 May 2023	4773	<5	9.17	8	10	
	20 June 2023	4932	<5	9.12	10	15	
	24 July 2023	4599	6	8.75	20	19	
	23 August 2023	5565	6	8.68	19	11	
	13 September 2023	5630	<5	8.67	10	37	
	18 October 2023	6080	<5	9.02	10	10	
	30 November 2023	5262	<5	8.89	11	20	
	12 December 2023	5340	<5	8.93	8	15	
A3	24 January 2023	41900	<5	9.89	19	82	
	22 February 2023	44870	<5	9.81	66	52	
	21 March 2023	39000	<5	9.91	93	127	
	18 April 2023	–	–	–	–	–	Too Low to Sample
	23 May 2023	3966	<5	8.87	7	98	
	20 June 2023	4826	<5	8.83	22	102	
	24 July 2023	4718	21	8.48	31	58	
	23 August 2023	2724	<5	8.66	12	94	
	13 September 2023	5620	<5	8.57	9	175	
	18 October 2023	6103	<5	8.74	8	40	
	30 November 2023	5075	<5	8.98	15	28	
	12 December 2023	5280	<5	8.8	10	36	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
B1	24 January 2023	1475	<5	8.51	39	5	
	22 February 2023	1380	<5	8.41	7	5	
	21 March 2023	921	<5	8.53	11	5	
	18 April 2023	718	<5	8.48	8	5	
	24 May 2023	–	–	–	–	–	Too Low to Sample
	20 June 2023	727	<5	8.27	6	5	
	24 July 2023	820	6	8.33	5	5	
	25 July 2023	807	6	7.69	6	9	
	23 August 2023	–	–	–	–	–	Too Low to Sample
	13 September 2023	963	<5	8.23	3	5	
	18 October 2023	784	<5	7.89	6	5	
	30 November 2023	691	<5	8.26	6	5	
	12 December 2023	694	<5	8.27	6	5	
B2	24 January 2023	22210	<5	9.61	1	42	
	22 February 2023	24940	<5	9.57	67	60	
	21 March 2023	25430	10	9.63	102	175	
	18 April 2023	29110	<5	9.69	170	189	
	23 May 2023	25450	8	9.66	403	502	
	20 June 2023	26200	<5	9.79	4	69	
	24 July 2023	16190	7	9.76	1	13	
	23 August 2023	25630	<5	9.74	10	5	
	13 September 2023	23400	<5	9.71	68	6	
	18 October 2023	24260	<5	9.73	6	5	
	30 November 2023	–	–	–	–	–	Too Low to Sample
	12 December 2023	–	–	–	–	–	Too Low to Sample
Box Cut	18 January 2023	4955	80	8.77	56	376	
	14 February 2023	4533	9	8.49	32	3510	
	14 March 2023	4533	84	8.49	125	–	
	5 April 2023	3344	208	8.88	93	1250	
	17 May 2023	3760	<5	8.57	5	2000	
	14 June 2023	4310	<5	8.56	25	156	
	19 July 2023	2694	24	8.59	34	39	
	16 August 2023	3987	<5	8.51	5	320	
	5 September 2023	4560	11	8.53	18	386	
	5 September 2023	4249	19	8.52	17	1610	
	11 October 2023	6435	7	8.85	29	84500	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
	14 November 2023	4840	<5	8.58	31	228	
	13 December 2023	4060	20	8.5	1	20700	
C	24 January 2023	45200	<5	9.66	310	77	
	22 February 2023	47360	<5	9.62	71	91	
	21 March 2023	40480	12	9.67	5	534	
	18 April 2023	48710	<5	9.67	73	56	
	23 May 2023	38430	90	9.69	6070	25100	
	23 May 2023	47780	<5	9.62	61	21	
	23 May 2023	47090	<5	9.61	54	24	
	20 June 2023	48920	5	9.75	624	1790	
	24 July 2023	49730	12	9.7	1	16	
	23 August 2023	52620	<5	9.72	2460	29	
	13 September 2023	54400	<5	9.71	5090	20	
	18 October 2023	–	-	–	–	–	Too Low to Sample
	30 November 2023	30520	<5	9.75	72	43	
	12 December 2023	32000	<5	9.61	51	28	
D	24 January 2023	977	<5	8.5	42	37	
	22 February 2023	977	<5	8.21	121	72	
	21 March 2023	745	<5	8.51	62	111	
	18 April 2023	635	<5	8.58	2	164	
	23 May 2023	753	<5	8.7	7	20	
	20 June 2023	674	<5	8.61	7	46	
	24 July 2023	965	6	8.64	6	14	
	23 August 2023	1011	<5	8.6	11	7	
	13 September 2023	979	<5	7.36	5	7	
	18 October 2023	837	<5	7.93	8	26	
	30 November 2023	443	<5	8.17	9	35	
	30 November 2023	502	<5	8.84	11	32	
	12 December 2023	597	<5	8.72	3	17	
SB1	18 January 2023	11070	8	9.29	70	1410	
	14 February 2023	7008	<5	9.08	21	4190	
	14 March 2023	5186	<5	9.79	38	1280	
	5 April 2023	4337	<5	9.2	23	397	
	17 May 2023	5272	18	9.15	155	–	
	14 June 2023	6271	<5	9.09	8	956	
	19 July 2023	4580	8	9.16	27	116	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
	15 August 2023	5854	<5	8.9	6	180	
	5 September 2023	5487	8	8.94	10	82	
	11 October 2023	6136	<5	9	50	496	
	14 November 2023	5670	9	8.97	4	16800	
	12 December 2023	5620	<5	9.1	7	1770	
SB2	18 January 2023	9243	<5	9.31	20	283	
	14 February 2023	7399	<5	9.02	31	1060	
	14 March 2023	5490	<5	9.42	26	172	
	5 April 2023	4554	<5	9.35	11	57	
	17 May 2023	5255	<5	9.11	10	41	
	14 June 2023	5818	<5	9.2	10	45	
	19 July 2023	5276	<5	9.19	8	27	
	15 August 2023	5933	<5	8.97	19	111	
	5 September 2023	5832	6	8.86	18	31	
	11 October 2023	5911	<5	9.1	16	24	
	14 November 2023	5740	5	9.18	9	24	
	12 December 2023	5280	<5	9.25	9	23	
SB3	18 January 2023	8314	<5	9.27	9	26	
	14 February 2023	9490	<5	9.38	16	29	
	14 March 2023	6667	<5	9.46	36	89	
	5 April 2023	293	<5	8.48	16	64	
	17 May 2023	3795	<5	9.6	29	58	
	14 June 2023	4572	<5	9.6	32	58	
	19 July 2023	5471	<5	9.27	23	75	
	15 August 2023	7412	<5	9.33	16	37	
	5 September 2023	6778	7	9.15	21	24	
	11 October 2023	6928	<5	9.07	28	48	
	14 November 2023	8560	<5	9.35	34	33	
	12 December 2023	7930	<5	9.34	23	90	
SB4	18 January 2023	1516	<5	9.12	13	13	
	14 February 2023	2607	<5	9.18	15	28	
	14 March 2023	2387	<5	9.61	26	93	
	5 April 2023	1550	<5	9.64	16	43	
	17 May 2023	2635	<5	9.47	17	9	
	14 June 2023	2864	<5	9.4	23	18	
	19 July 2023	3299	<5	9.57	24	18	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
	15 August 2023	4028	<5	9.16	24	16	
	5 September 2023	4514	<5	9.16	–	–	
	11 October 2023	5545	<5	9.03	19	23	
	12 December 2023	5580	<5	9.32	16	19	
SD1	18 January 2023	3777	<5	9.51	21	41	
	14 February 2023	4583	<5	9.61	37	37	
	14 March 2023	4514	<5	9.68	55	62	
	5 April 2023	2026	<5	9.57	22	46	
	17 May 2023	2914	<5	9.27	30	97	
	14 June 2023	3221	<5	9.33	10	62	
	19 July 2023	3202	<5	9.65	21	35	
	15 August 2023	–	–	–	–	–	Too Low to Sample
	5 September 2023	3711	6	9.31	35	178	
	11 October 2023	4539	<5	9.15	49	34	
	14 November 2023	5620	7	9.6	34	94	
	12 December 2023	5560	<5	9.7	65	40	
SD2	18 January 2023	1773	<5	9.17	12	12	
	14 February 2023	2048	<5	9.23	9	66	
	14 March 2023	1884	<5	9.56	19	42	
	5 April 2023	1380	<5	9.52	13	16	
	17 May 2023	1719	<5	9.41	20	58	
	14 June 2023	1849	<5	9.02	21	67	
	19 July 2023	1869	<5	9.25	14	96	
	15 August 2023	2203	<5	9.07	13	113	
	5 September 2023	2350	8	8.94	22	124	
	11 October 2023	3210	<5	9.46	24	138	
	14 November 2023	5180	7	9.54	77	172	
	12 December 2023	–	–	–	–	–	Too Low to Sample
SD3	18 January 2023	845	<5	8.79	11	137	
	14 February 2023	1383	<5	8.43	20	582	
	14 March 2023	1568	<5	9.23	44	1060	
	5 April 2023	517	<5	8.16	13	21	
	17 May 2023	806	<5	8.4	15	7	
	14 June 2023	900	<5	8.06	16	7	
	19 July 2023	920	<5	9	12	5	
	15 August 2023	1107	<5	8.59	11	8	

