2017

MT Piper Ash Placement Project, Lamberts North
Annual Environmental Management Report

EnergyAustralia
LIGHT THE WAY

Lamberts North Annual Environment Management Report

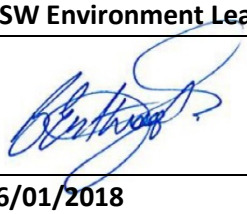
Name of Operation	**Mt Piper Ash Placement Lamberts North**
Name of Operator	**EnergyAustralia NSW**
Development Consent / Project Approval #	**09_0186**
Environment Protection Licence (EPL) #	**13007**
Water Access Licence (WAL) #	**10AL116411**
Water Supply and Water Use Approval #	**10CA117220**
AEMR start date	**1st September 2016**
AEMR end date	**31st August 2017**

I, Ben Eastwood, certify that this report is a true and accurate record of the compliance status of Mt Piper Ash Placement – Lamberts North for the period 1st September 2016 to 31st August 2017 and that I am authorised to make this statement on behalf of EnergyAustralia NSW.

Note:

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

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

Name of authorised reporting officer	**Ben Eastwood**
Title of authorised reporting officer	**NSW Environment Lead**
Signature of authorised reporting officer	
Date	**16/01/2018**

This report may be cited as:

EnergyAustralia NSW (2017) Lamberts North Annual Environmental Management Report September 2016 – August 2017. EnergyAustralia NSW, NSW Australia.

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1. Summary of compliance

EnergyAustralia (EA) owns and operates Lamberts North Ash Repository in accordance with Project Approval 09_0186 which was granted by the Minister for Planning on 12 February 2012. The Lamberts North Ash Repository is located approximately 18 kilometres north-west of the city of Lithgow and is situated adjacent to the Mount Piper Ash Repository and 700 meters to the east of the Mt Piper Power Station.

Built over two stages in 1992 and 1993, the Mt Piper Power Station comprises of two 700 MW coal-fired steam turbine generators which have the capacity to meet the energy needs of approximately 1.18 million homes in New South Wales every year. Mt Piper Power Station is fuelled using black coal sourced from mines in the local area. The power station's furnaces are designed to utilise the characteristics of the locally available coal to improve its efficiency and help keep the power station's emissions below statutory requirements. Ash is produced during coal combustion by the transformation of the non-combustible mineral matter present in coal.

The Lamberts North Annual Environment Management Report (AEMR) has been prepared pursuant to Schedule 2, Condition E21 of the Project Approval 09_0186. The AEMR has been prepared in accordance with the NSW Government's Post-approval requirements for State Significant Mining Developments Annual Review Guideline dated October 2015.

A summary of the Lamberts North Repository compliance achieved during the reporting period is provided in Table 1. Any non-compliance during the reporting period is briefly detailed in Table 2 with an extended review of compliance with the Conditions of Approval (CoA) presented in Appendix A.

Table 1 Statement of compliance

Were all conditions of the relevant approval(s) complied with	
Project Approval #09_0186	~~**YES**~~**/**NO
Environment Protection License (EPL) #13007	**YES/**~~NO~~
Water Access License (WAL) #10AL116411	**YES/**~~NO~~

Table 2 Details on Non-Compliance

Relevant Approval	Condition No.	Condition Summary	Compliance Status	Comment	Section where addressed within AEMR
Noise Management Monitoring Plan (NMMP)	Section 6.3.5.5	Review NMMP every 3 years	Non Compliant	The audit found that a review of the NMMP after three years of operation had not been conducted.	10,11
Noise Management Monitoring Plan (NMMP)	Section 6.3.4	Noise Management and Mitigation	Non Compliant	The audit found that sound output from plant and equipment has not been compared against typical noise levels presented in Australian Standard 2436 Guide to noise and vibration control	10,11
Groundwater Water Management Monitoring Plan (GMMP)	Section 6.4.2	Groundwater Monitoring Program	Non Compliant	Not including the monitoring results for bores D15, D16, D17 and D18 in the past annual groundwater monitoring reports	10,11
Groundwater Water Management Monitoring Plan (GMMP)	Section 6.4.3	Groundwater Monitoring Program	Non Compliant	There was a 2 meter decrease in water levels at bore D19 which should be investigated as required by the GMMP	10,11
Groundwater Water Management Monitoring Plan (GMMP)	Section 6.4.3	Groundwater Monitoring Program	Non Compliant	A Contractor that samples periodically has procedures for groundwater that may not to be compliant to standards detailed in the GMMP and need to be reviewed.	10,11

In assessing compliance with CoAs, the key for compliance assessment provided in Table 3 was used, in accordance with the NSW Government's Independent Audit Guideline.

Table 3 Compliance Status Key

Risk Level	Colour Code	Description
High		Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.
Medium		Non-compliance with: • Potential for serious environmental consequences, but is unlikely to occur; or • Potential for moderate environmental consequences, but is likely to occur.
Low		Non-compliance with: • Potential for moderate environmental consequences, but is unlikely to occur; or • Potential for low environmental consequences, but is likely to occur.
Administrative non-compliance		Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions).
Compliant		The intent and all elements of the requirement of the regulatory approval have been complied with.

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

- Noise from the Lamberts North Ash Repository site was inaudible at sensitive receivers during the reporting period.
- Air quality monitoring results were well below the OEMP assessment criteria for PM_{10} annual average of 30ug/m^3 and 24 hour maximum of 50 ug/m^3.
- There were no surface water discharge events during the reporting period.
- Water monitoring results were compliant with Environment Protection Licence
- There were no incidents that caused or threatened material harm to the environment.

2. Introduction

2.1 Background

The Mt Piper Power Station comprises of two 700 MW coal-fired steam turbine generators, built over two stages in 1992 and 1993. The power station is located approximately 17 km northwest of Lithgow and five kilometres east of Portland (Figure 1). In 1990 Lithgow City Council granted Delta Electricity (now EnergyAustralia NSW) consent for ash placement in the former Western Main open cut mine void adjacent to the power station. The ash placement area is in close proximity to the Mt Piper Power Station and is identified as Area 1 (Figure 2) in the Mt Piper Power Station Ash Placement Project Environment Assessment (SKM, 2010). EnergyAustralia acquired Mount Piper Power Station and associated land holdings and infrastructure from the state owned Delta Electricity in September 2013.

Ash from the power station is placed in a dry ash repository, and approximately 680,000 m3 of ash has been placed in this area on an annual basis. Based on the rate of ash emplacement, it was anticipated that this area would reach capacity by 2015. A proposal to create a new ash placement area in the Lamberts Gully area was submitted to the Department of Planning and Infrastructure (now Department of Planning and Environment) in 2009 and was approved in February 2012. The approved emplacement area includes former coal workings, and was also used for coal washery operations by the previous landholder.

Subsequent to Project Approval, Delta Electricity proposed to increase the area of ash placement within the Northern section of the Lamberts Gully site and to change the direction and location of the drainage line proposed to take clean water from the south west boundary (SKM, 2012). At this point the Project was essentially divided into two parts - Lamberts North and Lamberts South; this was in response to the uncertainty of Lamberts South becoming available in the future for ash placement due to land ownership issues outside Delta Electricity's control.

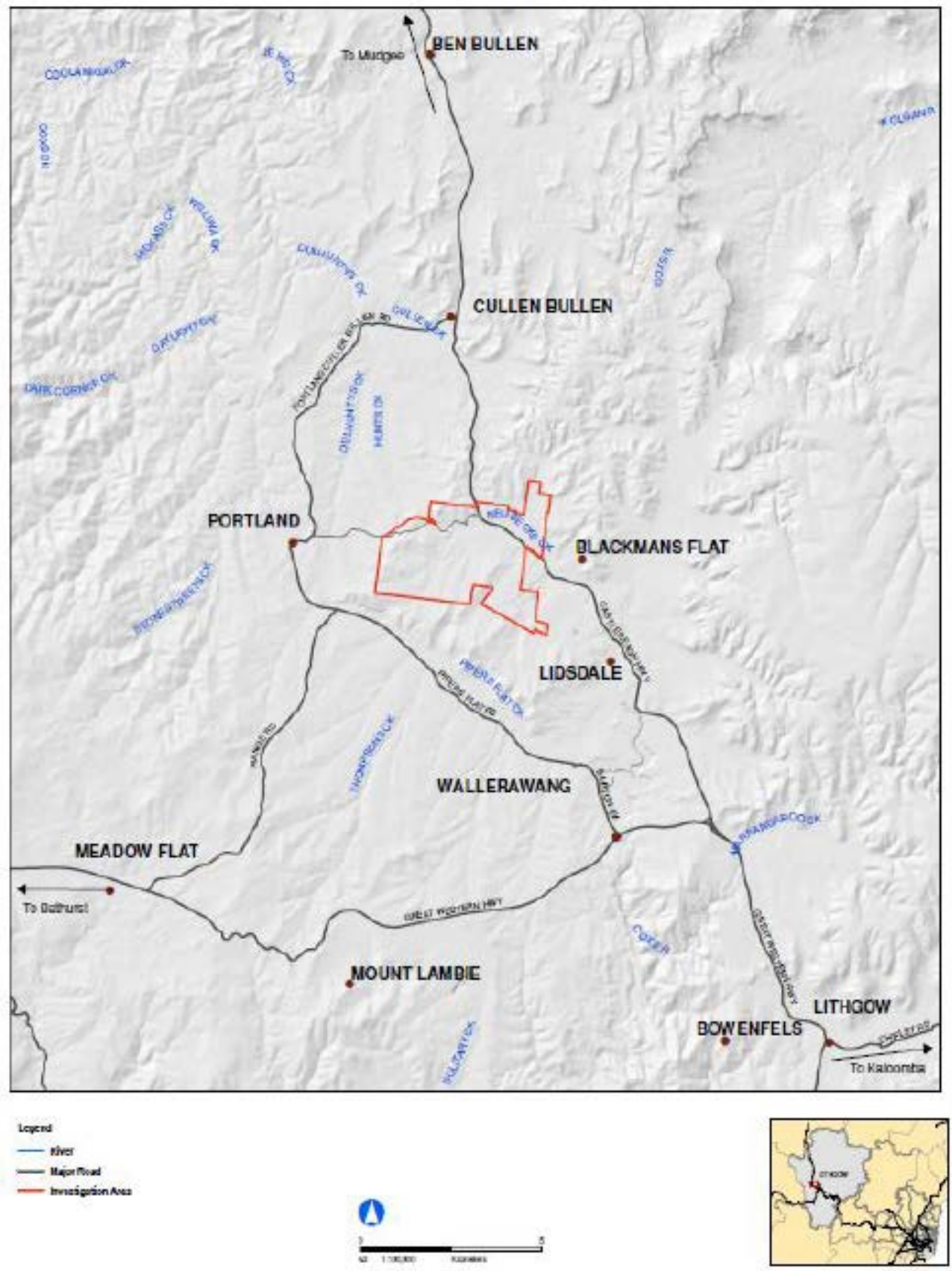

Figure 1 Regional context map

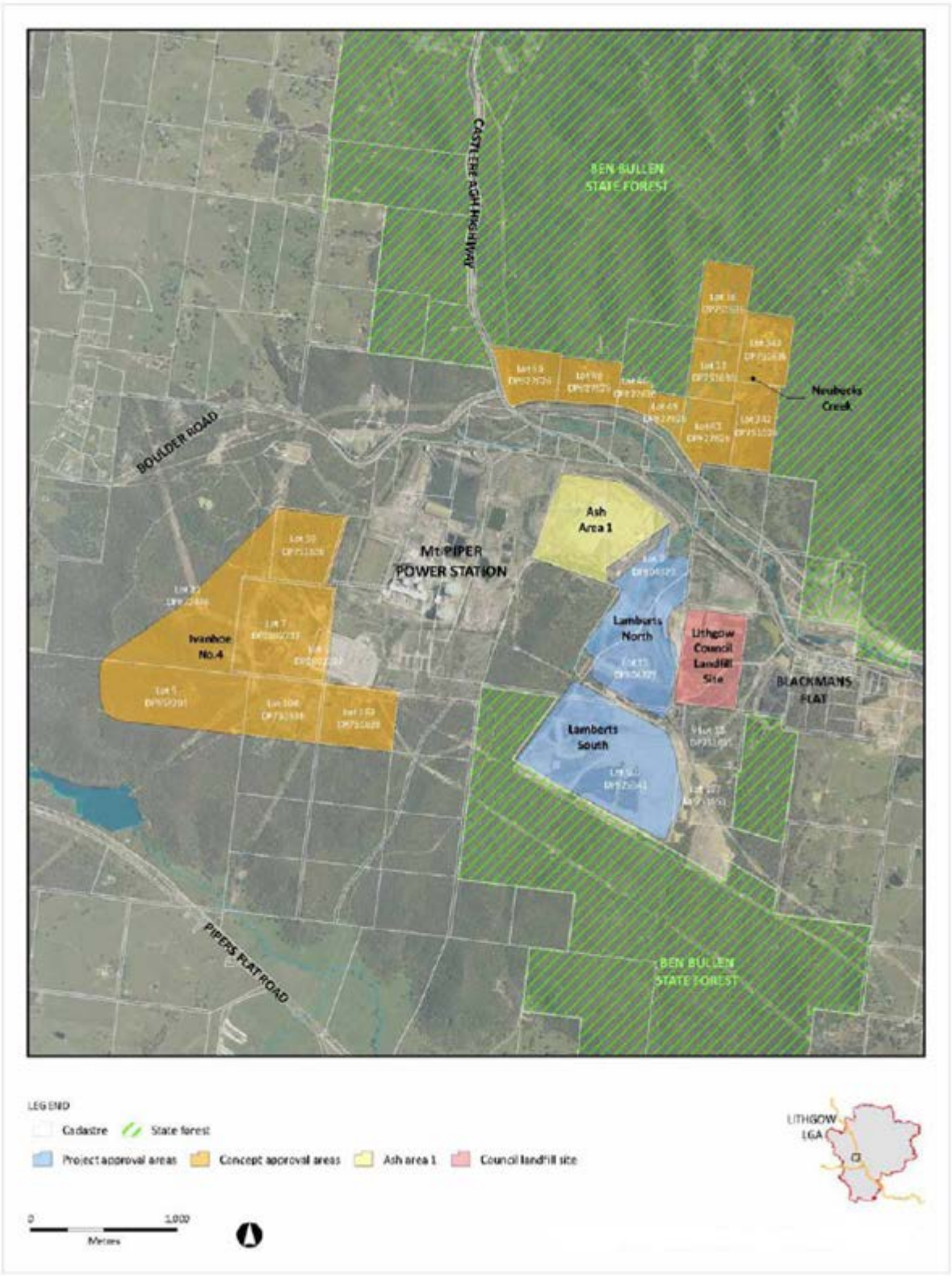

Figure 2 Site location and land tenure

2.2 Purpose of the AEMR

The Project Approval contains a number of conditions that need to be complied with by EnergyAustralia NSW, as the proponent, at different stages of the Project (Section 3). Condition E21 of the Project Approval (DPI, 2012) requires that EnergyAustralia NSW prepare and submit an Annual Environmental Management Report (AEMR) for the approval of the Secretary (formerly the Director-General), Department of Planning and Environment (DP&E).

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

- Review of project performance against the Operation Environmental Management Plan (OEMP) (Conditions of Approval (CoA) D2) and the Conditions of this Approval;
- Details of compliance with CoAs;
- A copy of the Complaints Register (refer to CoA B11) for the preceding twelve-month period (exclusive of personal details), and details of how these complaints were addressed and resolved;
- Identification of any circumstances in which the environmental impacts and performance of the project during the 12 month period have not been generally consistent with the environmental impacts and performance predicted in the documents listed under CoA A1, with details of additional mitigation measures applied to the project to address recurrence of these circumstances;
- Results of all environmental monitoring required under CoA, including interpretations and discussion by a suitably qualified person; and
- A list of all occasions in the preceding twelve-month period when environmental goals/objectives/impact assessment criteria for the project have not been achieved, indicating the reason for failure to meet the criteria and the action taken to prevent recurrence of that type of failure.

This AEMR has been prepared in order to satisfy Condition E21 of the Project Approval 09_0186 (DPI, 2012). This report covers the operations, environment and community performance of the Lamberts North Ash Repository from September 2016 to August 2017 (reporting period).

The report has been prepared in accordance with the NSW Government's *Post-approval requirements for State significant mining developments Annual Review Guideline.*

2.3 Project contacts

The contact details for Lamberts North Ash Repository are listed in Table 4

Table 4 Lamberts North Ash Placement Contact

Contact Person	Position	Telephone
Dr Coleen Milroy	Lamberts North Environment Representative	(02) 63548111

3. Consents, Leases and Licences

This AEMR has been prepared to address the relevant conditions of the project approval and the Statement of Commitments which have been triggered during the reporting period. The operation of the Lamberts North project must comply with the following statutory requirements (Table 5):

Table 5 Key Consents, Leases, Licenses and Permits

Approval/Lease/Licence	Issue Date	Expiry Date	Details/Comments
Project Approval 09_0186	16 February 2012	-	Granted by Minister for DoP, Section 75J of the EP&A Act.
Environment Protection License (EPL) No. 13007	29 June 2015	01 Jan 2020 (Review Date)	EPL held by EnergyAustralia NSW for Mt Piper Power Station Power Station
Water Access Licence No. 27428	28 February 2014	-	Granted by DPI Water, under the Water Management Act 2000
Water Supply Work and Water Use Approval 10CA117220	28 February 2014	-	Granted by DPI Water, under the Water Management Act 2000

There have been no changes to the approvals during the reporting period. A summary of compliance against the applicable statutory requirements is provided in Section 1.

3.1 Operations Environmental Management Plan

The Operations Environmental Management Plant (OEMP) provides the framework to manage the environmental aspects associated with the operation of Lamberts North. The OEMP (CDM Smith, 2013) 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 Statement of Commitments (SoC) presented in the Submissions Report (SKM, 2011).

The scope of the OEMP covers teh operations involving the movement and placement of ash from Mt Piper Power Station (MTPPS) to Lamberts North Ash Repository. Performance against the OEMP is provided generally in Sections 6 - 10.

3.2 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) for Lamberts North was developed in consultation with EnergyAustralia NSW's Western Environment Section and approved by the then DP&I in November 2012. The CEMP meets the requirements of CoA B4, providing the framework to manage the environmental aspects associated with construction works during Lamberts North operations. The CEMP has been written to address the requirements associated with the project as stipulated in the relevant provisions of the Project Approval 09_0186 issued by the DP&I (CDM Smith, 2012a).

4. Operations during reporting period

All ash placement operations for Mt Piper Power Station, including Lamberts North Ash Repository, are undertaken by a contracted specialist in ash placement. Lend Lease is the current service provider for EnergyAustralia NSW in all aspects of ash and dust management. The Lamberts North ash repository is currently managed under an 'operate and maintain' contract.

A summary of operations at Lamberts North within the reporting period can be found in Table 6.

Table 6 Operations Summary

Activity	Previous reporting period	This reporting period	Next reporting period*
Ash delivered to site (T)	133,342	302,926	300,000
Total ash produced at Mt Piper (T)	745,835	830,937	800,000
Ash reused for cement production (T)	270,726	219,727	220,000
Total reclaimed furnace bottom ash and fly ash (T)	2038	6086	2000
Total Ash Footprint (ha)	8.1 ha	12.2 ha	13 ha
Area of repository capped (ha)	Nil	Nil	<1 (not at height yet)

*Figures are 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 Condition 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 Mt Piper Power Station and the proposed Mt Piper Power station 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 Mt Piper Power Station 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 EnergyAustralia 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 Mt Piper Power Station to allow for the ash to be stored.

Under these circumstances, EnergyAustralia NSW is required to notify the EPA, formerly DECC, and nearby sensitive receivers prior to any emergency ash haulage or placement operations outside of the '*normal operation*' hours, and the Director-General of the DP&I within 7 days after the emergency operations have occurred.

No abnormal or emergency operating conditions occurred during the reporting period that required activities to be undertaken outside of the normal outside the normal operating hours during the reporting period.

4.3 Next reporting period

For the next reporting period, the following activities are expected to occur:

- Continue the progressive construction of the 937 m external layback for Lamberts North.
- Establish additional water storage ponds for managing surface water runoff.

5. Actions required from previous AEMR review

In a letter dated 1 February 2017, the DP&E stated that with regards to the 2015-16 Annual Environmental Management Report, the Department is generally satisfied that it adequately addresses the relevant requirements of the approval. Fifteen actions were requested by DP&E which are detailed in Table 7. A response to these actions was submitted to the DP&E in a letter dated 28 February 2017 and the status of these actions is discussed in the relevant sections of this AEMR.

Table 7 Actions required from last AEMR

Item	Action required from 2016 Annual Review	Requested by	Action taken	Where discussed in AEMR
1	***Reporting submission***– *The Department notes that the AEMR was submitted by early November 2016 in accordance with the approval. A letter from the Department dated 14 December 2016 granted an extension to 13 January 2017 and advised that future AEMRs are required to be submitted by 30 November.*	DP&E	Future AEMRs will be submitted by 30th November each year as requested.	Table 7
2	***Graphs*** *– Provide graphs in the main report to illustrate information presented, particularly for ground and surface water monitoring sections.*	DP&E	Graphs of data have been provided for air quality, surface water quality and groundwater quality data.	Sections 6.4 & 7
3	***Comparison of results*** *- Provide a comparison of data with the predictions in the Environmental Assessment and provide trends to enable a comparison between years.*	DP&E	A comparison of results against previous years, with a discussion of long term trends, has been provided for air quality, surface water quality and groundwater quality data.	Sections 6.4 & 7
4	***Rehabilitation areas*** *– Include a plan showing the areas of the ash placement facility that have been rehabilitated.*	DP&E	A plan indicating the location and status of rehabilitated areas has been provided in Appendix E.	Appendix E
5	***Community contributions*** *– Include community contributions and community engagement activities undertaken in addition to the Community Reference Forum.*	DP&E	Details of community engagement activities undertaken during the reporting period are provided within Community (Section 9).	Appendix I
6	***References*** *– Remove references to Delta Electricity from Appendices B, C and G.*	DP&E	The historical appendices B, C and G have been removed as these were the extracts from the OEMP	Appendices B, C and G
7	***Audits*** *– Provide a summary of compliance over the year for internal audits as opposed to including only one month.*	DP&E	An annual summary of the Lend Lease compliance program is detailed in Appendix H. Two internal audits were conducted during the reporting period (Section 10.2).	Section 10.2 Appendix H

Item	Action required from 2016 Annual Review	Requested by	Action taken	Where discussed in AEMR
8	***Timeframes*** *– Include timeframes for implementation of activities proposed in the next reporting period.*	DP&E	Section 12 has been updated to provide timeframes for completion.	Section 12
9	***Dust gauges*** *– In Appendix G it states that the dust monitors are to be reviewed to ensure compliance with the Australian Standard. This is not listed as a further improvement in Section 6.5.4. Please advise when this review will be undertaken.*	DP&E	A review of the dust monitors was performed at the end of March 2017. The review found that the gauges meet the requirements for the methods for sampling and analysis of ambient air AS/NZS 3580.10.1:2003.	Section 6.4.1.2
10	***Additional bores*** *– Has there been any consideration to the installation of an additional groundwater monitoring bore to obtain baseline data downstream of Neubecks Creek and D9.*	DP&E	Groundwater bore D8 is located downstream of Neubecks Creek monitoring site NC01 and bore D9. A second surface water monitoring point is located further downstream from D9 which is Neubecks Creek gauge site WX22. The Groundwater modelling did not indicate that additional bores downstream were required, when baseline data was being obtained. Monitoring is undertaken in accordance with the Groundwater Management and Monitoring Plan as approved by the Department as part of the Operational Environmental Management Plan.	Section 7.1.1
11	***Embankment bore*** *- Provide an explanation as to why only one bore was installed within the northern embankment wall instead of the two proposed in the 2015 AEMR.*	DP&E	Two bores were proposed to be drilled in the northern embankment wall at the same location including a shallow bore and a further deep monitoring bore. EA NSW sought expert independent advice in regards to the proposed location and installation of the additional bores. The deep bore found the standing water level to be below the interface of the ash and mine spoil and confirmed there was no groundwater in the ash repository. The shallow bore was intended to target the ash repository and interface zone, however based on the findings from the installation of the deep monitoring bore, EA NSW was advised that the proposed shallow bore would add little value and would not provide any additional groundwater data. As such the shallow bore was not installed. The results are described in detail in the 2016/17 Lamberts North Water Quality Assessment which is included as Appendix D in the AEMR.	Section 7.1.1

Item	Action required from 2016 Annual Review	Requested by	Action taken	Where discussed in AEMR
12	***Ecological Monitoring*** *- In accordance with Schedule 2 Condition B7, it is the expectation of the Department that ecological monitoring would be undertaken over the life of the project. In the AEMR it states that this will be continued until at least 2018. Please confirm that additional monitoring is planned during the life of the facility and for at least five years after final capping.*	DP&E	EANSW will ensure it meets its regulatory obligations as required under Schedule 2, condition B7 which includes the requirement for monitoring ecological health throughout the life of the Project as described in condition B7(a) and five years after the final capping as described in condition B7(d). EANSW will update the current statement in future AEMR to reflect this.	Section 6.3.1, 12
13	***Nu Rock*** *- It is understood that testing of the ash for use by NuRock is already underway. Please advise when the period of testing is planned to be completed and when a decision will be made on whether the project is feasible.*	DP&E	NuRock have completed their testing of the Mt Piper ash use as the main constituent for their products and are moving into the first production phase, with a plant design that can be ramped up to use 30,000 tonnes per year. A lease agreement and holding agreement have been signed to allow this phase to progress. NuRock have an approved Development Application from Lithgow City Council and have been granted an Environment Protection Licence from the EPA.	Section 6.1.2
14	***Independent Assessment*** *- It is understood following discussions with the Environment Protection Authority that an independent assessment of ground and surface water is being undertaken and is to be completed by the end of April 2017. It is requested that a copy of this report is provided to the Department when completed.*	DP&E	The draft independent assessment report was forwarded to the EPA and WaterNSW on the 19 September 2017. The final report will be issued to the Department on conclusion of the review process with EPA and WaterNSW.	Section 12

Item	Action required from 2016 Annual Review	Requested by	Action taken	Where discussed in AEMR
15	***Document upload*** *- It is noted that the IEA identified a non-compliance with Schedule 2 Condition B10 and that the documents as required under the approval were to be made available on the website by 7 October 2014. The AEMR states that the date for compliance has now been extended to 31 August 2017. The Department does not consider this date acceptable and requires that the documents as required under the approval are made available on the website by 31 March 2017.*	DP&E	The Lamberts North webpage was updated with the required documents on 27 March 2017.	Section 9.4

6. Environmental management and performance

Environmental monitoring for the operations at Lamberts North Ash Placement Area is designed to comply with the regulatory requirements specified in Section 3 of this AEMR, and also to provide an ongoing analysis of the condition of the environment surrounding the operations. Environmental monitoring is performed as part of the monitoring program at the sites indicated within Figure **3** and the results are used as indicators of the effectiveness of the environmental controls, and as guidelines for the management and maintenance of key environmental procedures.

Detailed procedures outlining the environmental monitoring responsibilities of key stakeholders and the impacts to be mitigated can be found within the individual sub-plans of the OEMP. Details regarding the environmental responsibilities, key stakeholders and the impacts to be mitigated regarding construction activities can be found within the CEMP. A summary of the environmental management measures and associated performance are provided in Table 8.

Table 8 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	Consider reduction in monitoring frequency
Air Quality	PM10 annual <30ug/m3 24 hour <50ug/m3 Depositional dust Increase in total 2g/m2/month to maximum of 3.5g/m2/month	Compliant	No change to PM_{10} trends for last 3 years	No additional action required
Biodiversity	Submit a biodiversity offset plan for approval	Compliant	Tender issued for further tree establishment at the biodiversity offset area.	Contractor engaged for biodiversity plantings in December 2017

Performance against environmental monitoring and compliance requirements are provided by Lend Lease as a monthly Client Service Report 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 H.

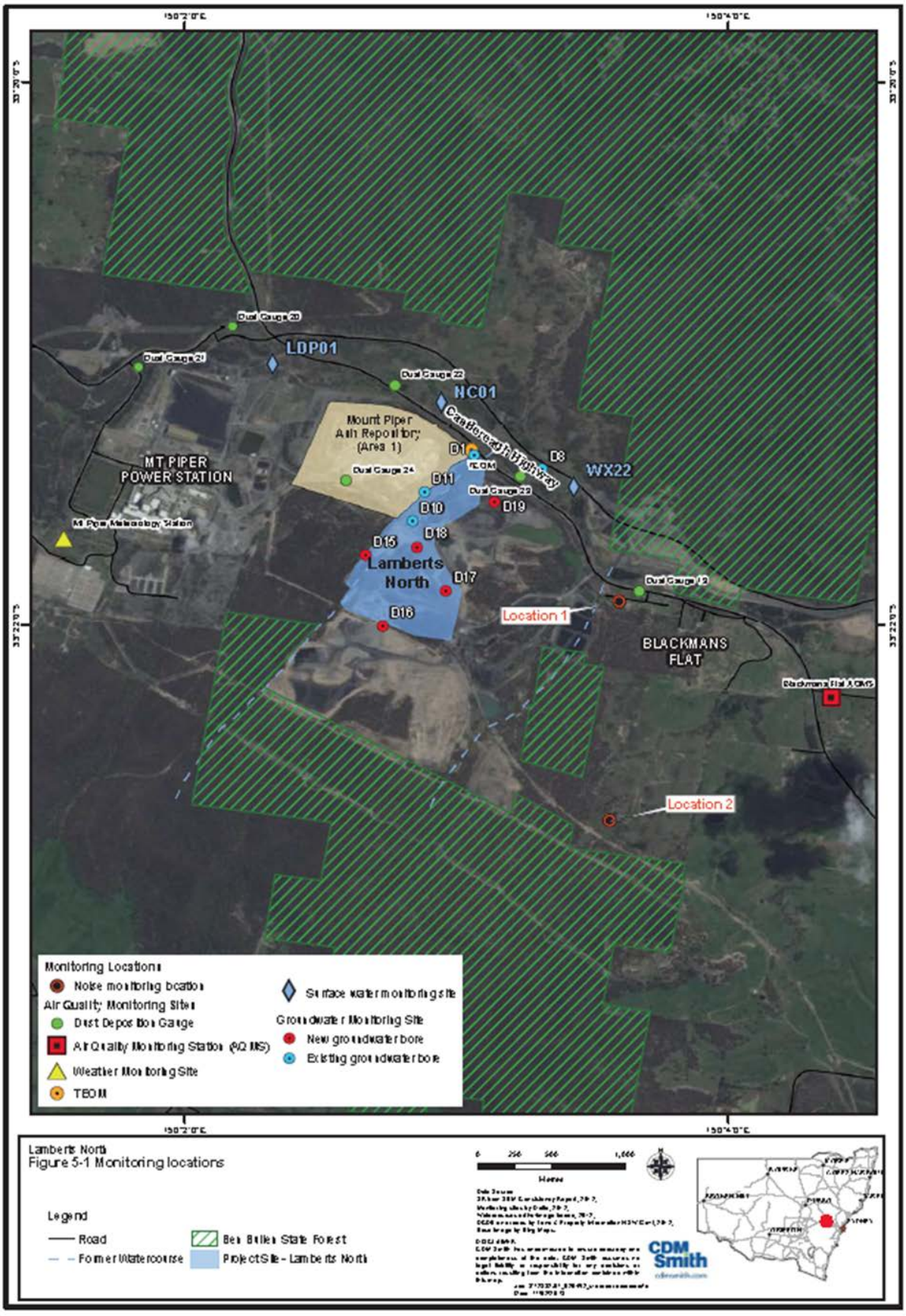

Figure 3 Environmental monitoring locations

6.1 Ash delivery and placement

6.1.1 Environmental Management

Ash generated as a by-product from the operation of Mt Piper Power Station is transported by conveyer from the Station to ash silos at the Mount Piper Ash Repository as part of the existing operations. Ash is then transported by heavy haulage vehicles (generally one to two trucks) from the silos to either the previously established Mt Piper Ash Repository, or to Lamberts North. Transport to Lamberts North is facilitated via the southern boundary haulage road in the existing ash repository. On delivery to the Lamberts North ash repository area, the water conditioned ash is deposited at the working face where compactors and bulldozers are then used to place the ash in stable landforms and to establish adequate and appropriate drainage. Ash placement can be broadly described as including the following processes:

- 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 Lamberts North, working to reach a final design height of 960 m AHD through abutment with Mount Piper Area 1 ash placement.
- Boundary faces are sequentially covered with material to be sourced from locally available material and commence replanting and restoration activities. The process is repeated until Lamberts North 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 Lamberts North reaches the design height of 940 m AHD. Progressive revegetation of batters will commence once the final perimeter batters are constructed and keyed into the adjoining Mt Piper Ash Repository.

6.1.2 Environmental Performance

During the reporting period a total of 302,926 tonnes of ash has been placed in Lamberts North Ash Repository. The ash placement and compaction works were conducted during the approved working hours for the operation. An average compaction rate of 98% has been achieved, exceeding the target of 95% dry density compaction. Records from Lend Lease indicate a further 219,727 tonnes of fly ash has been diverted from landfill for use in cement production.

NuRock have completed their testing of the Mt Piper ash as the main constituent for their products and are moving into the first production phase, with a plant design that can be ramped up to use approximately 30,000 tonnes per year. A lease agreement and holding agreement have been signed to allow this phase to progress.

NuRock have an approved Development Application from Lithgow City Council and have been granted an Environment Protection Licence from the EPA.

Compliance inspections are performed on a monthly basis by the contractor and the results are summarised in Appendix H. 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

- Support NuRock with the development its business onsite to reuse fly ash.
- Continue to market the reuse of fly ash to cement manufacturers.

6.2 Operational Noise Monitoring

6.2.1 Environmental Management

The Lamberts North Operational Noise Management Plan (ONMMP) has been developed to address the specific requirements of the Conditions of Approval (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 during the proposed works program 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 Lamberts North, have been identified as the nearest potentially affected sensitive receivers to noise from the repository site (Table 9):

Table 9 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 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 10.

Table 10 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 (*Table 7*) *applies under all meteorological conditions except for any of the following:*

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

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

c) Stability category G temperature inversion conditions.

6.2.2 Environmental Performance

Aurecon was engaged by EnergyAustralia NSW to carry out independent operational noise monitoring for the Lamberts North Project located in Blackmans Flat, NSW. The noise measurements were performed in October 2016 and May 2017 (Appendices B – C). Noise monitoring for Lamberts North was performed in accordance with the methods described in the approved ONMMP.

Noise from the ash placement area was inaudible at the sensitive receivers for the October 2016 and May 2017 monitoring periods. As the operational noise contribution from Lamberts North was inaudible, a desktop based noise prediction to estimate the noise contribution from the operational activities was performed. The predicted noise levels were calculated at a distance based on worst case noise emission levels without considering any barrier effects from the undulating surrounding terrain. The worst case modelling predicted that the noise levels would comply with the day and evening time criteria at both Location 1 and Location 2 and is within the predicted levels described in the environmental assessment (Monitoring reports are in Appendix B and C).

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 Ecological Monitoring

6.3.1 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. EnergyAustralia will maintain the EMP for a minimum of five years after the final capping of the Lamberts North Ash Repository in accordance with approval conditions.

The EMP was implemented in November 2012 prior to construction activities and then during construction in April 2013. Two sample sites were included in the program, NCR1 downstream of surface water discharge point and NCR2 which is downstream of the gauging site (WX22). The EMP aims to monitor and quantify the impacts on the ecology of Neubecks Creek and the associated riparian environment.

The specific objectives of the 2016-2017 study were to:

- Sample indicators of aquatic ecology in Neubecks Creek potentially affected by the Project and at reference (unaffected) sites there and on the Cox River in Spring 2016;

- Compare the findings with those of previous studies undertaken in Spring during 2012 to 2015 as part of the EMP;
- Assess whether any impacts to the aquatic ecology of Neubecks Creek occurred in 2016 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.

6.3.2 Environmental Performance

Cardno Pty Ltd was commissioned by EnergyAustralia to undertake the Spring 2016 monitoring component of the EMP. The 2016 monitoring included the following sites;

- Control NCR1 on Neubecks Creek upstream of the Project area;
- Impact NCR2 on Neubecks Creek adjacent to the Project area;
- Control NCR3 on Neubecks Creek upstream of the Project area;
- Control A16 on the Cox River at Lidsdale downstream of the confluence with Neubecks Creek; and
- Control CR0 on the Cox River, adjacent to Ben Bullen State Forest and upstream of the confluence with Neubecks Creek.

Assessment of aquatic habitat and sampling of in situ water quality and macroinvertebrates were undertaken on the 1 and 2 December 2016.

There was relatively little variation the SIGNAL2 Score (a biotic index of water pollution) observed between 2012 and 2016 at NCR2 and at NCR1 (Figure **4**). During this time, this index was somewhat more variable at A16 and that at CR0 and NCR3 appeared to decrease and increase, respectively between 2015 and 2016. Changes in the SIGNAL2 score through time do not suggest any impact due to the Project occurred.

There appeared to be a trend for a reduction in OE50 Taxa Score (a biotic index of habitat and water quality) between 2012 and 2016 at NCR2 (Figure **5**). However, this provided very little evidence of an impact due to the Project since a similar trend was evident in this index at control site A16. The index also appeared to decrease between 2015 and 2016 at CR0 and NCR3,while that at NCR1 appeared more variable than that at the other sites and there was no evidence of a trend.

In summary there was no conclusive evidence of any change in the Spring 2016 data that would suggest an impact due to the Project. None of the statistical tests indicated any change in biotic indices since 2012 at NCR2 that could be due to an impact of Project operations. Apart from some very limited evidence of a potential transient change in macroinvertebrate indicators at NCR2 in Autumn 2013 and an apparent, non-statistically significant decrease in OE50 Taxa Score (a biotic index of habitat and water quality) at NCR2 that took place whilst this index appeared to decrease at other sites, data collected over the course of the EMP does not suggest any impact to macroinvertebrates in Neubecks Creek has occurred due to the Project.

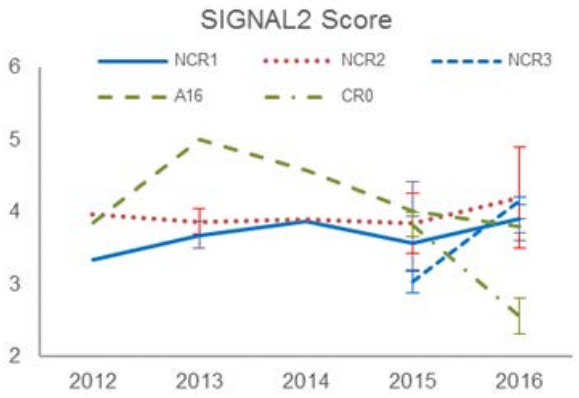

Figure 4 Signal2 Score results for impact and control sites for the period 2012-2016

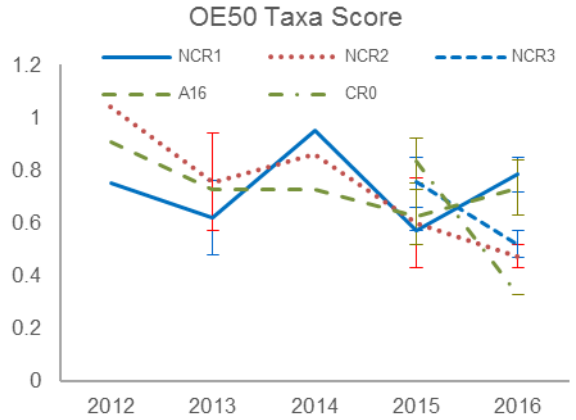

Figure 5 OE50 Taxa score results for impact and control site for the period 2012-2016

6.3.3 Reportable Incidents

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

6.3.4 Further Improvements

Two 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.

6.4 Air Quality Monitoring

6.4.1 Environmental Management

The Repository Site Management Plan (Lend Lease, 2012) for Lamberts North operations contains an Implementation Strategy in accordance with the Air Quality Monitoring Program, as required under the CoA as stipulated by DP&E and as outlined in the OEMP. The strategy 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, and continuous monitoring for dust/airborne particulates.

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

• Wash-down of security roadways, haul road/s and vehicle access roads;
• Use of perimeter sprays at the ash placement area;
• Mobile sprinkler system;
• Ash placement operations;
• Final and temporary capping of ash; and
• General maintenance of the ash placement area (Lend Lease, 2012).

6.4.1.1 Sprinklers and Pumps

Water application (measured in sprinkler hours) is based on wind velocity, humidity and temperature. The water used for dust suppression in Lamberts North is sourced from the Mt Piper cooling water system- no clean water is used in this application.

The Repository Management Plan (Lend Lease, 2015a) 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	**Water use guidelines**
>25o >20km/hr (10hrs/day)	15o <20km/hr (<4 hours/day)
15-24o <20km/hr (8 hrs/day)	
15o <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

6.4.1.2 Air quality monitoring

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

The monitoring network consists of five dust deposition gauges, one High Volume Air Sampler (HVAS) measuring particulate matter <10 µm (PM10) and 2.5 µm (PM2.5) and one Tapered Element Oscillating Microbalance (TEOM) measuring <10 µm (PM10) as shown on Figure **3**.

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

- Increase in Total Suspended Particulates (TSP) by > 2g/m2/month to a maximum of 3.5g/m2/month at dust deposition gauges outside the ash placement area
- PM10 annual average is <30µg/ m3 and 24 hour maximum does not exceed 50µg/m3

A review of the depositional dust monitors was performed at the end of March 2017. The review found that the gauges meet the requirements for the methods for sampling and analysis of ambient air (AS/NZS 3580.10.1:2003).

6.4.2 Environmental Performance

6.4.2.1 Dust suppression – Lamberts North Sprinkler system

Figure **6** 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.

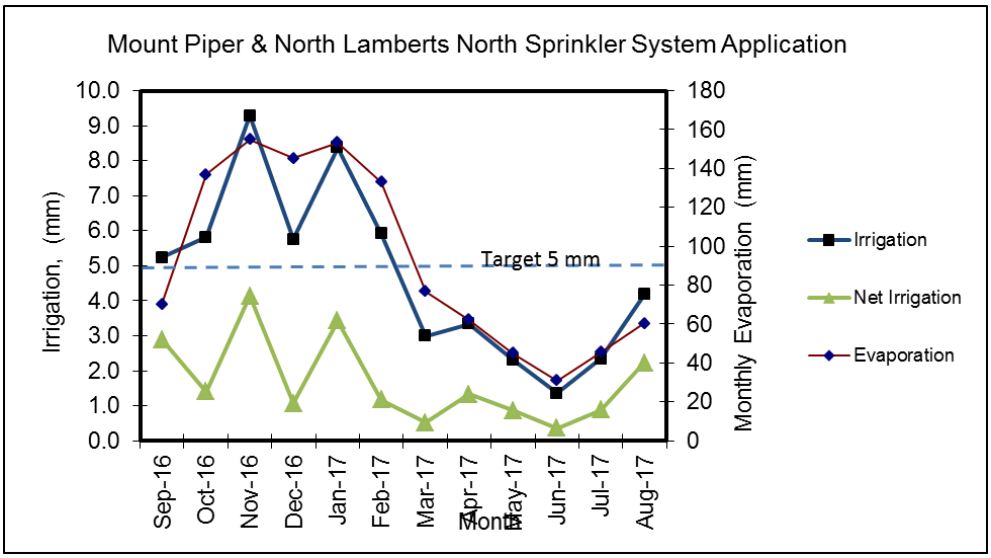

Figure 6 Efficacy of irrigation operations September 2015 - August 2016

6.4.2.2 Air quality monitoring

All depositional dust results are shown to be considerably lower than the concentrations predicted in the Environmental Assessment (predicted annual average of 3.5 g/m2/month deposited dust). Annual averages for gauges 19 and 21 have decreased and results for gauges 22 and 23 have increased in the reporting period. There was no significant change to the annual average for gauge 20 compared to previous reporting periods. The dust deposition rates are all within the nominated criteria (Table 12).

Comparative annual average depositional dust data for the combined average over the previous three year period is presented in Table 12. Additional comparative annual average depositional dust data for each of the five OEMP dust deposition gauges are presented in Figure **7** – Figure **11**.

