Mt Piper Ash Placement Project Lamberts North

Annual Operation Compliance Report

September 2021 – August 2022

Annual Operation Compliance Report

Project Name	**Mt Piper Ash Placement Project Lamberts North**
Project Application Number	**09_0186**
Description of Project	
Project Address	**Mt Piper Power Station, 350 Boulder Road, Portland 2847**
Proponent	**EnergyAustralia NSW**
Title of Compliance Report	**Annual Operation Compliance Report**
Reporting Period	**1 September 2021 – 31 August 2022**
Version	**1.0**
Date	**30 November 2022**

I declare that I have reviewed the contents of the attached Compliance Report and to the best of my knowledge:

i. the Compliance Report has been prepared in accordance with all relevant conditions of consent;

ii. the Compliance Report has been prepared in accordance with the Compliance Reporting Requirements;

iii. the findings of the Compliance Report are reported truthfully, accurately and completely;

iv. due diligence and professional judgement have been exercised in preparing the Compliance Report; and

v. the Compliance Report is an accurate summary of the compliance status of the development.

Notes:

- Under section 10.6 of the Environmental Planning and Assessment Act 1979 a person must not include false or misleading information (or provide information for inclusion in) a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that the information is false or misleading in a material respect. The proponent of an approved project must not fail to include information in (or provide information for inclusion in) a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that the information is materially relevant to the monitoring or audit. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000; and
- The Crimes Act 1900 contains other offences relating to false and misleading information: section 307B (giving false or misleading information – maximum penalty 2 years' imprisonment or 200 penalty units, or both).

Name of authorised reporting officer	**Ben Eastwood**
Title	**NSW Environment Leader**
Signature	
Qualification	**Bachelor Natural Resources Management (Hon)**
Company	**EnergyAustralia NSW**
Company Address	**Locked Bag 1, Portland NSW**

This report may be cited as:

EnergyAustralia NSW (2022) Lamberts North Annual Operation Compliance Report September 2021 – August 2022. EnergyAustralia NSW, NSW Australia.

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1. Summary of compliance

EnergyAustralia NSW (EA NSW) owns and operates the Mt Piper Ash Placement Project (PA 09_0186), comprising two separate ash repositories including the Lamberts North Ash Repository (LNAR) and the Lamberts South Ash Repository (LSAR) in accordance with Project Approval 09_0186, granted by the Minister for Planning on 12 February 2012. Ash placement activities have only occurred within the LNAR, with no ash placement taking place within the LSAR to date. Therefore, this Annual Operations Compliance Report (AOCR) focuses on environmental performance at the LNAR over the September 2021 – August 2022 reporting period. The LNAR is located approximately 18 kilometres north-west of the city of Lithgow and is situated adjacent to the Mount Piper Ash Repository (MPAR) and 700 meters to the east of the Mt Piper Power Station (MPPS). The MPAR is authorised under a separate consent (DA 80/10060) and is not the subject of this report.

The AOCR has been prepared pursuant to Schedule 2, Condition A10 of the Project Approval 09_0186. The AOCR has been prepared in accordance with the NSW Government's Post-approval requirements for Compliance Reporting dated May 2020.

A summary of the LNAR compliance achieved during the reporting period is provided in Table 1. No non-compliance was identified during the reporting period. An extended review of compliance with the Conditions of Approval (CoA) is presented in Appendix A.

The AOCR contains a summary of all monitoring carried out under the conditions of Project Approval 09_0186 during the reporting period. The groundwater and surface water monitoring performed during the reporting period identified some elevated results above the surface water and groundwater environmental goals identified in the relevant sub-plans contained in the approved Lamberts North Ash Placement Project Operation Environmental Management Plan dated April 2022 (OEMP). These elevated results are most likely to be associated with other adjacent approved activities in the area. EA NSW is undertaking further investigations (independent investigation) into the elevated results observed from the surface and groundwater monitoring.

Table 1 Details on Non-Compliance

Relevant Approval	Condition No.	Condition Summary	Compliance Status	Comment	Section where addressed within AOCR
n/a	n/a	n/a	n/a	n/a	n/a

In assessing compliance with CoAs, the key for compliance assessment provided in Table 2 was used, in accordance with the NSW Government's Independent Audit Guideline.

Table 2 Compliance Status Key

Risk Level	Colour Code	Description
Compliant		The proponent has collected sufficient verifiable evidence to demonstrate that all elements of the requirement have been complied with.
Non-compliant		The proponent has identified a non-compliance with one or more elements of the requirement.
Not triggered		A requirement has an activation or timing trigger that has not been met at the phase of the development when the compliance assessment is undertaken, therefore an assessment of compliance is not relevant.

An acceptable standard of environmental performance has been achieved during the reporting period as evidenced by the following:

- Noise from the LNAR site was inaudible at sensitive receivers during the reporting period.
- Analysis of the air quality data indicates air quality emissions from the LNAR have been managed effectively during the reporting period and comply with CoA D3 (d) and E18.
- There were no incidents associated with the LNAR site that caused or threatened material harm to the environment at this time.

2. Introduction

2.1 Background

The MPPS comprises of two coal-fired steam turbine generators, with a generating capacity of 700 and 730 MW, built over two stages in 1992 and 1993. The power station (along with the MPAR) is located approximately 17 km northwest of Lithgow and five kilometers east of Portland (**Figure 1**) and was originally authorised in 1990 by the Lithgow City Council (DA 80/10060). The approved footprint of the LNAR is adjacent to the MPAR, near the MPPS (**Figure 2**). EA NSW acquired MPPS and associated land holdings and infrastructure from the state-owned Delta Electricity (DE) in September 2013.

Ash from the power station is placed in a dry ash repository (either MPAR or LNAR) as required. Approximately 680,000 m^3 of ash has been placed on an annual basis, depending on electricity demand and generation.

The AOCR specifically relates to the Lamberts North Ash Placement Project which authorises the operation of two separate ash placement areas referred to the LNAR and the LSAR.

The LNAR is the active ash placement area and this AOCR reports on the environmental performance associated with it over the 2021 – 2022 reporting period. The LSAR is yet to be constructed.

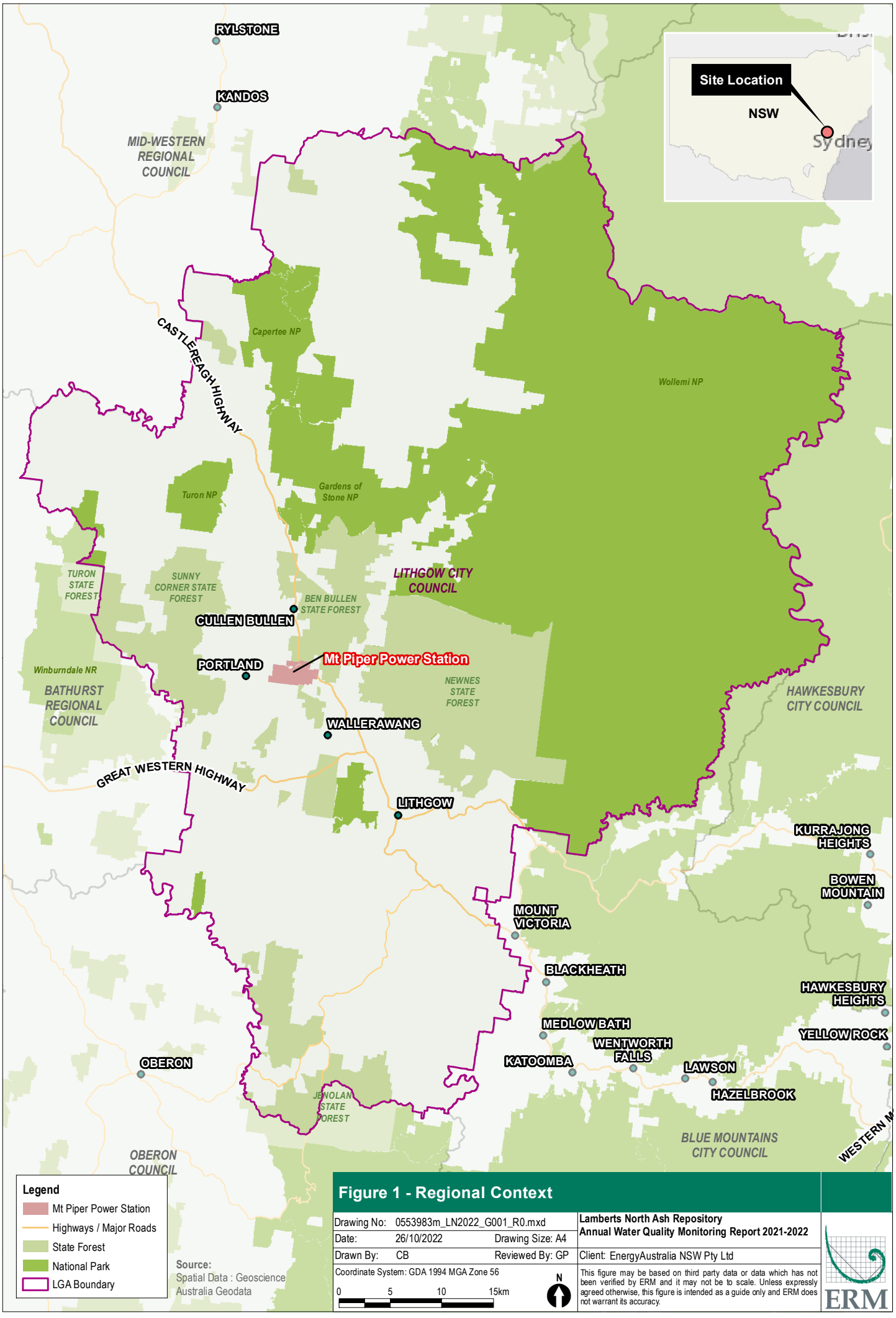


Figure 1 - Regional Context

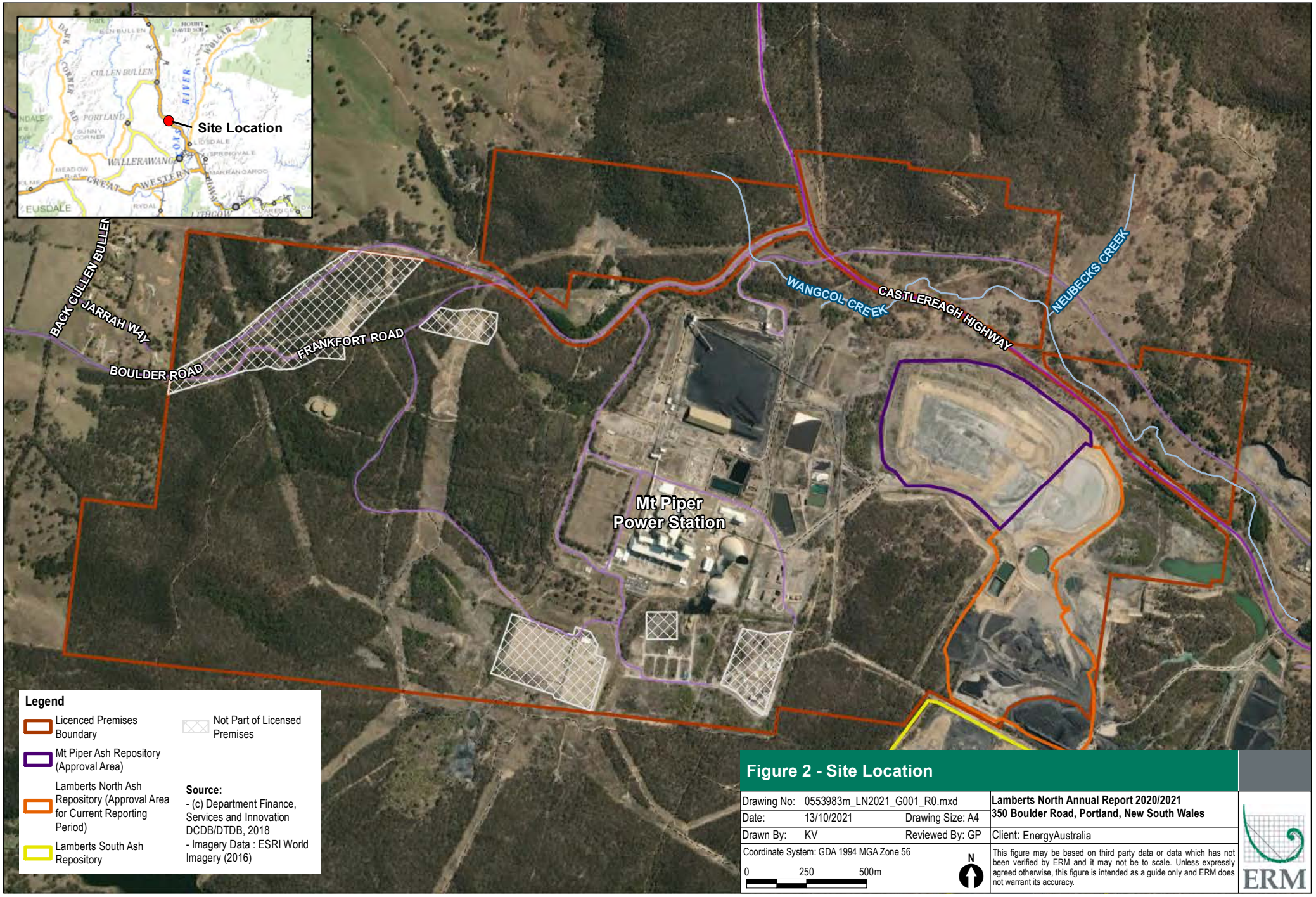
Drawing No:	0553983m_LN2022_G001_R0.mxd		
Date:	26/10/2022	Drawing Size: A4	
Drawn By:	CB	Reviewed By: GP	

Coordinate System: GDA 1994 MGA Zone 56

Lamberts North Ash Repository
Annual Water Quality Monitoring Report 2021-2022

Client: EnergyAustralia NSW Pty Ltd

ERM


Site Location
BACK CULLEN BULLEN
JARRAH WAY
BOULDER ROAD
FRANKFORT ROAD
WANGCOL CREEK
CASTLEREAGH HIGHWAY
NEUBECKS CREEK
Mt Piper
Power Station
Legend
Licenced Premises Boundary
Not Part of Licensed Premises
Mt Piper Ash Repository (Approval Area)
Lamberts North Ash Repository (Approval Area for Current Reporting Period)
Lamberts South Ash Repository
Source:
- (c) Department Finance, Services and Innovation DCDB/DTDB, 2018
- Imagery Data : ESRI World Imagery (2016)
Figure 2 - Site Location
Drawing No: 0553983m_LN2021_G001_R0.mxd
Date: 13/10/2021
Drawing Size: A4
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Reviewed By: GP
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Lamberts North Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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2.2 Purpose of the AOCR

The Project Approval (PA 09_0186) contains several conditions with which EA NSW needs to comply, as the proponent, at different stages of the Project (Section 3). Condition A10 of the Project Approval (DPE, 2021) requires that EA NSW prepare and submit an AOCR for the approval of the Secretary (formerly the Director-General), Department of Planning and Environment (DPE).

The AOCR is to include, but not necessarily be limited to:

- The Project's performance in terms of compliance with Conditions of Consent is evaluated on the basis of monitoring data and communicated at various stages during the life time of the project;
- The reporting obligations required by consent conditions are met;
- Opportunities for improvement are identified and adopted.

This AOCR has been prepared in order to satisfy CoA A10 of the Project Approval 09_0186 (DPE, 2021). This report covers the operations, environmental and community performance of the LNAR from 1 September 2021 to 31 August 2022 (reporting period).

The report has been prepared in accordance with the NSW Government's *Post-approval requirements for Compliance Reporting Guideline.*

2.3 Project contacts

The contact details for LNAR are listed in Table 3

Table 3 Lamberts North Ash Placement Contact

Contact Person	Position	Telephone
Ben Eastwood	NSW Environment Leader	(02) 63548111

3. Consents, Leases and Licences

This AOCR has been prepared to demonstrate the sites performance and compliance with the relevant conditions of PA 09_0186 and the Statement of Commitments (SoC). Licences and approvals applicable to LNAR are summarised in Table 4:

Table 4 Key Consents, Leases, Licenses and Permits

Approval/Lease/Licence	Issue Date	Expiry Date	Details/Comments
Project Approval 09_0186	16 February 2012 MOD 1: 21 September 2021	-	Granted by the Minister for Department of Planning and the Environment (DPE), under Section 75J of the Environmental Planning and Assessment Act (EP&A Act).
Environment Protection License (EPL) No. 13007	4 April 2022		EPL held by EA NSW for MPPS, granted by the Environment Protection Authority (EPA), under Section 55 of the Protection of the Environment Operations Act (POEO Act).
Water Access Licence No. 27428 (WAL)	24 March 2022	-	Granted by Department of Primary Industries-Water (DPE-Water), under the Water Management Act 2000
Water Supply Work and Water Use Approval 10CA117220	24 March 2022	-	Granted by DPE-Water, under the Water Management Act 2000

3.1 Operations Environmental Management Plan

The OEMP provides the framework to manage the environmental aspects associated with the operation of the LNAR. The OEMP (EA NSW, 2022a) outlines the requirements associated with the project as stipulated in the relevant provisions of the Project Approval 09_0186 issued by the now DPE, the EPL 13007 issued by the NSW EPA, and the SoC presented in the Submissions Report (SKM, 2011).

The scope of the OEMP covers the operations involving the movement and placement of ash from Mt Piper Power Station (MTPPS) to Lamberts North Ash Repository. The environmental performance against the OEMP is provided in Sections 6 - 10. The OEMP (EA NSW, 2022a) was reviewed by EnergyAustralia NSW during the 2021-22 reporting period to ensure that it reflects the current activities and management. The OEMP (EA NSW, 2022a) has been prepared in consultation with the EPA, WaterNSW, DPE-Water, and DPI-Fisheries. The OEMP was approved by the DPE on the 6 June 2022.

3.2 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) for the LNAR was developed in consultation with EA NSW's Western Environment Section and approved by the DPE in December 2012. The CEMP meets the requirements of CoA B4, providing the framework to manage the environmental aspects associated with construction works during LNAR operations. The CEMP has been prepared to address the requirements associated with the project as stipulated in the relevant provisions under Project Approval 09_0186 issued by the DPE (CDM Smith, 2012a). There were no construction activities undertaken throughout the reporting period.

4. Operations during reporting period

Ash placement operations for MPPS, including LNAR, are undertaken by contracted specialists in the handling and management of ash. Service Stream is the current service provider for EA NSW in regard to ash and dust management associated with the repository. The LNAR is currently managed under an 'operate and maintain' contract.

A summary of operations at the LNAR within the reporting period can be found in Table 5. It is noted that there will be an increase in ash delivered to the LNAR. This is due to the MPAR approaching its approved capacity but will ultimately depend upon actual electricity generation.

Table 5 Operations Summary

Activity	Previous reporting period	This reporting period	Next reporting period
Fly Ash delivered (T)	157,500	93,342	125,421*
Total ash produced at MPPS (T)	827,096	551,266	689,181*
Total Ash Footprint (ha)	16.7	16.7	16.7†
Area of repository capped (ha)	1.3	1.3	1.3†

† Estimate figure based on current year. *Figure based on average of previous years.

4.1 Normal operating hours

The normal hours of operation for the Project are between 6 am and 8 pm Monday to Friday, and 6 am to 5 pm Saturday and Sunday in accordance with CoA E1. Operations outside these hours are defined as abnormal or emergency operating conditions and are subject to specific requirements in accordance with E2 (Section 2.2.2 OEMP).

4.2 Abnormal or emergency operating conditions

Conditions under which operations outside the normal hours of operation can occur have been specified in the Project Approval and can be described as follows:

- Where it is required to avoid the loss of lives, property and/or to prevent environmental harm; or
- Where a breakdown of plant and/or equipment at the repository or the MPPS and the MPPS Extension project with the effect of limiting or preventing ash storage at the power station outside the normal operating hours Condition E1 (Section 3.1 OEMP).
- Where a breakdown of an ash haulage truck(s) or the conveyor belts prevents haulage during the operating hours stipulated under Condition E1 combined with insufficient storage capacity at MPPS to store ash outside of the normal operating hours; or
- In the event that the National Electricity Market Management Company (NEMMCO), or a person authorised by NEMMCO, directs EA NSW (as a licensee) under the National Electricity Rules to maintain, increase or be available to increase power generation for system security and there is insufficient ash storage capacity at the MPPS to allow for the ash to be stored.

Under these circumstances, EA NSW is required to notify the EPA, and nearby sensitive receivers prior to any emergency ash haulage or placement operations outside of the '*normal operation'* hours, and the Secretary of the DPE within 7 days after the emergency operations have occurred.

Emergency operating conditions were undertaken during the reporting period due to high levels of rainfall resulting from the La Niña weather pattern. The persistent high rainfall caused major delays to the MOD 1 operations which resulted in an emergency situation at MPPS where out of hours works in accordance with Condition E2 of the LNAR Consent were required to prevent environmental harm. A letter was submitted to the EPA and DPE requesting approval for temporary emergency operating hours to continue MOD 1 construction 24hours 7 days a week. Approval was granted on the 9 March 2022 for emergency operating hours to commence.

4.3 Activities conducted during the current reporting period

The following activities were undertaken during the reporting period:

- 93,342 tonnes Fly Ash placed in the LNAR for the reporting period.
- Mt Piper Ash Management Strategy update (EA NSW, 2020) indicating that EA NSW had met 40% ash re-use target by December 2020 was approved by the DPE.
- Emergency operating conditions had works conducted outside normal operating hours.
- Approved Conservation Agreement for the Thompsons Creek Reservoir Biodiversity Offset Area (BOA): Received 3rd March 2022.
- MP 09_0186 Mt Piper Ash Placement LNAR Modification (LNAR Mod 1) submitted to DPE. Modification of PA 09_0186 relates to the installation of a leachate barrier and leachate management system to better manage brine conditioned ash.
- LNAR Mod 1 conditions finalised September 2021.
- Leachate barrier and leachate management system construction and commissioned (Plates 1-3).

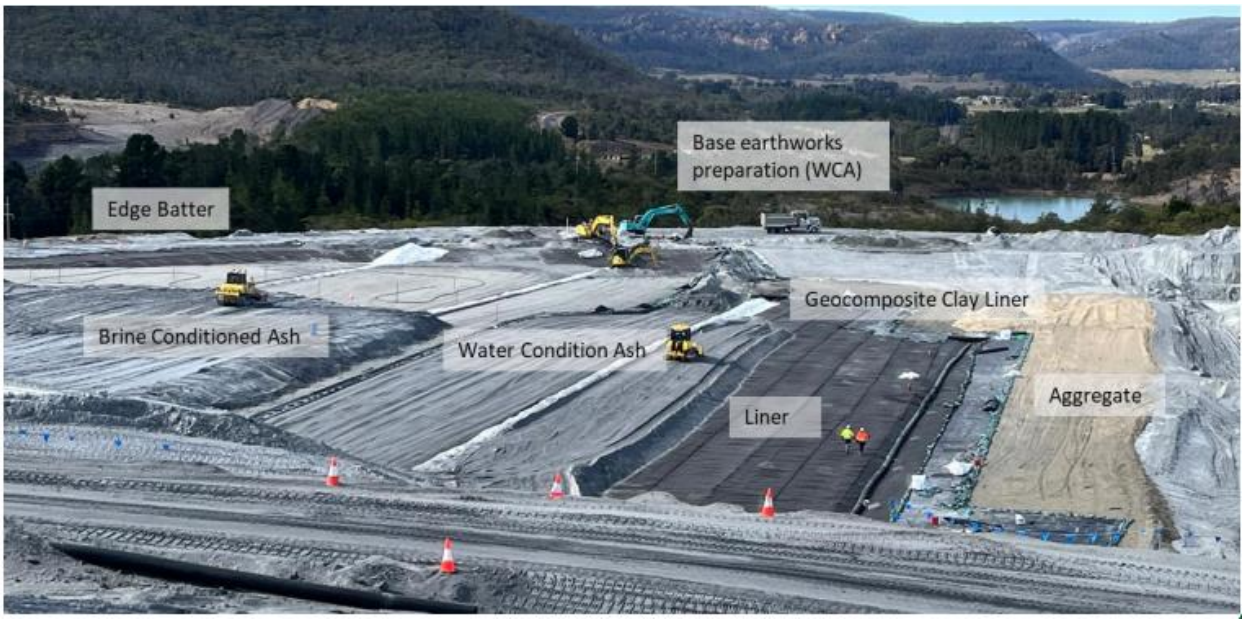


Plate 1 Construction of the Leachate Barrier

Plate 2 and 3 Leachate Barrier installation and interconnecting drainage pipe work

5. Actions required from previous AOCR review

Table 6 Actions required from last AOCR

Item	Action required from 2021 AOCR	Requested by	Action taken	Status	Where discussed in AOCR
1	*Upload a copy of the Annual Review to the EnergyAustralia website.*	DPE	Annual Review uploaded onto EA website 17th December 2021.	C	5

6. Environmental management and performance

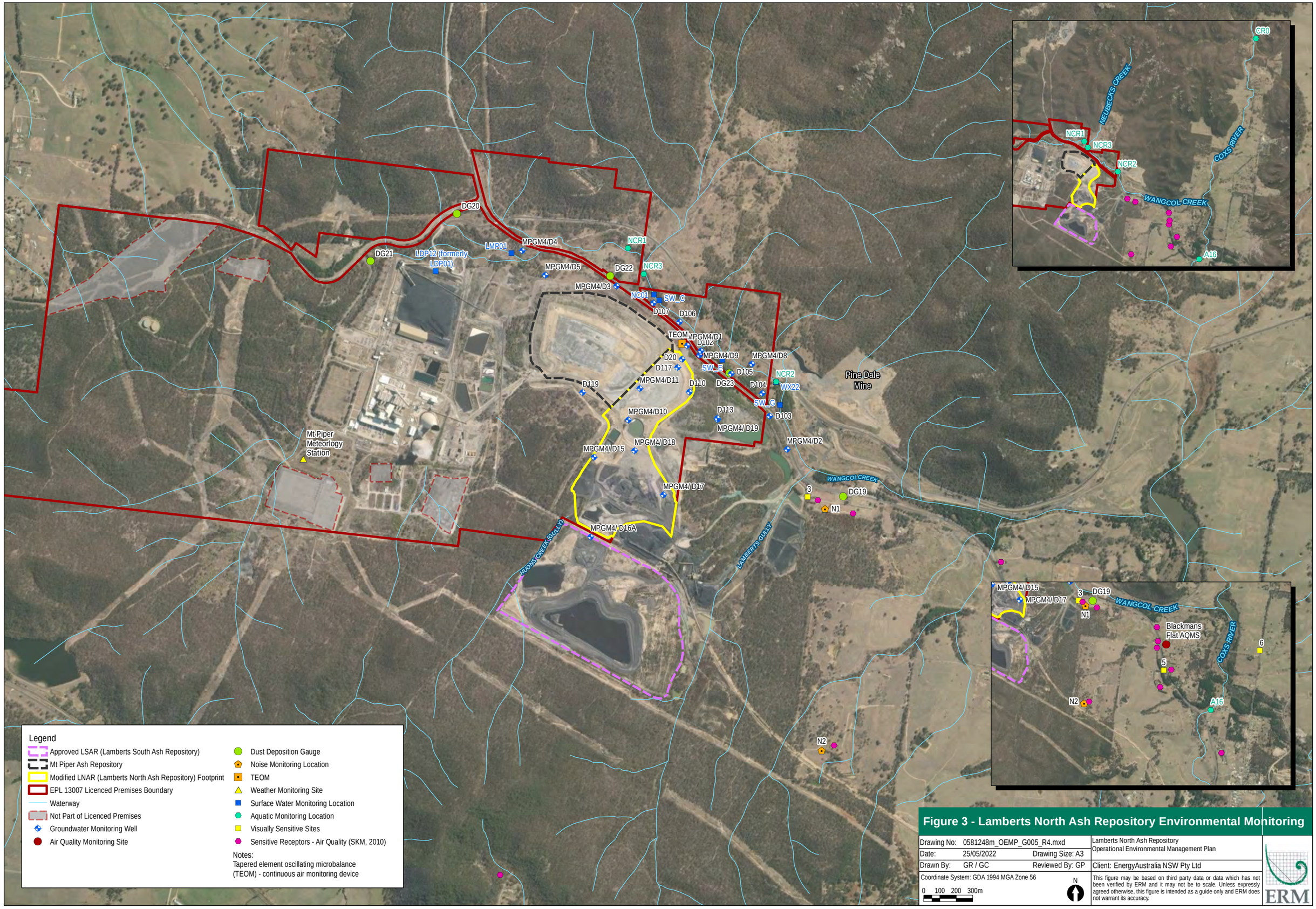
Environmental monitoring of the operations at LNAR is designed to comply with the regulatory requirements specified in Section 3 of the AOCR, and to provide an ongoing analysis of the condition of the environment surrounding the operations. Environmental monitoring is performed at the sites indicated within Figure 3 and the results are used to determine the effectiveness of the environmental controls and management practices at the LNAR.

Detailed procedures outlining the environmental monitoring responsibilities of key stakeholders and the impacts to be mitigated are described in the relevant sub-plans of the OEMP. Details regarding the environmental responsibilities, key stakeholders and the impacts to be mitigated regarding construction activities are described in the CEMP. A summary of the environmental management measures and associated performance are provided in Table 7.

Table 7 Environmental Performance

Aspect	Approval Criteria / EIS prediction	Performance during reporting period	Trends / Management Implications	Management Actions
Noise	Criteria Day 42 dB(A) Evening 38 dB(A) Night 35 dB(A)	Compliant	No change from previous years	No action required
Air Quality	PM10 annual <30ug/m^3 24 hour <50ug/m^3 Depositional dust Increase in total 2g/m^2/month to maximum of 3.5g/m^2/month	Compliant	PM_{10} results reflective of background conditions and below the daily standard limit for entire reporting period. Minor decrease in depositional dust trends	No additional action required
Biodiversity	Submit a biodiversity offset plan for approval	Compliant	The 2017 revegetation works continue to establish. Direct seeding work and biennial flora & fauna monitoring completed in 2020. Next round of monitoring due October 2022.	Area now managed in accordance with the Biodiversity Conservation Agreement

Performance against contract requirements is provided by Service Stream as a monthly Client Service Report (Service Stream, 2021; 2022) and through external consultant and internal data and reports. Summaries of these reports are provided in the sections below (6.1 – 6.7) and in Appendix C-E.



Legend

- Approved LSAR (Lamberts South Ash Repository)
- Mt Piper Ash Repository
- Modified LNAR (Lamberts North Ash Repository) Footprint
- EPL 13007 Licenced Premises Boundary
- Waterway
- Not Part of Licenced Premises
- Groundwater Monitoring Well
- Air Quality Monitoring Site
- Dust Deposition Gauge
- Noise Monitoring Location
- TEOM
- Weather Monitoring Site
- Surface Water Monitoring Location
- Aquatic Monitoring Location
- Visually Sensitive Sites
- Sensitive Receptors - Air Quality (SKM, 2010)

Notes:
Tapered element oscillating microbalance (TEOM) - continuous air monitoring device

Figure 3 - Lamberts North Ash Repository Environmental Monitoring

Drawing No: 0581248m_OEMP_G005_R4.mxd		Lamberts North Ash Repository Operational Environmental Management Plan
Date: 25/05/2022	Drawing Size: A3	
Drawn By: GR / GC	Reviewed By: GP	Client: EnergyAustralia NSW Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56 0 100 200 300m N		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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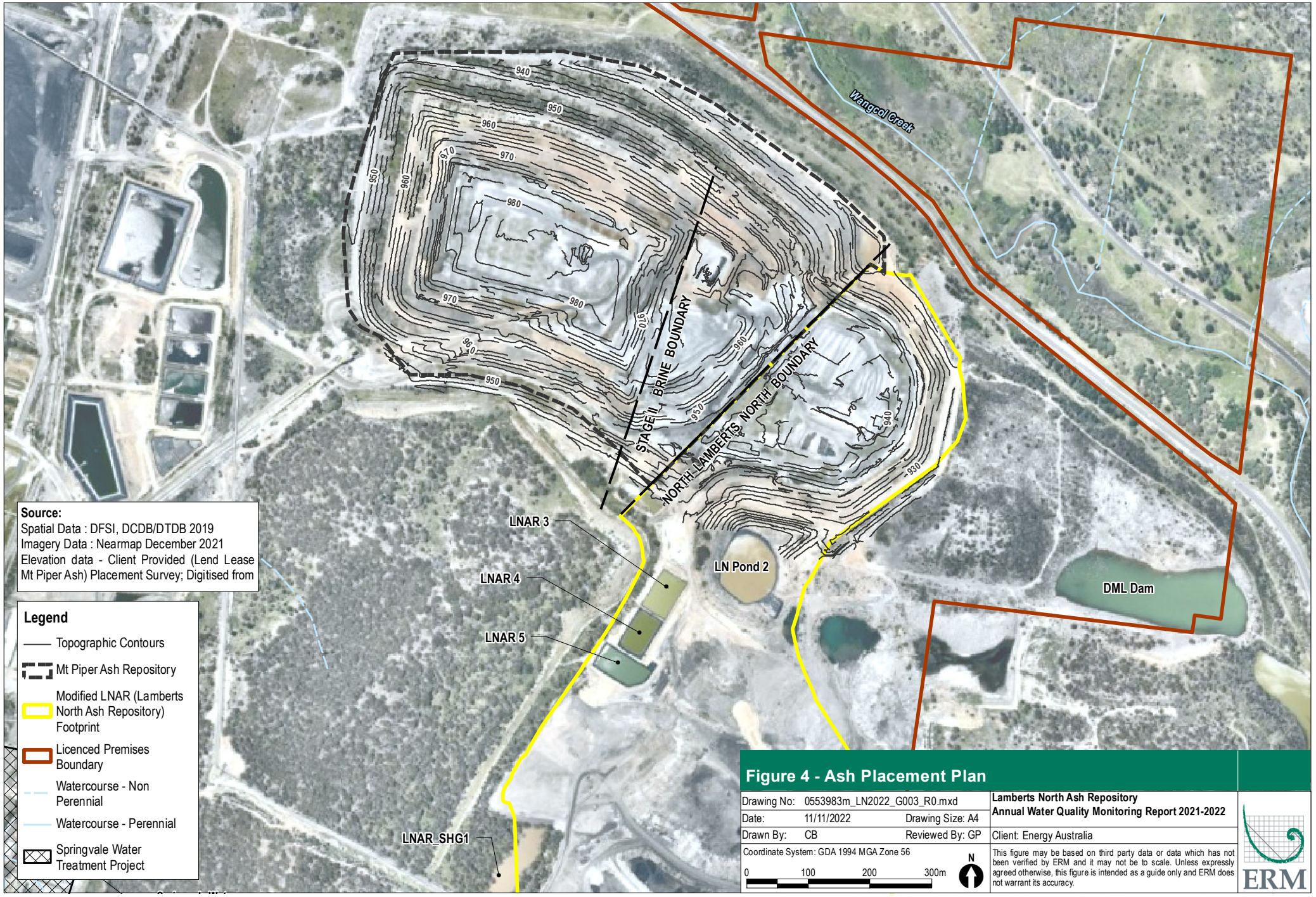
6.1 Ash delivery and placement

6.1.1 Environmental Management

Ash generated as a by-product from the operation of MPPS is transported by conveyer from the MPPS to ash silos at the MPAR as part of the existing approved operations. Ash is then transported by heavy haulage vehicles (generally one to two trucks) from the silos to either the MPAR, or the LNAR. Transport to LNAR is facilitated via the southern boundary haulage road in the existing ash repository. On delivery to the LNAR, the water conditioned ash is deposited at the working face where compactors and bulldozers are then used to place the ash in stable landforms with appropriate drainage infrastructure. Ash placement can be broadly described as including the following processes (see also Figure 4):

- Identifying the current operational location for placement of ash.
- Placing ash at the existing face using truck and shaping of ash with a bulldozer.
- The ash is treated to achieve an average compaction of 95%, relative to its maximum standard compaction, through controlled combination of water addition and machine compaction with the use of rollers and rubber-tyred vehicles.
- Ash is placed in layers and stepped to produce an overall batter slope of approximately 1(V):4(H), with benches added every 10 m in vertical height change. This process of ash placement produces an average batter length of 40 m.
- The sequence of ash placement will entail initially placing ash across the site starting from the most northerly part, then towards the east and south of LNAR, working to reach a final design height of 980 metres (m) Australia Height Datum (AHD) through abutment with the MPAR.
- Boundary faces are sequentially covered with material to be sourced from locally available material. Once the cover material is placed, vegetation replanting and restoration activities are undertaken. The process is repeated until LNAR is filled to its maximum permissible height and extent.
- Ash will be placed to the desired height (0.5 m to 1 m lifts) in pads, with materials that have been moisture-conditioned with water placed in the lower layers to an elevation as specified in approved design drawings, with corresponding heights of 10 m.
- Methods for the placement of ash materials to optimise compaction and stability of the emplacement areas include target moisture contact, compaction density, and progressive capping and vegetation.

Capping of exposed ash areas has been undertaken progressively as LNAR reaches its approved design height. Progressive revegetation of batters will commence once the final perimeter batters are constructed and keyed into the adjoining MPAR.


Wangcol Creek
STAGE II BRINE BOUNDARY
NORTH LAMBERTS NORTH BOUNDARY
940
950
960
970
980
LNAR 3
LNAR 4
LNAR 5
LNAR_SHG1
LN Pond 2
DML Dam
Source:
Spatial Data : DFSI, DCDB/DTDB 2019
Imagery Data : Nearmap December 2021
Elevation data - Client Provided (Lend Lease Mt Piper Ash) Placement Survey; Digitised from
Legend
Topographic Contours
Mt Piper Ash Repository
Modified LNAR (Lamberts North Ash Repository) Footprint
Licenced Premises Boundary
Watercourse - Non Perennial
Watercourse - Perennial
Springvale Water Treatment Project
Figure 4 - Ash Placement Plan
Drawing No: 0553983m_LN2022_G003_R0.mxd
Date: 11/11/2022
Drawing Size: A4
Drawn By: CB
Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56
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Lamberts North Ash Repository
Annual Water Quality Monitoring Report 2021-2022
Client: Energy Australia
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6.1.2 Environmental Performance

During the reporting period, 93,342 tonnes (T) of water-conditioned fly ash has been placed in LNAR. Temporary stockpiles of bottom ash are stored on LNAR prior to being sold or reused to upgrade roads on the ash repository. Up to 90,003 tonnes of fly ash has been diverted from emplacement for recycling and use in cement production.

Inspections on the ash repository are performed on a monthly basis by the contractor and the results are summarised in Appendix B. The management and mitigation measures specified in the approved OEMP were found to be complied with.

6.1.3 Reportable Incidents

No reportable incidents have been recorded against ash delivery and placement for the reporting period.

6.1.4 Further Improvements

- Install and manage the leachate barrier management system.
- Continue to support NuRock with the development of its business on-site to reuse fly ash.
- Continue to market the reuse of fly ash to cement manufacturers.
- Support a new negotiation for further use of fly ash.

6.2 Operational Noise Monitoring

6.2.1 Environmental Management

The LN Operational Noise Management & Monitoring Plan (ONMMP) has been developed to address the specific requirements of the CoA D3(a) and E7 to E14 for the Project. The ONMMP provides the framework to manage operational noise emissions and minimise potential noise impacts to sensitive receivers during the operation of the Project. The level of noise received by a sensitive receiver will depend on the location of the receiver, the type and duration of works and intervening topography, and existing building structures between the noise emission source and receiver.

The residential community of Blackmans Flat is located to the east of the private haul road and ash repository site. The following residential properties, located within 1100 m from LNAR, have been identified as the nearest potentially affected sensitive receivers to noise from the repository site (Table 8):

Table 8 Representative noise measurement locations

Sensitive Receiver	Distance to Haulage Road (m)
1. Blackmans Flat (east of Lamberts North)	1100
2. Blackmans Flat (west of Castlereagh Highway)	1100

During the reporting period compliance monitoring was conducted in April 2021 during the early morning and evening periods as per the requirements outlined in the ONMMP. The applicable operational noise criteria are outlined in the Project Approval (No. 09_0186), the OEMP and ONMMP. The criteria are summarised as follows:

The cumulative operational noise from the ash placement area and ash haulage activity shall not exceed a $L_{Aeq\ (15\ minute)}$ dB(A) as defined in condition E7 and identified in Table 9.

Table 9 Operational Noise Criterion (LAeq(15 minutes) dB(A))

Location	Day (7 am – 6 pm)	Evening (6 pm – 10pm)	Night (10 pm – 7 am)
All private sensitive receivers within the township of Blackmans Flat	42	38	35
Blackmans Flat (west of Castlereagh Highway)	42	38	35

This criterion applies under all meteorological conditions except for any of the following:

a) Wind speeds greater than 3 m/s at 10 m above ground;

b) Stability category F temperature inversion conditions and wind speed greater than 2m/s at 10m above ground level; and

c) Stability category G temperature inversion conditions.

6.2.2 Environmental Performance

Global Acoustics was engaged by EA NSW to carry out independent operational noise monitoring for the LN Project (Global Acoustics, 2022). The noise measurements were performed in May 2022 (Appendix C). Noise monitoring was performed in accordance with the methods described in the approved ONMMP.

The results of the measured noise levels at the sensitive receivers stipulated in the CoA (Location 1 and Location 2) can be found in Appendix B. The maximum 15-minute daytime equivalent sound pressure levels (LA_{eq}) at both the receiver locations were dominated by Castlereagh Highway traffic noise. Other noted noise sources were insects, birds, bats, other industrial operations, domestic and nocturnal animal activity. These measured equivalent sound pressure levels were in excess of the noise targets set for LNAR. However, it is not possible to conclusively determine the noise contribution from operational ash placement activities at LNAR at Locations 1 and 2 due to presence of other surrounding simultaneous noise sources and activities.

To quantify the likely noise contribution from the LNAR activities at Locations 1 and 2 from the LNAR, calculations were undertaken to estimate the noise emissions. The measurements are based on a worst-case operational scenario at both assessment locations and include adjustments for activities as outlined in Fact Sheet C of the EPA's *Noise Policy for Industry* (EPA, 2017).

Based on the worst–case noise modelling predictions undertaken, the noise resulting from the operations at the LNAR are below the $LA_{eq(15min)}$ 42dBA CoA criterion and are therefore deemed to comply with the OEMP (and PA 09_0186) at the representative residential receivers Location 1 and Location 2 (Table 10). The distances shown in Table 10 are considered minimum between the operational works and the respective receiver zones.

Table 10 Summary of Cumulative Noise Emissions against the Noise Criteria (dBA)

Location	Description	Maximum predicted noise	Day limit 42 dBA (07:00-18:00)	Evening limit 38 dBA (18:00-22:00) ^	Night limit 35 dBA (22:00-07:00) ^
1	Blackmans Flat (approx. 1.4km)	Inaudible	Inaudible	Inaudible	Inaudible
2	Wallerawang (approx. 2.5km)	Inaudible	Inaudible	Inaudible	Inaudible

6.2.3 Reportable Incidents

No reportable incidents have been recorded against operational noise for the reporting period.

6.2.4 Further Improvements

No further improvements have been identified for the next reporting period.

6.3 Biodiversity Offset Area (BOA)

An area of land adjacent to Thompsons Creek Reservoir has been identified as a suitable BOA for LNAR (refer to Figure 5). In confirming the BOA, various government and community organisations were consulted and the BOA was selected to build upon existing revegetation programs undertaken at Thompsons Creek Reservoir, with the aim of improving native vegetation connectivity in the region.

The BOA is a 6.8 ha land parcel comprised of two lots:

- Lot 243 of DP 801915 east site estimated 4.7 ha with approximately 605 m of foreshore
- Lot 432 of DP 803501 south side estimated 2.1 ha with 200 m of foreshore.

The BOA is located on the eastern foreshore of Thompsons Creek Reservoir which is owned and operated by EA NSW for water storage purposes. The BOA is bounded by EA NSW landholdings except for private landholdings along the southern boundary.

The Biodiversity Conservation Agreement (BCA) (BCT, 2022) details the management actions to be performed within the BOA to enhance habitat for native flora and fauna species through site rehabilitation and revegetation. Biennial, i.e. two-yearly, flora and fauna monitoring within the BOA is required to be performed in accordance with the BCA.

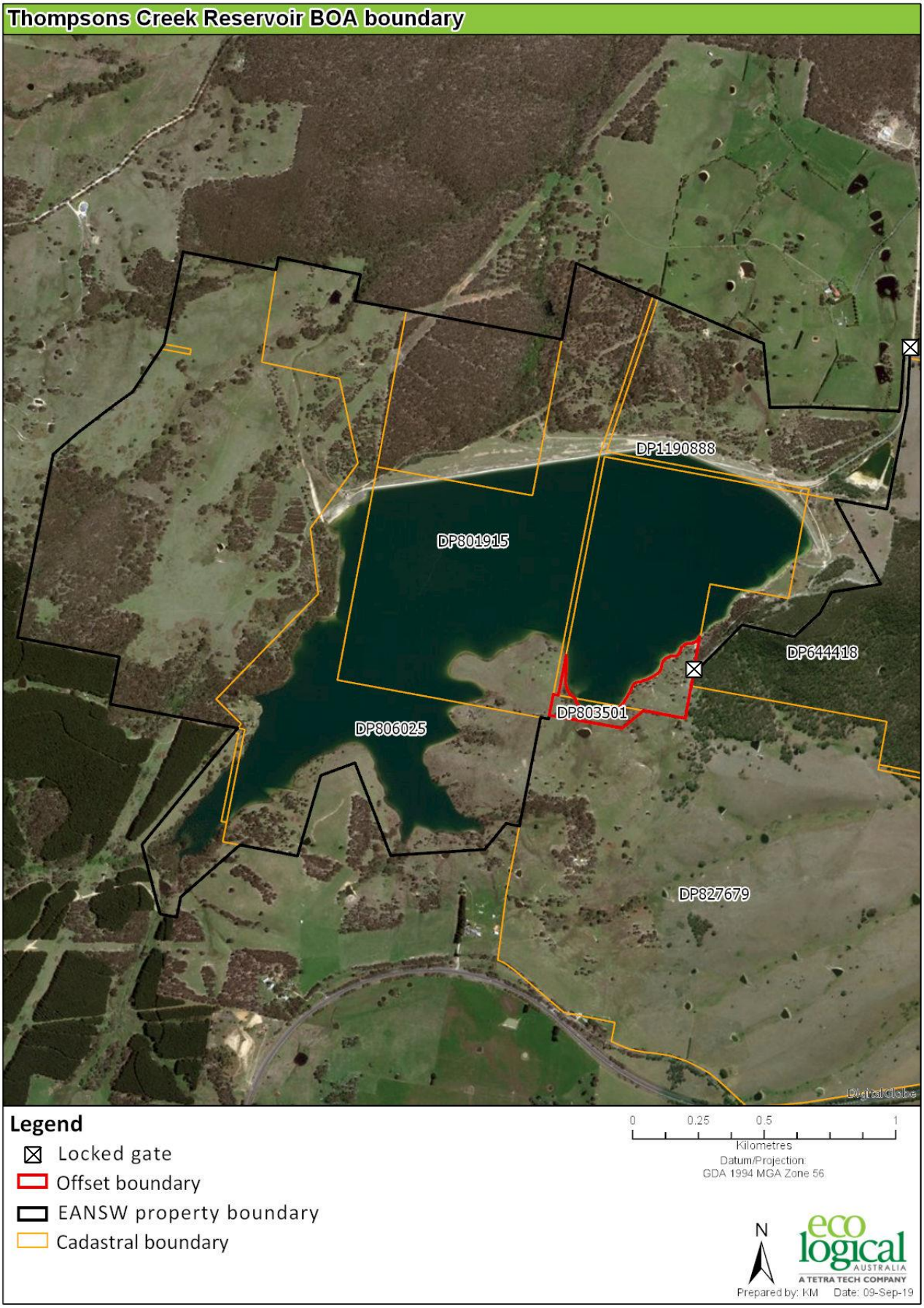

Figure 5: Thompsons Creek Reservoir Biodiversity Offset Area

6.3.1 Environmental Management

Revegetating works were undertaken across the BOA in 2017, with approximately 2,000 seedlings planted across a 1 ha (approximate) section of the BOA (Plate 1). To improve the native vegetation connectivity in the BOA, EA NSW engaged a contractor in October 2020 to undertake direct seeding works in areas devoid of native tree cover after the required flora and fauna monitoring was performed. A total area of 1.5 hectares was directly sown with a tree, shrub, and groundcover seed mixture in Spring 2020 (Plate). An exclusion zone of 30-40 metres from the Thompson Creek Reservoir high-water level was created to maintain access along the foreshore for recreational fishing activities. Management of the revegetation works during the reporting period included the replacement of fertiliser tablets and regular watering.

Plate 4 Established species from revegetation undertaken in 2017 (Photo taken November 2022).

Plate 5 Current vegetation within the BOA (Photo taken November 2022).

EA NSW have secured the Thompsons Creek Reservoir BOA in perpetuity during the reporting period. Guidance was sought from the Biodiversity Conservation Trust (BCT) for the suitability of managing the BOA under a formal conservation mechanism. The intention of this was to secure the BOA and provide the financial and management resources required to enhance its biodiversity values. An application for a Conservation Agreement was submitted to the BCT in March 2021. The final signed Conservation agreement was received in March 2022.

*Plate 6 Established species within the BOA (Photo taken November 2022)*1

Eco Logical Australia (ELA) was engaged by EA NSW to perform the biennial flora and fauna monitoring within the BOA. The monitoring was performed in September 2020 in accordance with the requirements within the BOMP and the report provided as Appendix E in the 2020-21 Lamberts North Annual Environment Management Report (EA NSW, 2021). The 2020 monitoring event reported an increase in species diversity for both native and exotic species, native groundcover and total successfully established seedlings. It is highly likely that these results were influenced by the above average rainfall experienced in the months preceding the monitoring, following drought conditions recorded during the 2018 monitoring period (ELA, 2018; 2020). The assessment of the revegetation works also found that the plantings have continued to develop with species composition and stem density characteristic of a native locally occurring woodland. Eucalypt species were the most successful establishers, which included key canopy species characteristic of the surrounding vegetation communities. Three species listed as priority weeds under the *Central Tablelands Regional Strategic Weed Management Plan 2017-2022* (LLS, 2017), i.e. Blackberry, Serrated Tussock and St John's Wort, were recorded during the 2020 monitoring event.

Overall bird species richness showed an increase with 37 species recorded overall in 2020, compared to 26 species recorded during both 2016 and 2018. Overall bird species richness included seven species of previously unrecorded native woodland birds, including the threatened Glossy Black-Cockatoo and more common species such as Red Wattlebird. No reptile species were recorded (opportunistically) throughout the 2020 monitoring. However, at present, there is limited habitat available for reptile and other ground-dwelling fauna in the form of large-woody debris or surface rock. The presence of introduced pest species European Rabbit were recorded during the 2020 monitoring, which will require management in accordance with the BOMP in order to reduce potential grazing pressure on the recent direct seeding revegetation works from this species.

The next flora and fauna monitoring period is scheduled for Spring 2022 (October), these surveys have been completed, with the results to be included in the 2023 AOCR.

6.3.2 Reportable Incidents

No reportable incidents have been recorded against the BOA for the reporting period.

6.3.3 Further Improvements

- Implement Management Plan Actions as required by the Biodiversity Conservation Agreement.
- Perform targeted herbicide treatment of the three listed weed species (Blackberry, Serrated Tussock & St John's Wort) recorded during the Flora & Fauna Monitoring.
- Perform manual removal of Blackberry post-herbicide treatment to avoid the potential of re-shooting.
- Control of European Rabbit recommended to minimise grazing pressure on recent direct seeding.