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
	5 September 2023	1163	<5	8.91	12	12	
	11 October 2023	1465	<5	9.19	14	31	
	14 November 2023	2140	<5	9.27	25	36	
	12 December 2023	2200	<5	9.22	27	158	
SD4	18 January 2023	951	<5	8.74	8	14	
	14 February 2023	1206	<5	8.85	2	29	
	14 March 2023	1101	<5	9.17	12	30	
	5 April 2023	1035	<5	8.99	9	8	
	17 May 2023	1352	<5	8.93	9	5	
	18 May 2023	1354	<5	9	5	7	
	14 June 2023	1471	<5	8.65	10	6	
	19 July 2023	1547	<5	9.1	9	5	
	15 August 2023	1824	<5	8.7	10	8	
	5 September 2023	2068	6	9.09	12	5	
	11 October 2023	3157	<5	9.19	17	12	
	14 November 2023	3680	8	9.4	19	32	
	12 December 2023	3770	<5	9.36	20	17	
SD6	18 January 2023	585	<5	8.31	17	5	
	14 February 2023	664	<5	8.18	16	8	
	14 March 2023	597	<5	8.6	19	18	
	5 April 2023	579	<5	8.2	15	6	
	15 May 2023	698	<5	8.27	14	18	
	14 June 2023	739	<5	8.43	15	6	
	19 July 2023	747	<5	8.87	15	6	
	15 August 2023	839	<5	8.26	14	29	
	5 September 2023	833	<5	8.81	15	37	
	11 October 2023	934	<5	8.82	16	37	
	14 November 2023	998	<5	8.44	20	32	
	12 December 2023	1080	<5	8.24	22	24	
SD7	31 January 2023	433	<5	8.51	17	6270	
	14 February 2023	606	<5	8.66	2	563	
	13 March 2023	309	<5	8.51	39	1940	
	14 March 2023	482	<5	8.06	34	9030	Wet Weather Sample
	30 March 2023	349	<5	8.25	42	3350	EPL Discharge Sample
	31 March 2023	285	<5	7.68	–	–	EPL Discharge Sample
	1 April 2023	956	<5	7.62	–	–	EPL Discharge Sample

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
	2 April 2023	990	<5	7.64	–	–	EPL Discharge Sample
	5 April 2023	2586	<5	9.6	11	774	
	17 May 2023	390	<5	8.89	135	1890	
	14 June 2023	243	<5	7.73	8	170	
	19 July 2023	–	–	–	–	–	Too Low to Sample
	15 August 2023	554	<5	8.75	8	25	
	5 September 2023	634	<5	8.41	5	10	
	11 October 2023	521	<5	8.5	6	35	
	14 November 2023	2240	<5	11.95	8	118	
	12 December 2023	423	<5	8.76	10	188	
SD8	18 January 2023	185	<5	8.11	5	22	
	14 February 2023	294	<5	7.04	6	11	
	14 March 2023	184	<5	8.38	7	30	
	5 April 2023	131	<5	6.58	6	192	
	17 May 2023	201	<5	7.2	5	39	
	14 June 2023	164	<5	7.6	6	28	
	19 July 2023	370	<5	9.07	4	10	
	15 August 2023	279	<5	8.78	4	14	
	5 September 2023	495	7	9.98	8	288	
	11 October 2023	19.49	<5	11.37	1	8	
	14 November 2023	641	<5	8.98	11	72	
	12 December 2023	2660	<5	10.79	8	69	
NRUS	24 January 2023	373	<5	7.19	8	79	
	22 February 2023	430	<5	7.62	7	40	
	20 March 2023	404	<5	7.2	9	42	
	18 April 2023	659	<5	7.04	6	46	
	23 May 2023	1046	<5	9.38	6	36	
	20 June 2023	873	<5	7.63	2	34	
	25 July 2023	936	<5	8.26	5	22	
	5 September 2023	1050	<5	8.23	6	54	
	4 October 2023	404	<5	8.11	7	46	
	7 November 2023	707	<5	7.35	7	50	
	6 December 2023	732	<5	8.35	5	32	

Appendix F – *Groundwater Monitoring*

Site ID	Date	Depth to Water - mbgl	Depth to Stand - mbtoc	Field Parameters			Total Metals																			Dissolved Metals																			pH Lab	EC - Lab - µs/cm	Major Cations (dissolved)				Total Cations - meq/L	Major Anions						Total Anions - meq/L	Ionic Balance	Ammonia as Nitrogen (N)	Nitrite as N - mg/L	Nitrate as N - mg/L	NOX as N - mg/L	Total Dissolved Solids mg/L	Total Suspended Solids mg/L	Free Cyanide mg/L	Total Cyanide mg/L	Weak Acid Dissociable Cyanide mg/L	Fluoride mg/L	Comments
				pH - Field	EC - Field - µs/cm	Temp - Field - °C	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (mg/L)	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Silver (Ag) - mg/L	Strontium (Sr) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L	Mercury (Hg) - mg/L	Aluminium (Al) - mg/L	Arsenic (As) - mg/L	Beryllium (Be) - mg/L	Barium (Ba) - mg/L	Cadmium (Cd) - mg/L	Chromium (Cr) - mg/L	Cobalt (Co) - mg/L	Copper (Cu) - mg/L	Lead (Pb) - mg/L	Manganese (Mn) - mg/L	Nickel (Ni) - mg/L	Selenium (Se) - mg/L	Silver (Ag) - mg/L	Strontium (Sr) - mg/L	Vanadium (V) - mg/L	Zinc (Zn) - mg/L	Boron (B) - mg/L	Iron (Fe) - mg/L	Mercury (Hg) - mg/L			Calcium (Ca) - mg/L	Magnesium (Mg) - mg/L	Sodium (Na) - mg/L	Potassium (K) - mg/L		Chloride (Cl) - mg/L	Sulfate (SO4) - mg/L	Hydroxide Alkalinity as CaCO3 - mg/L	Carbonate Alkalinity as CaCO3 - mg/L	Bicarbonate Alkalinity as CaCO3 - mg/L	Alkalinity - mg/L													
ANZECC Guideline - Stock Drinking Water							5	0.5			0.01	1	1	1	0.1		1					20			0.002	5	0.5				1	1	1	0.1		1					20			0.002			1000																							
P1	16-Mar-23	20.98	21.98	7.12	4520	26.2																																																															
P1	22-Jun-23	20.94	21.94	7.26	4500	15.6																																																															
P1	25-Sep-23	21.31	22.31	7.68	4610	23.2	0.88	0.021	<0.001	0.879	<0.0001	0.006	0.003	0.01	0.008	0.821	0.03	<0.01	----	----	<0.01	0.053	0.18	5.04	<0.0001	<0.01	0.018	----	0.859	----	<0.001	0.001	<0.001	<0.001	0.832	0.006	<0.01	<0.001	2.14	----	<0.005	0.17	2.15	<0.0001	7.26	4340	32	37	998	28	48.8	711	<10	<1	<1	1530	1530	50.6	1.87	10.6	0.04	0.01	0.05	2600	109	<0.004	<0.004	<0.004	0.2	
P1	18-Dec-23	20.75	21.75	7.37	4060	31.1																																																															
P2	16-Mar-23	27.9	28.82	6.28	19690	25.8																																																															
P2	21-Jun-23	27.9	28.82	6.36	20540	19																																																															
P2	25-Sep-23	27.98	28.9	6.98	17310	28.9	3.24	0.003	<0.001	0.857	0.0001	0.007	0.013	0.022	0.006	1.41	0.026	<0.01	----	----	0.02	0.035	0.28	7.27	<0.0001	<0.01	0.001	----	0.276	----	0.001	0.009	<0.001	<0.001	1.24	0.02	<0.01	<0.001	3.78	----	0.028	0.28	0.39	<0.0001	6.72	21400	175	419	4020	86	220	5560	361	<1	<1	3210	3210	228	1.83	3.91	<0.01	0.02	0.02	12300	1000	<0.004	<0.004	<0.004	1.2	
P2	18-Dec-23	27.94	28.86	6.66	19500	25.3																																																															
P3	16-Mar-23	10.01	10.95	6.37	17930	24.3																																																															
P3	23-Jun-23	10.03	10.97	6.45	18540	19.1																																																															
P3	26-Sep-23	10.03	10.97	6.09	13560	22.8	1.56	0.002	<0.001	0.193	0.0011	0.004	0.005	0.01	0.004	0.097	0.014	<0.01	----	----	<0.01	0.06	0.14	2.78	0.0008	<0.01	<0.001	----	0.047	----	<0.001	0.005	<0.001	<0.001	0.094	0.01	<0.01	<0.001	9.45	----	0.009	0.14	0.49	<0.0001	6.61	19200	313	480	3240	43	197	5590	1300	<1	<1	1420	1420	213	3.89	0.68	<0.01	0.11	0.11	11700	182	<0.004	<0.004	<0.004	0.9	