The PM_{10} and $PM_{2.5}$ results recorded by the Blackmans Flat Air Quality Station indicated the annual averages were below the 30 ug/m3 and 8 ug/m3 limits. The annual average PM_{10} result was 11µg/m3 (Figure **12**) and the annual average $PM_{2.5}$ result was 3 µg/m3 (Figure **13**) that is well below the statutory limits. The highest PM_{10} result recorded was 32ug/m3 and was recorded on the 13 May 2017. The elevated reading was assessed not to be associated with the Lamberts North Ash Placement Area as the predominant wind direction was to the west, i.e. away from the Blackmans Flat Air Quality Station.

Historical elevated recordings have generally been the result of fires, dust storms and hazard reduction burning occurring in the Central West, Blue Mountains, Hawkesbury and even the Sydney Region. These events are known to affect particulate levels by increasing the levels above the standard requirements across the state. As such, to account for natural events, the national goal for particulates excludes exceptional events such as these (OEH, 2017). Hazard reduction burns are generally performed in the aforementioned areas in July to September, with the bushfire season commencing in October. Conversely, peaks in the combined averages of the 5 depositional dust gauges generally align within the hazard reduction or bushfire season.

Table 12 Annual depositional dust summaries

	Total Insoluble solids (g/m2/month)				
	19	20	21	22	23
Date	Insol.	Insol.	Insol.	Insol.	Insol.
Sep-16	0.2	0.3	0.6	0.3	0.8
Oct-16	0.3	0.1	1.0	8.6	0.2
Nov-16	0.1	1.0	0.8	1.5	3.6
Dec-16	0.3	0.5	1.1	1.1	3.0
Jan-17	0.5	0.3	0.0	0.8	0.3
Feb-17	0.3	0.8	1.2	1.8	0.3
Mar-17	0.2	0.1	0.9	0.6	0.4
Apr-17	0.4	0.5	4.3	0.6	0.5
May-17	0.5	1.5	1.3	0.5	0.7
Jun-17	0.5	0.8	0.5	0.3	0.6
Jul-17	0.5	0.6	1.2	0.5	0.9
Aug-17	0.6	1.5	0.7	0.6	0.9
Annual averages					
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
2014	0.8	0.9	1.5	0.9	0.8

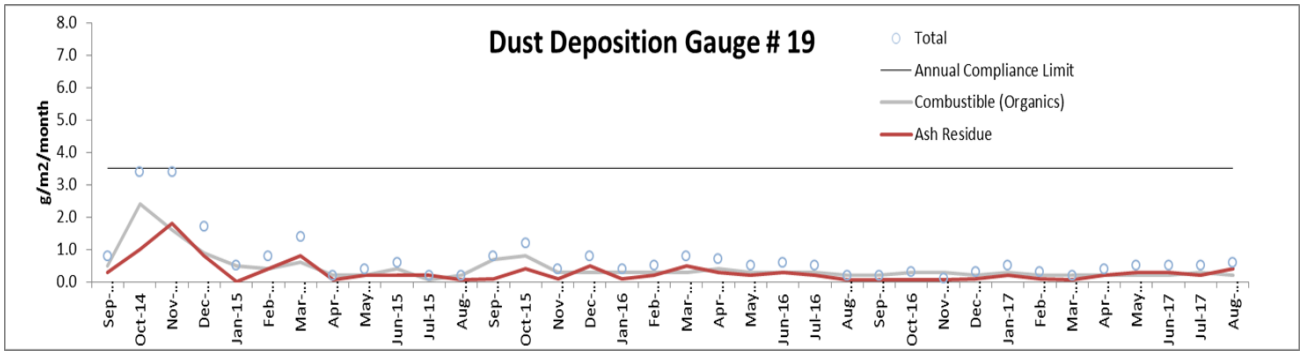

Figure 7 Depositional Dust Summary for Dust Gauge 19

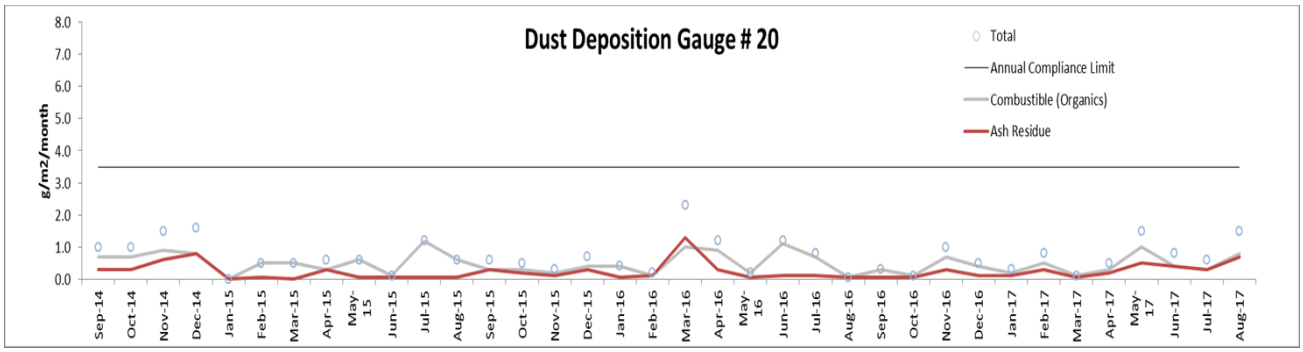

Figure 8 Depositional Dust Summary for Dust Gauge 20

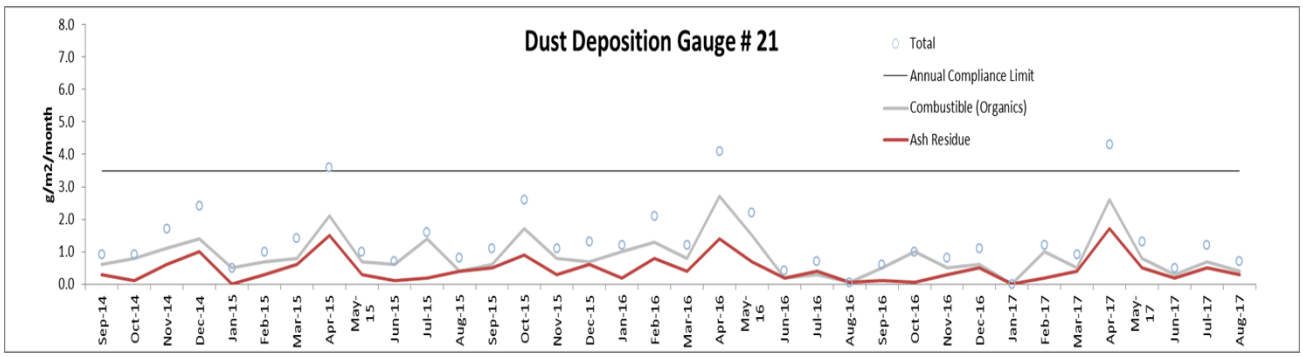

Figure 9 Depositional Dust Summary for Dust Gauge 21

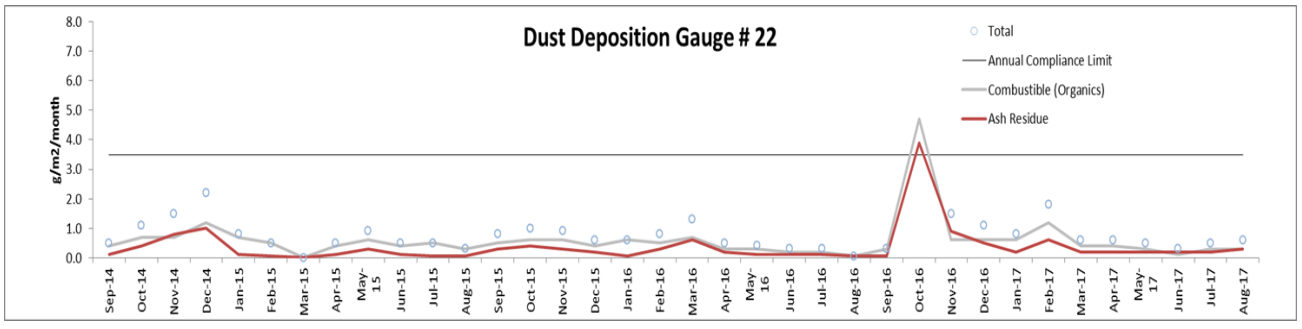

Figure 10 Depositional Dust Summary for Dust Gauge 22

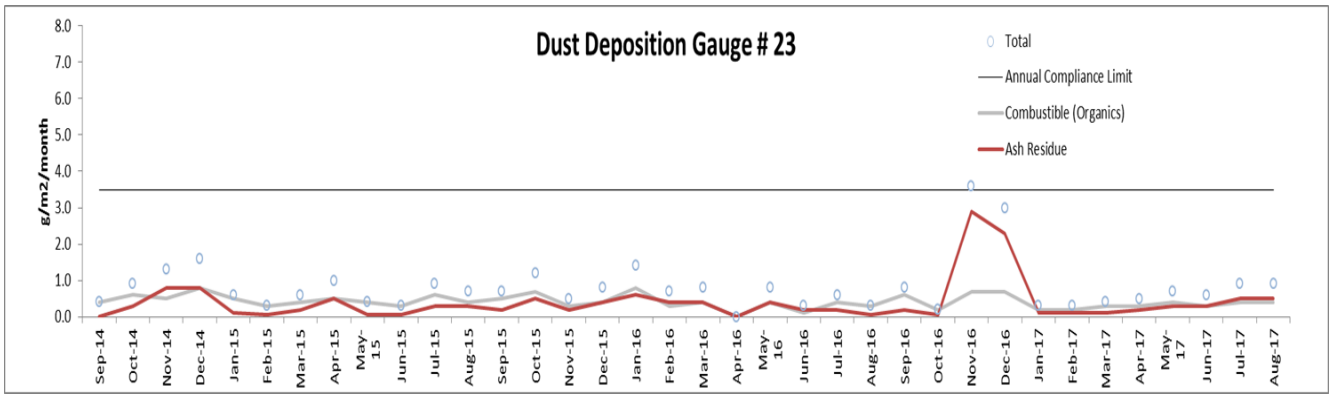

Figure 11 Depositional Dust Summary for Dust Gauge 23

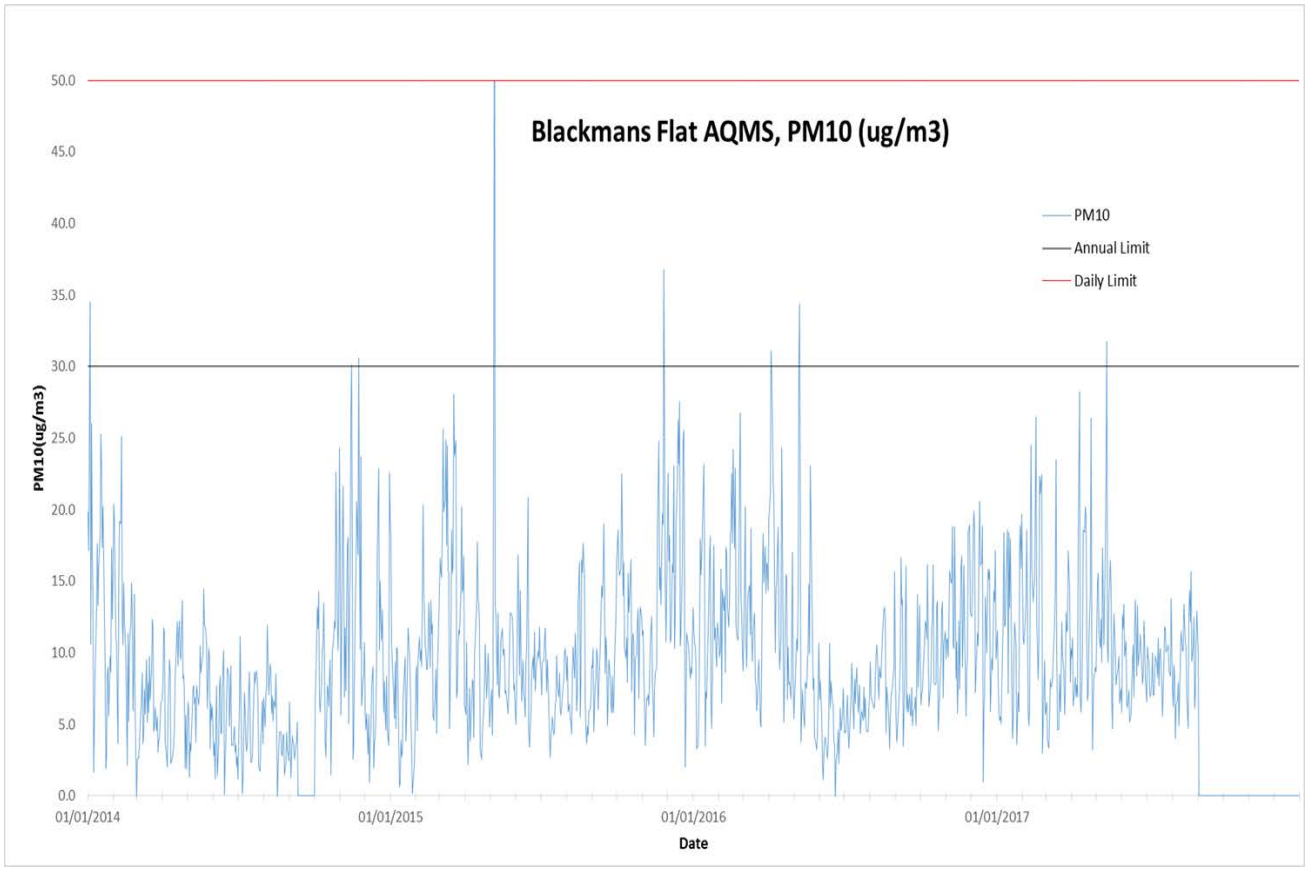

Figure 12 Average PM_{10} data from the Blackmans Flat AQMS for September 2015 to August 2016

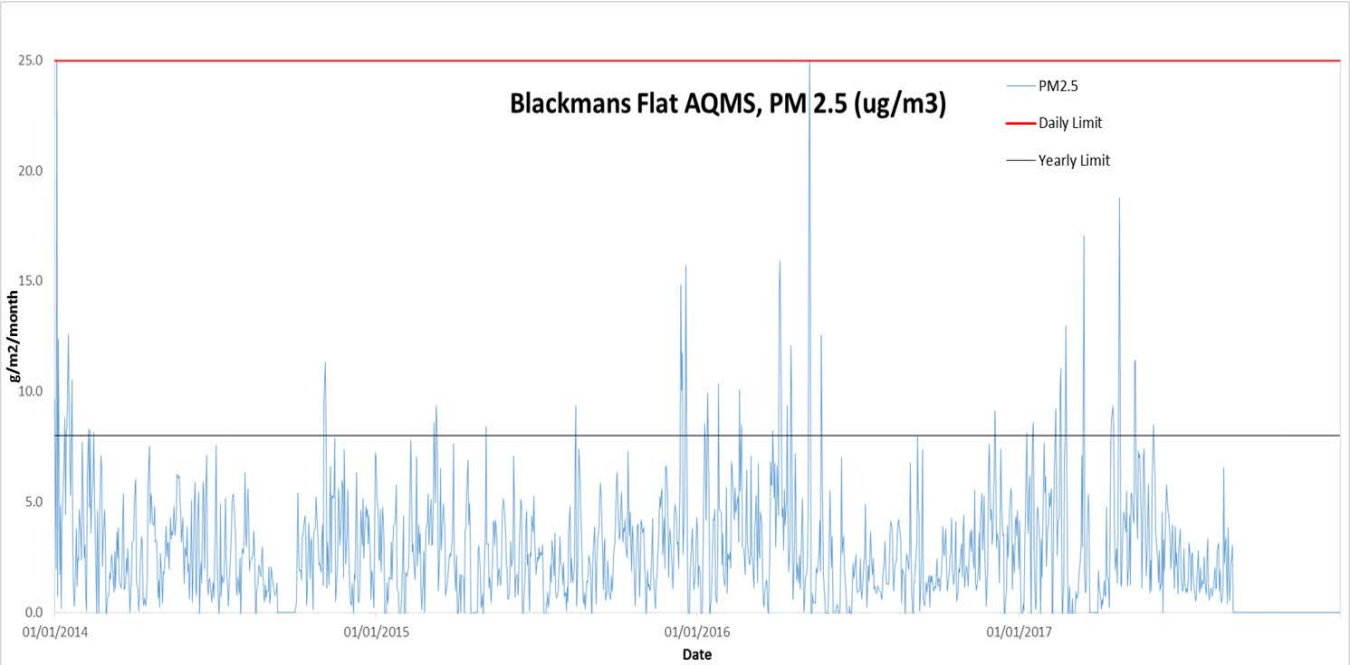

Figure 13 Average $PM_{2.5}$ data from the Blackmans Flat AQMS for September 2015 to August 2016

These results indicate that Lamberts North is managed effectively for dust and as such is in compliance with CoA D3 (d) and E18. Based on site observations and information reviewed potential impacts from the operation of the Lamberts North Ash Repository have been effectively mitigated and managed.

6.4.3 Reportable Incidents

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

6.4.4 Further Improvements

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

6.5 Waste Management

6.5.1 Environmental Management

Waste disposal practices at the Lamberts North Repository are managed in accordance with Environmental Protection Licence 13007 and the Waste Management Sub-Plan (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, 1999).

EnergyAustralia 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 other than those as stated on the licence approval to be kept on the site. 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.

Staff and contractors involved in the Lamberts North operations are made aware of the waste management procedures as outlined in the OEMP sub-plan. Waste-related documents and records reflect adherence to these protocols, thereby providing the foundations for a transparent approach to waste management. The OEMP provides further guidance and detail on specific waste streams and applicable management measures (OEMP Section 6.8).

6.5.2 Environmental Performance

An estimated 60 tonnes of settling pond sediments were co-placed at the ash repository during the reporting period. Pond sediments are sourced from settling basins located within the licenced premises at the Mt Piper Power Station. Other waste materials placed in the ash repository are detailed in Table 13. Fabric filter bags and settling pond sediments are licenced to be disposed of at the premises under EPL 13007 condition L4.2. The activities at the Lamberts North Repository were deemed to have met the OEMP targets for waste management for the 2016-17 reporting year. In addition, no non-conformances were identified and the OEMP requirements with respect to waste management were found to be complied with.

Table 13 Record of wastes

	Stainless Steel Clips	Mild Steel caps	Fabric Filter Bags
Total	7753	7753	7753

6.5.3 Reportable Incidents

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

6.5.4 Further Improvements

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

6.6 Heritage Management

6.6.1 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 Project 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, all Lend Lease personnel are educated on their due diligence duties in respect of the protection of Aboriginal and non-indigenous heritage sites and items.

6.6.2 Environmental Performance

No additional sites have been recorded within the vicinity of the Lamberts North Project Area.

6.6.3 Reportable Incidents

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

6.6.4 Further Improvements

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

7. Water management

7.1 Groundwater Monitoring

7.1.1 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 hydrological monitoring program was incorporated into the GMMP because of the change in design to Lamberts North addressed in the Consistency Report (SKM, June 2012). The assessment of baseline groundwater data was used to determine the location of monitoring bores for the GMMP.

Groundwater modelling (CEMP, CDM-Smith, June, 2012) indicated that water flow in the Huon drain is largely groundwater from the intersection of the Huon Void with the groundwater table. The groundwater model was able to determine that groundwater flows in a north easterly direction across the site. The GMMP is comprised of the following targets:

- The quality of water underlying the site is not impacted by the Lambert's North Ash Placement operations.

Performance criteria:

- There will be no significant long-term variation in groundwater quality from historical baseline quality values (as measured from existing monitoring wells on site) that are attributable to ash placement operations at Lamberts North (data available in OEMP Appendix B Table 7-4).
- Groundwater Water Quality Monitoring will be analysed at a NATA Accredited Laboratory by a qualified professional.

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 Mt Piper ash repository. Water samples taken at the bores- MPGM4/D1, D8, D9, D10, D11, D15, D16, D17, D18 and D19 provide information about groundwater flow under Lamberts North ash placement area within the Mt Piper ash repository (Figure **3**).

The GMMP provides the procedures and protocols that apply to the monitoring and testing of water quality and involves monthly sampling of existing long-term bores associated with Mt Piper ash repository and new bores located south of Huon Gully. Bore D9 is found outside the ash placement area and east of Huon Gully and south of Neubecks Creek and bore D8, north of Neubecks Creek. The Mt Piper ash placement area bores (MPGM/D10 and D11) on the western side of the ash placement area are used to monitor inflows from Mt Piper to the Lamberts North placement in Huon Gully. Bore D1 is north of Huon Gully and is used to detect seepage from the north-eastern Mt Piper brine placement. The groundwater bores D1, D8 and D9 are used to detect and warn of leachates that may enter Neubecks Creek. Bores D20, D1, and D8 and D9, are used to provide a warning of leachates that may enter Neubecks Creek to enable management actions to be undertaken to minimise effects of both the Mt Piper brine and the Lamberts North water conditioned ash placements.

The GMMP also provides a contingency plan for events that have the potential to pollute or contaminate groundwater.

7.1.2 Environmental Performance

Aurecon was commissioned by EnergyAustralia to undertake the Lamberts North groundwater quality and trace metal data for the fourth year of monitoring from pre-ash placement (October, 2012 to August, 2013) to the post-ash placement period (September, 2013 to August, 2017). The investigation of potential effects of the Lamberts North dry ash placement on the local surface and groundwater undertaken during the 2016/17 reporting period, together with the additional groundwater data collected at bore MPGM4/D20 in the Lamberts North embankment, has provided a better understanding of the groundwater processes in the area. From these investigations, it has been indicated that the northern Mt Piper area of the open-cut coal mine void is contributing some trace metals to the southern end of Huon Gully, via the rubble drain, such as boron and nickel, which then flow to bores D1 and D9 down gradient of Huon Gully. These inputs are in addition to those coming from the southern area underground coal mine groundwater, which flows beneath the southern Mt Piper ash placement area into the upper Huon Gully. This inflow is also enhanced with boron and nickel, but apparently from the south-western open-cut coal mine void entering the underground mine through cracks in the coal barrier between the mines.

Investigations have also shown chloride the groundwater entering the upper Huon Gully is from a source beneath the southern layers of water conditioned and brine conditioned ash (Aurecon, 2017b and c). Examination of the groundwater data for Lamberts North, including bore MPGM4/D20 indicates that the chloride and associated trace metals are diluted as they flow down Huon Gully by lower concentrations in mine water inflows from the western areas. In addition, rainfall runoff from the Mt Piper and Lamberts North ash placements has diluted the chloride and trace metals at the Lamberts North bore, D20, as the runoff seeps into the groundwater beneath the Lamberts North placement. Consequently, the chloride concentrations are significantly reduced and the boron concentration at the receiving groundwater bore, D9, only slightly exceeded the local guideline during both the 2015/16 and 2016/17 reporting periods.

Although there were elevated concentrations of some trace metals in the mine spoil beneath the Lamberts North site, the absence of selenium indicates they were unlikely to be due to the ash placement, but may have come from the compacted mine spoil under the ash. The mine spoil is saturated with groundwater and the elevated concentrations may be due to release from pyrites in the mine spoil. However, with dilution of the groundwater by rainfall runoff seeping into the groundwater beneath the ash layer, the trace metal concentrations have decreased to a lower level and did not significantly affect the trace metals at the down-gradient bores D1 or D9.

The large decrease in chloride from bore D10 to D9 suggests that the water flowing in Neubecks Creek seeps into the groundwater sampled at D9 as it flows under the creek. Consequent to the various enrichments and dilution processes, and the groundwater flows from Huon Gully mostly beneath Neubecks Creek, there were no exceedances of the Local/ANZECC (2000) trigger values at the receiving water site in Neubecks Creek.

Accordingly, as no adverse effects of the Lamberts North site have been identified, no ameliorative measures were indicated.

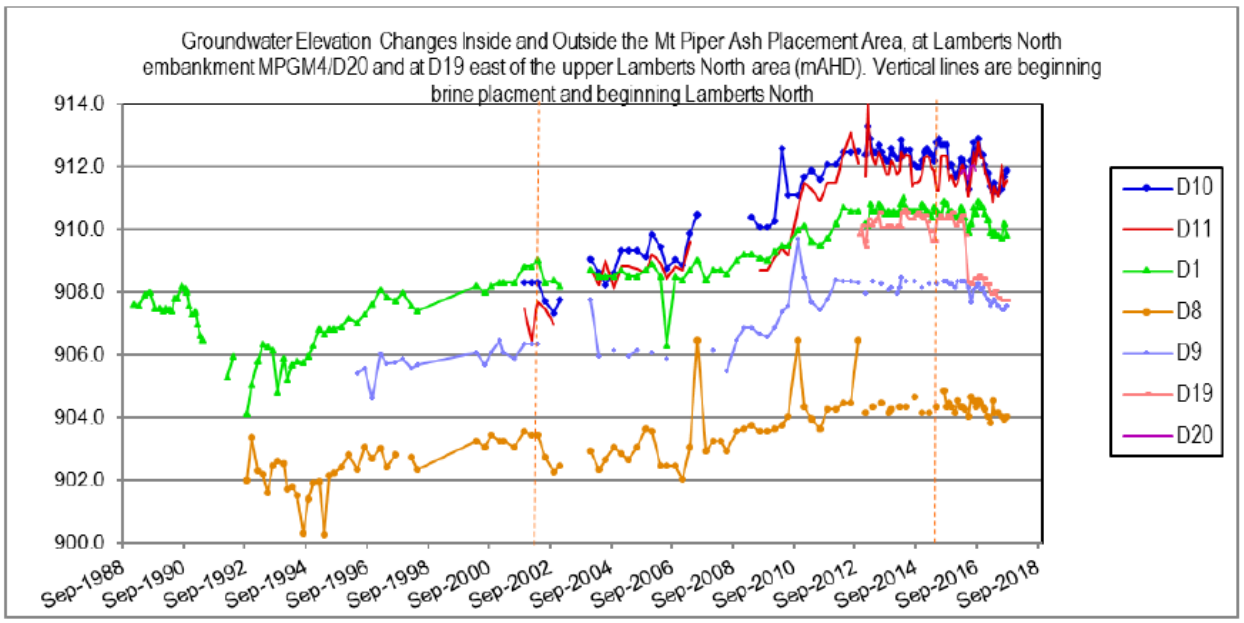

Figure 14 Groundwater Elevation changes at bores inside the Mt Piper ash placement area

To put the groundwater level changes since October, 2012 into context, and as bores D10 and D11 have been used to provide water quality and groundwater level data for flows from the Mt Piper site into Huon Gully, the long-term changes at these bores, as well as at D1, D8, D9, D19 and D20 are shown in Figure **14**. The overall trend for the groundwater levels in the area was historically to increase (ie rise), since ash was placed at the Mt Piper site in 2001. However, the increases have ceased since the dry weather began in 2012 (see Figure **14**). With continued dry weather, the groundwater levels at all the bores have begun to decrease.

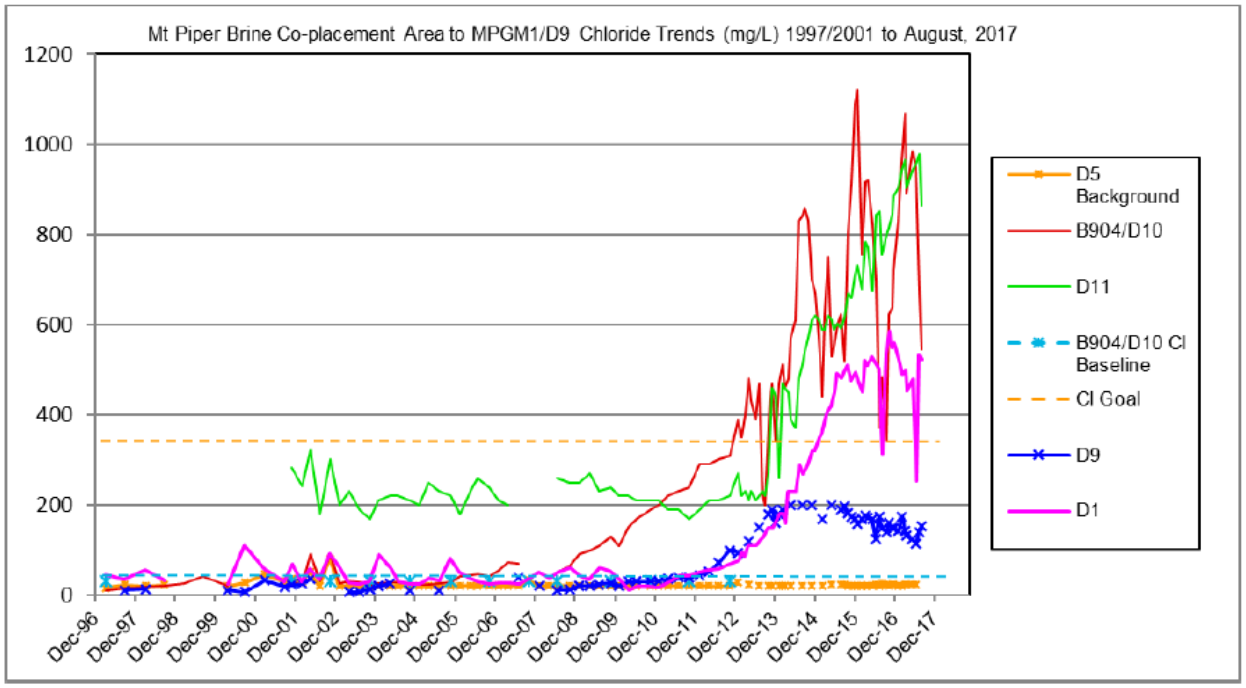

Figure 15 Mt Piper Brine Placement Area Chloride Trends at groundwater bores

As chloride is the tracer for brine leachates from the Mt Piper area, the trends in chloride concentrations at bores D10 and D11 are shown in Figure **15**. This shows that the chloride concentrations went over 350 mg/L in early

2013 within D10 and subsequently D11 in late 2013. The high rainfall event in June and July, 2016 caused the chloride to decrease to about 400 mg/L but the chloride at bore D11 remained at about 800 mg/L.

There was a subsequent decrease in chloride at D10 following the high rainfall event in March, 2017 of 175.6 mm. However, the chloride concentration continued to decrease to 545mg/L, even though the period from April to August, 2017 was characterised by below average rainfall. The chloride at D11 remained high and finished the reporting period at 864 mg/L.

These differing responses of D10 and D11 to the heavy rainfall events indicates differing influences of the diluting inflows of low chloride in underground coal mine groundwater that flows to those bores from the western and southern areas outside the ash placement. This is most likely explained by bore D10 being representative of the groundwater flowing from southern underground coal mine goaf areas to Huon Gully, while D11 is indicative of groundwater from the west into the open-cut mine rubble drain. Hence, it is likely that the D11 groundwater is located outside the flow path of the southern underground coal mine groundwater inflows to Huon Gully.

Figure **15** shows that, even though the chloride decreased at D10, it increased at D1 immediately after the March, 2017 rainfall event, indicating some input to Huon Gully from the groundwater sampled at bore D11. A similar increase at D1 occurred after the June and July, 2016 rainfall event.

Bore D9 is the closest to the seepage detection bore D1 and the salinity and sulphate concentrations have increased to be higher than the pre-placement concentrations such that they now exceed the ANZECC Groundwater Guidelines or Local Goals. The chloride at this bore has also increased, and now the post-50th percentile exceeds the pre-placement 90th percentile, giving a warning that the D10 chloride plume has reached D9 (see Figure **15**).

The trace metal concentrations at bore D9 met the ANZECC Groundwater Guidelines or Local Goals, other than for boron. The boron increase at D9 to 0.67 mg/L (compared to the pre-placement of 0.47 mg/L and the local guideline of 0.55 mg/L) appears to come from bore D1, which most likely gained its concentration from upgradient influences, such as bores D10 and D11, as well as the northern open-cut coal mine void bore B901. It is unlikely that the Lamberts North ash placement made a significant contribution to the boron because the D20 concentration was lower than the other potential sources.

Under the current conditions, the salinity, sulphate and chloride concentrations at D8, on the northern side of Neubecks Creek, are now lower than during the pre-placement period. Other than commonly low pH in the area, all the elements at D8 met the ANZECC Guidelines or Local Goals.

7.1.3 Reportable Incidents

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

7.1.4 Further Improvements

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.

7.2 Surface Water Quality Monitoring.

7.2.1 Environmental Management

The Soil and Surface Water Quality 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 is comprised of the following targets:

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

Performance criteria:

- Surface water monitoring results at Neubecks Creek will indicate no significant variations from historical baseline data.
- Ecological results at Neubecks Creek will indicate no significant variation from historical baseline data.
- No visual evidence of erosion and sedimentation impacts on Neubecks Creek following significant rainfall events.

Runoff water from Lamberts North 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 Operational Environment Management Plan for Lamberts North requires sampling at three locations (Figure **3**)- Mt Piper licenced monitoring point LMP01, Neubecks Creek (WX22) and upper Neubecks Creek (NC01) - to ensure operations are not impacting on catchment surface waters, and to comply with Section 120 of the *Protection of the Environment Operations Act 1997* and subsequently Mt Piper's EPL.

As the aquatic life in Neubecks Creek is required to be monitored, turbidity, nutrients, dissolved oxygen and temperature are included in the monitoring program. Changes in the water quality and trace metals at Neubecks Creek receiving water site (WX22), from pre- to post- placement were examined in the Aurecon Water Quality Monitoring Report.

7.2.2 Environmental Performance

Aurecon was commissioned by EnergyAustralia to undertake the Lamberts North Water monitoring report for the 2016-2017 reporting period.

The dry ash placement at Lamberts North was not a significant source of salinity or trace metals to Neubecks Creek during 2014/15 (Aurecon, 2016) or during 2015/16 (Aurecon, 2017a) when all the water quality and trace metal guidelines in the creek were met. Due to the large decrease in chloride from that at bore D1 to D9 shown in Figure **15**, and the understanding that most of the D9 groundwater flows beneath Neubecks Creek, the Lamberts North dry ash placement is not expected to be a significant contributor to the salinity or trace metals at the creek's receiving water site during the current reporting period.

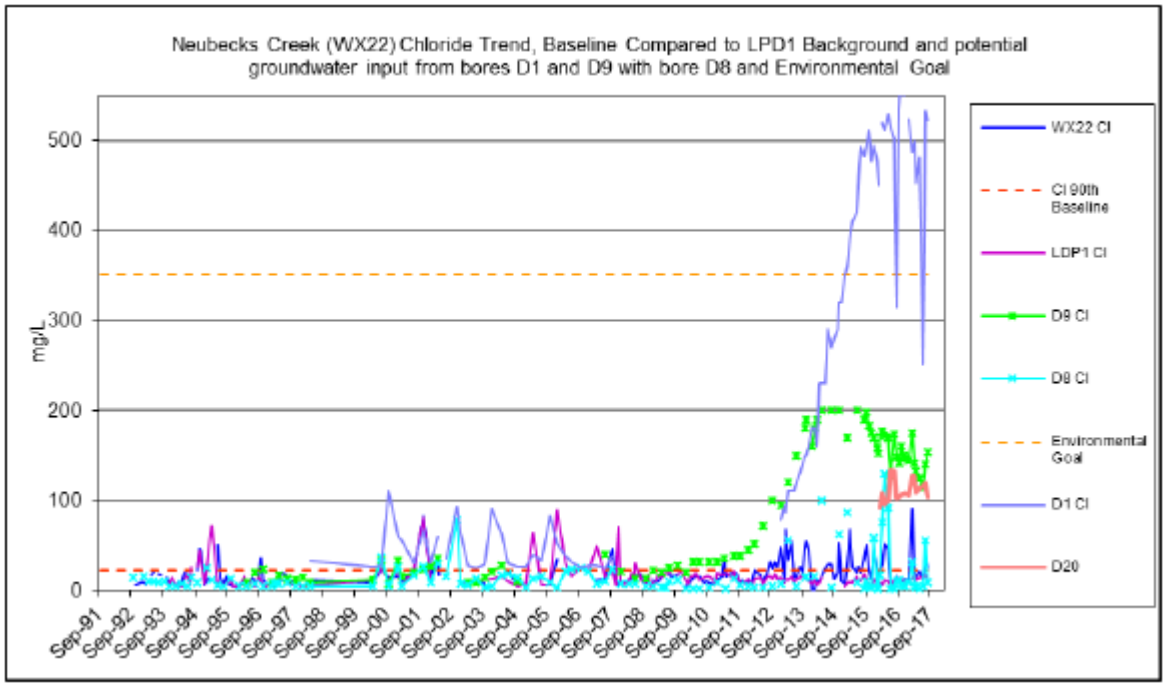

Figure 16 Chloride Trends in Neubecks Creek (WX22) Compared to its 90th percentile baseline

The variations in chloride at the Neubecks Creek receiving water site, WX22, are used as an indication of the effects of groundwater inflows from Huon Gully, beneath the Lamberts North placement, as well as from the ash itself, as potentially indicated by the recent measurements at bore D20. Those concentrations are compared to the creek background concentrations at LMP1, as well as the concentrations in bore D20 groundwater, near the bottom level of the ash placement, and the up-gradient groundwater bores D1 and D9 in Figure 16.

Figure 16 shows the sharp decrease in chloride at D1, due to the recent heavy rainfall events, which corresponds with the decrease in chloride at bore D10 (Figure **15**) and confirms the connection between the chloride plume in Huon Gully with bores D1 and D9. However, Figure 16 shows that the chloride increase at D9 was lower than expected compared, with that at D1, and is consistent with low chloride, local coal mine groundwater inflows of the D9 area. The much lower chloride concentrations in Neubecks Creek appear to reflect the view that most of the flows of groundwater pass under the creek (Figure **17**). In addition, any groundwater that does seep into the creek is diluted by the stream flows as they vary with rainfall runoff.

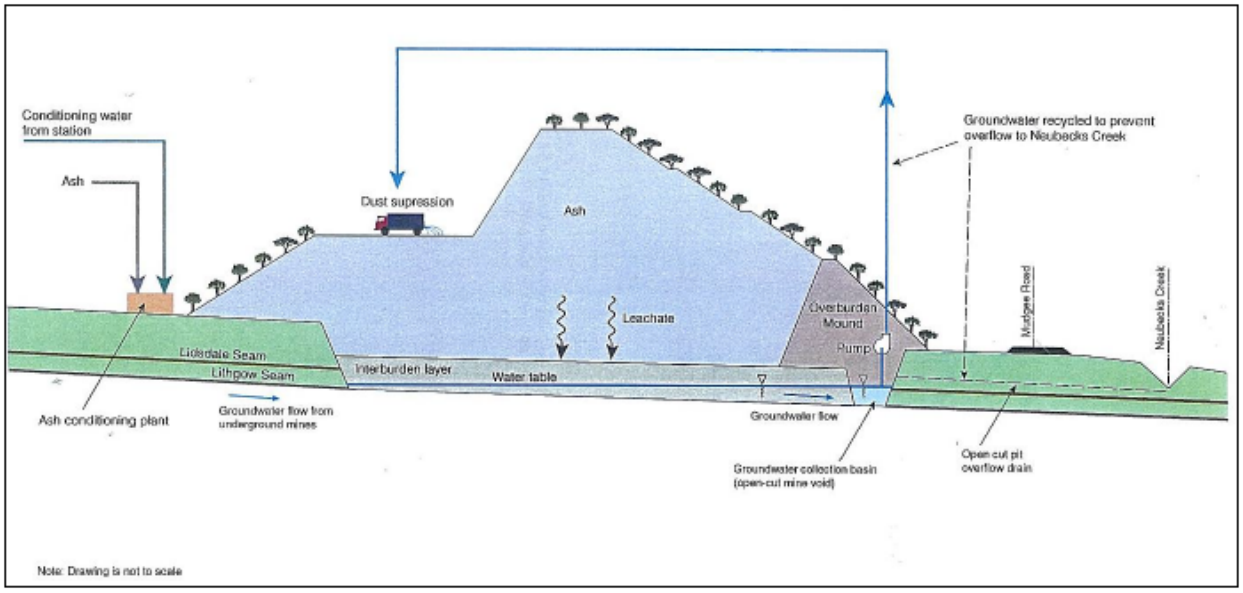

Figure 17 Schematic of Mt Piper ash placement management of surface and groundwater

7.2.3 Reportable Incidents

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

7.2.4 Further Improvements

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

7.3 Hydrological Monitoring

The hydrological monitoring program was incorporated into the GMMP because of the change in design to Lamberts North addressed in the Consistency Report (SKM, 2012), as indicated in Section 5.5.

7.4 Erosion and Sediment Control

7.4.1 Environmental Management

The repository 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 in the Lamberts North area are graded west to ensure security against a breach from any external boundary. All surface water runoff from the ash footprint of Lamberts North is managed within the boundary of the ash placement area.

The location of water retention within North Lamberts North 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 North Lamberts North ash placement site 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 Lamberts North placement area. Seepage reports to the lined LN Pond 2.

Based on site observations and information reviewed potential impacts from the operation of the Lamberts North Ash Repository on erosion and sediment control have been effectively mitigated and managed.

7.4.1 Reportable Incidents

No reportable incidents have been recorded against erosion and sediment control for the reporting period.

7.4.2 Further Improvements

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

8. Landscape and Revegetation

8.1.1 Environmental Management

During the reporting year no rehabilitation work was undertaken. Rehabilitation works at Lamberts North is limited until the 937 m contour layback has been constructed around the perimeter of the ash repository. The completion of the 937 m contour layback is anticipated to occur during the 2019 reporting year.

8.1.2 Environmental Performance

The Lamberts North Ash repository is in the early stages of its development. As such no land preparation or rehabilitation work was conducted during the reporting period. The rehabilitation status of Lamberts North is detailed in Table 14. The rehabilitation status of Lamberts North and the adjoining Mt Piper Ash Repository is shown in Appendix E.

Table 14 Rehabilitation Status

Area Type	Previous Reporting Period Sept 2015 – Aug 2016 Hectares	This Reporting Period Sept 2016 – Aug 2017 Hectares	Next Reporting Period Sept 2017 – Aug 2018 Hectares
Total Footprint	19.8	19.8	19.8
Total active disturbance	12.2	12.2	12.2
Land being prepared for rehabilitation	0	0	0
Land under active rehabilitation	0	0	0
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 Reference Group meetings were held on 21 September 2016, 30 November 2016, 22 February 2017, 7 June 2017, and 23 August 2017. The Community Reference Group comprises representatives from the local community and EnergyAustralia NSW. The Group meets on a quarterly basis to discuss matters relating to operations at Mt Piper and Wallerawang Power Stations, including activities at the ash repositories. The Community Reference Group minutes are made publically available via the Mt Piper and Wallerawang Community page on the Company's website www.energyaustralia.com.au.

9.2 Community Contributions

The Mt Piper Power Station and the associated Lamberts North Ash Repository 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. EnergyAustralia continues to support a number of community groups and organisations through in-kind support and financial sponsorship programs. During the reporting period, EnergyAustralia had the opportunity to support up to 60 different community organisations and events during the reporting period. A comprehensive list of these organisations and events are included in Appendix I.

9.3 Community Complaints

There were no community complaints reported relating to the Lamberts North Ash Repository during the reporting period. EnergyAustralia NSW maintains a 24 hour hotline for the public to report incidents, complaints or enquiries with contact details available on the EnergyAustralia website. EnergyAustralia 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 Lamberts North Ash Repository in accordance with Condition B10 of the Project's Conditions of Approval. Copies of the following documents are made publically available on the EnergyAustralia website:

- 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
- Community Reference Group Minutes

10. Independent Environmental Audit

10.1 Independent Environmental Audit

No independent environmental audits were conducted during the reporting period. There is no requirement to conduct an independent environmental audit unless directed by the Department in accordance with CoA E22.

10.2 Environmental Representative Audit

Internal audits were conducted on noise and groundwater compliance against the project approval and the relevant management plans during the reporting period. The findings of the audits are present in this section.

10.2.1 Noise Audit

Operations at Lamberts North were found to be performed generally in compliance with the project approval and the NMMP (See Appendix F). However, the audit found Lamberts North operations to be non-compliant with two administrative aspects associated the NMMP. A non-compliance was issued for not performing a review of the NMMP after three years of operation. The second non-compliance was issued for the failure to compare sound output from plant and equipment against typical noise levels presented in Australian Standard 2436 Guide to noise and vibration control on construction, demolition and maintenance sites.

The non-compliances can be characterised as administrative issues which can be easily rectified and do not present a compliance risk to the Lamberts North operations. Further it is recognised that a number of sensitive receivers the in the Blackmans Flat village have been purchased by a local mining Company and no longer reside in the area.