6.4 Ecological Monitoring

6.4.1 Environmental Management

The Ecological Monitoring Program (EMP) of the OEMP seeks to address the specific requirements of the CoA. The EMP provides for the requirements for the monitoring of aquatic ecology, in particular macro-invertebrates' aquatic habitat in accordance with CoA B7. EA NSW will maintain the EMP for a minimum of five years after the final capping of the LNAR in accordance with approval conditions.

The EMP was implemented in November 2012 prior to construction activities and then during construction in April 2013. In November 2020, the sample sites included in the program were, NCR1 downstream of surface water discharge point, NCR2 which is downstream of the gauging site (WX22), NCR3 on Wangcol Creek upstream of LN and Control A16 on the Cox River downstream of the confluence with Wangcol Creek (Figure 6). The EMP aims to monitor and quantify the impacts on the ecology of Wangcol Creek and the associated riparian environment.

The specific objectives of the 2021-2022 study were to:

- Sample indicators of ecological health in Wangcol Creek potentially affected by the Project and at unaffected control sites on the creek and on the Coxs River in Spring 2021
- Compare the findings with those of previous studies also undertaken in Spring as part of the EMP
- Assess whether any impacts to the aquatic ecology of Wangcol Creek occurred since the last Spring survey (in December 2018) and determine whether any such impacts were attributable to the Project; and
- Provide recommendations on any actions, if any, that may be required to minimise, mitigate or ameliorate any impacts to aquatic ecology that may have occurred and on any refinements to subsequent monitoring events that would improve the efficacy of the EMP.

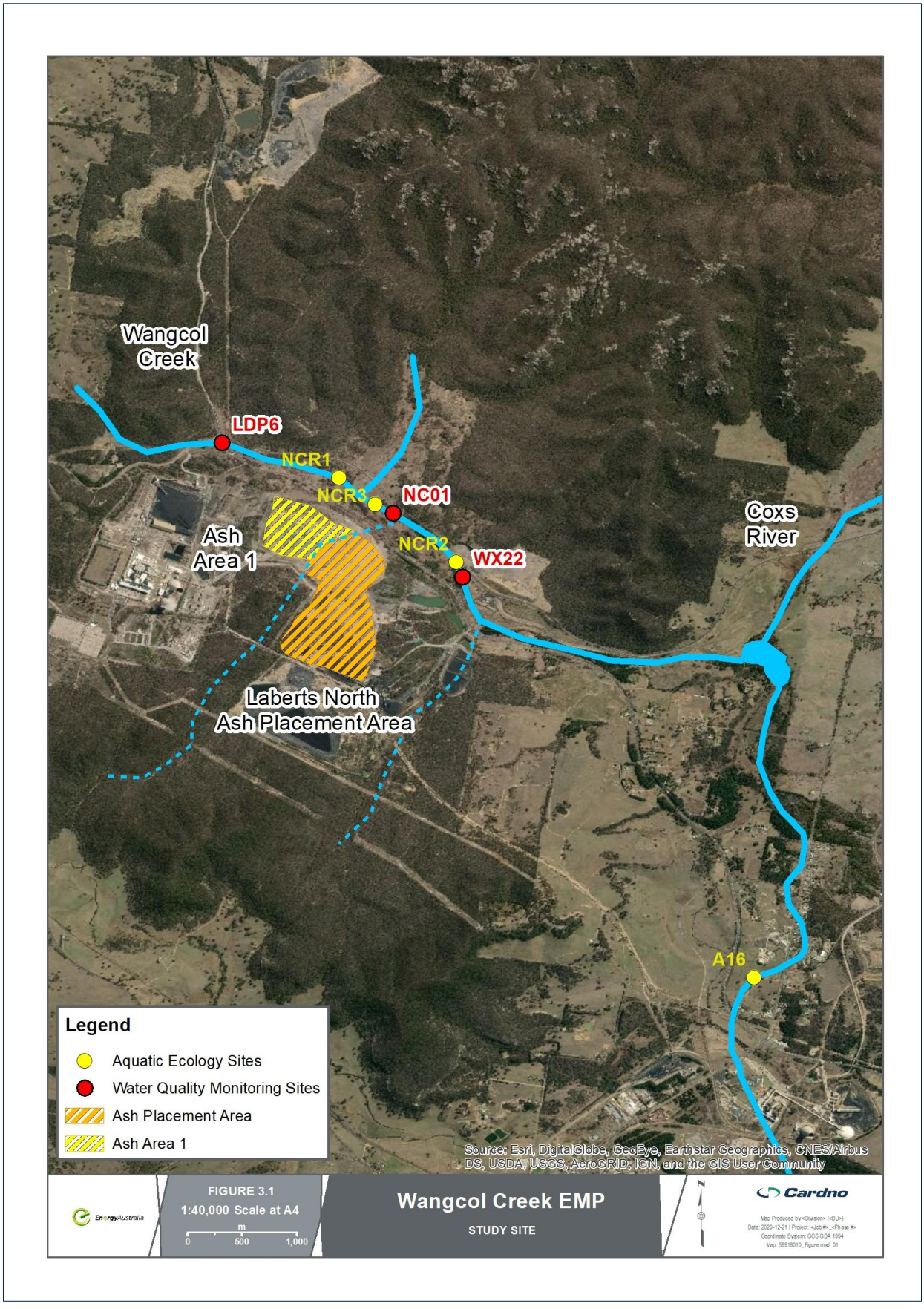

Figure 6 Aquatic ecological monitoring sites and long-term water quality monitoring sites

6.4.2 Environmental Performance

EA NSW engaged Cardno to conduct the EMP in accordance with the requirements of the OEMP. The assessment of aquatic habitat, water quality and macroinvertebrate assemblages was undertaken on 16 November 2021 during the Spring sampling season (Appendix D).

The biotic indices used in the monitoring program include the total number of taxa, number of pollution sensitive taxa (EPT), taxa score (OE50) and SIGNAL2 index to determine whether any changes to macroinvertebrates due to the Project have occurred.

There was no evidence in the Spring 2021 data that would suggest an impact due to the Project (Cardno, 2021). In particular, there was no evidence of a change in SIGNAL2 score in Spring 2021 following the apparent reduction in this indicator reported in the Autumn 2020 report (Cardno, 2020). Some variations in macroinvertebrate multivariate structure were detected during the Spring 2021 analysis, however this does not provide evidence of any impact relating to the project (Cardno, 2021).

The OE50 Taxa Score sampled in Spring at NCR1 has ranged from 0.36 to 0.95, 0.43 to 1.04 at NCR2, 0.19 to 0.85 at NCR3 and 0.36 to 0.91 at A16. OE50 Scores below 0.20 indicate extremely impaired habitat, 0.20 to 0.51 indicate severely impaired habitat (Band C), those from 0.52 to 0.83 indicate significantly impaired habitat (Band B) and those from 0.84 to 1.16 indicate habitat equivalent to reference condition (Band A). These results indicated that on all but one occasion (NCR2 in Spring 2012) the macroinvertebrate assemblages sampled were less diverse than predicted (i.e. OE50 Taxa Score < 1.00). OE50 Taxa Scores at control sites NCR1 and NCR3 in Spring 2021 increased significantly from Spring 2020 which were the lowest recorded during the EMP. NCR2 had no change and A16 displayed an increase from Spring 2020.

The SIGNAL2 Indices (Figure 7) recorded during Spring 2020 at NCR1 ranged from 3.1 to 4.2, 3.6 to 4.9 at NCR2, 2.9 to 4.5 at NCR3 and 3.6 to 5.2 at A16. These are indicative of severe to mild water pollution and suggest that Wangcol Creek and the Coxs River at these sites experience some degree of environmental stress due to poor water quality. There were no obvious trends in SIGNAL2 data across the EMP.

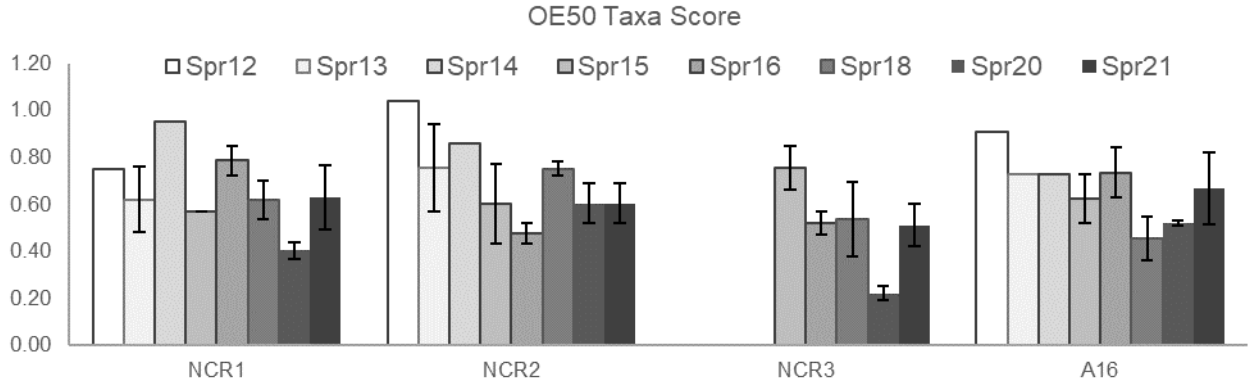

Figure 7 Signal2 results for impact and control sites for the period of 2012-2021

The complex interaction that exists between the various types of disturbances (e.g. those to habitat, water quality and flow) experienced in Wangcol Creek make any changes in water quality, and thus associated changes in macroinvertebrates, difficult to distinguish from those that could be due to the Project. Nevertheless, the EMP adds value to the wider monitoring program, and it is expected that any large magnitude and / or cumulative impacts to aquatic biota would be detected, allowing appropriate management actions to be implemented. Recent changes to the monitoring of aquatic ecology, including the addition of two further macroinvertebrate control sites, will assist in identifying any potential future impacts and help inform remediation efforts as necessary.

6.4.3 Reportable Incidents

No reportable incidents have been recorded against ecological monitoring for the reporting period.

6.4.4 Further Improvements

- Further monitoring should be undertaken as planned. This will maximise the validity of comparisons among data collected following Project commencement and between these data and baseline data. Data from ongoing surveys will allow more confident conclusions to be made on the presence and duration of any potential impact in Wangcol Creek that could be attributed to the Project.
- Three replicate AUSRIVAS samples should continue to be collected from each site during all future surveys. This will provide a measure of the variation present in each indicator at each site, thereby, improving the ability to detect any future impact by enabling the use of appropriate statistical analysis.

6.5 Air Quality Monitoring

6.5.1 Environmental Management

The OEMP (EA NSW, 2022a) outlines the Air Quality Monitoring Program, as required under the CoA (CoA D3 (d) and E18) as stipulated by PA 09_0186. The Air Quality Monitoring Program includes specific site management pertaining to the transport and emplacement of ash, managing dust within the ash repository using an extensive sprinkler system and water cart applications, meteorological monitoring and continuous monitoring for dust/airborne particulates. Sprinklers and compaction are used to minimise fugitive dust from the LNAR. Water trucks are used to manage fugitive dust from the haul roads.

Dust management at the LNAR is included in the responsibilities of all activities, including:

- Daily monitoring from weather station.
- Fly ash conditioning.
- Mobile sprinkler system
- Use of perimeter sprays at the ash placement area
- Wash-down of security roadways, haul road/s and vehicle access roads – water carts
- Static dust monitors
- Ash placement operations
- Final and temporary capping of ash; and
- General maintenance of the ash placement area (Lend Lease, 2012)

6.5.1.1 Sprinklers and Pumps

Dust suppression is a key performance objective for ash placement activities. Dust suppression concerns all aspects of exposed ash and ancillary aspects of vehicular traffic during permanent capping and other activities. The main dust suppression method on exposed ash is the use of sprinklers with water sourced from wash down ponds and the blow down towers from Mount Piper's cooling water system – no clean water is used in this application. Water application (measured in sprinkler hours) is based on wind velocity, humidity and temperature. Sprinklers are also used for haul roads. Water source, volumes and sprinkler numbers are monitored daily by Service Stream and reported to EA NSW monthly.

The OEMP (EA NSW, 2022a) provides a guide for sprinkler hours at an optimum of 4 hours per day during low evaporation at less than 3 mm per day to ensure that a target of 5 mm by irrigation application is not exceeded Table 11.

Table 11 Water use guideline

Water use guidelines based on temperature and wind speed	Water use guidelines
>25° >20km/hr (10hrs/day)	15° <20km/hr (<4 hours/day)
15-24° <20km/hr (8 hrs/day)	
15° <20km/hr (4 hours/day)	
Evaporation 3 – 7 mm per day	**Evaporation < 3 mm per day**
Oct, Nov, Dec, Jan, Feb, Mar	April, May, June, July, Aug, Sept

Operation of sprinklers in extreme hot and dry conditions requires extended irrigation hours

6.5.1.2 Air quality monitoring

Air quality impacts at LNAR are managed pursuant to PA 09_0186 and the approved Air Quality Management Plan (AQMP). The AQMP provides the assessment criteria for the LNAR which are monitored through a network of dust monitors.

The monitoring network consists of

- 5 dust deposition gauges (Figure 3), including Dust Gauges 19, 20, 21, 22 and 23
- 1 Tapered Element Oscillating Microbalance (TEOM) measuring <10 µm (PM_{10}) as shown on Figure 3.
- Air Quality Monitoring Station (AQMS) located at Blackmans Flat.

Dust monitoring results are recorded monthly with colour and textural observations.

Performance indicators recommended in the OEMP for air quality monitoring are as follows:

- Increase in Total Suspended Particulates (TSP) by > 2g/m^2/month to a maximum of 3.5g/m^2/month at dust deposition gauges outside the ash placement area
- PM_{10} annual average is <30µg/ m^3 and 24 hour maximum does not exceed 50µg/m^3

The installed dust gauges meet the requirements for the methods for sampling and analysis of ambient air (AS/NZS 3580.10.1:2003).

6.5.2 Environmental Performance

6.5.2.1 Dust suppression – Lamberts North Sprinkler system

Figure 8 reflects a relationship between sprinkler application and evaporation to identify that the target or maximum application rates for irrigation at 5 mm / day was achieved. Net irrigation was calculated by subtracting the daily evaporation from the daily sprinkler irrigation rate.

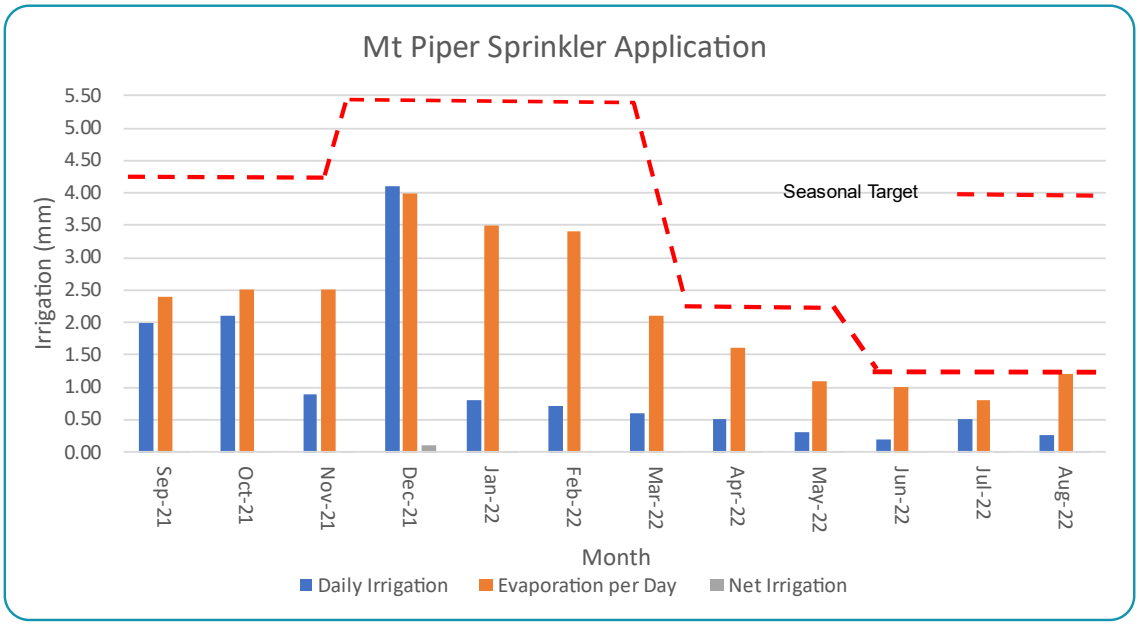

Figure 8 Efficacy of irrigation operations September 2021 – August 2022

6.5.2.2 Air quality monitoring

The 2021/22 reporting period was predominantly characterised by slightly above average temperatures, a slight increase on 2020 -2021 mean temperature and wet climatic conditions. Nationally averaged rainfall was 9% above average with La Niña influencing Australia's climate contributing to the wettest November on record (BOM, 2022a). NSW experienced above average rainfall for the majority of the reporting year and relatively cool temperatures throughout the state (BOM, 2022b).

Dust activity across the state was greatly varied throughout the reporting period. The Office of Environment & Heritage's DustWatch reports (OEH, 2022) reported increased dust activity mainly occurred in the southern parts of NSW throughout the year, with Broken Hill experiencing a dust storm in mid-January 2021. However, rainfall across NSW began to suppress dust activity in January 2022 and continued to reduce though to May, and substantial increases in groundcover expected to have led to a drop in overall dust activity in 2022.

Climatic conditions, state-wide dust activity and localised bushfires can influence air quality near the LNAR as reflected in previous Annual Reports These extreme events can impact on air quality in the Lithgow Local Government Area and are not related to impacts or activities at the LNAR.

Dust depositional results across gauges DG19-DG23 from September 2021 to August 2022 are shown in Table 12. The results for all gauges across the reported months, except for DG23 in February 2022, were below the assessment criteria of 3.5 g/m^2. The depositional dust results across all gauges remained quite variable from September 2021 to June 2022. This is largely in line with the 2021-2022 DustWatch Reports released by OEH which reported variably increasing dust activity from September 2021 to January 2022 and dust activity then began to decrease.

Comparative annual average depositional dust data for the combined average over the previous seven-year period is presented in. The increase in annual average for depositional dust concentrations from September 2017 through to January 2020 (refer to Table 12) is generally reflective of the extended drought conditions, increased frequency in state-wide dust storms and bush fires impacting the local air shed in the vicinity of the LNAR. The recorded decrease in annual average depositional dust for all gauges in the 2022 reporting period, i.e. 1 September 2021 to 31 August 2022, can be attributed to the generally wetter reporting period breaking the extended drought conditions experienced in previous years.

Table 12 Annual depositional dust summaries

Date	Total Insoluble solids (g/m^2/month)				
	DG 19	DG 20	DG 21	DG 22	DG 23
	Insol.	Insol.	Insol.	Insol.	Insol.
Sep-21	0.9	0.6	0.9	0.6	1.4
Oct-21	1.2	1.0	1.0	0.5	0.5
Nov-21	0.46	0.24	0.59	0.3	0.76
Dec-21	1.4	0.8	0.7	1.2	2.0
Jan-22	0.4	0.3	0.4	0.5	1.2
Feb-22	0.2	0.1	1.2	0.3	3.7
Mar-22	0.4	0.43	1.5	0.9	0.4
Apr-22	0.1	0.2	0.6	0.5	0.2
May-22	2.1	1.2	1.7	1.3	1.3
Jun-22	0.2	0.4	1.5	0.6	0.6
Jul-22	0.5	0.4	0.8	0.5	0.6
Aug-22	0.6	0.6	0.8	0.4	0.3
Annual averages					
2022	0.7	0.5	0.9	0.6	1.1
2021	0.6	0.4	1.2	0.8	1.1
2020	1.8	1.8	2.1	1.1	2.3
2019	1.7	1.8	2.4	2.2	2.7
2018	0.9	1.4	1.4	1.1	1.0
2017	0.4	0.7	1.1	1.4	1.0
2016	0.6	0.7	1.5	0.6	0.7
2015	1.1	0.8	1.4	0.8	0.8

Comparative depositional dust data for each of the five OEMP dust deposition gauges are presented in Figure 9-Figure 13. The generally higher annual average for depositional dust concentrations from September 2018 through to January 2020 (refer to Figure 9 to Figure 13) is generally reflective of the extended drought conditions, increased frequency in state-wide dust storms and bush fires impacting the local air shed in the vicinity of the LNAR within that period. There was a sudden increase in insoluble solids experienced in January 2020 which was recorded in four of the five monitoring gauges (refer Figure 9 to Figure 13). This is understood to be attributed to elevated levels of dust particles from dust storms and bushfires settling in the gauges and was not attributed to activities at the LNAR. Depositional dust concentrations post-January 2020 have decreased for all gauges, with a single anomalous peak above the 3.5 µg/m^2 per month limit recorded in gauge DG21 in July 2021 (Figure 11) and in gauge DG23 in February 2022 (Figure 13).

The anomalously high result recorded in Dust gauge DG23 in February 2022 (Figure 13) is deemed not to be caused by operations at Lamberts North. Due to the wet conditions during the reporting period and the consistently low results before and after February 2022.

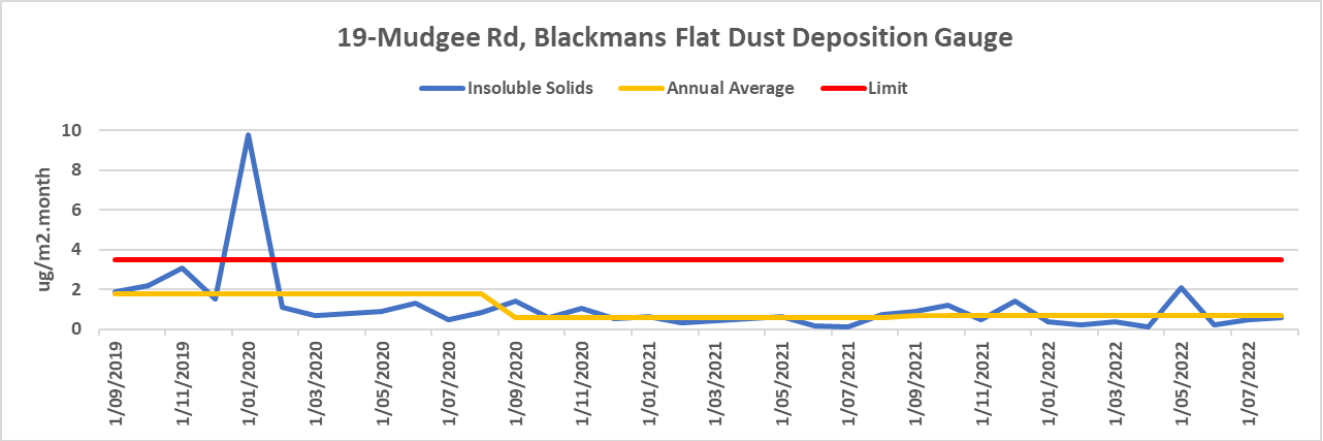

Figure 9 Depositional Dust Summary for Dust Gauge 19

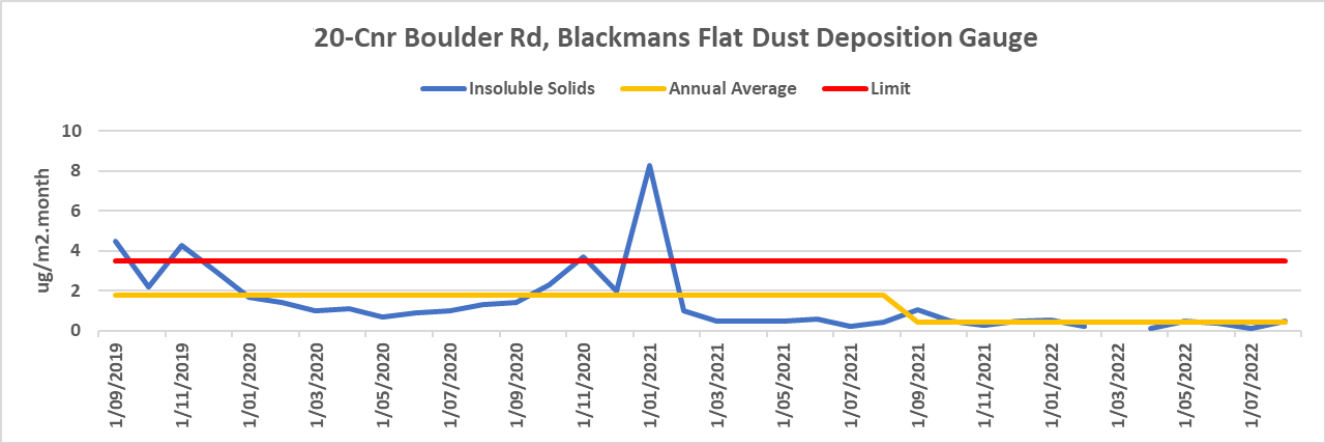

Figure 10 Depositional Dust Summary for Dust Gauge 20

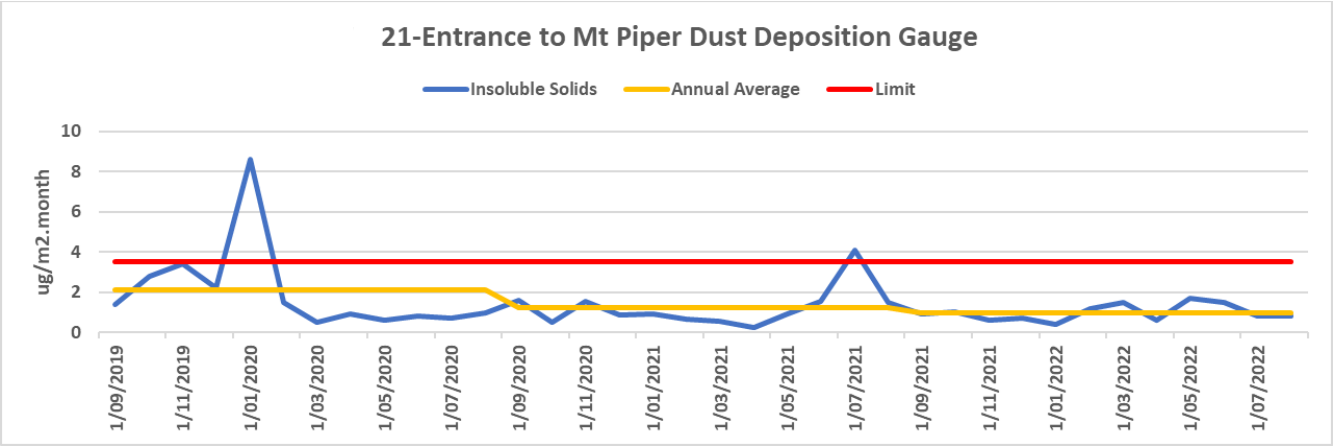

Figure 11 Depositional Dust Summary for Dust Gauge 21

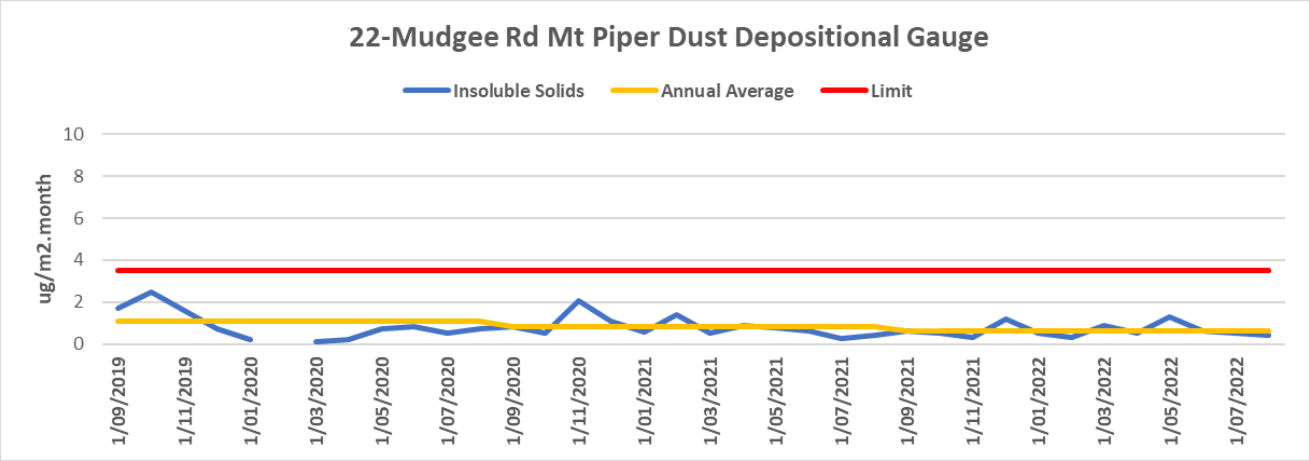

Figure 12 Depositional Dust Summary for Dust Gauge 22

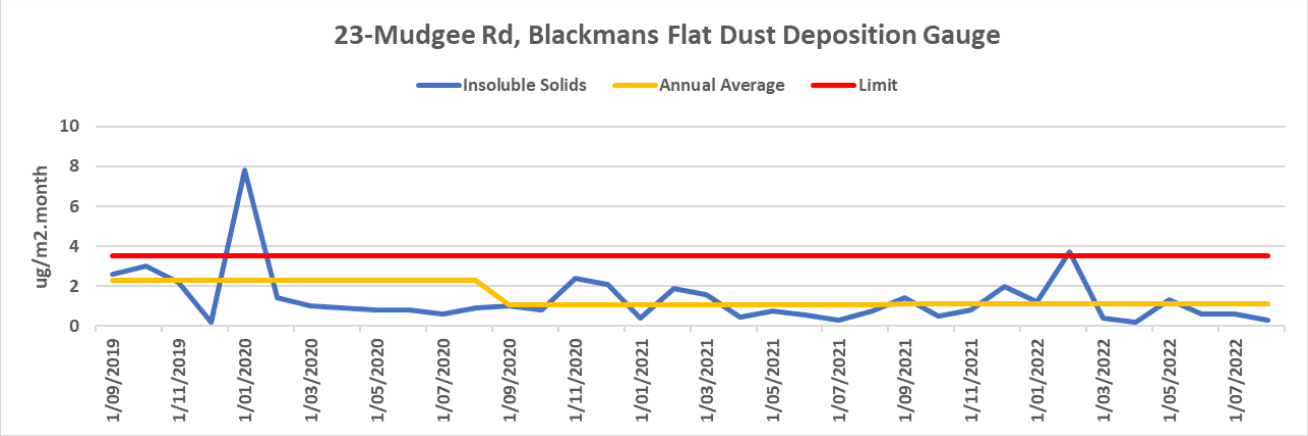

Figure 13 Depositional Dust Summary for Dust Gauge 23

EA NSW monitors fine particulates at LNAR, Blackmans Flat and Wallerawang air quality stations. These are located to the northwest, east and southern directions from the LNAR. Analysis of continuous air quality (PM_{10}) monitoring data from the Blackmans Flat, Wallerawang and LN air quality stations was undertaken for the reporting period (Figure 14).

The results show a generally decreasing trend of fine particulate matter over the reporting period, with all results below the National Environment Protection Measures (NEPM) Daily Standard Limit for PM_{10} (Figure 14). Above average rainfall has likely attributed to the fine particulate concentration levels remaining at the typically background levels for the region throughout the reporting period. With the rainfall received in the 2021-22 reporting period, the annual average PM_{10} results for LNAR is 6.1 µg/m^3, which is below the annual average criteria of 30 µg/m^3. The other local monitoring sites recorded PM_{10} results of 4.9 µg/m^3 at Blackmans Flat and 11.8 µg/m^3 at Wallerawang. The analysis indicates that the PM_{10} concentrations recorded during the 2021-22 reporting period are likely attributed to sources other than the LNAR. Furthermore, the dust suppression systems were operating and functional at LNAR.

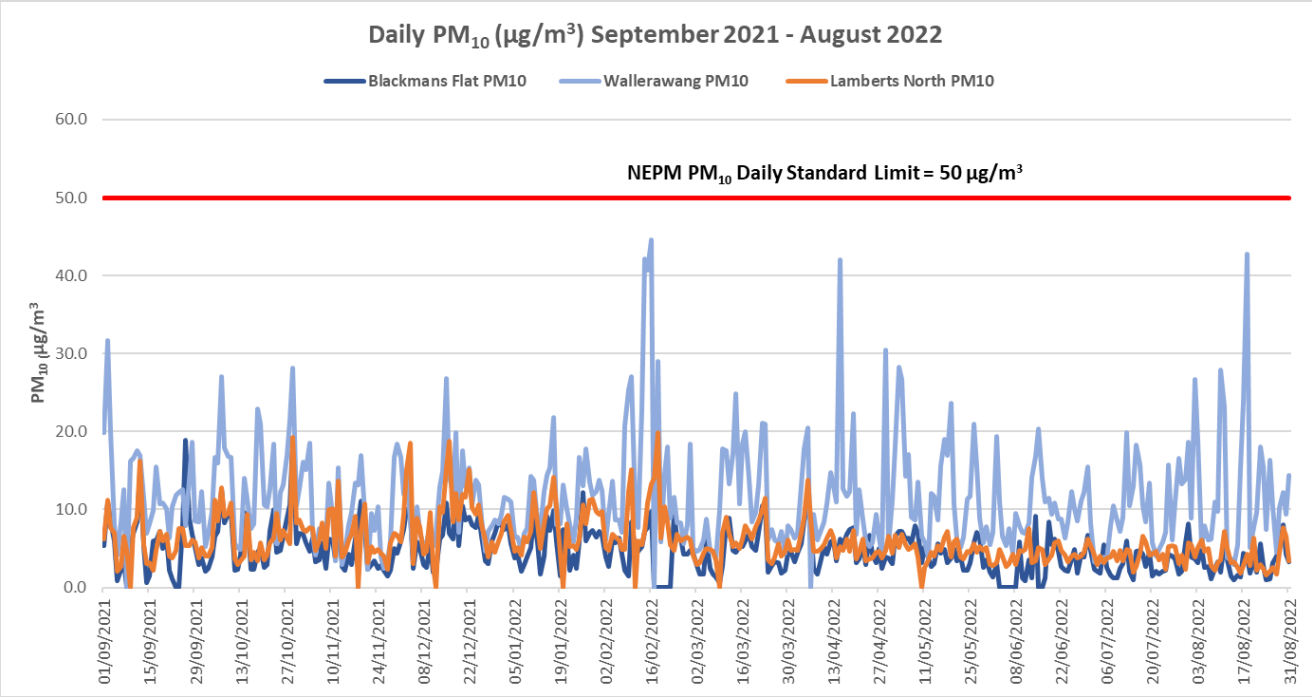

Figure 14 Average PM_{10} from the Mt Piper TEOM from September 2021 to August 2022

6.5.3 Reportable Incidents

No reportable incidents have been recorded against air quality management for the reporting period.

6.5.4 Further Improvements

The air quality management controls have been effective and will continue to be implemented for the LNAR, as such no further improvements have been identified for the next reporting period.

6.6 Waste Management

6.6.1 Environmental Management

Waste disposal practices at the LNAR are managed in accordance with Environmental Protection Licence 13007 and the Waste Management Sub-Plan (WMP, OEMP Section 6.8). Waste materials are assessed, classified, managed and disposed of in accordance with *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (EPA, 2014). The WMP addresses waste management on site, and satisfies CoA D2 (g), E23, E24 and E25.

The WMP provides a framework for EA NSW, its contractors and vendors to manage waste and to minimise the potential for adverse impacts to sensitive receivers during the operation of the Project and is comprised of the following targets:

- To ensure waste at the LNAR is managed in accordance with the conditions of EPL 13007.
- To ensure that all Staff and associated contractors involved in the LNAR operations are made aware of the waste management measures contained in the WMP, that waste generated on LNAR is recycled or disposed of in accordance with the WMP.

EA NSW and associated contractors:

- Are not to cause, permit or allow any waste generated outside the ash repository to be received at the ash repository for storage, treatment, processing, reprocessing or disposal, including no wastes except as permitted by the licence or an exemption certificate.
- Waste generated by site personnel (including maintenance wastes such as oils and greases) are collected on a regular basis to be recycled or disposed of at an appropriate facility.
- Evidence of a recycling system in use and site-generated waste being disposed of to an appropriate facility.
- Waste management details are recorded in the monthly environmental report.

Waste-related documents and records reflect adherence to these protocols, thereby providing the foundations for a transparent approach to waste management. The WMP provides further guidance and detail on specific waste streams and applicable management measures (OEMP Section 6.8).

6.6.2 Environmental Performance

The activities at the LNAR were deemed to have met the WMP targets for waste management for the 2021-2022 reporting year. There were no non-conformances identified and the WMP requirements were found to be compliant.

6.6.3 Reportable Incidents

No reportable incidents have been recorded against waste management for the reporting period.

6.6.4 Further Improvements

No further improvements are planned for the next reporting year.

6.7 Heritage Management (Aboriginal & non-Aboriginal)

6.7.1 Environmental Management

Project Approval 09_186 contains CoA's concerning heritage management in Part B – Prior to Construction (B5 (f)) and Part C – During Construction (C8 – 9). These conditions are managed under Section 5.6 of the CEMP. The LNAR has progressed into the operational phase and CoA Part B and C no longer apply.

Whilst there are no specific CoAs for Project Approval 09_0186 for Part E – During Operations, regarding heritage management, contract personnel are educated on their due diligence duties in respect of the protection of Aboriginal and non-indigenous heritage sites and items.

6.7.2 Environmental Performance

No additional sites have been recorded within the vicinity of the LNAR.

6.7.3 Reportable Incidents

No reportable incidents have been recorded against heritage management for the reporting period.

6.7.4 Further Improvements

No further improvements have been identified for the next reporting period.

7. Water management

7.1 Surface Water Quality Monitoring.

7.1.1 Environmental Management

The Soil and Surface Water Management Plan (SSWMP) is a sub-plan as outlined in the OEMP and addresses the specific requirements of the CoA D3 (c) and E16. The SSWMP addresses soil and water cycle management on site, including a surface water monitoring program at receiving waters that is comprised of the following targets:

- The water quality at Wangcol Creek is not impacted by LNAR operations;
- Zero environmental incidents that relate to pollution of waters at Wangcol Creek.
- Erosion to be effectively managed on site and not have an influence and/or impact on surrounding lands outside the boundary of LNAR.

Performance criteria:

- The Environmental Goals adopted have taken into consideration local baseline surface water conditions in Wangcol Creek prior to the commencement of ash placement in the eastern side of the MPAR (referred to as pre-placement). Baseline conditions were specifically established based on the 90th percentiles of the water quality dataset from monitoring site WX22 in Wangcol Creek. An early warning is triggered when the post-ash placement 50th percentiles for the various water quality indicators at each of the surface water monitoring sites, exceed the pre-placement 90th percentiles (Aurecon 2017).
- Ecological results at Wangcol Creek will indicate no significant variation from historical baseline data.
- No visual evidence of erosion and sedimentation impacts on Wangcol Creek following significant rainfall events.

Runoff water from the LNAR is contained in clean and dirty water sediment ponds and forms the primary source of water for dust suppression on exposed ash and capped areas as well as irrigation of the revegetated areas. The CoAs stipulate that a monitoring program must be implemented to record and observe water quality and potential impacts from repository operations on regional surface waters. The OEMP for the LNAR requires sampling at three locations (Figure 3; Table 13).

Table 13 Location of Surface Water Monitoring Points

Site ID	Location Description	Monitoring Frequency
LMP01	Final Holding Pond Weir – monitoring point is located north-west of the MPAR. This monitoring site is located in an upstream position relative to the LNAR.	Monthly[1]/Quarterly[2]
NC01	Located in Wangcol Creek. This monitoring site is located upstream to the LNAR and to the north of the MPAR and is an aquatic life background site.	Monthly[1]/Quarterly[2]
WX22	Located in Wangcol Creek at a stream gauge to the east/down-stream of the MPAR and LNAR and monitoring site LDP01. This monitoring site is also situated down-stream of monitoring bore D8.	Monthly[1]/Quarterly[2]

1. Selected field parameters monitored on a monthly basis as required
2. Monitoring undertaken by analytical laboratory Nalco Water – Ecolab

Changes in the water quality and trace metals at Wangcol Creek receiving water site (WX22), from pre-ash placement (October 2012 to August 2013) to the post-ash placement period (September 2013 to August 2017) was examined in the past by Aurecon reported within their Water Quality Monitoring Reports. For the reporting period 2021-2022 Environmental Resources Management Australia (ERM) was commissioned by EA NSW to carry out the Water Quality Monitoring Report (WQMR), refer to Appendix E.

7.1.2 Environmental Performance

ERM was commissioned to assess the results from the surface water monitoring program as set out in the OEMP and as required by Project Approval 09_0186 during the reporting period. A copy of the WQMR is contained in Appendix E. The surface water monitoring carried out monitors for changes in water quality in Wangcol Creek caused by multiple land uses in the area and is not restricted to LNAR activities.

Results above the LNAR water quality goals were recorded during the reporting period with respect to surface water. These results are most likely due to activities associated with the MPAR and has triggered contingency measures requiring the commencement of in independent investigation. This investigation is currently under way. Concentrations for the last 12 months, including those above the Environmental Goals, are presented in the tabulated surface water results in the annual water quality monitoring report in Appendix E.

Review of the surface water data presented in Appendix E indicates that, for specific analytes, concentrations at the downstream monitoring location of WX22 were generally higher than those reported at upstream locations LMP01 and NC01. Concentrations of EC, TDS, chloride, sulfate and nickel in surface water from WX22 were generally higher than in samples from the upstream monitoring locations. However, these results are not considered to be due to ash placement activities occurring at the LNAR. As reported in the Annual Environmental Monitoring Report – Water Management and Monitoring for the Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project (ERM, 2020) which focusses on the MPAR, the results are considered to be related to BCA placement activities at the MPAR (refer to Appendix E for further details).

Concentrations above the environmental goal of Nickel were reported at sampling site WX22 for 9 months of the reporting period. The concentrations reported had increased from the previous years reported highs in the summer period. Higher rainfall during this reporting period has likely resulted in higher relative groundwater contributing to the surface water receiving environment.

Elevated concentrations of Iron in surface water from LMP01, NC01, C, E were received for the majority of the reporting period, WX22 and G had decreased Iron concentrations compared to LMP01, NC01, C and E but also had sporadic spikes in Iron concentrations during the 2021/22 reporting period. These results are considered to be comparable to background surface water quality in the area, based on the surface water results from LMP01 and NC01 which are located upstream of the Ash Repositories.

A review of concentration trends in surface water with respect to key indicators including chloride (Figure 15), nickel (Figure 16), sulfate (Figure 17) and TDS (Figure 18) are presented below. These indicators were selected based on the results being above the Environmental Goals for surface water, the potential increase in concentration observed downstream of the Ash Repositories and/or trend analysis presented in previous annual monitoring reports. Surface water trend graphs for the period 2010 to the end of the current reporting period are presented below. Additional graphs generated and reviewed as part of the trend analysis are presented in Appendix E.

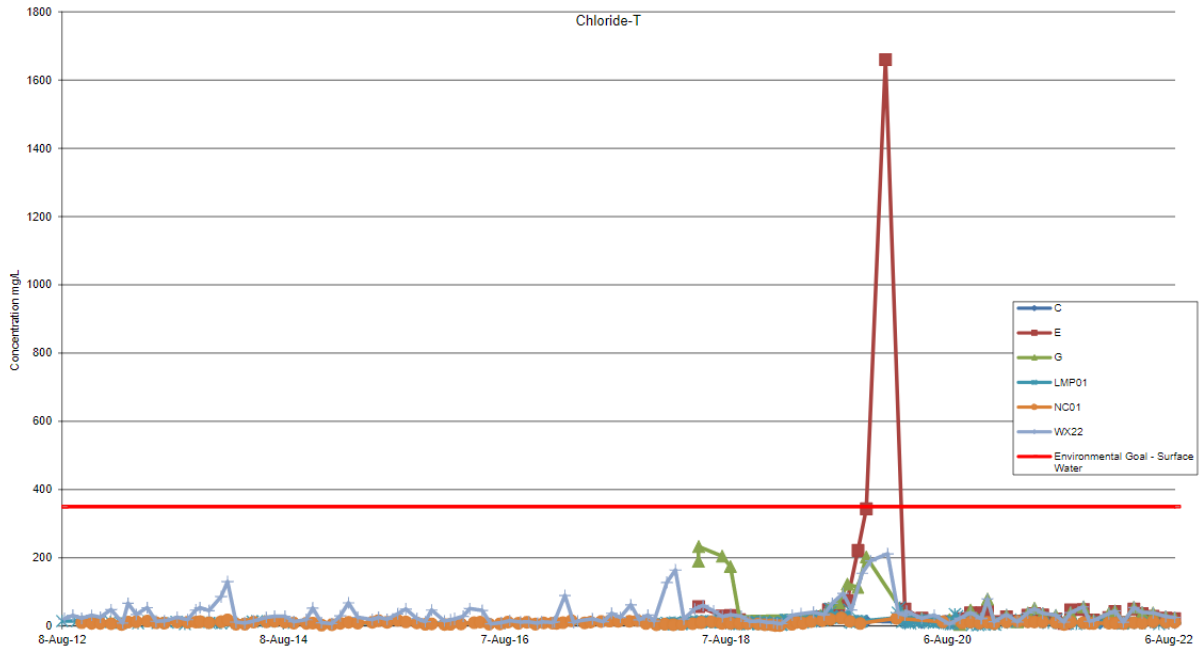

Figure 15 Chloride Concentrations in Surface Water

Chloride concentrations for all surface water monitoring locations were consistently below the Environmental Goal of 350 mg/L throughout the period 2010-2022 (Figure 15). The pattern of chloride concentrations in surface water from WX22 during the 2021/22 reporting period appeared to have improved from previous years, displaying fewer spikes, concentrations remained fairly consistent at each sample point during the reporting period. The consistent concentrations are likely associated with high stream flows for the majority of the reporting year.

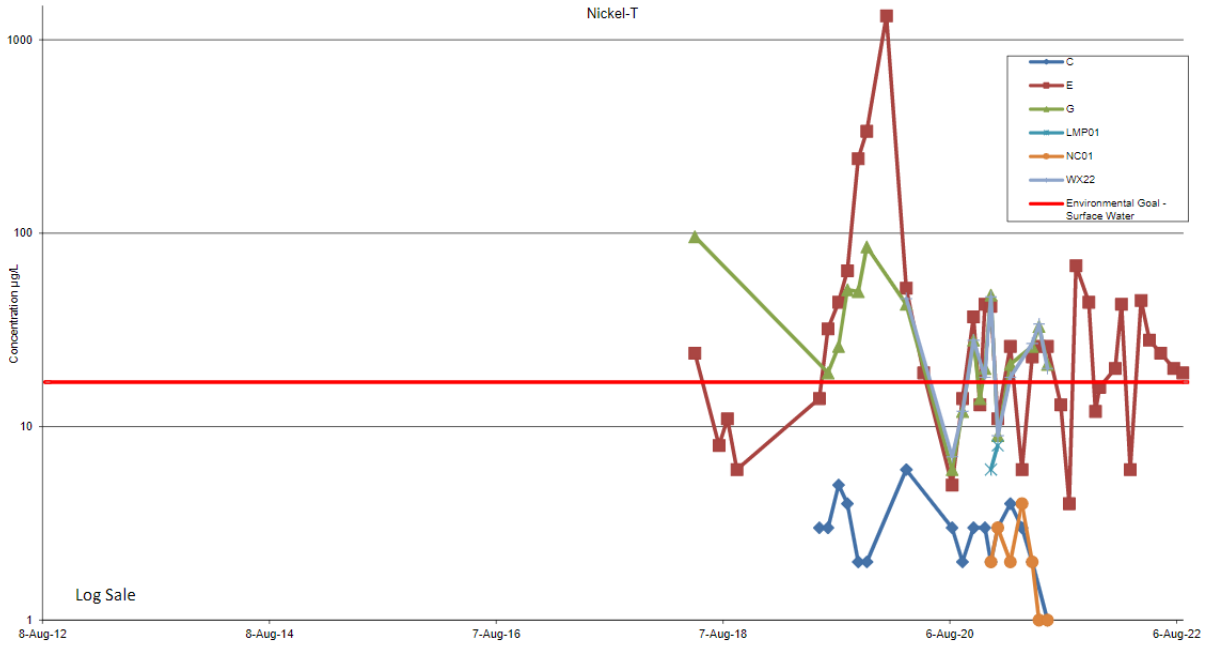

Figure 16 Nickel Concentrations in Surface Water

Nickel concentrations at LMP01 and NC01 have been generally stable since monitoring commenced in 2012. These upstream monitoring locations have reported concentrations of nickel equal to the Environmental Goal for surface water in March 2014 (NC01 – 17 µg/L) and February 2020 (LMP01 - 17 µg/L); other concentrations at these locations were below the Environmental Goal. No concentration trend is apparent in the data (Figure 16).

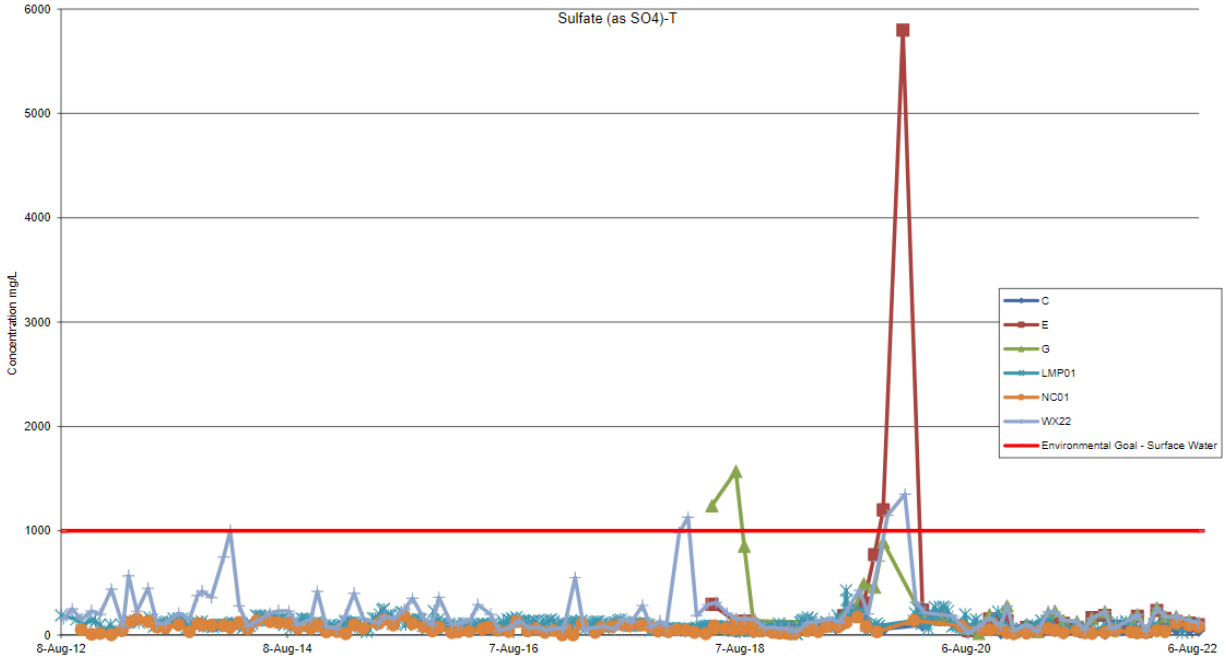

Figure 17 Sulfate Concentrations in Surface Water

Sulfate concentrations at LMP01 and NC01 have remained relatively stable since 2010, consistently below the Environmental Goal for surface water (Figure 17). The sulfate concentrations at WX22, downstream of the LNAR, were generally stable between 2010 and 2012. Post 2012, sulfate concentrations at WX22 were equal to or above the Environmental Goal during the summer period in February 2014, February 2018, November 2019 and January 2020 Figure 17

During this reporting period, the peak concentration was reported during the Autumn months (260 mg/L reported in April & May 2022), noting that concentrations remained below the Environmental Goal, and were also lower than the summer peaks recorded in previous reporting periods as shown in Figure 17.