P3	28-Dec-23	9.97	10.91	6.73	17250	27.7																																																																
P4	17-Mar-23	14.95	15.82	6.09		25.6																																																																
P4	20-Jun-23	17.08	17.95	6.41	28800	14.6																																																															
P4	25-Sep-23	17.19	18.06	6.87	24300	24.6	0.98	0.004	<0.001	0.249	<0.0001	0.01	0.014	0.022	0.01	1.31	0.032	<0.01	----	----	<0.01	0.056	0.22	5.55	<0.0001	<0.01	0.003	----	0.066	----	0.002	0.011	<0.001	<0.001	1.3	0.019	<0.01	<0.001	5.35	----	0.015	0.22	2.02	<0.0001	6.54	27200	245	645	5190	99	294	7240	1830	<1	<1	2360	2360	289	0.7	1.42	<0.01	0.05	0.05	16100	88	<0.004	<0.004	<0.004	1	
P4	15-Dec-23	17.22	18.09	6.54	24800	24																																																															
P5	17-Mar-23	21.84	22.76	6.24		26.4																																																															
P5	20-Jun-23	21.99	22.91	6.5	29900	12.6																																																														
P5	25-Sep-23	21.69	22.61	6.99	25200	26.6	0.91	0.008	<0.001	0.258	<0.0001	0.005	0.021	0.013	0.006	2.14	0.027	<0.01	----	----	<0.01	0.05	0.19	7.23	<0.0001	<0.01	0.004	----	0.15	----	0.002	0.007	<0.001	<0.001	2.14	0.011	<0.01	<0.001	6.78	----	<0.005	0.2	1.4	<0.0001	6.66	28100	241	547	5410	85	294	7730	744	<1	<1	2380	2380	281	2.34	4.98	<0.01	<0.01	<0.01	16300	267	<0.004	<0.004	<0.004	1	
P5	15-Dec-23	21.72	22.64	6.67	25800	26.5																																																															
P6	15-Mar-23	Dry	Dry																																																																			
P6	21-Jun-23	Dry	Dry																																																																			
P6	22-Sep-23	Dry	Dry																																																																			
P6	16-Jan-24	Dry	Dry																																																																			
P7	15-Mar-23	63.22	64.14	4.77	126	24																																																															
P7	21-Jun-23	63.23	64.15	5.27	120.9	17.2																																																															
P7	22-Sep-23	63.2	64.12	4.42	117.4	22.1	<0.01	<0.001	<0.001	0.029	<0.0001	0.009	0.002	<0.001	<0.001	0.002	0.006	<0.01	----	----	<0.01	0.009	<0.05	<0.05	<0.0001	<0.01	<0.001	----	0.03	----	0.008	0.002	0.001	<0.001	0.004	0.007	<0.01	<0.001	0.012	----	0.011	<0.05	<0.05	<0.0001	5.54	130	<1	2	26	3	1.37	26	4	<1	<1	19	19	1.2	6.85	<0.01	0.06	0.06	0.12	97	14	<0.004	<0.004	<0.004	<0.1	
P7	16-Jan-24	63.21	64.13	5.15	120.9	24.7																																																															
P8	15-Mar-23	50.64	51.47	6.96	952	22.6																																																															
P8	21-Jun-23	50.72	51.55	7.07	1026	11																																																															
P8	22-Sep-23	50.72	51.55	6.89	1013	22.2	6.03	0.003	<0.001	0.98	0.0002	0.006	0.006	0.02	0.012	0.324	0.009	<0.01	----	----	0.02	0.044	<0.05	6.5	<0.0001	<0.01	0.001	----	0.785	----	<0.001	<0.001	<0.001	<0.001	0.248	0.002	<0.01	<0.001	1.1	----	<0.005	<0.05	0.14	<0.0001	7.23	987	41	10	171	13	10.6	139	6	<1	<1	362	362	11.3	2.92	0.22	<0.01	0.01	0.01	618	712	<0.004	<0.004	<0.004	0.1	
P8	16-Jan-24	52.67	53.5	7.22	847	24																																																															
P9	14-Mar-23	26.69	27.3	7	20790	24.6																																																															
P9	20-Jun-23	17.29	17.9	6.57	22660	17.9																																																															
P9	22-Sep-23	26.57	27.18	6.47	19770	22.9	0.03	<0.001	<0.001	0.023	<0.0001	0.001	<0.001	0.001	<0.001	0.109	0.005	<0.01	----	----	<0.01	0.008	0.17	3.83	<0.0001	<0.01	<0.001	----	0.024	----	<0.001	<0.001	<0.001	<0.001	0.114	0.004	<0.01	<0.001	15.4	----	<0.005	0.17	3.97	<0.0001	6.74	21500	346	464	3860	51	225	5870	1870	<1	<1	690	690	218	1.43	1.48	<0.01	<0.01	<0.01	13200	18	<0.004	<0.004	<0.004	<0.1	
P9	14-Dec-23	26.3	26.91	6.78	20910	24.4																																																															
P10	16-Mar-23	19.46	20.51	6.49	16010	25.1																																																													H2S Odour
P10	22-Jun-23	18.96	20.01	6.83	16060	17.6																																																														
P10	25-Sep-23	22.31	23.36	7.27	15530	19.9	<0.01	<0.001	<0.001	0.099	<0.0001	<0.001	<0.001	0.004	<0.001	1.49	0.004	<0.01	----	----	<0.01	0.023	0.05	2.06	<0.0001	<0.01	<0.001	----	0.105	----	<0.001	<0.001	<0.001	<0.001	1.57	0.004	<0.01	<0.001	10.1	----	<0.005	0.06	1.52	<0.0001	6.85	16600	318	325	2910	49	170	4650	850	<1	<1	1060	1060	170	0.12	1.3	<0.01	0.01	0.01	9820	7	<0.004	<0.004	<0.004	<0.1	
P10	18-Dec-23	24.51	25.56	6.97	15380	24.1																																																															
P11	16-Mar-23	33.42	34.46	6.55	6990	20.8																																																															
P11	22-Jun-23	34.07	35.11	6.75	7360	18.3																																																															
P11	25-Sep-23	34.01	35.05	6.7	6930	20.4	0.37	0.006	<0.001	0.536	<0.0001	0.001	0.013	0.005	0.002	9.2	0.158	<0.01	----	----	<0.01	0.012	<0.05	2.4	<0.0001	<0.01	0.006	----	0.56	----	<0.001	0.013	<0.001	<0.001	9.67	0.164	<0.01	<0.001	3.12	----	0.007	<0.05	2.01	<0.0001	6.79	6670	276	115	1040	8	68.7	2270	6	<1	<1	311	311	70.4	1.22	0.29	<0.01	<0.01	<0.01	4410	24	<0.004	<0.004	<0.004	<0.1	
P11	18-Dec-23	34.21	35.25	6.82	6960	26.7																																																															
P12	14-Mar-23	44.63	45.38	7.47	3070	23.1																																																															
P12	21-Jun-23	44.95	45.7	7.45	3030	18.6																																																															
P12	25-Sep-23	45.37	46.12	8.05	2990	20.4	<0.01	0.013	<0.001	0.072	<0.0001	<0.001	0.003	0.003	<0.001	0.603	0.03	<0.01	----	----	<0.01	<0.005	0.14	0.59	<0.0001	<0.01	0.013	----	0.072	----	<0.001	0.003	<0.001	<0.001	0.609	0.031	<0.01	<0.001	0.35	----	0.006	0.15	0.43	<0.0001	7.66	3010	26	14	696	9	33	401	16	<1	<1	1120	1120	34	1.6	0.87	<0.01	<0.01	<0.01	1850	<5	<0.004	<0.004	<0.004	4	
P12	18-Dec-23	45	45.75	7.6	3020	26.2																																																															
P13	14-Mar-23	8.58	9.44	7.5	2429	23.3																																																															
P13	21-Jun-23	9.71	10.57	6.97	2470	20.1																																																															