10.2.2 Groundwater Audit

The audit found that the operation of Lamberts North in regards to the Groundwater Management and Monitoring Plan (GMMP) was generally undertaken in accordance with the requirements of the Conditions of Approval (See Appendix G). Five non compliances relating to the Conditions of Approval were identified. Two non-conformances were found for not including the monitoring results for bores D15, D16, D17 and D18 in the annual groundwater monitoring assessment as they form part of the GMMP. Two further non-compliances were issued for not investigating a 2 meter decrease in water levels at bore D19 as required by the GMMP. The final non-conformance relates to contractor, Lend Lease, groundwater sampling procedures which may not be compliant to the standards / codes detailed in the GMMP. The groundwater sampling program managed by Nalco, which forms the majority of groundwater sampling for Lamberts North, was found to be in accordance with groundwater sampling and analysis as a NATA accredited laboratory.

11. Incidents and non-compliances during the reporting period

Table 15 provide a summary of non-compliances identified in Section 1 of the Annual Review.

Table 15 Summary of non-compliance

Non Compliance No.1	
Nature of the incident/non-compliance.	Noise Management and Monitoring Plan (Section 6.3.5.5) The Audit found that a review of the Noise Management and Monitoring Plan (NMMP) after three years of operation had not been completed as required by section 6.3.5.5 in NMMP.
Date of incident/ non-compliance (if known; if not known state not known).	22 August 2017
The location of the incident/ non-compliance (include a figure if appropriate), if known.	Not applicable
Detail the cause of the incident/noncompliance.	A review of the Lamberts North OEMP that includes the NMMP was deferred due to an independent assessment of groundwater and surface water at the Mt Piper Power Station and Lamberts North Ash Repository's. It is proposed to review the Lamberts North OEMP including the NMMP following the completion of the independent groundwater assessment.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	No adverse effects were observed due to the deferred review of the NMMP. Noise monitoring conducted from 2013 to 2017 confirmed that activities have been carried out within noise limits. The NMMP component of the Lamberts North OEMP will be reviewed and updated to reflect current operations and submitted to the Department following the finalisation of the independent groundwater assessment.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ noncompliance.	The OEMP will be revised to ensure each sub-plan reflects current activities and practices at the site.
Non Compliance No.2	
Nature of the incident/non-compliance.	Noise Management and Monitoring Plan (Section 6.3.4). The Audit found that sound output from plant and equipment has not been compared against typical noise levels presented in Australian Standard 2436 Guide to noise and vibration control as required by section 6.3.4 of the NMMP.

Date of incident/ non-compliance (if known; if not known state not known).	22 August 2017
The location of the incident/ non-compliance (include a figure if appropriate), if known.	Not applicable
Detail the cause of the incident/noncompliance.	There was no evidence to confirm that the sound power level of existing equipment had been tested and compared against the typical noise levels presented in Australian Standard 2436 Guide to noise and vibration control as required by section 6.3.4 NMMP.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	No adverse effects were observed. The results from noise monitoring conducted between 2013 to 2017 confirm approved activities comply with noise limits. No noise complaints have been received relating to operations at Lamberts North.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ noncompliance.	The NMMP component of the Lamberts North OEMP will be reviewed to reflect current operations. As noise is not a sensitive environmental matter for the Lamberts North Project, it is proposed to change this commitment to undertake this type of assessment as required or in the event noise complaints are received that relate to heavy vehicle movements or a non-compliance is identified during routine noise monitoring.
Non Compliance No.3	
Nature of the incident/non-compliance.	Groundwater Management and Monitoring Plan (Section 6.4.2) The audit found that the groundwater monitoring bores D15 to D18 are not included in the Water Quality assessment performed annually by consultants although they are monitored according to GMMP and the EA sample schedule.
Date of incident/ non-compliance (if known; if not known state not known).	22 August 2017
The location of the incident/ non-compliance (include a figure if appropriate), if known.	Not applicable
Detail the cause of the incident/noncompliance.	EnergyAustralia engaged specialist consultants Aurecon to review and report on the relevant groundwater monitoring data on an annual basis. Annual groundwater reports prepared by Aurecon for the period 2014 to 2017 indicate the reason to exclude bores D15 to D18 is because they sample groundwater in the basement rock rather than coal washery waste or

	mine spoil. The 2015 annual groundwater report prepared by Aurecon states bore drilling logs for bores D15, D16, D17 and D18 indicate that these bores were drilled into the basement rock and the logs also indicate that the bore screens are sampling groundwater in the rocks and may not be efficiently sampling leachates from the coal washery wastes and/or mine spoil in the area. In addition, these bores may have misleadingly low groundwater levels because the pore pressure in rock could be lower than in the local mine spoil, causing the water level to rise less than if the bores were sampling the groundwater in the mine spoil.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	EnergyAustralia engaged specialist consultant ERM to undertake an independent assessment of groundwater and surface water quality data in the vicinity of the Mt Piper Ash Repository. It is anticipated that this assessment and modelling will be completed in late 2018. EnergyAustralia will be guided by the advice of its groundwater experts in regards to assessing any potential impacts to groundwater and reporting requirements. The reporting of relevant groundwater data and assessment of potential impacts will continue to be undertaken in accordance with the Project Approval.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ noncompliance.	The OEMP including the GMMP will be reviewed and updated following the completion of the independent groundwater assessment.
Non Compliance No.4	
Nature of the incident/non-compliance.	Groundwater Management and Monitoring Plan (Section 6.4.3) The audit found the water level in bore D19 had a decrease of approximately 2 meters which had not been investigated. An investigation is required by condition 6.4.3 of the GMMP for significant change in groundwater level.
Date of incident/ non-compliance (if known; if not known state not known).	22 August 2017
The location of the incident/ non-compliance (include a figure if appropriate), if known.	Bore D19
Detail the cause of the incident/noncompliance.	GMMP Section 6.4.3 requires that if there is any significant change in the groundwater level as measured by monthly depth measurements, then flow calculations will be undertaken and a rerun of the

	model considered.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	Energy Australia has engaged a specialist consultant to undertake an independent assessment of groundwater and surface water quality data in the vicinity of the Mt Piper Ash Repository.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ noncompliance.	The OEMP including the GMMP will be reviewed and updated following the completion of the independent groundwater assessment. This will include revised trigger levels for further monitoring and investigation.
Non-compliance No.5	
Nature of the incident/non-compliance.	The audit found the contractor's sampling procedures for groundwater may not conform to the standards / codes detailed in Section 6.4.3 of the GMMP.
Date of incident/ non-compliance (if known; if not known state not known).	22 August 2017
The location of the incident/ non-compliance (include a figure if appropriate), if known.	Not applicable
Detail the cause of the incident/noncompliance.	The audit found sampling procedures used by Lend Lease for groundwater sampling may not conform to the standards / codes detailed in the GMMP.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance.	Energy Australia NSW has notified Lend Lease of the requirement to comply with the standard / codes for groundwater sampling detailed in the GMMP by the 1 March 2018.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ noncompliance.	The contractor is required to demonstrate their sampling procedures meet the requirements of the relevant standards and codes and seek relevant training and certification if required.

Table 16 Summary of incidents, exceedances and regulatory action

Compliance Type	**Number**
Exceedance	Nil
Incidents	Nil
Official cautions	Nil

12. Activities Proposed in the reporting period

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

- Ash placement into Lamberts North.
- Environmental compliance monitoring for air quality, noise emissions and water quality.
- Water management works including the maintenance of sediment and erosion control structures.
- Dust suppression activities to minimise potential air quality impacts from the Lamberts North Ash Repository.
- Conduct a tree planting day at Thompson Creek Reservoir as part of the Lamberts North Biodiversity Offset Plan. The tree planting activity is scheduled to occur in December 2017.
- Update the independent groundwater investigation report after review comment is received from the EPA and then submit to DPE.
- Continue monitoring the ecological health of Neubecks Creek throughout the life of the Project. The monitoring will continue after final capping of the Lamberts North Ash Repository for a minimum of five years in accordance with approval conditions.

12.1 Environmental Management Targets and Strategies for the Next Year

Environmental measures to be implemented in the 2017-18 reporting period are detailed in Table 17.

Table 17 Measures to be implement in the next reporting period

Environment Management Area	Target / Strategy	Timeframe
Noise	Review the scope of independent noise monitoring in light of no incidents being recorded in the first three years of operations.	March 2018.
Noise	Conduct a review of the noise management and monitoring plan	August 2018
Water Quality	Review the groundwater management and monitoring plan	Following completion of the independent groundwater investigation.

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14. Glossary of Terms

AEMR	Annual Environmental Management Report
CEMP	Construction Environmental Management Plan
CIP	Community Information Plan
CoA	Condition of Approval (also known as MCoA – Minister's CoA)
CPM	Construction Project Manager
CSM	Construction Site Manager
DE	Delta Electricity
DECC	Department of Environment & Climate Change
DP&E	Department of Planning and Environment
DPI / DP&I	Department of Planning and Infrastructure
EA	EnergyAustralia
EPL	Environment Protection Licence
LN	Lamberts North
mAHD	Metres Australian Height Datum
NEMMCO	National Electricity Market Management Company
NSW RFS	NSW Rural Fire Service
NPWS	Nation Parks and Wildlife Services
OEH	Office of Environment & Heritage
OEMP	Operation Environmental Management Plan
ONVMP	Operational Noise and Vibration Management Plan
RL	Relative Level

Appendix A
Detailed review checklist for Conditions of Approval

Administrative Conditions

Terms of approval

Minister's Condition of Approval A1
The proponent shall carry out the project generally in accordance with the: ***a) Major Project Application 09_0186;*** ***b)* Mt Piper Ash Placement *(two volumes)* – Environmental Assessment*, prepared by Sinclair Knight Merz, August 2010 ;*** ***c)* Mt Piper Ash Placement – Submissions Report*, prepared by Sinclair Knight Merz, March 2011;*** ***d)* Delta's Letter to the Department – Submissions Report response to the Department and Agency Issues, dated 22 June 2011; and** ***e)* The conditions of this approval.**
Compliance Assessment Observations and Comments Based on the review undertaken, the Lamberts North operations have been carried out in accordance with the above requirements.
Compliance Assessment Finding - Compliant
Minister's Condition of Approval A2
In the event of an inconsistency between: ***a) The conditions of this approval and any document listed from condition A1a) – A1d) inclusive the conditions of this approval shall prevail to the extent of the inconsistency; and*** ***b) Any of the documents listed from the condition A1a) –A1d) inclusive, the most recent document shall prevail to the extent of the inconsistency.***
Compliance Assessment Observations and Comments No inconsistencies were observed between the documents listed above during implementation of the project or during the course of the review of operations in preparing this AEMR.
Compliance Assessment Finding - Compliant

Minister's Condition of Approval A3
The proponent shall comply with the reasonable requirements of the Director-General arising from the Department's assessment of: ***a) Any reports, plans or correspondence that are submitted in accordance with this approval; and*** ***b) The implementation of any actions or measures contained in these reports, plans or correspondence.***
Compliance Assessment Observations and Comments No requests from the Director-General of the DP&E have been received during the 2016-17 reporting period.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval A4
The proponent shall meet the requirements of the Director-General 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 of this approval.
Compliance Assessment Observations and Comments Based on the review undertaken, the Lamberts North operations have been carried out in accordance with the above requirements.
Compliance Assessment Finding – Compliant

Limits of approval

Minister's Condition 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.
Compliance Assessment Observations and Comments 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 DP&E in December 2012. Ash placement commenced in September 2013, well before the 'deadline' date.
Compliance Assessment Finding – Compliant

Statutory requirements

Minister's Condition of Approval 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.
Compliance Assessment Observations and Comments Based on the Environmental Assessment (SKM, 2010) and OEMP (CDM Smith, 2013), 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)
Compliance Assessment Finding – Compliant

Staging

Minister's Condition of Approval A7
Where the Proponent intends to construct and operate the project in discrete stage (i.e. Lamberts North and Lamberts South) it may comply with the requirements in conditions B4, B5, D2, D3 and D4 separately for each stage.
Compliance Assessment Observations and Comments A CEMP (CDM Smith, 2012a) for construction (CoA B4) including the Construction Noise Management Plan (CoA B5) was approved by the DPI 1 December 2012. An OEMP (CDM Smith, 2013) for operation (CoA D2) of Lamberts North including the Operational Noise Management Plan (CoA D3) and Groundwater Management Plan (CoA D4) was approved by the DPI on 13 May 2013. The abovementioned conditions are compliant for the Lamberts North and have not applied to Lamberts South as no construction works have commenced.
Compliance Assessment Finding – Compliant

Prior to Construction Conditions

Environmental Representative

Minister's Condition of Approval B1
Prior to the commencement of any construction activities, or as otherwise agreed by the Director-General, the Proponent shall nominate for the approval of the Director-General 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 Director- General. The Environmental Representative(s) shall: ***(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; 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.***
Compliance Assessment Observations and Comments In October 2012 Delta Electricity nominated the Senior Environment Officer Kelly Gillen as the Environmental Representative. The Senior Environment Officer was approved as the Environmental Representative by the DPI on 01 December 2012. The Senior Environment Officer oversees the implementation of Lamberts North operations through attendance at Monthly Client Meetings with Lend Lease. The Senior Environment Officer guides the project through site visits, sampling, auditing and other regulatory activities to ensure compliance with the environmental requirements of the CoAs and all relevant licences. In April 2015, EnergyAustralia NSW notified the DP&E of Ms Gillen's new position within the organisation and nominated the new Senior Environment Officer Coleen Milroy as the Environmental Representative.
Compliance Assessment Finding – Compliant

Groundwater Modelling

Minister's Condition of Approval B2
The Proponent shall undertake groundwater modelling by either adapting the existing UTS (2007) groundwater model to Lamberts North or developing a new groundwater model for Lamberts North. The updated model should be calibrated to site-specific data. In either case, the model shall incorporate the findings of groundwater monitoring of the existing ash placement areas. The Proponent shall consult with the SCA in the preparation of the groundwater model and the model shall be provided to the SCA within five months of project approval, unless otherwise agreed by the Director-General. ***The model shall address but not necessarily be limited 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, chloride, 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 updated as set out above in items a) – e) in consultation with the SCA, to apply to Lamberts South.***
Compliance Assessment Observations and Comments A Groundwater modelling report was prepared by CDM Smith in November 2012 (CDM Smith, 2012b). The report was prepared in consultation with the 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.
Compliance Assessment Finding – Compliant

Groundwater Monitoring

Minister's Condition of Approval 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 predications 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 the SCA. ***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 predications in B2 in the consideration of the design of the ash placement facilities.***
Compliance Assessment Observations and Comments 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.
Compliance Assessment Finding – Compliant

Construction Environmental Management Plan

Minister's Condition of Approval 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 Lithgow City Council and relevant government agencies, and be consistent with the Guideline for the Preparation of Environmental Management Plants (DIPNR, 2004 or its latest revision) and shall include, but not necessarily be limited to: ***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 A1b) and A1d);*** ***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.*** ***The CEMP for the project (or any stage of the project_ shall be submitted to the Director-General 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 Director-General. Construction shall not commence until written approval has been received from the Director-General.***
Compliance Assessment Observations and Comments 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 November 2012.
Compliance Assessment Finding – Compliant

Minister's Condition of Approval B5
As part of the CEMP for the project, the Proponent shall prepare and implement the following plans:
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:
i) Details of how construction activities and an indicative schedule for construction works;
ii) Identifications 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 exceedence 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.
b) A Groundwater Management Plan to detail measures to manage groundwater impacts. The Plan shall be prepared in consultation with the NOW and the SCA and include, but not necessarily be limited to:
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 exceedences of existing groundwater quality criteria approved for Area 1 (the existing ash placement area); and
v) Provisions for periodic reporting of results to the SCA during construction.
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 the SCA and the NOW and any other relevant government agency. The Plan shall include, but not necessarily be limited to:
i) Baseline data on the water quality and available flow data in Huons Creek, Lamberts Gully Creek and Neubecks Creek;
ii) Water quality objectives and impact assessment criteria for Huons Creek, Lamberts Gully Creek and Neubecks 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 control and provisions for recycling/reuse of water and the procedures for decommissioning water management structure 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 NOW and DPI (Fisheries) 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 NOW 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 Neubecks Creek;

xii) A protocol for the investigation of identified exceedences in the impact assessment criteria;

xiii) A response plan to address potential adverse surface water quality exceedences; and

xiv) Provisions for periodic reporting of results to DPI (Fisheries), NOW and the SCA as per condition B8.

d) An 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:

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

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.

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 EPA and shall include, but not necessarily be limited to:

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.

f) An Aboriginal Heritage Plan, to monitor and manage Aboriginal heritage impacts in consultation with the EPA. The plan should include, but not necessarily limited to:

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.

g) An Ash Transportation Plan, to provide details on the preferred option for the transportation of ash from Mt Piper Power Station to the ash placement areas. The Plan shall include but not necessarily be limited to:

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.

Compliance Assessment Observations and Comments

The CEMP for construction and all associated sub-plans for Lamberts North (CDM Smith, 2012a) was developed in consultation with Delta Electricity's Environment Section, NOW and SCA. The CEMP was approved by the DPI on 01 December 2012.

Compliance Assessment Finding – Compliant

Biodiversity Offsets

Minister's Condition of Approval B6
The Proponent shall develop and submit for approval of the Director-General, 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 Director-General. The Plan shall be developed in consultation with the EPA and shall: ***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 on 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, local Council) for long term management and funding of offsets and 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 outcomes. Rehabilitation measures are required to be implemented to ensure that the biodiversity impacts are consistent with a maintain or improve biodiversity outcome.***
Compliance Assessment Observations and Comments 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 (EANSW, 2015a) was approved 24 August 2015. A Biodiversity Offset Strategic Outline (BOSO) was prepared for Lamberts South and was considered appropriate by the Department.
Compliance Assessment Finding – Compliant

Ecological Monitoring & Compliance Monitoring & Tracking

Minister's Condition of Approval B7
The Proponent shall prepare and implement an Ecological Monitoring Program prior to construction, in consultation with the NOW and the DPI (Fisheries), to monitor and quantify the impacts on the ecology of Neubecks Creek and the associated riparian environment. The Program shall include, but not necessarily be limited to: ***a) A sampling, data collection and assessment regime to establish baseline ecological health and for ongoing monitoring of ecological health of the in-stream 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 Neubecks 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 Assessment Observations and Comments 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 for the September 2016 – August 2017 reporting period was performed in December 2016 (Cardno, 2017).
Compliance Assessment Finding - Compliant
Minister's Condition of Approval B8 & B9
B8 - The Proponent shall develop and implement a Compliance Tracking Program for the project, prior to commencing construction, to track compliance with the requirements of this approval and shall include, but not necessarily be limited to: ***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;*** ***b) Provisions for periodic reporting of the compliance status to the Director-General;*** ***c) A program for independent environmental auditing in accordance with AS/NZ ISO 19011:2003 – Guidelines for Quality and/or Environmental Management Systems Auditing;*** ***d) Procedures for rectifying any non-compliance identified during environmental auditing or review of compliance;*** ***e) Mechanisms for recording environmental incidents and actions taken in response to those incidents;*** ***f) Provisions for reporting environmental incidents to the Director-General 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 shall be implemented prior to construction of the project with a copy submitted to the Director-General for approval at least four weeks prior to the commencement of the project, unless otherwise agreed by the Director-General.*** ***B9 – Nothing in this approval restricts the Proponent from utilising any existing compliance tracking programs administered by the Proponent to satisfy the requirements of condition B8. In doing so, the Proponent must demonstrate to the Director-General how these systems address the requirements and/or have been amended to comply with the requirements of the condition.***
Compliance Assessment Observations and Comments A Compliance Tracking program was developed & implemented prior to commencing construction. The Compliance and Tracking document was approved by DPI on 13 December 2012.
Compliance Assessment Finding - Compliant

Community Information & Complaints Management

Minister's Condition of Approval B10
Prior to 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: ***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.***
Compliance Assessment Observations and Comments A project website is available for the Lamberts North 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 as Environmental Management Plans, Annual Environmental Management 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-and-wallerawang-community
Compliance Assessment Finding – Compliant
Minister's Condition of Approval 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: ***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.***
Compliance Assessment Observations and Comments 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: EnergyAustralia NSW – Mt Piper Power Station Locked Bag 1000 Portland NSW 2847 Email: contactus@energyaustraliansw.com.au
Compliance Assessment Finding – Compliant
Minister's Condition of Approval B12
The Proponent shall record the details of complaints received through the means listed under condition B11of this approval in a Complaints Register. The Register shall

record, but not necessarily be limited to:

- ***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 Director-General upon request.

Compliance Assessment Observations and Comments

Any complaints to EnergyAustralia NSW go via the switchboard, or through email or mail and are then redirected to the appropriate area of EnergyAustralia NSW operations.

All complaints are recorded in the Ellipse system in the Incidents and Complaints Register with all details captured including actions to be taken if necessary as per Environment Management System Administration Procedure for non-conformity, corrective and preventative action. If actions were necessary, a review of those actions is undertaken before the work order is closed. In addition, the ash contractors produce a monthly compliance report including a record of any complaints received.

No complaints have been received regarding the Lamberts North Project for the reporting period.

Compliance Assessment Finding - Compliant

Minister's Condition of Approval 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:

- ***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 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 Director-General one month prior to the commencement of construction.

Compliance Assessment Observations and Comments
The *Lamberts North Ash Placement Stakeholder Communications Plan* (September 2012) was specifically prepared and implemented for the purposes of this project. The CIP was published in the local newspaper Lithgow Mercury 08 December 2012. A Community Information Plan (CIP) was also prepared in October 2013. The CIP was recently updated to reflect EnergyAustralia (EA) as the owners and remove any references to Delta Electricity in accordance with a recommendation from the Independent Environmental Audit (Aurecon, 2014).
Compliance Assessment Finding – Compliant

Design

Minister's Condition of Approval B14
The ash placement areas shall be designed by a suitable qualified expert to ensure structural stability of the ash placement areas.
Compliance Assessment Observations and Comments
Design approved by DP&E 01 December 2012. The ash placement areas were designed by JK Williams, in consultation with Principal Contractors Lend Lease, to ensure structural stability of the ash placement areas. The ash placement areas were constructed in line with the design.
Compliance Assessment Finding - Compliant

During construction conditions

Environmental Incident reporting

Minister's Condition of Approval C1
The Proponent shall notify the Director-General 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 Director-General within seven days of the date on which the incident occurred.
Compliance Assessment Observations and Comments
No environmental incidents requiring notification of the Director-General occurred within the September 2016-August 2017 reporting period.
Compliance Assessment Finding – Compliant

Minister's Condition of Approval C2
The Proponent shall meet the requirements of the Director-General 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 Director-General may require.
Compliance Assessment Observations and Comments Not applicable as no incidents requiring notification of the Director-General occurred within the September 2016-August 2017 reporting period.
Compliance Assessment Finding – Not applicable

Construction Hours

Minister's Condition of Approval C3
Construction activities associated with the project shall only be undertaken during the following hours: ***a) 7:00 am to 6:00 pm, Monday to Fridays, inclusive;*** ***b) 8:00 am to 1:00 pm on Saturday; and*** ***c) At no time on Sundays or public holidays.***
Compliance Assessment Observations and Comments A CEMP was prepared for the works associated with the development of Lamberts North in preparation for ash placement and included a Construction Noise Management Plan and Noise Monitoring Program which addressed the construction hours. This was submitted and approved by the DP&I in November 2012. No construction activities have occurred during the reporting period.
Compliance Assessment Finding – Not applicable
Minister's Condition of Approval C4
Construction outside the hours stipulated in condition C3 of this approval is permitted in the following circumstance: ***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*** ***Where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.***

Compliance Assessment Observations and Comments

No construction activities have been performed during the reporting period.

Compliance Assessment Finding – Not applicable

Minister's Condition of Approval C5

a) The hours of construction activities specified under condition C3 of this approval may be varied with the prior written approval of the Director-General. Any request to alter the hours of construction specified under condition C3 shall be:

b) A) considered on a case-by-case basis;

c) Accompanied by details of the nature and need for activities to be conducted during the varied construction hours; and

d) Accompanied by information necessary for the Director-General to reasonably determine that activities undertaken during the varied construction hours will not adversely impact on the acoustic amenity of sensitive receiver in the vicinity of the site.

Compliance Assessment Observations and Comments

Approval was not required for a variation to construction hours.

Compliance Assessment Finding – Not applicable

Construction Noise

Minister's Condition of Approval C6

The construction noise objective for the project is to manage noise from construction activities (as measured by $L_{Aeq\ (15\ minute)}$ descriptor) so as not to exceed:

Location	*Day ($L_{Aeq\ (15minute)}$) dB(A)*
All private receivers within the township of Blackmans Flat	*46*
All other residences	*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), including noise generated by heavy vehicle haulage and other construction traffic associated with the project. Any activities that have the potential for noise emissions that exceed the objective must be identified and managed in accordance with the Construction Noise Management Plan (as referred to under Condition B5a of this approval).

Compliance Assessment Observations and Comments
Construction noise mitigation is detailed in CEMP Noise sub-plan approved by DPI 01 December 2012.
No construction activities have been performed during the reporting period.
Compliance Assessment Finding – Not applicable

Dust Generation

Minister's Condition of Approval 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 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.
Compliance Assessment Observations and Comments
Dust generation mitigation is detailed in CEMP Air quality sub-plan approved by DPI 01 December 2012.
No construction activities have been performed during the reporting period.
Compliance Assessment Finding – Not applicable

Heritage Impacts

Minister's Condition of Approval 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 the EPA (OEH) 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 the EPA (OEH) and the registered Aboriginal stakeholders and written authorisation from the EPA (OEH) is received by the Proponent.
Compliance Assessment Observations and Comments
The course of action for Aboriginal objects identified during construction is detailed in CEMP Aboriginal sub-plan approved by DPI 01 December 2012. No Aboriginal artefacts were discovered during construction.
Compliance Assessment Finding – Compliant

Minister's Condition of Approval 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 the EPA (OEH (Heritage Branch)) notified in accordance with the* Heritage Act 1977*. Works shall not recommence until the Proponent receives written authorisation from the EPA (OEH (Heritage Branch)).
Compliance Assessment Observations and Comments No historic relics were discovered during construction.
Compliance Assessment Finding – Compliant

Soil and Water Quality Impacts

Minister's Condition of Approval C10
The Proponent shall comply with section 120 of the* Protection of the Environment Operations Act 1997 *which prohibits the pollution of waters.
Compliance Assessment Observations and Comments Compliance is achieved through the CEMP Soil and water sub-plan approved by DPI 01 December 2012 and EPL 13007.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval 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).***
Compliance Assessment Observations and Comments Soil and water controls are detailed in CEMP Soil and Water sub-plan approved by DPI 01 December 2012.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval C12

During construction, the Proponent shall maintain of buffer of 50 metres from the construction work to Neubecks Creek.
Compliance Assessment Observations and Comments Buffer was maintained as documented in JKW contractor meeting minutes.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval C13
Surface water drainage must be appropriately engineered and stabilised to convey run off without collapse or erosion. Surface water runoff collection ponds are to be lined.
Compliance Assessment Observations and Comments Surface water drainage engineered and stabilised as per CEMP Soil and Water sub-plan approved by DPI 01 December 2012.
Compliance Assessment Finding – Compliant

Waste Generation and Management

Minister's Condition of Approval C14
All waste materials removed from the site shall only be directed to a waste management facility lawfully permitted to accept the materials.
Compliance Assessment Observations and Comments EnergyAustralia NSW manages all site waste in accordance with EPL 13007 disposal and restricted waste area or via waste contractors with licenced waste contractor.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval 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 a licence under the* Protection of the Environment Operations Act 1997*, if such a licence is required in relation to that waste.

Compliance Assessment Observations and Comments
No wastes generated outside the Lamberts North site were 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 personnel are required to report if they encounter any rubbish or wastes outside those that are allowed during routine operations.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval 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.
Compliance Assessment Observations and Comments
EANSW manages all site waste in accordance with EPL 13007 disposal and restricted waste area or via waste contractors with licenced waste contractor.
Compliance Assessment Finding – Compliant

Prior to Operations conditions

Ash Management

Minister's Condition of Approval 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 Director-General six months prior to the commencement of operations. The Proponent shall report on the status and outcomes of its investigations to the Director-General every two years from the commencement of the operation of the project, unless otherwise agreed by the Director-General.
Compliance Assessment Observations and Comments
Lamberts North Consistency Report (SKM, 2012) and Ash Management Strategy (DMC, 2010) approved by DPI 30 July 2012 detailing the long-term ash management strategy for ash re-use.
Compliance Assessment Finding – Compliant

Operational Environmental Management Plan

Minister's Condition of Approval D2
The Proponent shall prepare and implement an Operational Environmental Management Plan (OEMP) to detail an environmental management framework, practices and procedures to be followed during operation of the project. The Plan shall be prepared in consultation with Lithgow City Council and relevant government agencies, and shall be consistent with the Guideline for the Preparation of Environmental Management Plans (DIPNR 2004) and shall include, but not necessarily be limited to: ***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 condition 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 A1b and A1d of this approval; and*** ***i) The additional requirements of this approval.*** ***The Plan shall be submitted for the approval of the Director-General no later than four weeks prior to the commencement of operation of the project, unless otherwise agreed by the Director-General. Operation shall not commence until written approval has been received from the Director-General.*** ***Nothing in this approval precludes the Proponent from incorporating the requirements of the Operational Environmental Management Plan into existing environmental management systems and plans administered by the Proponent.***
Compliance Assessment Observations and Comments The Operation Environmental Management Plan (CDM Smith, 2013) was approved by DPI in May 2013 and operations at Lamberts North commenced in September 2013.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval D3

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

- ***a) An Operational Noise Management Plan to detail measures to mitigate and manage noise during operations of the project. The Plan shall be prepared in consultation with the EPA and include, but not necessarily be limited to:***
  - ***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.***
- ***b) A Groundwater Management Plan to detail measures to mitigate and manage groundwater impacts. The Plan shall be prepared in consultation with the NOW and the SCA and include, but not necessarily be limited to:***
  - ***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;***
  - ***iv) Groundwater assessment criteria including trigger levels for remedial measures;***
  - ***v) A contingency plan for events that have the potential to pollute or contaminate groundwater sources of water. The plan shall 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;***
  - ***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 shall continue for a minimum of five years following final capping and landscaping;***
  - ***vii) A protocol for the investigation of identified exceedences of the groundwater impact assessment criteria; and***

viii) Provisions for periodic reporting of results to the SCA as per condition B8.

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 shall be based on best environmental practice and shall be prepared in consultation with the NOW and the SCA and DPI (Fisheries). The Plan shall include, but not necessarily be limited to:

i) Baseline data on the surface water quality and available flow in Neubecks Creek and Lamberts Gully Creek;

ii) Water quality objectives and impact assessment criteria for Neubecks 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 pollutant from the site, including a strategy to minimise the area of bare surfaces, stabilise disturbed areas and minimise bank erosion;

v) Demonstration that the proposed erosion and sediment control measured 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, provision 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 Neubecks 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 exceedences on receiving waters including identified trigger levels for remedial measures or the activation of contingency plans; and

xii) Provisions for periodic reporting to the DPI (Fisheries) and the SCA as per condition B8.

d) An Air Quality Management Plan to outline measures to minimise impacts from the project on local air quality. The Plan shall be prepared in consultation with NSW Health and the EPA and include, but not necessarily be limited to:

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 exceedences in visible emissions including PM_{10}, 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 licence limits under normal and adverse weather conditions at all stages of the ash placement process.***

e) A Landscape/Revegetation Plan to outline measure 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 shall include, but not necessarily be limited to:

- ***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.***

f) A Site Rehabilitation Management Plan to outline measures to stabilise and rehabilitate the site following project completion. The Plan shall be prepared in consultation with the SCA. The Plan shall include, but not necessarily be limited to:

- ***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.***

Compliance Assessment Observations and Comments

The Operation Environmental Management Plan was prepared by CDM Smith. Sections 6.3 – 6.7 detail the required management plans as outlined above. Approval of the OEMP was granted in May 2013 and operations at Lamberts North commenced in September 2013.

Compliance Assessment Finding – Compliant

Groundwater Quality and Geotechnical Impacts

Minister's Condition of Approval 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.
Compliance Assessment Observations and Comments 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.
Compliance Assessment Finding – Compliant

Operational conditions

Operational Hours

Minister's Condition of Approval E1
Operational activities associated with the project shall only be undertaken from 6:00 am to 8:00 pm, Monday to Friday and 6:00 am to 5:00 pm Saturday and Sunday.
Compliance Assessment Observations and Comments Lend Lease have advised that no operational activities have taken place outside the hours designated above. Ash haul truck logs support this statement.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval 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 and the proposed Mt Piper Power Station Extension project 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 including the proposed Mt Piper Power Station Extension 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.***
Compliance Assessment Observations and Comments Lend Lease have advised that no operational activities have taken place outside the hours. No emergencies requiring out of hours operation have occurred within the reporting period.
Compliance Assessment Finding –Not applicable

Minister's Condition of Approval 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 Director-General for approval a report including, but not limited to: ***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 Director-General 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 Director-General.***
Compliance Assessment Observations and Comments Lend Lease have advised that no operational activities have taken place outside the hours. No emergencies requiring out of hours operation have occurred within the reporting period.
Compliance Assessment Finding –Not applicable
Minister's Condition of Approval E4
The Proponent shall notify the EPA prior to undertaking any emergency ash haulage or placement operations outside the hours of operation stipulated in condition E1 of this approval and keep a log of such operations.
Compliance Assessment Observations and Comments Lend Lease have advised that no operational activities have taken place outside the hours. No emergencies requiring out of hours operation have occurred within the reporting period.
Compliance Assessment Finding –Not applicable
Minister's Condition of Approval E5
The Proponent shall notify the Director-General 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.

Compliance Assessment Observations and Comments
Lend Lease have advised that no operational activities have taken place outside the hours. No emergencies requiring out of hours operation have occurred within the reporting period.
Compliance Assessment Finding –Not applicable
Minister's Condition of Approval E6
The Proponent shall notify nearby sensitive receivers (as defined in the Operational Noise Management Plan required under condition D3s of this approval) prior to 8.00 pm where it is known that emergency ash haulage or placement operations will be required outside the hours of operation stipulated in condition E1 of this approval.
Compliance Assessment Observations and Comments
Lend Lease have advised that no operational activities have taken place outside the hours. No emergencies requiring out of hours operation have occurred within the reporting period.
Compliance Assessment Finding –Not applicable

Operational Noise

Minister's Condition of Approval 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 Director-General and the EPA.

Compliance Assessment Observations and Comments

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 approved OEMP.

Compliance Assessment Finding – Compliant

Minister's Condition of Approval 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.***
Compliance Assessment Observations and Comments Addressed in section 6.3.5.4 of the approved OEMP and section 6.2.2 of this AEMR.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval E9
For the purposes of monitoring noise from the premises to determine compliance with the noise limits: ***a) Class 1 or 2 noise monitoring equipment as defined by AS IEC61672.1-2004 and AS IEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing, must be used;*** ***b) The modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment;*** ***c) The meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station at the premises; and*** ***d) Stability category temperature inversion conditions are to be determined by the sigmatheta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.***
Compliance Assessment Observations and Comments Addressed in Section 6.3.5.4 of the approved OEMP.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval E10
The Proponent shall implement measures to ensure noise attenuation of truck. 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.

Compliance Assessment Observations and Comments

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.

Compliance Assessment Finding – Compliant

Operational Noise Review

Minister's Condition of Approval E11

Within 60 days of the commencement of operation of the project, unless otherwise agreed to by the Director-General, the Proponent shall submit to the Director-General 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:

- ***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 A1b) 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

Compliance Assessment Observations and Comments

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 during the reporting period.

Compliance Assessment Finding – Compliant

Ongoing Operational Noise Monitoring

Minister's Condition of Approval 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 New South Wales Industrial Noise Policy (EPA, 2000) 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 D3a) of this approval, against the noise criteria specified in condition E7 of this approval.***

The Proponent shall forward to the EPA and the Director-General 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 Operational Noise Management Plan referred to in condition D3a) of this approval.

Compliance Assessment Observations and Comments

The operational noise monitoring program is included in Table 6-5 of the approved OEMP. Six-monthly monitoring was performed during 2016-2017. Both reports state 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.

Compliance Assessment Finding – Compliant

Minister's Condition of 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 Director-General 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 Director-General within 60 days of undertaking the noise monitoring which has identified exceedences of the operational noise criteria specified under condition E7, unless otherwise agreed to by the Director-General. The Proponent shall implement all reasonable and feasible mitigation measures in accordance with the requirements of the Director-General.

Compliance Assessment Observations and Comments

No non-compliances with the operational noise criteria specified under condition E7 has been reported during the reporting period.

Compliance Assessment Finding – Compliant
Minister's Condition of Approval E14
If after the implementation 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.
Compliance Assessment Observations and Comments No non-compliances with the operational noise criteria specified under condition E7 has been reported during the reporting period.
Compliance Assessment Finding – Not applicable

Groundwater Monitoring

Minister's Condition of Approval 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 the SCA, 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: ***a) Monitoring at established bore sites (or replacement bore sites in the event that the existing sites are damaged or lost) as described in the Groundwater Management Plan as per condition D3b); 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 D3b) of this approval.***
Compliance Assessment Observations and Comments 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 7.1.2 of this AEMR and can be found in Appendix D.
Compliance Assessment Finding – Compliant

Surface Water Quality Monitoring

Minister's Condition of Approval E16
The Proponent shall prepare and implement a surface water quality monitoring program to monitor the impacts of the ash placement activities on Neubecks Creek and Lamberts Gully. The Program shall be developed in consultation with the DPI (Fisheries) and the SCA, 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: ***a) Monitoring at the existing water quality monitoring sites as described in the document referred to under condition A1b);*** ***b) Monitoring at surface water discharge points from Lamberts Gully Creek;*** ***c) Monitoring at surface water discharge points into Neubecks 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 phosphorous and total nitrogen.***
Compliance Assessment Observations and Comments The Surface water monitoring programme is included in Table 6.21 of the approve OEMP. Monthly monitoring is performed at the Final Holding Pond monitoring station to Neubecks 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 7.2.2 of this AEMR and can be found in Appendix D.
Compliance Assessment Finding – Compliant

Hydrological Monitoring Program

Minister's Condition of Approval 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 the DPI (Fisheries). 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 D3c) of this approval.***
Compliance Assessment Observations and Comments 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.
Compliance Assessment Finding – Compliant

Air Quality Monitoring

Minister's Condition of Approval E18
The Proponent shall prepare and 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 D3d). 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 D3d) of this approval.***
Compliance Assessment Observations and Comments 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 6.5.1.2 of this AEMR.
Compliance Assessment Finding – Compliant

Environmental Incident Reporting

Minister's Condition of Approval E19 and E20
E19 - The Proponent shall notify the Director-General 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 Director-General within seven days of the date on which the incident occurred. ***E20 - The Proponent shall meet the requirements of the Director-General to address the cause or impact of any environmental incidents, as it relates to this approval, reported in accordance with condition E19 of this approval, within such period as the Director-General may require.***
Compliance Assessment Observations and Comments No environmental incidents requiring notification of the Director-General occurred within the reporting period.
Compliance Assessment Finding – Compliant

Annual Performance Reporting

Minister's Condition of Approval E21
The Proponent shall, throughout the life of the project, prepare and submit to the Director-General, and Annual Environmental Management Report (AEMR). The AEMR shall review the performance of the project against the Operation Environmental Management Plan (refer to condition D2 of this approval) and the conditions of this approval. The AEMR shall include, but not necessarily be limited to: ***a) Details of compliance with the conditions of this approval;*** ***b) A copy of the Complaints Register (refer to condition B11 of this approval) for the preceding twelve-month period (exclusive of personal details), and details of how these complaints were addressed and resolved;*** ***c) Identification of any circumstances in which the environmental impacts and performance of the project during the twelve month period have not been generally consistent with the environmental impacts and performance predicted in the documents listed under condition A1 of this approval, with details of additional mitigation measures applied to the project to address recurrence of these circumstances;*** ***d) Results of all environmental monitoring required under conditions of this approval, including interpretations and discussion by a suitable qualified person; and*** ***e) A list of occasion in the twelve month period when environmental goals/objectives/impact assessment criteria for the project have not been achieved, indicating the reason for failure to meet the criteria and the action taken to prevent recurrence of that type of failure.*** ***The Proponent shall submit a copy of the AEMR to the Director-General every year, with the first AEMR to be submitted no later than fourteen months after the commencement of operation of the project unless otherwise agreed by the Director-General. The Director-General may require the Proponent to address certain matters in relation to the environmental performance of the project in response to the Director-General's review of the Annual Environment Management Report. Any action required to be undertaken shall be completed within such period as the Director-General may require. The Proponent shall make copies of each AEMR available for public inspection on request. Copies of the AEMR shall be sent to the EPA and the SCA.***
Compliance Assessment Observations and Comments This AEMR satisfies the requirements of CoA E21.
Compliance Assessment Finding – Compliant

Independent Environmental Auditing

Minister's Condition of Approval E22
Within 12 months of commencement of operation of Lamberts North and Lamberts South and then as may be directed by the Director-General, the Proponent shall commission an independent person or team to undertake and Environmental Audit of the project. The independent person or team shall be approved by the Director-General prior to the commencement of the Audit. The Audit shall: ***a) Be carried out in accordance with ISO 19011:2002 – Guidelines for Quality and/or Environmental Management Systems Auditing;*** ***b) Assess compliance with the requirements of this approval, and other licences and approvals that apply to the project;*** ***c) Assess the environmental performance of the project against the predictions made and conclusions drawn in the documents referred to under conditionA1 of this approval;*** ***d) Review the effectiveness of the environmental management of the project, including any environmental impact mitigation works; and*** ***e) Review the adequacy of the Proponent's response to any complaints made about the project identified in the Complaints Register.*** ***The Environmental Audit Report shall be submitted to the Director-General within two months of the completion of the Audit, detailing the findings and recommendations of the Audit and including a detailed response from the Proponent to any of the recommendations contained in the Report.***
Compliance Assessment Observations and Comments In accordance with the above condition, EnergyAustralia engaged Aurecon to undertake the independent environmental audit on 2nd – 3rd September 2014.
Compliance Assessment Finding – Compliant

Waste Generation and Management

Minister's Condition of Approval E23
All waste materials removed from the site shall only be directed to a waste management facility lawfully permitted to accept the materials.
Compliance Assessment Observations and Comments Lend Lease 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 reporting period.
Compliance Assessment Finding – Compliant.

Minister's Condition of Approval 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.
Compliance Assessment Observations and Comments 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.
Compliance Assessment Finding – Compliant
Minister's Condition of Approval 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.
Compliance Assessment Observations and Comments Lend Lease 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.
Compliance Assessment Finding – Compliant

Post Operation conditions

Project Completion Management Plan

Minister's Condition of Approval F1
No later than one month prior to the decommissioning of the project, or as otherwise agreed by the Director-General, the Proponent is to prepare a Project Completion Management Plan, in consultation with the SCA, for the approval of the Director-General. The Plan is to include, but not necessarily be limited to: ***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 exceedences and mitigation measures in groundwater and groundwater quality impacts and if exceedences 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 Neubecks 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 exceedences and mitigation measures in surface water and surface water quality impacts and if exceedences continue, implementation of further measures and surface water monitoring to demonstrate compliance.***
Compliance Assessment Observations and Comments Project is still in operational phase.
Compliance Assessment Finding - Not Applicable

Appendix B

Lamberts North Operational Noise Assessment – October 2016

aurecon

Project: Mt Piper Power Station Ash Placement

Lamberts North – Operational Noise Assessment October 2016

Reference: 246493-001

Prepared for:
EnergyAustralia NSW

Revision: 3

8 November 2016

Document Control Record

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Document control						aurecon
Report Title		Lamberts North – Operational Noise Assessment October 2016				
Document ID		246493-LN-REP-06-Rev3	**Project Number**		246493-001	
File Path		\\Aurecon.info\Shares\AUSYD\Projects\BG\246493\3.Project Delivery\12.Deliverables\Acoustics\160829_Lamberts North (Sept 2016)\Report\Lamberts North Operational Noise Assessment October 2016-Rev3.docx				
Client		EnergyAustralia NSW	**Client Contact**		Coleen Milroy	
Rev	**Date**	**Revision Details/Status**	**Prepared by**	**Author**	**Verifier**	**Approver**
1	**31 October 2016**	Internal draft for review	AL	AL	HT	ML
2	**7 November 2016**	Draft for client review	AL	AL	HT	ML
3	**8 November 2016**	Final issue	AL	AL	HT	ML
Current Revision		**3**				

Approval			
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Title	Acoustic Engineer	Title	Technical Director

Mt Piper Power Station Ash Placement

Date | 8 November 2016
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1 Introduction

1.1 Project understanding

On 16 February 2012, Delta Electricity received Project Approval (09_0186) under delegation from the Minister of Planning for the Mt Piper Ash Placement Project (the Project) under Section 75J - *Environmental Planning and Assessment Act 1979* to permit the continued disposal of ash generated by the Mt Piper Power Station into the Lamberts North area, which is an extension of the existing Mt Piper ash repository. The Project Approval was granted subject to Conditions of Approval. EnergyAustralia NSW acquired Mt Piper Power Station and associated land holdings and infrastructure from the state-owned Delta Electricity in September 2013. As such the project is now owned by EnergyAustralia NSW.