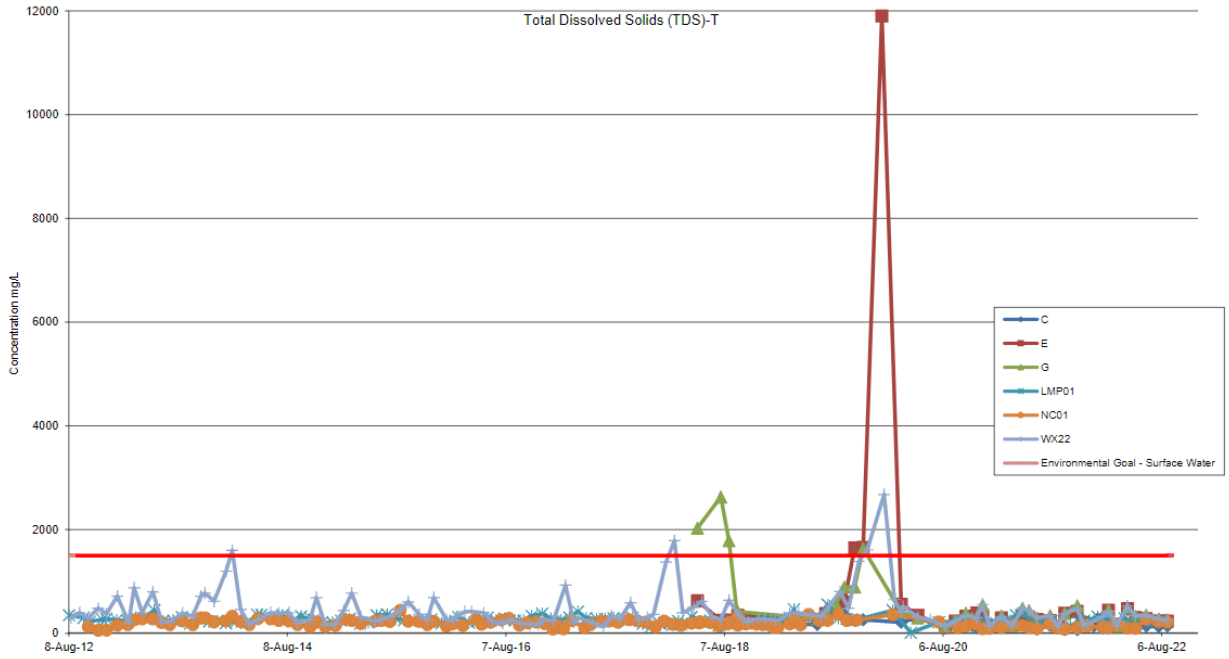

Figure 18 TDS Concentrations in Surface Water

TDS concentrations in surface water at LMP01 and NC01 have remained relatively stable since 2010, consistently below the Environmental Goal. At WX22, downstream of the LNAR, the TDS concentrations were generally stable between 2010 and 2012. Post 2012, the TDS concentrations at WX22 have reported above the Environmental Goal during the summer period in February 2014, February 2018, November 2019 and January 2020, consistent with the sulfate concentrations Figure 18.

During this reporting period, TDS concentrations at WX22 were consistently below the Environmental Goal and were lower than the summer peaks recorded in previous reporting periods Figure 18.

7.1.3 Reportable Incidents

No reportable incidents have been recorded against surface water management for the reporting period.

7.1.4 Further Improvements

- Surface water will continue to be monitored and appropriate action taken to mitigate potential impacts to Wangcol Creek. Mitigation controls will be informed following the completion of the independent groundwater investigation.

7.2 Groundwater Monitoring

7.2.1 Environmental Management

The Groundwater Management and Monitoring Plan (GMMP) is a sub-plan of the OEMP and seeks to address the specific requirements of the CoA D3 (b), E15 and E17. The objective of the GWMP is to assess compliance with the CoAs. The GMMP provides for the requirements for the ongoing groundwater monitoring program in accordance with CoA E15. The GMMP was established and implemented in October 2012 prior to construction activities and in addition to the existing monitoring regime for MPAR. The locations of the groundwater monitoring sites are presented in Figure 3.

In terms of performance criteria, water quality trigger values set out in the OEMP (CDM Smith 2013), as modified by Aurecon (2017), have been adopted as Environmental Goals for the analytes. In addition to the Environmental Goals outlined above, an early warning is triggered when the post-ash placement 50th percentiles for the various water quality indicators, exceed the pre-ash placement 90th percentiles (Aurecon 2017) (for further details, see Appendix E).

The GMMP provides the procedures and protocols that apply to the monitoring and testing of water quality and involves quarterly sampling of existing long-term bores associated with MPAR and new bores located south of Huon Gully. A list of the groundwater monitoring locations is provided below:

- Bore D9: East of Huon Gully and south of Wangcol Creek, located outside the ash placement area. Used to monitor groundwater quality and potential influence on Wangcol Creek
- Bore D8: North of Wangcol Creek. Used to monitor groundwater quality and potential influence on Wangcol Creek
- Bore D10 & D11: The MPAR bores, on the western side of the ash placement area are used to monitor inflows from MPAR to the LNAR in Huon Gully.
- Bore D1: North of Huon Gully, used to detect seepage from the north-eastern MPAR where BCA is emplaced and monitor groundwater quality and potential influence on Wangcol Creek.
- Bore D15: Inside of LNAR approval area, south and cross-hydraulic gradient of the currently active LNAR ash placement area and south of multipurpose storage ponds Pond BWA – Pond BWC
- Bores D16 & D17: Inside of LNAR approval area, south and cross-hydraulic gradient of the currently active LNAR ash placement area and north of the Centennial Coal reject emplacement areas
- Bore D18: Inside of LNAR approval area, south and cross-hydraulic gradient of the currently active LNAR ash placement area
- Bore D19: Downgradient of LNAR approval area, adjacent to Centennial's DML Dam

Bores D10 and D11 are considered to be **upgradient of the LNAR** with the results used to indicate groundwater contributions from the MPAR. Exceedances of the Environmental Goals for these bores are considered to be unrelated to either background groundwater conditions in the region or to potential impacts resulting from activities at the LNAR. These groundwater conditions are currently subject to review and management as part of the independent groundwater investigation.

Bores D15, D16 and D17 in the southern portion of the LNAR are considered to be south of and across gradient of the LNAR, with the results used to indicate baseline groundwater contributions. The Environmental Goal exceedances in this area are considered unlikely to be a result of activities at the LNAR based on the inferred direction of groundwater flow.

Bores D1, and D8 and D9, are considered to be downgradient of the LNAR and the MPAR. Elevated detections of Environmental Goals in these bores are also elevated relative to concentrations in bores to the south/across gradient of the LNAR, and are considered to be reflective of the same groundwater conditions reported at D10 and D11 (i.e. upgradient relative to groundwater flow direction). It is considered that exceedances of Environmental Goals are not a result of activities at LNAR. These groundwater conditions are currently subject to review and management as part of the independent groundwater investigation.

7.2.2 Environmental Performance

ERM was commissioned to assess the results from the groundwater monitoring program required by the OEMP and Project Approval 09_0186 during the reporting period. A copy of the WQMR is contained in Appendix E. The groundwater monitoring carried out during the reporting period identified a number of exceedances of water quality goals contained in the GMMP and this triggered contingency measures requiring the commencement of a groundwater investigation. This investigation is currently under way.

Based on groundwater quality data from bores located up gradient (and between the MPAR and LNAR), these concentrations (particularly chloride) are unlikely to be related solely to the LNAR. Based on these results, EA NSW is undertaking further assessment and an independent investigation of groundwater and surface water in the vicinity of the MPAR and LNAR.

A review of concentration trends with respect to key indicators including chloride (Figure 19), nickel (Figure 20), sulfate (Figure 21) and TDS (Figure 22) are presented for bores D11 (upgradient of the LNAR), D15 (south of the LNAR) and D9 (downgradient of the LNAR and the MPAR).

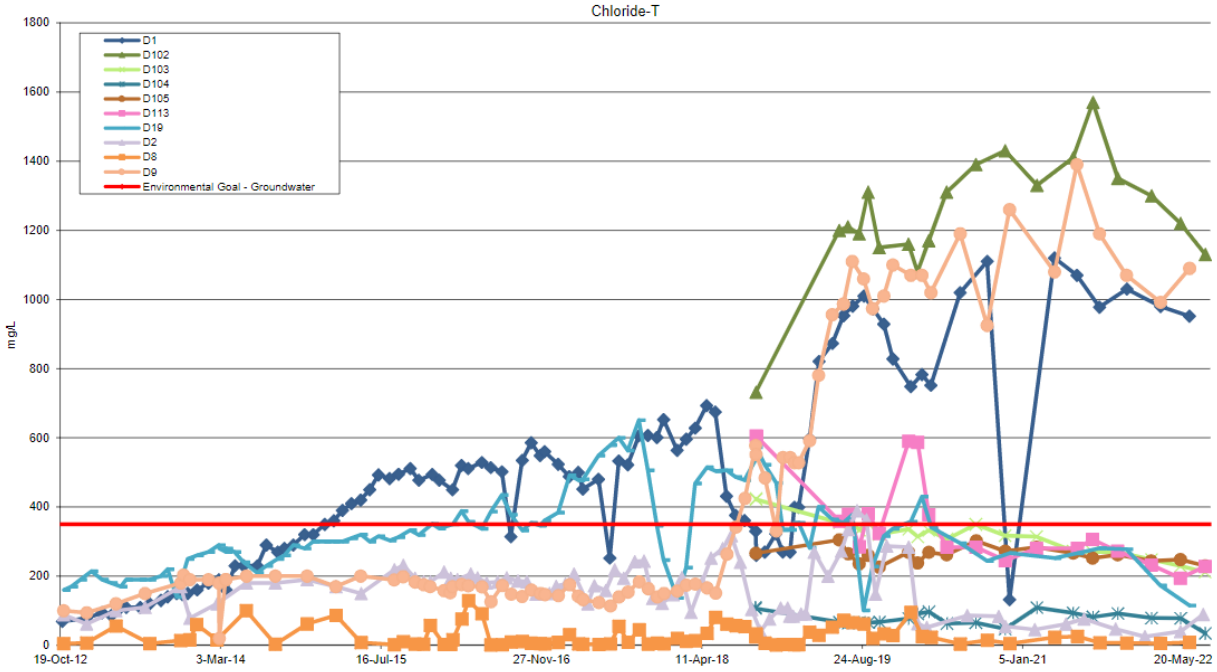

Figure 19 Chloride Concentrations in Groundwater

There is a generally increasing trend in chloride concentrations in groundwater from bore D11, particularly from the end of October 2013, when they increased above the Environmental Goals. Concentrations of chloride in groundwater from this bore appear to have stabilised since 2018 and this has continued during the 2021/22 reporting period shown in Appendix E.

To the south of the LNAR, chloride concentrations in groundwater from bore D15 increased in 2017 but have subsequently declined. A peak in chloride concentrations at bore D15 occurred in August 2019; however, this peak appears anomalous and is comparable with peaks identified for boron, sulfate, TDS and manganese from the same monitoring event. Since August 2019, the overall trend for chloride at D15 is generally stable and concentrations remained consistent with the historical dataset. With the exception of the August 2019 value, chloride concentrations in groundwater from D15 have remained below the Environmental Goals during the 21/22 reporting period shown in Appendix E.

Chloride concentrations in groundwater from bore D9 were generally stable from November 2013 to May 2018. However, since then, chloride concentrations have generally increased, reaching a maximum in June 2021. Concentrations appear to have begun to decline since the June 2021 peak, however more data is required to determine if the decrease will be sustained. Chloride concentrations in groundwater from this bore have been above the Environmental Goal for groundwater since December 2018 (Figure 19).

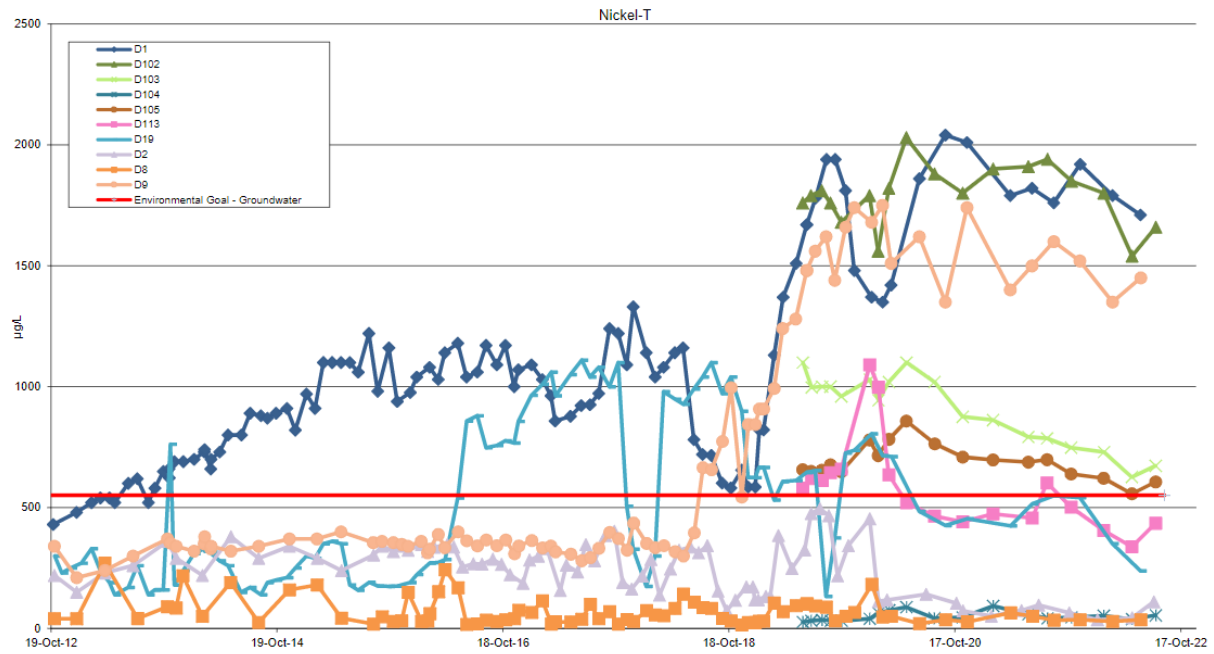

Figure 20 Nickel Concentrations in Groundwater

Nickel concentrations in groundwater from bore D11 increased from late 2012 to the end of 2017 (Figure 20). Concentrations have stabilised since 2018 shown in Figure 20 and Appendix E.

Nickel concentrations in groundwater from bore D15 have fluctuated above and, at times below, the Environmental Goal since monitoring commenced in 2012. However, since October 2017 nickel concentrations have remained above the Environmental Goal. During the 2020/21 reporting period concentrations remained within historical ranges however a decreasing trend is evident with the lowest concentration recorded in June 2021 since September 2017. The decreasing trend continued through the 2021/22 reporting period and concentrations dropped below the Environmental goals in March 2022 shown in Appendix E.

Nickel concentrations in D9 increased from 2010 to the beginning of 2014. Nickel concentrations were generally stable from 2014 to mid-2017, after which concentrations have overall increased and, in the 2021/22 reporting period, remained in the high end of the previously reported concentration range. Increased concentrations have been demonstrated to be attributed to the Mt Piper Ash Repository and not the LNAR (Figure 20).

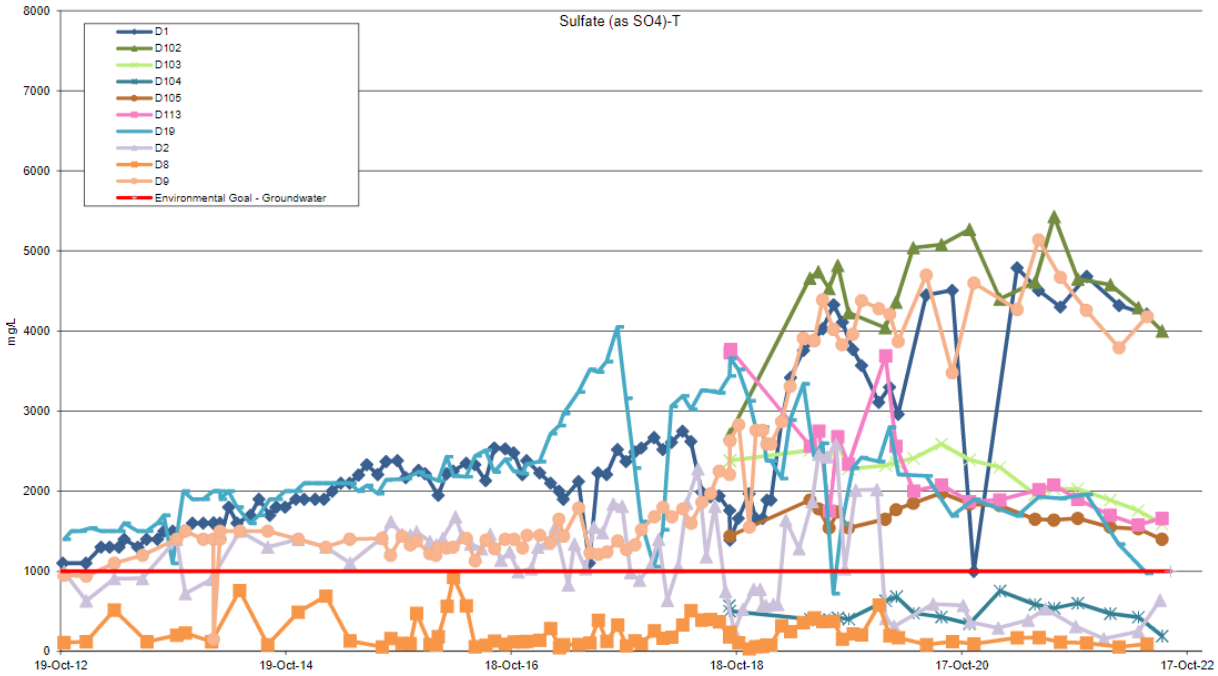

Figure 21 Sulfate Concentrations in Groundwater

An increase in sulfate concentrations was noted in groundwater from D11 in November 2013, with an increasing trend continuing until June 2017 (Figure 21). Since then, concentrations have fluctuated but have remained relatively stable; however, they continue to exceed Environmental Goals shown in Appendix E.

An increasing sulfate trend was apparent at bore D15 throughout 2017; however, concentrations have stabilised since that time. A peak in sulfate concentrations at bore D15 occurred in August 2019. This peak appears anomalous although it was comparable with peaks identified for boron, chloride, TDS and manganese from the same monitoring event. Since August 2019, the overall trend for sulfate at D15 has been declining, the last result during the reporting period gave a result of 1080 mg/L slightly above the Environmental Goal. However, concentrations have remained consistent with the historical dataset.

Consistent with the EC and TDS trends, sulfate concentration trends have been increasing in bore D9 since July 2018. This trend has continued through the current reporting period with the highest reported concentration recorded in June 2021. Increased concentrations have been demonstrated to be attributed to the Mt Piper Ash Repository and not the LNAR (Figure 21).

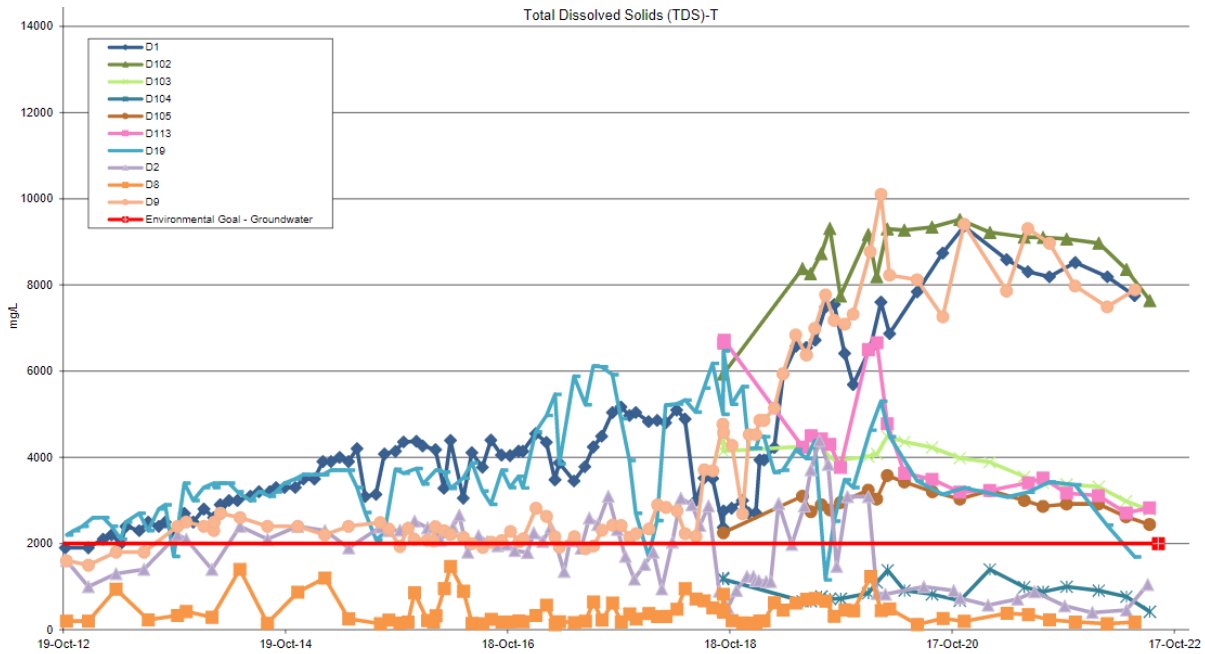

Figure 22 TDS Concentrations in Surface Water

A generally increasing trend in TDS concentrations was noted in groundwater from bore D11 since September 2013. TDS concentrations have generally been more variable, not increasing, in groundwater from D11 since March 2016 shown in Appendix E.

A peak in TDS concentrations at bore D15 occurred in August 2019. This peak appears anomalous although it was comparable with peaks identified for boron, chloride, sulfate and manganese from the same monitoring event. Since August 2019, the overall trend for TDS in groundwater from bore D15 have been steadily declining and have dropped below the Environmental Goals in March 2022. Concentrations have been consistent with the historical dataset shown in Appendix E.

TDS concentrations in groundwater from D15 and D9 increased slightly until July 2018. Beyond July 2018 concentrations in groundwater from bore D15 have remained stable whereas those in groundwater from bore D9 have increased, reaching the highest reported concentration in February 2020. TDS concentrations at D9 have since fluctuated but did not exceed the February 2020 peak. TDS concentrations in groundwater from bore D15 began to decline in January 2020, whilst remaining within historical range. Increased concentrations have been demonstrated to be attributed to the Mt Piper Ash Repository and not the LNAR (Figure 22).

7.2.3 Reportable Incidents

No reportable incidents have been recorded against groundwater managed for the reporting period.

7.2.4 Further Improvements

- Triggered by monitoring undertaken for the MPAR, an independent groundwater assessment is currently underway to investigate the variation of chloride concentrations in groundwater. This will assist in determining the source and pathway of elevated chlorides to Bore D10 and other sites near the LNAR.
- A leachate barrier management system is being installed to prevent any potential leachate impacts to groundwater at the LNAR.

7.3 Hydrological Monitoring

The hydrological monitoring program, required by CoA E17, was incorporated into the GMMP because of the change in design to LNAR addressed in the Consistency Report (SKM, 2012). It is noted that this particular condition relates to assessing and quantifying the impacts and effectiveness of the transformed section of Huons Creek into a subsurface drainage line. Monitoring was undertaken for a period of five years and is now completed.

7.4 Erosion and Sediment Control

7.4.1 Environmental Management

The LNAR catchment area uses external batters and laybacks to stabilise the ash placement and direct runoff to swale drains that are situated parallel to the batters. The swale directs the water towards a controlled point, being an off-flow structure placed approximately every 100m along the batter. The off-flow structure, which is typically a rock-lined chute, directs the water to a containment pond.

The trucks deliver ash to the working face and create a number of piles next to each other, prior to final placement. The piles of ash allow for any runoff to be directed to the dirty water sediment pond(s). The ash is then graded into its final position and compacted by rollers to specific compaction criteria to mitigate erosion and infiltration.

7.4.2 Environmental Performance

Management of the ash benches is with the primary principle of eliminating uncontrolled runoff over any batter. All benches associated with the LNAR area are graded west to ensure security against a breach from any external boundary. All surface water runoff from the ash footprint of the LNAR is managed within the boundary of the ash placement area.

The location of water retention within the LNAR has remained unchanged since 2014 in that surface water flow is retained over the original drainage line installed on the base of the placement site. All water collected on the LNAR is directed to the west side retention location. Free water is drained through the ash via a furnace bottom ash drainage line previously installed at the original floor level of the North LN placement area. Seepage reports to the lined LN Pond 2 (Plate 4). Perimeter pipeline for surface water to report to additional lined storage ponds is in place.

Plate 2 Lined LN Pond 3, 2, 1 (left to right) (Photo taken February 2022)

Based on site observations and information reviewed potential impacts from the operation of the LNAR regarding erosion and sediment control have been effectively mitigated and managed.

7.4.3 Reportable Incidents

No reportable incidents have been recorded regarding erosion and sediment controls for the reporting period.

7.4.4 Further Improvements

- Additional pond interconnector piping works.

8. Landscape and Revegetation

8.1.1 Environmental Management

During the reporting year, no rehabilitation work was undertaken due to the construction of the Geomembrane system. Rehabilitation works at the LNAR is planned to occur when the 937m contour layback has been constructed around the perimeter of the ash repository. The completion of the 937m contour layback is anticipated to occur during the 2023 reporting year following completion of the Geomembrane system.

8.1.2 Environmental Performance

Ash Placement activities at the LNAR were undertaken within the existing capping levels. As such no additional land preparation or rehabilitation work was required during the reporting period. The rehabilitation status of the LNAR is detailed in Table 14. The rehabilitation status of the Lamberts North and the adjoining Mt Piper Ash Repository is shown in Appendix E.

Table 14 Rehabilitation Status

Area Type	Prev. Reporting Period Sept 2019 – Aug 2020 Hectares	This Reporting Period Sept 2020 – Aug 2021 Hectares	Next Reporting Period Sept 2022 – Aug 2023 Hectares
Total Footprint	19.8	19.8	19.8
Total active disturbance	16.7	16.7	16.7
Land being prepared for rehabilitation	1.3	0	1.5
Land under active rehabilitation	0	1.3	1.3
Completed rehabilitation	0	0	0

8.1.3 Reportable Incidents

No reportable incidents have been recorded against landscape and revegetation management for the reporting period.

8.1.4 Further Improvements

No further improvements have been identified for the next reporting period.

9. Community

9.1 Community Engagement

During the reporting period Community Consultation Committee (CCC) meetings were held on 18 October 2021, 6 December 2021, 28 March 2022 and 18 July 2022. The CCC comprises representatives from the local community and EA NSW. The CCC meets three times per year to discuss matters relating to operations at MPPS, including activities at the ash repositories – MPAR and LNAR. The CCC minutes are made publicly available via the Mt Piper Community page on EA NSW website www.energyaustralia.com.au.

9.2 Community Contributions

The MPPS and the associated LNAR has contributed to the economy of the district and State through the purchase of materials and services from local and regional suppliers, and by direct and indirect employment. EA NSW continues to support a number of community groups and organisations through in-kind support and financial sponsorship programs. During the reporting period, EA NSW had the opportunity to support up to 36 different community organisations and events during the reporting period. A list of these organisations and events are included in Appendix I.

9.3 Community Complaints

There were no community complaints reported to EA NSW relating to the LNAR during the reporting period (Appendix J). EA NSW maintains a 24-hour hotline for the public to report incidents, complaints or enquiries with contact details available on the EnergyAustralia website. EA NSW records the details of all complaints received in a Complaints Register.

9.4 Website Information

A project specific webpage has been developed to keep the broader community up to date with recent activities at the LNAR in accordance with CoA B10. Copies of the following documents are made publicly available on the EA NSW website:

https://www.energyaustralia.com.au/about-us/energy-generation/mt-piper-power-station

- Environment Assessment
- Project Approval 09_0186
- Construction Environment Management Plan
- Operation Environmental Management Plan
- Annual Environmental Management Reports
- Environment Protection Licence 13007
- Pollution Incident Response Management Plan
- CCC Minutes
- Modification 1 Report and Response to Submissions

10. Independent Environmental Audit

10.1 Independent Environmental Audit

Actions from the independent environmental audit performed in October 2018 (SLR, 2018) that are yet to be closed out are detailed below in Table 15.

Table 15 Audit response action timeline

Recommendation Number	Recommendation	EnergyAustralia NSW Response	Proposed date of completion
9	Include DPE Water response in Appendix E (Stakeholders Consultation) of the OEMP	Noted, recommendations 9, 10, 11, and 12 will be incorporated into the OEMP when updated. An independent groundwater investigation has been commissioned by EA NSW. The DPE, EPA and Water NSW have been consulted throughout this process to-date. The independent groundwater investigation is ongoing and anticipated to be progressively completed throughout 2022. During the reporting period, EA NSW submitted an updated copy of the OEMP that incorporated changes associated with the modification to the PA 09_0186 Mt Piper Ash Placement LNAR Project Approval. The modification relates to the installation of a leachate barrier system (low permeability liner) and leachate management system to restrict the escape of leachate from the LNAR. The OEMP will be updated at the completion of the independent groundwater investigation.	Ongoing - 2022
10	Update the Groundwater Management Plan following the completion of the independent groundwater investigation		
11	Include a site water balance in the OEMP		
12	Undertake further assessment and an independent investigation of surface water in the vicinity of the LNAR		

10.2 Environmental Representative Audit

An internal audit was conducted on the ash placement and ash management commitments detailed in Sections 2.23 Ash Placement, 2.2.4 Ash Management and Table 6.11 Mitigation Measures of the OEMP. Two nonconformances and one Opportunity for Improvement were identified as detailed in Table 16.

Table 16 Internal Audit Findings

Element	Element section	Finding (minor nonconformance or opportunity for improvement)	Finding detail
Contractor Management	6.5 HSSE Monitoring and control	MNC	Environment team to audit Service Stream to verify against OEMP, HSSEMS and/or other.
	6.4.1 Contractor procedures	MNC	Environment team to ensure Service Stream Enviro deliverables have been provided and operationalised (supported by audit)
	6.1 Evaluation of performance	OFI	Consider if the existing Service Stream LNAR KPI's and contract conditions are an effective evaluation of performance.

11. Activities Proposed in the next reporting period

Activities to be conducted in the next reporting period will include:

- Ash placement into LNAR building to 937m external layback.
- Construction and Commissioning of LNAR Stage 1B Leachate Barrier
- Continue marketing the reuse of fly ash to cement manufacturers and other potential users.
- Dust suppression activities to minimise potential air quality impacts from the LNAR.
- Environmental compliance monitoring for noise emissions, air quality and water quality.
- Execution of the Conservation Agreement with BCT for the BOA. Undertake the necessary management actions as outlined and required by the Conservation Agreement.
- Continue monitoring the ecological health of Wangcol Creek throughout the life of the Project. The monitoring will continue after final capping of the LNAR for a minimum of five years in accordance with approval conditions.
- Water management works including the maintenance of sediment and erosion control structures.
- Continue the independent assessment of groundwater and surface water conditions.

11.1 Environmental Management Targets and Strategies for the Next Year

Environmental measures to be implemented in the next reporting period are detailed in Table 17.

Table 17 Measures to be implemented in the next reporting period

Environment Management Area	Target / Strategy	Timeframe
Ash Delivery and Placement	Continue to support NuRock with the development of its business on-site to reuse fly ash.	2022 onwards
	Continue to market the reuse of fly ash to cement manufacturers.	
	Support a new negotiation for further use of fly ash.	
Biodiversity Offset Area	Perform targeted herbicide treatment of the three listed weed species (Blackberry, Serrated Tussock & St John's Wort) recorded during the Flora & Fauna Monitoring.	2022 onwards
	Perform manual removal of Blackberry post-herbicide treatment to avoid the potential of re-shooting.	
	Control of European Rabbit recommended to minimise grazing pressure on recent direct seeding.	
	Complete management actions of the Conservation Agreement with BCT for the BOA.	

Environment Management Area	Target / Strategy	Timeframe
Ecological Monitoring	Further monitoring should be undertaken as planned. This will maximise the validity of comparisons among data collected following Project commencement and between these data and baseline data. Data from ongoing surveys will allow more confident conclusions to be made on the presence and duration of any potential impact in Wangcol Creek that could be attributed to the Project.	2022 onwards
	Three replicate AUSRIVAS samples should continue to be collected from each site during all future surveys. This will provide a measure of the variation present in each indicator at each site, thereby, improving the ability to detect any future impact by enabling the use of appropriate statistical analysis.	
Water Quality	Review the groundwater management and monitoring plan	Following completion of the independent groundwater investigation and in consideration of the pending LNAR Mod 1 conditions of approval.
Water Quality	Implement mitigation and control measures to manage potential groundwater and surface water impacts	2020 onwards.

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13. Glossary of Terms

AOCR	Annual Operation Compliance Report
AHD	Australian Height Datum
ANZECC	Australian & New Zealand Environmental & Conservation Council
AQMP	Air Quality Management Plan
AQMS	Air Quality Monitoring Station
BCA	Brine-conditioned Ash
BCT	Biodiversity Conservation Trust
BOA	Biodiversity Offset Area
BOM	Bureau of Meteorology
BOMP	Biodiversity Offset Management Plan
CCC	Community Consultative Committee
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval (Project Approval 09_0186)
dB	decibel
DE	Delta Electricity
DPE	Department of Planning & Environment
DPE-Water	– Department of Planning & Environment – Water
DPI-Fisheries	Department of Primary Industries - Fisheries
EA NSW	EnergyAustralia NSW
ELA	Eco Logical Australia
EMP	Ecological Monitoring Program
EPA	Environment Protection Authority
EP&A Act	*Environment Planning & Assessment Act 1979*
EPL	Environment Protection Licence
ERM	Environmental Resources Management Australia Pty Ltd
GMMP	Groundwater Management & Monitoring Plan
ha	hectares
LLS	Local Land Services
LN	Lamberts North
LNAR	Lamberts North Ash Repository
LSAR	Lamberts South Ash Repository
m	metres
m/s	Metres per second
Mod	Modification
MPAR	Mt Piper Ash Repository
MPPS	Mt Piper Power Station
MW	Megawatt
NEMMCO	National Electricity Markey Management Company

NEPM	National Environmental Protection Measures
NRAR	Natural Resource Access Regulator
NSW	New South Wales
OEH	Office of Environment & Heritage
OEMP	Operational Environmental Management Plan
ONMMP	Operational Noise Management & Monitoring Plan
PM	Particulate Matter
POEO Act	*Protection of the Environment Operations Act 1997*
SoC	Statement of Commitments
SPL	Sound Power Level
SSWMP	Soil & Surface Water Management Plan
T	tonnes
TEOM	Tapered Element Oscillating Membrane
TSP	Total Suspended Particulates
WAL	Water Access Licence
WMP	Waste Management Plan
WQMR	Water Quality Monitoring Report
$\mu g/m^3$	Microgram per cubic metre

Appendix A Conditions of Approval Compliance checklist and status

Lamberts North Compliance Tracking

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
Terms of Approval	**A1**	The Proponent must carry out the project:	At all times	Based on the review undertaken, the Lamberts North operations have been carried out in accordance with the requirements.	**Compliant**
	a)	in accordance with the conditions of this approval granted with respect to the Mt Piper Ash Placement Project (09_0186);			
	b)	in accordance with all written direction of the Secretary; and			
	c)	generally in accordance with the EA.			
	A2	The conditions of this approval and direction of the Secretary prevail to the extent of any inconsistency, ambiguity or conflict between them and the document listed in condition A1(c). In the event of an inconsistency, ambiguity or conflict between any of the documents listed in condition A1(c), the most recent document prevails to the extent of any inconsistency, ambiguity or conflict.	At all times	No inconsistencies were observed between the listed documents during implementation of the project or during the course of the review of operations for the AEMR.	**Compliant**
	A3	The Proponent shall comply with the reasonable requirements of the Secretary arising from the Department's assessment of:	At all times	In a letter dated 9 December 2021, the Secretary of the DPE requested one (1) action arising from their assessment of the 2020-2021 AEMR. This action has been addressed in Section 5 of the 2021-2022 AOCR.	**Compliant**
	a)	any documents that are submitted in accordance with this approval; and			
	b)	the implementation of any actions or measures contained in these documents.			
	A4	The Proponent shall meet the requirements of the Secretary in respect of the implementation of any measure necessary to ensure compliance with the conditions of this approval, and general consistency with the documents listed under condition A1(c) of this approval.	At all times	A request was made by the Secretary of the DPE in April 2018 for EA to have an Independent Environmental Audit (IEA) commissioned by June 2019. The IEA was performed in October 2018 (SLR, 2018)	**Compliant**
Limits of Approval	**A5**	This approval shall lapse five years after the date on which it is granted, unless the works that are the subject of this approval are physically commenced on or before that time.	Prior to construction	The Project Approval for Lamberts North Ash Repository (DPI, 2012) is dated 16 February 2012 with construction works on the Lamberts North Ash Repository project commencing 7 January 2013, following approval of the CEMP by DPE in December 2012. Ash placement commenced in September 2013, well before the 'deadline' date.	**Compliant**
Statutory Requirements	**A6**	The Proponent shall ensure that all licences, permits and approvals are updated and/or obtained as required by law and maintained as required with respect to the project. No condition of this approval removes the obligation for the Proponent to obtain, renew or comply with such licences, permits or approvals.	At all times	Based on the Environmental Assessment (SKM, 2010) and OEMP (EA NSW, 2022), no permits were required during the operational phase of the project. Prior to construction licences for sinking boreholes were obtained from the NSW Office of Water. No Commonwealth permits, licences or approvals have been identified for the project. The project complies with the requirements of EnergyAustralia NSW's EPL 13007 (See Section 1 of the 2021-22 AEMR)	**Compliant**
Staging	**A7**	Where the Proponent intends to construct and operate the project in discrete stages (i.e. Lamberts North and Lamberts South) it may comply with the requirements in conditions B4, B5, D2, D3, D4, D5 and D6 separately for each stage.	Prior to construction	A CEMP (CDM Smith, 2012a) for construction (CoA B4) including the relevant sub-plans outlined within CoA B5 was approved by the DPI 1 December 2012. An OEMP (CDM Smith, 2013) for operation (CoA D2) of Lamberts North, including the relevant operational sub-plans as outlined inCoA D3 was approved by the DPI in May 2013. The OEMP was reviewed and updated by EnergyAustralia NSW (2022)which was approved by the DPIE on 6 June 2022. An evaluation of ground water levels at Lamberts North (CDM Smith, 2012b) was provided to DPE in May 2013, in accordance with CoA D5. The Leachate Management System Water Balance Assessment (CoA D6) provided to the DPE in February 2022 was approved in April 2022. The abovementioned conditions are compliant for the Lamberts North stage. They have not been applied to the Lamberts South stage as no construction works have commenced for this stage to date.	**Compliant**
Incident Notification, Reporting and Response	**A8**	The Secretary must be notified in writing via the Major Projects website immediately after the Proponent becomes aware of an incident. The notification must identify the project (including the application number and the name of the project if it has one) and set out the location and nature of the incident. Subsequent notification requirements must be given, and reports submitted in accordance with the requirements set out in Appendix 2.	As required	No incidents requiring notification of the Secretary occurred during the reporting period.	**Not triggered**
Non-Compliance Notification	**A9**	The Secretary must be notified in writing via the Major Projects website within seven days after the Proponent becomes aware of any non-compliance. A noncompliance notification must identify the project and the application number for it, set out the condition of approval that the project is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the noncompliance. *Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*	As required	No non-compliances requiring notification of the Secretary occurred during the reporting period.	**Not triggered**
	A10	Compliance Reports of the project must be carried out in accordance with the Compliance Reporting Requirements outlined in the Compliance Reporting Post Approval Requirements (2020)	At all times	The 2021-22 AOCR had been developed in accordance with the requirements of the Compliance Reporting Post Approval Requirements (2020).	**Compliant**
Access to Information	**A11**	Until the completion of all rehabilitation required under this approval, the Proponent must:	At all times	A project website is available for the project: https://www.energyaustralia.com.au/about-us/energy-generation/lamberts-north-ash-repository the webpage hosts the Environmental Assessment, Submissions report and approvals, as well and Environmental Management Plans, Annual Environmental Management Reports & Compliance Reports and Compliance Tracking. Progress on operations and outcomes of compliance tracking are detailed within the Quarterly Community meeting and the minutes from this meeting are available from the following website: https://www.Energyaustralia.com.au/about-us/energy-generation/mt-piper-power-station/mt-piper-community All documentation is current and up to date.	**Compliant**
	a)	make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this approval) publicly available on its website:			
	i	The EA;			
	ii	all current statutory approvals for the project;			
	iii	all approved strategies, plans and programs required under the conditions of this approval;			
	iv	staging plans for the project if the construction, operation or decommissioning of the project is to be staged;			
	v	regular reporting on the environmental performance of the project in accordance with the reporting requirements in any plans or programs approved under the conditions of this approval;			
	vi	a comprehensive summary of the monitoring results of the project, reported in accordance with the specifications in any conditions of this approval, or any approved plans and programs;			
	vii	a summary of the current phase and progress of the project;			
	viii	contact details to enquire about the project or to make a complaint;			
	ix	a Complaints Register, updated monthly;			
	x	audit reports prepared as part of any Independent Environmental Audit of the project and the Proponent's response to the recommendations in any audit report;			
	xi	any other matter required by the Secretary; and			

Lamberts North Compliance Tracking

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
	b)	keep such information up to date, to the satisfaction of the Secretary.			
Environmental Representative	**B1**	Prior to the commencement of any construction activities, or as otherwise agreed by the Secretary, the Proponent shall nominate for the approval of the Secretary a suitably qualified and experienced Environmental Representative(s). The Proponent shall engage the Environmental Representative(s) during any construction activities, and throughout the life of the project, or as otherwise agreed by the Secretary. The Environmental Representative(s) shall:	At all times	In October 2012 Delta Electricity nominated the Senior Environment Officer Kelly Gillen as the Environmental Representative. The Senior Environmental Officer was approved as the Environmental Representative by the DPI on 1 December 2012. In April 2015, EnergyAustralia NSW notified the DPE of Ms Gillen's new position within the organisation and nominated the new Senior Environment Officer Coleen Milroy as the Environmental Representative. In April 2018, EnergyAustralia NSW advised the DPE of Mrs. Skye Zorz's nomination for the role of Environmental Representative for the Mount Piper Ash Placement Project. This was approved by the Secretary and Mrs. Zorz was approved for the role of Environmental Representative.	**Compliant**
	a)	oversee the implementation of all environmental management plans and monitoring programs required under this approval, and advise the Proponent upon the achievement of these plans/programs;			
	b)	consider and advise the Proponent on its compliance obligations against all matters specified in the conditions of this approval and the Statement of Commitments, as referred to under condition A1(c); and			
	c)	have the authority and independence to recommend to the Proponent reasonable steps to be taken to avoid or minimise unintended or adverse environmental impacts and, failing the effectiveness of such steps, to recommend to the Proponent that relevant activities are to be ceased as soon as reasonably practicable if there is a significant risk that an adverse impact on the environment will be likely to occur.			
Groundwater Modelling	**B2**	The Proponent shall develop and maintain an up to date groundwater model for Lamberts North. The model should be calibrated to site-specific data. The Proponent shall consult with Water NSW in the preparation of the groundwater model and the model shall be provided to Water NSW within five months of project approval, unless otherwise agreed by the Secretary. The model shall address but not necessarily be limited to the following:	Prior to construction	A Groundwater modelling report was prepared by CDM Smith in November 2012 (CDM Smith, 2012b). The report was prepared in consultation with SCA and evaluated the potential impacts of construction and operational activities at the site and to assist in determining appropriate surface and groundwater management measures. No construction work has commenced at Lamberts South. EnergyAustralia NSW maintains an up-to-date groundwater model. The most recent update to the model is being undertaken as part of the independent groundwater investigation (ongoing and to be completed in 2022). The model is maintained by independent experts ERM.	**Compliant**
	a)	to the following: (a) the findings of the groundwater monitoring of existing ash placement areas and be based on average groundwater quality data;			
	b)	updated predictions of the long term behaviour, fate and impacts of ash placement, in particular for water quality parameters such as sulphates, chlorides, boron, manganese, nickel, zinc, molybdenum copper, arsenic and barium;			
	c)	updated risk assessment for ground and surface water quality impacts under a range of rainfall events of differing duration and intensities (including up to a 100 year ARI event);			
	d)	calibration to site-specific data; and			
	e)	identification of appropriate surface and groundwater management measures required in order to achieve a neutral or beneficial effect on water quality.			
		Prior to construction of Lamberts South, the Lamberts North groundwater model is to be updated as set out above in items (a) - (e) in consultation with Water NSW, to apply to Lamberts South.			
Groundwater Monitoring	**B3**	Baseline groundwater monitoring data, including groundwater quality, location of groundwater monitoring wells, depth and flow of groundwater in the project area should be obtained for a minimum of two sampling events prior to construction and a minimum of two sampling events after construction and prior to ash placement commencing. The baseline monitoring data along with the modelling predictions in B2 should be used in the consideration of the design of the ash placement facilities. The location of groundwater monitoring wells and parameters to be monitored should be undertaken in consultation with Water NSW Prior to construction of Lamberts South the Proponent shall conduct baseline groundwater data collection as set out above, and use the results and the modelling predictions in B2 in the consideration of the design of the ash placement facilities	At all times	Groundwater bores were installed in July 2012 and were licenced for their construction with NSW Office of Water. The first sampling event for baseline testing was performed upon installation and prior to construction. The location and parameters to be undertaken were done in consultation with SCA. Existing historical groundwater bores that were established since the construction of Mt Piper are used to supplement the newly installed groundwater bores. Additional groundwater monitoring bores were installed as part of the independent groundwater investigation in 2018 and 2020.	**Compliant**
Construction Environmental Management Plan	**B4**	The Proponent shall prepare and implement a Construction Environmental Management Plan (CEMP) to outline environmental management practices and procedures to be followed during construction of the project. The Plan shall be prepared in consultation with Council and relevant government agencies, and be consistent with the Guideline for the Preparation of Environmental Management Plans (DIPNR, 2004 or its latest revision) and shall include, but not necessarily be limited to:	Prior to & during construction	A CEMP (CDM Smith, 2012a) for construction at Lamberts North was developed in consultation with Delta Electricity Environment Section, NOW and SCA. The CEMP was approved by the DPI in December 2012.	**Compliant**
	a)	a description of all relevant activities to be undertaken on the site during construction including an indication of stages of construction, where relevant;			
	b)	identification of the potential for cumulative impacts with other construction activities occurring in the vicinity and how such impacts would be managed;			
	c)	details of any site compounds and mitigation, monitoring, management and rehabilitation measures specific to the site compound(s) that would be implemented;			
	d)	statutory and other obligations that the Proponent is required to fulfil during construction including all relevant approvals, consultations and agreements required from authorities and other stakeholders, and key legislation and policies;			
	e)	evidence of consultation with relevant government agencies required under this condition and how issues raised by the agencies have been addressed in the plan;			
	f)	a description of the roles and responsibilities for all relevant employees involved in the construction of the project including relevant training and induction provisions for ensuring that all employees, contractors and sub-contractors are aware of their environmental and compliance obligations under these conditions of approval;			
	g)	details of how the environmental performance of construction will be managed and monitored, and what actions will be taken to address identified potential adverse environmental impacts;			
	h)	specific consideration of relevant measures to address any requirements identified in the documents referred to under conditions A1(c);			
	i)	a complaints handling procedure during construction;			
	j)	emergency management measures including measures to control bushfires;			
	k)	details of waste management including reuse and/or recycling of waste material, to minimise the need for treatment or disposal of those materials outside the site; and			
	l)	the additional requirements of this approval.			