P13	25-Sep-23	10.68	11.54	7.6	2184	22	2.18	0.001	<0.001	0.105	<0.0001	0.011	0.01	0.008	0.008	0.276	0.013	<0.01	----	----	0.01	0.019	0.07	3.14	<0.0001	<0.01	<0.001	----	0.078	----	<0.001	<0.001	<0.001	<0.001	0.004	0.002	<0.01	<0.001	1.3	----	<0.005	0.06	<0.05	<0.0001	7.28	2350	84	145	221	3	25.8	456	112	<1	<1	623	623	27.6	3.42	0.04	0.06	2.68	2.74	1310	108	<0.004	<0.004	<0.004	0.3	
P13	18-Dec-23	11.46	12.32	7.47	2222	24.2																																																															
P16	15-Mar-23	92.00	92.79	6.86	4500	26.8																																																															
P16	21-Jun-23	93.30	94.09																																																																		Pump Issue
P16	22-Sep-23	93.83	94.62																																																																		Pump Issue
P16	16-Jan-24	94.74	95.53	7.07	3770	25.8																																																															
P17	15-Mar-23	Dry	Dry																																																																			
P17	21-Jun-23	Dry	Dry																																																																			
P17	22-Sep-23	Dry	Dry																																																																			
P17	16-Jan-24	Dry	Dry																																																																			
P19	16-Mar-23	134.87	135.33	6.54	12240	21.5																																																															
P19	22-Jun-23	134.71	135.17	6.72	13750	13.2																																																															
P19	21-Sep-23	135.06	135.52	6.75	9730	28.2	0.43	0.006	<0.001	4.69	<0.0001	0.021	0.022	0.047	**0.127**	0.04	0.05	<0.01	----	----	<0.01	2.48	0.38	2.02	<0.0001	<0.01	<0.001	----	4.14	----	0.002	<0.001	<0.001	<0.001	0.014	0.012	<0.01	<0.001	9.52	----	<0.005	0.07	0.07	<0.0001	7.03	12700	105	170	2850	111	146	494	<10	<1	<1	7920	7920	172	8.21	8.63	0.33	<0.01	<0.01	7580	118	<0.004	<0.004	<0.004	1.5	
P19	14-Dec-23	134.85	135.31	7	12200	25.3																																																															
P28	14-Mar-23	Dry	Dry																																																																			
P28	19-Jun-23	Dry	Dry																																																																			
P28	22-Sep-23	Dry	Dry																																																																			
P28	15-Dec-23	Dry	Dry																																																																			
P29	15-Mar-23	3.79	4.63	7.81	15640	20.5																																			7.96	14500	102	246	3090	8	160	5230	624	<1	<1	618	618	173	3.88					9610						
P29	23-Jun-23	3.62	4.46	7.08	15480	17.6																																			7.22	16100	120	262	3010	4	158	4680	638	<1	<1	658	658	158	0.04					8820	<5					
P29	26-Sep-23	3.49	4.33	6.77	11650	24.1	0.22	0.001	<0.001	0.16	<0.0001	0.007	<0.001	0.008	<0.001	0.018	0.007	0.02	----	----	<0.01	0.03	<0.05	0.42	0.0003	<0.01	0.001	----	0.157	----	<0.001	<0.001	0.014	<0.001	0.014	0.004	0.02	<0.001	4.94	----	0.043	<0.05	<0.05	0.0002	7.30	17900	135	306	3170	8	170	5670	650	<1	<1	670	670	187	4.72	0.01	<0.01	6.94	6.94	10600	<5	<0.004	<0.004	<0.004	1.8	
P29	22-Dec-23	3.65	4.49	7.1	15160	18.8																																			7.28	15200	106	267	3180	5	166	5040	637	<1	<1	649	649	168	0.8					10200	7					
P30	15-Mar-23	11.94	12.68	6.89	17350	21.8																																			7.17	16500	144	369	3370	18	185	5610	1160	<1	<1	820	820	199	3.7					11300						
P30	23-Jun-23	11.71	12.45	6.94	18990	16.5																																			7.08	18300	152	350	3080	16	171	4990	1080	<1	<1	841	841	180	2.64					9140	14					
P30	26-Sep-23	11.58	12.32	6.64	13880	20.6	1.1	0.002	<0.001	0.1	<0.0001	0.004	<0.001	0.01	0.004	0.033	0.003	<0.01	----	----	<0.01	0.024	0.06	1.6	<0.0001	<0.01	<0.001	----	0.045	----	0.001	<0.001	0.004	<0.001	0.007	0.002	<0.01	<0.001	5.7	----	0.016	0.05	<0.05	<0.0001	7.11	18400	148	376	3270	18	181	5430	1250	<1	<1	862	862	196	4.08	<0.10	<0.01	8.21	8.21	10700	137	<0.004	<0.004	<0.004	0.8	
P30	22-Dec-23	11.46	12.2	6.91	16770	20.4																																			7.18	16700	139	382	3460	19	189	5340	1100	<1	<1	798	798	189	0.03					11800	6					
P31	15-Mar-23	15.69	16.61	7.26	7120	21.2																																			7.38	6470	89	162	1240	13	72	1710	344	<1	<1	825	825	71.9	0.11					4160						
P31	23-Jun-23	15.64	16.56	7.11	7440	16.7																																			7.34	7440	98	168	1220	12	72.1	1590	309	<1	<1	840	840	68.1	2.87					4000	28					
P31	26-Sep-23	15.65	16.57	6.24	6240	21.3	0.05	<0.001	<0.001	0.073	<0.0001	<0.001	<0.001	0.004	0.002	0.033	0.002	<0.01	----	----	<0.01	0.011	<0.05	0.16	<0.0001	<0.01	<0.001	----	0.073	----	<0.001	<0.001	0.002	<0.001	0.021	0.002	<0.01	<0.001	2.55	----	0.009	<0.05	<0.05	<0.0001	7.30	7310	96	170	1210	13	71.7	1680	345	<1	<1	872	872	72	0.17	<0.01	<0.01	8.81	8.81	3990	35	<0.004	<0.004	<0.004	1.6	
P31	22-Dec-23	15.57	16.49	7.11	6850	20.6																																			7.40	6860	84	166	1300	13	74.7	1710	333	<1	<1	791	791	71	2.58					4050	<5					
P32	15-Mar-23	6.6	7.54	8.3	1902	21.3																																			8.45	1710	<1	3	487	<1	21.4	73	57	<1	31	835	866	20.5	2.1					1140						
P32	23-Jun-23	6.84	7.78	8.32	1918	16.7																																			8.44	1860	<1	3	456	<1	20.1	59	51	<1	44	845	888	20.5	0.95					1090	44					
P32	26-Sep-23	7.98	8.92	7.89	1770	21.1	0.83	0.002	<0.001	0.015	<0.0001	0.003	0.001	0.007	0.006	0.019	0.002	<0.01	----	----	0.04	0.015	<0.05	0.62	<0.0001	<0.01	0.003	----	0.008	----	0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.01	<0.001	0.056	----	0.006	<0.05	<0.05	<0.0001	8.43	1880	1	5	484	<1	21.5	59	64	<1	59	865	924	21.4	0.13	<0.01	<0.01	1.38	1.38	1170	92	<0.004	<0.004	<0.004	4.8	
P32	22-Dec-23	7.19	8.13	8.21	1832	19.8																																			8.38	1810	<1	2	478	<1	21	162	88	<1	35	612	648	19.3	3.99					1220	13					
P33	14-Mar-23	Dry	Dry																																																																			
P33	23-Jun-23	N/A	14.68																																																																	Too Low to Sample
P33	22-Sep-23	Dry	Dry																																																																			
P33	22-Dec-23	N/A	10.6	7.35	1614	20																																			7.59	1580	2	3	359	1	16	351	103	<1	<1	204	204	16.1	0.42					1150	145					