This report has been developed in accordance with the Lamberts North Ash Placement Project Condition of Approval (CoA) E11 and the mitigation measures specified in the Operational Environment Management Plan (OEMP May 2013). The OEMP outlines the requirements of the ongoing noise monitoring program and operational noise review in accordance with CoA's E7, E8, E9 and E11.

1.2 Background to the Project

Lamberts North is located immediately east of EnergyAustralia NSW's existing Mt Piper Ash Repository, which is described as Area 1 in the Environmental Assessment (EA) (SKM, 2010). Ash placement at Mt Piper Ash repository is still currently being undertaken, but alternates with ash placement at Lamberts North.

Both sites are located in an area characterised by both rural and industrial influences, with a number of coal mines in relatively close proximity. The project site is predominately surrounded by Ben Bullen State Forest, which lies to the north and south east of Mt Piper Power Station, together with open cut coal mines and coal washeries. Wallerawang Power Station which is also owned by EnergyAustralia NSW, lies to the south east of the project site, approximately 5 km away, but is no longer operational following the announcement in November 2014, that the power station would be closed.

Lamberts North ash repository is approximately 53 hectares.

Historically, the Lamberts North area has been highly disturbed as a result of extensive mining activities including underground working (from the 1950s to the early 1990s) and recent open-cut mining activities being carried out by Centennial Coal.

EnergyAustralia NSW has engaged a principal contractor (Lend Lease) to manage and operate both the Mt Piper (Area 1) and Lamberts North ash repositories. Operations at Lamberts North commenced on 2 September 2013.

1.3 Scope of work

In accordance with CoA E11, the scope of work includes noise assessment comprising of attended/ unattended noise measurements at two sensitive receiver locations to determine potential noise impacts arising from the operational activities at Lamberts North ash repository.

1.4 Sensitive receivers

The sensitive receivers located within the vicinity of the Project and identified for noise impacts within the Operation Noise Management and Monitoring Plan (ONMMP), a sub plan of the OEMP, are described in Table 1 below. The two sensitive receivers closest to the site are located at Blackmans Flat approximately 1.4 km to the east of Lamberts North and at Wallerawang approximately 2.5 km south east of Lamberts North. Location 3 has been used as an additional location to measure the reference noise levels from the operational activities. The positions of the measurement locations are shown in Figure 1.

Table 1 | Sensitive receivers nearest to Lamberts North

Location ID[a]	Description	Map Coordinates	Noise monitoring location	Distance from Lamberts North Ash Repository
1	Blackmans Flat	33.36468ºS 150.05904ºE	Located at the western end of Noon Street on the southern side of the road. Positioned at the boundary of the residential property 90 m from the Castlereagh Highway.	1.4 km east
2	Wallerawang	33.37765ºS 150.06073ºE	Situated on a rural property southeast of Lamberts North, and approximately 1.3 km from Castlereagh Highway.	2.5 km south east
3	Lamberts North	33.35745ºS 150.04206ºE	Additional location at the south eastern boundary of the Lamberts North site	Within the Lamberts North site

[a] Refer to Figure 1 for locations

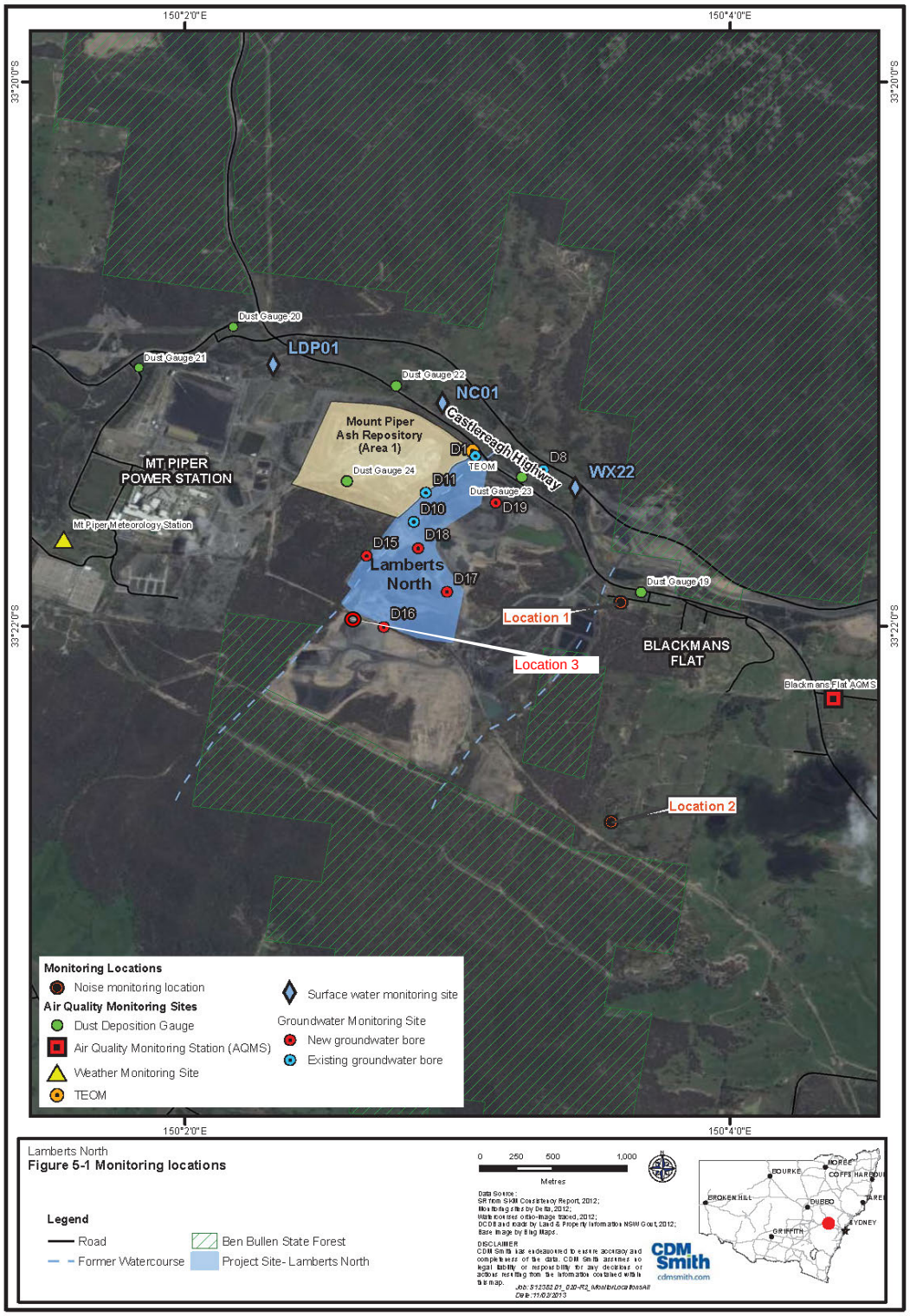


Figure 1 | Environmental noise monitoring locations

2 Operations at Lamberts North

2.1 Operation methodology

Key potential noise impacts during operational activities at Lamberts North and Mt Piper Ash Repository sites are 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 sprinkler systems;
- Developing and maintaining water management structures (containments, drains and sumps) using an excavator;
- Using various 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 and plant generate noise from the engine and drive line, hydraulics and reverse warning devices.

2.2 Activities at Lamberts North

The Mt Piper and Lamberts North sites are located adjacent to each other. Ash deposition at the Lamberts North site or Mt Piper site is dependent on many factors which are decided on a weekly basis by the Lend Lease environmental manager.

During the site visit from 16 – 18 October 2016, ash placement operations were occurring at Lamberts North site but no ash placement was occurring at Mt Piper Ash Repository (Area 1).

The equipment outlined in Table 2 was evident at Lamberts North during the site visit.

Noise generated from some of the equipment at a distance of 7 m was measured at Lamberts North by Aurecon in January 2013 (see Aurecon, 2013). Sound Power Levels (SWL) for the rest of the equipment were referenced from *AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites*.

Below is the summary of activities identified at Lamberts North during the site visit:

- The day/ activities started at 06:00 for a 06:15 start which included the daily tool box talk and work related discussions.
- The equipment on site consisted of one dozer at the stockpile (not visible), one dump truck and one light commercial vehicle. One water cart was sighted but was only operating occasionally if it was required.
- Dump trucks were being loaded near the ash bins and were unloaded at the junction of Lamberts North and Mt Piper ash repository sites.

- One dozer was operating on the ash stock pile which was not visible or audible at monitoring Location 3.
- All activities ceased by 17:00. No activities occurred during the evening or night time period (18:00 – 06:00) at either the Lamberts North or Mt Piper sites.

Table 2 | Equipment sighted at Lamberts North and Mt Piper site during the site visit

Equipment type	Number of equipment on site during the site visit	Sound Power Level SWL for each equipment type dBA[b]
Dozer / Crawler tractor*	1	106
Dump Truck*	1	104
Water Cart / truck*	1	107
Light commercial vehicle	1	106

* Sound Power Levels (SWL) calculated based on noise measurements at a distance of 7 m was which were carried out during the site visit previously (Mt Piper Power Station Ash Placement Project – Lamberts North Construction Noise monitoring 14-15 January 2013, Revision 2, dated 11 February 2013).

2.3 Description of the surrounding environment

Lamberts North site is predominantly surrounded by Ben Bullen State Forest with open cut coal mines and coal washeries. Noise sources, other than those resulting from ash placement activities, were audible during our site visit (e.g. light to heavy vehicles on distant road, animal noises, etc.) and contributed to the cumulative noise at the measurement location (Location 2).

Activities at Springvale colliery which is operated by Centennial Coal and lies to the south east of the site includes, but is not limited to the transportation of coal via conveyors, operation of equipment and mobile plant, etc. may also contribute to the cumulative noise at the measurement locations. Pine Dale coal mine is located to the north east of the site, but is unlikely to contribute to the cumulative noise at the measurement locations as the mine is currently under care and maintenance (i.e. non-operational).

[b] SWL includes adjustment for tonality.

3 Noise criteria

3.1 Conditions of Approval relating to noise

The ONMMP seeks to address the specific requirements of the CoA attached to the Project Approval for Lamberts North, insofar as they relate to noise and vibration during operation.

CoA E7 and CoA D3a(ii) define the operational noise requirements for the project, to ensure noise emissions from operational activities do not exceed the criteria shown in Table 3 below.

Table 3 | Construction noise criteria

Location	$L_{Aeq\ (15\ minute)}$ dBA		
	Day Time (7:00 – 18:00)	**Evening Time (18:00 – 22:00)**	**Night Time (22:00 – 7:00)**
All private receivers within the township of Blackmans Flat	42	38	35
All other residences	42	38	35

Note: 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 Director-General and the NSW EPA.

3.2 Operational hours

In accordance with the CoA E1, operational activities associated with the project shall only be undertaken from 6:00am to 8:00pm Monday to Friday and 6:00am to 5:00pm Saturday and Sunday. Operations outside the hours stipulated above are only permitted in emergency situations.

4 Noise survey

4.1 Methodology

Attended and unattended noise measurements were conducted from 16 – 18 October 2016 at the boundary of the nearest residential properties likely to be exposed to noise from the ongoing ash placement operation (Location 1 and Location 2).

The statistical noise measurements including the averaged A-weighted noise levels (L_{Aeq}), maximum A-weighted noise levels (L_{Amax}) and statistical A-weighted L_{A90} and L_{A10} noise levels[c] were conducted using a Larson Davis 831 Type 1 sound level meter equipped with a LD PRM831 pre-amplifier and a PCB 377B02 ½" microphone. The microphone was set to 'A' frequency weighting, 'F' time weighting, and was fitted with an approved windshield.

Measurements were typically taken at a height of 1.2 m and at least 3.5 m from any reflecting structure other than the ground. Maximum wind speeds at the microphone position was predominantly less than 5m/s. The measurement period at each location was 15 minutes. A Larson Davis CAL200 was utilised to calibrate the sound level meter before and after each series of measurements with no significant calibration drift noted. Measurements were typically taken in accordance with the Australian Standard *AS 1055 1997: Acoustics – Description and measurement of environmental noise*. Table 4 shows the equipment used for all the measurements undertaken on site.

Table 4 | Sound pressure level measurement equipment

Equipment	Make	Model	Serial No.	Type	Last Calibration	Calibration Due
Sound Level Meter	LD	831	0001595	1	19/08/2016	19/08/2018
Noise logger 1	LD	LXT	1718	1	1/09/2016	1/09/2018
Noise logger 2	RION	NL-21	00709529	2	29/09/2016	29/09/2018
Calibrator	LD	CAL200	6345	-	14/02/2016	14/02/2018

Noise measurements were conducted at three locations (as shown in Figure 1).

4.2 Weather data

Clear sky (except on 17 October) and intermittent wind (< 3 m/s) was prevalent at Location 3 over the measurement period on both days.

Clear sky and wind speeds of less than 1m/s was apparent on 16 and 18 October 2016. However there was intermittent rain on 17 October and wind speeds greater than 5 m/s during the day on 17 and partly on 18 October. These periods are shown in Appendix E.

There was no ash placement activity during the evening or night time period (18:00 – 06:00) as per the CoA and also discussed in Section 2.2. As stated in the NSW Industrial Noise Policy (INP), activities at the Lamberts North site during 06:00 – 07:00 are not considered as night time activity as this time period falls within the defined shoulder period[d].

[c] For an explanation of the acoustic terms please refer to the attached Glossary of Terminology in Appendix A

[d] As per NSW INP Section 3.3 (Dealing with 'shoulder' periods): For early morning (5am-7am) operations, it may be unduly stringent to expect such operations to be assessed against the night time criteria-especially if existing background noise levels are steadily rising in the these early morning hours.

As per Appendix C (*Procedure of assessing noise increase due to temperature inversions*) of *NSW INP, "if the development does not operate at night, there is no potential for noise impact due to inversions, and no further consideration of these effects is required"*.

Below is the summary of weather conditions prevalent during the noise monitoring which complies with the CoA E7 and CoA D3a(ii):

- Wind speeds were less than 3 m/s at 10 m above ground level for most of time.
- Stability Category F temperature inversion conditions were not prevalent during the operational activities.
- Stability Category G temperature inversion conditions were not prevalent during the operational activities.

4.3 Noise measurement results

During this monitoring period both attended and unattended monitoring was undertaken.

- Unattended continuous monitoring was undertaken at Location 1 and Location 2 from 9:00 am on 16 October to 10:00 am on 18 October 2016. Detailed results of continuous noise measurements over each 15-minute period are shown in Appendix D and average sound pressure levels over the day, evening and night-time monitoring periods is provided in Table 5.

  As noted in Appendix D and E, intermittent rain and wind speeds greater than 5 m/s were experienced at the weather station. The data during these periods was excluded from the overall measurements to ensure compliance with conditions CoA E7 and CoA D3a(ii). Excluded data had negligible effect on the overall noise measurements.

- Attended noise monitoring was also undertaken at all three locations. Multiple 15-minute measurements were undertaken and Table 5 provides a summary of the environmental noise monitoring results for each location.

A list of operating equipment identified at the Lamberts North site is outlined in Section 2.

Table 5 | Results of environmental noise monitoring

Note: rows in grey are results of attended monitoring, rows in white are results of unattended monitoring

Location	Date	Time	Period	Measured sound Pressure Level, dBA				Note
				$L_{Aeq, 15min}$ #	$L_{A10, 15min}$ ^^	$L_{A90, 15min}$ ^	$L_{Amax, 15min}$ *	
Location 1 *(Blackmans Flat)*	16/10/2016	10:29	Day	**56**	59	47	68	Note 1
	18/10/2016	8:44	Day	**55**	58	47	68	
	16/10/2016	7am-6pm	Day	**57**	60	46	94	
		6pm-10pm	Evening	**52**	58	37	71	
		10pm-7am	Night	**51**	57	39	72	
	17/10/2016	7am-6pm	Day	**55**	59	44	77	
		6pm-10pm	Evening	**53**	59	43	82	
		10pm-7am	Night	**52**	60	40	77	

Location	Date	Time	Period	Measured sound Pressure Level, dBA				Note
				$L_{Aeq, 15min}$ #	$L_{A10, 15min}$ ^^	$L_{A90, 15min}$ ^	$L_{Amax, 15min}$ *	
Location 2 *(Wallerawang)*	16/10/2016	10:51	Day	**51**	53	42	83	Note 2
	18/10/2016	8:22	Day	**46**	47	42	73	
	16/10/2016	7am-6pm	Day	**50**	54	42	86	
		6pm-10pm	Evening	**46**	49	41	72	
		10pm-7am	Night	**51**	56	43	74	
	17/10/2016	7am-6pm	Day	**45**	47	37	76	
		6pm-10pm	Evening	-	-	-	-	
		10pm-7am	Night	-	-	-	-	
Location 3 *(South eastern boundary of Lamberts North)*	16/10/2016	9:41	Day	**51**	53	45	81	Note 3
	16/10/2016	9:59	Day	**55**	58	47	70	
	17/10/2016	9:53	Day	**54**	58	47	71	

- See note 2 below for comment on the invalid noise measurements due to faulty microphone connection.

Measurements that were affected by rain and wind speeds higher than 5m/s were excluded from the assessment.

L_{Aeq} refers to A-weighted equivalent continuous sound pressure level over measurement period. It is used to quantify the average noise level over a time period.

^^ *L_{A10} refers to the A-weighted noise level which is exceeded for only 10% of the measuring period. It is usually used as the descriptor for intrusive noise level.*

^ *L_{A90} refers to the A-weighted noise level which is exceeded for 90% of the measuring period. It is usually used as the descriptor for background noise level during the measurement period.*

* *L_{Amax} refers to the maximum A-weighted noise level detected during the measuring period. It refers to the maximum background noise detected.*

***Note 1** (Residence - Location 1)*

From site observations at residential Location 1 (i.e. Blackmans Flat), the ambient noise was dominated by the traffic along Castlereagh Highway, local domestic and natural noises (e.g. insects, etc.) and low frequency hum from Mt Piper Power Station. There was no audible noise from the westerly direction (i.e. Centennial coal, Springvale Mine, etc.) during our site attendance.

Instantaneous[e] (attended) noise level was measured in the range of Instantaneous noise level L_{AF} 57 - 65 dBA when a vehicle was passing on Castlereagh Highway. Birds and insects contributed to the $L_{Amax\ 15\ minute}$ of 68-94 dBA in the day/ evening/ night time. No attended noise measurements were undertaken on the morning of 17 October due to unsuitable weather conditions at the site (slight drizzle).

***Note 2** (Residence - Location 2)*

The background noise level at the rural residential Location 2 (i.e. Wallerawang) was relatively similar to the background noise level at Location 1, especially during the evening and night time measurements. Noise contribution during the day and evening time period included noise from insects and birds. Other sources of ambient sound at this site included natural sounds (from wind noise, etc.) and distant vehicle traffic noise.

[e] See Appendix A – Glossary of terms

Based on sound localisation using binaural hearing during the attended measurements, there was no evidence of noise originating from the north westerly direction, thus indicating that noise contribution from Lamberts North to the overall equivalent sound pressure level at this location was negligible. Given the buffer distance of at least 2.5 km between Location 2 and Lamberts North, and with the intervening topography, the operational noise impact during day time at this location is considered to be minimal or insignificant.

Instantaneous[f] (attended) noise level was measured in the range of Instantaneous noise level L_{AF} 40 - 48 dBA when a vehicle was passing near the measurement location. 17 October evening and night time logging measurements were invalid due to faulty microphone connection. As there were no activities planned after 18:00, the invalid noise logging at Location 2 had negligible effect on the overall outcome. No attended noise measurements were undertaken on the morning of 17 October due to unsuitable weather conditions at the site (slight drizzle).

Note 3 *(Lamberts North eastern boundary - Location 3)*

From site observations at the south eastern site boundary of Lamberts North, noise was clearly audible from the mobile plant operating on Mt Piper/ Lamberts North. The noise varied and included sources such as engine noise from the dump trucks, reverse beeps from dozer/ trucks, bucket bangs of the dozer, loading of ash in the dump truck, etc.

[f] See Appendix A – Glossary of terms

5 Noise assessment

The results of the measured noise levels at the sensitive receivers (Location 1 and Location 2) can be found in Table 5 above. As discussed in Section 4, equivalent sound pressure levels (L_{Aeq}) at both the receiver locations were dominated by traffic noise, birds, insects, low hum from Mt Piper Power Station and noise from nearby coal mines. These measured equivalent sound pressure levels were in excess of the 42dBA day time noise target as per Table 3.

However, operational noise from Lamberts North was inaudible at both the sensitive receivers. As the operational noise contribution from Lamberts North was inaudible, we undertook a desktop based noise prediction to estimate the noise contribution from the operational activities as explained in the following section.

The operational activity at Lamberts North site commenced each day from approximately 06:00 until 17:00 during our site visit. There were no operational activities after 17:00 until 06:00 at these sites.

5.1 Predicted noise contribution

For the purpose of this assessment, we considered the worst case scenario of the following equipment operating simultaneously at the same location at Lamberts North.

- Dozer/ Crawler tractor x 1
- Dump truck x 1
- Water cart x 1
- Light commercial vehicle x 1

We note that the magnitude of the noise emission during the operation of the project may vary and will depend on the number and intensity of machines operating and the working location of the equipment. It is unlikely that all the plant and equipment will be running simultaneously in the same location and the nature of activities onsite is expected to vary from day to day.

The predicted noise levels were calculated (based on sound propagation through geometric spreading) at a distance based on worst case noise emission levels (i.e. maximum sound power levels) without considering any barrier effects from the undulating surrounding terrain. However due to intermittent operational characteristics and constant change of distance between the source-receiver, we have considered 50% operational efficiency (equipment operational for 50% of the time during each 15-minute measurement period) for each equipment type in the calculation. The results of this calculation are shown in Table 6.

It should be noted that the predicted levels in this section are worst case for each of the above operational activities at the assessment locations and include adjustments for annoying activities as outlined in the Interim Construction Noise Guideline (ICNG). The above prediction methodology takes into account the number of individual machines operating as well as the percentage in use during a 15 minute period, with all scheduled equipment operating at the minimum distance from the nearest sensitive receiver.

The predicted levels in Table 6 provide a theoretical maximum cumulative noise impact. The distances shown in Table 6 are considered minimum between the operational works and the respective receiver zones. The calculation also assumes that each item of equipment is operating at maximum capacity (i.e. maximum sound power level). In reality the mobile plant operate at much lower capacity during its operation and hence the levels shown in Table 6 are considered conservative and should be interpreted as indicative worst case only.

Table 6 | Predicted noise emission from Lamberts North equipment

Equipment at Lamberts North	Sound Power Level (SWL), dBA	Predicted sound pressure level at indicated distance, L_{Aeq} dBA	
		1.4 km (Location 1)*	2.5 km (Location 2)*
Dozer / Crawler tractor	106	32	27
Dump Truck	104	30	25
Water cart	107	33	28
Light commercial vehicle	106	32	27
Worst case predicted noise level from the operation of the above equipment		**38**	**33**

As shown in Table 7, results of our assessment revealed the following:

- Worst case modelling predicted that noise levels would comply with the day and evening time criteria at both Location 1 and Location 2.
- Worst case modelling indicates that the maximum predicted noise level will exceed the noise criteria during night time at Location 1. However CoA E1 for Lamberts North restricts any activities after 20:00 on weekdays and 17:00 on weekends (refer to Section 3.2 for more details), and therefore any predicted night time exceedance is not relevant.

Table 7 | Summary of maximum predicted noise level against the noise criteria (dBA)

Location*	Description	Maximum theoretical 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	Blackman's Flat	38	✓	✓	N/A
2	Wallerawang	33	✓	✓	N/A

✓ Complies with the stipulated noise criteria

^ No operational activity during night time periods.

* Refer to Figure 1 for receiver locations

As evident from Table 7 above, even the worst case noise associated with the operational activities at Lamberts North is predicted to comply with the stipulated noise criteria at both the sensitive receptors for both the day and evening periods.

6 Recommendations

6.1 Noise management measures

Should complaints from the community be received, the following noise control measures could be applied to minimise environmental noise emission from Lamberts North during operation of the project:

- If possible avoid the coincidence of noisy plant/machine working simultaneously.
- Construction trucks and other heavy machinery to use loop tracks as much as possible on the site to minimise the amount of reversing activities, i.e. managed through the Operational Traffic and Transport Management Plan.
- Consider the use of alternative warning system to the conventional single tone reversing alarm, such as broadband sound reversing alarm (e.g. BBS-TEK Backalarms) and warning lights.
- Installation of additional silencer/mufflers on the engine exhaust for plant working at Lamberts North.

7 Conclusion

Attended and unattended noise monitoring at Lamberts North has been carried out by Aurecon from 16 – 18 October 2016 in accordance with Australian Standard "*AS1055.1-1997 Acoustics – Description and measurement of environmental noise, Part 1: General procedures*" using a Type 1 LD 831 sound level meter. Worst case noise predictions were also carried out to provide estimate of the contribution of the noise from Lamberts North.

7.1 Location 1: Blackman's Flat

The environmental survey results revealed that the ambient noise at Location 1 (i.e. Blackmans Flat) was relatively high and the maximum equivalent continuous sound pressure level over 15 minutes at Location 1 was measured at $L_{Aeq\ (15minute)}$ 57 dBA. The measured noise levels were dominated by the intermittent road traffic along Castlereagh Highway and some local domestic noises.

The maximum predicted noise contribution resulting from the operation of equipment/ plant at the Lamberts North site at Location 1 was determined as 38 dBA as shown in Table 6.

7.2 Location 2: Wallerawang

The background noise level at Location 2 (i.e. Wallerawang) was relatively similar to the background noise level at Location 1 especially during evening and night time monitoring. The main sources of ambient sound at Location 2 were the natural sounds from wind noise, insects, bird/wildlife, etc. and distant vehicle traffic noise.

Based on sound localisation using binaural hearing during the attended measurement, there was no evidence of noise originating from the north westerly direction. This suggests that noise contribution from Lamberts North to the overall equivalent sound pressure level at this location is negligible. Maximum equivalent continuous noise over 15 minutes at Location 2 was measured at $L_{Aeq\ (15minute)}$ 51 dBA.

The maximum predicted noise contribution resulting from the operation of equipment/ plant at the Lamberts North site at Location 2 was determined to be 33 dBA as shown in Table 6.

7.3 Summary

The background noise levels measured at Locations 1 and 2 exceed the 42dBA day time noise target. However, the noise contribution from the operational activities at Lamberts North site as measured at Locations 1, 2 and 3 between 16 – 18 October 2016 cannot be conclusively attributed to the Lamberts North ash placement operations due the presence of other surrounding simultaneous noise sources and activities including surrounding coal mines, road traffic, insects, etc.

Based on the worst case noise modelling predictions undertaken, the noise resulting from the operation of equipment and mobile plant at the Lamberts North site comply with the *Lamberts North Ash Placement Project – Operational Environmental Management Plan (May 2013)* at the representative residential receivers Location 1 and Location 2.

8 References

Measurements and assessment of the construction activities were carried out in accordance with:

- Office of Environment & Heritage (OEH) *Interim Construction Noise Guideline (ICNG).*
- Australian Standard *AS 1055 1997: Acoustics – Description and measurement of environmental noise*.
- Australian Standard *AS 2436-2000 Guide to noise and vibration control on construction demolition and maintenance sites*.
- Lamberts North Ash Placement Project – Operational Environmental Management Plan (OEMP) May 2013.
- *Delta Electricity Project Conditions of Approval for Mt Piper Power Station Ash Repository Extension Project (approved on 16 February 2012).*
- *Mt Piper Power Station Ash Placement Project – Lamberts North Construction Noise monitoring 14-15 January 2013 (Revision 2, dated 11 February 2013)*

Appendix A
Glossary of terms

Term	Definition
Sound Pressure Level (Lp)	Sound or noise is the sensation produced at the ear by very small fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range (from 20 microPascals to 60 Pascals). A scale that compresses this range to a more manageable size and that is best matched to subjective response is the logarithmic scale, rather than a linear scale.
Sound Pressure Level (Lp)	Is defined as: $L_P = 10\log_{10}\left(\frac{p^2}{p_{ref}^2}\right)dB$ In the above equation, p is the sound pressure fluctuation (above or below atmospheric pressure), and p_{ref} is 20 microPascals (2 x 10^{-5} Pa), the approximate threshold of hearing. To avoid a scale which is too compressed, a factor of 10 is included, giving rise to the decibel, or dB for short.
A-Weighted Decibel (dBA) & Loudness	In some circumstances, the sound pressure level is expressed as C-Weighted decibels, instead of the more common A-Weighted. The C-Weighting filter is designed to replicate the response of the human ear above 85 dB, and places a greater weighting on low frequency noise.
L_{Aeq}	The time averaged C-weighted sound pressure level for a time interval, as defined in AS1055.1. It is generally described as the equivalent continuous C-weighted sound pressure level that has the same mean square pressure level as a sound that varies over time. It can be considered as the average sound pressure level over the measurement period.
L_{Ceq}	The time averaged C-weighted sound pressure level for a time interval, as defined in AS1055.1. It is generally described as the equivalent continuous C-weighted sound pressure level that has the same mean square pressure level as a sound that varies over time. It can be considered as the average sound pressure level over the measurement period.
L_{An}	The sound level, which, for a specified time interval, in relation to an investigation of a noise, means the A-weighted sound pressure level that is equalled or exceeded for n% of the interval. Commonly used percentages are 1, 10, 90 & 99%.

Term	Definition
L_{Cpk}	The peak C-weighted sound pressure level for a time interval.
$L_{Cmax,T}$	The average maximum C-weighted sound pressure level, which, for the specified time interval, means the C-weighted sound pressure level during the interval obtained by using the fast time weighting and arithmetically averaging the maximum sound levels of the noise during the interval. Under certain conditions the 10th percentile noise level, $L_{C10,T}$, can represent the average maximum C-weighted sound pressure level.
L_{A10}	A-weighted noise level which is exceeded for only 10% of the measuring period. It is usually used as the descriptor for intrusive noise level and represents ambient road traffic noise in general.
L_{A90}	A-weighted noise level which is exceeded for 90% of the measuring period. It is usually used as the descriptor for background noise level during the measurement period.
L_{AF}	Instantaneous A-weighted noise level is the noise displayed for each second of the measurement during the entire monitoring.
L_{Amin}	Minimum A-weighted noise level detected during the measuring period. It refers to the minimum background noise detected.
Octave	Frequency bands allow a representation of the spectrum associated with a particular noise. They are an octave wide, meaning that the highest frequency in the band is just twice the lowest frequency, with all intermediate frequencies included and all other frequencies excluded. Each octave band is described by its centre frequency.
Maximum Exposure Time (Hours)	The maximum possible time a person can be safely exposed to a specific noise level (L_{Aeq}).

Appendix B
Photos of noise monitored locations at Blackmans Flat and Wallerawang

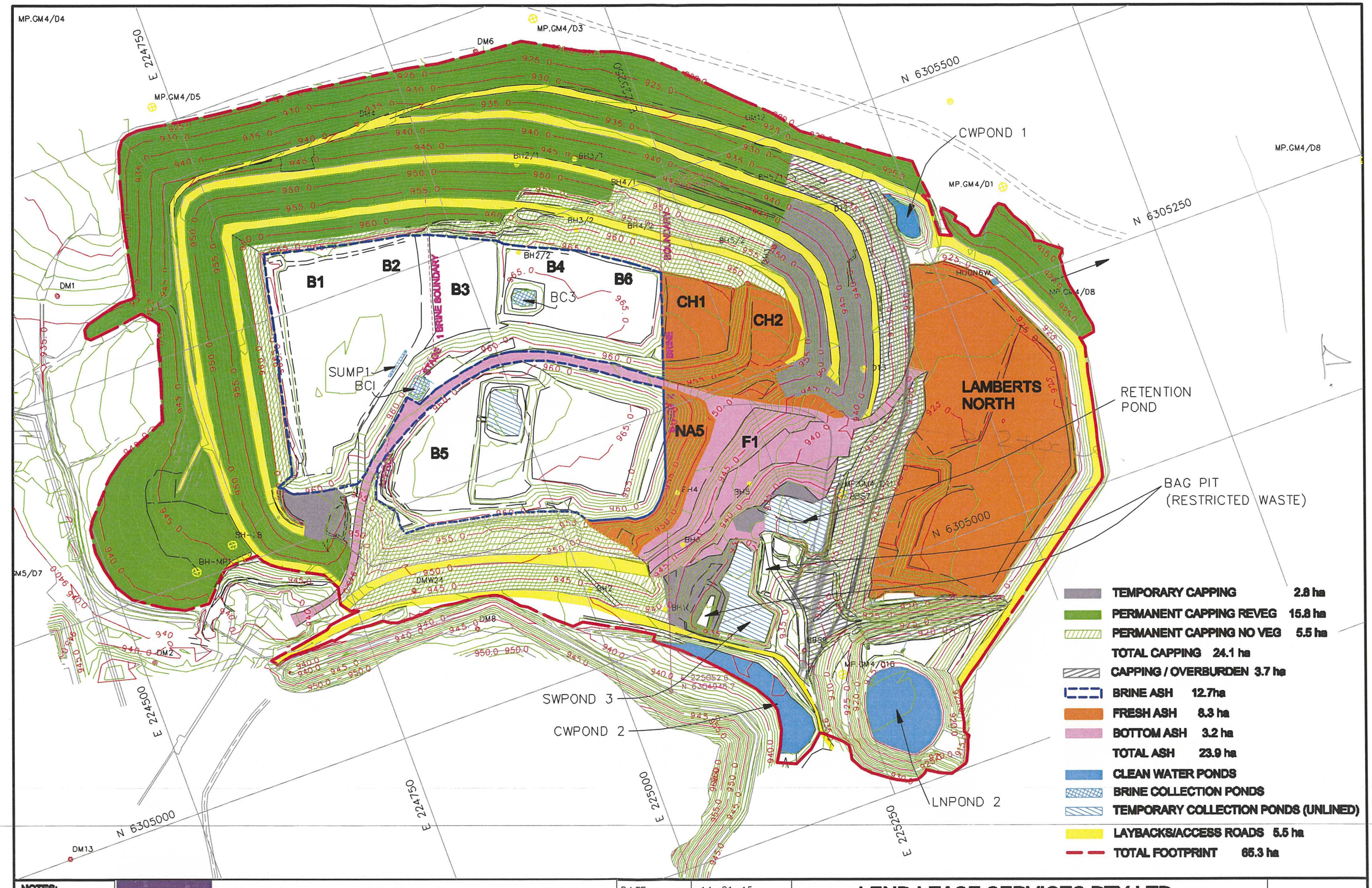
Figure 2 | Photograph of Measurement Location 1 (Blackman's Flat)

Figure 3 | Photograph of Measurement Location 2 (Wallerawang)

Figure 4 | Photograph of Lamberts North South eastern boundary (Location 3)

Figure 5 | Photograph of Lamberts North South eastern boundary with a dozer operating

Appendix C
Lamberts North location map



NOTES:

M.G.A. CO-ORDINATES

CEH SURVEY
CONSULTING AND ENGINEERING AND MINING SURVEYORS
"Ashtabe" 1 Rutherford Lane, LITHGOW 2790
ABN: 68 058 544 551 Office: (02) 6351 2281
Email: survey@ceh.com.au Website: www.ceh.com.au

DATE	14-01-15
AMENDED	25-08-15
SURVEYOR	B.N.
DRAWN	KEITH FLETCHER
CHECKED	

LEND LEASE SERVICES PTY LTD
MOUNT PIPER - ASH EMPLACEMENT
SURVEY - 14th JANUARY 2015
SCALE - 1 : 4000 (A3 SHEET)

DWG No

MPA0115 AREAS

913.31

30/3/15

MP GM4/D3

DM6

E 225750

MP GM4/D5

914.79

DM4

N 6305500

BH2/1

914.54

(2.51)

BH3/1

BH4/1

BH5/1

DT2

MP.GM4/D1

910.75?

BH3/2

915.92

(3.10)

BH4/2

912.73

(1.24)

BH2/2

BH5/2

913.60

(3.66)

BOUNDARY

BRINE BOUNDARY

HUCNEWL

MP.GM4/D8

DM1

DT3

N 6305250

MP.GM5/D4

BH-L6

BH-MP1

MP.GM5/D7

DMW24

BH4

BH5

BH3

BH2

BH1

MP.GM4/D11

BES

912.66

DM8

BBSS

MP.GM4/D10

912.18

DM2

E 225052.6

N 6304948.7

E 224500

E 224750

E 225000

E 225250

N 6305000

DM13

LEND LEASE SERVICES PTY LTD.

NOTES:

M.G.A. CO-ORDINATES

CEH SURVEY

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1 Abbotsleigh Rutherford NSW 2320

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DATE	23-06-15
AMENDED	
SURVEYOR	B.N.
DRAWN	KEITH FLETCHER
CHECKED	

~~LLS INDUSTRIAL~~ PTY LTD

MOUNT PIPER - ASH EMPLACEMENT

SURVEY : 23rd JUNE 2015

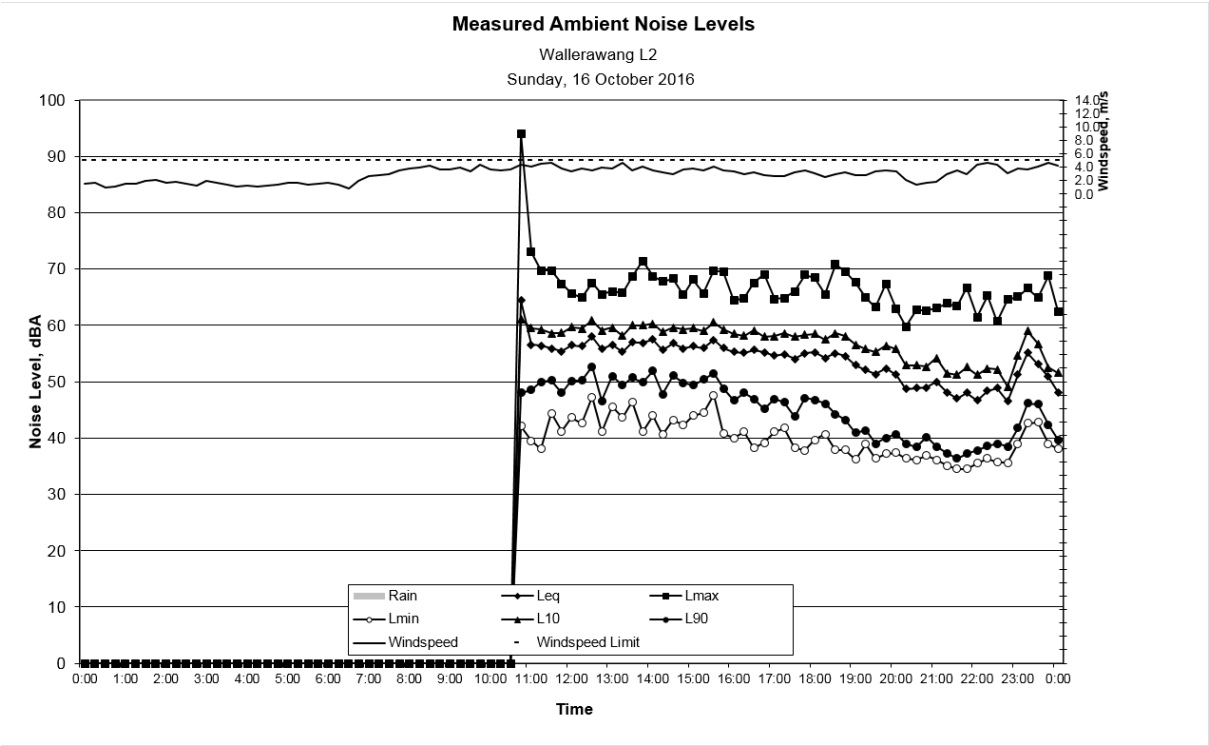
SCALE - 1 : 4000 (A3 SHEET)

DWG No

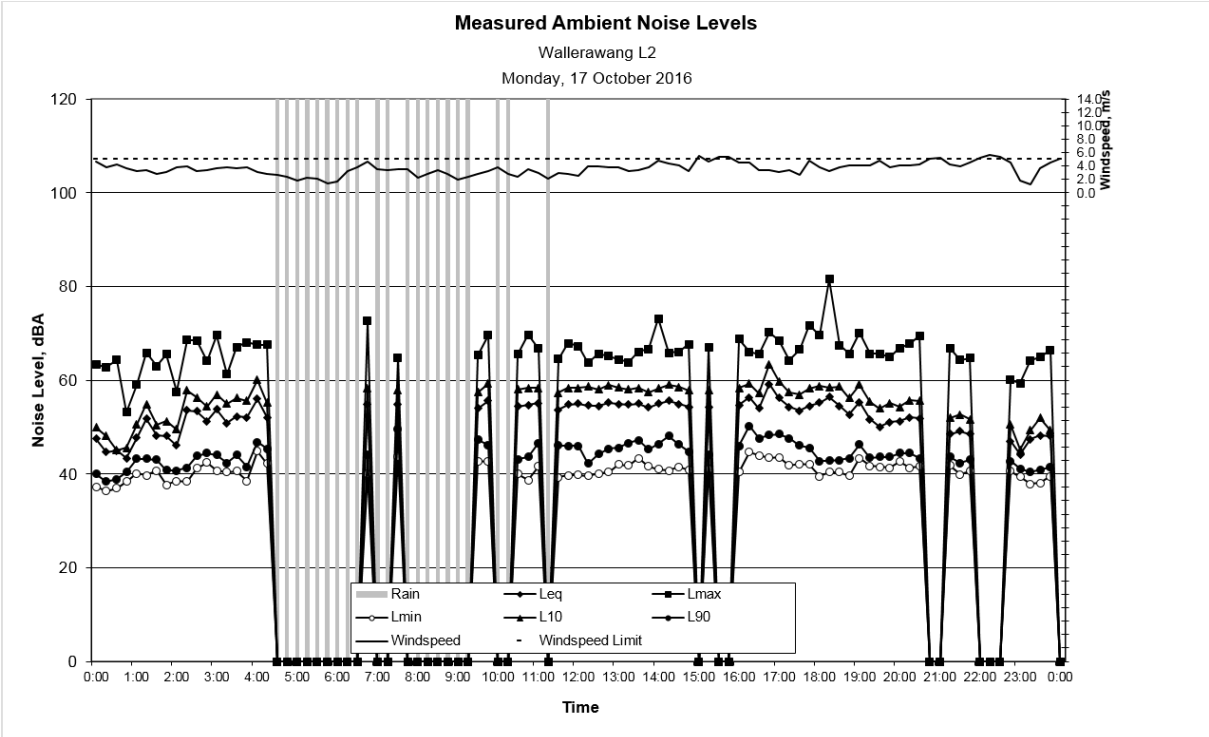
MPA0615

Appendix D
Noise monitoring graphs

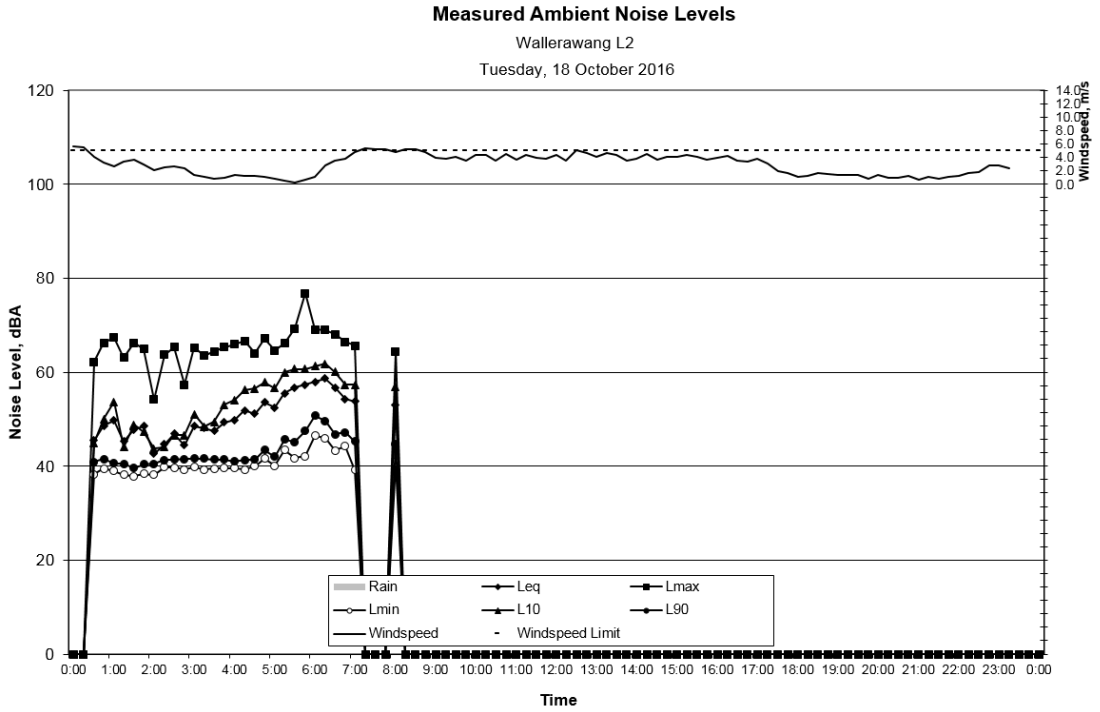
Location 1 – Residential property at Blackmans Flat (16/10/2016)