Lamberts North Compliance Tracking

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
		The CEMP for the project (or any stage of the project) shall be submitted to the Secretary for approval at least four weeks prior to the commencement of any construction work associated with the project (or stage as relevant), unless otherwise agreed by the Secretary. Construction shall not commence until written approval has been received from the Secretary.			
	B5	As part of the CEMP for the project, the Proponent shall prepare and implement the following plans:			
Construction Noise Management Plan	a)	a Construction Noise Management Plan to detail how construction noise impacts would be minimised and managed. The Plan shall be developed in consultation with the EPA and shall include, but not necessarily be limited to:	Prior to & during construction	A CEMP (CDM Smith, 2012a) for construction at Lamberts North containing a Construction Noise Management Plan was developed in consultation with Delta Electricity Environment Section, NOW and SCA. The CEMP was approved by the DPI in December 2012.	**Compliant**
	i)	details of construction activities and an indicative schedule for construction works;			
	ii)	identification of construction activities that have the potential to generate noise impacts on sensitive receivers;			
	iii)	identification of noise criteria and procedures for assessing noise levels at sensitive receivers;			
	iv)	details of reasonable and feasible actions and measures to be implemented to minimise noise impacts;			
	v)	details of noise monitoring and if any noise exceedance is detected, how any non-compliance would be rectified; and			
	vi)	procedures for notifying sensitive receivers of construction activities that are likely to affect their noise amenity.			
Groundwater Management Plan	b)	a Groundwater Management Plan to detail measures to manage groundwater impacts. The Plan shall be prepared in consultation with DPIE Water and Water NSW and include, but not necessarily be limited to:	Prior to & during construction	A CEMP (CDM Smith, 2012a) for construction at Lamberts North containing a Groundwater Management Plan was developed in consultation with Delta Electricity Environment Section, NOW and SCA. The CEMP was approved by the DPI in December 2012.	**Compliant**
	i)	identification of the construction activities that could affect groundwater at the site, including groundwater interference and impacts to groundwater users and dependent species;			
	ii)	a description of the management controls to minimise impacts to groundwater during construction;			
	iii)	methods for monitoring groundwater during construction including a program to monitor groundwater flows and groundwater quality in the project area;			
	iv)	a response program to address identified exceedances of existing groundwater quality criteria approved for Area 1 (the existing ash placement area); and			
	v)	provisions for periodic reporting of results to Water NSW during construction.			
Soil and Surface Water Management Plan	c)	a Soil and Surface Water Management Plan to outline measures that will be employed to manage water on the site, to minimise soil erosion and the discharge of sediments and other pollutants to lands and/or waters throughout the construction period. The Plan shall be based on best environmental practice and shall be prepared in consultation with Water NSW and DPIE Water and any other relevant government agency. The Plan shall include, but not necessarily be limited to:	Prior to & during construction	A CEMP (CDM Smith, 2012a) for construction at Lamberts North containing a Soil and Surface Water Management Plan was developed in consultation with Delta Electricity Environment Section, NOW and SCA. The CEMP was approved by the DPI in December 2012.	**Compliant**
	i)	baseline data on the water quality and available flow data in Huons Creek, Lamberts Gully Creek and Wangcol Creek;			
	ii)	water quality objectives and impact assessment criteria for Huons Creek, Lamberts Gully Creek and Wangcol Creek;			
	iii)	a geomorphic assessment of the capacity of Lamberts Gully Creek to accommodate additional flow under a range of rainfall events and duration, prior to commencement of construction works;			
	iv)	identification of the construction activities that could cause soil erosion or discharge sediment or water pollutants from the site;			
	v)	description of stockpile locations and disposal methods;			
	vi)	a description of the management methods to minimise soil erosion or discharge of sediment or water pollutants from the site, including a strategy to minimise the area of bare surfaces, stabilise disturbed areas, and minimise bank erosion;			
	vii)	demonstration that the proposed erosion and sediment control measures will conform with, or exceed, the relevant requirements of Managing Urban Stormwater: Soils and Construction (Landcom, 2004);			
	viii)	a site water management strategy identifying drainage design including the separation of clean and dirty water areas for the project, details of the lining of surface water collection ponds and the associated water management measures including erosion and sediment controls and provisions for recycling/reuse of water and the procedures for decommissioning water management structures on the site and consideration to the treatment of water prior to discharge to the environment			
	ix)	measures to monitor and manage soil and water impacts in consultation with DPIE Water including: control measures for works close to or involving waterway crossings (including rehabilitation measures following disturbance and monitoring measures and completion criteria to determine rehabilitation success);			
	x)	measures to monitor and manage flood impacts in consultation with DPIE Water and shall include, but not necessarily be limited to a flood model for predicted water levels and contingency measures for the site during potential floods;			
	xi)	a program to monitor surface water quality, including Lamberts Gully Creek and Wangcol Creek;			
	xii)	a protocol for the investigation of identified exceedances in the impact assessment criteria;			
	xiii	a response plan to address potential adverse surface water quality exceedances; and			
	xiv)	provisions for periodic reporting of results to DPIE Water and Water NSW as per condition B8.			
Air Quality Management Plan	d)	a Air Quality Management Plan, to provide details of dust control measures to be implemented during the construction of the project. The Plan shall be prepared in consultation with the EPA and should include, but not necessarily be limited to:	Prior to & during construction	A CEMP (CDM Smith, 2012a) for construction at Lamberts North containing an Air Quality Management Plan was developed in consultation with Delta Electricity Environment Section, NOW and SCA. The CEMP was approved by the DPI in December 2012.	**Compliant**
	i)	identification of sources of dust deposition including, truck movements, regrading, backfilling, stockpiles and other exposed surfaces;			
	ii)	identification of criteria, monitoring and mitigation measures for the above sources; and			

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
	iii)	a reactive management programme detailing how and when construction operations are to be modified to minimise the potential for dust emissions, should emissions exceed the relevant criteria.			
Flora and Fauna Management Plan	e)	a Flora and Fauna Management Plan, to outline measures to protect and minimise loss of native vegetation and native fauna habitat as a result of construction of the project. The Plan shall be prepared in consultation with the BCS and shall include, but not necessarily be limited to:	Prior to & during construction	A CEMP (CDM Smith, 2012a) for construction at Lamberts North containing a Flora and Fauna Management Plan was developed in consultation with Delta Electricity Environment Section, NOW and SCA. The CEMP was approved by the DPI in December 2012.	**Compliant**
	i)	plans showing terrestrial vegetation communities; important flora and fauna habitat areas; locations of threatened flora and fauna and areas to be cleared. The plans shall also identify vegetation adjoining the site where this contains important habitat areas and/or threatened species, populations or ecological communities;			
	ii)	procedures to accurately determine the total area, type and condition of vegetation community to be cleared;			
	iii)	methods to manage impacts on flora and fauna species and their habitat which may be directly or indirectly affected by the project, procedures for vegetation clearing or soil removal/stockpiling and procedures for identifying and re-locating hollows, installing nesting boxes and managing weeds; and			
	iv)	a procedure to review management methods where they are found to be ineffective.			
Aboriginal Heritage Plan	f)	an Aboriginal Heritage Plan to monitor and manage Aboriginal heritage impacts in consultation with registered Aboriginal stakeholders and prepared in consultation with Heritage NSW. The plan should include but not necessarily limited to:	Prior to & during construction	A CEMP (CDM Smith, 2012a) for construction at Lamberts North containing an Aboriginal Heritage Plan was developed in consultation with Delta Electricity Environment Section, NOW and SCA. The CEMP was approved by the DPI in December 2012.	**Compliant**
	i)	an updated Cultural Heritage Management Plan to cover the protection of sites previously recorded in the 2005 Aboriginal heritage assessment;			
	ii)	procedures for the management of unidentified objects and/or human remains, including ceasing work;			
	iii)	Aboriginal cultural heritage induction processes for construction personnel; and			
	iv)	procedures for ongoing Aboriginal consultation and involvement should Aboriginal heritage sites or objects be found during construction.			
Ash Transportation Plan	g)	an Ash Transportation Plan to provide details on the preferred option for the transportation of ash from the Mt Piper Power Station to the ash placement areas. The Plan shall include but not necessarily limited to:	Prior to & during construction	A CEMP (CDM Smith, 2012a) for construction at Lamberts North containing an Ash Transportation Plan was developed in consultation with Delta Electricity Environment Section, NOW and SCA. The CEMP was approved by the DPI in December 2012.	**Compliant**
	i)	justification of the proposed option for ash transportation (either haulage access roads and/or conveyor) for ash transportation;			
	ii)	details of the proposed option, including construction requirements, impacts and mitigation measures;			
	iii)	plans showing the location of the chosen option; and			
	iv)	provision of mitigation measures should the conveyor breakdown			
Biodiversity Offsets	**B6**	The Proponent shall develop and submit for the approval of the Secretary, a Biodiversity Offset Management Plan. The Biodiversity Offset Management Plan is to be submitted within 12 months of the project approval, unless otherwise agreed to by the Secretary. The Plan shall be developed in consultation with the BCS and shall:		A Biodiversity Offset Management Plan (BOMP) for Lamberts North in consultation with OEH was submitted 14 May 2013 to DPI. The BOMP (Delta Electricity, 2012) was not approved 18 June 2013 and DPI requested the BOMP to be revised to include an offset of 1:1 to the existing rehabilitation site and be resubmitted. The BOMP was revised in consultation with OEH and submitted 23 July 2015. The revised BOMP (EA NSW, 2015) was approved 24 August 2015. A Biodiversity Offset Strategic Outline (BOSO) was prepared for Lamberts South and was considered appropriate by the Department. The BOMP was further revised in consultation with OEH and submitted to DPE 3 May 2019. The revised BOMP (EA NSW, 2019b) was approved 19 December 2019. EA NSW secured the Thompsons Creek Reservoir BOA in perpetuity during the 2021-22 reporting period. Guidance was sought from the Biodiversity Conservation Trust (BCT) for the suitability of managing the BOA under a formal conservation mechanism. The intention of this was to secure the BOA and provide the financial and management resources required to enhance its biodiversity values. An application for a Conservation Agreement was submitted to the BCT in March 2021. The final signed Conservation agreement was received in March 2022.	**Compliant**
	a)	identify the objectives and outcomes to be met by the Biodiversity Offset Management Plan;			
	b)	describe the size and quality of the habitat/vegetation communities of the offset;			
	c)	identify biodiversity impacts, including impacts related to the loss of impacted flora and fauna including threatened Capertee Stringybark (Eucalyptus cannonii), nine (9) hectares of remnant vegetation (including, Red Stringy Bark Woodland, Scribbly Gum Woodland, Ribbon Gum Woodland), habitat for microbat and woodland bird species and the 31 ha of rehabilitated vegetation to be removed;			
	d)	describe the decision-making framework used in selecting the priority ranking of compensatory habitat options available in the region. Where possible, this should include purchase of land, development of agreements with identified land management authorities (e.g. EPA, Council) for long term management and funding of offsets and mitigation measures, and installation of identified mitigation measures;			
	e)	include an offset for direct and indirect impacts of the proposal which maintains or improves biodiversity values;			
	f)	identify the mechanisms for securing the biodiversity values of the offset measures in perpetuity and identify a monitoring regime, responsibilities, timeframes and performance criteria; and			
	g)	detail contingency measures to be undertaken should monitoring against performance criteria indicate that the offset/ rehabilitation measures have not achieved performance outcomes. Rehabilitation measures are required to be implemented to ensure that the biodiversity impacts are consistent with a maintain or improve biodiversity outcome.			
Ecological Monitoring Program	**B7**	The Proponent shall prepare and implement an Ecological Monitoring Program prior to construction, in consultation with DPIE Water and BCS to monitor and quantify the impacts on the ecology of Wangcol Creek and the associated riparian environment. The Program shall include, but not necessarily be limited to:	At all times	The Ecological Monitoring Plan (EMP) was produced 31 November 2012 in consultation with NOW and DPI (Fisheries). Baseline data was sampled 7 November 2012 and autumn and spring sampling obtained for 2013 and 2014. Spring sampling has been performed in December 2016 (Cardno, 2017), December 2018 (Cardno, 2019), November 2020 (Cardno, 2021) and November 2021 (Cardno, 2022). Autumn sampling has been performed in May 2018 (Cardno, 2018) and May 2020 (Cardno, 2020).	**Compliant**
	a)	a sampling, data collection and assessment regime to establish baseline ecological health and for ongoing monitoring of ecological health of the instream environment during construction and throughout the life of the project (including operation);			
	b)	at least one in-stream sampling period prior to ash placement at Wangcol Creek and at least two (2) sampling periods following ash placement at each of Lamberts North and Lamberts South;			
	c)	an assessment regime for monitoring the ecological health of the riparian environment for a period of at least five (5) years after final capping; and			
	d)	management measures to address any adverse ecological impacts.			
Compliance Monitoring and Tracking	**B8**	The Proponent must develop and implement a Compliance Tracking Program for the project, prior to commencing construction, to track compliance with the requirements of this approval and must include, but not necessarily be limited to:	At all times	A Compliance Tracking program (this document) was developed & implemented prior to commencing construction. The Compliance and Tracking document was approved by DPI on 13 December 2012.	**Compliant**
	a)	provisions for periodic review of the compliance status of the project against the requirements of this approval and the Statement of Commitments detailed in the document referred to in condition A1c) of this approval;			

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
	b)	provisions for periodic reporting of the compliance status to the Secretary;			
	c)	a program for independent environmental auditing in accordance with the Department's Independent Audit Post Approval Requirements (2020);			
	d)	procedures for rectifying any non-compliance identified during environmental auditing or review of compliance, complying with the requirements listed in condition A8 of this approval;			
	e)	mechanisms for recording environmental incidents and actions taken in response to those incidents, complying with the requirements listed in condition A8 of this approval;			
	f)	provisions for reporting environmental incidents to the Secretary during construction and operation; and			
	g)	provisions for ensuring all employees, contractors and sub-contractors are aware of, and comply with, the conditions of this approval relevant to their respective activities.			
		The Compliance Tracking Program must be implemented prior to construction of the project with a copy submitted to the Secretary for approval at least four weeks prior to the commencement of the project, unless otherwise agreed by the Secretary.			
	B9	Nothing in this approval restricts the Proponent from utilising any existing compliance tracking programs administrated by the Proponent to satisfy the requirements of condition B8. In doing so, the Proponent must demonstrate to the Secretary how these systems address the requirements and/or have been amended to comply with the requirements of the condition.			
Community Information and Complaints Management Provision of Information	**B10**	Prior to the construction of the project, the Proponent shall establish and maintain a website for the provision of electronic information associated with the project. The Proponent shall, subject to confidentiality, publish and maintain up-to-date information on this website or dedicated pages including, but not necessarily limited to:	Prior to construction	A project website is available for the project: https://www.energyaustralia.com.au/about-us/energy-generation/lamberts-north-ash-repository the webpage hosts the Environmental Assessment, Submissions report and approvals, as well and Environmental Management Plans, Annual Environmental Management Reports & Compliance Reports and Compliance Tracking. Progress on operations and outcomes of compliance tracking are detailed within the Quarterly Community meeting and the minutes from this meeting are available from the following website: https://www.Energyaustralia.com.au/about-us/energy-generation/mt-piper-power-station/mt-piper-community	**Compliant**
	a)	the documents referred to under condition A1 of this approval;			
	b)	this project approval, Environment Protection Licence and any other relevant environmental approval, licence or permit required and obtained in relation to the project;			
	c)	all strategies, plans and programs required under this project approval, or details of where this information can be viewed;			
	d)	information on construction and operational progress; and			
	e)	the outcomes of compliance tracking in accordance with the requirements of this project approval.			
Complaints and Enquiries Procedure	**B11**	Prior to the construction of the project, the Proponent shall ensure that the following are available for community complaints and enquiries during construction and operation:	Prior to construction	The Project website contains a link to the following website which contains the relevant contact details are available from the following website: https://www.energyaustralia.com.au/about-us/energy-generation/mt-piper-power-station This website lists the following contact details for the project: 24-hour contact number – call Mt Piper Power Station on (02) 6354 8111 Postal Address: Mt Piper Power Station Locked Bag 1000 Portland, NSW, 2847 Email: community@energyaustralia.com.au These details were published in the Community Information Plan (CIP) article published in Lithgow Mercury dated 8 December 2012.	**Compliant**
	a)	a 24 hour contact number(s) on which complaints and enquiries about construction and operational activities may be registered;			
	b)	a postal address to which written complaints and enquiries may be sent; and			
	c)	an email address to which electronic complaints and enquiries may be transmitted.			
		The telephone number, postal address and email address shall be published in a newspaper circulating in the local area prior to the commencement of the project. The above details shall also be provided on the website required by condition B11 of this approval.			
	B12	The Proponent shall record the details of complaints received through the means listed under condition B11 of this approval in a Complaints Register. The Register shall record, but not necessarily be limited to:	At all times	Any complaints to EnergyAustralia NSW go via the switchboard, or through email or mail and are then redirected to the appropriate area of EnergyAustralia operations. All complaints are recorded in the Incidents and Complaints register with all details captured including actions taken if necessary as per EA NSW Environment Management System (EMS) Procedure. If actions were necessary, a review of those actions are to be taken before the complaint is closed out. In addition, the ash contractors produce a monthly compliance report including any complaints received. No complaints were received regarding operations of the Ash Repositories, including LNAR, for the reporting period (as per Appendix H of the AOCR).	**Compliant**
	a)	the date and time of the complaint;			
	b)	the means by which the complaint was made (e.g. telephone, email, mail, in person);			
	c)	any personal details of the complainant that were provided, or if no details were provided a note to that effect;			
	d)	the nature of the complaint;			
	e)	the time taken to respond to the complaint;			
	f)	any investigations and actions taken by the Proponent in relation to the complaint;			
	g)	any follow-up contact with, and feedback from, the complainant; and			
	h)	if no action was taken by the Proponent in relation to the complaint, the reason(s) why no action was taken.			
		The Complaints Register shall be made available for inspection by the Secretary upon request.			
Community Information Plan	**B13**	Prior to the commencement of construction of the project, the Proponent shall prepare and implement a Community Information Plan which sets out the community communications and consultation processes to be undertaken during construction and operation of the project. The Plan shall include but not be limited to:	Prior to construction	The Lamberts North Ash Placement Stakeholder Communications Plan (September 2012) was specifically prepared and implemented for the purposes of this project. This was published in the local newspaper, the Lithgow Mercury, dated 8 December 2012. A Community Information Plan (CIP) was also prepared in October 2013. The CIP was updated to reflect EnergyAustralia NSW as the owners and remove any references to Delta Electricity in accordance with a recommendation from the 2014 Independent Environmental Audit by Aurecon.	**Compliant**
	a)	measures for disseminating information on the development status of the project and methods for actively engaging with surrounding landowners, including Forests NSW and affected stakeholders regarding issues that would be of interest/ concern to them during the construction and operation of the project; and			
	b)	procedures to inform the community where work has been approved to be undertaken outside the normal Construction hours, in particular noisy activities.			
		A copy of the Plan shall be provided to the Secretary one month prior to the commencement of construction.			
Design	**B14**	The ash placement areas shall be designed by a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary to ensure structural stability of the ash placement areas.	Prior to construction	Design approved by DPE 1 December 2012. The ash placement areas were designed by JK Williams, in consultation with the Principal Ash contractors to ensure structural stability of the ash placement areas. The ash placement areas were constructed in line with the design.	**Compliant**
Environmental Incident Reporting	**C1**	The Proponent shall notify the Secretary of any environmental incident within 12 hours of becoming aware of the incident. The Proponent shall provide full written details of the incident to the Secretary within seven days of the date on which the incident occurred.	At all times	No environmental incidents requiring notification of the Secretary occurred during the 2021-2022 reporting period.	**Not triggered**

Lamberts North Compliance Tracking

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
	C2	The Proponent shall meet the requirements of the Secretary to address the cause or impact of any environmental incident, as it relates to this approval, reported in accordance with condition C1 of this approval, within such period as the Secretary may require.			
Construction Hours	**C3**	Construction activities associated with the project shall only be undertaken during the following hours:	During construction	No construction activities that trigger the requirements described under these conditions have occurred during the reporting period. Installation of the leachate barrier system is expressly defined within the consent as “operations”.	**Not triggered**
	a)	7:00 am to 6:00 pm, Mondays to Fridays, inclusive			
	b)	8:00 am to 1:00 pm on Saturdays; and			
	c)	at no time on Sundays or public holidays.			
	C4	Construction outside the hours stipulated in condition C3 of this approval is permitted in the following circumstances:			
	a)	where construction works do not cause audible noise at any sensitive receiver; or			
	b)	for the delivery of materials required outside these hours by the Police or other authorities for safety reasons; or			
	c)	where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.			
	C5	The hours of construction activities specified under condition C3 of this approval may be varied with the prior written approval of the Secretary. Any request to alter the hours of construction specified under condition C3 shall be:			
	a)	considered on a case-by-case basis;			
	b)	accompanied by details of the nature and need for activities to be conducted during the varied construction hours; and			
	c)	accompanied by information necessary for the Secretary to reasonably determine that activities undertaken during the varied construction hours will not adversely impact on the acoustic amenity of sensitive receivers in the vicinity of the site.			
Construction Noise	**C6**	The construction noise objective for the project is to manage noise from construction activities (as measured by LAeq (15 minute) descriptor) so as not to exceed: Location: All private receivers within the township of Blackmans Flat — Day (LAeq (15 minute)) dB(A): 46 Location: All other residences — Day (LAeq (15 minute)) dB(A): 43 The Proponent shall implement reasonable and feasible noise mitigation measures with the aim of achieving the construction noise objective consistent with the requirements of the Interim Construction Noise Guideline (DECC, July 2009) (or its latest version), unless the Secretary agrees otherwise, including noise generated by heavy vehicle haulage and other construction traffic associated with the project.	During construction	No construction activities that trigger the requirements described under these conditions have occurred during the reporting period. Installation of the leachate barrier system is expressly defined within the consent as “operations”.	**Not triggered**
Dust Generation	**C7**	The Proponent shall construct the project in a manner that minimises dust emissions from the site, including wind-blown from earth works and stockpiles and traffic generated dust. All activities on the site shall be undertaken with the objective of preventing visible emissions of dust from the site. Should such visible dust emissions occur at any time, the Proponent shall identify and implement all practicable dust mitigation measures, including cessation of relevant works, as appropriate, such that emissions of visible dust cease.	During construction	No construction activities that trigger the requirements described under these conditions have occurred during the reporting period. Installation of the leachate barrier system is expressly defined within the consent as “operations”.	**Not triggered**
Heritage Impacts	**C8**	If during the course of construction the Proponent becomes aware of any previously unidentified Aboriginal object(s), all work likely to affect the object(s) shall cease immediately and Heritage NSW informed in accordance with the National Parks and Wildlife Act 1974. In addition, registered Aboriginal stakeholders shall be informed of the finds. Works shall not recommence until an appropriate strategy for managing the objects has been determined in consultation with Heritage NSW and the registered Aboriginal stakeholders and written authorisation from Heritage NSW is received by the Proponent.	During construction	The course of action for Aboriginal objects identified during construction is detailed in the CEMP Aboriginal sub-plan approved by DPI 1 December 2012. No aboriginal artefacts were discovered during construction.	**Compliant**
	C9	If during the course of construction the Proponent becomes aware of any unexpected historical relic(s), all work likely to affect the relic(s) shall cease immediately and notify Heritage NSW in accordance with the Heritage Act 1977. Works shall not recommence until the Proponent receives written authorisation from Heritage NSW.	During construction	No historical relics were discovered during construction.	**Compliant**
Soil and Water Quality Impacts	**C10**	The Proponent shall comply with section 120 of the Protection of the Environment Operations Act 1997 which prohibits the pollution of waters.	At all times	Compliance is achieved through the CEMP Soil and Surface Water sub-plan approved by DPI 1 December 2012 and EPL 13007.	**Compliant**
	C11	Soil and water management controls shall be employed to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction activities, in accordance with:			
	a)	Managing Urban Stormwater: Soils and Conservation (Landcom, 2004);			
	b)	Managing Stormwater: Urban Soils and Construction 2A Installation of Services (DECC 2008); and			
	c)	Managing Stormwater: Urban Soils and Construction Vol 2C Unsealed Roads (DECC 2008).			
	C12	During construction, the Proponent shall maintain a buffer of 50 metres from the construction work to Wangcol Creek.		Buffer was maintained as documented in JK Williams Contractor meeting minutes.	**Compliant**
	C13	Surface water drainage must be appropriately engineered and stabilised to convey run off without collapse or erosion. Surface water run off collection ponds are to be lined.		Surface water drainage was engineered and stabilised as per CEMP Soil and Surface Water sub-plan approved by DPI 1 December 2012.	**Compliant**
Waste Generation and Management	**C14**	All waste materials removed from the site shall only be directed to a waste management facility lawfully permitted to accept the materials.	At all times	EnergyAustralia NSW manages all site waste in accordance with EPL 13007, disposal and restricted waste area or via licenced waste contractor.	**Compliant**
	C15	The Proponent shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by an EPL, if such a licence is required in relation to that waste.		No wastes generated outside the Lamberts North site were allowed to enter the area. To prevent unlawful access to the repository area, regular security patrols are conducted across the site. Both the Principal Ash Contractor and EnergyAustralia NSW personnel are required to report if they encounter any rubbish or wastes outside those that are allowed during routine operations.	**Compliant**

Lamberts North Compliance Tracking

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
	C16	The Proponent shall ensure that all liquid and / or non-liquid waste generated and / or stored on the site is assessed and classified in accordance with the Waste Classification Guidelines (DECC, 2008), or any future guideline that may supersede that document.		EnergyAustralia NSW manages all site waste in accordance with EPL 13007, disposal and restricted waste area or via licenced waste contractor.	**Compliant**
Ash Management	**D1**	The Proponent shall prepare a long-term ash management strategy including a program for investigation and assessment of alternative ash management measures with a goal of 40% reuse of ash by 31 December 2020. The report shall be submitted to the Secretary six months prior to the commencement of operations. The Proponent shall report on the status and outcomes of its investigations to the Secretary every two years from the commencement of the operation of the project, unless otherwise agreed by the Secretary.	Prior to & during operations	Lamberts North Consistency Report (SKM, 2012) and Ash Management Strategy (Delta Electricity, 2012) approved by DPI 30 July 2012 details the long-term ash management strategy for ash re-use. EnergyAustralia have provided two yearly updates on the status of the Ash Management Strategy (EA NSW, 2016; 2018; 2020)	**Compliant**
Operational Environmental Management Plan	**D2**	The Proponent must prepare an Operational Environmental Management Plan (OEMP) to detail an environmental management framework, practices and procedures to be followed during operation of the project. The OEMP must be prepared to the satisfaction of the Secretary, and in consultation with the relevant government agencies and must include, but not necessarily be limited to:	Prior to operations	The Operation Environmental Management Plan (CDM Smith, 2013) was approved by DPI in May 2013 and operations at Lamberts North commenced in September 2013. The OEMP was reviewed by EnergyAustralia NSW during the 2021-22 reporting period to ensure that it reflects the current activities and management. The OEMP (EA NSW, 2022) was approved by the DPIE on 6 June 2022.	**Compliant**
	a)	identification of all statutory and other obligations that the Proponent is required to fulfil in relation to operation of the project, including all approvals, licences, approvals and consultations;			
	b)	a description of the roles and responsibilities for all relevant employees (including contractors) involved in the operation of the project;			
	c)	overall environmental policies and principles to be applied to the operation of the project;			
	d)	standards and performance measures to be applied to the project, and a means by which environmental performance can be periodically reviewed and improved, where appropriate;			
	e)	management policies to ensure that environmental performance goals are met and to comply with the conditions of this approval;			
	f)	the environmental monitoring requirements outlined under conditions E12 to E18 inclusive;			
	g)	details of waste management including reuse and/or recycling of waste material, to minimise the need for treatment or disposal of those materials outside the site;			
	h)	specific consideration of relevant measures to address any requirements identified in the documents referred to under conditions A1(c) of this approval;			
	i)	the additional requirements of this approval;			
	j)	details of traffic management measures for public roads including managing vehicle movements, ensuring haul routes proposed are communicated to contractors and staff and complied with, measures to reduce impacts during peak hours and at intersections, scheduling heavy vehicle movements to minimise convoy or platoon lengths, identifying local climate conditions that may affect road safety and ensuring truckloads are covered at all times; and			
	k)	incorporation of traffic management measures into a Drivers Code of Conduct for transporting materials on public roads for all contractors and staff.			
		The OEMP must be submitted for the approval of the Secretary no later than four weeks prior to the commencement of operation of the project, unless otherwise agreed by the Secretary. Operation must not commence until written approval has been received from the Secretary. Nothing in this approval precludes the Proponent from incorporating the requirements of the OEMP into existing environmental management systems and plans administered by the Proponent.			
	D3	As part of the OEMP for the project, required under condition D2 of this approval, the Proponent must prepare and implement the following Management Plans:			
Operational Noise Management Plan	a)	an Operational Noise Management Plan to detail measures to mitigate and manage noise during operation of the project. The Plan must be prepared in consultation with the EPA and include, but not necessarily be limited to:	Prior to operations	The Operation Environmental Management Plan (CDM Smith, 2013) containing an Operational Noise Management Plan was approved by DPI in May 2013 and operations at Lamberts North commenced in September 2013. The OEMP was reviewed by EnergyAustralia NSW during the 2021-22 reporting period to ensure that it reflects the current activities and management. The OEMP (EA NSW, 2022) was approved by the DPIE on 6 June 2022.	**Compliant**
	i)	identification of activities that will be carried out in relation to the project and the associated noise sources;			
	ii)	identification of all relevant sensitive receivers and the applicable criteria at those receivers commensurate with the noise limit specified under condition E7 of this approval;			
	iii)	noise monitoring procedures (as referred to in condition E12 of this approval) for periodic assessment of noise impacts at the relevant receivers against the noise limits specified under this approval and the predicted noise levels as detailed in the EA;			
	iv)	details of all management methods and procedures that will be implemented to control individual and overall noise emissions from the site during operation, including the feasibility of noise reducing benching;			
	v)	procedures to ensure that all reasonable and feasible noise mitigation measures are applied during operation of the project and procedures and corrective actions to be undertaken if non-compliance against the operational noise criteria as detailed in condition E7 is detected at the sensitive receivers; and			
	vi)	provisions for periodic reporting of results to the EPA as per condition B8.			
Groundwater Management Plan	b)	a Groundwater Management Plan to detail measures to mitigate and manage groundwater impacts. The Plan must be prepared in consultation with DPIE Water and Water NSW and include, but not necessarily be limited to:	Prior to operations	The Operation Environmental Management Plan (CDM Smith, 2013) containing a Groundwater Management Plan was approved by DPI in May 2013 and operations at Lamberts North commenced in September 2013. The OEMP was reviewed by EnergyAustralia NSW during the 2021-22 reporting period to ensure that it reflects the current activities and management. The OEMP (EA NSW, 2022) was approved by the DPIE on 6 June 2022. It is noted that the ground and surface water monitoring performed during the 2019-20 reporting period identified some exceedances of the surface water and groundwater environmental goals identified in the relevant sub-plans contained in the approved Lamberts North Ash Placement	**Compliant**
	i)	consideration of the revised updated groundwater model as per condition B2;			
	ii)	baseline data on groundwater quality (including Huons Creek), location of groundwater monitoring wells, depth and available flow of groundwater in the project area;			
	iii)	identification of potential sources of water pollutants and management measures, including the leachate management system which must be designed and constructed generally in accordance with the Environmental Guidelines, Solid Waste Landfills (EPA, 2016) and monitoring requirements;			
	iv)	groundwater assessment criteria including trigger levels for remedial measures;			

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
	v)	a contingency plan for events that have the potential to pollute or contaminate groundwater sources of water. The plan must include remediation actions and communication strategies (including notification of potentially affected nearby bore users) for the effective management of such an event to prevent discharge of these pollutants from all sources within the project area;		Project Operation Environmental Management Plan dated May 2013 (Lamberts North OEMP) (CDM Smith, 2013) triggering the contingency measures contained in the Lamberts North OEMP. These contingency measures require the carrying out of a further surface water and groundwater investigations and these investigations are currently still under way.	
	vi)	a monitoring program as per condition E15 for groundwater connectivity, water levels, groundwater flow and water quality over the short and long term that includes upstream and downstream locations. The program must continue for a minimum of five years following final capping and landscaping;			
	vii)	a protocol for the investigation of identified exceedances of the groundwater impact assessment criteria; and			
	viii)	provisions for periodic reporting of results to Water NSW as per condition B8.			
Soil and Surface Water Management Plan	c)	a Soil and Surface Water Management Plan to outline measures that will be employed to manage water on the site, to minimise soil erosion and the discharge of sediments and other pollutants to lands and/or waters throughout the life of the project. The Plan must be based on best environmental practice and must be prepared in consultation with the DPIE Water and Water NSW. The Plan must include, but not necessarily be limited to:	Prior to operations	The Operation Environmental Management Plan (CDM Smith, 2013) containing a Soil and Surface Water Management Plan was approved by DPI in May 2013 and operations at Lamberts North commenced in September 2013. The OEMP was reviewed by EnergyAustralia NSW during the 2021-22 reporting period to ensure that it reflects the current activities and management. The OEMP (EA NSW, 2022) was approved by the DPIE on 6 June 2022. It is noted that the ground and surface water monitoring performed during the 2019-20 reporting period identified some exceedances of the surface water and groundwater environmental goals identified in the relevant sub-plans contained in the approved Lamberts North Ash Placement Project Operation Environmental Management Plan dated May 2013 (Lamberts North OEMP) (CDM Smith, 2013) triggering the contingency measures contained in the Lamberts North OEMP. These contingency measures require the carrying out of a further surface water and groundwater investigations and these investigations are currently still under way.	**Compliant**
	i)	baseline data on the surface water quality and available flow in Wangcol Creek and Lamberts Gully Creek			
	ii)	water quality objectives and impact assessment criteria for Wangcol Creek and Lamberts Gully Creek;			
	iii)	identification of the operation activities that could cause soil erosion or discharge sediment or water pollutants from the site;			
	iv)	a description of the management controls to minimise soil erosion or discharge of sediment or water pollutants from the site, including a strategy to minimise the area of bare surfaces, stabilise disturbed areas, minimise bank erosion and including the leachate management system which must be designed and constructed generally in accordance with the Environmental Guidelines, Solid Waste Landfills (EPA, 2016);			
	v)	demonstration that the proposed erosion and sediment control measures will conform with, or exceed, the relevant requirements of Managing Urban Stormwater: Soils and Construction (Landcom, 2004);			
	vi)	details of the water management system including separation of clean and contaminated/polluted water flows, provisions for the treatment, recycling/reuse and/or discharge of flows;			
	vii)	site water balance including water usage for ash placement, sources of water and quantity of run-off generated;			
	viii)	details of the lining for the surface water collection ponds;			
	ix)	measures to minimise potential surface water infiltration;			
	x)	a flow and water quality monitoring program for Wangcol Creek and Lamberts Gully Creek that includes discharge points, upstream and downstream locations as per condition E16 and limits for identified pollutants;			
	xi)	specified remedial actions and contingency plans to mitigate any water quality exceedances on receiving waters including identified trigger levels for remedial measures or the activation of contingency plans; and			
	xii)	provisions for periodic reporting of results to Water NSW as per condition B8.			
Air Quality Management Plan	d)	a Air Quality Management Plan to outline measures to minimise impacts from the project on local air quality. The Plan must be prepared in consultation with NSW Health and the EPA and include, but not necessarily be limited to:	Prior to operations	The Operation Environmental Management Plan (CDM Smith, 2013) containing an Air Quality Management Plan was approved by DPI in May 2013 and operations at Lamberts North commenced in September 2013. The OEMP was reviewed by EnergyAustralia NSW during the 2021-22 reporting period to ensure that it reflects the current activities and management. The OEMP (EA NSW, 2022) was approved by the DPIE on 6 June 2022.	**Compliant**
	i)	baseline data on dust deposition levels;			
	ii)	air quality objectives and impact assessment criteria;			
	iii)	an assessment of alternative methods of ash placement to minimise the exposure of active placement areas to prevailing winds;			
	iv)	mitigation measures to be incorporated during ash placement activities, haulage, etc;			
	v)	an operating protocol for the ash placement irrigation system including activation rates, application rates and area of coverage and means of dealing with water shortages;			
	vi)	detail how ash placement moisture levels will be maintained;			
	vii)	a contingency plan to deal with high winds and dust suppression;			
	viii)	a protocol for the investigation of visible emissions from the ash placement area;			
	ix)	a response plan to address exceedances in visible emissions including PM10, TSP and deposited dust from the ash placement areas; and			
	x)	an air quality monitoring program as referred to in condition E18 of this approval including identified air quality monitoring locations (including monitoring at sensitive receivers) and meteorological monitoring to predict high wind speed events;			
	xi)	provisions for periodic reporting of results to the EPA as per condition B8; and			
	xii)	a protocol for suppressing dust emissions within the EPL limits under normal and adverse weather conditions at all stages of the ash placement process.			
Landscape / Revegetation Plan	e)	a Landscape/Revegetation Plan to outline measures to minimise the visual impacts of the ash placement areas and ensure the long-term stabilisation of the site and compatibility with the surrounding landscape and land use. The Plan must include, but not necessarily be limited to:	Prior to operations	The Operation Environmental Management Plan (CDM Smith, 2013) containing a Landscape & Revegetation Plan was approved by DPI in May 2013 and operations at Lamberts North commenced in September 2013. The OEMP was reviewed by EnergyAustralia NSW during the 2021-22 reporting period to ensure that it reflects the current activities and management. The OEMP (EA NSW, 2022) was approved by the DPIE on 6 June 2022.	**Compliant**
	i)	identification of design objectives and standards based on local environmental values, vistas, and land uses;			
	ii)	identification of the timing and progressive implementation of revegetation works for ash placement areas as they are completed, including short-term and long term goals including landscape plans;			
	iii)	a schedule of species to be used in revegetation, including the use of local native species in revegetation works selected by a qualified expert to ensure the rehabilitation works do not compromise the long term integrity of the capping; and			
	iv)	procedures and methods to monitor and maintain revegetated areas during the establishment phase and long-term.			

Lamberts North Compliance Tracking

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
Site Rehabilitation Plan	f)	a Site Rehabilitation Management Plan to outline measures to stabilise and rehabilitate the site following project completion. The Plan must be prepared in consultation with Water NSW and DPIE Water. The Plan must include, but not necessarily be limited to:	Prior to operations	The Operation Environmental Management Plan (CDM Smith, 2013) containing a Site Rehabilitation Management Plan was approved by DPI in May 2013 and operations at Lamberts North commenced in September 2013. The OEMP was reviewed by EnergyAustralia NSW during the 2021-22 reporting period to ensure that it reflects the current activities and management. The OEMP (EA NSW, 2022) was approved by the DPIE on 6 June 2022.	**Compliant**
	i)	reinstatement of geomorphologic stable drainage lines on the rehabilitated areas and a timeframe for rehabilitation;			
	ii)	restoration, rehabilitation and revegetation of the project's site;			
	iii)	measures to control water pollutants from rehabilitated areas; and			
	iv)	a program and timeframe for monitoring rehabilitated areas.			
	D3A	The Proponent must implement the OEMP as approved by the Secretary.	At all times	Based on the review undertaken, the Lamberts North operations have been carried out in accordance with the OEMP.	**Compliant**
Groundwater Quality and Geotechnical Impacts	**D4**	Prior to commencement of operation the Proponent shall submit a geotechnical report prepared by a suitably qualified expert that demonstrates the site has been engineered as being suitable for ash placement. The report must also provide an evaluation of groundwater levels once re-profiling has been completed.	Prior to operations	An evaluation of groundwater levels at Lamberts North (CDM Smith, 2012b) was provided to DPI May 2013. The groundwater level evaluation report demonstrated that the activities associated with preparation and re-profiling of Lamberts North area had minimal impact on groundwater levels on and immediately adjacent to the site.	
Leachate Management System	**D5**	Prior to the commencement of operation of each stage of the ash placement process, the Proponent must demonstrate to the satisfaction of the Secretary, in consultation with the EPA, that the design of the leachate management system is generally consistent with the Environmental Guidelines, Solid Waste Landfills (EPA, 2016), including:	Prior to operations of each stage	The Lamberts North Ash Repository Leachate Barrier System Water Balance Assessment (ERM, 2022) was approved by DPE 27 April 2022.	**Compliant**
	a)	the leachate barrier system, including liner and leachate collection system; and			
	b)	the leachate storage dam/s including freeboard, appropriate sizing based on site water balance modelling and liner.			
Operational Hours	**E1**	Operational activities associated with the project shall only be undertaken from 6.00 am to 8.00 pm Monday to Friday and 6.00am to 5.00pm Saturday and Sunday.	During Operations	Emergency operating conditions were undertaken for part of the reporting period due to high levels of rainfall resulting from the La Niña weather pattern. The persistent high rainfall caused major delays to the MOD 1 operations resulting in an emergency situation at MPPS where out of hours works, in accordance with Condition E2 of the LNAR Consent, were required to prevent environmental harm. A letter was submitted to the EPA and DPE requesting approval for temporary emergency operating hours to continue MOD 1 construction 24hours 7 days a week. Approval was granted on the 9 March 2022 for emergency operating hours to commence.	**Compliant**
	E2	Operations outside the hours stipulated in condition E1 of this approval are only permitted in the following emergency situations:			
	a)	where it is required to avoid the loss of lives, property and/or to prevent environmental harm; or			
	b)	breakdown of plant and/or equipment at the ash placement areas or the Mt Piper Power Station with the effect of limiting or preventing ash storage at the power station outside the operating hours defined in condition E1; or			
	c)	a breakdown of an ash haulage truck(s) or the conveyor preventing haulage during the operating hours stipulated in condition E1 combined with insufficient storage capacity at the Mt Piper Power Station to store ash outside of the project operating hours; or			
	d)	in the event that the Australian Energy Market Operator (AEMO), or a person authorised by AEMO, directs the Proponent (as a licensee) under the National Electricity Rules to maintain, increase or be available to increase power generation for system security and there is insufficient ash storage capacity at the Mt Piper Power Station to allow for the ash to be stored.			
		In the event of conditions E2b) or E2c) arising, the Proponent is to take all reasonable and feasible measures to repair the breakdown in the shortest time possible.			
	E3	In the event that an emergency situation as referred to under condition E2b) or E2c) occurs more than once in any two month period, the Proponent shall prepare and submit to the Secretary for approval a report including, but not limited to:	During operations - emergency situations	Emergency operating conditions were undertaken during the reporting period due to high levels of rainfall resulting from the La Niña weather pattern. The persistent high rainfall caused major delays to the MOD 1 operations which resulted in an emergency situation at MPPS where out of hours works in accordance with Condition E2 of the LNAR Consent were required to prevent environmental harm. A letter was submitted to the EPA and DPE requesting approval for temporary emergency operating hours to continue MOD 1 construction 24hours 7 days a week. Approval was granted on the 9 March 2022 for emergency operating hours to commence. A letter report detailing the extension of the emergency conditions was submitted to the EPA and DPE 3 May 2022.	**Compliant**
	a)	the dates and a description of the emergency situations;			
	b)	an assessment of all reasonable and feasible mitigation measures to avoid recurrence of the emergency situations;			
	c)	identification of a preferred mitigation measure(s); and			
	d)	timing and responsibility for implementation of the mitigation measure(s).			
		The report is to be submitted to the Secretary within 60 days of the second emergency situation occurring. The Proponent shall implement all reasonable and feasible mitigation measures in accordance with the requirements of the Secretary.			
	E4	The Proponent shall notify the EPA prior to undertaking any emergency ash haulage or placement operations outside of the hours of operation stipulated in condition E1 of this approval and keep a log of such operations.			
	E5	The Proponent shall notify the Secretary in writing within seven days of undertaking any emergency ash haulage or placement operations outside of the hours of operation stipulated in condition E1 of this approval.			
	E6	The Proponent shall notify nearby sensitive receivers (as defined in the OEMP required under condition D3(a) of this approval) prior to 8.00 pm where it is known that emergency ash haulage or placement operations will be required outside of the hours of operation stipulated in condition E1 of this approval.			
Operational Noise	**E7**	The cumulative operational noise from the ash placement area and ash haulage activity shall not exceed the following $LA_{eq(15\ minute)}$ dB(A): **Location** / **Day (7am to 6pm)** / **Evening (6pm to 10pm)** / **Night (10pm to 7am)** All private sensitive receivers within the township of Blackmans Flat: 42 / 38 / 35 All other sensitive receivers: 42 / 38 / 35 This noise criteria set out above applies under all meteorological conditions except for any of the following:	During operations	Noise criteria is included in Table 6-4 of the approved OEMP. Meteorological conditions to which the above criteria apply are included in Section 6.3.5.3 of the OEMP.	**Compliant**

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
	a)	wind speed greater than 3 metres/second at 10 metres above ground level;			
	b)	stability category F temperature inversion conditions and wind speed greater than 2 metres/second at 10 metres above ground level; and			
	c)	stability category G temperature inversion conditions.			
		This criteria does not apply where the Proponent and an affected landowner have reached a negotiated agreement in regard to noise, and a copy of the agreement has been forwarded to the Secretary and the EPA.			
	E8	To determine compliance with the LAeq(15 minute) noise limits, the noise monitoring equipment must be located at the most affected:	During operations	Addressed in section 6.3.5.4 of the approved OEMP and section 6.2 of the 2021-22 AOCR.	**Compliant**
	a)	within 30 metres of a dwelling façade where any dwelling on the property is situated more than 30 metres from the property boundary that is closest to the premises; or			
	b)	approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises			
	E9	For the purposes of monitoring noise from the premises to determine compliance with the noise limits:	During operations	Addressed in section 6.3.5.4 of the approved OEMP.	**Compliant**
	a)	noise monitoring must be undertaken in accordance with the Noise Policy for Industry (NSW EPA, 2017), or its latest version, using equipment accepted by the EPA in writing;			
	b)	the meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station at the premises; and			
	c)	stability category temperature inversion conditions are to be determined in accordance with the Noise Policy for Industry (NSW EPA, 2017), or its latest version.			
	E10	The Proponent shall implement measures to ensure noise attenuation of trucks. These measures may include, but are not necessarily limited to, installation of residential class mufflers, engine shrouds, body dampening, speed limiting, fitting of rubber stoppers to tail gates, limiting the use of compression braking, and ensuring trucks operate in a one-way system at the ash placement areas where feasible.	During operations	The plant and equipment mitigation measures are included in Table 6-3 of the approved OEMP. No noise complaints have been received for Lamberts North within the reporting period.	**Compliant**
Operational Noise Review	**E11**	Within 60 days of the commencement of operation of the project, unless otherwise agreed to by the Secretary, the Proponent shall submit to the Secretary an Operational Noise Review to confirm the operational noise impacts of the project. The Operational Noise Review shall be prepared in consultation with the EPA. The Review shall:	Prior to operations	The Operation Noise Review Report was prepared in October 2013 by Aurecon. The report was submitted to the DPI on 9th October 2013 and the EPA 10th October 2013 for review. The report concluded that the noise resulting from Lamberts North operations comply with the criteria specified in condition E7 at the representative residential receivers at Location 1 and Location 2. No complaints regarding noise from Lamberts North have been recorded within the reporting period.	**Compliant**
	a)	identify the appropriate operational noise objectives and levels for sensitive receivers;			
	b)	describe the methodologies for noise monitoring, including the frequency of measurements and location of monitoring sites;			
	c)	document the operational noise levels at sensitive receivers as ascertained by the noise monitoring program;			
	d)	assess the noise performance of the project against the noise criteria specified in condition E7 of this approval and the predicted noise levels as detailed in the report referred to under condition A1 of this approval; and			
	e)	provide details of any entries in the Complaints Register relating to noise impacts.			
		Where monitoring indicates noise levels in excess of the operational noise criteria specified in condition E7 of this approval, the Proponent shall prepare a report as required by condition E13 of this approval.			
Ongoing Operational Noise Monitoring	**E12**	The Proponent shall prepare and implement an Operational Noise Monitoring Program to assess compliance against the operational noise criteria stipulated in condition E7 of this approval, throughout the life of the project. The noise monitoring program shall be prepared in consultation with the EPA and must include the proposed frequency of monitoring and as a minimum must include monitoring when there are any significant changes in work locations or processes. The noise monitoring program shall be prepared in accordance with the requirements of the Noise Policy for Industry (NSW EPA, 2017), or its latest version, and shall include, but not be limited to:	Prior to & during operations	The operational noise monitoring program is included in Table 6-5 of the approved OEMP. Monitoring was performed during the reporting period. The report states that the noise resulting from Lamberts North operations complies with the criteria specified under condition E7 at the representative residential receivers at Location 1 and Location 2.	**Compliance**
	a)	monitoring at Lamberts North, Lamberts South and Blackmans Flat during ash placement activities; and			
	b)	monitoring of the effectiveness of any noise mitigation measures implemented under condition D3(a) of this approval, against the noise criteria specified in condition E7 of this approval.			
		The Proponent shall forward to the EPA and the Secretary a report containing the results of any non-compliance within 14 days of conducting a noise assessment. The monitoring program shall form part of the OEMP referred to in condition D3 (a) of this approval.			
	E13	Where noise monitoring including as required by condition E11 and E12 of this approval identifies any non-compliance with the operational noise criteria specified under condition E7 of this approval the Proponent shall prepare and submit to the Secretary a report including, but not limited to:	During operations – if required	No non-compliances with the operational noise criteria specified under condition E7 has been reported during this reporting period	**Compliant**
	a)	an assessment of all reasonable and feasible physical and other mitigation measures for reducing noise at the source;			
	b)	identification of the preferred measure(s) for reducing noise at the source;			
	c))	feedback from directly affected property owners and the EPA on the proposed noise mitigation measures; and			
	d)	location, type, timing and responsibility for implementation of the noise mitigation measure(s).			
		The report is to be submitted to the Secretary within 60 days of undertaking the noise monitoring which has identified exceedances of the operational noise criteria specified under condition E7, unless otherwise agreed to by the Secretary. The Proponent shall implement all reasonable and feasible mitigation measures in accordance with the requirements of the Secretary.			