P34	14-Mar-23	Dry	Dry																																																																			
P34	19-Jun-23	Dry	Dry																																																																			
P34	22-Sep-23	Dry	Dry																																																																			
P34	15-Dec-23	Dry	Dry																																																																			
P39A	16-Mar-23	5.35	6.35	6.87	7860	25.2																																																															
P39A	20-Jun-23	6.49	7.49	7.26	7580	16.9																																																															
P39A	26-Sep-23	5.19	6.19	6.52	7340	23.9	0.02	<0.001	<0.001	0.068	<0.0001	<0.001	<0.001	0.002	<0.001	0.384	0.002	<0.01	----	----	<0.01	<0.005	<0.05	1.47	<0.0001	<0.01	<0.001	----	0.072	----	<0.001	<0.001	<0.001	<0.001	0.395	<0.001	<0.01	<0.001	3.94	----	<0.005	<0.05	0.43	<0.0001	7.24	7970	119	116	1430	29	78.4	1920	376	<1	<1	716	716	76.3	1.38	0.35	<0.01	0.02	0.02	4340	16	<0.004	<0.004	<0.004	0.8	
P39A	28-Dec-23	5.17	6.17	7.11	7430	26.8																																																															
P39B	16-Mar-23	4.89	5.96	6.88	12850	35.9																																																															
P39B	20-Jun-23	5.12	6.19	7.21	13770	17.2																																																															
P39B	26-Sep-23	5.3	6.37	6.64	7740	27.6	16.2	0.006	0.005	0.243	0.0001	0.046	0.177	0.017	0.02	4.84	0.078	0.02	----	----	0.15	0.051	0.06	13.3	<0.0001	<0.01	<0.001	----	0.053	----	<0.001	0.018	<0.001	<0.001	1.08	0.008	0.01	<0.001	5.67	----	<0.005	0.05	<0.05	<0.0001	7.20	13800	212	318	2520	12	147	3360	1840	<1	<1	1120	1120	155	2.91	0.15	0.03	0.95	0.98	8470	10000	<0.004	<0.004	<0.004	0.8	
P39B	28-Dec-23	5.21	6.28	7.03	11740	21.3																																																															
P43	16-Mar-23	8.45	9.41	7.07	11810	22.7																																																															
P43	20-Jun-23	7.71	8.67	7.11	13860	15.6																																																															
P43	26-Sep-23	7.73	8.69	6.65	5820	25.9	0.18	0.001	<0.001	0.133	<0.0001	0.004	<0.001	<0.001	<0.001	2.26	0.008	<0.01	----	----	<0.01	0.007	0.13	1.6	<0.0001	<0.01	0.001	----	0.135	----	0.001	<0.001	<0.001	<0.001	2.31	0.004	<0.01	<0.001	5.15	----	<0.005	0.12	0.88	<0.0001	7.20	12400	120	211	2100	37	116	3680	366	<1	<1	845	845	128	5.19	5.17	<0.01	<0.01	<0.01	6610	24	<0.004	<0.004	<0.004	1.2	
P43	28-Dec-23	7.77	8.73	7.13	11630	22																																																															
P47	14-Mar-23	23.62	24.6	7.24	5800	24.6																																																															
P47	22-Jun-23	23.55	24.53	7.07	7520	13.6																																																															
P47	21-Sep-23	23.5	24.48	6.85	5220	25.2	3.82	0.002	<0.001	0.086	<0.0001	0.022	0.013	0.015	0.004	0.142	0.045	<0.01	----	----	0.02	0.025	0.17	7.89	<0.0001	<0.01	0.001	----	0.04	----	<0.001	0.005	<0.001	<0.001	0.064	0.017	<0.01	<0.001	0.993	----	<0.005	0.16	0.87	<0.0001	7.09	6460	34	124	1260	40	67.7	954	428	<1	<1	1600	1600	67.8	0.04	0.42	<0.01	<0.01	<0.01	3820	551	<0.004	<0.004	<0.004	0.6	
P47	14-Dec-23	23.48	24.46	7.03	5940	26.4																																																															
P51	16-Mar-23	5.25	5.85	7.36	19540	21.7																																																															
P51	20-Jun-23	4.96	5.56	7.15	2010	20.3																																																															
P51	21-Sep-23	4.77	5.37	7.14	16160	23.1	0.18	0.002	<0.001	0.052	<0.0001	0.004	<0.001	0.001	<0.001	0.063	0.019	<0.01	----	----	<0.01	0.022	<0.05	0.34	<0.0001	<0.01	0.002	----	0.051	----	0.002	<0.001	<0.001	<0.001	0.057	0.017	<0.01	<0.001	5.06	----	<0.005	<0.05	0.16	<0.0001	7.42	20600	37	461	3800	12	205	6500	803	<1	<1	856	856	217	2.79	<0.10	<0.01	0.02	0.02	13300	24	<0.004	<0.004	<0.004	1	
P51	14-Dec-23	4.7	5.3	7.48	18680	24.5																																																															
P52	16-Mar-23	4.73	5.24	7.1	2072	22																																																															
P52	20-Jun-23	5.23	5.74	7.24	2090	19.9																																																															
P52	21-Sep-23	5.76	6.27	7.09	1574	23.7	0.24	0.002	<0.001	0.173	<0.0001	0.004	0.006	0.005	0.001	0.406	0.026	<0.01	----	----	<0.01	0.03	<0.05	1.38	<0.0001	<0.01	0.001	----	0.164	----	<0.001	0.001	<0.001	<0.001	0.398	0.008	<0.01	<0.001	1.52	----	0.014	<0.05	0.45	<0.0001	7.30	2060	105	108	224	9	24.1	303	78	<1	<1	646	646	23.1	2.17	2.34	<0.01	<0.01	<0.01	1130	25	<0.004	<0.004	<0.004	0.7	
P52	14-Dec-23	6.22	6.73	7.43	2076	22.9																																																															
P53	16-Mar-23	6.37	6.88	7.38	1208	22.9																																																															
P53	20-Jun-23	7.12	7.63	7.21	1739	19.1																																																															
P53	21-Sep-23	7.76	8.27	7.05	1324	24.5	0.54	<0.001	<0.001	0.2	<0.0001	0.004	0.004	0.003	<0.001	0.068	0.007	<0.01	----	----	<0.01	0.023	0.06	0.72	<0.0001	<0.01	<0.001	----	0.201	----	<0.001	<0.001	<0.001	<0.001	0.008	0.005	<0.01	<0.001	1.31	----	0.012	0.06	<0.05	<0.0001	7.40	1560	92	82	132	5	17.2	222	40	<1	<1	517	517	17.4	0.62	<0.01	<0.01	2.53	2.53	881	21	<0.004	<0.004	<0.004	0.7	
P53	14-Dec-23	8.31	8.82	7.66	1192	23																																																															
P58	14-Mar-23	17.77	18.17	7.11	11360	24.7																																			7.27	11000	38	71	3160	78	147	1570	124	<1	<1	4670	4670	140	2.44					7780						
P58	23-Jun-23	24.12	24.52	6.88	11480	15.2																																			7.10	12300	15	59	3270	74	150	1380	88	<1	<1	5030	5030	141	2.91					7570	1060					
P58	26-Sep-23	19.93	20.33	6.5	10260	24	12.8	0.008	0.002	0.711	0.0002	0.138	0.016	0.1	0.02	1.09	0.093	<0.01	----	----	0.05	0.151	0.35	17	<0.0001	<0.01	0.005	----	0.425	----	0.001	0.003	0.004	<0.001	0.38	0.008	<0.01	<0.001	1.7	----	0.015	0.37	<0.05	<0.0001	6.97	12300	36	71	3000	80	140	1500	129	<1	<1	5110	5110	147	2.41	6.54	0.01	0.01	0.02	8150	2780	<0.004	<0.004	<0.004	0.7	
P58	22-Dec-23	19.2	19.6	7.36	11440	21.5																																			7.72	11500	29	65	3180	80	147	1800	131	<1	<1	4220	4220	138	3.28					8120	37					
P83	15-Mar-23	Dry	Dry																																																																			
P83	20-Jun-23	Dry	Dry																																																																			