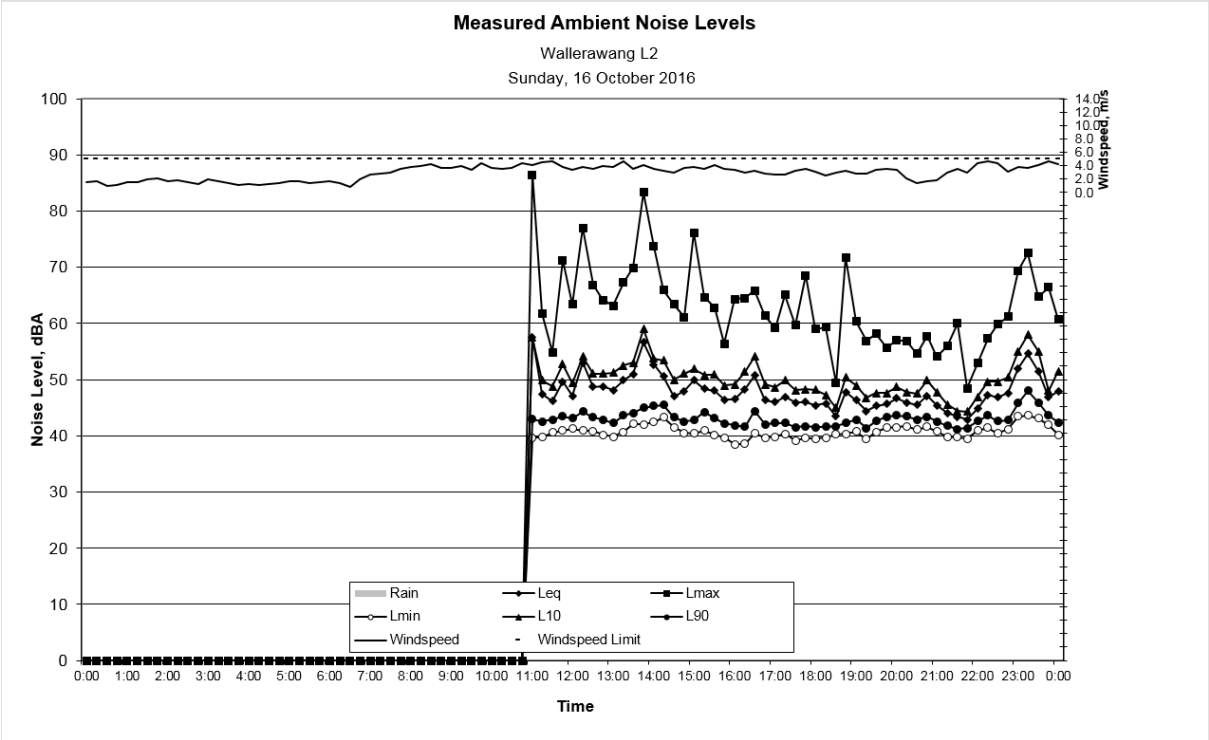
Location 1 – Residential property at Blackmans Flat (17/10/2016)



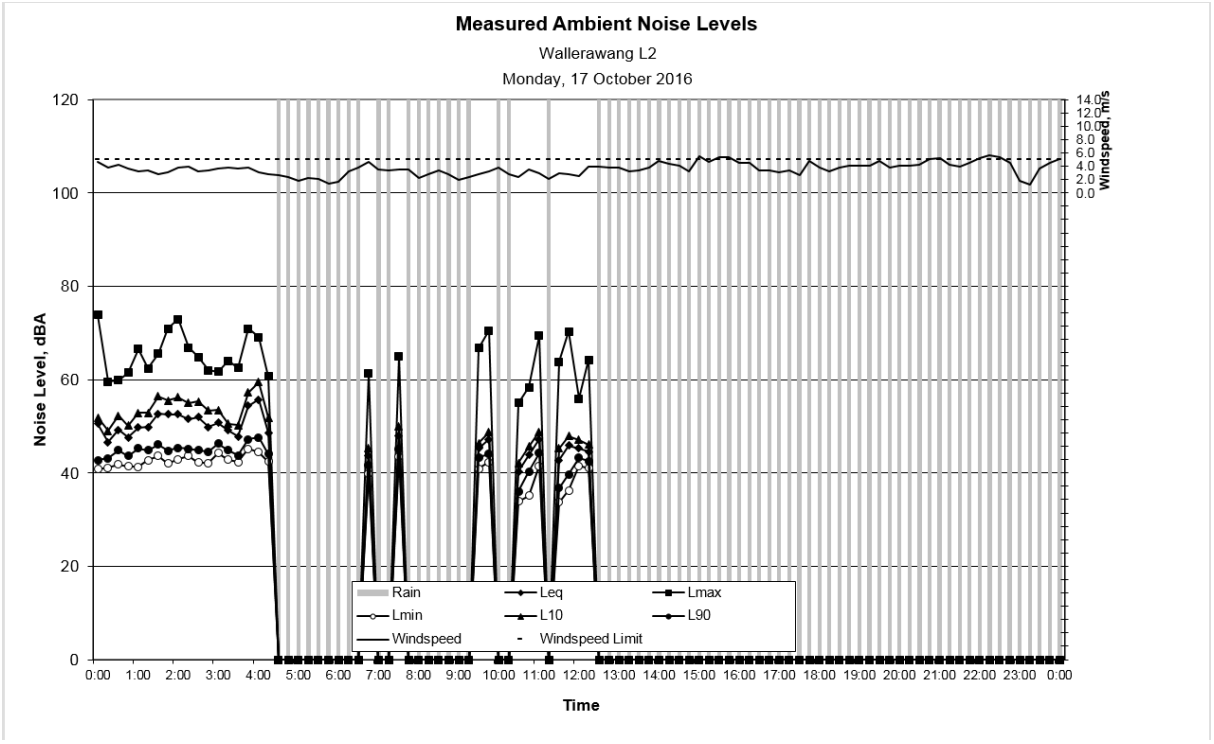
Location 1 – Residential property at Blackmans Flat (18/10/2016)



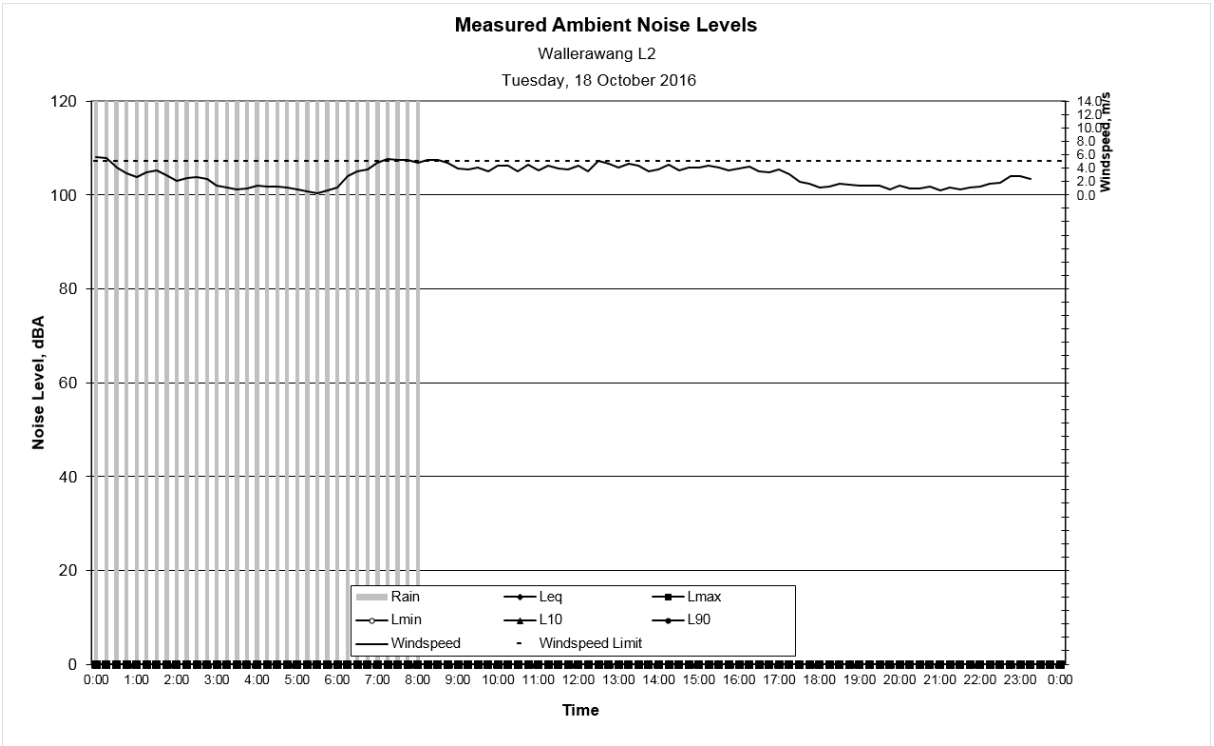
Location 2 – Residential property at Wallerawang (16/10/2016)



Location 2 – Residential property at Wallerawang (17/10/2016)



Location 2 – Residential property at Wallerawang (18/10/2016)



Appendix E
Weather summary

Table 8 | Meteorological conditions during noise survey

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 5 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
16/10/2016	12:00:00 AM	0.0	1.5	342	9.2	77.7
16/10/2016	12:15:00 AM	0.0	1.6	118	9.3	77.0
16/10/2016	12:30:00 AM	0.0	0.9	13	9.4	76.0
16/10/2016	12:45:00 AM	0.0	1.1	123	9.2	76.7
16/10/2016	1:00:00 AM	0.0	1.5	350	9.6	75.7
16/10/2016	1:15:00 AM	0.0	1.5	231	10.0	74.3
16/10/2016	1:30:00 AM	0.0	1.9	334	10.2	74.0
16/10/2016	1:45:00 AM	0.0	2.1	333	10.7	71.3
16/10/2016	2:00:00 AM	0.0	1.7	338	10.6	71.3
16/10/2016	2:15:00 AM	0.0	1.8	337	10.5	71.3
16/10/2016	2:30:00 AM	0.0	1.5	331	10.3	72.0
16/10/2016	2:45:00 AM	0.0	1.3	346	10.0	72.7
16/10/2016	3:00:00 AM	0.0	1.9	320	9.7	74.0
16/10/2016	3:15:00 AM	0.0	1.7	325	9.8	73.0
16/10/2016	3:30:00 AM	0.0	1.4	341	9.4	74.3
16/10/2016	3:45:00 AM	0.0	1.0	316	8.8	76.0
16/10/2016	4:00:00 AM	0.0	1.2	301	7.2	82.0
16/10/2016	4:15:00 AM	0.0	1.2	309	6.1	87.3
16/10/2016	4:30:00 AM	0.0	1.3	336	6.9	85.0
16/10/2016	4:45:00 AM	0.0	1.4	236	6.6	85.0
16/10/2016	5:00:00 AM	0.0	1.6	239	6.3	85.3
16/10/2016	5:15:00 AM	0.0	1.7	344	6.3	86.7
16/10/2016	5:30:00 AM	0.0	1.4	241	7.5	81.3

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 5 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
16/10/2016	5:45:00 AM	0.0	1.6	25	9.0	75.3
16/10/2016	6:00:00 AM	0.0	1.7	21	9.7	72.0
16/10/2016	6:15:00 AM	0.0	1.4	26	9.9	71.7
16/10/2016	6:30:00 AM	0.0	0.8	117	11.6	66.7
16/10/2016	6:45:00 AM	0.0	2.0	315	13.1	61.3
16/10/2016	7:00:00 AM	0.0	2.6	323	13.8	58.7
16/10/2016	7:15:00 AM	0.0	2.7	327	14.2	57.3
16/10/2016	7:30:00 AM	0.0	2.9	308	14.6	56.7
16/10/2016	7:45:00 AM	0.0	3.5	322	15.5	54.3
16/10/2016	8:00:00 AM	0.0	3.7	316	16.2	51.3
16/10/2016	8:15:00 AM	0.0	3.9	328	16.7	49.7
16/10/2016	8:30:00 AM	0.0	4.3	329	17.0	48.3
16/10/2016	8:45:00 AM	0.0	3.7	320	17.6	47.0
16/10/2016	9:00:00 AM	0.0	3.6	323	18.0	47.3
16/10/2016	9:15:00 AM	0.0	3.9	311	18.0	46.7
16/10/2016	9:30:00 AM	0.0	3.3	317	18.4	46.7
16/10/2016	9:45:00 AM	0.0	4.3	336	18.7	46.0
16/10/2016	10:00:00 AM	0.0	3.6	350	19.3	45.3
16/10/2016	10:15:00 AM	0.0	3.5	339	19.2	45.7
16/10/2016	10:30:00 AM	0.0	3.7	336	19.6	45.0
16/10/2016	10:45:00 AM	0.0	4.3	313	19.5	44.7
16/10/2016	11:00:00 AM	0.0	4.1	315	19.7	44.0
16/10/2016	11:15:00 AM	0.0	4.5	316	19.9	44.3
16/10/2016	11:30:00 AM	0.0	4.6	318	20.1	43.7
16/10/2016	11:45:00 AM	0.0	3.8	332	20.4	44.0
16/10/2016	12:00:00 PM	0.0	3.4	322	20.3	45.3
16/10/2016	12:15:00 PM	0.0	3.8	312	20.3	46.0
16/10/2016	12:30:00 PM	0.0	3.5	312	20.9	44.3
16/10/2016	12:45:00 PM	0.0	4.0	323	20.4	44.7
16/10/2016	1:00:00 PM	0.0	3.7	333	21.1	43.7
16/10/2016	1:15:00 PM	0.0	4.7	325	20.5	43.3
16/10/2016	1:30:00 PM	0.0	3.5	306	20.6	44.3
16/10/2016	1:45:00 PM	0.0	4.0	311	20.9	43.3
16/10/2016	2:00:00 PM	0.0	3.5	315	20.9	44.0

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 5 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
16/10/2016	2:15:00 PM	0.0	3.2	214	21.2	44.3
16/10/2016	2:30:00 PM	0.0	2.9	321	21.2	45.0
16/10/2016	2:45:00 PM	0.0	3.7	319	20.8	46.0
16/10/2016	3:00:00 PM	0.0	3.8	317	20.4	45.7
16/10/2016	3:15:00 PM	0.0	3.6	318	20.0	47.3
16/10/2016	3:30:00 PM	0.0	4.1	331	20.8	46.3
16/10/2016	3:45:00 PM	0.0	3.6	340	20.1	49.7
16/10/2016	4:00:00 PM	0.0	3.4	310	19.4	48.0
16/10/2016	4:15:00 PM	0.0	3.0	325	19.3	49.7
16/10/2016	4:30:00 PM	0.0	3.2	333	19.0	51.0
16/10/2016	4:45:00 PM	0.0	2.8	347	18.8	54.0
16/10/2016	5:00:00 PM	0.0	2.7	228	18.5	54.0
16/10/2016	5:15:00 PM	0.0	2.7	353	18.2	55.0
16/10/2016	5:30:00 PM	0.0	3.3	239	18.0	55.0
16/10/2016	5:45:00 PM	0.0	3.6	351	17.7	55.0
16/10/2016	6:00:00 PM	0.0	3.1	345	17.4	55.0
16/10/2016	6:15:00 PM	0.0	2.5	345	17.1	56.3
16/10/2016	6:30:00 PM	0.0	2.9	356	17.0	57.0
16/10/2016	6:45:00 PM	0.0	3.3	354	16.9	57.3
16/10/2016	7:00:00 PM	0.0	2.8	236	16.8	58.3
16/10/2016	7:15:00 PM	0.0	2.8	237	16.5	60.0
16/10/2016	7:30:00 PM	0.0	3.3	238	16.5	60.0
16/10/2016	7:45:00 PM	0.0	3.5	355	16.5	60.0
16/10/2016	8:00:00 PM	0.0	3.4	238	16.5	60.0
16/10/2016	8:15:00 PM	0.0	2.1	348	16.3	60.7
16/10/2016	8:30:00 PM	0.0	1.4	338	16.1	62.3
16/10/2016	8:45:00 PM	0.0	1.6	117	15.9	63.0
16/10/2016	9:00:00 PM	0.0	1.8	125	15.7	64.0
16/10/2016	9:15:00 PM	0.0	2.9	128	15.7	63.0
16/10/2016	9:30:00 PM	0.0	3.5	236	16.0	60.7
16/10/2016	9:45:00 PM	0.0	3.0	355	15.9	60.0
16/10/2016	10:00:00 PM	0.0	4.4	356	16.0	59.0
16/10/2016	10:15:00 PM	0.0	4.6	355	15.9	59.3
16/10/2016	10:30:00 PM	0.0	4.4	357	15.8	59.3

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 5 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
16/10/2016	10:45:00 PM	0.0	3.1	234	15.6	60.0
16/10/2016	11:00:00 PM	0.0	3.8	2	15.5	60.3
16/10/2016	11:15:00 PM	0.0	3.6	240	15.3	60.0
16/10/2016	11:30:00 PM	0.0	4.1	240	15.4	59.7
16/10/2016	11:45:00 PM	0.0	4.6	239	15.5	59.0
17/10/2016	12:00:00 AM	0.0	4.2	119	15.5	59.0
17/10/2016	12:15:00 AM	0.0	4.7	240	15.5	59.0
17/10/2016	12:30:00 AM	0.0	3.8	237	15.3	59.0
17/10/2016	12:45:00 AM	0.0	4.2	357	15.4	59.0
17/10/2016	1:00:00 AM	0.0	3.7	355	15.5	58.3
17/10/2016	1:15:00 AM	0.0	3.3	122	15.7	58.0
17/10/2016	1:30:00 AM	0.0	3.4	348	15.8	57.0
17/10/2016	1:45:00 AM	0.0	2.8	341	15.9	56.3
17/10/2016	2:00:00 AM	0.0	3.1	342	16.0	56.0
17/10/2016	2:15:00 AM	0.0	3.8	333	16.1	56.0
17/10/2016	2:30:00 AM	0.0	3.9	331	16.0	57.0
17/10/2016	2:45:00 AM	0.0	3.3	322	15.8	57.0
17/10/2016	3:00:00 AM	0.0	3.4	323	15.7	57.7
17/10/2016	3:15:00 AM	0.0	3.6	330	15.3	61.7
17/10/2016	3:30:00 AM	0.0	3.8	328	14.7	67.0
17/10/2016	3:45:00 AM	0.0	3.6	326	14.4	69.0
17/10/2016	4:00:00 AM	0.0	3.8	322	14.3	70.0
17/10/2016	4:15:00 AM	0.0	3.0	317	13.9	74.0
17/10/2016	4:30:00 AM	0.0	2.8	317	12.9	83.3
17/10/2016	4:45:00 AM	0.1	2.7	328	12.2	88.0
17/10/2016	5:00:00 AM	0.1	2.3	324	11.7	92.3
17/10/2016	5:15:00 AM	0.3	1.8	321	11.4	94.7
17/10/2016	5:30:00 AM	0.3	2.2	321	11.2	96.0
17/10/2016	5:45:00 AM	0.1	2.1	232	11.2	96.0
17/10/2016	6:00:00 AM	0.1	1.3	350	11.1	96.7
17/10/2016	6:15:00 AM	0.1	1.6	316	11.1	97.0
17/10/2016	6:30:00 AM	0.4	3.2	268	11.2	97.0
17/10/2016	6:45:00 AM	0.1	3.7	240	10.5	95.7
17/10/2016	7:00:00 AM	0.0	4.7	243	10.2	93.7

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 5 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
17/10/2016	7:15:00 AM	0.1	3.5	241	9.8	93.0
17/10/2016	7:30:00 AM	0.1	3.3	258	9.6	92.3
17/10/2016	7:45:00 AM	0.0	3.5	255	9.3	92.7
17/10/2016	8:00:00 AM	0.2	3.5	237	8.7	92.7
17/10/2016	8:15:00 AM	0.1	2.2	251	8.2	92.0
17/10/2016	8:30:00 AM	0.1	2.8	252	8.0	92.3
17/10/2016	8:45:00 AM	0.1	3.3	258	7.7	92.3
17/10/2016	9:00:00 AM	0.2	2.7	263	7.3	91.7
17/10/2016	9:15:00 AM	0.1	2.0	285	6.9	92.7
17/10/2016	9:30:00 AM	0.1	2.4	259	7.0	93.0
17/10/2016	9:45:00 AM	0.0	2.8	241	7.5	91.7
17/10/2016	10:00:00 AM	0.0	3.2	255	8.0	90.3
17/10/2016	10:15:00 AM	0.2	3.7	259	7.5	90.3
17/10/2016	10:30:00 AM	0.1	2.8	249	7.3	93.0
17/10/2016	10:45:00 AM	0.0	2.4	256	8.3	93.7
17/10/2016	11:00:00 AM	0.0	3.5	268	8.3	91.3
17/10/2016	11:15:00 AM	0.0	3.0	270	7.9	91.3
17/10/2016	11:30:00 AM	0.2	2.1	277	7.7	92.7
17/10/2016	11:45:00 AM	0.0	3.0	287	7.8	92.0
17/10/2016	12:00:00 PM	0.0	2.8	293	7.8	90.7
17/10/2016	12:15:00 PM	0.0	2.5	278	7.9	90.7
17/10/2016	12:30:00 PM	0.0	4.0	273	8.0	89.7
17/10/2016	12:45:00 PM	0.0	3.9	269	7.8	88.7
17/10/2016	1:00:00 PM	0.0	3.7	257	8.2	87.3
17/10/2016	1:15:00 PM	0.0	3.7	266	8.6	85.3
17/10/2016	1:30:00 PM	0.0	3.3	270	9.1	84.7
17/10/2016	1:45:00 PM	0.0	3.3	274	8.9	85.0
17/10/2016	2:00:00 PM	0.0	3.8	265	9.1	83.0
17/10/2016	2:15:00 PM	0.0	4.8	249	9.4	82.0
17/10/2016	2:30:00 PM	0.0	4.4	245	9.9	80.0
17/10/2016	2:45:00 PM	0.1	4.0	248	9.6	82.3
17/10/2016	3:00:00 PM	0.0	3.2	258	9.2	88.3
17/10/2016	3:15:00 PM	0.0	5.4	257	10.2	82.7
17/10/2016	3:30:00 PM	0.0	4.7	252	11.0	77.0

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 5 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
17/10/2016	3:45:00 PM	0.0	5.4	248	11.1	71.7
17/10/2016	4:00:00 PM	0.0	5.4	246	9.0	80.0
17/10/2016	4:15:00 PM	0.0	4.6	237	9.2	86.3
17/10/2016	4:30:00 PM	0.0	4.4	243	9.8	79.7
17/10/2016	4:45:00 PM	0.1	3.4	236	10.0	78.3
17/10/2016	5:00:00 PM	0.0	3.4	258	9.4	79.3
17/10/2016	5:15:00 PM	0.0	3.1	262	9.3	80.0
17/10/2016	5:30:00 PM	0.0	3.4	254	9.0	79.7
17/10/2016	5:45:00 PM	0.0	2.6	255	8.6	81.7
17/10/2016	6:00:00 PM	0.0	4.8	249	8.6	82.0
17/10/2016	6:15:00 PM	0.0	3.8	244	8.1	84.3
17/10/2016	6:30:00 PM	0.0	3.2	250	7.8	84.3
17/10/2016	6:45:00 PM	0.0	3.8	248	7.6	84.7
17/10/2016	7:00:00 PM	0.0	4.1	251	7.5	85.0
17/10/2016	7:15:00 PM	0.0	4.1	249	7.6	85.3
17/10/2016	7:30:00 PM	0.0	4.1	247	7.6	86.3
17/10/2016	7:45:00 PM	0.0	4.8	245	7.6	87.0
17/10/2016	8:00:00 PM	0.0	3.8	234	7.4	87.0
17/10/2016	8:15:00 PM	0.0	4.1	239	7.4	87.0
17/10/2016	8:30:00 PM	0.0	4.1	235	7.3	87.0
17/10/2016	8:45:00 PM	0.0	4.2	243	7.4	87.0
17/10/2016	9:00:00 PM	0.0	5.0	240	7.4	85.7
17/10/2016	9:15:00 PM	0.0	5.2	248	7.4	86.0
17/10/2016	9:30:00 PM	0.0	4.2	240	7.2	86.7
17/10/2016	9:45:00 PM	0.0	3.9	238	7.2	87.3
17/10/2016	10:00:00 PM	0.0	4.4	247	7.2	87.7
17/10/2016	10:15:00 PM	0.0	5.2	250	7.3	87.7
17/10/2016	10:30:00 PM	0.0	5.6	250	7.5	87.0
17/10/2016	10:45:00 PM	0.0	5.4	253	7.5	86.7
17/10/2016	11:00:00 PM	0.0	4.5	247	7.4	86.7
17/10/2016	11:15:00 PM	0.0	1.8	287	7.2	85.7
17/10/2016	11:30:00 PM	0.0	1.3	331	6.9	86.3
17/10/2016	11:45:00 PM	0.0	3.7	262	7.0	86.7
18/10/2016	12:00:00 AM	0.0	4.6	253	7.0	86.3

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 5 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
18/10/2016	12:15:00 AM	0.0	5.0	256	6.8	87.0
18/10/2016	12:30:00 AM	0.0	5.7	249	6.9	86.3
18/10/2016	12:45:00 AM	0.0	5.4	245	6.7	87.0
18/10/2016	1:00:00 AM	0.0	4.1	246	6.5	87.0
18/10/2016	1:15:00 AM	0.0	3.3	249	6.3	85.7
18/10/2016	1:30:00 AM	0.0	2.6	251	6.1	85.3
18/10/2016	1:45:00 AM	0.0	3.3	248	6.2	84.7
18/10/2016	2:00:00 AM	0.0	3.6	256	6.2	84.0
18/10/2016	2:15:00 AM	0.0	2.9	260	6.0	84.0
18/10/2016	2:30:00 AM	0.0	2.1	258	5.9	84.0
18/10/2016	2:45:00 AM	0.0	2.6	258	6.0	83.3
18/10/2016	3:00:00 AM	0.0	2.7	259	5.9	83.0
18/10/2016	3:15:00 AM	0.0	2.4	257	5.9	83.0
18/10/2016	3:30:00 AM	0.0	1.4	274	5.7	83.3
18/10/2016	3:45:00 AM	0.0	1.1	284	5.1	85.0
18/10/2016	4:00:00 AM	0.0	0.9	258	4.0	88.0
18/10/2016	4:15:00 AM	0.0	0.9	227	2.5	94.0
18/10/2016	4:30:00 AM	0.0	1.3	239	2.0	96.0
18/10/2016	4:45:00 AM	0.0	1.3	237	1.9	97.0
18/10/2016	5:00:00 AM	0.0	1.3	231	1.5	97.0
18/10/2016	5:15:00 AM	0.0	1.1	239	1.4	97.0
18/10/2016	5:30:00 AM	0.0	0.8	235	1.5	97.0
18/10/2016	5:45:00 AM	0.0	0.6	230	2.1	98.0
18/10/2016	6:00:00 AM	0.0	0.2	129	3.0	97.3
18/10/2016	6:15:00 AM	0.0	0.7	33	4.3	96.0
18/10/2016	6:30:00 AM	0.0	1.2	299	6.1	87.7
18/10/2016	6:45:00 AM	0.0	2.7	279	8.4	76.3
18/10/2016	7:00:00 AM	0.0	3.5	273	9.1	72.0
18/10/2016	7:15:00 AM	0.0	3.8	267	9.8	69.0
18/10/2016	7:30:00 AM	0.0	4.8	265	10.0	66.3
18/10/2016	7:45:00 AM	0.0	5.3	261	10.4	64.3
18/10/2016	8:00:00 AM	0.0	5.2	268	10.6	62.3
18/10/2016	8:15:00 AM	0.0	5.2	250	11.1	61.0
18/10/2016	8:30:00 AM	0.0	4.7	256	11.5	60.0

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 5 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
18/10/2016	8:45:00 AM	0.0	5.3	264	11.5	59.7
18/10/2016	9:00:00 AM	0.0	5.2	273	11.6	59.7
18/10/2016	9:15:00 AM	0.0	4.7	268	11.9	60.0
18/10/2016	9:30:00 AM	0.0	3.9	273	12.3	59.3
18/10/2016	9:45:00 AM	0.0	3.8	275	12.6	59.7
18/10/2016	10:00:00 AM	0.0	4.0	297	12.6	58.7
18/10/2016	10:15:00 AM	0.0	3.6	277	12.9	60.0
18/10/2016	10:30:00 AM	0.0	4.3	258	13.6	58.7
18/10/2016	10:45:00 AM	0.0	4.3	269	13.6	58.0
18/10/2016	11:00:00 AM	0.0	3.6	284	13.8	59.3
18/10/2016	11:15:00 AM	0.0	4.5	279	13.6	57.0
18/10/2016	11:30:00 AM	0.0	3.7	291	14.1	57.0
18/10/2016	11:45:00 AM	0.0	4.4	278	13.8	56.7
18/10/2016	12:00:00 PM	0.0	4.0	299	14.0	55.0
18/10/2016	12:15:00 PM	0.0	3.8	282	13.8	56.7
18/10/2016	12:30:00 PM	0.0	4.3	286	14.1	55.0
18/10/2016	12:45:00 PM	0.0	3.6	282	13.8	56.7
18/10/2016	1:00:00 PM	0.0	5.1	283	14.5	53.3
18/10/2016	1:15:00 PM	0.0	4.7	275	15.0	53.0
18/10/2016	1:30:00 PM	0.0	4.0	283	14.6	53.7
18/10/2016	1:45:00 PM	0.0	4.7	269	14.7	53.3
18/10/2016	2:00:00 PM	0.0	4.3	285	14.7	53.7
18/10/2016	2:15:00 PM	0.0	3.5	284	14.9	54.3
18/10/2016	2:30:00 PM	0.0	3.7	286	15.0	54.0
18/10/2016	2:45:00 PM	0.0	4.5	287	15.1	52.0
18/10/2016	3:00:00 PM	0.0	3.7	279	14.5	53.0
18/10/2016	3:15:00 PM	0.0	4.1	275	14.6	53.0
18/10/2016	3:30:00 PM	0.0	4.1	284	14.2	53.3
18/10/2016	3:45:00 PM	0.0	4.4	275	14.2	54.0
18/10/2016	4:00:00 PM	0.0	4.1	293	14.2	52.3
18/10/2016	4:15:00 PM	0.0	3.6	284	13.8	54.3
18/10/2016	4:30:00 PM	0.0	4.0	276	13.8	54.0
18/10/2016	4:45:00 PM	0.0	4.2	280	14.5	51.0
18/10/2016	5:00:00 PM	0.0	3.6	284	14.5	50.7

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 5 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
18/10/2016	5:15:00 PM	0.0	3.3	288	14.2	51.3
18/10/2016	5:30:00 PM	0.0	3.8	282	13.4	54.0
18/10/2016	5:45:00 PM	0.0	3.1	281	13.0	56.3
18/10/2016	6:00:00 PM	0.0	1.9	294	12.8	57.3
18/10/2016	6:15:00 PM	0.0	1.7	306	12.4	60.0
18/10/2016	6:30:00 PM	0.0	1.1	298	12.0	63.0
18/10/2016	6:45:00 PM	0.0	1.2	293	11.8	64.0
18/10/2016	7:00:00 PM	0.0	1.7	325	11.6	64.3
18/10/2016	7:15:00 PM	0.0	1.5	314	11.6	64.0
18/10/2016	7:30:00 PM	0.0	1.4	326	11.5	64.0
18/10/2016	7:45:00 PM	0.0	1.4	315	11.2	65.0
18/10/2016	8:00:00 PM	0.0	1.4	310	11.0	66.0
18/10/2016	8:15:00 PM	0.0	0.9	291	10.9	67.0
18/10/2016	8:30:00 PM	0.0	1.3	299	10.8	67.0
18/10/2016	8:45:00 PM	0.0	1.0	260	10.7	67.7
18/10/2016	9:00:00 PM	0.0	1.0	310	10.8	66.7
18/10/2016	9:15:00 PM	0.0	1.3	316	10.8	66.0
18/10/2016	9:30:00 PM	0.0	0.7	218	10.6	66.7
18/10/2016	9:45:00 PM	0.0	1.0	319	10.7	65.7
18/10/2016	10:00:00 PM	0.0	0.9	325	9.7	70.0
18/10/2016	10:15:00 PM	0.0	1.1	314	9.5	72.0
18/10/2016	10:30:00 PM	0.0	1.2	291	10.1	69.7
18/10/2016	10:45:00 PM	0.0	1.7	284	10.9	66.0
18/10/2016	11:00:00 PM	0.0	1.8	255	11.1	65.0
18/10/2016	11:15:00 PM	0.0	2.8	265	11.2	63.7
18/10/2016	11:30:00 PM	0.0	2.8	256	11.0	64.7
18/10/2016	11:45:00 PM	0.0	2.3	258	10.7	66.3

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Appendix C

Lamberts North Operational Noise Assessment – May 2017

aurecon

Project: Mt Piper Power Station Ash Placement

Lamberts North – Operational Noise Assessment May 2017

Reference: 246493-001

Prepared for:
EnergyAustralia NSW

Revision: 2

1 June 2017

Document Control Record

Document prepared by:

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Document control						
Report Title		Lamberts North – Operational Noise Assessment May 2017				
Document ID		246493-LN-REP-07-Rev2	**Project Number**		246493-001	
File Path		\\Aurecon.info\Shares\AUSYD\Projects\BG\246493\3.Project Delivery\12.Deliverables\Acoustics\170419_Lamberts North (April 2017)\Report\Lamberts North Operational Noise Assessment May 2017-Rev2.docx				
Client		EnergyAustralia NSW	**Client Contact**		Coleen Milroy	
Rev	**Date**	**Revision Details/Status**	**Prepared by**	**Author**	**Verifier**	**Approver**
1	**26 May 2017**	Internal draft for review	AL	AL	HT	ML
2	**1 June 2017**	Final issue	AL	AL	HT	ML
Current Revision		**2**				

Approval			
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Mt Piper Power Station Ash Placement

Date | 1 June 2017
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1 Introduction

1.1 Project understanding

On 16 February 2012, Delta Electricity received Project Approval (09_0186) under delegation from the Minister of Planning for the Mt Piper Ash Placement Project (the Project) under Section 75J - *Environmental Planning and Assessment Act 1979* to permit the continued disposal of ash generated by the Mt Piper Power Station into the Lamberts North area, which is an extension of the existing Mt Piper Ash Repository. The Project Approval was granted subject to Conditions of Approval. EnergyAustralia NSW acquired Mt Piper Power Station and associated land holdings and infrastructure from the state-owned Delta Electricity in September 2013. As such the project is now owned by EnergyAustralia NSW.

This report has been developed in accordance with the Lamberts North Ash Placement Project Condition of Approval (CoA) E11 and the mitigation measures specified in the Operational Environment Management Plan (OEMP May 2013). The OEMP outlines the requirements of the ongoing noise monitoring program and operational noise review in accordance with CoA's E7, E8, E9 and E11.

1.2 Background to the Project

Lamberts North is located immediately east of EnergyAustralia NSW's existing Mt Piper Ash Repository, which is described as Area 1 in the Environmental Assessment (EA) (SKM, 2010). Ash placement at Mt Piper Ash Repository is still currently being undertaken, but alternates with ash placement at Lamberts North.

Both sites are located in an area characterised by both rural and industrial influences, with a number of coal mines in relatively close proximity. The project site is predominately surrounded by Ben Bullen State Forest, which lies to the north and south east of Mt Piper Power Station, together with open cut coal mines and coal washeries. Wallerawang Power Station which is also owned by EnergyAustralia NSW, lies to the south east of the project site, approximately 5 km away, but is no longer operational following the announcement in November 2014, that the power station would be closed.

Lamberts North ash repository is approximately 53 hectares.

Historically, the Lamberts North area has been highly disturbed as a result of extensive mining activities including underground working (from the 1950s to the early 1990s) and recent open-cut mining activities being carried out by Centennial Coal.

EnergyAustralia NSW has engaged a principal contractor (Lend Lease) to manage and operate both the Mt Piper (Area 1) and Lamberts North ash repositories. Operations at Lamberts North commenced on 2 September 2013.

1.3 Scope of work

In accordance with CoA E11, the scope of work includes noise assessment comprising of attended/ unattended noise measurements at two sensitive receiver locations to determine potential noise impacts arising from the operational activities at Lamberts North ash repository.

1.4 Sensitive receivers

The sensitive receivers located within the vicinity of the Project and identified for noise impacts within the Operation Noise Management and Monitoring Plan (ONMMP), a sub plan of the OEMP, are described in Table 1 below. The two sensitive receivers closest to the site are located at Blackmans Flat approximately 1.4 km to the east of Lamberts North and at Wallerawang approximately 2.5 km south east of Lamberts North. Location 3 has been used as an additional location to measure the reference noise levels from the operational activities. The positions of the measurement locations are shown in Figure 1.

Table 1 | Sensitive receivers nearest to Lamberts North

Location ID[a]	Description	Map Coordinates	Noise monitoring location	Distance from Lamberts North Ash Repository
1	Blackmans Flat	33.36468ºS 150.05904ºE	Located at the western end of Noon Street on the southern side of the road. Positioned at the boundary of the residential property 90 m from the Castlereagh Highway.	1.4 km east
2	Wallerawang	33.37765ºS 150.06073ºE	Situated on a rural property southeast of Lamberts North, and approximately 1.3 km from Castlereagh Highway.	2.5 km south east
3	Lamberts North	33.35745ºS 150.04206ºE	Additional location at the south eastern boundary of the Lamberts North site	Within the Lamberts North site

[a] Refer to Figure 1 for locations

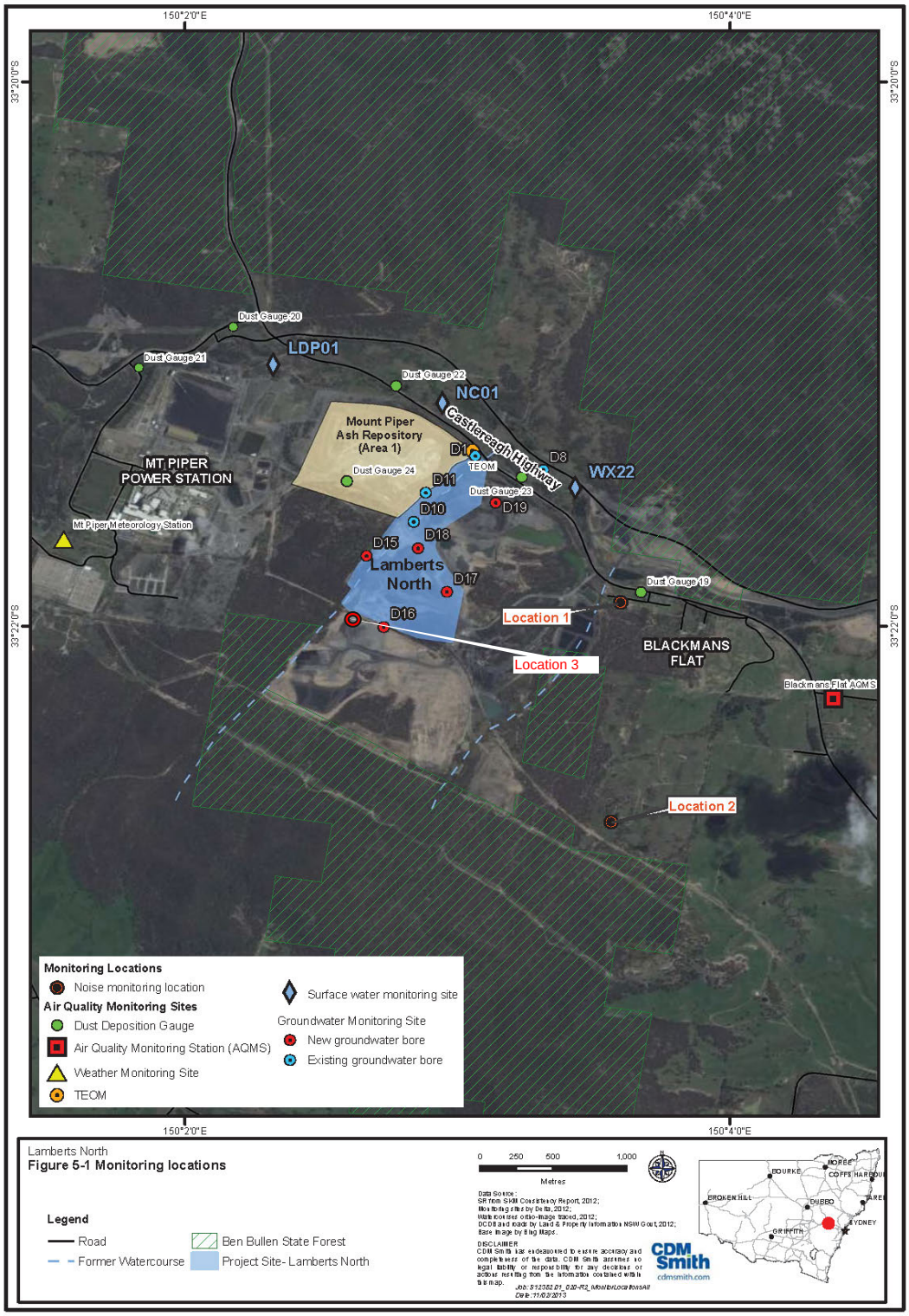


Figure 1 | Environmental noise monitoring locations

2 Operations at Lamberts North

2.1 Operation methodology

Key potential noise impacts during operational activities at Lamberts North and Mt Piper Ash Repository sites are 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 sprinkler systems;
- Developing and maintaining water management structures (containments, drains and sumps) using an excavator;
- Using various 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 and plant generate noise from the engine and drive line, hydraulics and reverse warning devices.

2.2 Activities at Lamberts North

The Mt Piper and Lamberts North sites are located adjacent to each other. Ash deposition at the Lamberts North site or Mt Piper site is dependent on many factors which are decided on a weekly basis by the Lend Lease environmental manager.

During the site visit from 30 April – 1 May 2017, ash placement operations were occurring at Lamberts North site but no ash placement was occurring at Mt Piper Ash Repository (Area 1).

The equipment outlined in Table 2 was evident at Lamberts North during the site visit.

Noise generated from some of the equipment at a distance of seven metres was measured at Lamberts North by Aurecon in January 2013 (see Aurecon, 2013). Sound Power Levels (SWL) for the rest of the equipment were referenced from *AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites*.

Below is the summary of activities identified at Lamberts North during the site visit:

- The day/ activities started at 06:00 for a 06:15 start which included the daily tool box talk and work related discussions.
- The equipment on site consisted of a dozer, a dump truck, a water cart and one light commercial vehicle based on the initial briefing provided to us by the Lend Lease security officer prior to attending the site. Appendix F shows the copy of site attendance sheet signed by plant operators.
  - The dump truck was being loaded with ash near the ash bins and was unloaded at the junction of Lamberts North and Mt Piper ash repository sites.