Lamberts North Compliance Tracking

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
	E14	If after the implementation of all reasonable and feasible source controls, as identified in the report required by condition E13, the noise generated by the project continues to exceed the criteria stipulated in condition E7 the Proponent shall implement at the receiver reasonable and feasible noise mitigation measures, such as double glazing, insulation, air conditioning and or other building acoustic treatments, in consultation with and with the agreement of the affected landowner.	During operations – if required	No non-compliances with the operational noise criteria specified under condition E7 has been reported during this reporting period	**Compliant**
Groundwater Monitoring	**E15**	The Proponent shall prepare and implement a Groundwater Monitoring Program to monitor the impacts of ash placement activities on local groundwater quality and hydrology. The Program shall be developed in consultation with Water NSW, and shall describe the location, frequency, rationale and procedures and protocols for collecting groundwater samples as well as the parameters analysed and methods of analysis. The monitoring program shall be ongoing for the operation of the project and for a minimum of 5 years following project completion and include, but not be limited to:	Prior to & during operations	The Groundwater Monitoring program is included as part of the Groundwater Management Plan as Section 6.4.3 of the approved OEMP. Monitoring has been carried out on a continual monthly basis including the first 12 months of operations to establish baseline data. Results of Groundwater monitoring during the reporting period have been addressed in Section 7.2 and can be found in Appendix E of the 2021-22 AOCR.	**Compliant**
	a)	monitoring at established bore sites (or replacement bore sites in the event that existing sites are damaged or lost) as described in the Groundwater Management Plan as per condition D3(b); and			
	b)	a schedule for periodic monitoring of groundwater quality, depth and flow at all monitoring sites, at an initial frequency of no less than once every month for the first 12 months of operation.			
		The monitoring program shall form part of the Groundwater Management Plan referred to in condition D3(b) of this approval.			
Surface Water Quality Monitoring	**E16**	The Proponent shall prepare and implement a surface water quality monitoring program to monitor the impacts of the ash placement activities on Wangcol Creek and Lamberts Gully. The Program shall be developed in consultation with Water NSW, and shall describe the location, frequency, rationale and the procedures and protocols for collecting water samples as well as the parameters analysed and methods of analysis. The program shall include, but not necessarily be limited to:	Prior to & during operations	The Surface water monitoring programme is included in Table 6.21 of the approve OEMP. Monitoring is performed at the Final Holding Pond monitoring station to Wangcol Creek (LDP01), and at NC01 and WX22. Wet weather monitoring was performed in October 2013 and March 2014. Results of Surface water monitoring during the reporting period have been addressed in Section 7.1. and can be found in Appendix E of the 2021-22 AOCR.	**Compliant**
	a)	monitoring at the existing water quality monitoring sites as described in the document referred to under condition A1c);			
	b)	monitoring at surface water discharge points from Lamberts Gully Creek			
	c)	monitoring at surface water discharge points into Wangcol Creek;			
	d)	wet weather monitoring with a minimum of two events recorded within the first 12 months operation of the project; and			
	e)	a schedule for periodic monitoring of surface quality at all sites throughout the life of the project, at an initial frequency of no less than once every month for the first 12 months and must include, but not be limited to, monitoring of dissolved oxygen, turbidity, sulphates, salinity, boron, manganese, iron chloride, total phosphorus and total nitrogen.			
Hydrological Monitoring Program	**E17**	A Hydrological Monitoring Program to assess and quantify the impacts and effectiveness of the transformed section of Huons Creek into a sub-surface drainage line in consultation with Water NSW and DPIE Water and any other relevant government agency. Monitoring is to be undertaken for a period of five (5) years upon completion of the creek transformation. The program must include sampling for identified pollutants before and after the transformation works and include a sampling site downstream of the sub-surface section of Huons Creek. In the first 12 months following completion of the transformation, monitoring is to be undertaken at least every three (3) months upon completion of the creek transformation and after any heavy wet weather event. The monitoring program shall form part of the Soil and Surface Water Management Plan referred to in condition D3(c) of this approval.	Prior to & during operations	Huons Creek was filled in during construction of the Lamberts North ash placement site commenced. As such, it was not developed as a sub-surface drain as was originally proposed. A Consistency report (SKM, 2012) was submitted to the DPI on 30 July 2012. The report states that groundwater modelling performed during construction demonstrated that the water contained within the creek was largely groundwater as a result of the Huon Void intersecting the groundwater table. Based on this finding, the hydrological monitoring program was incorporated into the Groundwater Management Plan.	**Compliant**
Air Quality Monitoring	**E18**	The Proponent shall prepare an Air Quality Monitoring Program, in consultation with the EPA and NSW Health. The Program shall include, but not necessarily be limited to, monitoring for dust. Monitoring sites shall be identified as per condition D3 (d). The air quality monitoring program shall be ongoing for the life of the project, and during final rehabilitation and stabilisation of the site. The monitoring program shall form part of the Air Quality Management Plan referred to in condition D3(d) of this approval.	Prior to & during operations	The Air Quality Monitoring Program is included in section 6.6.6 of the approved OEMP. It states that air quality monitoring will be undertaken for the life of the project. TEOM and dust gauge data has been collected monthly in the first 12 months of operation to determine whether additional monitoring stations are required as a result of the project. The results of Air Quality monitoring during the reporting period are addressed in Section 6.5 of the 2021-22 AOCR.	**Compliant**
Environmental Incident Reporting	**E19**	The Proponent shall notify the Secretary of any environmental incident within 12 hours of becoming aware of the incident. The Proponent shall provide full written details of the incident to the Secretary within seven days of the date on which the incident occurred.	At all times	No environmental incidents requiring notification of the Director- General occurred within the 2021-2022 reporting period.	**Not triggered**
	E20	The Proponent shall meet the requirements of the Secretary to address the cause or impact of any environmental incident, as it relates to this approval, reported in accordance with condition E19 of this approval, within such period as the Secretary may require.			
Waste Generation and Management	**E23**	All waste materials removed from the site shall only be directed to a waste management facility lawfully permitted to accept the materials.	At all times	The Principal Ash Management Contractor utilises EnergyAustralia NSW's waste management facilities for wastes generated in the operation of the repository, including waste oils, general waste and materials for recycling. These are stored in intermediate storage facilities at Mt Piper Power Station and routinely removed by EnergyAustralia NSW's waste contractors. No additional waste materials were generated during the 2021-2022 reporting period.	**Compliant**
	E24	The Proponent shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997, if such a licence is required in relation to that waste.	At all times	No wastes generated outside the Lamberts North site are allowed to enter the area. To prevent the unlawful access to the repository area, regular security patrols are conducted across the site. Both Lend Lease and EnergyAustralia NSW security personnel are required to report if they encounter wastes outside those that are allowed during routine operations	**Compliant**
	E25	The Proponent shall ensure that all liquid and / or non-liquid waste generated and / or stored on the site is assessed and classified in accordance with the Waste Classification Guidelines (DECC, 2008), or any future guideline that may supersede that document.	At all times	The Principal Ash Management Contractor provides Monthly Ash Placement Work Instructions to address all issues of routine site maintenance as part of a monthly work program. Waste management is conducted in accordance with EPA guidelines.	**Compliant**

Lamberts North Compliance Tracking

Heading	Number	Condition Requirement	Development phase	2021-2022 Observation	Compliance Finding
Revision of Strategies, Plans and Programs	**E26**	Within 3 months, unless the Secretary agrees otherwise, of:	At all times	The OEMP was reviewed by EnergyAustralia NSW during the 2021-22 reporting period to ensure that it reflects the current activities and management. The OEMP (EA NSW, 2022) was approved by the DPIE on 6 June 2022.	**Compliant**
	a)	the submission of an incident report or independent audit report under condition B8 or B9; and			
	b)	the approval of any modification to the conditions of this approval; or			
	c)	a direction of the Secretary under condition A1 of Schedule 2;			
		the Proponent must review and, if necessary, revise the studies, strategies or plans required under the conditions of approval to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted to the Secretary for approval, unless otherwise agreed with the Secretary. *Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.*			
Project Completion Management Plan	**F1**	No later than one month prior to the decommissioning of the project, or as otherwise agreed by the Secretary, the Proponent is to prepare a Project Completion Management Plan, in consultation with Water NSW, for the approval of the Secretary. The Plan is to include but not necessarily be limited to:	Prior to decommissioning	The Project is still in operational phase.	**Not triggered**
	a)	identification of structures to be removed and how they will be removed;			
	b)	measures to reduce impacts on the environment and surrounding sensitive land uses			
	c)	details of components to be recycled;			
	d)	details of rehabilitation and revegetation with reference to the biodiversity offset required under condition B6;			
	e)	groundwater assessment criteria including trigger levels for remedial measures;			
	f)	a groundwater monitoring program as per condition E15 for groundwater connectivity, water levels, groundwater flow and water quality over the short and long term that includes upstream and downstream locations. The program shall continue for a minimum of five years following final capping and landscaping;			
	g)	a contingency plan to address potential exceedances and mitigation measures in groundwater and groundwater quality impacts and if exceedances continue, implementation of further measures and groundwater monitoring to demonstrate compliance;			
	h)	surface water assessment criteria including trigger levels for remedial measures;			
	I	available flow and water quality monitoring program for Wangcol Creek and Lamberts Gully Creek that includes discharge points, upstream and downstream locations as per condition E16 and limits for identified pollutants. The program shall continue for a minimum of five years following final capping and landscaping; and			
	j)	a contingency plan to address potential exceedances and mitigation measures in surface water and surface water quality impacts and if exceedances continue, implementation of further measures and surface water monitoring to demonstrate compliance.			

Appendix B Annual Summary of Service Stream Compliance

Summary of Contractor compliance at Lamberts North

	September 2021	October 2021	November 2021	December 2021	January 2022	February 2022	March 2022	April 2022	May 2022	June 2022	July 2022	August 2022
Ash Moisture **Fresh Water 18-20%**	C	C	C	C	C	C	C	C	C	C	C	C
Compaction Testing **Dry density ratio 95%** **Fresh ash acceptable 93%**	C	C	C	C	C	C	C	C	C	C	C	C
Landform Stability **No slumping or movement**	C	C	C	C	C	C	C	C	C	C	C	C
Weather station operational	C	C	C	C	C	C	C	C	C	C	C	C
Irrigation system Operational	C	C	C	C	C	C	C	C	C	C	C	C
Internal dust deposition gauges **Insoluble solids = 4 g m^{-2} month**	C	C	C	C	C	C	C	C	C	C	C	C
Ash Contaminated Water contained within site boundary	C	C	C	C	C	C	C	C	C	C	C	C
Geotechnical vibrating wire piezometers **Stack stability**	C	C	C	C	C	C	C	C	C	C	C	C
No Community complaint	C	C	C	C	C	C	C	C	C	C	C	C

Appendix C Lamberts North Operational Noise Assessment – May 2022

Global Acoustics

NOW PART OF EMM

creating opportunities

Lamberts North Ash Placement Project

Environmental Noise Monitoring

May 2022

Prepared for EnergyAustralia NSW Pty Ltd

Lamberts North Ash Placement Project

Environmental Noise Monitoring

May 2022

EnergyAustralia NSW Pty Ltd

E220483 RP1

Version	Date	Prepared by	Approved by	Comments
0.1	18/06/2022	Jesse Tribby	Tony Welbourne	Draft Report
1.0	18/07/2022	Ryan Bruniges	Tony Welbourne	Final Report

Approved by

Tony Welbourne
Associate Director
18 June 2022

Level 3 175 Scott Street
Newcastle NSW 2300

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1 Introduction

1.1 Background

Global Acoustics (now part of EMM) engaged by Energy Australia NSW Pty Ltd to conduct an annual noise survey of operations at the Lamberts North Ash Placement Project (LN) associated with Mount Piper Power Station near Wallerawang, NSW. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with the specified limits, in accordance with the LN Operational Noise Management and Monitoring Plan (ONMMP).

Attended environmental noise monitoring described in this report were undertaken during the day, evening, and night periods of 19 May 2022 at two locations around LN.

1.2 Attended noise monitoring locations

Monitoring locations are outlined in Section 6.3 of the ONMMP and have been detailed in Table 1.1 and shown on Figure 1.1 of this report.

Table 1.1 Attended noise monitoring locations

Descriptor [1]	Name [1]	Monitoring Location
N1	Location 1	Noon Street, Blackmans Flat
N2	Location 2	End of Karawatha Drive, Wallerawang

Notes: 1. Monitoring location descriptors and names sourced from LN Operational Environmental Management Plan.

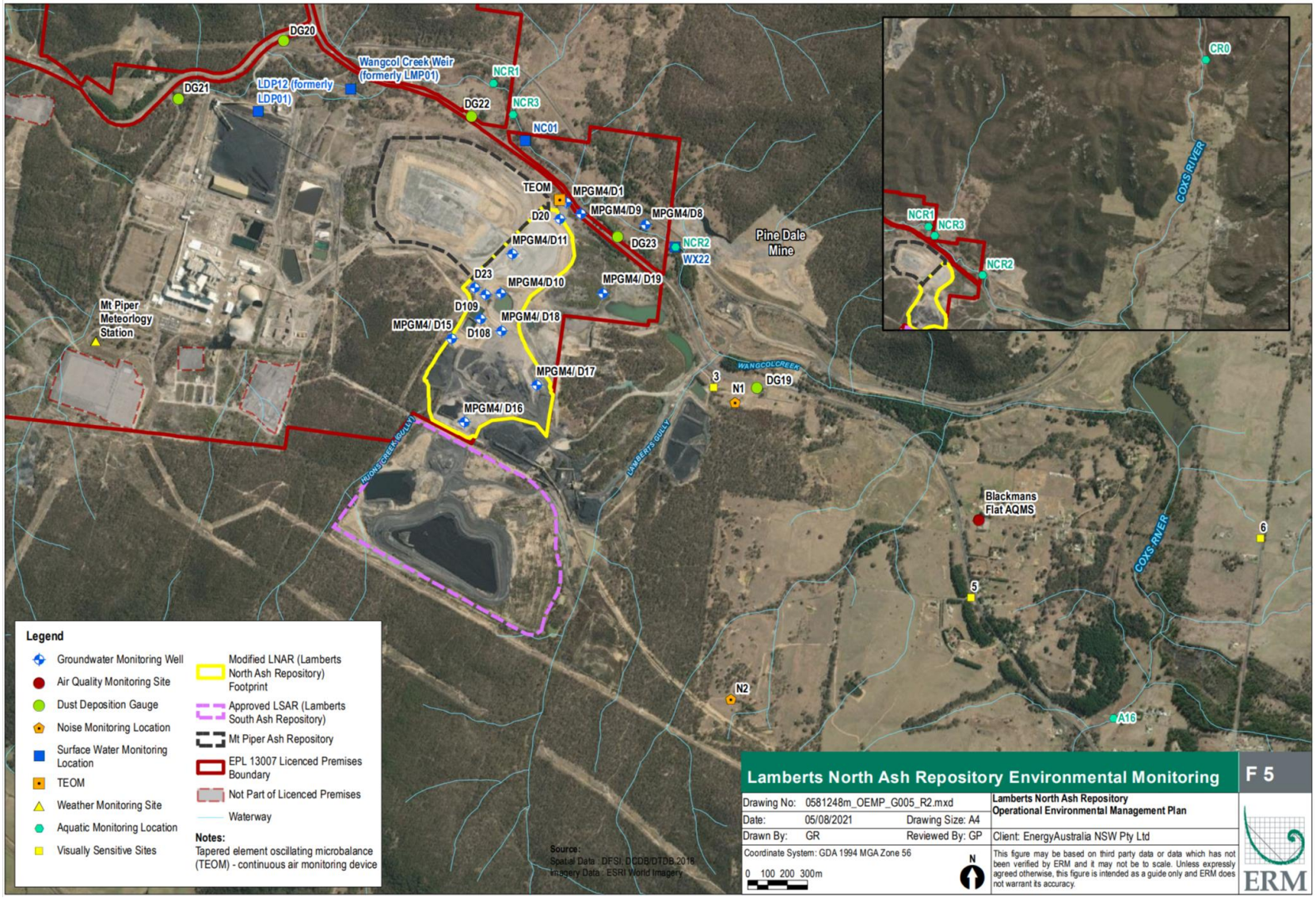

Figure 1.1 Monitoring locations

1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise.
L_{Amax}	The maximum A-weighted noise level over a time period.
L_{A1}	The noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The average noise A-weighted energy during a measurement period.
L_{A50}	The noise level which is exceeded for 50 per cent of the time and the median noise level during a measurement period.
L_{A90}	The level exceeded for 90 percent of the time. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
SC	Stability class (or category) is determined from measured wind speed and either sigma-theta or VTG.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	This is the period 7:00am to 6:00pm.
Evening	This is the period 6:00pm to 10:00pm.
Night	This is the period 10:00pm to 7:00am.

2 Regulatory requirements and noise criteria

2.1 Project Approval

The most current approval associated with activities at LN is the 'Mount Piper Ash Placement Project', Project Approval 09_0186 (September 2021 Mod1), which encompasses activities at LN and Lamberts South (LS) ash disposal areas. Part E of the project approval details specific conditions relating to noise generated by activities in operational areas. Relevant sections of the conditions of consent are reproduced in Appendix A.

2.2 Noise Monitoring Program

Noise monitoring requirements are detailed in the ONMMP, which is contained within the LN Operational Environmental Management Plan (OEMP). The most recent version of the OEMP was issued in 2019. Relevant sections are reproduced in Appendix A.

2.3 Noise criteria

Operational noise criteria are set out in Condition E7 of the Project Approval. Noise criteria from the Project Approval are reproduced in Table 2.1.

Table 2.1 Operational noise criteria, dB[3]

Monitoring Location	Day $L_{Aeq,15minute}$	Evening $L_{Aeq,15minute}$	Night $L_{Aeq,15minute}$
N1	42	38	35
N2	42	38	35

2.4 Meteorological conditions

Part E7 of the project approval outlines meteorological conditions required for criteria to be applicable. Noise criteria detailed in the project approval apply under all meteorological conditions except for the following:

a) wind speed greater than 3 metres/second measured at 10 metres above ground level;

b) stability category F temperature inversion conditions and wind speed greater than 2 metres/second measured at 10 metres above ground level; or

c) stability category G temperature inversion conditions.

Meteorological data for LN was obtained from the Mount Piper Power Station automatic weather station (AWS), in accordance with the NMMP.

2.5 Modifying factors

The EPA 'Noise Policy for Industry' (NPfI, 2017) was approved for use in NSW in October 2017. For assessment of modifying factors, the NPfI immediately superseded the 'Industrial Noise Policy' (INP, 2000), as outlined in the EPA document 'Implementation and transitional arrangements for the Noise Policy for Industry' (2017). Assessment and reporting of modifying factors has been undertaken in accordance with Fact Sheet C of the NPfI.

3 Methodology

3.1 Overview

Attended environment noise monitoring was conducted in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise', relevant NSW EPA requirements, and the OEMP. Prior to conducting attended monitoring at the approved monitoring locations, LN operations were confirmed to be active as due diligence. Meteorological data was obtained from the Mount Piper AWS which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended noise monitoring

During this survey, attended monitoring was undertaken during the day, evening, and night periods at each monitoring location. The duration of each measurement was 15 minutes. Atmospheric condition measurement was also undertaken at each monitoring location.

This survey presents noise levels gathered during attended monitoring that are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of LN's contribution, if any, to measured levels. At each receptor location, LN's $L_{Aeq,15minute}$ (in the absence of any other noise) was measured directly, where possible, or, determined by frequency analysis.

If the exact contribution of the source of interest (in this case LN) cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise descriptors in accordance with Section 7.1 of the NPfI. This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no noise from LN activities was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible from LN activities but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods (eg measure closer and back calculate) to determine a value for reporting.

All LN noise levels noted as NM in this report are due to one or more of the following reasons:

- Site noise levels were extremely low and unlikely, in many cases, to be even noticed.
- Site noise levels were masked by another relatively loud noise source that is characteristic of the environment (eg breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer.
- It was not feasible, nor reasonable to employ methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or L_{Amax}, received from the site during the entire measurement period (ie the highest level of the worst minute during the 15 minute measurement).

Often extraneous noise events (for example, road traffic pass-bys and dogs) interfere with the measurement of site noise levels in the frequency range of interest. Where required, the sound level meter is paused during these occurrences to aid in quantification of the site only noise.

3.3 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable, such that the site only L_{Aeq} was not "NM" or less than a maximum cut off value (eg "<20 dB" or "<30dB").

If applicable, modifying factors have been reported and added to measured site only L_{Aeq} noise levels when meteorological conditions satisfied requirements for site noise criteria to be applicable. Low-frequency modifying factors have only been applied to site-only L_{Aeq} levels if LN was the only contributing low-frequency noise source.

3.4 Attended noise monitoring equipment

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix B.

Table 3.1 Attended noise monitoring equipment

Model	Serial number	Calibration due date
Rion NA-28 sound level meter	00701424	02/06/2023
Pulsar 105 acoustic calibrator	79631	26/05/2023

4 Results

4.1 Total measured noise levels

Overall noise levels measured at each location during attended measurement are provided in Table 4.1. These noise levels represent total environmental noise levels and are not necessarily the result of activities at LN.

Table 4.1 Measured noise levels - May 2022 [1]

Location	Start Date and Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB
N1	19/05/2022 16:25	70	66	61	57	55	46	34
N1	19/05/2022 16:49	50	47	46	42	43	32	28
N1	19/05/2022 20:37	51	46	45	44	43	42	41
N2	19/05/2022 21:00	66	60	54	50	43	36	33
N2	19/05/2022 22:00	47	46	45	44	44	43	41
N2	19/05/2022 22:24	63	59	55	49	43	34	33

Notes: 1. Levels in this table are not necessarily the result of activity at LN.

4.2 Modifying factors

Measured LN-only levels were assessed for the applicability of modifying factors in accordance with the NPfI and methodology described in Section 3.3.

There were no modifying factors applicable to site during the survey. LN noise was analysed and did not satisfy requirements for tonal, intermittent, or low-frequency modifying factors, as defined by the NPfI.

4.3 Attended noise monitoring

Table 4.2 details noise levels from LN in the absence of other noise sources. Criteria are then applied if weather conditions are in accordance with the project approval. Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.2 $L_{Aeq,15minute}$ generated by LN against operational noise criteria –May 2022

Location	Start Date and Time	Wind Speed m/s [1]	Stability Class [1]	Criterion dB [5]	Criterion Applies? [2]	LN L_{Aeq} dB [3,4]	Exceedance dB [4,5]
N1	19/05/2022 16:25	0.6	A	42	Yes	IA	Nil
N1	19/05/2022 16:49	1.8	E	38	Yes	IA	Nil
N1	19/05/2022 20:37	1.4	E	35	Yes	IA	Nil
N2	19/05/2022 21:00	1.3	D	42	Yes	IA	Nil
N2	19/05/2022 22:00	1.5	F	38	Yes	IA	Nil
N2	19/05/2022 22:24	1.3	F	35	Yes	IA	Nil

Notes: 1. Noise emission limits apply for all meteorological conditions except those detailed in Section 2.4.
2. Site-only $L_{Aeq,15minute}$ attributed to LN, including modifying factors if applicable.
3. Bold results in red indicate exceedance of the relevant criterion (if applicable).
4. NA in exceedance column means atmospheric conditions outside conditions specified in Section 2.4, therefore criterion was not applicable.

4.4 Atmospheric conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.3. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.3 Measured atmospheric conditions – May 2022

Location	Start Date and Time	Temperature °C	Wind Speed m/s	Wind Direction °Magnetic North [1]	Cloud Cover 1/8s
N1	19/05/2022 16:25	13	0.0	-	4
N1	19/05/2022 16:49	3	0.0	-	1
N1	19/05/2022 20:37	3	0.0	-	3
N2	19/05/2022 21:00	8	0.5	230	3
N2	19/05/2022 22:00	6	0.9	110	2
N2	19/05/2022 22:24	4	0.5	235	3

Notes: 1. "-" indicates calm conditions at monitoring location.

Meteorological data used for compliance assessment is sourced from the LN AWS.

5 Discussion

5.1 Noted noise sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are considered in each measurement via statistical descriptors. From these observations summaries have been derived for the location where an exceedance was measured and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50} and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 5.1 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz while site noise (mining in this example) is at frequencies less than 1000 Hz, which is typical. Adding levels at frequencies that relate to site only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining, such as dogs, cows, or (most commonly) road traffic.

It should be noted that the method of summing statistical values up to a cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

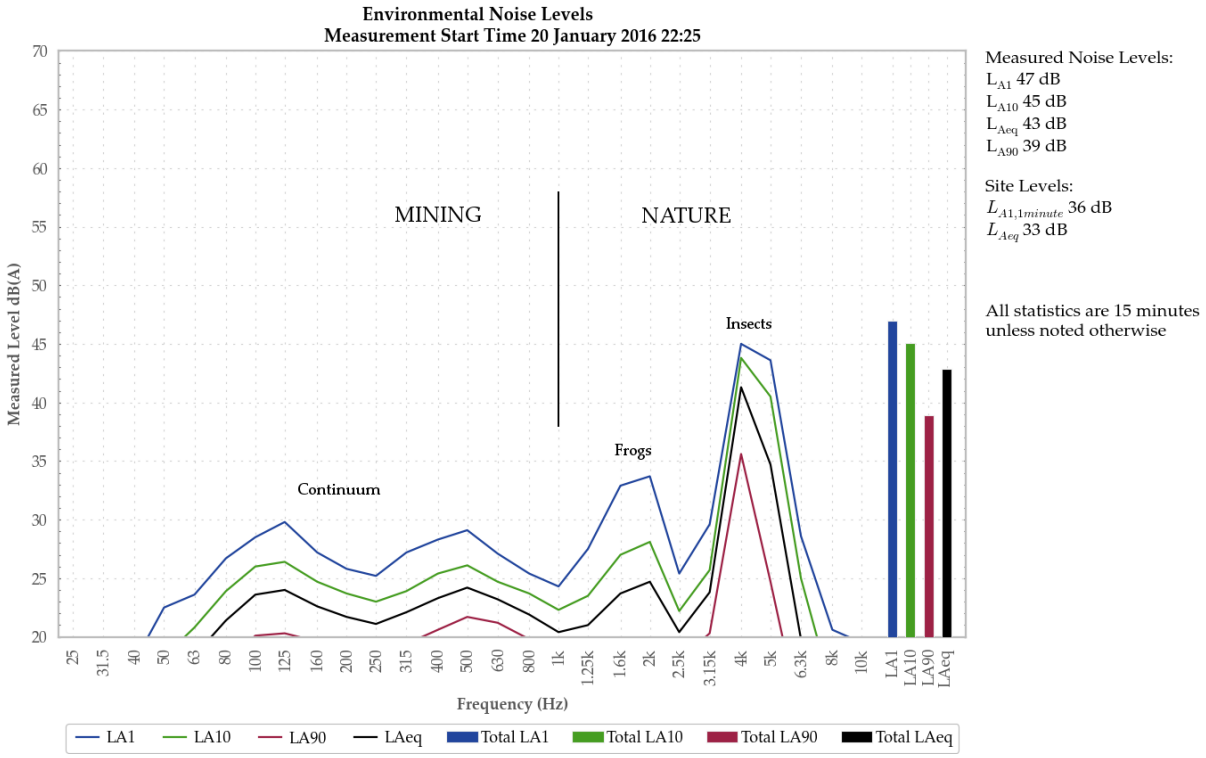

Figure 5.1 Example graph (refer to Section 5.1 for explanatory note)

5.1.1 N1 – Day

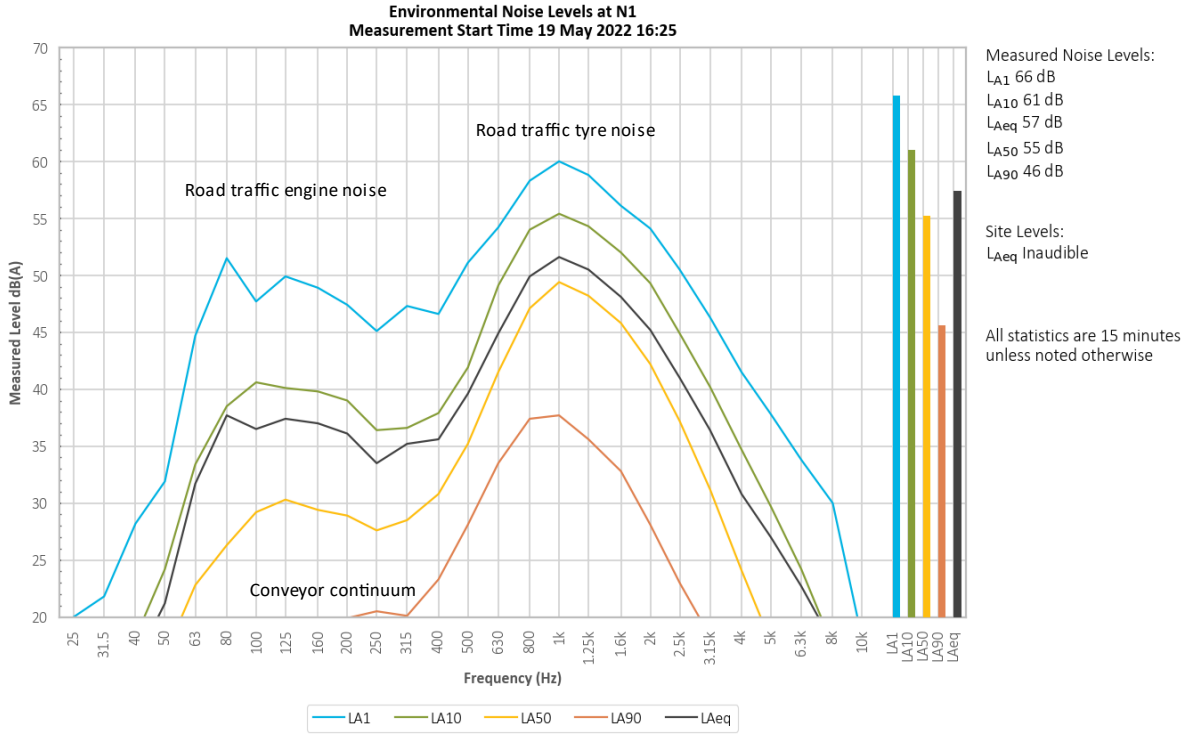

Figure 5.2 Environmental noise levels, N1 (Noon Street)

LN was inaudible during the day period measurement at N1.

Road traffic noise generated measured noise levels.

Noise from a pump and conveyor (from another site) and birds was also noted.

5.1.2 N1 – Evening

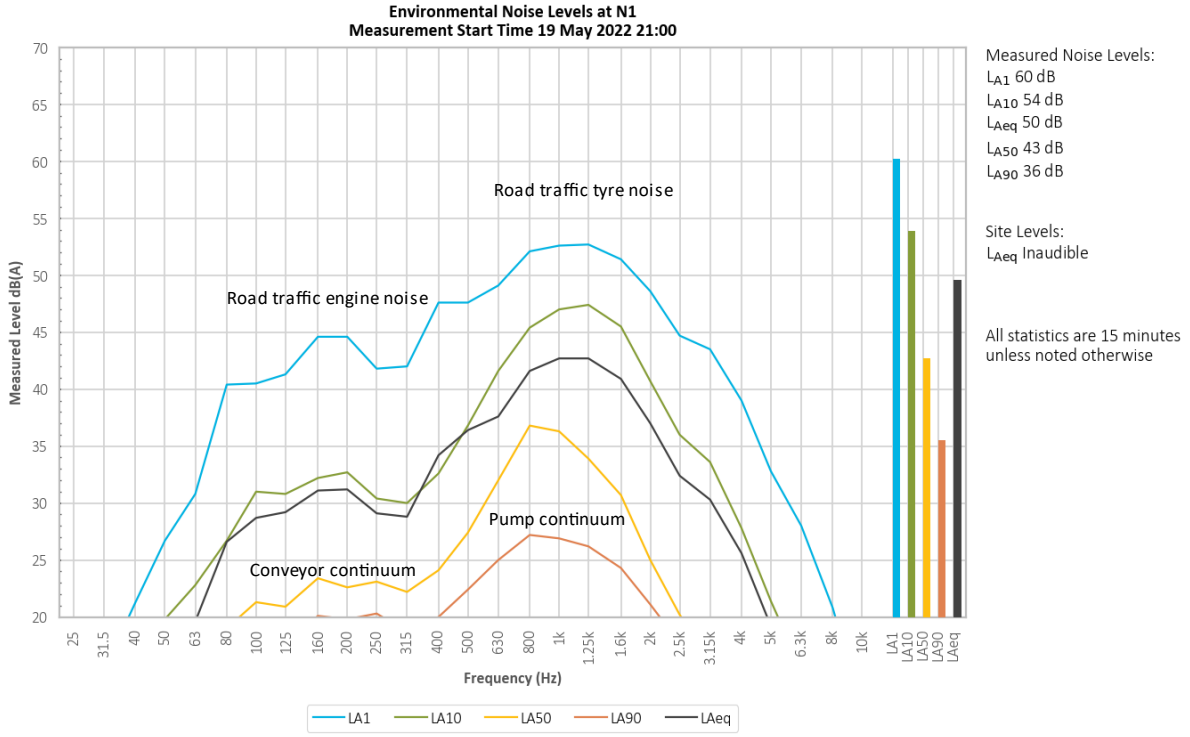

Figure 5.2 Environmental noise levels, N1 (Noon Street)

LN was inaudible during the evening period measurement at N1.

Road traffic noise generated the measured L_{A1}, L_{A10}, L_{Aeq}, and L_{A50}. Pump and conveyor noise from another site was responsible for the measured L_{A90}.

5.1.3 N1 – Night

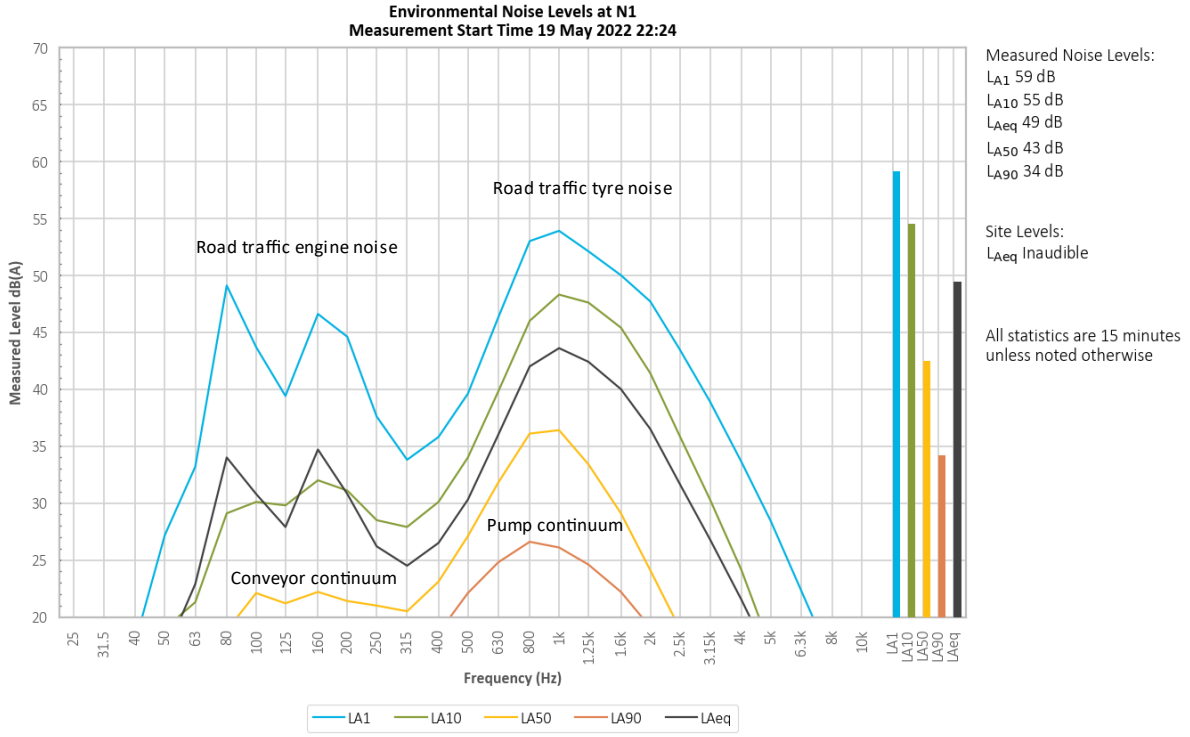

Figure 5.3 Environmental noise levels, N1 (Noon Street)

LN was inaudible during the night period measurement at N1.

Road traffic noise generated the measured L_{A1}, L_{A10}, L_{Aeq}, and L_{A50}. Pump and conveyor noise from another site was responsible for the measured L_{A90}.

5.1.4 N2 – Day

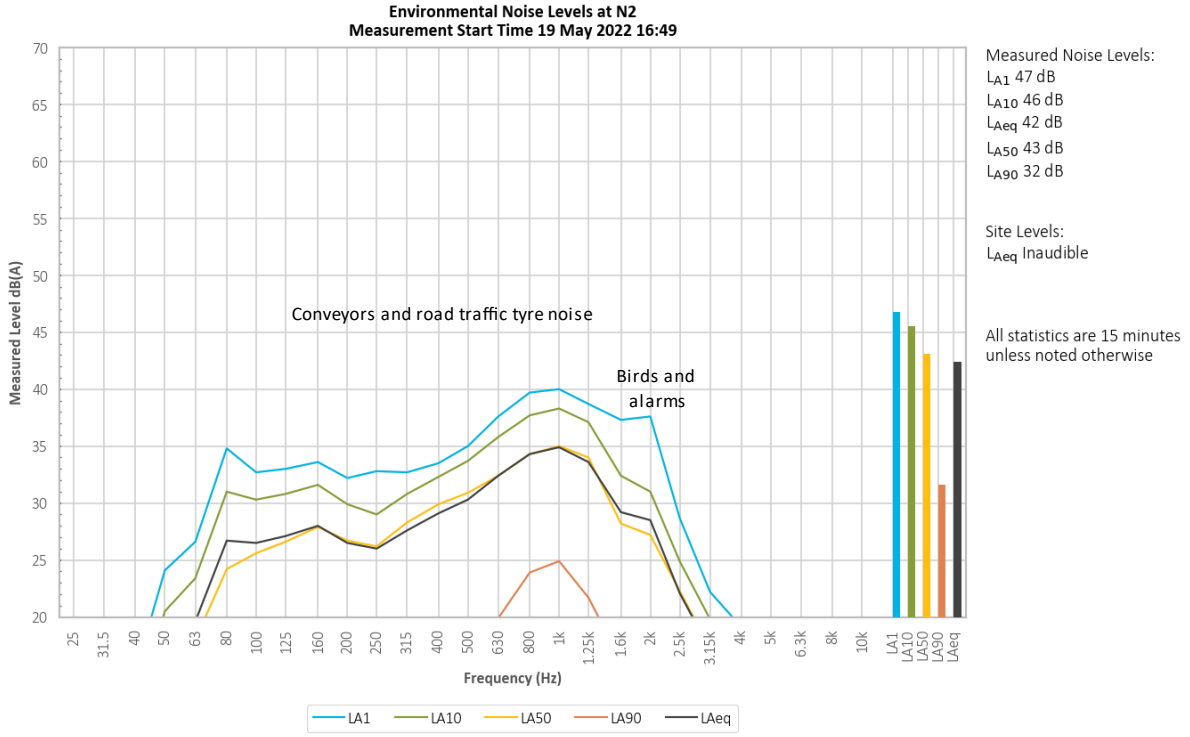

Figure 5.4 Environmental noise levels, N2 (Karawatha Drive)

LN was inaudible during the day period measurement at N2.

Conveyors were primarily responsible for measured noise levels. Birds and conveyor alarms contributed to the measured L_{A1}. Road traffic tyre noise contributed to the measured L_{A90}.

Road traffic engine noise and impact noise from another site were also noted.

5.1.5 N2 – Evening

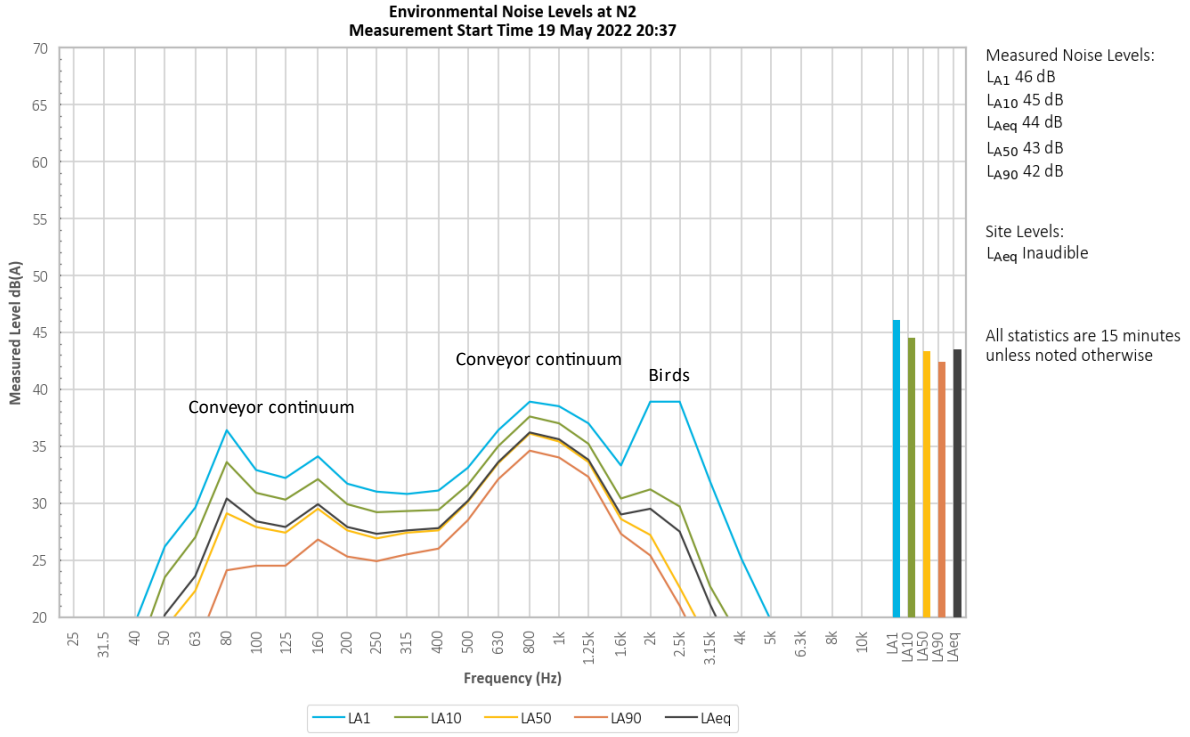

Figure 5.5 Environmental noise levels, N2 (Karawatha Drive)

LN was inaudible during the evening period measurement at N2.

Conveyor continuum was primarily responsible for measured noise levels. Duck calls also contributed to the measured L_{A1}.

Noise from bats and breeze in foliage was also noted.

5.1.6 N2 – Night

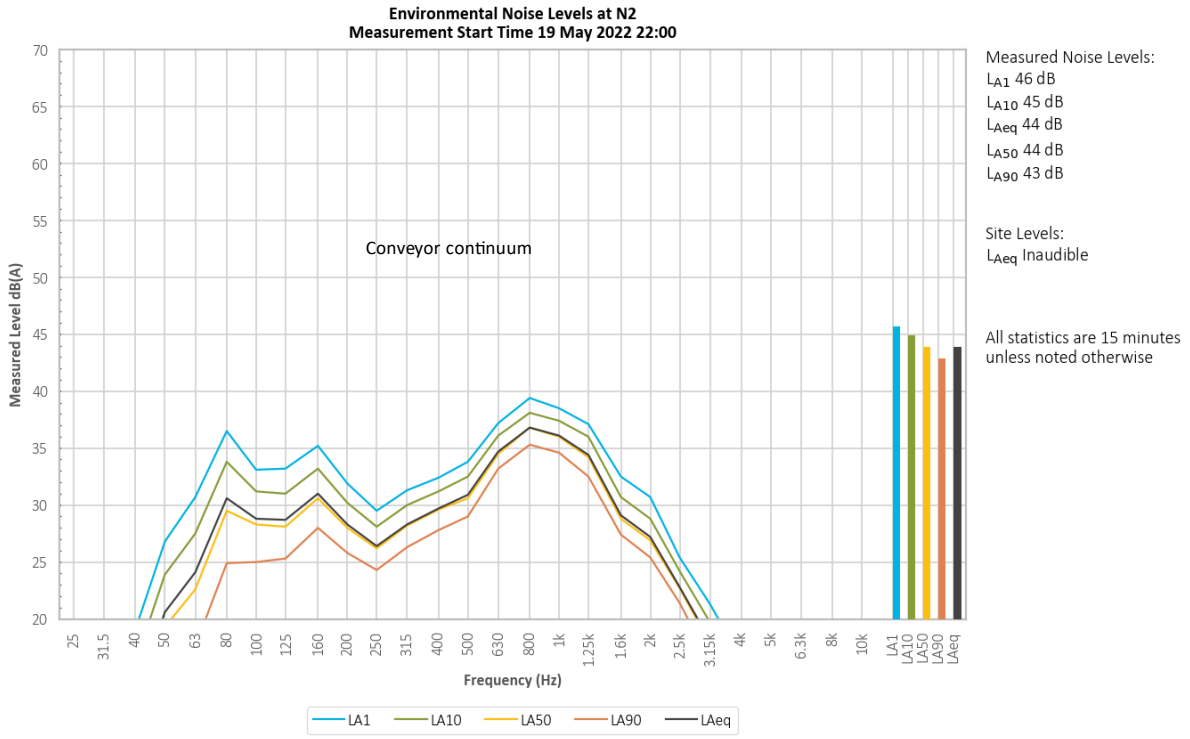

Figure 5.6 Environmental noise levels, N2 (Karawatha Drive)

LN was inaudible during the night period measurement at N2.

Conveyor continuum was responsible for measured noise levels.

Bird calls and road traffic tyre noise were also noted.

6 Summary

Global Acoustics were engaged by EnergyAustralia NSW Pty Ltd to conduct an annual noise survey of operations at LN. The purpose of the survey was to quantify and describe the acoustic environment around the site and compare results with the specified limits, in accordance with the ONMMP.

Attended environmental noise monitoring described in this report was undertaken during the day, evening, and night periods of 19 May 2022 at two monitoring locations around LN.

Noise levels from LN complied with relevant criteria at all monitoring locations during theMay 2022 survey.

Appendix A
Regulatory documents

EMM
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A.1 Project Approval

D3. As part of the OEMP for the project, required under condition D2 of this approval, the Proponent **must** prepare and implement the following Management Plans:

(a) an **Operational Noise Management Plan** to detail measures to mitigate and manage noise during operation of the project. The Plan **must** be prepared in consultation with the EPA and include, but not necessarily be limited to:

vi) identification of activities that will be carried out in relation to the project and the associated noise sources;

vii) identification of all relevant sensitive receivers and the applicable criteria at those receivers commensurate with the noise limit specified under condition E7 of this approval;

viii) noise monitoring procedures (as referred to in condition E12 of this approval) for periodic assessment of noise impacts at the relevant receivers against the noise limits specified under this approval and the predicted noise levels as detailed in the EA;

ix) details of all management methods and procedures that will be implemented to control individual and overall noise emissions from the site during operation, including the feasibility of noise reducing benching;

x) procedures to ensure that all reasonable and feasible noise mitigation measures are applied during operation of the project and procedures and corrective actions to be undertaken if non-compliance against the operational noise criteria as detailed in condition E7 is detected at the sensitive receivers; and

xi) provisions for periodic reporting of results to the EPA as per condition B8.

Operational Noise

E7. The cumulative operational noise from the ash placement area and ash haulage activity shall not exceed the following $L_{Aeq(15\ minute)}$ dB(A):

Location	Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10pm to 7am)
All private sensitive receivers within the township of Blackmans Flat	42	38	35
All other sensitive receivers	42	38	35

This noise criteria set out above applies under all meteorological conditions except for any of the following:

(a) wind speed greater than 3 metres/second at 10 metres above ground level;
(b) stability category F temperature inversion conditions and wind speed greater than 2 metres/second at 10 metres above ground level; and
(c) stability category G temperature inversion conditions.

This criteria does not apply where the Proponent and an affected landowner have reached a negotiated agreement in regard to noise, and a copy of the agreement has been forwarded to the **Secretary** and the EPA.

E8. To determine compliance with the $L_{Aeq(15\ minute)}$ noise limits, the noise monitoring equipment must be located at the most affected point:

(a) within 30 metres of a dwelling façade where any dwelling on the property is situated more than 30 metres from the property boundary that is closest to the premises; or
(b) approximately on the boundary where any dwelling is situated 30 metres or less from the property boundary that is closest to the premises.

E9. For the purposes of monitoring noise from the premises to determine compliance with the noise limits:

(a) noise monitoring must be undertaken in accordance with the *Noise Policy for Industry* (NSW EPA, 2017), or its latest version, using equipment accepted by the EPA in writing;
(b) the meteorological data to be used for determining meteorological **conditions** is the data recorded by the meteorological weather station at the premises; and
(c) stability category temperature inversion conditions are to be determined **in accordance with the *Noise Policy for Industry* (NSW EPA, 2017), or its latest version.**

E10. The Proponent shall implement measures to ensure noise attenuation of trucks. These measures may include, but are not necessarily limited to, installation of residential class mufflers, engine shrouds, body dampening, speed limiting, fitting of rubber stoppers to tail gates, limiting the use of compression braking, and ensuring trucks operate in a one-way system at the ash placement areas where feasible.

Ongoing Operational Noise Monitoring

E12. The Proponent shall prepare and implement an **Operational Noise Monitoring Program** to assess compliance against the operational noise criteria stipulated in condition E7 of this approval, throughout the life of the project. The noise monitoring program shall be prepared in consultation with the EPA and must include the proposed frequency of monitoring and as a minimum must include monitoring when there are any significant changes in work locations or processes.

The noise monitoring program shall be prepared in accordance with the requirements of the ***Noise Policy for Industry*** **(NSW EPA, 2017), or its latest version,** and shall include, but not be limited to:

(a) monitoring at Lamberts North, Lamberts South and Blackmans Flat during ash placement activities; and

(b) monitoring of the effectiveness of any noise mitigation measures implemented under condition D3(a) of this approval, against the noise criteria specified in condition E7 of this approval.

The Proponent shall forward to the EPA and the **Secretary** a report containing the results of any non-compliance within 14 days of conducting a noise assessment. The monitoring program shall form part of the **OEMP** referred to in condition D3 (a) of this approval.

E13. Where noise monitoring including as required by condition E11 and E12 of this approval identifies any non-compliance with the operational noise criteria specified under condition E7 of this approval the Proponent shall prepare and submit to the **Secretary** a report including, but not limited to:

(a) an assessment of all reasonable and feasible physical and other mitigation measures for reducing noise at the source;

(b) identification of the preferred measure(s) for reducing noise at the source;

(c) feedback from directly affected property owners and the EPA on the proposed noise mitigation measures; and

(d) location, type, timing and responsibility for implementation of the noise mitigation measure(s).

The report is to be submitted to the **Secretary** within 60 days of undertaking the noise monitoring which has identified exceedances of the operational noise criteria specified under condition E7, unless otherwise agreed to by the **Secretary**.

The Proponent shall implement all reasonable and feasible mitigation measures in accordance with the requirements of the **Secretary**.

E14. If after the implementation of all reasonable and feasible source controls, as identified in the report required by condition E13, the noise generated by the project continues to exceed the criteria stipulated in condition E7 the Proponent shall implement at the receiver reasonable and feasible noise mitigation measures, such as double glazing, insulation, air conditioning and or other building acoustic treatments, in consultation with

6.3.2 Sensitive Receptors

The term 'sensitive receiver' used in this plan refers to nearby receivers, such as residents and businesses that may potentially be affected by noise emissions identified for the project. In the Environmental Assessment (EA), two sensitive receivers were identified as locations 1 and 2. Location 1 is located in Blackmans Flat approximately 1.1km east of the project. Location 2 is located on a rural property 1.1km west of Castlereagh Highway (SKM, 2010). Refer to Figure 3 for more detail.

6.3.3 Noise generating activities

6.3.3.1 Approved operational conditions

Operational hours associated with the project shall be undertake during the following hours (CoA E1):

- Monday to Friday: 6am – 8pm
- Saturday to Sunday: 6am – 5pm.

6.3.3.2 Key potential noise impacts

Key potential noise impacts during operational activities are anticipated to include those listed below:

- Transporting fly ash and bottom ash to the ash repository using haulage trucks along the designated haul roads;
- Placing ash in stockpiles in designated areas before being spread out by a dozer;
- Compacting the ash using a dozer and roller;
- Maintenance on the haulage roads using a grader, roller, dozers and water carts;
- Dust suppression across the site using a series of techniques including but not limited to water carts and sprinklers systems;
- Developing and maintaining water management structures (containments, drains and sumps) using an excavator;
- Using variously sized pumps on site to pump water from various water sources;
- Using light vehicles on occasion to inspect the ash repository and carry out environmental monitoring;

  The machinery & plant generate noise from the engine & drive line, hydraulics and reverse warning devices

6.3.5 Operational Noise Monitoring Program

This section provides the requirements for the ongoing noise monitoring program and operational noise review in accordance with CoA E8, E9, E11 E12, E13, and E14.

Table 6-5 provides the details of the noise monitoring program.

Table 6-6 provides the standards and requirements that shall be considered during monitoring. The meteorological data recorded at the Mount Piper Power Station weather station will be used in the investigation of any recorded exceedance exceedances of approved noise criteria or noise complaints (Figure 3).

The reporting requirements and corrective actions required in the event of non-compliance are listed in Table 6-7 and Table 6-8 , respectively. The source or reference for measures is the OEMP and the CoA.

6.3.5.1 Guidelines

All operator-attended and unattended noise monitoring will be conducted in accordance with the following guidelines:

- Environmental Noise Control Manual (EPA, 1994);
- Noise Policy for Industry (EPA, 2017), and
- AS 1055: 1997 *Acoustics – Description and Measurement of Environmental Noise.*

6.3.5.2 Noise Criteria

As specified in CoA E7, the cumulative operational noise from the ash placement area and ash haulage activity shall not exceed the LAeq (15 minute) dB(A) identified in Table 6-4 .

Table 6-4 Operational Noise criterion (LAeq(15 minute) dB(A))

Location	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm to 7am)
All private sensitive receptors within the township of Blackmans Flat	42	38	35
All other sensitive receivers	42	38	35

These criteria do not apply where the Proponent and an affected landowner have reached a negotiated agreement in regard to noise, and a copy of that agreement has been forwarded to the Secretary and the NSW EPA.

6.3.5.3 Meteorological Conditions

The noise criteria identified in Table 6-4 above applies under meteorological conditions except for any of the following:

- Wind speed greater than 3 m/second at 10 m above ground level;
- Stability category F temperature inversion conditions and wind speed greater than 2 m/second at 10 m above ground level; and
- Stability category G temperature inversion conditions.

6.3.5.5 Monitoring

The Noise Monitoring Program, including the Noise Monitoring Review, is provided below in Table 6-5. Table 6-6 provides the standards and requirements that shall be considered during monitoring.