P83	29-Jun-23	Dry	Dry																																																																			
P83	24-Jul-23	Dry	Dry																																																																			
P83	17-May-23	Dry	Dry																																																																			
P83	21-Sep-23	Dry	Dry																																																																			
P83	06-Nov-23	Dry	Dry																																																																			
P83	27-Nov-23	Dry	Dry																																																																			
P83	14-Dec-23	Dry	Dry																																																																			
P84	15-Mar-23		13.7	6.74	21260	24.7																																																														
P84	20-Jun-23		13.14	6.85	22440	20.4																																																															
P84	29-Jun-23		13.82	6.88	21390	13.5	0.89	0.002	<0.001	0.119	<0.0001	0.003	0.017	0.009	0.003	1.1	0.023	<0.01	<0.001	4.42	0.01	0.077	0.07	1.16	<0.0001	<0.01	0.002		0.107		<0.001	0.016	0.001	<0.001	1.02	0.021	<0.01	<0.001	4.49		0.052	0.1	0.08	<0.0001	7.23	21500	80	352	4380	34	224	6060	981	<1	<1	2330	2330	238	2.94	0.26	<0.01	0.49	0.49	13200	75	<0.004	<0.004	<0.004	0.9	
P84	24-Jul-23		13.76	6.72	21660	18	0.45	0.002	<0.001	0.115	<0.0001	0.002	0.017	0.004	0.002	1.08	0.022	<0.01	<0.001	4.35	<0.01	0.05	0.07	0.56	<0.0001	<0.01	0.002	<0.001	0.103	<0.0001	<0.001	0.016	<0.001	<0.001	1.04	0.021	<0.01	<0.001	4.52	<0.01	0.037	0.07	0.13	<0.0001	6.93	19400	87	392	4810	36	247	6280	1160	<1	<1	2400	2400	249	0.5	0.4	<0.01	0.36	0.36	14200	84	<0.004	<0.004	<0.004	0.9	
P84	17-Aug-23		13.73	6.98	20610	25.9	<0.01	0.002	<0.001	0.108	<0.0001	<0.001	0.015	0.001	<0.001	1.05	0.02	<0.01	<0.001	4.78	<0.01	0.059	<0.05	0.17	<0.0001	0.85	0.003	<0.001	0.113	0.0001	0.004	0.016	0.011	0.002	1.11	0.023	<0.01	<0.001	4.77	<0.01	0.049	0.09	1.21	<0.0001	6.98	21600	106	405	4990	38	257	6020	1130	<1	<1	2490	2490	243	2.71	0.33	0.06	0.24	0.3	13100	48	<0.020	<0.020	<0.020	0.8	
P84	21-Sep-23		13.65	6.67	11510	26.1	0.29	0.002	<0.001	0.092	<0.0001	0.002	0.015	0.002	<0.001	1.04	0.018	<0.01	<0.001	4.41	<0.01	0.029	0.06	0.85	<0.0001	<0.01	0.002	<0.001	0.097	<0.0001	<0.001	0.016	<0.001	<0.001	1.09	0.019	<0.01	<0.001	4.83	<0.01	0.024	0.06	0.45	<0.0001	6.95	22700	90	392	4600	36	238	5710	1140	<1	<1	2530	2530	235	0.51	<0.10	0.04	0.34	0.38	13900	50	<0.004	<0.004	<0.004	0.9	
P84	06-Nov-23		13.64	6.74	21010	23.1	0.8	0.002	<0.001	0.106	<0.0001	0.005	0.018	0.008	0.002	1.22	0.02	<0.01	<0.001	4.66	<0.01	0.056	0.09	1.4	<0.0001	0.01	0.001	<0.001	0.103	<0.0001	<0.001	0.017	<0.001	<0.001	1.27	0.02	<0.01	<0.001	4.76	<0.01	0.045	0.06	0.36	<0.0001	7.04	22000	96	413	4880	37	252	5740	1280	<1	<1	2800	2800	244	1.51	0.27	<0.01	0.14	0.14	13900	29	<0.004	<0.004	<0.004	0.9	
P84	27-Nov-23		13.61	6.81	21550	21.7	0.12	0.002	<0.001	0.101	0.0001	0.002	0.016	0.006	0.001	1.18	0.021	<0.01	<0.001	4.54	<0.01	0.062	0.08	0.6	<0.0001	<0.01	0.002	<0.001	0.104	0.0002	<0.001	0.016	0.002	<0.001	1.19	0.02	<0.01	<0.001	4.46	<0.01	0.045	0.12	<0.05	<0.0001	6.99	22600	84	375	4530	39	233	5720	1070	<1	<1	2480	2480	233	0.02	0.25	0.01	0.42	0.43	13500	46	<0.004	<0.004	<0.004	0.8	
P84	14-Dec-23		13.62	6.94	18270	27.5	0.39	0.003	<0.001	0.107	<0.0001	0.004	0.02	0.003	0.002	1.39	0.021	<0.01	<0.001	4.94	<0.01	0.048	0.08	1.04	<0.0001	0.01	0.002	<0.001	0.09	<0.0001	<0.001	0.016	0.003	<0.001	1.25	0.016	<0.01	<0.001	4.18	<0.01	0.03	0.06	0.29	<0.0001	6.88	22200	92	409	4730	36		5580	1090	<1	<1	2620	2620			0.98	0.04	1.55	1.59	14300	32	<0.004	<0.004	<0.004	0.9	
P85	15-Mar-23	Dry	Dry																																																																			
P85	20-Jun-23	Dry	Dry																																																																			
P85	29-Jun-23	Dry	Dry																																																																			
P85	24-Jul-23	Dry	Dry																																																																			
P85	17-Aug-23	Dry	Dry																																																																			
P85	21-Sep-23	Dry	Dry																																																																			
P85	06-Nov-23	N/A	10.8																																																																	Too Low to Sample
P85	27-Nov-23	N/A	10.8																																																																	Too Low to Sample
P85	14-Dec-23	Dry	Dry																																																																			
P88	20-Jun-23	Dry	Dry																																																																			
P88	29-Jun-23	Dry	Dry																																																																			
P88	24-Jul-23	Dry	Dry																																																																			
P88	17-Aug-23	Dry	Dry																																																																			
P88	21-Sep-23	Dry	Dry																																																																			
P88	06-Nov-23	Dry	Dry																																																																			
P88	27-Nov-23	Dry	Dry																																																																			

P88	14-Dec-23	Dry	Dry																																																															
P89	20-Jun-23	Dry	Dry																																																															
P89	29-Jun-23	Dry	Dry																																																															
P89	24-Jul-23	Dry	Dry																																																															
P89	17-Aug-23	Dry	Dry																																																															
P89	21-Sep-23	Dry	Dry																																																															
P89	06-Nov-23	Dry	Dry																																																															
P89	27-Nov-23	Dry	Dry																																																															
P89	14-Dec-23	Dry	Dry																																																															
WB2	14-Mar-23	8.97	9.44																																																														Pump Issue
WB2	20-Jun-23	N/A	N/A																																																														Pump Issue
WB2	25-Sep-23	N/A	N/A																																																														Pump Issue
WB2	14-Dec-23	N/A	11.92																																																														No Sample