- The dozer was operating on the ash stock pile which was not visible or audible at monitoring Location 3.
- One water cart was sighted but was only operating occasionally if it was required.
- The light commercial vehicle was occasionally being used to transport drivers.

- All activities ceased by 17:00. No activities occurred during the evening or night time period (18:00 – 06:00) at either the Lamberts North or Mt Piper sites.

Table 2 | Equipment sighted at Lamberts North and Mt Piper site during the site visit

Equipment type	Number of equipment on site during the site visit	Sound Power Level SWL for each equipment type dBA[b]
Dozer / Crawler tractor*	1	106
Dump Truck*	1	104
Water Cart / truck*	1	101
Light commercial vehicle	1	100

* Sound Power Levels (SWL) calculated based on noise measurements at a distance of 7 m which were carried out during a previous site visit (see Mt Piper Power Station Ash Placement Project – Lamberts North Construction Noise monitoring 14-15 January 2013, Revision 2, dated 11 February 2013).

2.3 Description of the surrounding environment

Lamberts North site is predominantly surrounded by Ben Bullen State Forest with open cut coal mines and coal washeries. Noise sources, other than those resulting from ash placement activities, were audible during the site visit (e.g. light to heavy vehicles on distant road, animal noises, etc.) and contributed to the cumulative noise at the measurement location (Location 2).

Activities at Springvale colliery which is operated by Centennial Coal and lies to the south east of the site includes, but is not limited to the transportation of coal via conveyors, operation of equipment and mobile plant, etc. may also contribute to the cumulative noise at the measurement locations. Pine Dale coal mine is located to the north east of the site, but is unlikely to contribute to the cumulative noise at the measurement locations as the mine is currently under care and maintenance (i.e. non-operational).

[b] SWL includes adjustment for tonality.

3 Noise criteria

3.1 Conditions of Approval relating to noise

The ONMMP seeks to address the specific requirements of the CoA attached to the Project Approval for Lamberts North, insofar as they relate to noise and vibration during operation.

CoA E7 and CoA D3a(ii) define the operational noise requirements for the project, to ensure noise emissions from operational activities do not exceed the criteria shown in Table 3 below.

Table 3 | Operation noise criteria

Location	$L_{Aeq\ (15\ minute)}$ dBA		
	Day Time (7:00 – 18:00)	**Evening Time (18:00 – 22:00)**	**Night Time (22:00 – 7:00)**
All private receivers within the township of Blackmans Flat	42	38	35
All other residences	42	38	35

Note: 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 Director-General and the NSW EPA.

3.2 Operational hours

In accordance with the CoA E1, operational activities associated with the project shall only be undertaken from 6:00am to 8:00pm Monday to Friday and 6:00am to 5:00pm Saturday and Sunday. Operations outside the hours stipulated above are only permitted in emergency situations.

4 Noise survey

4.1 Methodology

Attended and unattended noise measurements were conducted from 30 April – 1 May 2017 at the boundary of the nearest residential properties (Location 1 and Location 2) likely to be exposed to noise from the ongoing ash placement operation.

The statistical noise measurements including the averaged A-weighted noise levels (L_{Aeq}), maximum A-weighted noise levels (L_{Amax}) and statistical A-weighted L_{A90} and L_{A10} noise levels[c] were conducted using a Larson Davis 831 Type 1 sound level meter equipped with a LD PRM831 pre-amplifier and a PCB 377B02 ½" microphone. The microphone was set to 'A' frequency weighting, 'F' time weighting, and was fitted with an approved windshield.

Measurements were typically taken at a height of 1.2 m and at least 3.5 m from any reflecting structure other than the ground. Maximum wind speeds at the microphone position was predominantly less than 5 m/s. The measurement period at each location was 15 minutes. A Larson Davis CAL200 was utilised to calibrate the sound level meter before and after each series of measurements with no significant calibration drift noted. Measurements were typically taken in accordance with the Australian Standard *AS 1055 1997: Acoustics – Description and measurement of environmental noise*. Table 4 shows the equipment used for all the measurements undertaken on site.

Table 4 | Sound pressure level measurement equipment

Equipment	Make	Model	Serial No.	Type	Last Calibration	Calibration Due
Sound Level Meter	LD	831	0001595	1	19/08/2016	19/08/2018
Noise logger 1	LD	LXT	1718	1	1/09/2016	1/09/2018
Noise logger 2	RION	NL-21	00709529	2	29/09/2016	29/09/2018
Calibrator	LD	CAL200	6345	-	14/02/2016	14/02/2018

Noise measurements were conducted at three locations (as shown in Figure 1).

4.2 Weather data

Clear sky and intermittent wind (< 1.5 m/s) was prevalent at Location 3 over the attended measurement period on both days. Clear sky and wind speeds of less than 1 m/s was apparent over the measurement period on 30 April and 1 May 2017 at Location 1 and Location 2.

The weather data for these measurement periods are shown in Appendix E from the Mt Piper weather station. Weather data shows wind speeds higher than 3 m/s during morning time on 1/05/2017. Measurement data was excluded from the assessment during that time.

As discussed in Section 2.2, there was no ash placement activity during the evening or night time period (18:00 – 06:00). In accordance with the NSW Industrial Noise Policy (INP), activities at the

[c] For an explanation of the acoustic terms please refer to the attached Glossary of Terminology in Appendix A

Lamberts North site during 06:00 – 07:00 are not considered as night time activity as this time period falls within the defined shoulder period[d].

As per Appendix C (*Procedure of assessing noise increase due to temperature inversions*) of *NSW INP, "if the development does not operate at night, there is no potential for noise impact due to inversions, and no further consideration of these effects is required"*.

Below is the summary of weather conditions prevalent during the noise monitoring which complies with the CoA E7 and CoA D3a(ii):

- Wind speeds were less than 3 m/s at 10 m above ground level for most of time.
- Stability Category F temperature inversion conditions were not prevalent during the operational activities.
- Stability Category G temperature inversion conditions were not prevalent during the operational activities.

4.3 Noise measurement results

During the current monitoring period both attended and unattended monitoring was undertaken.

- Unattended continuous monitoring was undertaken at Location 1 and Location 2 from 11:00 am on 30 April to 04:00 am on 1 May 2017. Detailed results of continuous noise measurements over each 15-minute period are shown in Appendix D and average sound pressure levels over the day, evening and night-time monitoring periods is provided in Table 5.

  As noted in Appendix D and E, wind speeds greater than 3 m/s were experienced at the weather station for a few hours on 1 May 2017. The data during these periods was excluded from the overall measurements to ensure compliance with conditions CoA E7 and CoA D3a(ii). Excluded data had negligible effect on the overall noise measurements.

- Attended noise monitoring was also undertaken at all three locations. Multiple 15-minute measurements were undertaken and Table 5 provides a summary of the environmental noise monitoring results for each location.

A list of operating equipment identified at the Lamberts North site is outlined in Section 2.

Table 5 | Results of environmental noise monitoring

Note: rows in grey are results of attended monitoring, rows in white are results of unattended monitoring

Location	Date	Time	Period	Measured sound Pressure Level, dBA				Note
				$L_{Aeq, 15min}$ #	$L_{A10, 15min}$ ^^	$L_{A90, 15min}$ ^	$L_{Amax, 15min}$ *	
Location 1 *(Blackmans Flat)*	30/04/2017	10:15	Day	51	56	38	64	Note 1
	1/05/2017	11:05	Day	60	64	49	78	
	30/04/2017	7am-6pm	Day	55	59	37	81	
		6pm-10pm	Evening	52	58	38	70	
		10pm-7am	Night	51	58	35	70	
	1/05/2017	7am-6pm	Day	55	60	40	76	

[d] As per NSW INP Section 3.3 (Dealing with 'shoulder' periods): For early morning (5am-7am) operations, it may be unduly stringent to expect such operations to be assessed against the night time criteria-especially if existing background noise levels are steadily rising in the these early morning hours.

Location	Date	Time	Period	Measured sound Pressure Level, dBA				Note
				$L_{Aeq, 15min}$ #	$L_{A10, 15min}$ ^^	$L_{A90, 15min}$ ^	$L_{Amax, 15min}$ *	
		6pm-10pm	Evening	52	58	36	71	
		10pm-7am	Night	49	55	35	78	
Location 2 *(Wallerawang)*	30/04/2017	10:51	Day	41	43	37	61	Note 2
	1/05/2017	11:26	Day	66	69	48	85	
	30/04/2017	7am-6pm	Day	44	47	35	84	
		6pm-10pm	Evening	49	46	38	95	
		10pm-7am	Night	41	46	35	70	
	1/05/2017	7am-6pm	Day	47	49	38	93	
		6pm-10pm	Evening	40	42	33	58	
		10pm-7am	Night	46	38	28	85	
Location 3 *(South eastern boundary of Lamberts North)*	30/04/2017	9:06	Day	51	54	48	66	Note 3
	30/04/2017	9:41	Day	49	49	44	64	
	1/05/2017	10:26	Day	60	64	51	77	

Measurements that were affected by rain and wind speeds higher than 3m/s were excluded from the assessment.

\# *L_{Aeq} refers to A-weighted equivalent continuous sound pressure level over measurement period. It is used to quantify the average noise level over a time period.*

^^ *L_{A10} refers to the A-weighted noise level which is exceeded for only 10% of the measuring period. It is usually used as the descriptor for intrusive noise level.*

^ *L_{A90} refers to the A-weighted noise level which is exceeded for 90% of the measuring period. It is usually used as the descriptor for background noise level during the measurement period.*

* *L_{Amax} refers to the maximum A-weighted noise level detected during the measuring period. It refers to the maximum background noise detected.*

***Note 1** (Residence - Location 1)*

From site observations at residential Location 1 (i.e. Blackmans Flat), the ambient noise was dominated by the traffic along Castlereagh Highway, local domestic and natural noises (e.g. insects, etc.) and low frequency hum from Mt Piper Power Station. There was no audible noise from the westerly direction (i.e. Centennial Coal, Springvale Mine, etc.) during our site attendance.

The maximum equivalent continuous sound pressure level over 15 minutes at Location 1 was measured at $L_{Aeq\ (15minute)}$ 60 dBA. Instantaneous[e] (attended) noise level in the range L_{AF} 41 - 57 dBA was measured when a vehicle was passing on Castlereagh Highway. Birds and insects contributed to the $L_{Amax\ 15\ minute}$ of 64-81 dBA in the day/ evening/ night time.

***Note 2** (Residence - Location 2)*

The background noise level at the rural residential Location 2 (i.e. Wallerawang) was relatively similar to the background noise level at Location 1, especially during the evening and night time

[e] See Appendix A – Glossary of terms

measurements. Noise contribution during the day and evening time period included noise from insects and birds. Other sources of ambient sound at this site included natural sounds (from wind noise, etc.) and distant vehicle traffic noise.

Based on sound localisation using binaural hearing during the attended measurements, there was no evidence of noise originating from the north westerly direction, thus indicating that noise contribution from Lamberts North to the overall equivalent sound pressure level at this location was negligible. Given the buffer distance of at least 2.5 km between Location 2 and Lamberts North, and with the intervening topography, the operational noise impact during day time at this location is considered to be minimal or insignificant.

Maximum equivalent continuous noise over 15 minutes at Location 2 was measured at $L_{Aeq\ (15minute)}$ 66 dBA. Instantaneous[f] (attended) noise level in the range of L_{AF} 35 - 51 dBA was measured when a vehicle was passing near the measurement location. Birds and insects contributed to the $L_{Amax\ 15\ minute}$ of 58-95 dBA in the day/ evening/ night time.

Note 3 *(Lamberts North eastern boundary - Location 3)*

From site observations at the south eastern site boundary of Lamberts North, noise was clearly audible from the mobile plant operating on Lamberts North. The noise varied and included sources such as engine noise from the dump trucks, reverse beeps from dozer/ trucks, bucket bangs of the dozer, loading of ash in the dump truck, etc.

[f] See Appendix A – Glossary of terms

5 Noise assessment

The results of the measured noise levels at the sensitive receivers (Location 1 and Location 2) can be found in Table 5 above. As discussed in Section 4, equivalent sound pressure levels (L_{Aeq}) at both the receiver locations were dominated by traffic noise, birds, insects, low hum from Mt Piper Power Station and noise from nearby coal mines. These measured equivalent sound pressure levels were in excess of the 42dBA day time noise target as per Table 3.

However, operational noise from Lamberts North was inaudible at both the sensitive receivers. As the operational noise contribution from Lamberts North was inaudible, Aurecon undertook a desktop based noise prediction to estimate the noise contribution from the operational activities. This is described in more detail in the following section.

The operational activity at Lamberts North site commenced each day from approximately 06:00 until 17:00 during our site visit. There were no operational activities between 17:00 and 06:00 at these sites.

5.1 Predicted noise contribution

For the purpose of this assessment, the worst case scenario of the following equipment operating simultaneously at the same location at Lamberts North, was considered.

- Dozer/ Crawler tractor x 1
- Dump truck x 1
- Water cart x 1
- Light commercial vehicle x 1

We note that the magnitude of the noise emission during the operation of the project may vary and will depend on the number and intensity of machines operating and the working location of the equipment. It is unlikely that all the plant and equipment will be running simultaneously in the same location. In addition the nature of activities onsite is expected to vary from day to day.

The predicted noise levels were calculated (based on sound propagation through geometric spreading) at a distance based on worst case noise emission levels (i.e. maximum sound power levels) without considering any barrier effects from the undulating surrounding terrain. However due to intermittent operational characteristics and constant change of distance between the source-receiver, a 50% operational efficiency (equipment operational for 50% of the time during each 15-minute measurement period) for each equipment type in the calculation has been used. The results of this calculation are shown in Table 6.

It should be noted that the predicted levels in this section are worst case for each of the above operational activities at the assessment locations and include adjustments for annoying activities as outlined in the Interim Construction Noise Guideline (ICNG). The above prediction methodology takes into account the number of individual machines operating as well as the percentage in use during a 15 minute period, with all scheduled equipment operating at the minimum distance from the nearest sensitive receiver.

The predicted levels in Table 6 provide a theoretical maximum cumulative noise impact. The distances shown in Table 6 are considered minimum between the operational works and the respective receiver zones. The calculation also assumes that each item of equipment is operating at maximum capacity (i.e. maximum sound power level). In reality the mobile plant operate at much lower capacity during its

operation and hence the levels shown in Table 6 are considered conservative and should be interpreted as indicative worst case only.

Table 6 | Predicted noise emission from Lamberts North equipment

Equipment at Lamberts North	Sound Power Level (SWL), dBA	Predicted sound pressure level at indicated distance, L_{Aeq} dBA	
		1.4 km (Location 1)*	2.5 km (Location 2)*
Dozer / Crawler tractor	106	32	27
Dump Truck	104	30	25
Water cart	101	27	22
Light commercial vehicle	100	26	21
Worst case predicted noise level from the operation of the above equipment		**35**	**30**

As shown in Table 7, results of our assessment revealed the following:

- Worst case modelling predicted that noise levels would comply with the day and evening time criteria at both Location 1 and Location 2 as shown Table 7.
- Worst case modelling indicates that the maximum predicted noise level will exceed the noise criteria during night time at Location 1. However CoA E1 for Lamberts North restricts any activities after 20:00 on weekdays and 17:00 on weekends (refer to Section 3.2 for more details), and therefore any predicted night time exceedance is not relevant.

Table 7 | Summary of maximum predicted noise level against the noise criteria (dBA)

Location*	Description	Maximum theoretical 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	Blackman's Flat	35	✓	✓	N/A
2	Wallerawang	30	✓	✓	N/A

✓ Complies with the stipulated noise criteria

^ No operational activity during night time periods.

* Refer to Figure 1 for receiver locations

As evident from Table 7 above, the worst case noise associated with the operational activities at Lamberts North is predicted to comply with the stipulated noise criteria at both the sensitive receptors for both the day and evening periods.

6 Recommendations

6.1 Noise management measures

Should complaints from the community be received, the following noise control measures could be applied to minimise environmental noise emission from Lamberts North during operation of the project:

- If possible avoid the coincidence of noisy plant/machine working simultaneously.
- Construction trucks and other heavy machinery to use loop tracks as much as possible on the site to minimise the amount of reversing activities, i.e. managed through the Operational Traffic and Transport Management Plan.
- Consider the use of alternative warning system to the conventional single tone reversing alarm, such as broadband sound reversing alarm (e.g. BBS-TEK Backalarms) and warning lights.
- Installation of additional silencer/mufflers on the engine exhaust for plant working at Lamberts North.

7 Conclusion

Attended and unattended noise monitoring at Lamberts North has been carried out by Aurecon from 30 April – 1 May 2017 in accordance with Australian Standard "*AS1055.1-1997 Acoustics – Description and measurement of environmental noise, Part 1: General procedures*" using a Type 1 LD 831 sound level meter. Worst case noise predictions were also carried out to provide an estimate of the noise contribution from operational activities at Lamberts North.

7.1 Location 1: Blackman's Flat

The environmental survey results revealed that the ambient noise at Location 1 (i.e. Blackmans Flat) was relatively high and the maximum equivalent continuous sound pressure level over 15 minutes at Location 1 was measured at $L_{Aeq\ (15minute)}$ 60 dBA. The measured noise levels were dominated by the intermittent road traffic along Castlereagh Highway and some local domestic noises.

The maximum predicted noise contribution resulting from the operation of equipment/ plant at the Lamberts North site at Location 1 was determined to be 35 dBA as shown in Table 6.

7.2 Location 2: Wallerawang

The background noise level at Location 2 (i.e. Wallerawang) was relatively similar to the background noise level at Location 1 especially during evening and night time monitoring. The main sources of ambient sound at Location 2 were the natural sounds from wind noise, insects, bird/wildlife, etc. and distant vehicle traffic noise.

Based on sound localisation using binaural hearing during the attended measurement, there was no evidence of noise originating from the north westerly direction. This suggests that noise contribution from Lamberts North to the overall equivalent sound pressure level at this location is negligible. Maximum equivalent continuous noise over 15 minutes at Location 2 was measured at $L_{Aeq\ (15minute)}$ 66 dBA.

The maximum predicted noise contribution resulting from the operation of equipment/ plant at the Lamberts North site at Location 2 was determined to be 30 dBA as shown in Table 6.

7.3 Summary

The background noise levels measured at Locations 1 and 2 exceed the 42dBA day time noise target. However, it is not possible to conclusively determine the noise contribution from the operational ash placement activities at Lamberts North site at Locations 1, 2 and 3 between 30 April – 1 May 2017 due the presence of other surrounding simultaneous noise sources and activities including surrounding coal mines, road traffic, insects, etc.

Based on the worst case noise modelling predictions undertaken, the noise resulting from the operation of equipment and mobile plant at the Lamberts North site comply with the *Lamberts North Ash Placement Project – Operational Environmental Management Plan (May 2013)* at the representative residential receivers Location 1 and Location 2.

8 References

Measurements and assessment of the construction activities were carried out in accordance with:

- Office of Environment & Heritage (OEH) *Interim Construction Noise Guideline (ICNG).*
- Australian Standard *AS 1055 1997: Acoustics – Description and measurement of environmental noise*.
- Australian Standard *AS 2436-2000 Guide to noise and vibration control on construction demolition and maintenance sites*.
- Lamberts North Ash Placement Project – Operational Environmental Management Plan (OEMP) May 2013.
- *Delta Electricity Project Conditions of Approval for Mt Piper Power Station Ash Repository Extension Project (approved on 16 February 2012).*
- *Mt Piper Power Station Ash Placement Project – Lamberts North Construction Noise monitoring 14-15 January 2013 (Revision 2, dated 11 February 2013)*

Appendix A
Glossary of terms

Term	Definition
Sound Pressure Level (Lp)	Sound or noise is the sensation produced at the ear by very small fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range (from 20 microPascals to 60 Pascals). A scale that compresses this range to a more manageable size and that is best matched to subjective response is the logarithmic scale, rather than a linear scale.
Sound Pressure Level (Lp)	Is defined as: $L_P = 10\log_{10}\left(\frac{p^2}{p_{ref}^2}\right)dB$ In the above equation, p is the sound pressure fluctuation (above or below atmospheric pressure), and p_{ref} is 20 microPascals (2 x 10^{-5} Pa), the approximate threshold of hearing. To avoid a scale which is too compressed, a factor of 10 is included, giving rise to the decibel, or dB for short.
A-Weighted Decibel (dBA) & Loudness	In some circumstances, the sound pressure level is expressed as C-Weighted decibels, instead of the more common A-Weighted. The C-Weighting filter is designed to replicate the response of the human ear above 85 dB, and places a greater weighting on low frequency noise.
L_{Aeq}	The time averaged C-weighted sound pressure level for a time interval, as defined in AS1055.1. It is generally described as the equivalent continuous C-weighted sound pressure level that has the same mean square pressure level as a sound that varies over time. It can be considered as the average sound pressure level over the measurement period.
L_{Ceq}	The time averaged C-weighted sound pressure level for a time interval, as defined in AS1055.1. It is generally described as the equivalent continuous C-weighted sound pressure level that has the same mean square pressure level as a sound that varies over time. It can be considered as the average sound pressure level over the measurement period.
L_{An}	The sound level, which, for a specified time interval, in relation to an investigation of a noise, means the A-weighted sound pressure level that is equalled or exceeded for n% of the interval. Commonly used percentages are 1, 10, 90 & 99%.

Term	Definition
L_{Cpk}	The peak C-weighted sound pressure level for a time interval.
$L_{Cmax,T}$	The average maximum C-weighted sound pressure level, which, for the specified time interval, means the C-weighted sound pressure level during the interval obtained by using the fast time weighting and arithmetically averaging the maximum sound levels of the noise during the interval. Under certain conditions the 10th percentile noise level, $L_{C10,T}$, can represent the average maximum C-weighted sound pressure level.
L_{A10}	A-weighted noise level which is exceeded for only 10% of the measuring period. It is usually used as the descriptor for intrusive noise level and represents ambient road traffic noise in general.
L_{A90}	A-weighted noise level which is exceeded for 90% of the measuring period. It is usually used as the descriptor for background noise level during the measurement period.
L_{AF}	Instantaneous A-weighted noise level is the noise displayed for each second of the measurement during the entire monitoring.
L_{Amin}	Minimum A-weighted noise level detected during the measuring period. It refers to the minimum background noise detected.
Octave	Frequency bands allow a representation of the spectrum associated with a particular noise. They are an octave wide, meaning that the highest frequency in the band is just twice the lowest frequency, with all intermediate frequencies included and all other frequencies excluded. Each octave band is described by its centre frequency.
Maximum Exposure Time (Hours)	The maximum possible time a person can be safely exposed to a specific noise level (L_{Aeq}).

Appendix B
Photos of noise monitored locations at Blackmans Flat and Wallerawang

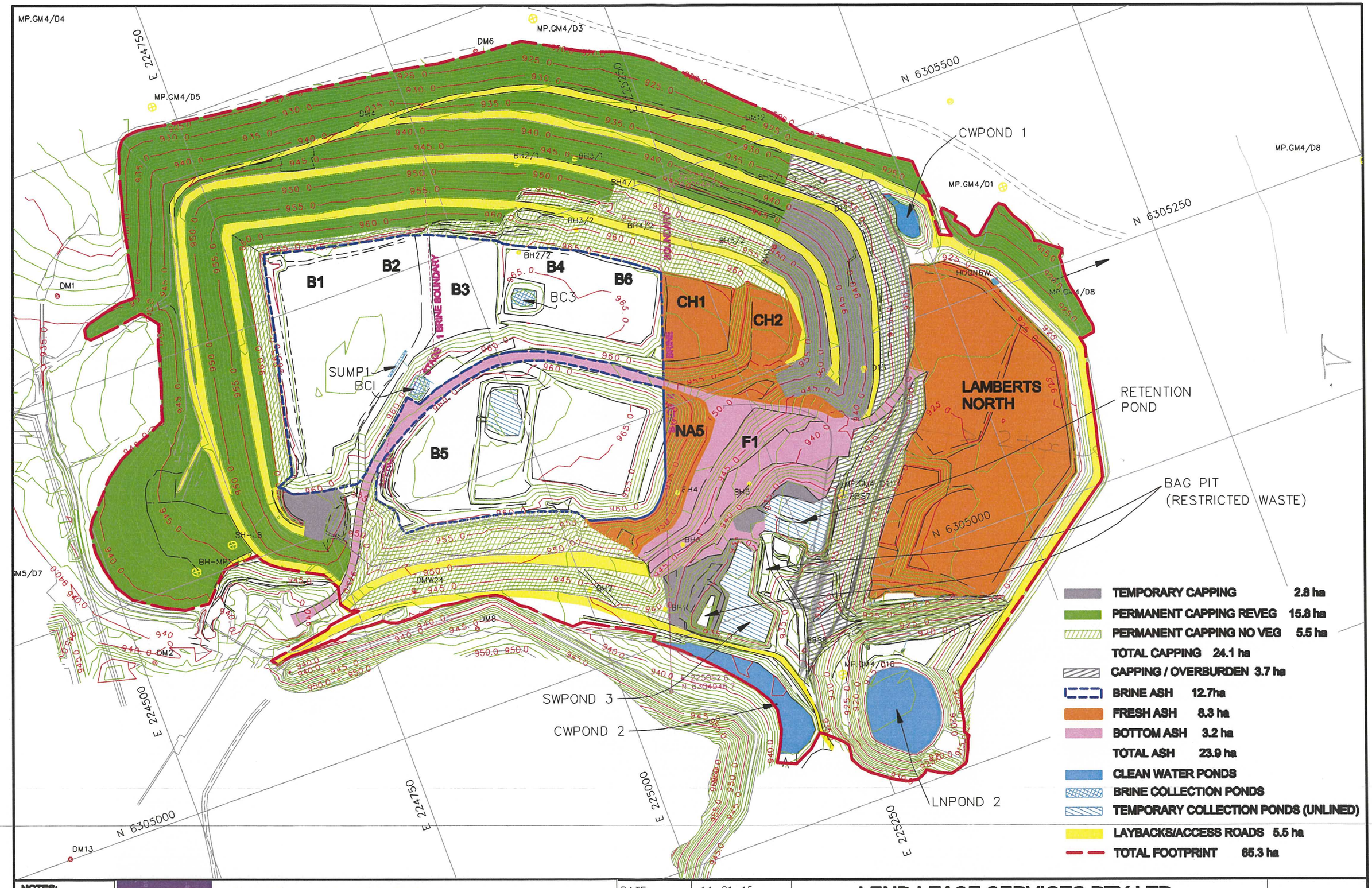
Figure 2 | Photograph of Measurement Location 1 (Blackman's Flat)

Figure 3 | Photograph of Measurement Location 2 (Wallerawang)

Figure 4 | Photograph of Lamberts North South eastern boundary (Location 3)

Figure 5 | Photograph of Lamberts North South eastern boundary with a Haul Truck operating

Appendix C
Lamberts North location map



NOTES:

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DATE	14-01-15
AMENDED	25-08-15
SURVEYOR	B.N.
DRAWN	KEITH FLETCHER
CHECKED	

LEND LEASE SERVICES PTY LTD
MOUNT PIPER - ASH EMPLACEMENT
SURVEY - 14th JANUARY 2015
SCALE - 1 : 4000 (A3 SHEET)

DWG No

MPA0115 AREAS

913.31

30/3/15

MP GM4/D3

DM6

E 225750

MP GM4/D5

914.79

DM4

N 6305500

BH2/1

914.54

(2.51)

BH3/1

BH4/1

BH5/1

DT2

MP.GM4/D1

910.75?

BH3/2

915.92

(3.10)

BH4/2

912.73

(1.24)

BH2/2

BH5/2

913.60

(3.66)

BOUNDARY

BRINE BOUNDARY

HUCNEWL

MP.GM4/D8

DM1

DT3

N 6305250

MP.GM5/D4

BH-L6

BH-MP1

MP.GM5/D7

DMW24

BH4

BH5

BH3

BH2

BH1

MP.GM4/D11

BES

912.66

DM8

BBSS

MP.GM4/D10

912.18

DM2

E 225052.6

N 6304948.7

E 224500

E 224750

E 225000

E 225250

N 6305000

DM13

LEND LEASE SERVICES PTY LTD.

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DATE	23-06-15
AMENDED	
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DRAWN	KEITH FLETCHER
CHECKED	

~~LLS INDUSTRIAL~~ PTY LTD

MOUNT PIPER - ASH EMPLACEMENT

SURVEY : 23rd JUNE 2015

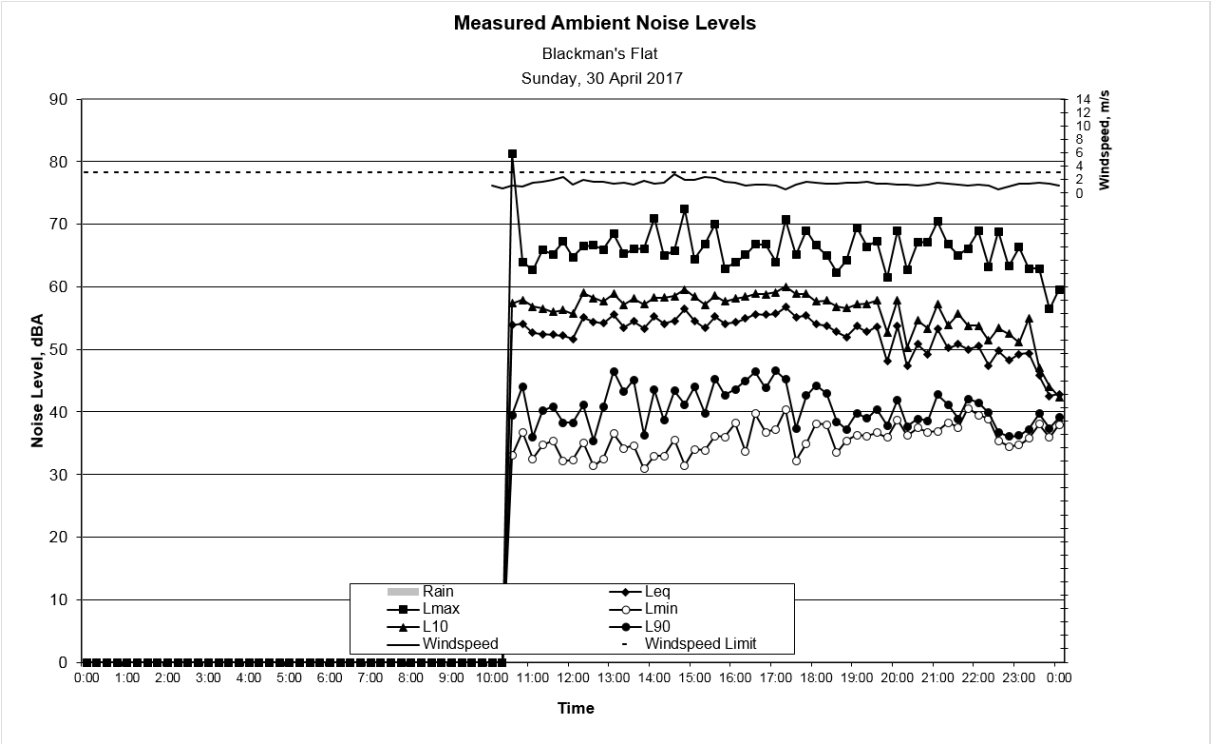
SCALE - 1 : 4000 (A3 SHEET)

DWG No

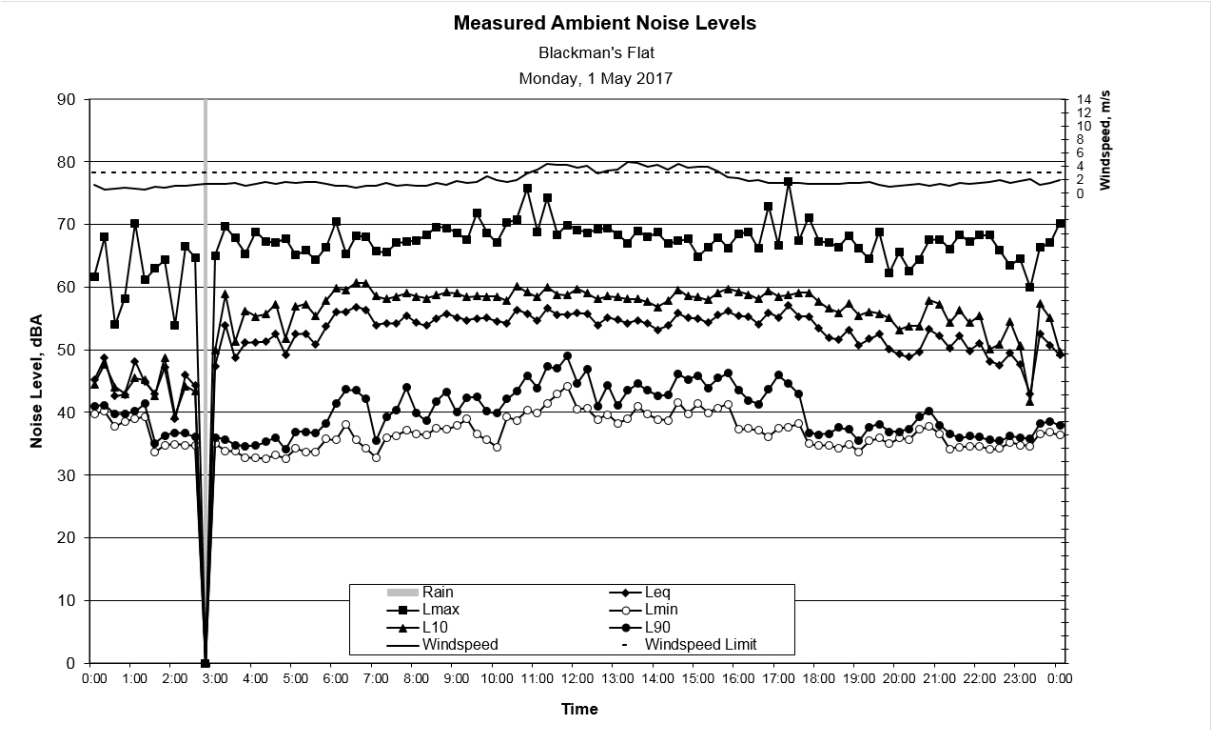
MPA0615

Appendix D
Noise monitoring graphs

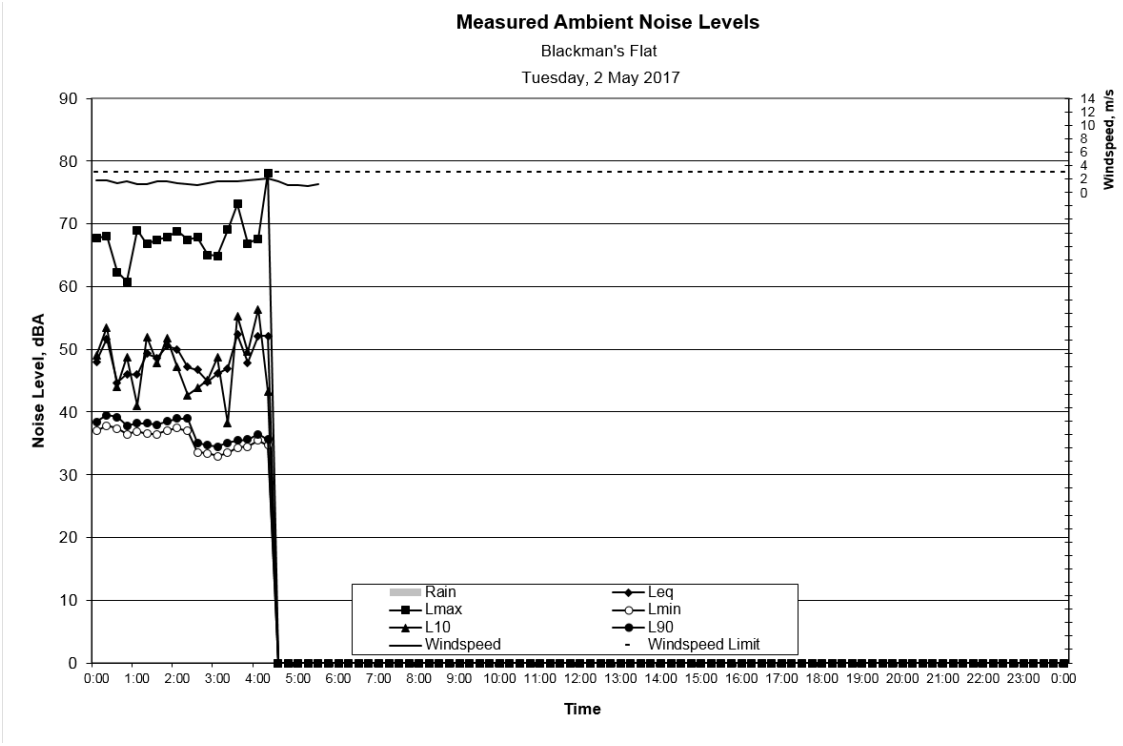
Location 1 – Residential property at Blackmans Flat (30/04/2017)



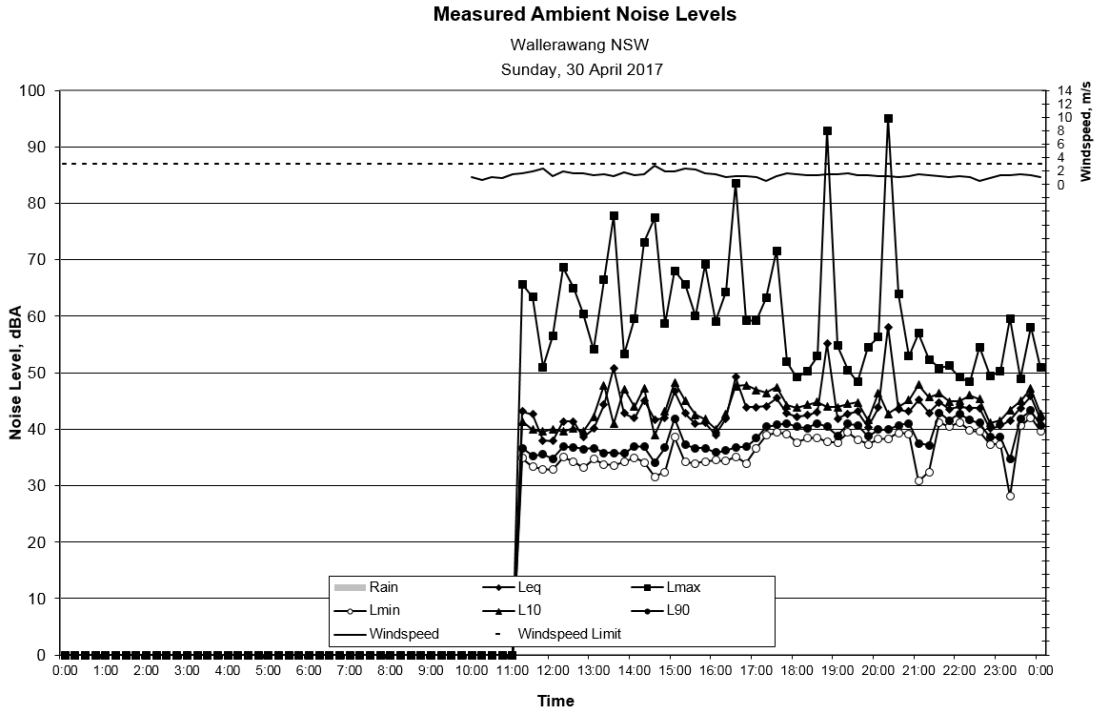
Location 1 – Residential property at Blackmans Flat (01/05/2017)



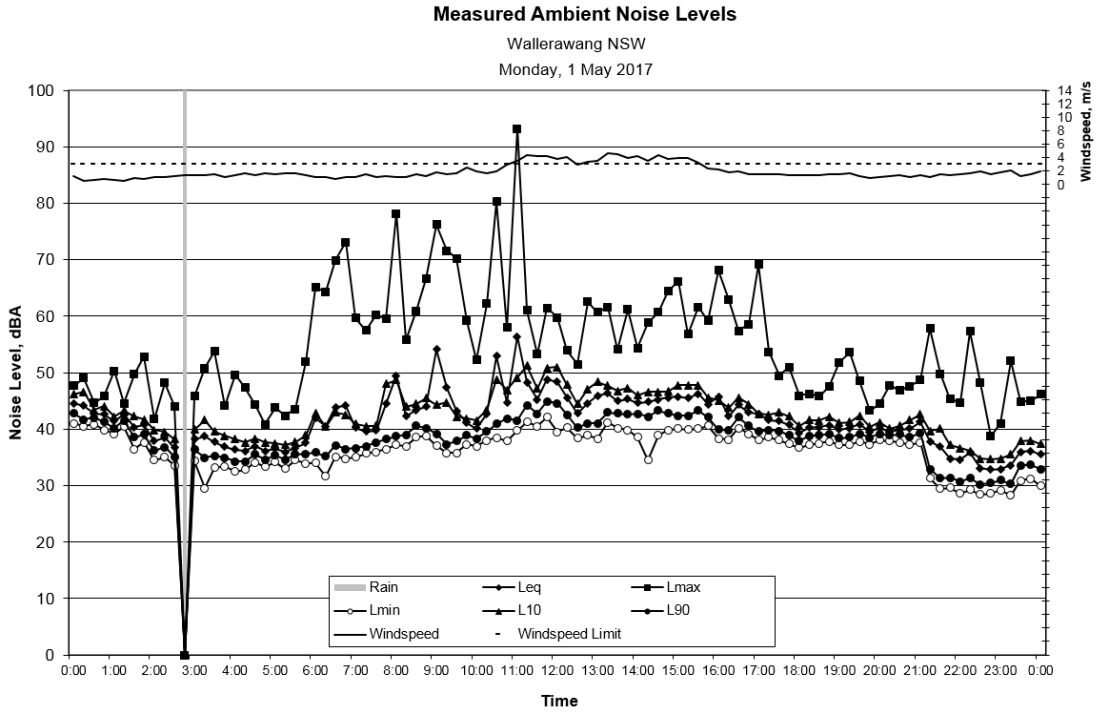
Location 1 – Residential property at Blackmans Flat (02/05/2017)



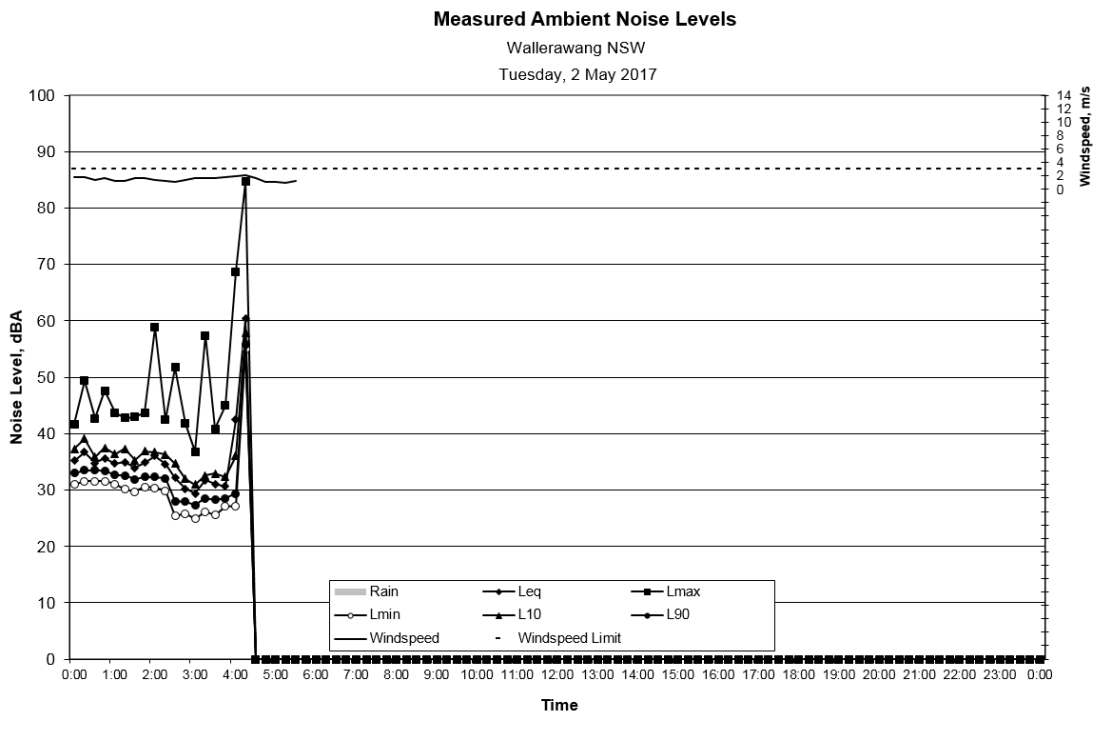
Location 2 – Residential property at Wallerawang (30/04/2017)