Table 6-5 Noise monitoring program

Potential impact	Location	Parameters	Frequency	Technique	Reporting	Responsibility	CoA and OEMP reference
Operational Noise Review	Two most affected sensitive receivers: • Blackmans Flat • Wallerawang (Refer to Figure 3)	LAeq, LA10, LA90 and LAMax. Noise levels shall not exceed criterion stipulated in Table 6-4	One-off survey that includes: Four separate days – 3-week days and a Sunday, within the first 60 days of operation.	Attended and unattended noise monitoring technique shall be undertaken adopting the following guidelines; ▪ NSW industrial Noise policy; ▪ AS 1055: 1997 *Acoustics – Description and Measurement of Environmental Noise;* ▪ *Environmental noise control manual (EPA 2004)* Ongoing attended monitoring using Class 1 or 2 noise monitoring equipment as defined by AS IEC61672.1-2004 and ASEIC61672.2-2004, or other noise monitoring equipment accepted by the NSW EPA in writing.	An Operational Noise Review within the 60 days of commencement of operation.	Specialist consultant on behalf of EnergyAustralia NSW.	D3(a) (ii) D3(a) (iii), E7, E8, E9, E11
Ongoing Noise monitoring	Two most affected sensitive receivers: Blackmans Flat Wallerawang	LAeq, LA10, LA90 and LAMax. Noise levels shall	Annual or following a complaint as required	Attended and unattended noise monitoring technique shall be undertaken adopting the following guidelines;	Annual monitoring report. Non-compliances:	Noise Specialist	D3(a) (ii) D3(a) (iii), E7, E8, E9, E12
	(refer to Figure 3) Other locations as required, in response to a substantiated complaint.	not exceed the noise criteria (Table 6-4) at the nearest most affected receiver.	Annual	▪ NSW industrial Noise policy; ▪ AS 1055: 1997 *Acoustics – Description and Measurement of Environmental Noise;* ▪ *Environmental noise control manual (EPA 2004)* Ongoing attended monitoring using Class 1 or 2 noise monitoring equipment as defined by AS IEC61672.1-2004 and ASEIC61672.2-2004, or other noise monitoring equipment accepted by the NSW EPA in writing.	1. If noise monitoring survey indicates non-compliance against compliance criteria, then EnergyAustralia NSW is required to forward a report containing the results to the NSW EPA and the Secretary within 14 days of conducting a noise assessment. 2. An additional investigation report shall be submitted to the Secretary within 60 days of undertaking noise monitoring and must include the criteria specified in CoA E13 within 60 days of undertaking the noise monitoring.	EnergyAustralia NSW EnergyAustralia NSW	Environmental Noise Control Manual Industrial Noise Policy (EPA 2000) AS1055 CoA E12 CoA E13

Appendix B
Calibration certificates

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B.1 Calibration Certificates

Acoustic Research Labs Pty Ltd
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www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C21344

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	00701424
Microphone Serial Number :	01916
Pre-amplifier Serial Number :	01463

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	20.6°C	**Ambient Temperature :**	22.4°C
Relative Humidity :	47%	**Relative Humidity :**	44%
Barometric Pressure :	101.05kPa	**Barometric Pressure :**	100.91kPa

Calibration Technician :	Jeff Yu	**Secondary Check:**	Harrison Kim
Calibration Date :	2 Jun 2021	**Report Issue Date :**	2 Jun 2021

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.12dB*	*Temperature*	*±0.2°C*
1kHz	*±0.11dB*	*Relative Humidity*	*±2.4%*
8kHz	*±0.13dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests	*±0.10dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

NATA

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1

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Sound Calibrator

IEC 60942-2017

Calibration Certificate

Calibration Number C21341

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 79631

Atmospheric Conditions
Ambient Temperature : 22.7°C
Relative Humidity : 47.5%
Barometric Pressure : 100.64kPa

Calibration Technician : Jeff Yu
Calibration Date : 26 May 2021
Secondary Check: Harrison Kim
Report Issue Date : 26 May 2021

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.02	1000.40

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.14dB*	*Temperature*	*±0.2°C*
Frequency	*±0.09%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.09%*	*Barometric Pressure*	*±0.015kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

* The tests <1000 kHz are not covered by Acoustic Research Labs Pty Ltd NATA accreditation.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Appendix D Wangcol Creek Ecological Monitoring Program – Autumn 2022

Wangcol Creek Ecological Monitoring Program

Wangcol Creek EMP Spring 2012 to Spring 2021

NE30154

Prepared for
EnergyAustralia

16 November 2022

Cardno
Shaping the Future

Contact Information

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Effective Date 16/11/2022

Approved By:

Kate Reeds
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Date Approved 16/11/2022

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0	16/11/2022	Final	Dan Pygas	

Executive Summary

Introduction and Background

EnergyAustralia NSW (EnergyAustralia) operates Mount Piper Power Station (MPPS), near Lithgow NSW. On 16 February 2012, EnergyAustralia was granted approval for the construction and placement of ash at the Lamberts North Ash Placement Project (the Project). The Project provides a storage area for ash produced from the burning of coal after the previous storage area (Ash Area 1) reached capacity.

The 2010 Environmental Assessment for the Project identified several aspects of construction and ash placement that may affect the aquatic ecology of nearby Wangcol Creek, located just north of the Project site. The primary effect identified was that on water quality, via potential changes to Electrical Conductivity (EC) and concentrations of heavy metals. The approval conditions required an Ecological Monitoring Program (EMP) be established, aimed at detecting potential impacts to aquatic biota and habitat in Wangcol Creek and informing management decisions taken to mitigate, minimise and / or ameliorate any impacts. Construction of the Project commenced in February 2013 and ash placement on the Project site commenced in September 2013.

Cardno (NSW/ACT) Pty Ltd, formerly Cardno Ecology Lab, was commissioned by EnergyAustralia to undertake the spring 2021 monitoring component of the EMP. In accordance with the EMP, previous sampling was undertaken by Cardno or other specialist consultants in spring (November) 2012, autumn (May) 2013, spring (December) 2013, autumn (May) 2014, spring (November) 2014, spring (December) 2015, spring (December) 2016, autumn (May) 2018, spring (December) 2018, autumn (May) 2020, spring (November) 2020 and most recently for the current study in spring (November) 2021.

The spring 2021 monitoring consisted of surveys of aquatic habitat, water quality and macroinvertebrate assemblages (using the AUSRIVAS protocol) by Cardno on 16 November 2021 at the following sites:

> Control NCR1 on Wangcol Creek upstream of the Project area;

> Impact NCR2 on Wangcol Creek adjacent to the Project area;

> Control NCR3 on Wangcol Creek upstream of the Project area; and

> Control A16 on the Coxs River at Lidsdale downstream of the confluence with Wangcol Creek.

The primary objectives of this monitoring were to:

> Assess whether any impacts to the aquatic ecology of Wangcol Creek were detected at NCR2 in spring 2021 and determine whether any such impacts were attributable to the Project; and,

> Provide recommendations on actions, if any, that may be required to minimise, mitigate or ameliorate any impacts to the aquatic environment that may have occurred, and on any refinements to subsequent monitoring events that would improve the efficacy of the EMP.

Indicators of Aquatic Ecology

The following biotic indices were derived from the macroinvertebrate data collected in spring 2021 and statistically compared with those from previous spring surveys in 2012, 2013, 2014, 2015, 2016, 2018 and 2020:

> Total number of taxa;

> Number of pollution sensitive Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa;

> OE50 Taxa Score (a biotic index of aquatic habitat and water quality); and

> SIGNAL2 Score (a biotic index of water pollution).

Changes in the structure of macroinvertebrate assemblages in all samples collected in spring of 2012, 2013, 2014, 2015, 2016, 2018, 2020 and 2021 were also explored using graphical multivariate techniques. In addition to the *in-situ* water quality data, long-term water quality and water discharge data from Wangcol Creek and local rainfall data sourced from EnergyAustralia, the Bureau of Meteorology, and WaterNSW were examined to aid in the interpretation of macroinvertebrate data.

Identified Impacts

There was no evidence of any change in spring 2021 data that would suggest an impact due to the Project. None of the statistical tests indicated any change through time at NCR2 that could otherwise have indicated an impact. Although some differences in the macroinvertebrate multivariate assemblage structure were detected following the most recent analysis, these did not provide evidence of any impact related to the project. There was also no evidence of a change in SIGNAL2 Score in spring 2020 and spring 2021 following the apparent reduction in this indicator observed previously in autumn 2020. The capture of a native mountain galaxiid in the AUSRIVAS dip net at one of the control sites in autumn and spring 2018 and spring 2021 indicates Wangcol Creek provides habitat for at least one native species of fish.

Examination of long-term water quality data from Wangcol Creek during and prior to the Project, showed variability in the location, timing and magnitude of several measures. This is likely to be related to the heavily modified catchment associated with coal mining, energy generation and other industries, local rainfall, flow and hydrology in Wangcol Creek, and the relative effect of evaporation and dilution occurring during low and high flow conditions, respectively. Background concentrations of many metals, some of which often exceed guidelines for the protection of aquatic ecosystems, would be one of the factors influencing the type and abundance of macroinvertebrates and other aquatic biota in Wangcol Creek.

The complex interactions that exist between the various types of disturbance experienced in Wangcol Creek (e.g., those affecting habitat, water quality and flow) make any changes in indicators of ecological health difficult to distinguish from those that could be due to the Project. Nevertheless, the Environmental Monitoring Program does add value to the wider monitoring program, and it is expected that any large magnitude and / or cumulative impacts to aquatic biota would be detected, allowing appropriate management actions to be implemented. Recent changes to the monitoring of aquatic ecology, including the addition of further control sites, will assist in identifying any future impacts, were they to occur, and inform future impact minimisation and remediation efforts.

Recommendations

1. Based on Condition B7 of the Project Approval, ongoing monitoring should continue throughout the life of the project (including operation), and for at least two (2) sampling periods following ash placement Thus, it is recommended that further monitoring should be undertaken annually in spring during operation of the Project and for at least two years after completion of all activities that could impact aquatic ecology. The next sampling event would be undertaken in Spring 2022.
2. Sampling should continue at the additional control sites established on Wangcol Creek (NCR3). While no baseline data is available from this site, control data collected here during future surveys would improve the power of statistical tests and aid in the detection of an impact occurring in the future.
3. Three replicate AUSRIVAS samples should continue to be collected from each site during all future surveys. This will provide a measure of the variation present in each indicator at each site, thereby, improving the ability to detect any future impact by enabling the use of appropriate statistical analysis.

Based on the results of this 2021 survey, no Project specific mitigation, impact minimisation or ameliorative actions are recommended at this stage.

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1 Introduction

1.1 Background

EnergyAustralia NSW (EnergyAustralia) operates Mount Piper Power Station (MPPS), near Lithgow, NSW. MPPS comprises two 700 MW steam turbine generators and produces power through the burning of coal sourced from local coal mines. On 16 February 2012, EnergyAustralia was granted approval for the Lamberts North Ash Placement Project (the Project) by the Department of Planning and Infrastructure (DP&I). The Project provides a facility for the storage of ash produced from MPPS following Ash Area 1 reaching its ash storage capacity. The Project includes construction activities and the delivery, placement, and capping of ash, the rehabilitation of the site and ongoing management. Construction began in February 2013 and ash placement began in September 2013.

The Environmental Assessment for the Project (SKM 2010) identified several aspects of construction and ash placement that could affect the aquatic ecology of Wangcol Creek, which flows in an easterly direction just north of the Project. Potential effects included, but were not limited to:

> Impacts to water availability flowing into Wangcol Creek due to changes to on-site water usage and changes to run-off caused by reductions in catchment area;

> Changes to the flood regime of Wangcol Creek due to the modification of the landform of the area to accommodate the ash placement facility; and

> Impacts to the water quality of Wangcol Creek, such as changes to electrical conductivity and metal concentrations, due to the mobilisation of sediment and other contaminants during construction and operation.

Condition B7 of the Conditions of Approval (CoA) for the Project required that an Ecological Monitoring Program (EMP) (GHD 2014a) be designed, aimed at detecting potential impacts to the aquatic ecology of Wangcol Creek due to the Project, and informing management decisions taken to mitigate, minimise and / or ameliorate any impacts that were detected. The EMP would incorporate baseline and ongoing (for at least 5 years after ash capping) monitoring of the ecological health of Wangcol Creek, and implementation of management measures to address any ecological impacts that were identified. The EMP formed part of the Construction Environmental Management Plan (CEMP), and subsequent Operational Environmental Management Plan (OEMP) for the Project. EnergyAustralia NSW commissioned Cardno (NSW/ACT) Pty Ltd (Cardno) (formerly the Cardno Ecology Lab) to undertake the spring 2021 monitoring in accordance with the EMP.

1.2 Current Study

The specific objectives of the current study were to:

> Sample indicators of ecological health in Wangcol Creek potentially affected by the Project and at unaffected control sites on the creek and on the Coxs River in spring 2021;

> Compare the findings with those of previous studies also undertaken in spring as part of the EMP;

> Assess whether any impacts to the aquatic ecology of Wangcol Creek occurred since the last spring survey (in November 2020) and determine whether any such impacts were attributable to the Project; and

> Provide recommendations on actions, if any, that may be required to minimise, mitigate or ameliorate any impacts to aquatic ecology that may have occurred and on any refinements to subsequent monitoring events that would improve the efficacy of the EMP.

Following the recommendations made after the 2015 study (Cardno Ecology Lab 2015a), monitoring incorporated sampling of AUSRIVAS edge habitat only with no sampling of AUSRIVAS riffle habitat undertaken (**Section 2.1**). Sampling also included an additional reference site on Wangcol Creek upstream of any potential impact that may be experienced due to the Project. In addition, this monitoring incorporated the recommendations made previously in the review of the EMP by Cardno Ecology Lab in 2014 (Cardno Ecology Lab 2014a) (**Section 2.2**).

2 Previous Studies

2.1 Monitoring

In accordance with the EMP, baseline aquatic ecology sampling was undertaken at two sites on Wangcol Creek in spring 2012 (GHD 2014b). Further sampling at these sites was done in autumn 2013 (GHD 2014c), spring 2013 (GHD 2014d), autumn 2014 (GHD 2014e), spring of 2014 (Cardno Ecology Lab 2015a), 2015 (Cardno 2016) and 2016 (Cardno 2017), autumn 2018 (Cardno 2018), spring 2018 (Cardno 2019), autumn 2020 (Cardno 2020a) and spring 2020 (Cardno 2021) (**Table 2.1**).

Table 2-1 Timing of aquatic ecology surveys undertaken for the Wangcol Creek EMP and the respective report reference. The timing of key Project activities and the respective monitoring phase is also identified.

Monitoring Phase	Sampling Date	AUSRIVAS Season	Report Reference
Preparation of EMP	n/a	n/a	GHD (2014a)
Baseline	8 Nov 2012	Spring 2012	GHD (2014b)
Commencement of Construction – February 2013			
During Construction	6 May 2013	Autumn 2013	GHD (2014c)
Commencement of Ash Placement – September 2013			
During Ash Placement	12 Dec 2013	Spring 2013	GHD (2014d)
	22 May 2014	Autumn 2014	GHD (2014e)
	19 Nov 2014	Spring 2014	Cardno Ecology Lab (2015a)
	14 Dec 2015	Spring 2015	Cardno (2016a)
	1 to 2 Dec 2016	Spring 2016	Cardno (2017)
	9 and 11 May 2018	Autumn 2018	Cardno (2018)
	11 December 2018	Spring 2018	Cardno (2019)
	20 May 2020*	Autumn 2020	Cardno (2020a)
	18 November 2020	Spring 2020	Cardno (2021)
	16 November 2021	Spring 2020	*Current study*

*planned originally to be undertaken in late November / early December 2019, though due to bush fire risk at that time, the survey was postponed to autumn 2020.

These reports included background information on the aquatic ecology of Wangcol Creek and present the results of AUSRIVAS sampling and the assessment of aquatic habitat at these sites. The reports assessed whether impacts to the aquatic ecology of Wangcol Creek may have occurred following the baseline study. No impacts attributable to the Project were identified in data collected following the start of construction in autumn 2013 (GHD 2014c). GHD (2014d and e) suggested that impacts to macroinvertebrates may have occurred following the commencement of ash placement in spring 2013 and autumn 2014, respectively. However, the review did not find any conclusive evidence of this (**Section 2.2**).

2.2 EMP Review

Cardno Ecology Lab reviewed the EMP following a request by EnergyAustralia in late 2014. The review included the EMP and monitoring undertaken from spring 2012 to autumn 2014. The aim was to examine the suitability and efficacy of the EMP and recommend any appropriate amendments to future monitoring to help ensure the objectives of the OEMP are met with respect to aquatic ecology. The specific objectives, scope, identified issues and detailed recommendations of the critical review are detailed in Cardno Ecology Lab (2014).

The following associated recommendations were made:

> Based on its location with respect to Project activities, NCR1 on Wangcol Creek has been re-classified as a control site;

> Results from an ongoing *in situ* and *ex situ* water quality monitoring program are used to aid in the interpretation of macroinvertebrate data;

> As construction activities commenced in February 2013 and prior to the autumn 2013 sampling event in May 2013, data from May 2013 is treated as post-baseline data;

> The statistical approach has been revised following the re-classification of NCR1 as a control site and confirmation that sampling in autumn provides post-baseline data.

These were incorporated into the current study as appropriate.

2.3 Previous Surveys

Cardno Ecology Lab (2015a) undertook the spring 2014 monitoring following the implementation of the amendments to the EMP (**Section 2.2**). This included a re-assessment of all data collected during the EMP. The findings provided some limited evidence that changes in macroinvertebrates occurred at the impact site (NCR2) on Wangcol Creek in autumn 2013 that could be associated with the commencement of construction of the Project. These included a reduction in the total number and the number of relatively pollution sensitive Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa, a lower OE50 Taxa Score and a change in the structure of the macroinvertebrate assemblage observed at this site. However, appropriate statistical tests, which would provide strong evidence of the presence or absence of an impact, could not be performed in the absence of autumn baseline data. There was also evidence of a subsequent recovery in most of these indicators, and data from NCR2 in autumn 2013 were comparable with those collected further downstream at the sites on the Coxs River sampled as part of the separate Coxs River Biological Monitoring Program (Cardno Ecology Lab 2015b).

Indicators of water quality varied widely depending on location and sampling date. There was some indication that the elevated concentration of zinc that occurred near NCR2 just prior to the autumn 2013 survey, may have contributed to changes in macroinvertebrates occurring there. However, as macroinvertebrates will likely respond to the combined effect of several elevated indicators as well as several other environmental cues (such as drought and flood events) operating in the creek, it was unclear how much of the variation in macroinvertebrate data was explained by levels of zinc and other measures of water quality. The taxa absent from NCR2 in autumn 2013 (i.e. generally those that are pollution tolerant), together with the presence of some pollution sensitive taxa, suggested that other factors, such as habitat fragmentation following reduced flow, may also influence macroinvertebrates in Wangcol Creek. The cause of elevations in electrical conductivity (EC) in Wangcol Creek, such as those observed around the time of ash placement on the Project site (GHD 2014d) and which was unclear at the time of the review, was attributed to low rainfall and flow patterns in the creek, rather than any impacts due to the Project (Aurecon 2014).

The following additional recommendations made in Cardno Ecology Lab (2015a), aimed at further improving the robustness and cost effectiveness of the EMP, were incorporated into the current study:

> As no autumn baseline data is available, sampling in spring is preferred. Though no baseline data collected in autumn is available, surveys in autumn would, however, allow assessment of any changes that may manifest in autumn only;

> Due to the paucity of AUSRIVAS data collected from riffle habitat (following frequent low flows during sampling), sampling of riffle habitat (when present) should cease and effort be re-directed to collection of two replicate AUSRIVAS edge samples at each site, thereby improving the ability to detect any future impact by enabling the use of appropriate statistical analysis; and

> Establishment of an additional control site on Wangcol Creek and on the Coxs River, upstream of any potential impact that may be experienced due to the Project. While no baseline data would be available from these sites, control data collected here during future surveys would improve the power of statistical tests and aid in the detection of an impact occurring in the future. This site was surveyed in spring 2015 and spring 2016, but monitoring has since discontinued due to very low water levels following persistent low rainfall.

> Where appropriate, the more specific recommendations provided in Cardno Ecology Lab (2014a) aimed at improving the overall robustness of the study have also been implemented.

The findings of the spring 2015 monitoring did not provide any evidence of an impact due to the Project (Cardno 2016). None of the PERMANOVA tests undertaken on data collected from NCR1 and NCR2 in spring of 2013 and 2015 indicated a change that could otherwise be due to a Project related impact. There

was also no conclusive evidence of any change in spring 2016 data that would suggest an impact due to the Project (Cardno 2017). None of the statistical tests indicated any change through time at NCR2 that could be due to a Project related impact. Surveys in autumn 2018 (Cardno 2018) and spring 2018 (Cardno 2019) also provided no evidence of an impact of the Project on aquatic ecology. There was limited evidence to suggest a change in one indicator (SIGNAL2 Score) that occurred at NCR2 in autumn 2020 could be associated with the Project (Cardno 2020a). Detailed examination of trends in this indicator at other sites and of the individual taxa did not provide convincing evidence of an impact. In any case, the observed small magnitude of the reduction in this indicator does not raise concern for aquatic ecology in Wangcol Creek at that time. There was also no evidence that the reduction in SIGNAL2 Score that occurred at NCR2 in autumn 2020 persisted in spring 2020, nor was their evidence of any change in other indicators in spring 2020 data that would suggest an impact due to the Project. (Cardno 2021).

3 Existing Information

3.1 Environmental Context

Wangcol Creek (also known as Neubecks Creek) flows in an easterly direction north of the Project site (**Figure 3.1**). It is a naturally ephemeral creek (though it may appear perennial due to ongoing discharge from industries within its catchment). It has two main tributaries: a western arm which arises in the southwest of Ben Bullen State forest, several kilometres northwest of the Project, and a northern arm which arises in Blackmans Flat a few kilometres northwest of the Project site. These two tributaries join just north of the Castlereagh Highway and to the northwest of the Project site before joining the Coxs River at Blue Hole, a flooded historic quarry, approximately 2 kilometres north of Lidsdale. Other tributaries of Wangcol Creek include Lamberts Gully, which flows north into Wangcol Creek from the southeast of the Project Area. The Project includes ash placement over Huons Gully, which otherwise would have flowed into Wangcol Creek upstream of Lamberts Gully. Several un-named drainage lines also traverse the area.

Wangcol Creek is situated in a substantially disturbed catchment in which water quality, quantity and drainage patterns are influenced by surrounding historical and current mining operations (Ivanhoe Colliery, Commonwealth Open Cut Coal Mine, Angus Place Coal Mine, Kerosene Vale Mine, and Pine Dale Coal Mine), power generation (Mount Piper and Wallerawang Power Stations) and agricultural land practices. The creek has also been re-aligned several times to facilitate nearby mining practices.

3.2 Aquatic and Riparian Habitat

The riparian vegetation of the Wangcol Creek Catchment consists primarily of cleared land with some disturbed native regrowth. The section of creek in the vicinity of Blackmans Flat is almost devoid of native riparian vegetation except for scattered trees and occasional patches of *Leptospermum* sp. (Centennial Coal 2012). Some more established mixed native and invasive trees and shrubs (e.g. willow (*Salix alba*) and blackberry (*Rubus* sp.)) are present along the main channel of the creek in the vicinity of the Project.

Adjacent to the Project, Wangcol Creek consists of faster flowing riffle and deeper slower flowing pools (GHD 2014a). The substratum generally consists of sand, coarse gravel, cobbles and rock. In places there are large deposits of fine sediment.

3.3 Water Quality

3.3.1 Environmental Assessment

Water quality in Wangcol Creek was reviewed as part of the Environmental Assessment for the Project (SKM 2010). The review examined water quality data collected from four previously established water quality monitoring sites located on the creek in the vicinity of the Project (**Figure 3.1**):

> LDP6 (previous MPPS Licensed Discharge Point 1): located upstream of the Project and the previous ash storage area (Ash Area 1). This site has previously been referred to as LDP01;

> WX22: Wangcol Creek gauging station, located adjacent to the Project;

> Site 2: Springvale Coal monitoring site located immediately upstream of the confluence with Lamberts Gully; and

> Site 3: Springvale Coal monitoring site located immediately downstream of the confluence with Lamberts Gully.

Data were available from LDP6 and WX22 for the period 2000 to 2009 and from Sites 2 and 3 (2000 to 2007). Data were compared with Australian Guideline Default Trigger Values (DTVs) (ANZECC/ARMCANZ 2000) for upland rivers in south-eastern NSW. The findings are summarised as follows:

> Electrical Conductivity (EC) often exceeded the upper DTV (350 µs/cm) and was recorded as high as 1333 µs/cm at LDP6 and 1200 µs/cm at Site 3;

> pH was within lower and upper DTVs (6.5 to 8.0); and

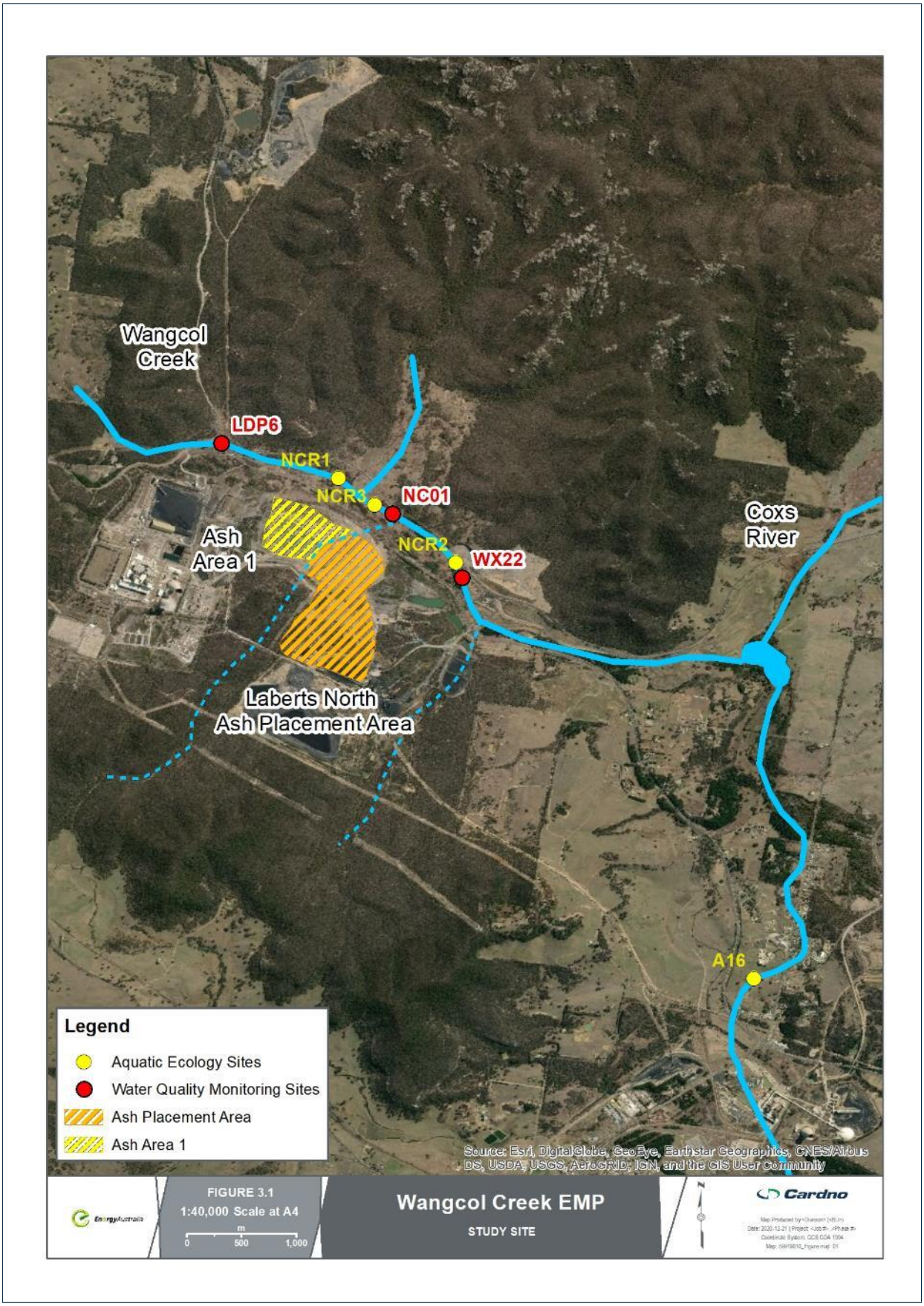


Figure 3-1 Aerial image identifying the location of the Project (Lamberts North), the previous ash depository (Ash Area 1), Wangcol Creek, the Coxs River, aquatic ecology monitoring sites and long-term water quality monitoring sites.

> Concentrations of metals (aluminium, sliver, arsenic, cadmium, chromium, manganese, copper and zinc) were above the trigger value for 95% protection of freshwater ecosystems at one or more sites.

Additional water quality data from WX22 collected by EnergyAustralia from 2008 to 2012 were presented in GHD (2014a). These data indicated that nickel, boron, copper and lead in Wangcol Creek can also exceed DTVs at times.

3.3.2 Ash Area 1 Monitoring

Aurecon (2014) reviewed water quality data as part of the ongoing monitoring associated with Stages 1 and 2 of the previous Ash Area 1 placement area. This included surface water quality data collected at LDP6, WX22 and NC01 (on Wangcol Creek upstream of the Project site and the confluence with Lamberts Gully) prior to (October 2012 to August 2013), and following (September 2013 to August 2014) ash placement on the Project site. The findings are summarised as follows:

> Median EC ranged from 310 to 640 µs/cm and was often above the upper DTV for upland creeks (noting that Aurecon (2014) used DTVs for lowland rivers) at LDP6 and WX22 before, and after, ash placement and at NC01 following ash placement;

> pH ranged from 7.0 to 7.8 and was within the DTVs at each site before, and after, ash placement;

> Turbidity ranged from 2.3 to 26 ntu and was slightly above the upper DTV at LDP6 before ash placement; and

> Concentrations of heavy metals and indicators of water quality measured following ash placement were compared with locally derived guidelines (90th percentile of pre-placement data). While the concentrations of several metals (including barium, nickel and zinc) exceeded these local guidelines, it was noted that exceedances could not be attributed to the Project due to the confounding influence of groundwater flow from historic mine workings and Ash Area 1.

It was also noted that elevated ECs and concentrations of metals observed in Wangcol Creek were due to preceding periods of low rainfall and flow. Relatively high ECs and concentrations of nickel at WX22, compared with those at LDP6 and NC01, were attributed to inflows from MPPS via Huon Gully. Elevated concentrations of zinc at WX22 were most likely due to local mine water seepage during dry weather.

Groundwater from the Project area flows eastward towards Huons Gully, then into Wangcol Creek (Aurecon 2014). Groundwater from the Ash Area 1 area may also flow eastward through the Project area and into Wangcol Creek via Huons Gully, and potentially northeast towards Wangcol Creek. This pattern of groundwater flow prevented the identification of suitable water quality tracers that could be used to identify potential leachates from the ash deposited on the Project site and discriminate them from those associated with Ash Area 1.

3.4 Aquatic Biota

There is little publicly available information on the aquatic biota of Wangcol Creek. GHD (2014a) reviewed the findings of a 1993 aquatic flora and fauna survey of Wangcol Creek by the former Department of Water Resources (DWR 1994). The findings of this review are summarised in **Sections 3.4.1** and **3.4.2**. Additional information on macroinvertebrates in Wangcol Creek and the wider upper Coxs River Catchment is summarised from the findings of SCA Sydney Drinking Water Catchment Audits (GHD 2013). The findings of an ecotoxicology study in the northern arm of Wangcol Creek (Battaglia *et al*. 2005) are also summarised in **Section 3.4.2.1**.

3.4.1 Flora

The review of DWR (1994) provided by GHD (2014a) noted the following observations of aquatic flora in Wangcol Creek:

> Emergent aquatic flora is relatively diverse, with common species including tall spikerush (*Eleocharis sphacelata*), spikerush (*Eleocharis acuta*), jointed rush (*Juncus articulatus*), common reed (*Phragmites australis*) and cumbungi (*Typha orientalis*);

> Submerged aquatic flora was sparse and consisted of green algae (*Chara* sp., *Nitella* sp., *Spirogyra* sp. and *Rhizoclonium* sp.);

> A smothering effect due to the presence of fine sediments in the creek was offered as an explanation of the low diversity of submerged aquatic flora;

> Dense beds of tall spikerush and cumbungi were present in some sections of creek, reducing water flow in these sections.

3.4.2 Fauna

3.4.2.1 Aquatic Macroinvertebrates

The review of DWR (1994) suggested that Wangcol Creek supported a diverse macroinvertebrate community, dominated by true flies (Order: Diptera), caddisflies (Order: Trichoptera), damselflies and dragonflies (Order: Odonata) and beetles (Order: Coleoptera).

More recent surveys of AUSRIVAS edge habitat in Wangcol Creek adjacent to the Project and at other nearby sites on the Coxs River were undertaken as part of the SCA Sydney Drinking Water Catchment Audits (GHD 2013). The results of the 2009 survey on Wangcol Creek indicated the aquatic habitat here was severely impaired (AUSRIVAS Band C) relative to reference condition. The aquatic habitat at sites on the Coxs River upstream and downstream of the confluence with Wangcol Creek sampled in 2009 ranged from severely impaired to significantly impaired (AUSRIVAS Band B) relative to reference condition. Further monitoring at a subset of these sites in 2011 also indicated that the aquatic habitat was severely to significantly impaired. Long term sampling undertaken at A16 (also included in the EMP, see **Section 4.2**) on the Coxs River downstream of the confluence with Wangcol Creek from 2001 to 2012 indicated that the condition of aquatic habitat ranged generally from severely impaired to equivalent to reference condition (AUSRIVAS Band A). In 2002, the macroinvertebrate assemblage at this site was richer than expected under the AUSRIVAS model (Band X). While the habitat condition at A16 appears to have declined from 2009 to 2012, there has been a general improvement across the Upper Coxs River sub-catchment through that time (GHD 2013).

It was noted in GHD (2014a) that the macroinvertebrate assemblages at most of the sites sampled in the Coxs River catchment (at least prior to 2010), were characterised by pollution-tolerant taxa, and that the invertebrate assemblages and individual taxa were influenced by EC in the river.

A study by Battaglia *et al*. (2005) indicated that the abundance and diversity of macroinvertebrate fauna in Wangcol Creek was much lower than two reference creeks (Megalong Creek and Jocks Creek) and attributed this difference to acid mine drainage (AMD) from previous mining activities within the area. The study found a strong correlation between water quality (concentrations of several analytes, including nickel and zinc, which were found to be greater in Wangcol Creek than in the reference creeks) and macroinvertebrate data. The study also concluded that poor water quality impacted on macroinvertebrate assemblages within the creek, rather than the quality of the sediment from the creek bed.

3.4.2.2 Fish

The DWR (1994) review indicated three species of fish occurring in Wangcol Creek during the DWR (1994) survey, these were:

> The native mountain galaxias (*Galaxius olidus*), which represented over 90% of the fish caught;

> The native flathead gudgeon (*Philypnodon grandiceps*); and

> The non-native wild goldfish (*Carassius auratus*).

The diversity and abundance of the fish assemblage in Wangcol Creek was considered to be relatively poor in comparison with other nearby freshwater streams.

Topographical maps show several crossings that may represent barriers to fish movement by reducing longitudinal connectivity and habitat availability, and could cause population fragmentation.

3.5 Summary

Wangcol Creek is situated in a heavily disturbed and modified catchment. It has experienced substantial environmental stress due to historic and current coal mining activities, power generation and land clearing practices and continues to do so. Poor water quality (primarily elevated EC and concentrations of heavy

metals) due to discharged process water, groundwater flow from historic mine workings, increased sedimentation due to run-off from nearby roads and other impermeable surfaces and the removal of native vegetation are likely the major contributing factors to the generally depauperate macroinvertebrate and fish assemblages supported by the creek. SKM (2010) noted that there is sufficient data from the on-going monitoring and the modelling studies undertaken as part of previous and current studies to suggest that the main contribution to impaired water in Wangcol Creek is historic coal mining activities rather than Ash Area 1 or the operation of MPPS. The findings of the review of water quality data collected before and after ash placement on the Project site by Aurecon (2014) suggested a complex interaction between the various water quality impacts in Wangcol Creek (Aurecon 2014), which would also be affected by local rainfall patterns and water flow in the creek.

The 2010 audit (DECCW 2010) indicated that as a whole, the Upper Coxs River sub-catchment was under a high level of stress, due to inflows from the sewage treatment plants, inflows of urban stormwater, runoff from roads and grazing lands, regulation of flows by dams, extraction of surface and ground water, occurrence of barriers to fish passage, geomorphological disturbance from past and present mining and licenced discharges from nearby power stations and coal mines. Despite these observations, Wangcol Creek does support aquatic biota and habitat of ecological value. While the riparian corridor has been impacted by historic vegetation clearing, channel realignments and establishment of exotic species, it is relatively intact along the main channel of the creek and would be an important source of woody debris and bank stabilisation. The creek also supports several native macrophytes which provide habitat for macroinvertebrates and fish and may also be important in nutrient cycling, limit the magnitude and duration of elevated concentrations of nutrients and help prevent eutrophication due to excess nutrients.

Monitoring programs such as that included in the EMP that aim to detect the potential impact on the aquatic ecology of Wangcol Creek due to specific activities (such as the Project) must take into consideration the various impacts the creek has experienced, now and in the past, and patterns of rainfall and flow. While any potential impact due to the Project would only be one of several types of disturbance that the creek currently experiences, the effect of cumulative impacts is also important.

4 Methodology

4.1 Study Rationale

The primary aim of the study is to identify changes in the selected indicators of aquatic ecology at the impact site that are in a different direction, or of a different magnitude, to those at the control sites. Any such changes would be related to variation in environmental (such as water quality) data in an attempt to explain the pattern of changes and explore the potential cause of any impact.

The methods utilised in the current study and described in **Sections 4.2** to **4.6** are based on those undertaken previously and prescribed in the EMP (GHD 2014a) and incorporate the modifications and additions described in the review of the EMP (Cardno Ecology Lab 2014a) (**Sections 2.1** and **2.2**).

4.2 Study Sites

The following sites were sampled by Cardno on 16 November 2021 within the spring AUSRIVAS sampling season (**Figure 3.1**):

> Control NCR1 located on Wangcol Creek upstream of Huons Gully and the Project area. While this site is situated on a section of Wangcol Creek which has, and continues to be, impacted by other disturbances, it is not expected to experience any impact due to the Project (**Section 2.2**);

> Impact NCR2 located on Wangcol Creek downstream of Huons Gully and adjacent to the Project area;

> Control NCR3 located on Wangcol Creek between the Northern Arm and Huons Gully upstream of the Project area. A control site could not be established farther upstream because the habitat there was unsuitable (consisting of a wide channel with dense aquatic vegetation or a narrow, re-sectioned channel with minimal riparian vegetation) and would not be expected to provide comparable control data for NCR2; and

> Control A16 located on the Coxs River approximately 5 km downstream of the ash placement (this site is an ongoing Sydney Catchment Authority (SCA) macroinvertebrate monitoring site).

Note that the control site on the Coxs River (A16) is located downstream of the impact site and could conceivably experience impacts due to the Project. It is considered unlikely that such impacts would occur because A16 is located some distance downstream and receives substantial flows from the upper Coxs River. The latitude and longitude of each site are presented in **Appendix A**.

4.3 Timing

The timing of the current and previous sampling undertaken at each site is presented in **Table 4.1**.

Table 4-1 The timing and number of AUSRIVAS edge and riffle habitat samples collected at each of the Wangcol Creek EMP aquatic ecology monitoring sites during 2012 to 2020

Date	AUSRIVAS Season	NCR1		NCR2 (Impact Site)		NCR3	A16		CR0
AUSRIVAS Habitat		Edge	Riffle	Edge	Riffle	Edge	Edge	Riffle	Edge
8 Nov 2012	Spring 2012	1	1	1	1		1	1	
6 May 2013	Autumn 2013	2		1	1				
12 Dec 2013	Spring 2013	2		2			1	1	
22 May 2014	Autumn 2014	2		2					
19 Nov 2014	Spring 2014	1		1			1	1	
14 Dec 2015	Spring 2015	2		2		2	2		2
1 to 2 Dec 2016	Spring 2016	2		2		2	2		2
9 and 11 May 2018	Autumn 2018	2		2		2	2		
11 December 2018	Spring 2018	3		3		3	3		
20 May 2020	Autumn 2020	3		3		3	3		
18 November 2020	Spring 2020	3		3		3	3		
16 November 2021	Spring 2021	3		3		3	3		

Note, only spring data were examined in the current report (**Section 2.1**). Riffle habitat was not sampled due to absence of this habitat during low flows. Monitoring was not undertaken at CR0 in autumn 2018 and spring 2018 due to low water level, and monitoring here has now ceased due to persistent low water level.

4.4 Field Sampling

4.4.1 Aquatic Habitat

Aquatic habitat was assessed using methods in the NSW AUSRIVAS Manual (Turak *et al.* 2004). Descriptions of physical habitat included visual assessments of streambed composition, aquatic and riparian vegetation, potential disturbance and sketches of the river profiles.

The condition of aquatic habitat was assessed using the Reference Condition Selection Criteria (RCSC) categories developed by the Queensland Government (QLD DNRM 2001), as per the requirements of the EMP (**Appendix B**). This assessment rates the level of influence (from 1 to 5, with 1 being a very major impact and 5 an indiscernible impact) that a watercourse experiences from several potential anthropogenic disturbances in relation to the selection of reference aquatic ecology monitoring sites. The condition of aquatic habitat was also assessed using a modified version of the Riparian, Channel and Environmental (RCE) Inventory method (Peterson 1992; Chessman *et al.* 1997). This assessment involves evaluation and scoring of the characteristics of the adjacent land, the condition of riverbanks, channel and bed of the watercourse, and degree of disturbance evident at each site (**Appendix C**). The maximum score (52) indicates a stream with little or no obvious physical disruption and the lowest score (13), a heavily channelled stream without any riparian vegetation, can be considered to be in poor condition.

Digital photographs were taken looking upstream and downstream at each site to provide a record of aquatic habitat present at the time of sampling and to aid in the site descriptions.

4.4.2 Water Quality

Water quality was measured *in situ* with a YSI 6920 water quality probe and meter that were calibrated prior to sampling. Water quality was measured before aquatic fauna were sampled to avoid disturbance to the waterway. The following variables were recorded between 10:00 and 15:00 on the day of sampling:

> Temperature (°C);

> Electrical Conductivity, EC (µs/cm);

> pH;

> Dissolved oxygen, DO (mg/L and % saturation);

> Turbidity (ntu).

Duplicate readings of each variable were taken in accordance with Australian Guidelines (ANZECC/ARMCANZ 2000).

These water quality data were intended to provide information on environmental conditions at the time of sampling for aquatic ecology. Long term trends in water quality data collected by other specialists were also examined (**Section 4.6.1**).

4.4.3 AUSRIVAS Macroinvertebrates

Aquatic macroinvertebrates associated with edge habitats were sampled using the AUSRIVAS rapid assessment methodology (RAM) (Turak *et al*. 2004). Three replicate edge samples were collected with dip nets (250 µm mesh) over a period of 3 to 5 minutes from a total of 10 m of habitat within a 100 m reach of the river at each site. The dip net was used to agitate and scoop up material from vegetated river edge habitats. Where the habitat was discontinuous, patches of habitats with a total length of 10 m were sampled over the 100 m reach. Each RAM sample was rinsed from the net onto a white sorting tray from which live animals were removed (“picked”) using forceps and pipettes. Each tray was picked for a minimum period of forty minutes, after which they were picked at ten-minute intervals either until no new specimens had been found or total of 60 minutes (i.e. the initial 40 minutes plus up to another 20 minutes) had elapsed. Care was taken to collect cryptic and fast-moving animals in addition to those that were conspicuous and / or slow-moving. The animals collected at each site were placed into a labelled jar containing 70% alcohol in water. The aim of the live picking is to pick as many macroinvertebrate taxa as possible. There is no set minimum or maximum number of animals to be collected, however, at least 20 chironomids were collected where possible to help ensure that an adequate representation of all subfamilies was obtained.

Environmental variables, including alkalinity, modal river width and depth, percentage boulder or cobble cover, and latitude and longitude were recorded in the field. These variables were required for running the AUSRIVAS predictive model for edge habitat. Distance from source, altitude, and land-slope were determined from appropriate topographic maps. Mean annual rainfall was sourced from the regional precipitation maps presented in the AUSRIVAS Sampling and Processing Manual (Turak *et al*. 2004).

4.5 Laboratory Methods

AUSRIVAS samples were sorted under a binocular microscope (at 40 X magnification) and identified to Family level with the exception of Oligochaeta and Polychaeta (Class), Ostracoda (Subclass), Nematoda and Nemertea (Phylum), Acarina (Order) and Chironomidae (Subfamily). Up to ten animals of each family were counted, in accordance with the latest AUSRIVAS protocol (Turak *et al*. 2004).

4.6 Data Analysis

4.6.1 Water Quality and Hydrological Data

Water quality data were compared with the Australia, New Zealand Environment Conservation Council default trigger values (DTVs) for physical and chemical stressors for slightly disturbed upland rivers in southeast Australia (ANZECC/ARMCANZ 2000). The sites on Wangcol Creek and the Coxs River are at an altitude of 885 to 920 m and thus are classified as upland watercourses by ANZECC/ARMCANZ (2000). For metal data, guidelines for 95% protection of species for slightly to moderately disturbed ecosystems were utilised. While Wangcol Creek is probably more accurately described as a heavily modified system, guidelines for slightly to moderately disturbed systems are applied to these systems as a precautionary measure (ANZECC/ARMCANZ 2000).

EC and pH data collected from LDP6, NC01 and WX22 (**Figure 3.1**) by EnergyAustralia between 12 January 2014 and August 2022 were examined to aid in the interpretation of macroinvertebrate data. Concentrations of nickel and zinc (metals identified as exceeding locally derived guidelines following ash placement on the Project site (Aurecon 2014) (**Section 3.3.2**) and aluminium and boron (previous examination of these data suggested elevated concentrations of this metal occurred around the time of the aquatic ecology survey in spring 2014 (Cardno Ecology Lab 2015a)) recorded from these sites from January 2014 to September 2017 provided by EnergyAustralia were examined to aid the interpretation of macroinvertebrate data. Previous examination of data for four other metals of potential concern (barium, copper (Cu-F), iron (Fe-F) and manganese (Mn-F) (Cardno Ecology Lab 2015) suggested an increase in concentrations above background levels at one or more sites prior to the spring 2015 aquatic ecology survey (Cardno 2016). EC and the concentration of boron, nickel and zinc appeared elevated at WX22 (adjacent to the ash placement and NCR2) in early 2018 prior to the December 2018 survey. Boron also appeared to be elevated at LDP6 and NC01 at this time.

Local monthly rainfall data obtained from the Bureau of Meteorology (BOM) station at Lidsdale (approximately 5 to 6 km southeast of the aquatic ecology monitoring sites on Wangcol Creek) (BOM 2021) and monthly discharge data from WaterNSW station 212055 (WaterNSW 2021) from January 2012 to 30 November 2021 are also presented.

This cursory examination of water quality data has been undertaken to help understand any patterns in macroinvertebrate data. More detailed assessment of impacts to water quality in Wangcol Creek due to the Project will be undertaken by other specialist consultants.

4.6.2 Macroinvertebrate Indicators

The AUSRIVAS protocol uses an internet-based software package to determine the environmental condition of a waterway based on predictive models of the distribution of aquatic macroinvertebrates at reference sites (Coysh *et al.* 2000). The ecological health of the river was assessed by comparing the macroinvertebrate assemblages collected in the field (i.e. 'observed') with macroinvertebrate assemblages expected to occur in reference waterways with similar environmental characteristics. The data from this study were analysed using the NSW models for pool edge habitat sampled in spring. The AUSRIVAS predictive model generates the following indices:

> OE50Taxa Score – The ratio of the number of macroinvertebrate families with a greater than 50% predicted probability of occurrence that were actually observed (i.e. collected) at a site to the number of macroinvertebrate families expected with a greater than 50% probability of occurrence. OE50 taxa scores provide a measure of the impairment of macroinvertebrate assemblages at each site, with values close to

0 indicating an impoverished assemblage and values close to 1 indicating that the condition of the assemblage is similar to that of the reference rivers.

> Overall Bands derived from OE50Taxa scores which indicate the level of impairment of the assemblage. These bands are graded as described in **Table 4.2**.

Table 4-2 AUSRIVAS Bands and corresponding OE50 Taxa Scores for AUSRIVAS edge habitat sampled in spring

Band	Description	Spring OE50 Score
X	Richer invertebrate assemblage than reference condition	>1.16
A	Equivalent to reference condition	0.84 to 1.16
B	Sites below reference condition (i.e. significantly impaired)	0.52 to 0.83
C	Sites well below reference condition (i.e. severely impaired)	0.20 to 0.51
D	Impoverished (i.e. extremely impaired)	≤0.19

The SIGNAL2 biotic index (Stream Invertebrate Grade Number Average Level) developed by Chessman (2003) was also used to determine the environmental quality of sites on the basis of the presence or absence of families of macroinvertebrates. This method assigns grade numbers between 1 (highly tolerant of pollution) and 10 (highly sensitive to pollution) to each macroinvertebrate family, based largely on their responses to chemical pollutants. The sum of all grade numbers for that site was then divided by the total number of families recorded in each site to obtain an average SIGNAL2 Score. The SIGNAL2 Score therefore uses the average sensitivity of macroinvertebrate families to present a snapshot of biotic integrity at a site. SIGNAL2 values are as follows:

> SIGNAL > 6 = Healthy habitat;

> SIGNAL 5 – 6 = Mild pollution;

> SIGNAL 4 – 5 = Moderate pollution; and,

> SIGNAL < 4 = Severe pollution.

The calculation of the SIGNAL2 Score was calculated using un-weighted SIGNAL2 grade data. Weighting SIGNAL2 grades according to abundance may bias the SIGNAL2 Score towards naturally more abundant taxa.

Two other biotic indicators; total taxon richness (the number of macroinvertebrate taxa collected in the sample) and Ephemeroptera, Plecoptera and Trichoptera (EPT) Taxon Richness (the combined number of mayfly, stonefly and caddis fly taxa, respectively, which are considered to be relatively pollution sensitive) were also obtained from AUSRIVAS macroinvertebrate data. The relative contribution of each of the major taxonomic groups (including Trichoptera, Diptera, Coleoptera, Hemiptera, Plecoptera, Odonata, Ephemeroptera, Crustacea and Mollusca) to the total number of taxa present in each sample was also examined visually to provide an indication of any changes that could be indicative of an impact.

4.6.3 Statistical Analysis

4.6.3.1 Interpretation and Data Presentation

The objective of the statistical analyses was to identify differences in the macroinvertebrate indicators at the Impact site that may differ from those at the Control sites. Statistically significant differences associated with an interactive effect of Survey and Site could provide evidence that an impact may have occurred. Evidence is assessed by examining differences between pairs of Surveys and Sites.

Two statistical designs were utilised according to the availability of replicate sampling (i.e. two or more AUSRIVAS samples per site). The first used data collected from NCR1 and NCR2 in spring of 2013, 2015, 2016, 2018 and 2020 and the second, data from NCR1, NCR2, NCR3 and A16 sampled in 2015, 2016, 2018 and 2020 (**Section 4.6.3.2**). The first design enabled changes since 2013 (albeit following commencement of the Project) at NCR1 and NCR2 to be examined, the second design also included additional control sites NCR3 and A16 also (albeit only from 2015 onwards) to help place any changes at NCR2 in the context of the wider catchment area.

Differences in univariate indicators among AUSRIVAS macroinvertebrate assemblages sampled in edge habitat at each site in spring of each year sampled (2012, 2013, 2014, 2015, 2016, 2018 and 2020) were also explored.