WB3a	19-Jan-23	5.077	5.587	7.11	1057	20.48																																																														
WB3a	20-Feb-23	5.662	6.172	7.45	1141	20.9																																																														
WB3a	23-Mar-23	5.808	6.318	7.32	1223	20.425																																																														
WB3a	27-Apr-23	5.947	6.457	7.39	1278	20.516																																																														
WB3a	18-May-23	6.032	6.542	7.26	1227	20.62																																																														
WB3a	20-Jun-23	6.174	6.684	7.17	1155	20.39																																																														
WB3a	20-Jul-23	6.276	6.786	7.24	989	19.744																																																														
WB3a	10-Aug-24	6.323	6.833	7.11	972	20.34																																																														
WB3a	06-Sep-23	6.431	6.941	6.76	907	21.563																																																														
WB3a	11-Oct-23	6.524	7.034	7.85	1080	21.296																																																														
WB3a	16-Nov-23	6.601	7.111	7.08	948	20.99																																																														
WB3a	21-Dec-23	6.7	7.21	6.95	899	19.596																																																														
WB3b	19-Jan-23	5.516	6.026	6.88	687	20.34																																																														
WB3b	20-Feb-23	6.293	6.803	7.38	701	20.99																																																														
WB3b	23-Mar-23	5.778	6.288	7.12	687	20.522																																																														
WB3b	27-Apr-23	5.894	6.404	7.2	696	20.613																																																														
WB3b	18-May-23	5.993	6.503	7.07	708	20.76																																																														
WB3b	20-Jun-23	6.131	6.641	6.66	695	20.49																																																														
WB3b	20-Jul-23	6.204	6.714	7.11	675	20.089																																																														
WB3b	10-Aug-23	6.258	6.768	6.63	675	20.46																																																														
WB3b	06-Sep-23	6.394	6.904	6.84	705	21.795																																																														
WB3b	11-Oct-23	6.461	6.971	7.77	681	21.286																																																														
WB3b	16-Nov-23	6.558	7.068	6.79	697	20.871																																																														
WB3b	21-Dec-23	6.547	7.057	7.19	679	19.495																																																														
WB4	19-Jan-23	6.496	7.046	6.75	845	21.63																																																														
WB4	20-Feb-23	6.449	6.999	7.09	851	21.97																																																														
WB4	23-Mar-23	6.418	6.968	7.11	793	21.583																																																														
WB4	27-Apr-23	6.404	6.954	7.21	798	21.407																																																														
WB4	18-May-23	6.402	6.952	7.09	794	21																																																														
WB4	20-Jun-23	6.448	6.998	7.05	775	20.28																																																														
WB4	20-Jul-23	6.476	7.026	7.13	874	20.573																																																														
WB4	10-Aug-24	6.475	7.025	7.05	778	20.5																																																														
WB4	06-Sep-23	6.539	7.089	6.81	795	21.357																																																														
WB4	11-Oct-23	6.597	7.147	7.72	851	21.652																																																														
WB4	16-Nov-23	6.651	7.201	6.75	805	21.292																																																														
WB4	21-Dec-23	7.377	7.927	6.87	808	20.174																																																														
WB5a	19-Jan-23	7.117	8.237	6.56	368.6	19.26																																																														
WB5a	20-Feb-23	7.352	8.472	6.75	406	19.6																																																														
WB5a	23-Mar-23	7.698	8.818	6.66	303	18.72																																																														
WB5a	27-Apr-23	7.801	8.921	6.75	423.2	18.649																																																														
WB5a	18-May-23	7.828	8.948	6.54	522	18.78																																																														
WB5a	20-Jun-23	7.94	9.06	6.43	494	18.55																																																														
WB5a	20-Jul-23	7.946	9.066	6.78	490.1	18.154																																																														
WB5a	10-Aug-23	7.982	9.102	6.76	493	19.13																																																														
WB5a	06-Sep-23	8.001	9.121	6.5	496	19.259																																																														
WB5a	11-Oct-23	7.996	9.116	7.28	471	20.403																																																														
WB5a	16-Nov-23	8.124	9.244	6.54	506	19.618																																																														
WB5a	20-Dec-23	586.88	588	6.98	588	19.81																																																														
WB5b	19-Jan-23	7.446	8.566	6.81	480.4	19.23																																																														
WB5b	20-Feb-23	7.855	8.975	6.95	420	19.33																																																														
WB5b	23-Mar-23	7.93	9.05	7.09	376.1	18.738																																																														
WB5b	27-Apr-23	7.876	8.996	7.24	371.8	18.849																																																														
WB5b	18-May-23	7.878	8.998	7.02	403	18.86																																																														
WB5b	20-Jun-23	7.919	9.039	6.72	442	18.18																																																														
WB5b	20-Jul-23	7.898	9.018	6.93	443.8	18.386																																																														
WB5b	10-Aug-23	8.098	9.218	6.85	443	18.42																																																														
WB5b	06-Sep-23	8.029	9.149	6.69	468.5	20.622																																																														
WB5b	11-Oct-23	8.342	9.462	7.27	469	19.989																																																														
WB5b	16-Nov-23	8.534	9.654	6.97	479	19.593																																																														
WB5b	20-Dec-23	8.742	9.862	7.19	526	19.425																																																														