Location 2 – Residential property at Wallerawang (01/05/2017)



Location 2 – Residential property at Wallerawang (02/05/2017)



Appendix E
Weather summary

Table 8 | Meteorological conditions during noise survey

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 3 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
30/04/2017	10:00:00 AM	0.0	1.1	73	12.5	84.0
30/04/2017	10:15:00 AM	0.0	0.7	28	12.9	83.0
30/04/2017	10:30:00 AM	0.0	1.2	28	13.3	81.3
30/04/2017	10:45:00 AM	0.0	1.0	88	13.7	79.0
30/04/2017	11:00:00 AM	0.0	1.6	39	14.3	74.3
30/04/2017	11:15:00 AM	0.0	1.7	28	14.3	71.0
30/04/2017	11:30:00 AM	0.0	2.0	37	15.3	68.0
30/04/2017	11:45:00 AM	0.0	2.4	132	14.5	69.0
30/04/2017	12:00:00 PM	0.0	1.2	69	14.9	67.0
30/04/2017	12:15:00 PM	0.0	2.0	139	14.8	68.0
30/04/2017	12:30:00 PM	0.0	1.6	236	14.6	69.3
30/04/2017	12:45:00 PM	0.0	1.7	22	14.5	69.7
30/04/2017	1:00:00 PM	0.0	1.4	243	14.8	69.3
30/04/2017	1:15:00 PM	0.0	1.5	33	14.8	68.7
30/04/2017	1:30:00 PM	0.0	1.2	49	14.7	67.3
30/04/2017	1:45:00 PM	0.0	1.8	25	14.8	67.3
30/04/2017	2:00:00 PM	0.0	1.3	35	14.8	66.0
30/04/2017	2:15:00 PM	0.0	1.5	158	15.0	65.3
30/04/2017	2:30:00 PM	0.0	2.8	23	15.6	61.0
30/04/2017	2:45:00 PM	0.0	2.0	17	15.7	60.3
30/04/2017	3:00:00 PM	0.0	1.9	14	15.5	60.7
30/04/2017	3:15:00 PM	0.0	2.4	22	15.6	61.3
30/04/2017	3:30:00 PM	0.0	2.2	25	15.1	63.3

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 3 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
30/04/2017	3:45:00 PM	0.0	1.7	20	14.4	67.0
30/04/2017	4:00:00 PM	0.0	1.5	353	13.9	71.3
30/04/2017	4:15:00 PM	0.0	1.2	337	13.5	74.3
30/04/2017	4:30:00 PM	0.0	1.2	341	14.8	68.3
30/04/2017	4:45:00 PM	0.0	1.2	344	14.7	67.7
30/04/2017	5:00:00 PM	0.0	1.1	343	12.8	77.0
30/04/2017	5:15:00 PM	0.0	0.6	302	11.6	83.3
30/04/2017	5:30:00 PM	0.0	1.3	260	10.3	88.7
30/04/2017	5:45:00 PM	0.0	1.6	248	9.5	91.3
30/04/2017	6:00:00 PM	0.0	1.5	249	8.9	92.3
30/04/2017	6:15:00 PM	0.0	1.4	253	8.4	93.7
30/04/2017	6:30:00 PM	0.0	1.4	241	7.9	95.0
30/04/2017	6:45:00 PM	0.0	1.5	245	7.6	95.7
30/04/2017	7:00:00 PM	0.0	1.5	238	7.5	96.0
30/04/2017	7:15:00 PM	0.0	1.7	243	6.8	97.0
30/04/2017	7:30:00 PM	0.0	1.4	239	6.9	98.0
30/04/2017	7:45:00 PM	0.0	1.3	239	6.3	98.0
30/04/2017	8:00:00 PM	0.0	1.3	242	5.9	98.7
30/04/2017	8:15:00 PM	0.0	1.2	241	5.8	99.0
30/04/2017	8:30:00 PM	0.0	1.1	238	5.3	99.3
30/04/2017	8:45:00 PM	0.0	1.3	234	4.8	99.3
30/04/2017	9:00:00 PM	0.0	1.5	235	5.2	100.0
30/04/2017	9:15:00 PM	0.0	1.4	229	4.9	100.0
30/04/2017	9:30:00 PM	0.0	1.3	243	5.1	100.0
30/04/2017	9:45:00 PM	0.0	1.1	249	4.9	100.0
30/04/2017	10:00:00 PM	0.0	1.2	229	4.5	100.0
30/04/2017	10:15:00 PM	0.0	1.1	221	4.6	100.3
30/04/2017	10:30:00 PM	0.0	0.5	346	5.3	101.0
30/04/2017	10:45:00 PM	0.0	0.9	307	6.0	101.0
30/04/2017	11:00:00 PM	0.0	1.4	233	6.6	101.0
30/04/2017	11:15:00 PM	0.0	1.4	253	5.9	101.0
30/04/2017	11:30:00 PM	0.0	1.5	239	6.0	101.0
30/04/2017	11:45:00 PM	0.0	1.4	236	6.1	101.0
1/05/2017	12:00:00 AM	0.0	1.2	261	6.1	101.0

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 3 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
1/05/2017	12:15:00 AM	0.0	1.2	320	6.6	101.0
1/05/2017	12:30:00 AM	0.0	0.5	324	7.2	101.0
1/05/2017	12:45:00 AM	0.0	0.7	308	7.2	101.0
1/05/2017	1:00:00 AM	0.0	0.8	256	7.3	101.0
1/05/2017	1:15:00 AM	0.0	0.7	259	6.9	101.0
1/05/2017	1:30:00 AM	0.0	0.6	118	6.8	101.0
1/05/2017	1:45:00 AM	0.0	1.0	240	6.6	101.0
1/05/2017	2:00:00 AM	0.0	0.8	127	6.6	101.0
1/05/2017	2:15:00 AM	0.0	1.0	306	7.0	101.0
1/05/2017	2:30:00 AM	0.0	1.2	339	8.0	101.0
1/05/2017	2:45:00 AM	0.0	1.2	340	8.1	101.0
1/05/2017	3:00:00 AM	0.1	1.3	343	8.6	101.0
1/05/2017	3:15:00 AM	0.0	1.3	344	8.7	101.0
1/05/2017	3:30:00 AM	0.0	1.4	336	8.7	101.0
1/05/2017	3:45:00 AM	0.0	1.5	349	8.6	101.0
1/05/2017	4:00:00 AM	0.0	1.1	354	8.5	101.0
1/05/2017	4:15:00 AM	0.0	1.3	322	8.5	101.0
1/05/2017	4:30:00 AM	0.0	1.7	334	8.5	101.0
1/05/2017	4:45:00 AM	0.0	1.3	320	8.5	101.0
1/05/2017	5:00:00 AM	0.0	1.7	329	8.5	101.0
1/05/2017	5:15:00 AM	0.0	1.5	332	8.5	101.0
1/05/2017	5:30:00 AM	0.0	1.7	316	8.4	101.0
1/05/2017	5:45:00 AM	0.0	1.6	316	8.3	101.0
1/05/2017	6:00:00 AM	0.0	1.3	350	8.2	101.0
1/05/2017	6:15:00 AM	0.0	1.0	339	8.3	101.0
1/05/2017	6:30:00 AM	0.0	1.1	315	8.2	101.0
1/05/2017	6:45:00 AM	0.0	0.8	228	8.3	101.0
1/05/2017	7:00:00 AM	0.0	1.0	346	8.3	101.0
1/05/2017	7:15:00 AM	0.0	1.1	212	8.3	101.0
1/05/2017	7:30:00 AM	0.0	1.6	15	8.3	101.0
1/05/2017	7:45:00 AM	0.0	1.1	314	8.3	101.0
1/05/2017	8:00:00 AM	0.0	1.2	342	8.5	101.0
1/05/2017	8:15:00 AM	0.0	1.1	233	8.9	101.0
1/05/2017	8:30:00 AM	0.0	1.1	343	9.3	101.0

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 3 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
1/05/2017	8:45:00 AM	0.0	1.5	338	9.6	101.0
1/05/2017	9:00:00 AM	0.0	1.2	335	10.4	100.3
1/05/2017	9:15:00 AM	0.0	1.8	318	12.4	96.0
1/05/2017	9:30:00 AM	0.0	1.5	352	13.1	89.7
1/05/2017	9:45:00 AM	0.0	1.7	239	13.4	88.0
1/05/2017	10:00:00 AM	0.0	2.5	122	14.1	85.0
1/05/2017	10:15:00 AM	0.0	2.0	337	15.0	82.0
1/05/2017	10:30:00 AM	0.0	1.7	224	15.3	79.3
1/05/2017	10:45:00 AM	0.0	1.9	221	16.0	74.7
1/05/2017	11:00:00 AM	0.0	2.9	328	16.2	70.3
1/05/2017	11:15:00 AM	0.0	3.5	317	16.5	62.3
1/05/2017	11:30:00 AM	0.0	4.4	325	16.7	60.7
1/05/2017	11:45:00 AM	0.0	4.2	323	17.3	58.3
1/05/2017	12:00:00 PM	0.0	4.2	316	17.3	57.7
1/05/2017	12:15:00 PM	0.0	3.7	307	17.0	57.7
1/05/2017	12:30:00 PM	0.0	4.1	314	16.9	56.3
1/05/2017	12:45:00 PM	0.0	3.0	312	17.0	55.7
1/05/2017	1:00:00 PM	0.0	3.3	332	17.6	54.0
1/05/2017	1:15:00 PM	0.0	3.5	307	18.0	50.0
1/05/2017	1:30:00 PM	0.0	4.7	276	17.6	48.7
1/05/2017	1:45:00 PM	0.0	4.5	274	17.7	48.7
1/05/2017	2:00:00 PM	0.0	4.0	274	17.8	48.3
1/05/2017	2:15:00 PM	0.0	4.2	265	17.9	48.3
1/05/2017	2:30:00 PM	0.0	3.5	286	17.8	50.0
1/05/2017	2:45:00 PM	0.0	4.4	286	17.3	51.0
1/05/2017	3:00:00 PM	0.0	3.8	283	17.5	52.0
1/05/2017	3:15:00 PM	0.0	3.9	273	17.0	54.3
1/05/2017	3:30:00 PM	0.0	3.9	273	16.6	56.3
1/05/2017	3:45:00 PM	0.0	3.2	280	16.2	58.3
1/05/2017	4:00:00 PM	0.0	2.4	271	16.1	61.0
1/05/2017	4:15:00 PM	0.0	2.3	311	16.2	59.7
1/05/2017	4:30:00 PM	0.0	1.8	315	15.2	64.7
1/05/2017	4:45:00 PM	0.0	2.0	289	14.5	68.0
1/05/2017	5:00:00 PM	0.0	1.6	286	14.1	70.0

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 3 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
1/05/2017	5:15:00 PM	0.0	1.5	305	13.8	72.0
1/05/2017	5:30:00 PM	0.0	1.5	323	13.6	72.7
1/05/2017	5:45:00 PM	0.0	1.6	330	13.4	74.0
1/05/2017	6:00:00 PM	0.0	1.4	318	12.8	76.3
1/05/2017	6:15:00 PM	0.0	1.4	306	12.5	78.3
1/05/2017	6:30:00 PM	0.0	1.4	300	12.7	77.0
1/05/2017	6:45:00 PM	0.0	1.4	292	12.8	76.0
1/05/2017	7:00:00 PM	0.0	1.5	316	13.1	74.3
1/05/2017	7:15:00 PM	0.0	1.5	325	12.7	75.3
1/05/2017	7:30:00 PM	0.0	1.6	321	13.1	71.3
1/05/2017	7:45:00 PM	0.0	1.2	322	12.9	71.3
1/05/2017	8:00:00 PM	0.0	1.0	317	11.3	79.7
1/05/2017	8:15:00 PM	0.0	1.2	260	10.2	85.7
1/05/2017	8:30:00 PM	0.0	1.2	237	9.7	88.3
1/05/2017	8:45:00 PM	0.0	1.3	252	9.3	89.3
1/05/2017	9:00:00 PM	0.0	1.2	299	9.6	87.0
1/05/2017	9:15:00 PM	0.0	1.3	324	10.2	82.0
1/05/2017	9:30:00 PM	0.0	1.2	313	10.0	83.0
1/05/2017	9:45:00 PM	0.0	1.5	299	9.8	85.0
1/05/2017	10:00:00 PM	0.0	1.4	314	10.0	83.3
1/05/2017	10:15:00 PM	0.0	1.5	294	10.4	80.3
1/05/2017	10:30:00 PM	0.0	1.6	289	10.8	76.3
1/05/2017	10:45:00 PM	0.0	1.9	284	10.9	74.7
1/05/2017	11:00:00 PM	0.0	1.6	292	11.5	71.0
1/05/2017	11:15:00 PM	0.0	1.8	284	11.9	69.0
1/05/2017	11:30:00 PM	0.0	2.0	293	12.2	68.0
1/05/2017	11:45:00 PM	0.0	1.3	303	12.1	68.0
2/05/2017	12:00:00 AM	0.0	1.5	330	11.7	69.7
2/05/2017	12:15:00 AM	0.0	1.9	281	11.1	73.0
2/05/2017	12:30:00 AM	0.0	1.9	299	11.7	70.3
2/05/2017	12:45:00 AM	0.0	1.8	329	11.1	71.7
2/05/2017	1:00:00 AM	0.0	1.3	287	10.2	75.7
2/05/2017	1:15:00 AM	0.0	1.6	271	9.1	81.7
2/05/2017	1:30:00 AM	0.0	1.3	276	9.0	81.7

Note: Highlighted rows shows the evidence of rain or wind speeds higher than 3 m/s. Corresponding measured noise levels are excluded from the assessment.

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
2/05/2017	1:45:00 AM	0.0	1.3	302	8.5	83.7
2/05/2017	2:00:00 AM	0.0	1.6	278	7.3	90.0
2/05/2017	2:15:00 AM	0.0	1.6	282	6.9	92.0
2/05/2017	2:30:00 AM	0.0	1.4	281	6.7	93.0
2/05/2017	2:45:00 AM	0.0	1.3	280	6.7	93.0
2/05/2017	3:00:00 AM	0.0	1.0	288	6.5	93.7
2/05/2017	3:15:00 AM	0.0	1.4	265	6.4	94.0
2/05/2017	3:30:00 AM	0.0	1.6	242	6.4	94.0
2/05/2017	3:45:00 AM	0.0	1.6	234	6.1	94.0
2/05/2017	4:00:00 AM	0.0	1.7	243	6.0	95.0
2/05/2017	4:15:00 AM	0.0	1.8	251	5.9	95.3
2/05/2017	4:30:00 AM	0.0	1.9	268	5.7	96.0
2/05/2017	4:45:00 AM	0.0	2.0	268	6.1	96.0
2/05/2017	5:00:00 AM	0.0	1.7	257	6.7	95.0
2/05/2017	5:15:00 AM	0.0	1.0	278	7.3	95.0
2/05/2017	5:30:00 AM	0.0	1.0	254	7.3	95.0
2/05/2017	5:45:00 AM	0.0	1.0	278	7.3	96.0
2/05/2017	6:00:00 AM	0.0	1.3	269	7.3	96.0

Appendix F
Site attendance sheets

Lendlease Services business

MP-SF-733A – Site Communications Log Mt Piper Ash Placement Area

700 – Environmental Management

MT PIPER

DATE: 30-4-17

APA Operator Name		Verbal 103 and Time In	Communications Check				Time Out	Sign Out
			7:00am/pm	11:00am/pm	2:00am/pm	5:00am/pm		
Regulars	[illegible]	[illegible]					1452	[illegible]
	RYE CANN	595					1452	[illegible]
	M Hughes	5:50					1652	M Hughes
	[illegible]	5:50.					16:52	[illegible]
	[illegible]	550					1652	[illegible]
	P Deague	7-30					5-00	P Deague
Others								
LL M/O Initials								
Time of Check								

SUB-CONTRACTOR MECHANICAL PERSONNEL

Mechanical Personnel	Time in	Plant/Equipment	Nature of Breakdown/Service	Time Out	Equipment/Plant Available Y/N
AKIL LAU	8:44			8:00	

Lendlease PERSONNEL COMMUNICATIONS LOG

Name	Time In	Time Out	Time In	Time Out	Time In	Time Out	Time In	Time Out

Lendlease Services business

MP-SF-733A – Site Communications Log Mt Piper Ash Placement Area

700 – Environmental Management

MT PIPER **DATE:** 1-5-17

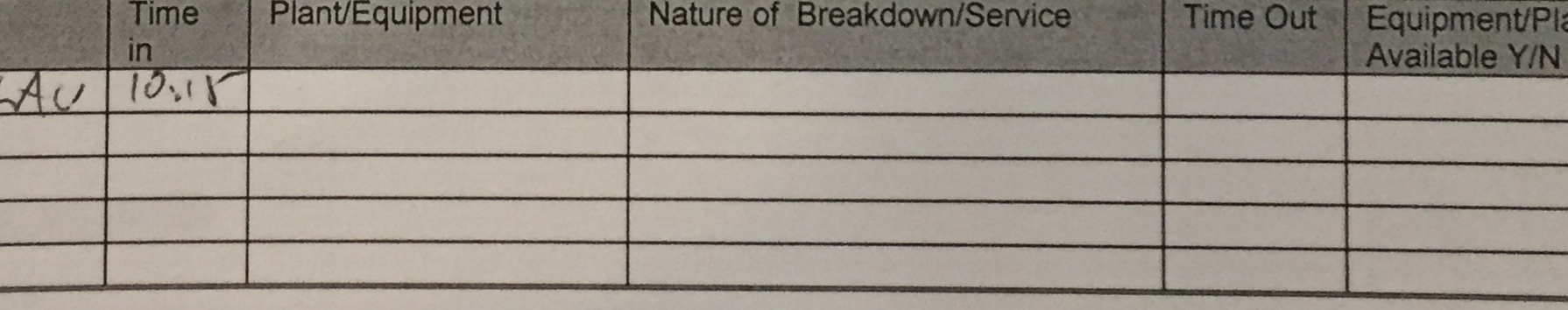
APA Operator Name		Verbal 103 and Time In	Communications Check				Time Out	Sign Out
			7:00am/pm	11:00am/pm	2:00am/pm	5:00am/pm		
Regulars	1 [illegible]	5.40	✓					
	[illegible]	545	✓					
	[illegible]	555	✓					
	[illegible]	620	✓					
	[illegible]	7-20						
Others								
LL M/O Initials			IA					
Time of Check			7.05					

SUB-CONTRACTOR MECHANICAL PERSONNEL

Mechanical Personnel	Time in	Plant/Equipment	Nature of Breakdown/Service	Time Out	Equipment/Plant Available Y/N
AIRC LAU	10:15				

Lendlease PERSONNEL COMMUNICATIONS LOG

Name	Time In	Time Out	Time In	Time Out	Time In	Time Out	Time In	Time Out
KMANNUS	0630							



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Swaziland, Tanzania, Thailand, Uganda,
United Arab Emirates, Vietnam.

Appendix D

Lamberts North Ash Repository Water Quality Report 2016 – 2017

Lamberts North Water Conditioned Fly Ash Placement Water Quality Monitoring

Annual Update Report for 2016/17

Reference: 254150

Prepared for:
EnergyAustralia NSW

Revision 3

21 November 2017

Document Control Record

Document prepared by:

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Document control						
Report Title		Annual Update Report for 2016/17				
Document ID		Lamberts North Water Conditioned Fly Ash Placement Water Quality Monitoring	**Project Number**		254150	
File Path		P:\ENERGY\7053\Lamberts North Groundwater 2014 & 2015 & 2016\2016 Report\LN Gd WQ annual update initial draft Sept15 to Aug16.docx				
Client		EnergyAustralia NSW	**Client Contact**		Peter Griffiths	
Rev	**Date**	**Revision Details/Status**	**Prepared by**	**Author**	**Verifier**	**Approver**
0	19 September 2017	Initial Draft report	B Hodgson	B Hodgson	M. Luger	M Luger
1	6 November 2017	Draft for EnergyAustralia NSW review	B Hodgson	B Hodgson	C Molloy	C Molloy
2	17 November 2017	Final Draft	B Hodgson	B Hodgson	C Molloy	C Molloy
3	21 November 2017	Final Report	B Hodgson	B Hodgson	C Molloy	C Molloy
Current Revision		**3**				

Contents

Figures

Tables

Attachments

Attachment 1:

1. a) Water Quality Data and Summary for Neubecks Creek WX22 and

   b) Mt Piper Power station Licence Discharge Point LDP01 with

   c) Neubecks Creek background site for Lamberts North NC01

2. Water Quality Data and Summary for Mt Piper Groundwater Receiving Water Bores and MPGM4/D8 and MPGM 4/D9

3. Water Quality Data and Summary for Mt Piper Groundwater Seepage Detection Bore MPGM4/D1

4. Water Quality Data and Summary for Mt Piper Ash Placement Area Groundwater Bores MPGM4/D10 and MPGM4/D11

5. Water Quality Data and Summary for Lamberts North Groundwater Bores MPGM4/D19 and MPGM4/D20 with underground coal mine background groundwater bore MPGM4/D23

6. 6a. Lamberts North Water Conditioned Ash Runoff Pond Water Quality October, 2012 to July, 2014
   6b. LN runoff collection sump 1 2016
   6c. Water Quality Data for LN Pond 2 September, 2016 to August, 2017

Attachment 2: Lithgow Rainfall Data from January, 2000 to August, 2016 (mm/month) from Bureau of Meteorology

Attachment 3: a) Map of Coal Mine workings in the Mt Piper Ash Placement Area
(Bores B901 and MPGM4/D11 sample Western Main Open-cut groundwater; B904 and MPGM4/D10 sample underground goaf coal mine groundwater)
Mt Piper Power Station Groundwater Bore Collar and Pipe Height Survey results for
i) December, 2011 with Bores MPGM4/D9 and D19 Levels in 2012
ii) Groundwater Level Survey 20th March, 2014
(including water level of SW3 Pond and abandoned underground coal mine water seepage point into Huon Gully)
c) Bore logs for MPGM4/D20 (Lamberts North embankment), D23 southern underground coal mine and MPGM4/D1

Attachment 4: Assessment Criteria – Local baseline and ANZECC (2000) Trigger values for Groundwater receiving waters and Neubecks Creek (Aurecon, 2011) in OEMP by CDM Smith (2013)

Summary

Aurecon has been engaged to assist EnergyAustralia NSW in their statutory reporting on the Lamberts North water conditioned ash placement area for the effects of the ash placement on water quality and trace metals in receiving surface and groundwater during 2016/17.

The key findings of the 2016/17 water quality data review were:

- The local and ANZECC (2000) guidelines in the receiving groundwater bore MPGM4/D9 have continued to be met, other than for salinity and sulphate from a source upgradient of the Lamberts North site, and mine water related manganese and boron.
- At the Neubecks Creek receiving water site, all the water quality and trace metal guidelines were met for the specifically derived local and ANZECC (2000) trigger values for the Lamberts North site.
- The compacted mine spoil beneath the Lamberts North ash area is saturated with groundwater and appears to be the cause of elevated trace metals in bore MPGM4/D20, potentially due to oxidation of coal pyrites in the mine spoil, rather than from the dry ash placement.

As no adverse water quality effects of the Lamberts North site could be identified, no ameliorative measures are indicated in the report.

The reports by GHD (2014) and Cardno (2015, 2016 and 2017) on the aquatic life in Neubecks Creek found that the macroinvertebrates were already in a poor condition due to the mineralised water quality characteristics of the local surface and groundwater. Statistical analyses showed no significant differences from the upstream background sites in Neubecks Creek with that near the downstream receiving water site at WX22. The lack of effects indicated that the aquatic life had adapted to the local mineralised conditions in the creek. Hence, Cardno (2017) found there was no evidence of effects of the Lamberts North water conditioned ash placement on the aquatic life in Neubecks Creek.

1. Introduction

Aurecon has been engaged by EnergyAustralia NSW to undertake the Lamberts North annual surface and groundwater quality report for 2016/17 over the period September, 2016 to August, 2017. The 2016/17 report is required by the Conditions of Approval for Lamberts North ash repository.

The Mt Piper 2015/16 annual update report noted that the source of brine leachates entering the upper Huon Gully is from beneath the southern Mt Piper water and brine conditioned ash placements (Aurecon, 2017b), so not from the brine conditioned ash. This report is to include the background bores MPGM4/D10 and D11 so the potential effects of brine leachates from the brine conditioned ash area at Mt Piper are not assigned to the Lamberts North water conditioned dry ash placement.

Surface and groundwater monitoring for the Lamberts North placement began in October, 2012 to provide baseline data before ash placement began in September, 2013. The Lamberts North water quality sampling sites, including the receiving waters for groundwater at bores MPGM4/D8 and D9, as well as surface water in Neubecks Creek at WX22, are shown on an aerial photograph of the Mt Piper and Lamberts North areas in Figure 2.

The review also includes the groundwater quality data in the new Lamberts North embankment at bore MPGM4/D20, which was installed in December, 2015. This bore was drilled to sample the groundwater near the level of the interface of the ash base and compacted mine spoil underneath (approximately RL917m)[1].

The previous report for 2015/16 (Aurecon, 2017a) found that all the Local/ANZECC (2000) surface water trigger values, including trace metals[2] were met in Neubecks Creek. It was also found that, other than elevated concentrations of salinity, sulphate and a minor increase for boron, all the groundwater characteristics met the local trigger values at the receiving groundwater bore MPGM4/D9.

[1] The 2015/16 sampling showed that the water level was lower than the interface level at about RL912m (Aurecon, 2017a), indicating that the ash was not in contact with the groundwater.

[2] The local trigger values for copper, nickel and zinc are based upon the 90th Percentile baseline concentrations in Neubecks Creek at WX22 using pre-placement data from October 2012 to August, 2013. The pre-placement data was set in 2012/13 so Lamberts North was not assigned potential earlier influences of the Mt Piper brine co-placement.

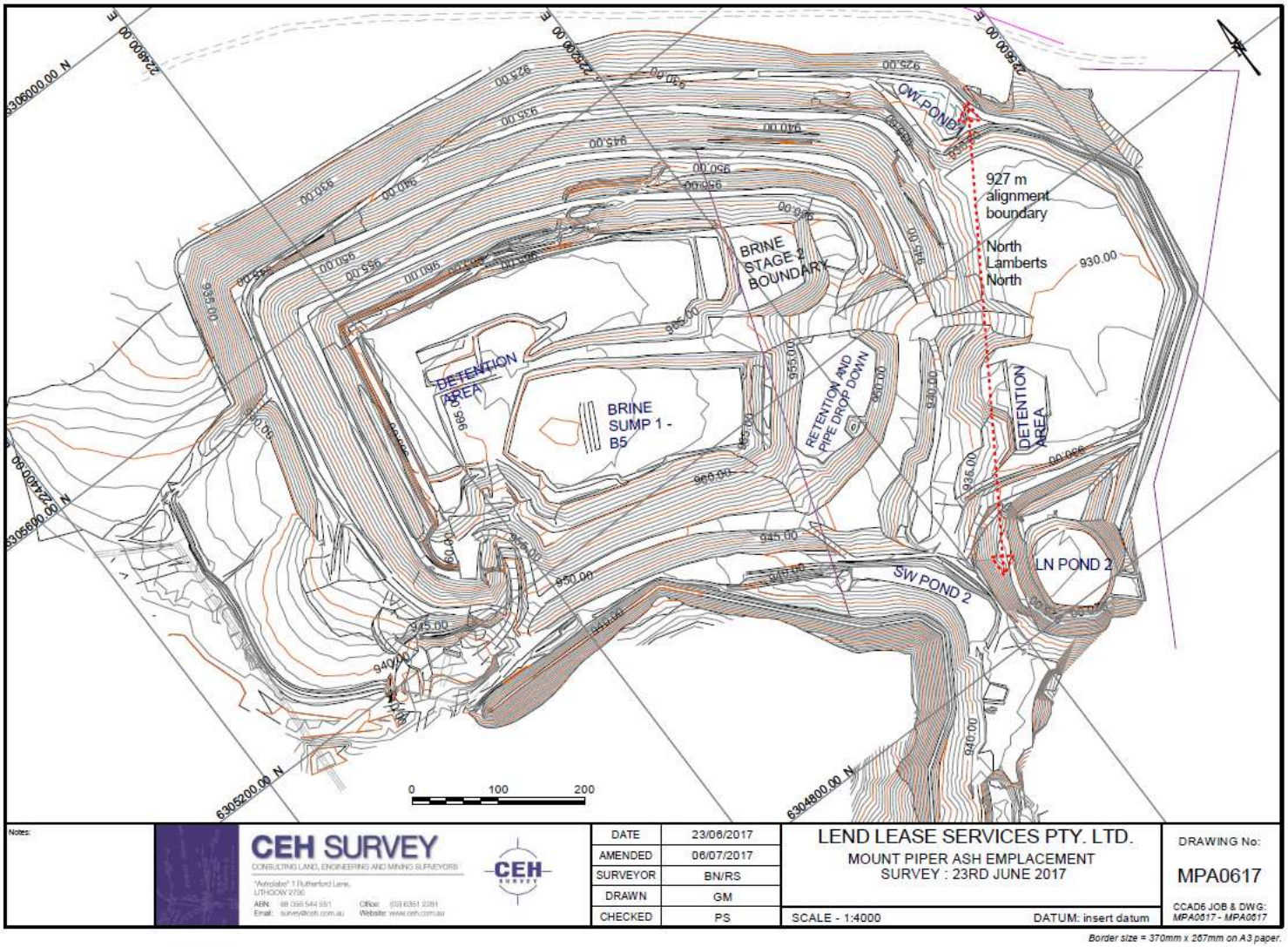

Figure 1: Mt Piper Power Station Brine Conditioned Ash and Lamberts North Placement Area contours in June, 2017.

The ash placement contours for the Mt Piper and Lamberts North sites in July, 2017 are shown in Figure 1. Placement of water conditioned flyash in the Lamberts North site has been undertaken in the re-contoured Huon Gully since September, 2013.

1.1 Scope

Aurecon has been engaged by EnergyAustralia NSW to prepare the fourth annual review report on surface and groundwater quality for the Lamberts North dry ash placement. The scope includes preparation of a report for the 2016/17 Lamberts North Water Quality Annual Update, which involves the following:

- Results of all surface and groundwater water quality monitoring required under the Conditions of Approval, including the new bore MPGM4/D20 and data interpretations and written discussion
- Review whether the water quality in surface and groundwater meets the relevant water quality criteria. If the criteria is not met, and the cause can conclusively be attributed to the Lamberts North dry ash placement, Aurecon is to inform EnergyAustralia NSW of any water quality criteria not met so that it can be investigated and reasons for exceedance can be determined
- Collate and update the database at established bore sites as described in the Lamberts North Groundwater Management Plan
- Assess and report on the fourth year of monitoring of groundwater quality and depth of the water table at all monitoring sites.
- Collate and update the database for monitoring of dissolved oxygen, turbidity, sulphates, salinity, boron, manganese, iron, chloride, total phosphorus and total nitrogen at the existing water quality monitoring sites.
- Assess and report on the fourth post-placement year of water quality monitoring at the Mt Piper surface water discharge point (at the Final Holding Pond LPD1) and in Neubecks Creek at NC1 and WX22
- Summarise the consultant report on the aquatic life in Neubecks Creek for:
    - sampling, data collection and baseline ecological health and assessment of the ecological health of the in-stream environment during the ash dam construction and the first year of ash placement;
    - at least one in-stream sampling at Neubecks Creek, prior to ash placement, and at least two (2) sampling periods following ash placement at Lamberts North;
    - management measures to address any adverse ecological impacts conclusively attributed to the Lamberts North dry ash placement.

To assist in the surface and groundwater assessment, the changes in water quality from pre- to post-ash placement have been graphed at all the sampling sites to aid in the assessment of potential effects of Lamberts North on surface and groundwater quality.

1.2 Outline of Report Structure

The report is structured to cover the issues in the EnergyAustralia NSW brief and includes:

- Description of the surface and groundwater quality monitoring program
- Description of the surface water rainfall runoff management and its importance to minimising infiltration into the Lamberts North site and into the local groundwater
- Assessment of effects, if any, of the dry ash placement on surface and groundwater quality, during the 2016/17 post-placement period. The assessment takes into account the Mt Piper and local coal mine groundwater inflows to Huon Gully, as well as the effects of conditioning the ash with cooling tower blowdown water
- Discussion on the findings including potential exceedances of the receiving water environmental goals and the potential necessity for mitigation measures

- Summary of the aquatic life monitoring in Neubecks Creek undertaken in December, 2016 by Cardno (2017)
- Presentation of conclusions and recommendations.

The sequence of surface and groundwater quality findings, assessment and inferences drawn has been followed throughout the report.

1.3 Aims and Objectives of Monitoring

The Lamberts North OEMP for the water conditioned dry ash placement sets out the surface and groundwater quality monitoring to be undertaken to provide feed-back for ash placement and surface rainfall runoff management. The aim of the monitoring is to ascertain whether or not leachates[3] from the water conditioned fly ash cause a significant increase in concentrations above the local/ANZECC (2000) guideline trigger values (environmental goals) in surface and/or groundwater receiving waters (see Table 1 in Section 2).

The OEMP states that ameliorative measures are only to be implemented if exceedances of the local/ANZECC (2000) trigger values are observed and are shown conclusively to be attributable to the operation of the Lamberts North ash placement. Such attribution is to be based upon a targeted investigation of the likely sources of the salts (represented by chloride, conductivity, total dissolved salts and sulphate) or trace metals that caused the environmental goals to be exceeded, as well as the process by which the Lamberts North placement could have introduced leachates into the local groundwater.

If the monitoring shows a significant pollution event down-gradient of the ash area, the OEMP suggests the submission of a report to the relevant Authorities that provides a description of the proposed ameliorative measures, including a timeframe for the management actions to be implemented. This could allow informed consideration of the findings of the targeted investigation of the likely sources and causes.

To be consistent with the Mt Piper Brine Conditioned Ash Water Management Plan, the Lamberts North OEMP has adopted the approach of having early warning of potential effects on groundwater and surface water. This is achieved by comparison of the measured post-placement median (50th percentile) concentrations of parameters of interest with the relevant local (pre-placement 90th percentile concentrations) and ANZECC (2000) trigger values at the groundwater bores D8 and D9 and in Neubecks Creek at WX22. The intent of this approach is to allow the ash placement managers time to investigate the cause of any early warning trigger being exceeded and to implement mitigation measures if the cause is the water conditioned dry ash placement. It should be noted that the comparisons made in this report take any changes in water quality at the upstream sites in Neubecks Creek into account. This practice is also followed for the Mt Piper Brine in ash co-placement surface and groundwater monitoring.

For the purposes of the OEMP, the final receiving waters are taken as being Neubecks Creek, just downstream of the ash placement area at WX22 (Figure 2, Section 2) and the ANZECC (2000) guidelines and local guidelines for surface water apply to WX22. The ANZECC (2000) guidelines and local guidelines for the groundwater and surface water receiving waters are shown in Table 1 in Section 2.5, which also shows the 2012/2013 pre-placement baseline 90th percentile concentrations for Lamberts North.

[3] Leachates could be due to surface runoff from the Mt Piper ash placement directed into the Lamberts North ash area and, by direct rainfall infiltration through the ash into the underlying groundwater. The repository has been designed to minimise effects of a rise in the groundwater table under the ash that may cause salts and trace metals to be leached from the ash.

1.4 Issues and Challenges

A new bore MPGM4/D23 was installed in December, 2015 to sample the underground coal mine groundwater inflows to Huon Gully from the south-west of bore D10. This sampling supplements that of the Mt Piper background bores MPGM4/D4 and D5, as well as the pre-brine co-placement bores B901 and B904 (see Figure 2).

The internal ash placement bores MPGM4/D10 and D11 are included in the Lamberts North monitoring program to provide data on the groundwater quality flowing into Huon Gully from the up-gradient coal mine groundwater and the Mt Piper water and brine conditioned ash placements. These bores provide early warning of potential effects of the Mt Piper ash placement on the seepage detection bore D1 and the receiving groundwater bore D9, which are located between the ash area property boundary and Neubecks Creek.

Prior to June, 2016, the groundwater flows down Huon Gully also included rainfall runoff from the Mt Piper water conditioned ash area. EnergyAustralia NSW has advised that since June, 2016, surface runoff from the Mt Piper water conditioned ash area has been redirected from Huon Gully to into the final holding point within the Lamberts North ash placement area (See Figure 1). The runoff water collected in the holding pond is directed to the Lamberts North Ash Repository lined LN Pond 2 through a subsurface drain dug into the compacted mine spoil, at the ash basement level, and located at the southern end of the Lamberts North ash repository.

However, the previous Lamberts North ash placement report for the reporting period 2015/16 (Aurecon, 2017a) indicates that some of the rainfall runoff collected in the Lamberts North west side retention area, recharges the groundwater flows under the Lamberts North site. Table 3 in Aurecon, 2017a shows that the D20 chloride concentration (109 mg/L) was about 4-fold lower than at bore D1 (483 mg/L), which is immediately down-gradient of the groundwater sampled by D20 that is beneath the ash placement.

1.5 Information provided by EnergyAustralia NSW

In connection with the assignment, EnergyAustralia NSW has provided copies of the following data and information[4] (the sampling sites referred to are shown in Figure 2):

- Ash Placement Area Contours in 2017 (Figure 1) showing the areas and elevation of the placed ash and surface water runoff ponds used for management, including:
    - an unlined pond called the “Lamberts North Detention Area” to collect rainfall runoff (a temporary pond over furnace ash),
    - subsurface drain for directing runoff water from the detention area to a lined pond (LN Pond 2)
- Description of Lamberts North surface water runoff management and how it is integrated with the Mt Piper runoff
- Description of the Lamberts North ash placement in 2016/17, including how the site ash placement is expected to combine with the Mt Piper ash placement.
- Lamberts North groundwater bore water quality data for bores MPGM4/20, D1, D10, D11, D8, D9, D19 and D23[5]
- Water level data for the groundwater bores

[4] EnergyAustralia NSW collected data on total nitrogen, turbidity and dissolved oxygen concentrations at the three sites in Neubecks Creek for a related report, and only the relevant data related to this study has been included in this report.

[5] Data for D15, D16, D17 & D18 was also provided (as they are part of the approved OEMP groundwater monitoring network) but these bores have previously been noted as being drilled into rock rather than in local alluvium or coal mine waste/chitter, so they have not been used since reporting began in 2013.

- Mt Piper surface water quality monitoring data at the power station Licence Discharge Point LDP1 (v-notch below the Holding Pond) which is used as the up-stream background site, the aquatic life background site NC01 and at the Neubecks Creek receiving water site at WX22.
- Stream flow data for WX22 gauge 212055 in Neubecks Creek is available from Department of Primary Industries Office of Water (http://realtimedata.water.nsw.gov.au/water.stm).

- Water quality data in rainfall runoff from the following areas and ponds:
  - Mt Piper water conditioned ash area
  - Mt Piper brine areas that were considered by EANSW suitable to release
  - Lamberts North ash area
  - Pond CW!
  - Pond CW2
  - LN pond 2
  - And if possible water quality from the dammed Huon Creek, which is north of the coal conveyor[6].

1.6 Lamberts North Water Conditioned Ash Placement and Rainfall Runoff Management

An embankment made of compacted mine spoil was constructed at the northern end of Huon Gully to retain the ash placement as it is progressively placed up to the design height of RL980m and joined with the ash placement at Mt Piper (see CDM Smith, 2013). The current June, 2017 contours of the dry ash placement areas in Lamberts North are shown in Figure 1.

EnergyAustralia NSW advised Aurecon that during the reporting period September 2016 to August 2017, a total 302,926 tonne of fly ash was placed on the Lamberts North area. Most of this ash was placed from February, 2017 to August 2017, raising the ash level by about 3 m. When the Lamberts North ash level has reached RL937m, it is expected to begin to be joined with the eastern end of the Mt Piper water conditioned ash area.

1.6.1 Rainfall Runoff Management

EnergyAustralia NSW has also advised that pond levels and the irrigation supply for dust suppression are currently managed via the LN Pond 2 (Figure 1), with the water pumped back to power station holding ponds and used for dust mitigation purposes.

Rainfall runoff from the following areas and ponds reports to the Lamberts North Detention Area (see Figure 1) and drains into LN Pond 2:

- Mt Piper water conditioned ash area;
- Mt Piper brine area, from brine sump 1, that were considered by EANSW suitable to release;
- Lamberts North ash area.

In addition, all benches in the Lamberts North area are graded west to direct the rainfall runoff to the unlined retention sump on the western side of the Lamberts North area. The gradient also prevents runoff from flowing over the external boundary wall. The collected runoff is then directed to the lined LN Pond 2, at the southern end of Huon Gully, via a slotted pipe laid on the bottom of a sloped drainage line dug into mine spoil at the original floor level, and the drainage line then filled with furnace bottom ash.

[6] This site is on Centennial land, hence EnergyAustralia NSW don't have direct access to collect water quality data.

External runoff collected from capped areas on the south side of the Mt Piper ash repository is directed to the small water collection pond called CW Pond 2 (Figure 1) at the location of Bore MPGM4/D23 which was installed in December, 2015 to sample the underground coal mine groundwater. All other surface water runoff from external capped batters and laybacks at Mt Piper are directed to a north-eastern clean water pond (CW Pond 1). This water is also used for irrigation supply at the Lamberts North ash pad. All clean surface water is contained within the site boundary.

2. Surface and Groundwater Monitoring

This Section provides an overview of the groundwater and surface water quality monitoring at the Lamberts North dry ash placement for the current reporting period September, 2016 to August, 2017. The long-term trends from the pre-placement groundwater of October, 2012 to August, 2013 with the post-placement period September, 2013 to August, 2017 are also reviewed. The monitoring design, management of the water conditioned ash placement and receiving water quality guidelines are set out in the Lamberts North Operational Environmental Management Plan (CDM Smith, 2013).

The groundwater monitoring program was established in October 2012 and involves monthly sampling at the bores shown in Figure 2, which includes both long-term Mt Piper monitoring bores D10 and D11, as well as the new bore, D20, recently installed in the Lamberts North embankment. The other bores involved in the monitoring are D1, D8, D9, D19[7] and D23.

Bore D1 is north of Huon Gully and is used for detection of seepage from the north-eastern Mt Piper brine placement. However, it should be noted that bore D1 has been assumed by the OEMP to be the seepage detection bore for the Lamberts North placement. Similarly, the groundwater bores D9 and then D8 on the southern and northern sides of Neubecks Creek, respectively, are used as the Mt Piper receiving water bores and they are also assumed by the OEMP to be the receiving water bores for the Lamberts North placement. Given this monitoring design complexity, it has been attempted, in previous reports and in this report, to interpret the potential effects of the Lamberts North placement from that of the Mt Piper area. This has been assisted by the installation of bore D20 in the Lamberts North embankment, which samples the groundwater below the level of the dry ash placement.

Bores D20, D1, D8 and D9, are used to provide a warning of leachates that may enter Neubecks Creek to enable management actions to be undertaken to minimise effects of both the Mt Piper brine and the Lamberts North water conditioned ash placements.

From previous reports, it has been shown that the elevated chloride levels flowing in the groundwater down Huon Gully, beneath the Lamberts North site, reaches bore D1. From there, it flows to bore D9, and then under Neubecks Creek, via the coal seam, to D8 on the north side of the creek. Bore D19 is located to the east of the Lamberts North site and, although it is outside the ash placement area, it samples washery waste/mine spoil in that area and provides information on groundwater flowing towards bore D9 and Neubecks Creek.

The long-term trends in surface and groundwater concentrations, since the Lamberts North sampling began in October, 2012, are examined for potential effects on the receiving groundwater bores, D8 and D9, as well as the surface water in Neubecks Creek at the receiving water site WX22.

[7] Bores D15 to D18, in the southern area of the Lamberts North site, are located around the previous Centennial Coal Mine open-cut area, which is now part of the Centennial coal washery, located in the south-east of the site. These bores are not used in this, or previous reports, because they sample groundwater in the basement rock rather than coal washery waste or mine spoil.