4.6.3.2 Multivariate Analyses

A matrix of differences in the types of taxa between all possible pairs of samples was compiled by calculating their respective Bray-Curtis dissimilarity coefficients. Permutational analysis of variance (PERMANOVA+ in Primer v6) was used to examine spatial differences and temporal changes, and their interaction, in macroinvertebrate assemblage presence / absence data sampled using AUSRIVAS (Anderson *et al*. 2008; Clarke and Gorley 2006). Differences in the levels of factors and interaction terms may be examined by *Post-hoc* permutational t-tests. Only statistical differences with a significance level of $P \leq 0.05$ are considered. Significant differences between groups may arise due to differences between group means, differences in dispersion (equivalent to variance) among groups or a combination of both. Either outcome could be indicative of an impact. Moreover, only significant statistical interactions are potentially indicative of an impact, hence significant main effects are not considered in detail.

Two analytical designs were utilised:

1. Comparison among sites sampled in spring of 2013, 2015, 2016, 2018, 2020 and 2021 (NCR1 and NCR2 only):
   - Year: A fixed factor with six levels: 2013, 2015, 2016, 2018, 2020 and 2021; and
   - Site: A fixed factor with two levels: NCR1 and NCR2.
2. Comparison among all sites sampled in spring of 2015, 2016, 2018, 2020 and 2021:
   - Year: A fixed factor with five levels: 2015, 2016, 2018, 2020 and 2021; and
   - Site: A fixed factor with four levels NCR1, NCR2, NCR3 and A16.

Multivariate patterns in data collected from each site during spring of 2013, 2015, 2016, 2018, 2020 and 2021 were examined using the Principal Coordinates Analysis (PCoA) routine in PERMANOVA+. This is a generalised form of Principal Components Analysis (PCA) in which samples are projected onto linear axes based on their dissimilarities in a way that best describes the patterns among them using as few dimensions as possible (Clarke and Gorley 2006). The amount of variation 'explained' by each principal axis is indicated and the dissimilarity between data points can be determined from their distances apart on the axes (Anderson *et al*. 2008). Relative differences among samples were also examined using Hierarchical Clustering in PERMANOVA+ in Primer v6.

4.6.3.3 Univariate Analyses

PERMANOVA + was used to examine spatial differences and temporal changes in the number of taxa, OE50 Taxa Scores, SIGNAL2 Indices and the number of EPT taxa. These analyses were based on a Euclidean distance matrix of all possible pairs of samples of the variable of interest and with $P \leq 0.05$. The analytical designs described in **Section 4.6.3.2** were utilised.

As is the case with multivariate analyses, significant differences between groups (e.g. NCR1 and NCR2) may arise due to differences between group means, differences in dispersion (variance) among groups or a combination of both. A potential impact could affect both the magnitude and dispersion of an indicator (e.g. number of taxa). If a statistically significant difference between groups was detected that could be indicative of a mining impact, the proportion of the statistical difference attributable to the difference in variance between pairs of groups would be explored using the PERMDISP procedure to determine whether variances were statistically different. If there is no statistical difference between variances, the statistical difference detected between groups is most likely due to differences between group means. When a statistical difference between variances is detected, the difference between groups could be due to both the difference in variance and the mean between groups.

4.6.3.4 QA/QC Procedures

Data generated in the field were checked for accuracy and completeness before leaving each site. On return to the laboratory, field data sheets were photocopied, entered into spreadsheet format and checked. Spreadsheet files were locked prior to analysis to prevent accidental over-writes or corruption.

In the laboratory, the remains of each macroinvertebrate sample were retained and checked by another staff member to ensure that no animals were missed. A Cardno staff member with appropriate training and

experience checked the identifications and counting of samples. These activities were recorded on the Laboratory Management Sheet. Data were entered into an electronic spreadsheet and data for each sample were printed and checked by a second staff member.

5 Results

5.1 Aquatic Habitat

5.1.1 NCR1

As for previous surveys undertaken by Cardno, the aquatic habitat at control location NCR1 upstream of the Project in 2021 appeared relatively undisturbed (**Plate 1a** and **b**). There was no evidence of recent channel re-alignments or re-sectioning, and several mature trees, albeit including some invasive willows, were present on both banks. This vegetation would help stabilise banks, thereby minimising erosion and associated increases in sedimentation. It would also be a source of woody debris which provides habitat for fish and macroinvertebrates. The upstream section of the site consisted of a large pool which was bordered by dense beds of cumbungi. The downstream section consisted of a channel approximately 1 m in width with loose cobble and pebble substratum. Some flow was present at the time of sampling. Rushes (*Juncus* sp.) were common along this section.

5.1.2 NCR2 (Impact Site)

While the section of Wangcol Creek at the impact site NCR2 (**Plate 1c** and **d**) also did not appear to have been subject to recent modification, the banks just downstream of the site previously had been re-sectioned and reinforced. Riparian vegetation consisted primarily of grasses and a few isolated trees. The absence of substantial bank stabilising vegetation likely explains the bank slumping and erosion present throughout the site. The channel consisted of loose material covered with fine sediment / diatom layer. A concrete gauging station / ford situated through the centre of the site acted as a small weir.

5.1.3 A16

The relatively steep banks, uniform bank profile and absence of any trees and other substantial riparian vegetation at A16 (**Plate 1e** and **f**) suggest that this section of the Coxs River has been re-aligned and / or re-sectioned. Bank slumping was present, though bank material was somewhat stabilised by grasses. The channel consisted primarily of loose cobbles and pebbles and moderate water flow was present at the time of sampling.

5.1.4 NCR3

The aquatic habitat at NCR3 (**Plate 2a** and **b**) was very similar to that at NCR2. The riparian vegetation within a few metres of the creek was relatively undisturbed with several large trees and grasses. There was no evidence of bank or channel modifications.

5.1.5 RCE Scores

General observations of aquatic habitat at each site were supported by the results of the RCE inventory. The total RCE scores for Sites NCR1, NCR2, NCR3 and A16 were 36, 25, 36 and 33, respectively (**Appendix D**). These scores were the same as those recorded for these sites in previous surveys. The low score for NCR2 was due primarily to the relatively poor condition of the riparian vegetation, unstable banks and the absence of in-stream habitat (e.g. large woody debris). A16 also scored relatively low in categories associated with the condition of riparian vegetation, compared with NCR1 and NCR2, though it did score relatively highly in categories associated with channel form, riffle / pool sequence and channel substratum.

The results of the Reference Condition Selection Criteria (RCSC) assessment reflected the disturbed nature of the local and catchment wide environment (**Appendix D**). Each site scored 1 to 2 (indicative of major influences) in categories associated with the influence of major extractive industry, alteration of riparian vegetation, and point-source wastewater discharge. Influence from intensive agriculture and major dams / weirs was not apparent at any site.

Plate 1: Photographs of NCR1 looking a) upstream and b) downstream, NCR2 looking c) upstream and d) downstream and A16 looking e) upstream and f) downstream.

Plate 2: Photographs of NCR3 looking a) upstream and b) downstream.

5.2 Water Quality and Hydrology

5.2.1 Spring 2021 Water Quality

The mean values for each water quality indicator for each site measured in spring 2021 (NCR1, NCR2 and NCR3 on Wangcol Creek and A16 on Coxs River) are presented in **Appendix E**. The results are summarised as follows:

> Temperature ranged from 15.5 °C to 19.2 °C on Wangcol Creek and was 23.5 °C on Coxs River;

> EC ranged from 325 µS/cm to 612 µS/cm on Wangcol Creek and was 814 µS/cm on Coxs River. It was above the upper DTV at all sites;

> pH ranged from 7.1 to 8.4 on Wangcol Creek and was 7.3 on Coxs River. It was above the upper DTVs at NCR1;

> ORP ranged from -67 mV to -45 mV on Wangcol Creek and was 35 mV on Coxs River;

> Dissolved oxygen ranged from 72.3 % to 84.3 % and was below the lower DTV on Wangcol Creek. Dissolved oxygen was 90.5 % and within DTVs on Coxs River; and.

> Turbidity ranged from 1.9 to 27 on Wangcol Creek and was 1.2 ntu on Coxs River. It was above the upper DTV at NCR1 and NCR3 and below the lower DTV at NCR2 and A16.

5.2.2 Long Term Data

Daily discharge data from WaterNSW station 212055 (WX22) on Wangcol Creek from January 2012 to November 2021 (WaterNSW 2022) are presented in **Figure 5-1**. WX22 is located immediately downstream of impact site NCR2 (see **Figure 3-1**). Examination of rainfall from BOM station 063132 at Lidsdale indicated that greater discharge events in Wangcol Creek followed periods of greater rainfall. EC data (**Figure 5-2a**) suggests that EC measured at WX22 was more variable than that at NC01 and LDP6, located further upstream from WX22 (see **Figure 3-1**). Elevated ECs at this site tend to occur following periods of low rainfall and discharge, and low ECs tend to occur following periods of high rainfall and discharge. The high EC recorded at WX22 in April 2017, January 2018 and January 2020 followed relatively low rainfall. The EC measured further upstream at LDP6 and NC01 (up to 880 µS/cm) was far lower, and less variable, than at WX22 (up to 3,040 µS/cm) and appears less influenced by rainfall and discharge. This pattern was similar, but less pronounced, in EC data prior to January 2016 (Cardno Ecology Lab 2015a). The EC at each site was often above the upper DTVs (350 µS / cm). During the majority of 2020 and 2021 EC was relatively comparable among all sites, and did not exceed 1,000 µS/cm.

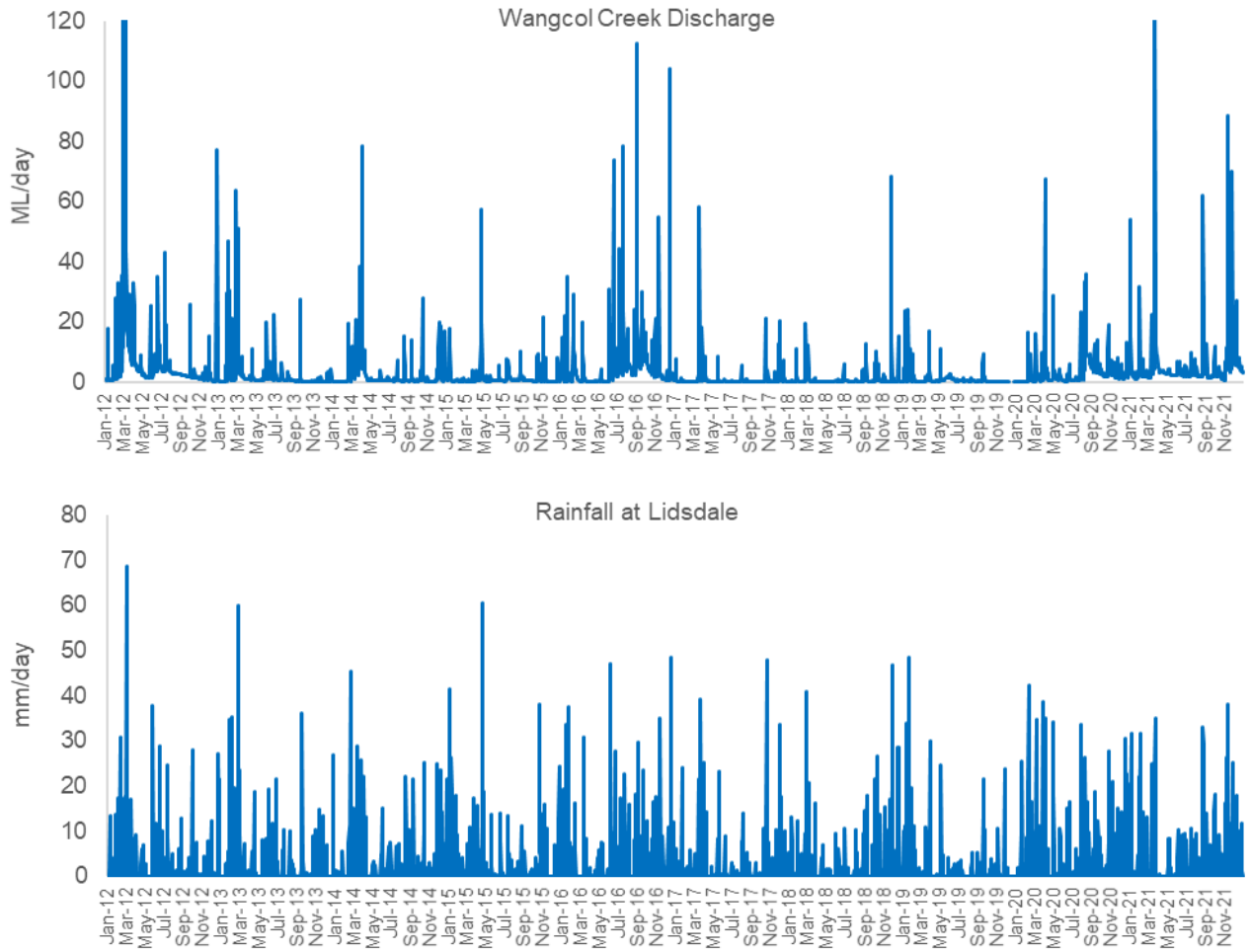
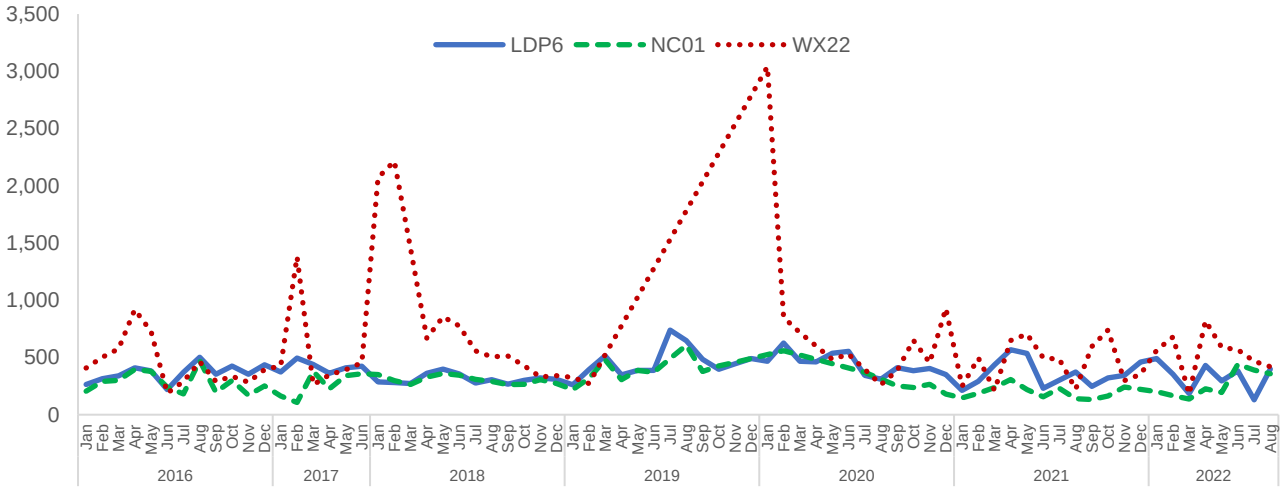


Figure 5-1 Daily rainfall at BOM Lidsdale station 063132 and daily discharge at NSW DPI (Water) station 212055 at WX22 on Wangcol Creek, January 2012 to 30 June 2020. The peak discharge in March 2012 was reported as 2,841 ML/day (WaterNSW 2021). To enable easy interpretation of the other discharge data, the Y axis scale is limited to 120 ML/day

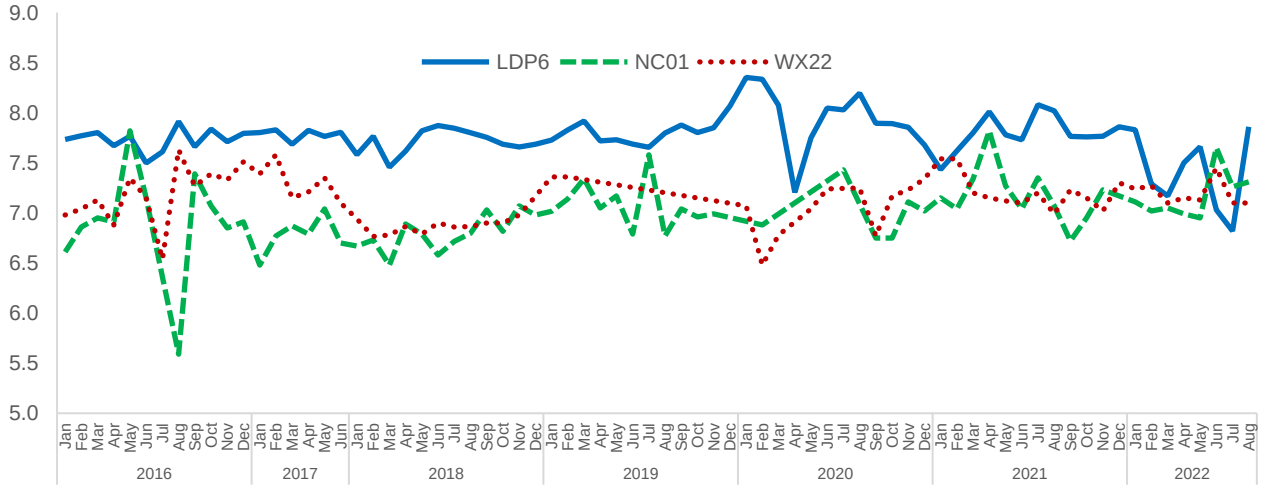
The spring 2012 to 2015 surveys were undertaken following several months of low to moderate rainfall and discharge and show correspondingly low ECs at WX22 (approximately 200 µS/cm to 700 µS/cm) (**Figure 5-2a**). The December 2016 survey was undertaken following a relatively greater amount of rainfall and discharge in Wangcol Creek and lower ECs at WX22 (200 µS/cm to 500 µS/cm). The December 2018 survey was undertaken approximately 2 weeks following a rainfall event in late November 2018, also during correspondingly low ECs. pH at LDP6, NC01 and WX22 largely remained within DTVs (pH 6.5 to 8.0) (**Figure 5-2b**). The November 2020 survey was undertaken following approximately 0.2 mm of rainfall in the previous 24 hours and 13 mm in the previous 7 days. The November 2021 survey was undertaken following approximately 5.2 mm of rainfall in the previous 24 hours and 65.8 mm in the previous 7 days. On occasion, there was relatively great differences among the pH measured at each site, sometimes close to 1 pH unit and in 2020 up to 2 pH units. The pH at LDP6 was generally greater than that at NC01 and WX22 and appeared elevated at LDP6 in 2020.

Figure 5-2c, **Figure 5-3a-c** and **Figure 5-4** present the concentrations of a selection of heavy metals (those identified previously as exceeding local guidelines or identified as potentially elevated prior to the aquatic ecology surveys (**Section 4.6.1**)) measured at LDP6, NC01 and WX22 on Wangcol Creek between January 2016 and August 2022. Concentrations of boron, and zinc appeared to be elevated at WX22 adjacent to the ash placement area during January to February 2018 and January to February 2020. The concentration of Nickel was greater at WX22 than that LDP6 and NC01 during the majority of sampling events. Boron also appeared to be elevated upstream of here (at NC01 and LDP6) at this time. Concentrations of zinc, aluminium and copper were elevated above guidelines at LDP6 and NC01 on occasion, with boron, nickel, zinc all above the guideline value at LDP6 in January 2020. Copper was also elevated at LDP6 in July 2019. In the 12 months prior to and during the current survey in November 2021, concentrations of all metals at each site were relatively low, with no evidence of substantial elevations. This likely reflects the greater dilution associated with greater rainfall and flow during this time. Water quality data from 2022 will be considered in detail following further surveys.

a) Electrical Conductivity (ANZECC/ARMCANZ (2000) DTVs = 30 µS/cm to 350 µS/cm)



b) pH (ANZECC/ARMCANZ (2000) DTVs = 6.5 to 8.0)



c) Boron (ANZECC/ARMCANZ (2000) 95 % Species Protection Trigger Value = 0.37 mg / L)

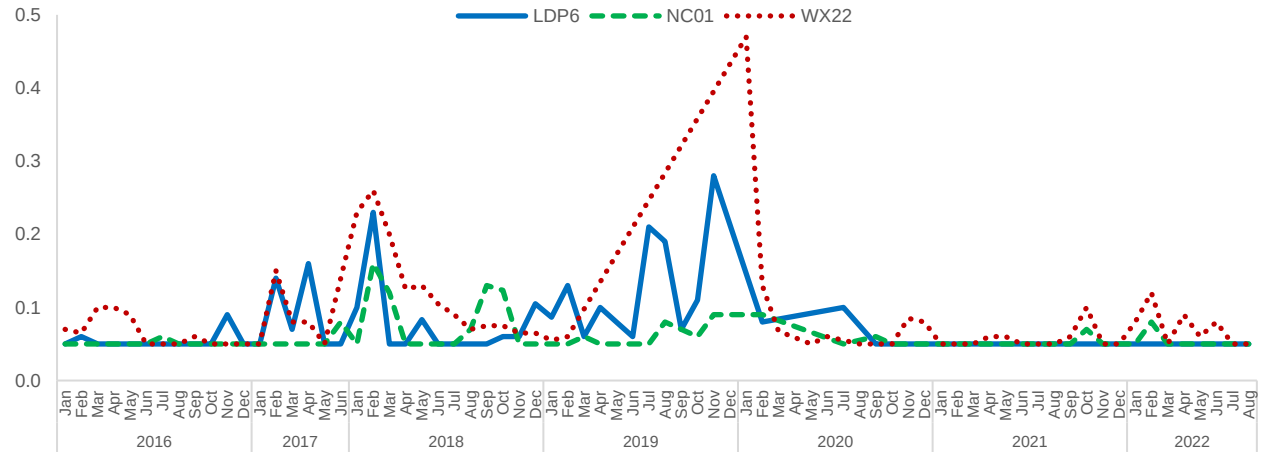
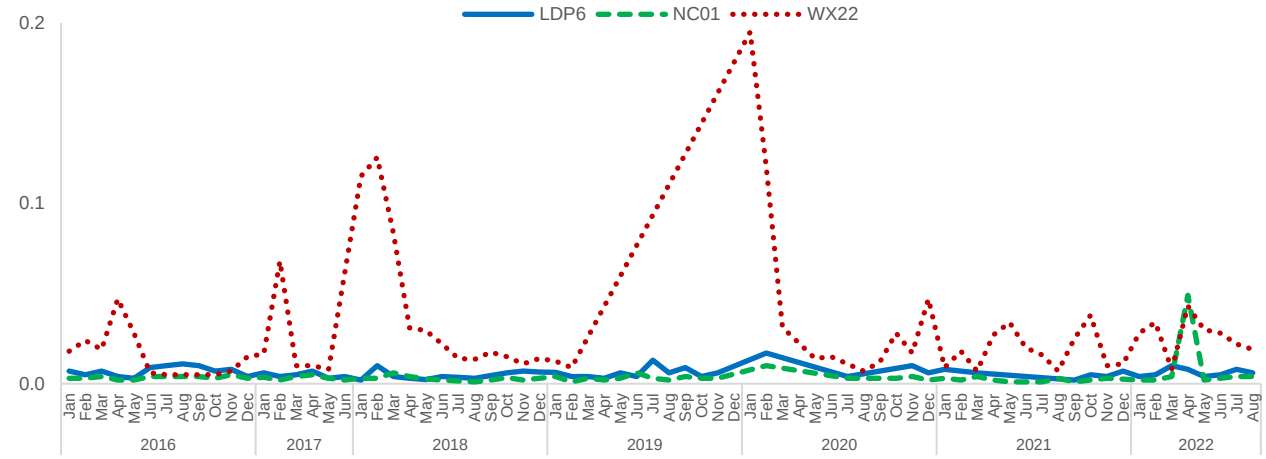
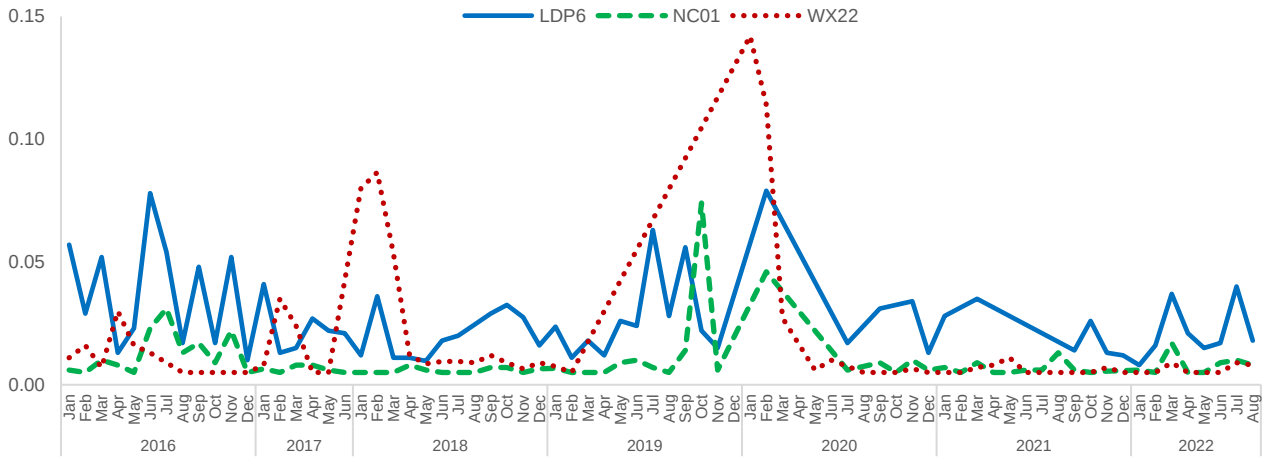


Figure 5-2 a) Electrical conductivity (EC), b) pH and c) concentration (mg / L) of boron measured at LDP6, NC01 and WX22 on Wangcol Creek by EnergyAustralia from January 2014 to June 2020.

a) Nickel (ANZECC/ARMCANZ (2000) 95 % Species Protection Trigger Value = 0.011 mg / L)



b) Zinc (ANZECC/ARMCANZ (2000) 95 % Species Protection Trigger Value = 0.008 mg / L)



c) Aluminium (ANZECC/ARMCANZ (2000) 95 % Species Protection Trigger Value = 0.055 mg / L)

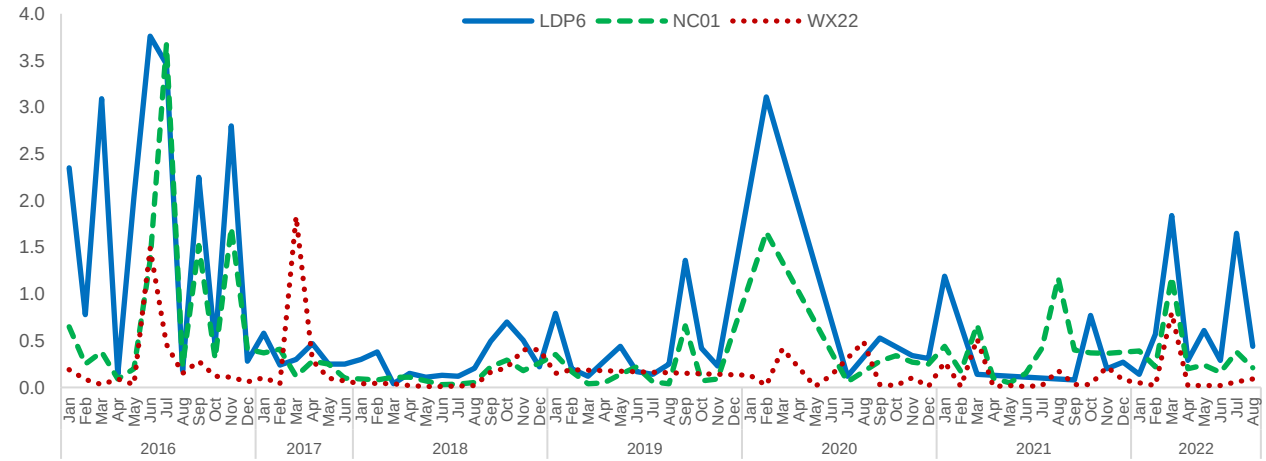


Figure 5-3 Concentrations (mg / L) of a) nickel, b) zinc and c) aluminium measured at LDP6, NC01 and WX22 on Wangcol Creek by EnergyAustralia from January 2014 to June 2020.

Copper (ANZECC/ARMCANZ (2000) 95 % Species Protection Trigger Value = 0.0014 mg/L)

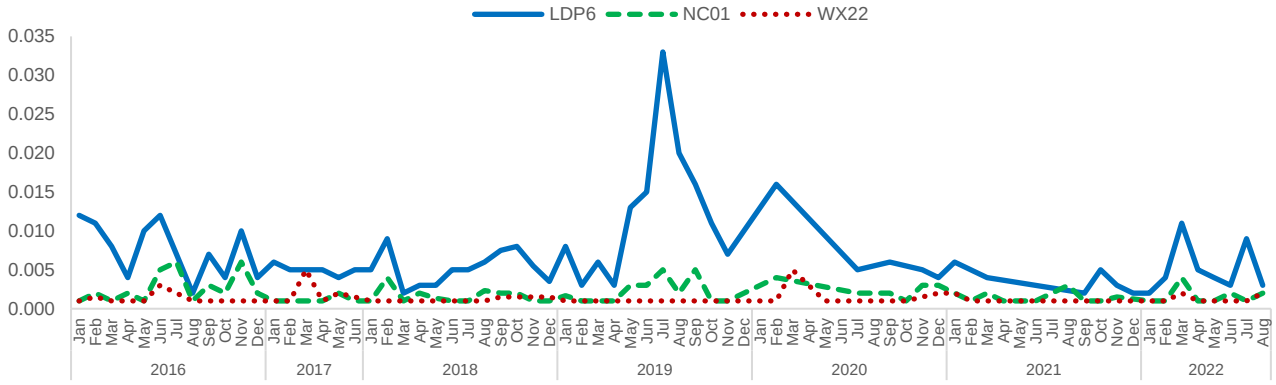


Figure 5-4 Concentrations (mg / L) of copper measured at LDP6, NC01 and WX22 on Wangcol Creek by EnergyAustralia from January 2014 to June 2020.

5.3 AUSRIVAS Macroinvertebrates

5.3.1 General Findings

5.3.1.1 Identified Taxa

A total of 42 taxa were identified from the 12 samples collected in spring 2021 (**Appendix F**). Over the course of the EMP, a total of 93 macroinvertebrate taxa have been identified from the 55 edge samples collected in spring. Out of the 80 taxa assigned a SIGNAL2 grade, 61 were assigned a grade of 5 or lower, indicating that the majority of taxa are moderately to very tolerant of pollution. Seven taxa (Athericidae, Gripopterygiidae, Hydrobiosidae, Leptophlebiidae, Telephlebiidae, Glossosomatidae and Philopotamidae) have a SIGNAL2 grade of 8 to 9, indicating they are sensitive to pollution. Leptophlebiidae were found at the majority of samples collected from NCR1 and NCR2.

The most common taxa identified from edge samples (those identified in over half all samples from Wangcol Creek and Coxs River) included Dytisidae (diving beetles), Leptophlebiidae (mayflies), Chironomidae (non-biting midge) (consisting of the subfamilies: Chironominae, Orthocladiinae and Tanypodinae) and Corixidae (backswimmers). Leptophlebiidae are pollution sensitive, however, most of the other taxa are pollution tolerant (SIGNAL2 grade 2 to 4). Few taxa appeared to be restricted to individual sites or separate watercourses. There was some evidence to suggest that Caenidae are uncommon at NCR1, and that Atyidae, are uncommon at A16. These taxa have been assigned SIGNAL2 Grades of 1 to 4. It should be noted, however, that the presence of pollution tolerant taxa does not necessarily indicate poor water quality, as these taxa would be expected to occur in watercourses with good water quality also.

Eastern gambusia was inadvertently caught in the AUSRIVAS dip net in each sample from Wangcol Creek in 2021. A mountain galaxiid was inadvertently caught in the AUSRIVAS dip net at NCR3 in 2018 and in 2021, though none were found in 2020.

5.3.1.1 Number of Taxa

The number of macroinvertebrate taxa identified from edge samples collected at NCR1 has ranged from 14 to 27, 14 to 29 at NCR2, 12 to 25 at NCR3 and 7 to 24 at A16 (**Appendices F** and **G; Figure 5-5**). No site had consistently more or fewer taxa though there was slight evidence of a decrease in number of taxa at NCR2 and NCR3 through time.

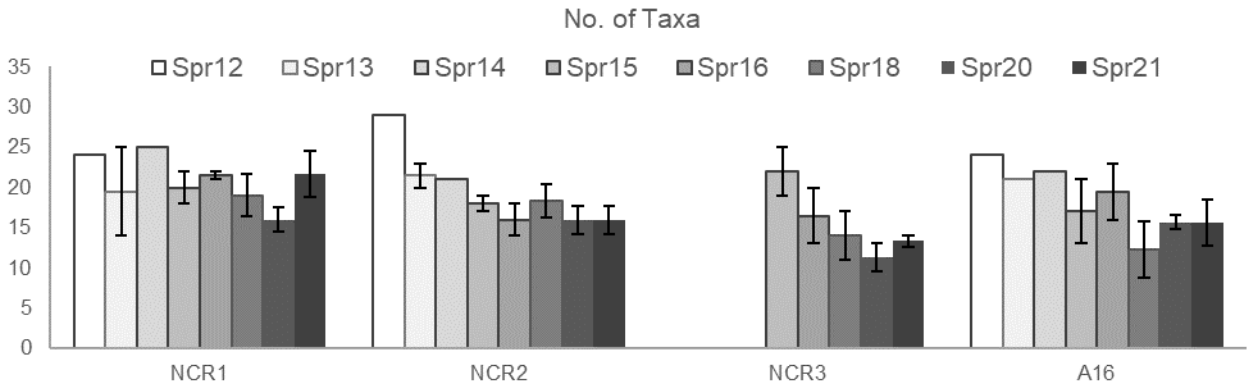


Figure 5-5 Number of Taxa identified in AUSRIVAS samples from each site sampled between spring 2012 and spring 2020
Standard error bars are displayed where n ≥ 2.

5.3.1.2 Number of EPT Taxa

The number of EPT taxa identified from edge samples collected from NCR1 has ranged from 1 to 7 at NCR2, 0 to 3 at NCR3 and 1 to 8 at A16 (**Appendices F** and **G**; **Figure 5-6**). The number of EPT taxa sampled at NCR1 and NCR2 has been relatively consistent, except a larger number were sampled at NCR2 in spring 2012. Overall, more EPT taxa have been sampled at A16 than at the other sites sampled, particularly NCR3.

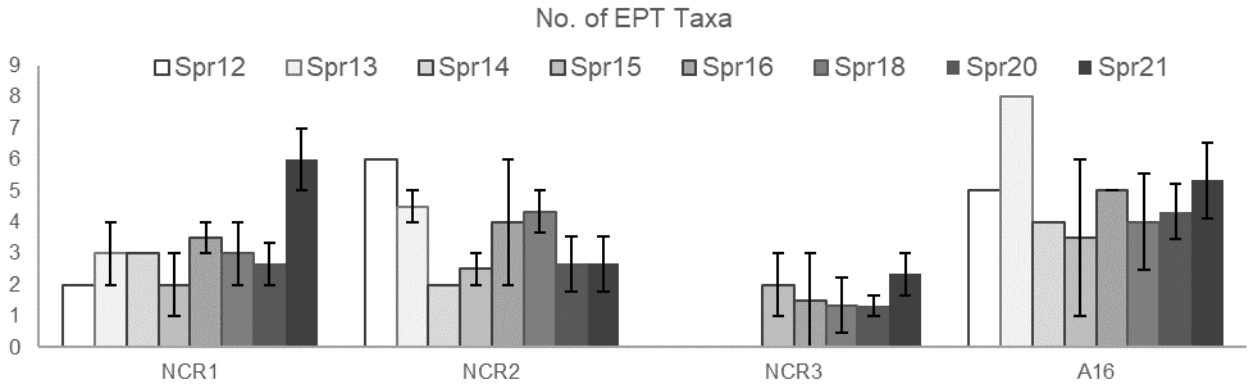


Figure 5-6 Number of EPT Taxa identified in AUSRIVAS samples from each site sampled between spring 2012 and spring 2020
Standard error bars are displayed where n ≥ 2.

5.3.1.3 OE50 Taxa Score

The OE50 Taxa Score at NCR1 has ranged from 0.36 to 0.95, 0.43 to 1.04 at NCR2, 0.19 to 0.85 at NCR3 and 0.36 to 0.91 at A16 (**Appendices F** and **G**; **Figure 5-7**). OE50 Scores from below 0.20 indicate extremely impaired habitat, 0.20 to 0.51 indicate severely impaired habitat (Band C), those from 0.52 to 0.83 indicate significantly impaired habitat (Band B) and those from 0.84 to 1.16 indicate habitat equivalent to reference condition (Band A). These results indicated that on all but one occasion (NCR2 in spring 2012) the macroinvertebrate assemblages sampled were less diverse than predicted (i.e., OE50 Taxa Score < 1.0). There was limited evidence to suggest a decrease in OE50 Taxa Score between spring 2012 and spring 2016 at NCR2, however, the OE50 Taxa Score in spring 2018 was relatively high. OE50 Taxa Scores at control sites NCR1 and NCR3 in spring 2020 were also the lowest recorded during the EMP, though there was an apparent increase in the OE50 Taxa Score at these sites in the latest survey in spring 2021.

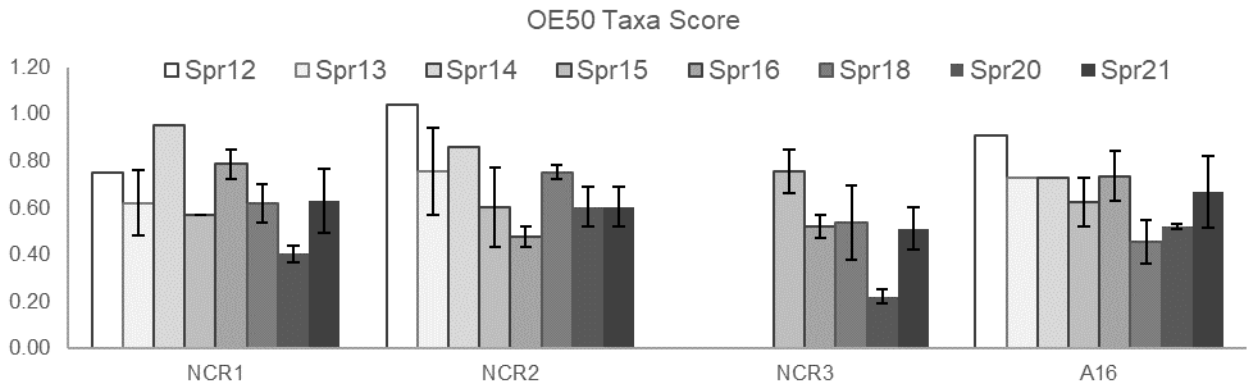


Figure 5-7 OE50 Taxa Scores from AUSRIVAS samples from each site sampled between spring 2012 and spring 2020. Standard error bars are displayed where n ≥ 2.

5.3.1.4 SIGNAL2 Score

The SIGNAL2 Score at NCR1 ranged from 3.1 to 4.2 (indicative of severe to moderate pollution), 3.6 to 4.9 (indicative of severe to moderate pollution) at NCR2, 2.9 to 4.5 (indicative of severe to moderate pollution) at NCR3 and 3.6 to 5.2 (Indicative of severe to mild pollution) at A16 (**Appendices F** and **G; Figure 5-8**). The SIGNAL2 Score at NCR3 in 2015 was 2.9 and 3.2 (indicative of severe pollution). These results suggest that all these sites experience some degree of environmental stress due to poor water quality. There were no obvious trends in SIGNAL2 data.

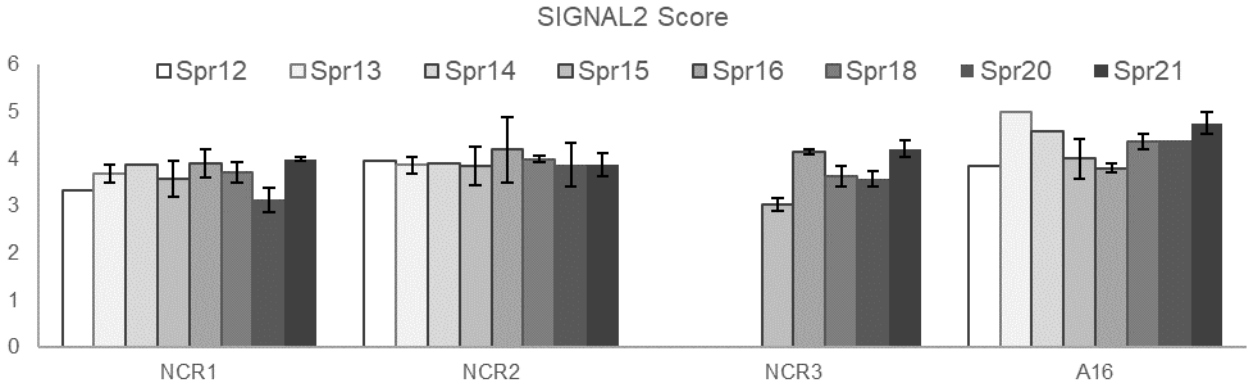


Figure 5-8 SIGNAL2 Scores from AUSRIVAS samples from each site sampled between spring 2012 and spring 2020. Standard error bars are displayed where n ≥ 2.

5.3.2 Relative Contribution of Taxonomic Groups

The relative contribution of taxonomic groups in edge samples was relatively consistent among sites and surveys, and there was little evidence of any substantial changes in the relative contribution of taxonomic groups occurring at NCR2 that could be indicative of an impact (**Figure 5-9**). Oligochaetes and hydracarina were absent from one of the samples collected at NCR2 in spring 2016, however, neither is sensitive to water pollution.

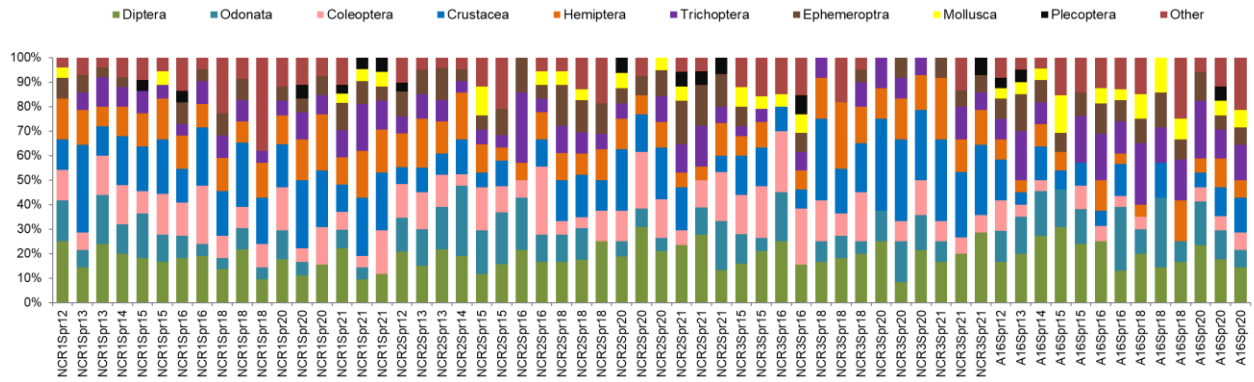


Figure 5-9 Relative contribution of major taxonomic groups identified from AUSRIVAS edge samples collected at NCR1, NCR2 and NCR3 on Wangcol Creek and A16 on the Coxs River during spring of 2013, 2014, 2018, 2020 and 2021. 'Other' includes taxa in the Families Pyralidae and Dugesiidae, the Order Temnocephalidae, Subclasses Oligochaeta and Collembola and the taxonomic group Hydracarina.

5.3.3 Statistical Analyses

None of the PERMANOVA tests undertaken using data collected from NCR1 and NCR2 in spring of 2013, 2015, 2016, 2018, 2020 and 2021 indicated a statistically significant interaction between Survey and Site (**Table 5-1**). There was a statistically significant effect of Survey for Number of EPT Taxa and multivariate assemblage structure and of Site for SIGNAL2 Score and multivariate assemblage structure. None of these differences indicated an impact.

Table 5-1 Summary of results of PERMANOVA analyses undertaken using AUSRIVAS data collected from NCR1 and NCR2 in autumn of 2014, 2018, 2020 and 2021. * = P ≤ 0.05, ** = P ≤ 0.01, *** = P ≤ 0.001, ns = not statistically significant. See Appendix I for full results.

Indicator	Source of Variation		
	Site	Survey	Survey x Site
Number of Taxa	ns	ns	ns
Number of EPT Taxa	ns	*	ns
OE50 Taxa Score	ns	ns	ns
SIGNAL2 Score	*	ns	ns
Assemblage	***	***	ns

One of the PERMANOVA tests (that for multivariate assemblage structure) undertaken using data collected from all sites in spring of 2015, 2016, 2018, 2020 and 2021 indicated a statistically significant interaction between Survey and Site (**Table 5-2**). Examination of *post-hoc* pairwise tests of pairs of Surveys indicated significant differences between 2015 and 2020 and between 2015 and 2021 at NCR3 and at AR16, and between 2020 and 2021 at NCR3 (**Appendix H Ci and Cii**). Differences between Surveys at NCR3 and A16 (both control sites) do not provide evidence of an impact.

Significant differences between pairs of Sites were also detected between NCR1 and A16 in 2018, and between NCR1 and A16, and between NCR2 and A16, in 2020. Similarly, differences between NCR1 and A16 (both control sites) in 2018 do not indicate an impact. Differences between NCR2 (impact) and A16 (control) in 2020 are also not indicative of an impact given that differences were also detected in 2020 between control sites NCR1 and A16.

There was also a statistically significant effect of Survey for Number of EPT Taxa, SIGNAL2 Score, OE50 Taxa Score and multivariate assemblage structure and of Site for Number of EPT Taxa and SIGNAL2 Score. None of these differences indicated an impact.

Table 5-2 Summary of results of PERMANOVA analyses undertaken using AUSRIVAS data collected from NCR1, NCR2, NCR3, A16 and CR0 in spring of 2015, 2016. * = P ≤ 0.05, ** = P ≤ 0.01, *** = P ≤ 0.001, ns = not statistically significant. See Appendix I for full results

Indicator	Source of Variation		
	Site	Survey	Survey x Site
Number of Taxa	ns	ns	ns
Number of EPT Taxa	**	*	ns
OE50 Taxa Score	ns	**	ns
SIGNAL2 Score	**	**	ns
Assemblage	RED	RED	**

The PCoA undertaken for all edge assemblages sampled (except at CR0) during spring of 2012, 2013, 2014, 2015, 2016, 2018, 2020 and 2021 is presented in **Figure 5-10a**. There is evidence to suggest that assemblages at A16 differed from those at each of the other sites. This is evident in assemblages from A16 tending to group towards the left of the PCoA away from those at the other sites. There was little evidence of other distinct groupings. The results of the CLUSTER diagram **(Figure 5-10b**) are reflective of the PCoA, with generally little evidence of distinct groupings of samples from particular Surveys and Sites. The only exception evident in the PCoA was two of the samples from A16 in spring 2018, which were relatively dissimilar from each other and all other assemblages sampled (the two blue open circles group at the far left of the CLUSTER diagram). Replicate samples tended to be most similar to each other (e.g. those from NCR3 in spring 2015), though several replicate samples were also relatively dissimilar (e.g. NCR2 in spring 2015). Differences among replicates could indicate relatively great natural variation in macroinvertebrate assemblages at the time of sampling.

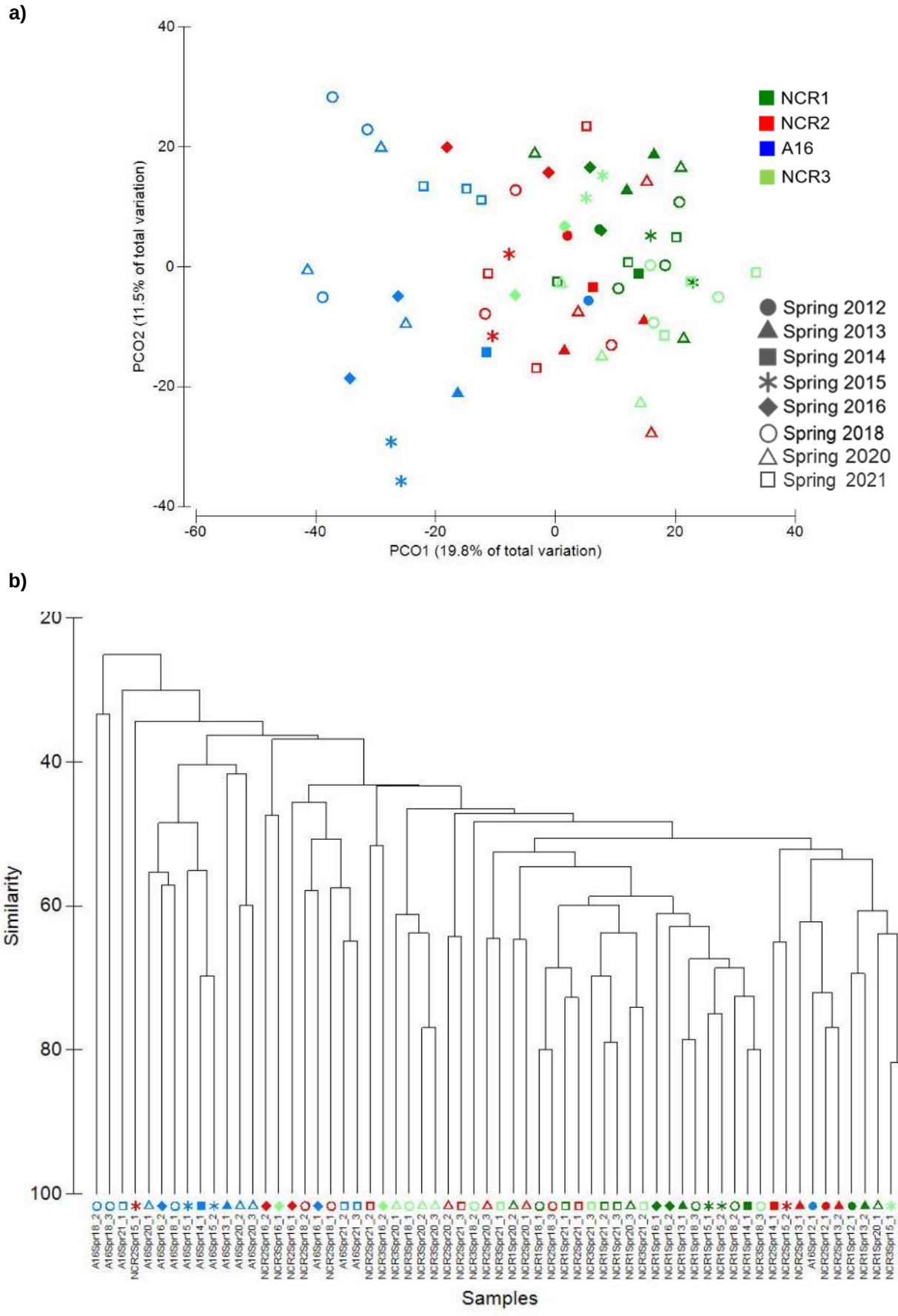


Figure 5-10 a) Principal Coordinates Analysis (PCoA) and b) CLUSTER diagram of AUSRIVAS edge macroinvertebrate assemblages sampled using AUSRIVAS at NCR1, NCR2 and NCR3 on Wangcol Creek and at A16 on Coxs River in spring of 2012, 2013, 2015, 2016, 2018, 2020 and 2021.