WB6b	19-Jan-23	20.771	21.611	7.26	549	21.8																																																														
WB6b	20-Feb-23	13.897	14.737	7.17	566	22.59																																																														
WB6b	23-Mar-23	9.928	10.768	7.21	514	21.144																																																														
WB6b	27-Apr-23	9.095	9.935	7.38	503	20.759																																																														
WB6b	18-May-23	9.043	9.883	7.06	510	20.07																																																														
WB6b	20-Jun-23	9.129	9.969	7.17	510	20.05																																																														
WB6b	20-Jul-23	8.922	9.762	7.3	502	20.055																																																														
WB6b	10-Aug-23	13.262	14.102	7.27	498	20.13																																																														
WB6b	06-Sep-23	9.244	10.084	6.96	515	21.279																																																														
WB6b	11-Oct-23	15.547	16.387	8.28	538	21.464																																																														
WB6b	16-Nov-23	16.404	17.244	7.24	526	21.719																																																														
WB6b	20-Dec-23	15.054	15.894	7.24	514	20.271																																																														
WB7	19-Jan-23	10.257	10.257	6.71	1021	21.91																																																														
WB7	20-Feb-23	10.773	10.773	6.69	928	21.23																																																														
WB7	16-Mar-23	4.98	4.98	6.96	776	28																																																														
WB7	27-Apr-23	10.787	10.787	6.99	965	20.792																																																														
WB7	18-May-23	10.689	10.689	6.6	967	19.98																																																														
WB7	20-Jun-23	10.617	10.617	6.53	997	19.99																																																														
WB7	20-Jul-23	10.504	10.504	6.91	902	19.815																																																														
WB7	10-Aug-23	10.494	10.494	6.84	967	21																																																														
WB7	06-Sep-23	10.513	10.513	6.6	982	20.783																																																														
WB7	11-Oct-23	10.709	10.709	7.91	932	20.873																																																														
WB7	16-Nov-23	10.937	10.937	6.51	959	20.888																																																														
WB7	20-Dec-23	11.008	11.008	6.57	986	20.455																																																														
WB10	16-Mar-23	N/A	N/A																																																															No Access
WB10	23-Jun-23	N/A	N/A	6.72	5150	20.6																																																														
WB10	26-Sep-23	11.56	11.76	6.53	4320	17.2	<0.01	<0.001	<0.001	0.052	<0.0001	<0.001	<0.001	0.002	<0.001	0.001	<0.001	<0.01	----	----	<0.01	0.012	<0.05	0.07	<0.0001	<0.01	<0.001	----	0.054	----	<0.001	<0.001	0.001	<0.001	0.002	<0.001	<0.01	<0.001	2.92	----	0.014	<0.05	<0.05	<0.0001	6.85	4870	218	286	338	5	49.2	1220	65	<1	<1	690	690	49.6	0.31	<0.01	<0.01	5.76	5.76	3500	<5	<0.004	<0.004	<0.004	<0.1	
WB10	16-Jan-24	11.76	11.76	6.82	4660	28.5																																																														

Appendix G – *Ambient Flow Monitoring*

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
KC1DS	14-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	30-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	29-Jun-23	–	–	–	–	–	Too Low to Sample
	27-Sep-23	–	–	–	–	–	Too Low to Sample
	24-Nov-23	–	–	–	–	–	Rain Event - Too Low to Sample
KC1US	14-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	30-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	29-Jun-23	–	–	–	–	–	Too Low to Sample
	27-Sep-23	–	–	–	–	–	Too Low to Sample
	24-Nov-23	–	–	–	–	–	Rain Event - Too Low to Sample
KC2DS	14-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	30-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	29-Jun-23	–	–	–	–	–	Too Low to Sample
	27-Sep-23	–	–	–	–	–	Too Low to Sample
	24-Nov-23	–	–	–	–	–	Rain Event - Too Low to Sample
KC2US	14-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	30-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	29-Jun-23	–	–	–	–	–	Too Low to Sample
	27-Sep-23	–	–	–	–	–	Too Low to Sample
	24-Nov-23	–	–	–	–	–	Rain Event - Too Low to Sample
KCDS	14-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	30-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	29-Jun-23	–	–	–	–	–	Too Low to Sample
	27-Sep-23	–	–	–	–	–	Too Low to Sample
	24-Nov-23	–	–	–	–	–	Too Low to Sample

Data Point	Date	EC – Field (µS/cm)	Oil & Grease (mg/L)	pH - Field	Total Organic Carbon (mg/L)	Total Suspended Solids (mg/L)	Comments
KCUS	14-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	30-Mar-23	110	<5	7.45	16	72	Discharge Sample – Wet Weather
	29-Jun-23	–	–	–	–	–	Too Low to Sample
	27-Sep-23	–	–	–	–	–	Too Low to Sample
	24-Nov-23	–	–	–	–	–	Rain Event - Too Low to Sample
PC1	14-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	30-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	29-Jun-23	–	–	–	–	–	Too Low to Sample
	27-Sep-23	–	–	–	–	–	Too Low to Sample
	24-Nov-23	–	–	–	–	–	Rain Event - Too Low to Sample
PCa	14-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	30-Mar-23	–	–	–	–	–	Rain Event - Too Low to Sample
	29-Jun-23	–	–	–	–	–	Too Low to Sample
	27-Sep-23	–	–	–	–	–	No Access
	24-Nov-23	–	–	–	–	–	Rain Event - Too Low to Sample

Appendix H – *Subsidence Pond Monitoring*

	EC (µS/cm)												
SAMPLE DATE	LW101 Ponding	LW104 North	LW105 North	LW105 South	LW106 North	LW107 North	LW108 North	LW108 South	LW109 North	LW109 North A	LW109 South	LW110 North	LW110 South
25/01/2023	235	274	538		307	321	410	659	331	82		377	
28/02/2023	330												
15/03/2023	274												
31/03/2023	146		166	137				110		82	125	159	
27/04/2023	218							222			326		
25/05/2023	226							229			368		
21/06/2023	235							331			408		
28/07/2023	250												
25/08/2023	292												
27/09/2023	323												
31/10/2023	638												
24/11/2023	351										639		
29/12/2023	555												

Note: Grey cells indicate sampling point either 'Dry' or 'Too Low to Sample'