6 Discussion

6.1 Aquatic Habitat

The findings of this and previous investigations indicate that aquatic habitat in Wangcol Creek has experienced past degradation due primarily to local industry and historic land clearing. This appears to have been more severe at NCR2, where the condition of the riparian vegetation, creek banks and streambed were poorer compared with that upstream at NCR1 and NCR3. While these sites have experienced impacts in the past, no further direct impacts to aquatic habitat in Wangcol Creek (e.g. creek realignment, vegetation clearing) due to the Project were predicted or have been detected. Although the current condition of aquatic habitat in Wangcol Creek is not attributable to the Project, the differences in habitat observed between NCR2 and monitoring sites further upstream in Wangcol Creek (NCR1 and NCR3) and the upstream monitoring site in the Coxs River (A16) could be expected to influence the number and type of macroinvertebrate taxa (and other aquatic biota) found in samples at these sites. Notably, there was greater abundance of riparian and aquatic vegetation at NCR1 and NCR3 compared with NCR2 and A16. The additional food and habitat this would afford may partly explain any differences in the structure of macroinvertebrate assemblages sampled at these sites. The presence of the mountain galaxiid in the dip net at NCR3 in autumn of 2017 and spring of 2018 and 2021 also indicates that the creek is providing habitat for at least one native species of fish.

6.2 Water Quality and Hydrology

Water quality in Wangcol Creek is influenced by various types of anthropogenic disturbance. This is evident in several indicators (e.g. EC and concentrations of several metals) being outside of default guidelines for the protection of aquatic life. Aurecon (2014) attributed these impacts to previous and current coal mining and power generation activities, among others. While the Project may also be influencing water quality in Wangcol Creek, it has not been possible to discriminate potential changes in water quality associated with the Project from confounding effects of other pre-existing influences (e.g. groundwater seepage from Ash Area 1). The duration and magnitude of elevated measures of some water quality indicators in Wangcol Creek appear to be influenced by flow, which in turn is influenced by patterns in local rainfall (no major flow controlling impoundments are present on Wangcol Creek). During periods of low rainfall and flow, water in Wangcol Creek likely consists of a series of disconnected pools where evaporation results in increased EC and concentrations of metals (Aurecon 2014). Periods of high rainfall and flow will have a diluting effect, thereby reducing the EC and the concentrations of metals. This process likely explains the variation in measures of water quality observed in Wangcol Creek and the elevations in EC and concentrations of metals observed following low rainfall. Differences in the location, duration and magnitude of water quality impairment in Wangcol Creek will depend on a complex set of interactions (e.g., historic and current coal mining activities, power generation and historic land clearing etc.) and local rainfall, discharge and hydrology.

While the relative influence of impacts to water quality from multiple sources in Wangcol Creek remains unclear, the changes that have been observed during the course of the EMP, and variation among sites, would be expected to influence macroinvertebrates (and other aquatic flora and fauna) in the creek. This may have explained the apparent change in biotic indices and structure of the macroinvertebrate assemblage sampled previously at NCR2 in autumn 2013 following the commencement of construction on the Project site (Cardno Ecology Lab 2015a). In any case, elevations in EC at this time were attributed to rainfall and flow patterns in the creek, rather than any impacts due to the Project (Aurecon 2014) (**Section 2.3**). The depauperate macroinvertebrate assemblage sampled previously in Wangcol Creek by Battaglia *et al*. (2005) was attributed to reduced pH (measured at pH 5.1 in Wangcol Creek compared with pH 6.5 to 6.7 in reference creeks), high concentrations of metals, or a combination of these, associated with acid mine drainage (AMD). pH data collected by EnergyAustralia suggest that, while somewhat variable, pH in Wangcol Creek is generally within DTVs for the protection of aquatic life.

Measures of water quality sampled by Cardno in spring 2021 were generally comparable to those measured previously as part of the EMP by Cardno and others (GHD 2014b to e). Although the EC recorded in Wangcol Creek during the course of the EMP was often in excess of the upper DTV (350 µS/cm), this does not necessarily mean that this poses a threat to aquatic life. The relatively lower EC recorded in Wangcol Creek in December 2016 was likely a result of a diluting effect of recent rainfall and higher flows, whereas the elevated EC at WX22 in autumn 2018 and autumn 2020 appeared to be associated with low rainfall. A review of the sensitivity of Australian freshwater biota to salinity undertaken by Hart *et al*. (1991) indicates that adverse effects on freshwater macroinvertebrates are likely to become apparent when salinity rises to around 1,000 mg/L (approximately 1,562 µS/cm). Aquatic macrophytes and riparian plants are slightly more tolerant, being sensitive to salinities from 1,000 mg/L to 2,000 mg/L (1,562 µS/cm to 3,134 µS/cm) and above 2,000 mg/L (>3,134 µS/cm), respectively. Adult fish are tolerant of salinities up to 10,000 mg/L

(15,620 µS/cm). A subsequent review of the effects of increasing salinity on freshwater ecosystems in Australia undertaken by Nielsen *et al*. (2003) indicates the following:

> Majority of algae do not tolerate salinities > 10,000 mg/L (15,620 µS/cm);

> Diatoms decrease in abundance and richness as salinity increases;

> Freshwater plants tolerate salinities up to 4,000 mg/L (6,250 µS/cm), but adverse effects on growth and development of roots and leaves become apparent above 1,000 mg/L (1,562 µS/cm);

> Macroinvertebrate fauna of rivers appear to be tolerant and fairly resilient to increasing salinity;

> Structurally simple macroinvertebrates such as soft-bodied hydra, insect larvae and molluscs are more sensitive to increased salinity;

> Salinity tolerance testing of 59 macroinvertebrate taxa indicated tolerance ranged from 5,000 to 50,000 mg/L (7,810 to 78,100 µS/cm), with baetid mayflies and macro-crustaceans being the least and most tolerant, respectively; and

> A majority of native and introduced fish appear to be tolerant of salinities in excess of 3,000 mg/L (4,686 µS/cm).

These findings would suggest that for the majority of the time during the EMP the ECs measured in Wangcol Creek (i.e. approximately 100 to 2,000 µS/cm), while not ideal should not have substantial detrimental effects on most macroinvertebrates. Baetid mayflies, which were found to be particularly sensitive to EC, were found in the AUSRIVAs samples collected from Wangcol Creek in at NCR2 in May 2020, following recent elevated EC of 3,040 µS/cm in January 2020 a few 10s metres downstream at WX22 (Cardno 2020a).

Water quality data from 2021 did not indicate elevated concentrations of any metals sampled. Elevated concentrations of some metals were detected at WX22 adjacent to the ash placement area in early 2018 and early 2020. Clear elevations in the concentrations of some metals were also detected around March 2015, though by the time of the 2015 survey, concentrations of these were no longer elevated. Elevations in the concentrations of barium, nickel, aluminium, and zinc in Wangcol Creek have also been previously detected, and prior to previous aquatic ecology investigations. No clear association with water quality and macroinvertebrate data was found during previous surveys (**Section 2.3**). Prior to the current survey, while concentrations of aluminium, copper and zinc appeared somewhat elevated at some sites on Wangcol Creek (**Section 5.2.2**), there was no evidence of any associated effect on macroinvertebrates (**Section 6.3**). The previous finding of a reduction in the number of EPT taxa at NCR2 between autumn 2018 and autumn 2020 could, however, be related to observed changes in water quality in early 2020 (Cardno 2020a and **Section 6.2**).

It is unlikely that any potential impact to water quality due to the Project could be completely isolated from background impacts associated with historic and current coal mining, power generation and historic land clearing activities. A complex interaction between the specific characteristics of each impact (in terms of type and magnitude of impact to water quality), local rainfall, flow and hydrology and water quality in Wangcol Creek would make it almost impossible to definitively attribute any change to water quality, and thus any effect on macroinvertebrates, to the Project. Nevertheless, the collection and interpretation of water quality data during monitoring of aquatic ecology will help identify the cause of any changes detected in macroinvertebrate data indicative of an impact. This information would help target any future impact minimisation and remediation efforts.

6.3 Macroinvertebrates

6.3.1 General Findings

The general findings of the current study support those of previous investigations. The macroinvertebrate assemblage supported by Wangcol Creek appears to experience some degree of environmental stress. This is evident in OE50 Taxa Scores and AUSRIVAS Bands generally indicative of macroinvertebrate assemblages that are less diverse than predicted by the AUSRIVAS model, and thus relatively poor aquatic habitat and / or water quality. Low individual taxon SIGNAL2 grades and SIGNAL2 indices are also indicative of severe to moderate pollution.

Despite this, some pollution sensitive taxa were also identified. This suggests that while the macroinvertebrate assemblage does experience some degree of environmental stress due to poor habitat and water quality, conditions are not as severe as what may be expected considering the sometimes very poor water quality of Wangcol Creek (with several indicators often measured outside of guidelines for the

protection of aquatic life) and the degree of historic habitat modification it has experienced. The aquatic ecology of Wangcol Creek also does not appear to be particularly poor in a regional context. AUSRIVAS data collected from Wangcol Creek were comparable to those collected from A16 on the Coxs River, which has, and continues to, experience similar disturbances (i.e. impacts to water quality and the condition of riparian vegetation) to Wangcol Creek. These results were also comparable to those of the ongoing Coxs River Biological Monitoring Program, where the AUSRIVAS Bands at sites on the Coxs River downstream of Wangcol Creek during 2011 to 2020 ranged from Band C to Band B, with most sites on most occasions assigned Band B (Cardno Ecology Lab 2020).

The presence of Leptophlebiidae in edge samples collected from Wangcol Creek, including in each sample collected from NCR2 in autumn 2020 (Cardno 2020b), in one of the three samples from NCR2 in spring 2020 (Cardno 2020a), and in all three samples from NCR2 in the current study, also suggests that the effect of poor water quality on macroinvertebrate fauna in the creek is somewhat limited. Previously, fewer leptophlebiids have been associated with elevated ECs due to mine water discharge in the Georges River (Cardno Ecology Lab 2010a and references therein). This study, and the findings of an Australian Coal Industry Research Program (ACARP) funded study into the effects of saline water discharge on aquatic biota in the Southern and Hunter Coalfields of NSW (Cardno Ecology Lab 2010b), also suggested that elevated EC can influence the abundance of aquatic macroinvertebrates.

While low pH was suggested as a possible cause of depauperate macroinvertebrate assemblages in Wangcol Creek in an earlier study by Battaglia *et al*. (2005), this was not apparent in EMP. pH measured during the EMP was above that measured in Wangcol Creek (pH 5.1) by Battaglia *et al*. (2005) and largely within DTVs. The findings here are similar to those of Soucek *et al*. (2000), where the abundance and diversity of macroinvertebrates was found to be reduced in streams affected by acid mine discharge, irrespective of pH, suggesting other factors such as metal toxicity were responsible.

Any inferences regarding the role of water quality in influencing macroinvertebrates in Wangcol Creek must be made with caution as several other measures of water quality not considered here, such as concentrations of nutrients, or a combination of these, may be influencing macroinvertebrates in Wangcol Creek. It is also likely that assemblages sampled through time on Wangcol Creek (and any other watercourse) are not independent, potentially confounding any associated inferences. It is also possible that the macroinvertebrate fauna present in Wangcol Creek has, over time, become tolerant to impaired water quality and that any short-term elevations in otherwise already elevated measures may have a limited observable effect.

6.3.2 Changes in Macroinvertebrates

PERMANOVA tests did not indicate any Project related changes to macroinvertebrate assemblages in spring 2021. Likewise, there was no evidence of any trends in data collected in spring that could be indicative of an impact occurring. This is consistent with the findings of previous investigations in spring (**Section 2.3**). As was the case in spring 2020 (Cardno 2020b), in the current study in spring 2021, there was no evidence of the reduction in SIGNAL2 Score that was observed previously in autumn 2020 (Cardno 2020a). Overall, data collected over the course of the EMP does not suggest any impact to macroinvertebrates in Wangcol Creek has occurred due to the Project. There were also no changes in macroinvertebrate indicators sampled from autumn 2013 to autumn 2018 that indicate an impact (Cardno 2018). Although the total number of taxa and number of EPT taxa at NCR2 was lower in autumn 2018 than in autumn of 2013 and 2014, similar changes were also observed at the control location NCR1 (Cardno 2018). The low OE50 Taxa Score at control sites NCR1 and NCR3 noted in spring 2020 (also the lowest recorded during the EMP (Cardno 2020b)), was not evident at these sites in spring 2021.

Previously, the only other evidence of an impact occurring in data collected in spring and autumn was the apparent reduction in the total number of taxa and the number of EPT taxa, a lower OE50 Taxa Score and a change in the structure of the macroinvertebrate assemblage observed at NCR2 in autumn 2013 (**Section 2.3**). However, these observations could not be supported by statistical tests and, in any case, there was evidence of a recovery following this survey. Such changes were also not evident in the current study. Although a statistically significant interactive effect of Site and Survey was detected in the multivariate assemblage data in spring 2021, examination of pairwise tests provided no evidence this was related to the project. Significant differences between pairs of surveys at control sites NCR3 and A16, and between control sites NCR1 and A16, in isolation do not provide conclusive evidence of an impact. Differences between the impact site NCR2 and control site A16 in 2020 were also not related to the project as differences between two control sites (NCR1 and A16) were also detected in 2020.

7 Conclusion and Recommendations

There was no evidence to suggest a change in macroinvertebrate indicators occurred at NCR2 in spring 2021 that could be associated with the Project. Furthermore, the condition of aquatic habitat and biota at NCR2 did not differ substantially from the habitat upstream of the Project. There was also no evidence that the reduction in SIGNAL2 Score that occurred at NCR2 in autumn 2020 persisted in spring 2020 or in spring 2021.

The complex interaction that exists between the various types of disturbances experienced in Wangcol Creek make any changes in water quality, and thus associated changes in macroinvertebrates, difficult to distinguish from those that could be due to the Project. Nevertheless, the EMP adds value to the wider monitoring program, and it is expected that any large magnitude and / or cumulative impacts to aquatic biota would be detected, allowing appropriate management actions to be implemented. Recent changes to the monitoring of aquatic ecology, including the addition of two further macroinvertebrate control sites, will assist in identifying any future impacts, were they to occur, and help inform future impact minimisation and remediation efforts as necessary.

The following recommendations will help to ensure the robustness of the EMP and the detection of potential impacts on aquatic ecology due to the Project:

2. Based on Condition B7 of the Project Approval, ongoing monitoring should continue throughout the life of the project (including operation), and for at least two (2) sampling periods following ash placement Thus, it is recommended that further monitoring should be undertaken annually in spring during operation of the Project and for at least two years after completion of all activities that could impact aquatic ecology. The next sampling event would be undertaken in Spring 2022.
3. Sampling should continue at the additional control sites established on Wangcol Creek (NCR3). While no baseline data is available from this site, control data collected here during future surveys would improve the power of statistical tests and aid in the detection of an impact occurring in the future.
4. Three replicate AUSRIVAS samples should continue to be collected from each site during all future surveys. This will provide a measure of the variation present in each indicator at each site, thereby, improving the ability to detect any future impact by enabling the use of appropriate statistical analysis.

At this stage no Project specific mitigation, impact minimisation or ameliorative actions are recommended.

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APPENDIX A

GPS COORDINATES OF AQUATIC ECOLOGY MONITORING SITES FOR THE WANGCOL CREEK EMP

Cardno
Shaping the Future

Site	Latitude	Longitude
NCR1	-33.35061	150.04753
NCR2	-33.35822	150.05704
NCR3	-33.35205	150.04852
A16	-33.38001	150.07990
CR0	-33.32678	150.09817

Datum: WGS 84, Zone 56H

APPENDIX B

REFERENCE CONDITION SELECTION CRITERIA

Cardno
Shaping the Future

No.	Reference Condition Selection Criteria Category	Comment
1	Influence of intensive agriculture upstream	Intensive agriculture is that which involves irrigation, widespread soil disturbance, use of agrochemicals and pine plantations. Dry-land grazing does not fall into this category.
2	Influence of major extractive industry (current or historical) upstream	This includes mines, quarries and sand/gravel extraction.
3	Influence of major urban area upstream	This will be relative to population size, river size and distance between the site and the impact.
4	Influence of significant point-source wastewater discharge upstream	Exceptions can be made for small discharges into large rivers.
5	Influence of dam or major weir	Sites within the ponded area of impoundments also fail.
6	Influence of alteration to seasonal flow regime	This may be due to abstraction or regulation further upstream than the coverage by Criterion 5. Includes either an increase or decrease in seasonal flow.
7	Influence of alteration to riparian zone	Riparian vegetation should be intact and dominated by native species.
8	Influence of erosion and damage by stock on riparian zone and banks	Stock damage to the stream bed may be included in this category.
9	Influence of major geomorphological change on stream channel	Geomorphological change includes bank slumping, shallowing, braiding and unnatural aggradation or degradation.
10	Influence of alteration to in-stream conditions and habitats	This may be due to excessive algal and macrophyte growth, by sedimentation and siltation, by reduction in habitat diversity by drowning or drying out of habitats (e.g. riffles) or by direct access of stock into the river

APPENDIX C

RIVER, CHANNEL AND ENVIRONMENTAL (RCE) CATAGORIES

Cardno
Shaping the Future

Descriptor and category	Score
1. Land use pattern beyond the immediate riparian zone	
Undisturbed native vegetation	4
Mixed native vegetation and pasture/exotics	3
Mainly pasture, crops or pine plantation	2
Urban	1
2. Width of riparian strip of woody vegetation	
More than 30 m	4
Between 5 and 30 m	3
Less than 5 m	2
No woody vegetation	1
3. Completeness of riparian strip of woody vegetation	
Riparian strip without breaks in vegetation	4
Breaks at intervals of more than 50 m	3
Breaks at intervals of 10 - 50 m	2
Breaks at intervals of less than 10 m	1
4. Vegetation of riparian zone within 10 m of channel	
Native tree and shrub species	4
Mixed native and exotic trees and shrubs	3
Exotic trees and shrubs	2
Exotic grasses / weeds only	1
5. Stream bank structure	
Banks fully stabilised by trees, shrubs etc.	4
Banks firm but held mainly by grass and herbs	3
Banks loose, partly held by sparse grass etc.	2
Banks unstable, mainly loose sand or soil	1
6. Bank undercutting	
None, or restricted by tree roots	4
Only on curves and at constrictions	3
Frequent along all parts of stream	2
Severe, bank collapses common	1
7. Channel form	
Deep: width / depth ratio < 7:1	4
Medium: width / depth ratio 8:1 to 15:1	3
Shallow: width / depth ratio > 15:1	2
Artificial: concrete or excavated channel	1

Descriptor and category	Score
8. Riffle / pool sequence	
Frequent alternation of riffles and pools	4
Long pools with infrequent short riffles	3
Natural channel without riffle / pool sequence	2
Artificial channel; no riffle / pool sequence	1
9. Retention devices in stream	
Many large boulders and/or debris dams	4
Rocks / logs present; limited damming effect	3
Rocks / logs present, but unstable, no	2
Stream with few or no rocks / logs	1
10. Channel sediment accumulations	
Little or no accumulation of loose sediments	4
Some gravel bars but little sand or silt	3
Bars of sand and silt common	2
Braiding by loose sediment	1
11. Stream bottom	
Mainly clean stones with obvious interstices	4
Mainly stones with some cover of algae / silt	3
Bottom heavily silted but stable	2
Bottom mainly loose and mobile sediment	1
12. Stream detritus	
Mainly un-silted wood, bark, leaves	4
Some wood, leaves etc. with much fine	3
Mainly fine detritus mixed with sediment	2
Little or no organic detritus	1
13. Aquatic vegetation	
Little or no macrophyte or algal growth	4
Substantial algal growth; few macrophytes	3
Substantial macrophyte growth; little algae	2
Substantial macrophyte and algal growth	1

APPENDIX D

RESULTS OF RCSC AND RCE ASSESSMENTS

Cardno
Shaping the Future

River, Channel and Environmental (RCE) Category in spring 2021)				Site
	NCR1	NCR2	NCR3	A16
Land use pattern beyond the immediate riparian zone	3	2	3	2
Width of riparian strip of woody vegetation	3	2	3	1
Completeness of riparian strip of woody vegetation	2	1	2	1
Vegetation of riparian zone within 10 m of channel	3	2	3	1
Stream bank structure	3	1	3	2
Bank undercutting	4	1	4	3
Channel form	3	3	3	4
Riffle / pool sequence	2	2	2	4
Retention devices in stream	3	1	3	2
Channel sediment accumulations	2	2	2	4
Stream bottom	3	3	3	4
Stream detritus	3	2	3	2
Aquatic vegetation	2	3	2	3
Total	36	25	36	33

Reference Condition Selection Criteria Category				Site
	NCR1	NCR2	NCR3	A16
Influence of intensive agriculture upstream	5	5	5	5
Influence of major extractive industry (current or historical) upstream	1	1	1	1
Influence of major urban area upstream	3	3	3	5
Influence of significant point-source wastewater discharge upstream	2	2	2	2
Influence of dam or major weir	5	5	5	5
Influence of alteration to seasonal flow regime	3	3	3	3
Influence of alteration to riparian zone	1	1	1	1
Influence of erosion and damage by stock on riparian zone and banks	5	5	5	3
Influence of major geomorphological change on stream channel	3	1	3	2
Influence of alteration to in-stream conditions and habitats	3	3	3	3

1 = Very major impact

2 = Major impact

3 = Moderate impact

4 = Minor impact

5 = Indiscernible impact

APPENDIX E

MEAN WATER QUALITY DATA FROM SITES NCR1, NCR2, NCR3 AND A16 SAMPLED SPRING 2021

Cardno
Shaping the Future

Measure	DTVs	Site							
		NCR1		NCR2		NCR3		A16	
		Mean	**SE**	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**
Temperature (°C)	n/a	15.5	0.0	19.2	0.0	16.8	0.0	23.5	0.0
Conductivity (µS/cm)	30-350	345	0	612	0	325	0	814	0
pH	6.5-8.0	8.4	0.0	7.2	0.0	7.1	0.0	7.3	0.0
ORP (mV)	n/a	-45	0.0	-56	0.0	-67	0.0	35	0.0
DO (% Sat)	90-110	72.3	0.0	84.3	0.0	79.5	0.0	90.5	0.0
Turbidity (NTU)	2-25	27	0.0	1.9	0.0	26	0.0	1.2	0.0

DTV: Default Trigger Values for slightly disturbed upland rivers in southeast Australia (ANZECC/ARMCANZ 2000). Grey shading indicates measure outside of DTVs

APPENDIX F

RAW AUSRIVAS DATA SPRING 2020

Cardno
Shaping the Future

Taxon	NCR1	NCR1	NCR1	NCR2	NCR2	NCR2	NCR3	NCR3	NCR3	A16	A16	A16
Replicate	1	2	3	1	2	3	1	2	3	1	2	3
Dugesiidae												1
Nematoda	1			1								
Corbiculidae/Sphaeriidae											1	
Lymnaeidae	3			3								
Physidae		1	2								1	
Oligochaeta	1											
Cladocera		5	2	1				1			2	1
Copepoda	10	10	7	1			3	10	1		5	
Ostracoda	10	10	8	4		1	10	10	1	1	10	4
Atyidae	3	5	5				2	3	1		1	1
Parastacidae		1					2		2			
Hydracarina	1				1			2				
Caenidae	1	1		1	1						7	5
Baetidae	2			1	4	1					10	5
Leptophlebiidae	8	2	3	10	10	10	2	4	2	3	4	10
Coenagrionidae	1					4					2	1
Megapodagrionidae					1	2	1					
Gomphidae					1					1	1	2
Aeshnidae	1	2				1					1	
Gripopterygiidae	1	3	4	4	2	1			1			3
Veliidae	1	3	1			1	1		3			2
Gelastocoridae										1		
Corixidae	7	3	10	2			10	10	10			
Notonectidae	1	3			3	8	3	2				
Pleidae		2	1									
Haliplidae			1		1							
Dytiscidae	2	1	3	4	10	4		2	7			
Hydrochidae							1				1	
Hydrophilidae	1		1			1						
Scirtidae						1						
Elmidae											1	
Dixidae	4	3	1		2	6	4	2	1	1		1
Chironomidae-Chironominae	2			3	2			1	1	3	3	1
Chironomidae-Tanypodinae	10	7	9	10	10	3	2	4	4	3	9	6
Ceratopogonidae	1			1	1				1			
Simuliidae	2									6		2
Tipulidae	1			1	1							
Hydroptilidae	1	10	10	9	1			1	1		2	4
Hydropsychidae	1	1	1	1						1		
Ecnomidae	2	2			1			1		2		1
Calamoceratidae											3	
Leptoceridae		3			2	1					8	4

Note: a maximum of 10 individuals were counted per sample

Wangcol Creek EMP Spring 2012 to Spring 2021

APPENDIX

G

BIOTIC INDICES RAW DATA

Cardno
Shaping the Future

Date	AUSRIVAS Season	No. of Taxa	No. of EPT Taxa	OE50 Taxa Score	AUSRIVAS Band	SIGNAL2 Score
NCR1						
8 Nov 2012	Spring 2012 Rep 1	24	2	0.75	B	3.3
12 Dec 2013	Spring 2013 Rep 1	14	2	0.48	C	3.5
12 Dec 2013	Spring 2013 Rep 2	25	4	0.76	B	3.9
19 Nov 2014	Spring 2014 Rep 1	25	3	0.95	A	3.9
14 Dec 2015	Spring 2015 Rep 1	22	3	0.57	B	3.9
14 Dec 2015	Spring 2015 Rep 2	18	1	0.57	B	3.2
1-2 Dec 2016	Spring 2016 Rep 1	22	4	0.85	A	3.6
1-2 Dec 2016	Spring 2016 Rep 2	21	3	0.72	B	4.2
11 Dec 2018	Spring 2018 Rep 1	20	4	0.75	B	3.9
11 Dec 2018	Spring 2018 Rep 2	23	4	0.63	B	3.9
11 Dec 2018	Spring 2018 Rep 3	14	1	0.47	C	3.3
18 Nov 2020	Spring 2020 Rep 1	17	2	0.47	C	3.1
18 Nov 2020	Spring 2020 Rep 2	18	4	0.36	C	3.2
18 Nov 2020	Spring 2020 Rep 3	13	2	0.38	C	3.1
16 Nov 2021	Spring 2021 Rep 1	27	7	0.85	A	3.9
16 Nov 2021	Spring 2021 Rep 2	21	7	0.66	B	4.1
16 Nov 2021	Spring 2021 Rep 3	17	4	0.38	C	4.0
NCR2						
8 Nov 2012	Spring 2012 Rep 1	29	6	1.04	A	4.0
12 Dec 2013	Spring 2013 Rep 1	20	4	0.57	B	3.7
12 Dec 2013	Spring 2013 Rep 2	23	5	0.94	A	4.0
19 Nov 2014	Spring 2014 Rep 1	21	2	0.86	A	3.9
14 Dec 2015	Spring 2015 Rep 1	17	2	0.43	C	3.4
14 Dec 2015	Spring 2015 Rep 2	19	3	0.77	B	4.3
1-2 Dec 2016	Spring 2016 Rep 1	14	6	0.52	B	4.9
1-2 Dec 2016	Spring 2016 Rep 2	18	2	0.43	C	3.5
11 Dec 2018	Spring 2018 Rep 1	18	5	0.69	B	3.9
11 Dec 2018	Spring 2018 Rep 2	22	5	0.78	B	4.1
11 Dec 2018	Spring 2018 Rep 3	15	3	0.78	B	4.0
18 Nov 2020	Spring 2020 Rep 1	16	3	0.52	B	3.5
18 Nov 2020	Spring 2020 Rep 2	13	1	0.52	B	3.7
18 Nov 2020	Spring 2020 Rep 3	19	4	0.77	B	4.4
16 Nov 2021	Spring 2021 Rep 1	17	6	0.66	B	4.4
16 Nov 2021	Spring 2021 Rep 2	18	7	0.81	B	4.5
16 Nov 2021	Spring 2021 Rep 3	15	4	0.66	B	4.3
NCR3						
14 Dec 2015	Spring 2015 Rep 1	25	3	0.85	A	3.2
14 Dec 2015	Spring 2015 Rep 2	19	1	0.66	B	2.9
1-2 Dec 2016	Spring 2016 Rep 1	20	0	0.47	C	4.2
1-2 Dec 2016	Spring 2016 Rep 2	13	3	0.57	C	4.1
11 Dec 2018	Spring 2018 Rep 1	12	1	0.38	C	3.8
11 Dec 2018	Spring 2018 Rep 2	10	0	0.38	C	3.2

Date	AUSRIVAS Season	No. of Taxa	No. of EPT Taxa	OE50 Taxa Score	AUSRIVAS Band	SIGNAL2 Score
11 Dec 2018	Spring 2018 Rep 3	20	3	0.85	A	3.9
18 Nov 2020	Spring 2020 Rep 1	8	1	0.28	C	4.5
18 Nov 2020	Spring 2020 Rep 2	12	2	0.19	D	3.1
18 Nov 2020	Spring 2020 Rep 3	14	1	0.19	D	3.1
16 Nov 2021	Spring 2021 Rep 1	12	1	0.36	C	4.1
16 Nov 2021	Spring 2021 Rep 2	14	3	0.50	C	4.0
16 Nov 2021	Spring 2021 Rep 3	14	3	0.67	B	4.5
A16						
8 Nov 2012	Spring 2012 Rep 1	24	5	0.91	A	3.9
12 Dec 2013	Spring 2013 Rep 1	20	8	0.73	B	5.0
19 Nov 2014	Spring 2014 Rep 1	22	4	0.73	B	4.6
14 Dec 2015	Spring 2015 Rep 1	13	1	0.52	B	3.6
14 Dec 2015	Spring 2015 Rep 2	21	6	0.73	B	4.4
1-2 Dec 2016	Spring 2016 Rep 1	16	5	0.84	A	3.7
1-2 Dec 2016	Spring 2016 Rep 2	23	5	0.63	B	3.9
11 Dec 2018	Spring 2018 Rep 1	19	7	0.64	B	4.4
11 Dec 2018	Spring 2018 Rep 2	7	2	0.36	C	4.7
11 Dec 2018	Spring 2018 Rep 3	11	3	0.36	C	4.1
18 Nov 2020	Spring 2020 Rep 1	17	6	0.50	C	4.6
18 Nov 2020	Spring 2020 Rep 2	16	4	0.53	B	4.5
18 Nov 2020	Spring 2020 Rep 3	14	3	0.53	B	4.1
16 Nov 2021	Spring 2021 Rep 1	10	3	0.36	C	5.2
16 Nov 2021	Spring 2021 Rep 2	19	6	0.82	B	4.5
16 Nov 2021	Spring 2021 Rep 3	18	7	0.82	B	4.6

EPT = Ephemeroptera, Plecoptera and Trichoptera

APPENDIX H

RESULTS OF PERMANOVAS

Cardno
Shaping the Future

A) Comparison between NCR1 and NCR2 sampled in spring of 2013, 2015, 2016, 2018 and 2020:

i) No. of Taxa

Source of Variation	df	SS	MS	*F*	*P*
Site	1	32.86	32.86	2.491	0.131
Survey	6	94.96	15.83	1.200	0.357
Survey x Site	6	52.42	8.74	0.662	0.674
Residual	18	237.50	13.19		
Total	31	416.88			

ii) No. of EPT Taxa

Source of Variation	df	SS	MS	*F*	*P*
Site	1	0.89	0.89	0.400	0.537
Survey	**6**	**44.97**	**7.49**	**3.359**	**0.021**
Survey x Site	6	4.55	0.76	0.340	0.915
Residual	18	40.17	2.23		
Total	31	91.22			

iii) SIGNAL2 Score

Source of Variation	df	SS	MS	*F*	*P*
Site	**1**	**0.72**	**0.72**	**4.781**	**0.043**
Survey	6	1.68	0.28	1.868	0.137
Survey x Site	6	0.33	0.06	0.371	0.893
Residual	18	2.71	0.15		
Total	31	5.81			

iv) OE50 Taxa Score

Source of Variation	df	SS	MS	*F*	*P*
Site	1	0.01	0.01	0.464	0.506
Survey	6	0.18	0.03	1.590	0.207
Survey x Site	6	0.22	0.04	1.939	0.124
Residual	18	0.34	0.02		
Total	31	0.76			

v) Assemblage

Source of Variation	df	SS	MS	*F*	*P*
Site	**1**	**3892**	**3892**	**3.764**	**0.001**
Survey	**6**	**12607**	**2101**	**2.032**	**<0.001**
Survey x Site	6	5007	834	0.807	0.807
Residual	18	18611	1034		
Total	31	40621			

B) Comparison among NCR12, NCR2, NCR3 and A16 sampled in spring of 2015, 2016, 2018, 2020 and 2021

i) No. of Taxa

Source of Variation	df	SS	MS	*F*	*P*
Site	3	129.01	43.00	2.886	0.053
Survey	4	127.54	31.89	2.140	0.099
Survey x Site	12	165.32	13.78	0.925	0.536
Residual	32	476.83	14.90		
Total	51	927.75			

ii) No. of EPT Taxa

Source of Variation	df	SS	MS	*F*	*P*
Site	**3**	**51.71**	**17.24**	**5.995**	**0.002**
Survey	**4**	**36.94**	**9.23**	**3.212**	**0.026**
Survey x Site	12	15.22	1.27	0.441	0.928
Residual	32	92.00	2.88		
Total	51	200.52			

iii) SIGNAL2 Score

Source of Variation	df	SS	MS	*F*	*P*
Site	**3**	**3.14**	**1.05**	**6.233**	**0.002**
Survey	**4**	**3.28**	**0.82**	**4.895**	**0.004**
Survey x Site	12	2.09	0.17	1.040	0.441
Residual	32	5.37	0.17		
Total	51	14.53			

iv) OE50 Taxa Score

Source of Variation	df	SS	MS	*F*	*P*
Site	3	0.14	0.05	1.707	0.186
Survey	**4**	**0.46**	**0.12**	**4.120**	**0.009**
Survey x Site	12	0.45	0.04	1.337	0.247
Residual	32	0.90	0.03		
Total	51	2.00			

v) Assemblage

Source of Variation	df	SS	MS	*F*	*P*
Site	3	19421	6474	6.030	RED
Survey	4	16268	4067	3.788	RED
Survey x Site	**12**	**19484**	**1624**	**1.512**	**0.002**
Residual	32	34355	1074		
Total	51	90465			

RED = term redundant due to significant interaction term

C) Comparison among NCR12, NCR2, NCR3 and A16 sampled in spring of 2015, 2016, 2018, 2020 and 2021 – Pairwise Tests of Assemblage Structure.

i) Assemblage – Pairwise Tests – Surveys

NCR1	t	P (MC)	NCR2	t	P (MC)
Spr15, Spr16	1.204	0.328	Spr15, Spr16	1.176	0.338
Spr15, Spr18	1.188	0.291	Spr15, Spr18	1.129	0.329
Spr15, Spr20	1.461	0.178	Spr15, Spr20	1.280	0.249
Spr15, Spr21	1.858	0.091	Spr15, Spr21	1.231	0.271
Spr16, Spr18	1.095	0.362	Spr16, Spr18	0.999	0.437
Spr16, Spr20	1.366	0.205	Spr16, Spr20	1.147	0.318
Spr16, Spr21	1.332	0.228	Spr16, Spr21	1.158	0.309
Spr18, Spr20	1.480	0.134	Spr18, Spr20	1.010	0.421
Spr18, Spr21	1.649	0.085	Spr18, Spr21	0.974	0.443
Spr20, Spr21	1.455	0.153	Spr20, Spr21	0.980	0.428
NCR3	**t**	**P (MC)**	**A16**	**t**	**P (MC)**
Spr15, Spr16	1.595	0.182	Spr15, Spr16	1.356	0.244
Spr15, Spr18	1.802	0.086	Spr15, Spr18	1.515	0.167
Spr15, Spr20	**2.872**	**0.022**	**Spr15, Spr20**	**2.056**	**0.056**
Spr15, Spr21	**2.872**	**0.021**	**Spr15, Spr21**	**2.076**	**0.049**
Spr16, Spr18	1.318	0.227	Spr16, Spr18	1.216	0.285
Spr16, Spr20	2.036	0.061	Spr16, Spr20	1.169	0.305
Spr16, Spr21	1.851	0.086	Spr16, Spr21	1.535	0.139
Spr18, Spr20	1.858	0.053	Spr18, Spr20	1.393	0.158
Spr18, Spr21	1.279	0.218	Spr18, Spr21	1.220	0.260
Spr20, Spr21	**2.114**	**0.037**	Spr20, Spr21	1.355	0.172

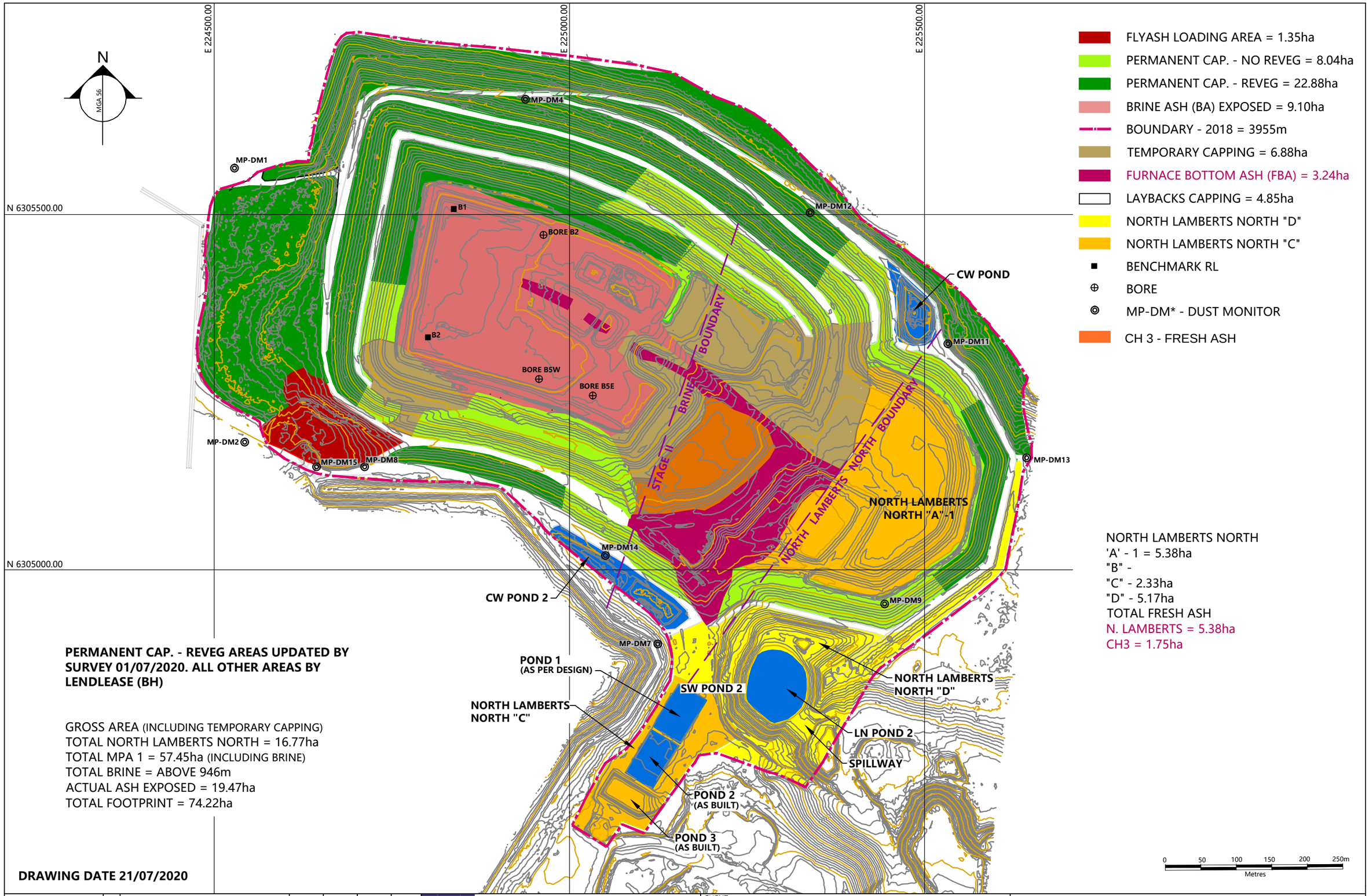
ii) Assemblage – Pairwise Tests - Sites

Spr15	t	P (MC)	Spr16	t	P (MC)
NCR1, NCR2	1.313	0.290	NCR1, NCR2	1.058	0.412
NCR1, NCR3	2.035	0.100	NCR1, NCR3	0.916	0.512
NCR1, A16	2.658	0.072	NCR1, A16	1.688	0.141
NCR2, NCR3	1.627	0.190	NCR2, NCR3	1.037	0.423
NCR2, A16	1.635	0.167	NCR2, A16	1.115	0.384
NCR3, A16	2.768	0.055	NCR3, A16	1.286	0.272
Spr18	**t**	**P (MC)**	**Spr20**	**t**	**P (MC)**
NCR1, NCR2	1.169	0.300	NCR1, NCR2	1.147	0.311
NCR1, NCR3	0.926	0.494	NCR1, NCR3	1.732	0.074
NCR1, A16	**2.018**	**0.039**	**NCR1, A16**	**2.001**	**0.037**
NCR2, NCR3	1.366	0.167	NCR2, NCR3	1.679	0.087
NCR2, A16	1.460	0.137	**NCR2, A16**	**1.893**	**0.044**
NCR3, A16	1.966	0.034	NCR3, A16	2.401	0.017
Spr21	**t**	**P (MC)**			
NCR1, NCR2	1.117	0.333			
NCR1, NCR3	1.444	0.135			
NCR1, A16	1.594	0.099			
NCR2, NCR3	1.566	0.125			
NCR2, A16	1.247	0.241			
NCR3, A16	1.764	0.068			

Monte-Carlo Simulation (MC) used when number of unique permutations <100

Appendix E Lamberts North Ash Placement Project - Annual Water Quality Monitoring Report 2021– 2022

Appendix F Mt Piper Ash Repository & Lamberts North Rehabilitation Plan



PERMANENT CAP. - REVEG AREAS UPDATED BY SURVEY 01/07/2020. ALL OTHER AREAS BY LENDLEASE (BH)

GROSS AREA (INCLUDING TEMPORARY CAPPING)
TOTAL NORTH LAMBERTS NORTH = 16.77ha
TOTAL MPA 1 = 57.45ha (INCLUDING BRINE)
TOTAL BRINE = ABOVE 946m
ACTUAL ASH EXPOSED = 19.47ha
TOTAL FOOTPRINT = 74.22ha

NORTH LAMBERTS NORTH
'A' - 1 = 5.38ha
"B" -
"C" - 2.33ha
"D" - 5.17ha
TOTAL FRESH ASH
N. LAMBERTS = 5.38ha
CH3 = 1.75ha

DRAWING DATE 21/07/2020

NOTES:

AREAS BY LENDLEASE

Disclaimer:
CEH Survey Pty. Ltd. do not guarantee the accuracy or completeness of this plan and are not liable for any loss or damage which the user may suffer resulting from the use of this plan.

No.	AMENDMENT	DATE	DRAWN	CHECK'D	AUTH'D

CEH SURVEY
CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
"Astrolabe" 1 Rutherford Lane, LITHGOW 2790
ABN: 68 056 544 551 Email: survey@ceh.com.au Office: (02) 6351 2281 Website: www.ceh.com.au

SCALE: 1 : 5000 (A3)

CLIENT: LEND LEASE SERVICES PTY LTD

LOCALITY: MOUNT PIPER

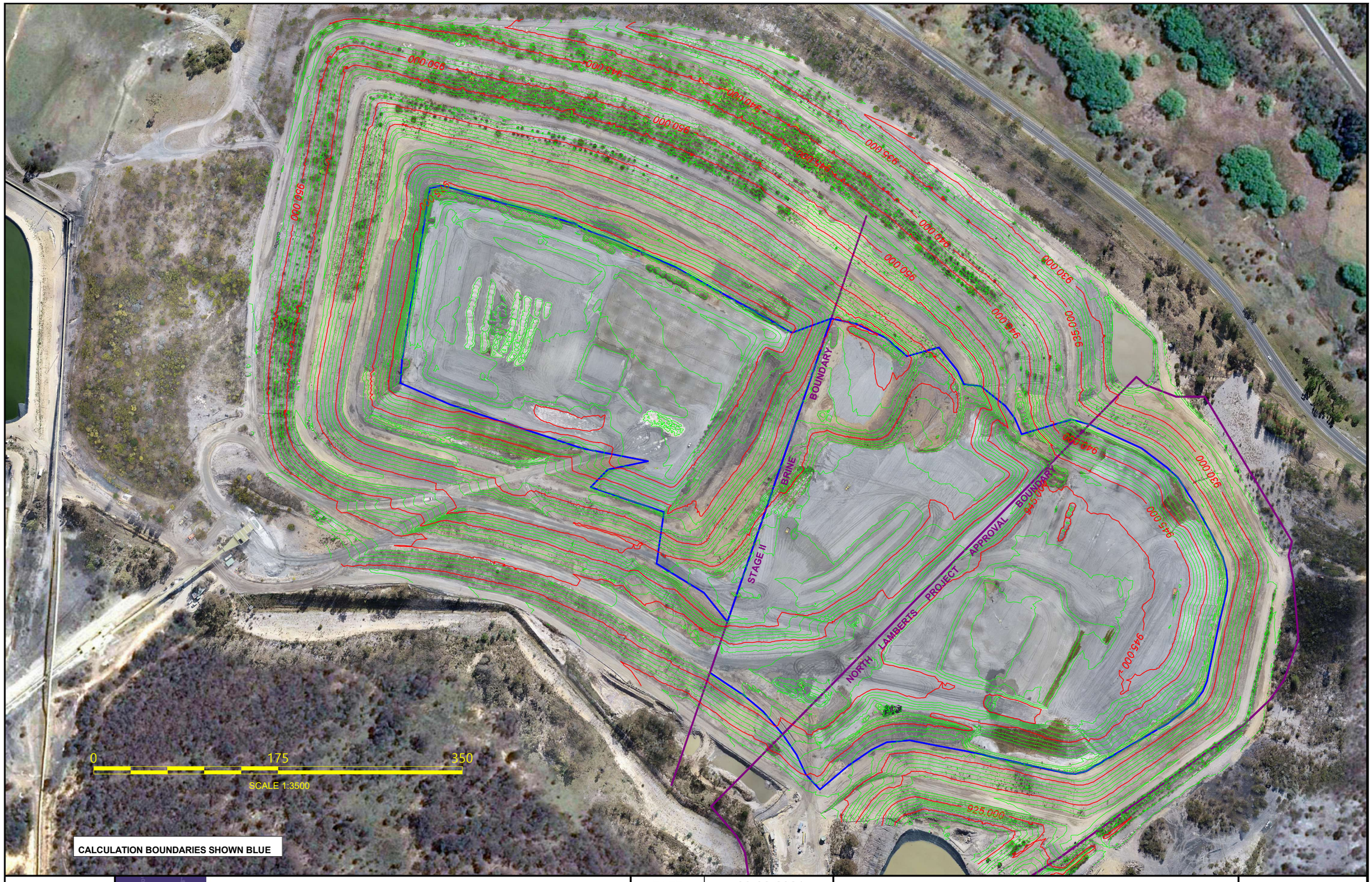
LGA: LITHGOW

PLAN: **LEND LEASE SERVICES PTY LTD**
MOUNT PIPER ASH EMPLACEMENT
SURVEY: FEBRUARY 2020

SURVEYOR:	DRAWN:	DATE:	PLAN No.
T.H./B.N./L.B.	G.M./D.M.	21-07-2020	MPA0220 (As surveyed)

CEH Job No. - 3/841

PLAN No. MPA0220 AS SURVEY



CEH SURVEY

CONSULTING LAND, ENGINEERING AND MINING SURVEYORS

"Astrolabe" 1 Rutherford Lane,
LITHGOW 2790

ABN: 68 056 544 551 Office: (02) 6351 2281
Email: survey@ceh.com.au Website: www.ceh.com.au

DATE	09-08-2021
AMENDED	
SURVEYOR	TH/BN
DRAWN	TH
CHECKED	

LEND LEASE SERVICES PTY. LTD.

MOUNT PIPER - ASH PLACEMENT
SURVEY : 9th AUGUST 2021

SCALE - 1:3500 (A3) DATUM: MGA (ZONE 56)

DRAWING No:

MPA0821
(as surveyed)

CCAD6 JOB & DWG:
MPA0821 - MPA0821 as survey

Appendix G Annual EnergyAustralia NSW Community Sponsorships and Donations

Sponsorship Contributions – 1 September 2021 – 31 August 2022

Date	Name	Project	Type
Dec 21	Portland Business Association	Local Event	Sponsorship
Dec 21	Capertee Public School	EnergyAustralia Community Award	Sponsorship
Dec 21	Cooerwull Public School	EnergyAustralia Community Award	Sponsorship
Dec 21	Cullen Bullen Public School	EnergyAustralia Community Award	Sponsorship
Dec 21	Hampton Public School	EnergyAustralia Community Award	Sponsorship
Dec 21	Meadow Flat Public School	EnergyAustralia Community Award	Sponsorship
Dec 21	St Patricks School	EnergyAustralia Community Award	Sponsorship
Dec 21	Wallerawang Public School	EnergyAustralia Community Award	Sponsorship
Dec 21	Zig Zag Public School	EnergyAustralia Community Award	Sponsorship
Dec 21	Movember	Men's mental health	Donation
Nov 21	Barton Park Giant Tree Arboretum	Assistance with projects at Arboretum	Sponsorship
Nov 21	Lithgow Public School	EnergyAustralia Community Award	Sponsorship
Nov 21	Portland Central School	EnergyAustralia Community Award	Sponsorship
Nov 21	St Josephs School Portland	EnergyAustralia Community Award	Sponsorship
Oct 21	Lithgow City Council	Lithglow	Sponsorship
Oct 21	Lives Lived Well	Find Your Way Project (Mental Health)	Grant
Oct 21	Mountains Youth Services Team	Outdoor Explore Program – Lithgow High	Grant
Oct 21	Thrive Services	Thrive Nutrition Program	Grant
Sept 21	Lithgow High School	EnergyAustralia Community Award	Sponsorship
Sept 21	Steptember	Fundraiser for Cerebral Palsy	Donation
August 22	St Josephs School	Hire of Amusement Ride Spring Fete	Donation
August 22	Dry July	Fundraising event	Donation
Aug 22	Barton Park Giant Tree Arboretum	Assistance with projects	Sponsorship
Aug 22	Rydal Show Society	Annual Show	Sponsorship
Aug 22	La Salle Academy Lithgow	EnergyAustralia Community Award	Sponsorship
July 22	Biggest Morning Tea	Cancer fundraising event	Donation
June 22	Portland Foundations	Community Event	Sponsorship
June 22	Lithgow District Model Railway Club	Purchase Mower	Donation
June 22	Wallerawang Memorial Men's Shed	Purchase Band Saw	Donation
June 22	Lithgow High School	Excursion to Sydney Bangarra Dance Theatre	Donation
May 22	Sea Bees	Fishing Event – Lake Lyell	Sponsorship
May 22	Portland Pool	Purchase Maintenance Equipment	Donation

April 22	Ironfest	Major community event for 2023	Sponsorship
March 22	Lithgow City Council	Lithglow	Sponsorship
March 22	Portland Art Show	Local art exhibition	Sponsorship
March 22	Lithgow Show Society	Annual show	Sponsorship

Appendix H Complaints Register

Complaints No.	Date Received	Nature (Enquiry / Notification / Complaint)	Issue(s)	EA NSW Response	Corrective Actions Required	Actions Completed	
						Y / N	Date
No complaints received.							