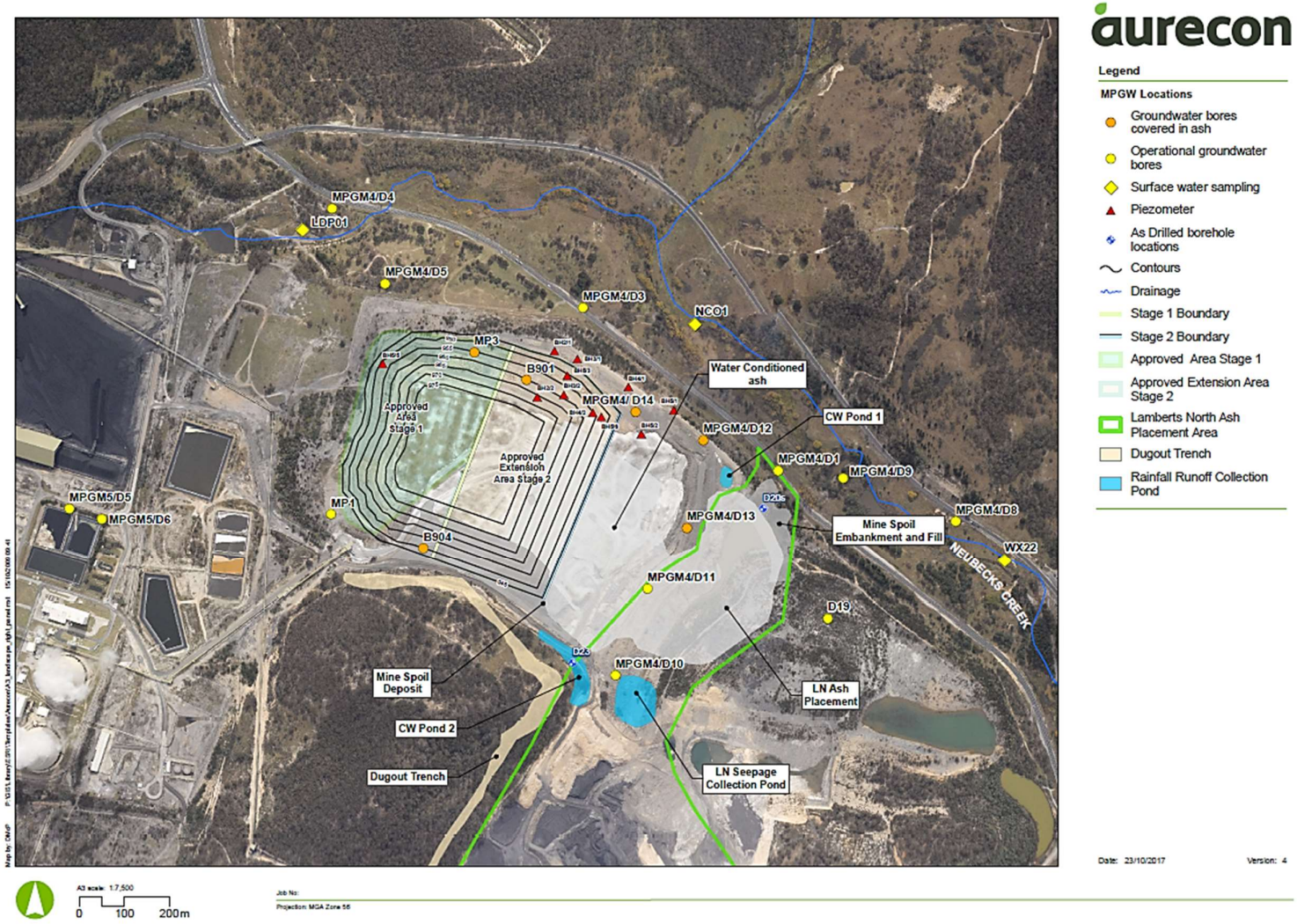

Figure 2. Lamberts North Ash Placement Area and Neubecks Creek Groundwater and Surface Water Quality Monitoring Sites

2.1 Surface Water

As well as routine monitoring of water quality in Neubecks Creek at WX22, the ash placement contractor, Lend Lease Infrastructure (LLI), has monitored the water quality of rainfall runoff from the Lamberts North ash placement area since the first year of operation of the ash placement. EnergyAustralia NSW has advised that the runoff water is collected in a retention area and directed to the lined LN Pond 2 via a subsurface drainage line.

To provide a background benchmark to the WX22 receiving water site, the sampling sites LDP01, and the new NCO1, upstream on Neubecks Creek have been monitored monthly prior to ash placement and have continued to be monitored for comparison with results from WX22, downstream of Huon Gully (Figure 2).

The database provided for review includes monitoring of dissolved oxygen, turbidity, total phosphorus and total nitrogen at the three water quality monitoring sites in Neubecks Creek. It is understood that they are monitored in relation to the aquatic life monitoring and are not related to the groundwater effects on the creek, so they are not used in this report, but are collated in Attachment 1, as required by the work scope in Section 1.1.

2.2 Groundwater

Prior to construction and ash placement, groundwater monitoring started in October, 2012. It was conducted at monthly intervals to establish baseline results for the bores located inside and outside the Lamberts North area. Monthly monitoring has continued since ash placement began in September 2013. Additionally, groundwater down-gradient of Lamberts North is monitored at bores MPGM4/D1, D8 and D9 to detect groundwater seepage moving from the ash placement area toward Neubecks Creek. The new bore MPGM4/D20 samples the groundwater flowing from under the dry ash and can be compared to the groundwater down-gradient at D1 and the receiving water sites.

The groundwater bore characteristics of water table depth, collar level and height of the PVC pipe were checked previously in 2011 and again in March, 2014 (see Attachment 3). These characteristics have been used to convert the groundwater level measurements, which are taken from the top of the pipe, to relative levels below the ground surface in mAHD. The characteristics and bore logs for bores D20 and D23 are also shown in Attachment 3.

The OEMP places emphasis on the need to understand water level changes taking place in the ash placement in Huon Gully and proposed to use bore D1 as a surrogate. This requirement has been supplemented by installation of D20 at the embankment because it was likely that D1 was too far away to understand water level changes, if any, in the ash (Note that D20 showed that the groundwater level was lower than the bottom of the ash, Aurecon, 2017a).

Each groundwater bore is monitored to allow identification of the direction of water movement and, in the case of the bores installed for Mt Piper, to measure the predicted groundwater level rise due to mounding under the large water conditioned ash placement area. Note that the layer of compacted mine spoil placed in Huon Gully was designed such that the expected increase in height of the water table in Huon Gully would not come into contact with the bottom of the Lamberts North ash placement. The water level monitoring data for the groundwater bores monitored for Lamberts North since October, 2012, including bore D1 and D20 since February, 2016, are shown in spread-sheet format in Attachment 1.

2.3 Groundwater Modelling Verification

Verification of the groundwater model prediction of a groundwater level rise lower than the base of the ash placement was suggested to be undertaken in the OEMP if there was a significant increase in the groundwater level at D1. The OEMP suggested that, if there is any significant increase, flow calculations should be undertaken and consideration given to re-running the CDM Smith (2012) groundwater model. As the groundwater level at D1 has not increased, verification of the CDM Smith (2012) groundwater model is not considered to be required.

2.4 Methods

Groundwater level measurements are undertaken at each bore using a dip meter, from the top of the bore pipe, before being bailed or pumped out. NALCO remove three bore volumes as suggested by the groundwater standard - 1998d, AS/NZS 5667.11:1998: Water quality – Sampling. Part 11: Guidance on Sampling of Ground Waters. After pumping, the water in the bore is allowed to recharge to a level suitable for sampling.

The surface and groundwater water quality characteristics monitored at each site are shown in Attachment 1. Sampling and analyses are undertaken as required on behalf of EnergyAustralia NSW by NALCO Analytical Resources[8], who measure conductivity, pH and dissolved oxygen in the field with a calibrated instrument and all other parameters in their NATA Accredited Laboratory. EnergyAustralia NSW has provided a copy of the NALCO laboratory data to Aurecon for the 2016/17 assessment.

EnergyAustralia NSW monitors the discharge flow at the Mt Piper Power Station to Neubecks Creek at a v-notch and the NALCO samplers note if the creek is flowing at the stream flow gauge 212055 near WX22 gauge in Neubecks Creek. The stream flow data is available from Department of Primary Industries Office of Water (DPI Water, formerly NOW) at http://realtimedata.water.nsw.gov.au/water.stm.

The OEMP requires the water quality and trace metal concentrations to be measured by the methods specified in DEC (2004). This method requires that all trace metal concentrations, except for iron and manganese, are measured on unfiltered samples. At collection, unfiltered trace metal samples are preserved with nitric acid and concentrations are measured on samples using the “acid extractable” method. This involves addition of hydrochloric acid and heating for 15 minutes on a steam bath, as set out in Standard Methods.

Since July, 2012, EnergyAustralia NSW has been determining the concentrations of aluminium, copper and zinc in filtered water collected at both the Mt Piper Licence Discharge Point LDP01 and at the Neubecks receiving water site, WX22. Similar filtered trace metal tests have been undertaken at the new upstream site NC01 since October, 2012. The trace metal tests were undertaken on filtered samples to give dissolved, rather than total “acid extractable” concentrations, because the ANZECC (2000) guideline trigger levels are based on free (not bound to organic matter) ionic metals (eg Cu^{2+}), which are difficult to measure, and the dissolved concentrations may be closer to that of the ionic trigger values, but most likely higher due to binding with dissolved organic matter.

However, the Local/ANZECC (2000) trigger value environmental goals for surface water (see Table 1, Section 2.5) are based on unfiltered samples measured by the “acid extractable” method. As the

[8] Nalco has NATA accreditation Number 1099 and is accredited for ISO/IEC 17025

dissolved concentration data is obtained by filtering the samples, it is not consistent with the environmental goals shown in Table 1, which are based on unfiltered samples, so the filtered data has not been used in this report.

To allow comparison with the ANZECC (2000) guideline trigger levels, for those trace metals that do not have a locally derived trigger (such as arsenic), EnergyAustralia NSW began low detection limit (DL) testing for trace metals in April/July, 2006, so that all the metals, except silver, were measured at DLs lower than the ANZECC trigger levels. In this report, trace metal data shown as less than the DL are treated in the following way to be consistent with the previous reporting of trace metals at Mt Piper. When the concentration is less than the DL, and the DL is less than the trigger level shown in Table 1, the concentration has been assumed to be the same as the DL. In the event that the laboratory reports the DL as higher than the ANZECC trigger level, the concentration of the metal is assumed to be half of the DL.

EnergyAustralia NSW has advised that silver has continued to be analysed at a higher DL than the guideline trigger value of 0.00005 mg/L because the matrix of elements present in the water samples prevents NALCO from measuring concentrations at the ANZECC (2000) guideline trigger value level (see Attachment 1). The silver data has continued to be tested at <0.001 mg/L, which is 20 times the ANZECC (2000) guidelines, so it has not been assessed in this report. As recommended in previous reports for the ash placement at Mt Piper, it is suggested that silver cease to be monitored as it provides no useful information.

2.5 Guidelines

The locally derived and ANZECC (2000) guideline trigger values for the groundwater and surface water receiving waters are set out in the Mt Piper Brine Conditioned Ash Water Management Plan (Connell Wagner, 2008). The WMP freshwater trigger values for cadmium, chromium and copper were adjusted for the effects of water hardness in Neubecks Creek (see Aurecon, 2011 and notes to Table 1). The OEMP adopted these trigger values as the Lamberts North ash placement environmental goals in (CDM Smith, 2013). They are also shown in Attachment 4 in this report. However, as the goals in the OEMP were for the Mt Piper surface and groundwater, some of the goals used in the OEMP have been adjusted by using the Lamberts North pre-ash placement baseline data to minimise the possibility of the Mt Piper water and brine conditioned ash area from being assigned to the Lamberts North placement. The effects, if any, of the Lamberts North placement on the receiving waters of Neubecks Creek, and the surrounding groundwater, have been assessed by comparison with these goals shown in Table 1.

Table 1. Pre-2000 brine co-placement 90th Percentile Baseline concentrations and Local/ANZECC (2000) Trigger Value Environmental Goals for the Groundwater Receiving Waters and Neubecks Creek with some Lamberts North elements adjusted for 90th Percentile Goals applying to bores MPGM4/D8 and D9 and WX22 during 2012/13 (bold and parentheses)

Element (mg/L)	Groundwater Collection Basin Pre-brine placement 90th Percentile	Groundwater ANZECC or Local Guidelines#	Neubecks Creek at WX22 Pre-brine placement 90th Percentile	Surface Water ANZECC or Local Guidelines#
General Water Quality				
pH		6.5 – 8.0	6.7-7.8	6.5 – 8.0
Cond/ (uS/cm)	1576	2600^	894	2200
TDS	1306	2000	580	1500^
Cl	31.5	350	22	350+
SO4	824	1000 **(1170)!**	332	1000++
Trace Metals				
As	0.001	0.024	<0.001	0.024
Ag	<0.001	0.00005	-	0.00005
Ba	0.037	0.7	0.029	0.7+++
Be	0.001	0.1	<0.001	0.1
B	0.244	0.37 **(0.55)!**	0.09	0.37
Cd	0.002	0.002	<0.001	0.00085
Cr	0.001	0.005	<0.001	0.002
Cu	0.001	0.005 **(0.0075)!**	<0.001	0.0035 **(0.005)!!**
F	0.435	1.5	0.338	1.5+++
Fe	0.664	**0.664 (15.9)!**	0.281	0.3+++
Hg	<0.0001	0.00006	-	0.00006
Mn	5.704	**5.704 (8.57)!**	0.72	1.9
Mo	0.001	0.01	<0.001	0.01+
Ni	0.5509	**0.5509**	0.005	0.017 **(0.051)!!**
Pb	0.001	0.005	<0.001	0.005
Se	0.002	0.005	<0.001	0.005
Zn	0.908	**0.908**	0.116	**0.116**

* high detection limits used when determining the baseline concentrations – see text

^ 2000 mg/L TDS/0.77 for groundwater; 0.68 x 2200 uS/cm low land river conductivity protection of aquatic life

ANZECC (2000) guidelines for protection of freshwaters, livestock, irrigation water or drinking water. Local guideline based upon 90th percentile pre-brine placement are shown in **bold** without parentheses – see text.

Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness: Current Ca, Mg in GCB 147, 113 mg/L: in Neubecks Creek 19.7, 11.8 mg/L, respectively. Note: Surface water have changed from the Mt Piper WMP trigger values (Connell Wagner, 2008a) for Cd from 0.001 to 0.00085 mg/L; Cr from 0.001 to 0.002 mg/L and Cu from 0.0025 to 0.0035 mg/L due to changes in water hardness.

! Lamberts North trigger values adjusted from OEMP to allow for pre-placement baseline data October 2012 to August, 2013 at MPGM4/D9 for groundwater, which do not apply to Mt Piper bores D10 or D11, as well as at WX22 for surface water in parenthesis.

+ irrigation water moderately tolerant crops; irrigation. Note: Molybdenum drinking is 0.05 mg/L ++ Livestock +++ drinking water

! ! Lamberts North from pre-placement 90th Percentile baseline for October 2012 to August, 2013 at MPGM4/D9 and Neubecks Creek at WX22 in **parenthesis**

The ANZECC Guidelines for Groundwater Protection in Australia (ANZECC, 1995) and the NEPC (1999) require the background water quality in groundwater bores to be taken into account. As the NEPC (1999) did not define the meaning of "background" concentrations, the baseline concentrations were defined in previous reports for the Mt Piper ash placement as the 90th percentile of the pre-placement concentrations for naturally mineralised, highly disturbed groundwater (condition 3 waterbodies), or the ANZECC guideline default trigger values, whichever is higher.

The Protection of the Environment Operations Act requires consideration of the ANZECC (2000) guidelines when assessing potential effects on water quality in receiving waters. To achieve this, the OEMP uses the locally derived and ANZECC (2000) guideline trigger values developed for the Mt Piper Brine Conditioned Ash as the local environmental goals for the Lamberts North ash placement. The guideline trigger values apply to the receiving waters of the ash placement seepage, which are taken as being the two groundwater bores MPGM4/D8 and D9 and Neubecks Creek at WX22 (Figure 2). Hence, the Local/ANZECC (2000) trigger values shown in Table 1 for groundwater apply to bores D8 and D9 and the surface water guidelines apply to WX22, which is the final receiving water site for the Lamberts North ash placement.

The local/ANZECC trigger values shown in Table 1 are based on 90th percentiles pre-2000 data for the Mt Piper brine conditioned ash placement. As ash was not placed at Lamberts North until September, 2013, the 90th percentiles for bores D8 and D8 and Neubecks Creek at WX22 were checked for any increases in the pre-Lamberts North data that could have potentially been due to the Mt Piper area, as well as changes in the catchment background conditions since 2000, so they are not assigned to the Lamberts North placement. This was achieved by calculating the 90th percentile of the pre-placement data at bores D8 and D9 and at WX22[9] from October, 2012 to August, 2013. The resulting increases in the 90th percentile baselines, that are applicable to Lamberts North only, are shown in bold and parenthesis in Table 1[10].

In addition, the Local/ANZECC (2000) trigger values for trace metals used in Table 1 were developed for unfiltered samples, in both surface and groundwater, to establish the pre-placement baseline for Mt Piper ash placement. The baseline data were collected prior to November, 2000 and are consistent with the DEC (2004) requirement for measurements on unfiltered samples.

The pre-placement 90th percentiles that are higher than the default trigger values, are the local guidelines, which are shown in bold in Table 1. The local guidelines for salinity, chloride and sulphate take into account the protection of freshwater aquatic life (via groundwater seepage into Neubecks Creek), livestock, and irrigation water or drinking water guidelines. Table 1 shows that the guidelines for groundwater may be different from those used in Neubecks Creek, where the effects on aquatic life are considered.

2.5.1 Early Warning of Water Quality Changes

As described in the OEMP, it is necessary to provide an early warning of water quality changes to allow time to undertake targeted investigations of the cause and to implement control measures before the environmental goals are exceeded at the receiving water sites. An early warning is triggered when the post- 50th percentiles for the various elements at the receiving water sites exceed their pre-

[9] Bores D8, D9 and WX22 are all in the path of groundwater seepage from the Mt Piper ash placement into Huon Gully, so the background measurements from October, 2012 to August, 2013 have been taken into account. Catchment inflows include the Mt Piper placement groundwater seepage to Huon Gully and local, up-stream, coal mine discharges to Neubecks Creek.
[10] The local, pre-placement Lamberts North 90th percentile baselines are not as reliable as those for Mt Piper because they are only based on eleven measurements at WX22 and four at D8 & D9, whereas the ANZECC (2000) guidelines require a minimum of 24 measurements to set local guidelines.

placement 90th percentiles. This is supported by sampling at bore MPGM4/D1, one of the Mt Piper groundwater seepage detection bores, which has been used to provide an early warning of potential future changes at the surface and groundwater receiving waters. The OEMP has nominated that bore to provide early warning of water quality and water level changes possibly taking place due to the Lamberts North ash placement.

The aim of any targeted investigations that arise is to determine if the changes are due to the water conditioned ash placement or some other cause. If the increases are due to the placement, mitigation measures could be implemented to avoid parameter concentrations approaching or consistently exceeding the relevant ANZECC and local guideline goals in the groundwater at either bore D8 or D9 or at the Neubecks Creek receiving water site, WX22.

2.6 Control Charts

Long-term changes at the receiving water sites are tracked by control charts. The long-term changes were taken from January/February, 2009 to August, 2013[11] to provide 24 measurements (as recommended by the ANZECC (2000) guidelines) prior to ash placement in September, 2013.

At the groundwater receiving water sites, the MPGM4/D8 and D9, long-term changes are indicated by comparison with the pre-90th baseline, post- 50th percentile and/or the groundwater trigger value environmental goals. The Lamberts North site used bore D23 as background bore to the local mine water inflows to Huon Gully for comparison with the water quality conditions at the Mt Piper seepage detection bore, D1, the embankment bore D20, or bores D8 and D9. This means that changes at bores D1 and D20, and the receiving water sites, may be compared to effects of coal mine water inflows and leachates from under the southern Mt Piper ash placement.

At WX22, long-term changes are indicated by comparison with background conditions at the Mt Piper Power Station Licence Discharge Point, LDP01, on the upper Neubecks Creek, and the environmental goals. The new upstream site, NC01, in Neubecks Creek, just downstream of the Mt Piper Stage I brine conditioned ash placement and the Neubecks Creek north arm (Figure 2) are also compared with the changes at WX22.

2.7 Data Quality

The data contained in this report was provided by EnergyAustralia NSW and was checked for outliers using the ANZECC (2000) protocol. In accordance with the protocol, outliers of three times the standard deviation are removed from the dataset, provided no environmental changes have occurred that could account for such a significant change. No values were deleted from the 2016 to 2017 dataset.

Silver concentrations have not been used in this report because the high detection limits used mean they cannot be compared to the ANZECC (2000) guideline of 0.00005 mg/L. Hence, it is suggested that EnergyAustralia NSW have the tests undertaken at the appropriate detection limits.

[11] The January/February, 2009 to July, 2012 Mt Piper groundwater data is from Aurecon (2010, 2011 and 2012)

2.8 Climatic Conditions

The average annual rainfall over the pre- to post-water conditioned ash placement period from October, 2012 to August, 2017 was low at 756.5 mm/year (Attachment 2), which is 87.8% of the long-term annual rainfall of 862 mm/year. During this period, the monthly average rainfall of 60.4 mm/month, was below the long-term average of 72 mm/month, even though there have been many above average rainfall events, including rainfall in December, 2016 of 94.8 mm, and March, 2017 of 175.6 mm.

Figure 3 shows that there was a trend from above average rainfall in 2012 to below average in 2016/17. This trend has been highlighted by calculation of the corresponding change in the cumulative monthly rainfall deficit, which is also shown in Figure 3. A rainfall deficit has accumulated because there has only been sixteen rainfall events higher than 72 mm/month in the last four and a half years.

The monthly rainfall deficit was calculated by subtracting the monthly rainfall each month from the long-term average rainfall of 72 mm/month. When the rainfall is lower than 72 mm/month, the difference is called the deficit. A positive deficit means a dominance of below average rainfall and a negative one indicates above average rainfall. The deficit (positive and negative) was accumulated each month until August 2017.

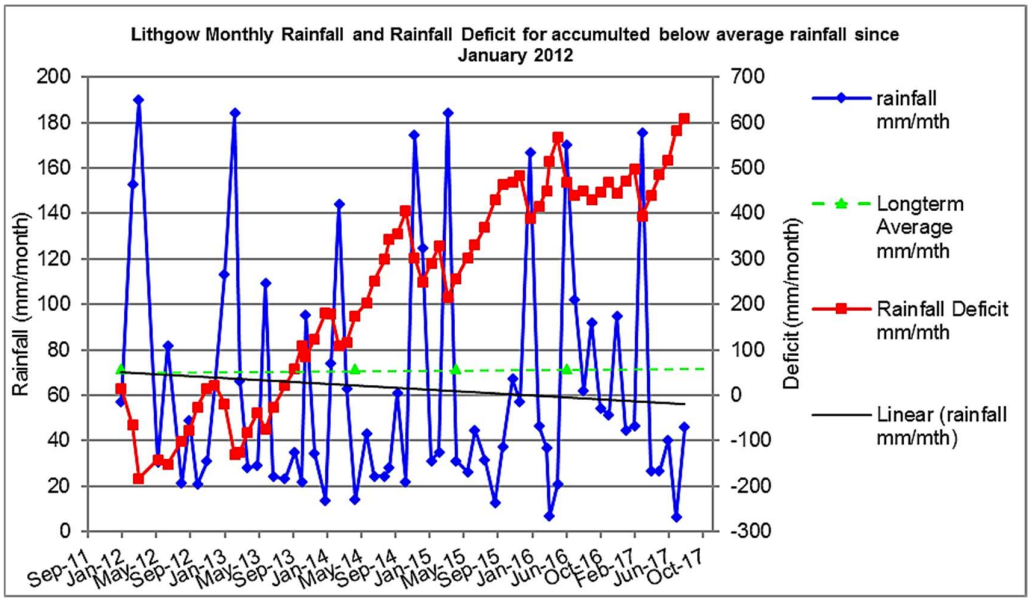

Figure 3. Lithgow Rainfall from January 2012 to August 2017 showing trend for decrease to below average rainfall and corresponding cumulative Rainfall Deficit

3. Review of Mt Piper background effects on Surface and Groundwater

This Section reviews the Lamberts North surface and groundwater quality and trace metal data for the fourth year of monitoring from pre-ash placement (October, 2012 to August, 2013) to the post-ash placement period (September, 2013 to August, 2017). The earlier report (Aurecon, 2016) for the reporting period 2014/15 estimated the rainfall infiltration through the dry ash placement, and by taking into account the salinity and trace metal inputs from the Mt Piper ash area, as well as the locally mineralised coal mine conditions, the results indicated no significant effects on the receiving surface or groundwater. This finding is consistent with that predicted for the dry ash placement by SKM (2010), and similar findings have been found by reviews of the surface and groundwater data in all the reports since monitoring began.

The previous report for 2015/16 also found that the Neubecks Creek receiving water site, WX22, had all the water quality and trace metal concentrations lower than the specifically derived local and ANZECC (2000) trigger values for the Lamberts North site (Aurecon, 2017a).

The previous report also noted that although the nickel concentration in Neubecks Creek was lower than the local goal, there was a trend for increase, so the possible causes were investigated. The elevated nickel levels tended to occur during the drier years due to reduced flow in Neubecks. The source of the elevated nickel was found to be due to elevated concentrations in the Western Main open-cut coal mine void groundwater that flows through the rubble drain, under the Mt Piper layers of water conditioned and brine conditioned ash, into Huon Gully. It appears that some of this groundwater enters Neubecks Creek during rainfall events, where it is diluted by the stream flow to acceptable levels.

The Neubecks Creek aquatic life sampling by Cardno (2016) is reviewed in Section 4.6.

3.1 Groundwater Level Changes

To put the groundwater level changes since October, 2012 into context, and as bores D10 and D11 have been used to provide water quality and groundwater level data for flows from the Mt Piper site into Huon Gully, the long-term changes at these bores, as well as at D1, D8, D9, D19 and D20 are shown in Figure 4.

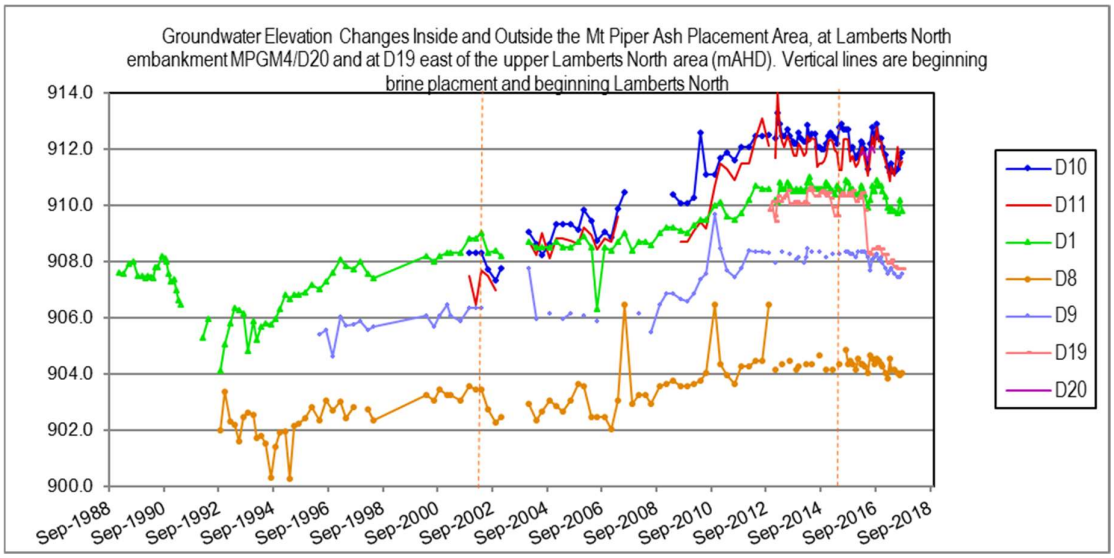

Figure 4. Groundwater Elevation changes at bores inside the Mt Piper ash placement area (MPGM4/D10 and D11 since 2001), at the Lamberts North embankment (MPGM4/D20 from February, 2016 - has similar depth as D11), Seepage Detection bore (D1 since 1989), at Groundwater Receiving Water Bores (D8 and D9 since 1992 and 1996), and just outside Lamberts North ash placement area at D19 since October, 2012

The overall trend for the groundwater levels in the area was historically to increase (ie rise), since ash was placed at the Mt Piper site in 2001[12]. However, the increases have ceased since the dry weather began in 2012 (see Figure 3). With continued dry weather, the groundwater levels at all the bores have begun to decrease.

For example, Figure 4 shows that bore D1 is about 2m higher than it was prior to beginning of ash placement at Mt Piper and is about 1.9m lower than at D20.

3.1.1 Groundwater levels below the Lamberts North Ash placement

Prior to commencement of ash placement, the groundwater level in Huon Gully was reduced to approximately RL901m by pumping, at which level the sediment bottom of the Groundwater Collection Basin (Huon Void) was exposed. The Huon Void was then filled with compacted mine spoil to RL917m, 4m above the highest estimated groundwater level as recommended by the CDM Smith (2012) model. The model indicated that groundwater levels across Lamberts North were at their maximum during wet weather patterns and suggested that groundwater levels were expected to remain at least 4m below the base of the dry ash placement. Therefore, effects of groundwater flows, or level rises, in Lamberts North on leaching salts and trace metals from the ash placement was not predicted to occur. Installation of the bore MPGM4/D20 in the northern embankment in December, 2015 showed that the groundwater level was about RL912m and 5m below the bottom of the ash placement.

The groundwater levels for the embankment bore D20 in Figure 4 show that bore D20 samples the groundwater in the mine spoil under the ash. Its close relationship with the D11 levels indicates that the groundwater level under the ash is determined by the up-gradient flows from the Mt Piper area.

[12] The groundwater level in the Mt Piper ash placement area was predicted to rise by about 2m by groundwater modelling (PPI, 1999).

The previous report noted that the OEMP placed emphasis on the potential for water level increases in the Lamberts North ash placement area to leach salts and trace metals from the ash and suggested that bore D1 could be used to indicate if there has been a groundwater level increase inside the ash area due to it being placed in the local groundwater collection area of Huon Gully. However, Figure 4 shows no groundwater level rise at D1 since ash placement began at Lamberts North in 2013. This, together with the D20 level being well below that of the ash, indicates a limited input of salts and trace metals could be expected from the Lamberts North ash placement to the local groundwater.

3.1.2 Groundwater Flow Directions

The indicative groundwater flow directions beneath the Lamberts North ash placement via Huon Gully to bores MPGM4/D20, D1, D9 and Neubecks Creek are shown here to obtain an understanding of the sources of groundwater that could affect the local water quality.

The flow directions in Figure 5 suggests that groundwater flows follow the dip in the mined coal seam strata, under the Lamberts North ash area, in a north-easterly direction from the up-gradient groundwater table areas to bores D1 and then to D9 and Neubecks Creek. This is discussed further in the next Section.

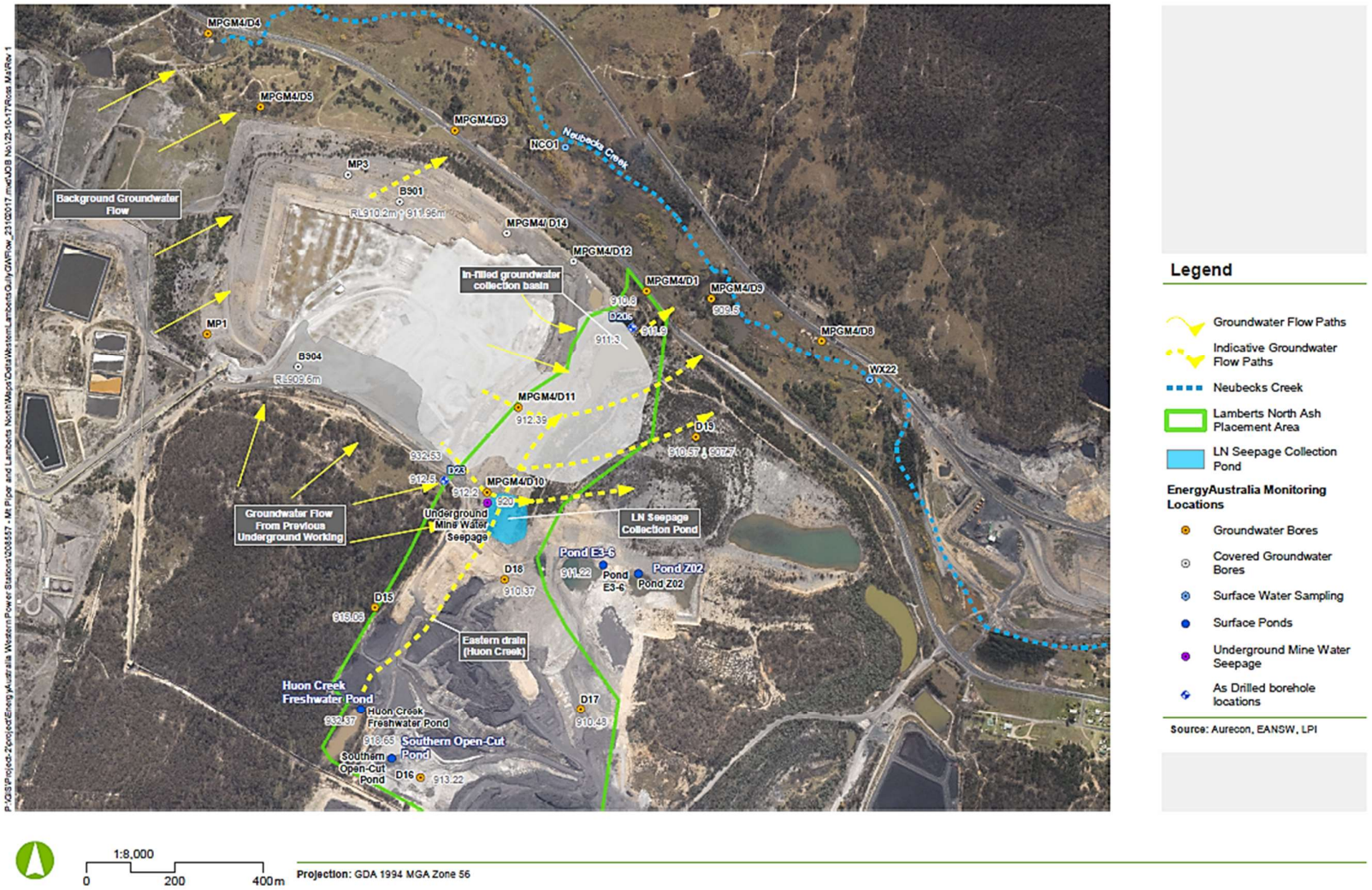

Figure 5. Schematic of Indicative Groundwater flow paths at the Mt Piper Brine Placement Area and beneath the Lamberts North ash placement via Huon Gully to bores MPGM4/D20, D1, D9 and Neubecks Creek

3.2 Groundwater seepage from the Mt Piper ash placement to Neubecks Creek

An important consideration for potential effects of the Lamberts North ash placement on the local groundwater, and its effects on the water quality in Neubecks Creek, is that the groundwater follows the dip in the mined coal seam strata toward the low point at bore D9 and then under Neubecks Creek, as shown in Figure 6.

The 2007 UTS groundwater model (Merrick, 2007) found that the Mt Piper ash placement area aquifer system is driven by underground coal mine groundwater flows. The mine groundwater flows naturally from the rubble drain, under the Mt Piper ash, to the northern end of Huon Gully beneath the Lamberts North ash area (sampled by bore D20) and then toward Neubecks Creek via bores D1 and D9.

Figure 6 shows that the groundwater flow from underground coal mines, from the west and south[13] of the Mt Piper ash placement area, is expected to follow the coal seams. As the coal seams had been removed from the Western Main open-cut void, an "interburden" layer (also called a rubble drain) was placed in the open-cut void to allow the mine water to flow under the ash without coming into contact with it. Any groundwater flowing towards Neubecks Creek from the Huon Gully Void, or more recently, under or around the Lamberts North placement in Huon Gully, is expected to flow under the creek via the coal seams, as shown in Figure 6.

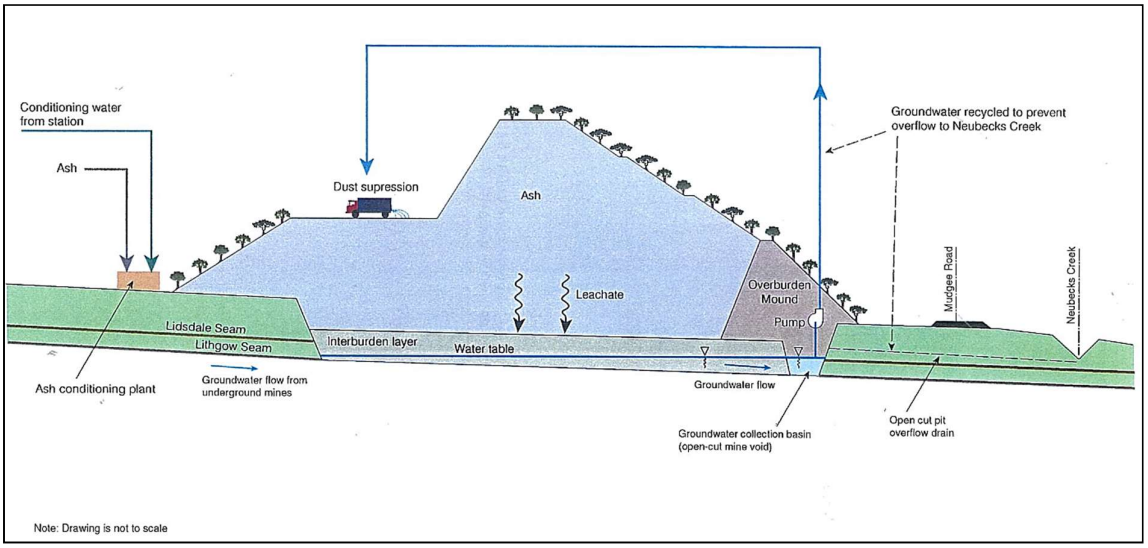

Figure 6. Schematic of Mt Piper ash placement management of surface and groundwater - from PPI (1999). (Note the Groundwater Collection Basin has been replaced by the Lamberts North ash placement on top of compacted mine spoil)

Some of the groundwater flowing down Huon Gully could potentially enter Neubecks Creek, upstream of the WX22 creek gauge 212055 after rainfall events that cause the water table to rise such that it is above the base of the creek. The UTS model predicted the salt load on the creek, from which the groundwater flow has been estimated at <0.1 ML/day, indicating that most of the mine groundwater flowing from under the Mt Piper ash placement, and down Huon Gully, actually flows under the creek.

[13] The southern underground mine groundwater had limited access to the open-cut by a coal barrier that was left in place.

Following from the above review of groundwater characteristics and a review of the effects of Mt Piper inputs to Huon Gully in the next Section, the review of the Lamberts North ash placement groundwater and surface water effects are undertaken in Section 4.

3.3 Lamberts North background groundwater quality

To prevent the effects of the Mt Piper inflows to Huon Gully from being assigned to the Lamberts North ash placement operations, the water quality at the groundwater bores D10 and D11, inside the Mt Piper placement area, are used to provide the concentrations of salts and trace metals entering Huon Gully from Mt Piper. Accordingly, the post-ash placement water quality data for the period September, 2016 to August, 2017 for bores D10 and D11 are summarised in Table 2.

Table 2 shows the changes in groundwater quality changes at bores D10 and D11, compared to their pre-Lamberts North concentrations from October, 2012 to August, 2013, as well as the bore D10 90th percentile baseline for the same period. The current status for September, 2016 to August, 2017 is also shown. To put these changes into context they are compared to the background bore D5 concentrations from October, 2012 to August, 2013, which samples the underground coal mine groundwater up-gradient of the ash area, as well as the bore D4 background that samples shallow groundwater, near Neubecks Creek, in a previous open-cut copper, lead and zinc mine (see Figure 5).

Significant changes in water quality are highlighted in Table 3 by the following colour codes:

- Blue is for concentrations higher than the ANZECC or local guidelines, during and before the Lamberts North dry ash placement began in September, 2013;
- Yellow shows the concentration increases for characteristics triggering investigations of the causes because the post-median is greater than the 90th percentile baseline.

Table 2 shows that during 2016/17 reporting period, the D10 and D11 bores had chloride, salinity and sulphate concentrations higher than the ANZECC or local guidelines. They also had elevated concentrations of boron, cadmium and nickel, while fluoride, and zinc was elevated at D10 only. The trace metals at D10 showing significant decreases since the Lamberts North pre-placement period were copper, manganese, lead and selenium.

The background bore, D5, remained at low concentrations for all the elements, except for the locally abundant iron and manganese, some boron and the locally acidic groundwater conditions. Bore D4 is highly acidic and potentially contributes arsenic, chromium, and lead to the local groundwater entering Neubecks Creek upstream of the Mt Piper and Lamberts North ash placement areas.

Table 2 also shows the brine leachate concentrations potentially expected from brine conditioned ash. The leachates have relatively low concentrations of iron, manganese, nickel, lead and zinc, which prompted an investigation of the source of the elevated nickel and zinc, and subsequently, the source of boron at bore D10. As mentioned above, the source was found to be from the open-cut coal mine groundwater that the Mt Piper ash is placed above. The migration of these metals through the rubble drain appears related to the rise in groundwater local levels as ash is placed to a higher level above the mine void.

These background conditions are taken into account in assessing the effects of the Lamberts North site on the local surface and groundwater quality in Section 4.

Table 2: Lamberts North background groundwater quality using Mt Piper Brine conditioned ash Bores D10 and D11 compared to the brine placement background bores D4 and D5, Brine Conditioned Ash Leachates and ANZECC Groundwater Guidelines or Local Goals

Element (mg/L)	Mt Piper Brine Co-Placement Area Internal Monitoring Bores^					D5 Back-ground Oct., 2012 to Aug., 2013	D4 Back-ground Oct., 2012 to Aug., 2013	Brine Conditioned ash Leachate (PPI, 1999)	ANZECC Guideline Goals for Ground-water#
	Pre-Lamberts North Oct., 2012 to Aug., 2013		Current Lamberts North Sept., 2016 to August, 2017		D10 Baseline (Pre-Lamberts North 90th Percentile)				
	D10	D11	D10	D11	D10	D5	D4		
pH	5.6	7.1	5.6	6.2	5.7	5.9	3.1	7.6	6.5-8.0
Cond (µS/cm)	4533	2278	8820	9164	5180	1150	1200	10900	2600
TDS	4267	1433	7499	7965	5100	898	903	8400	2000^
SO4	2456	345	4317	4631	2820	599	562	3750	1000++
Cl	382	227	769	900	472	23.8	11.3	1410	350+
As	0.001	0.0028	0.0009	0.008	0.001	0.002	0.086	0.050	0.024
B	3.46	1.02	3.36	2.9	4.86	1.2	0.025	7.6	0.37**(0.55)!**
Cd	0.0054	0.0002	0.0061	0.00009	0.0065	0.0002	0.001	0.003	0.001
Cr	0.0014	0.0025	0.0006	0.0012	0.002	0.001	0.006	0.037	0.004
Cu	0.0118	0.005	0.0008	0.0009	0.0264	0.002	0.004	0.078	0.005**(0.0075)!**
Fe**	3.7	0.07	2.00	75.25	7.64	37.9	95.3	0.007	**0.664 (15.9)!**
Mn**	7.3	2.21	7.3	17.2	8.9	9.9	0.95	0.44	**5.704(8.57)!**
Mo	0.007	0.0008	0.0008	0.0006	<0.01	0.005	0.005	0.84	0.01+
F	1.7	0.525	5.85	0.24	2.02	0.25	0.25	6.0	1.5+++
Ni	0.694	0.055	0.903	0.908	0.796	0.084	0.0265	0.20	**0.5509**
Pb	0.0066	0.005	0.004	0.005	0.009	<0.001	0.0338	<0.0002	0.005
Se	0.0067	0.002	0.003	<0.001	<0.010	<0.002	<0.002	0.180	0.005
Zn	1.33	0.045	1.08	0.128	1.70	0.085	0.278	0.039	**0.908**

^Bore D10 samples groundwater flowing from underground coal mine goaf areas and D11 samples open-cut mine area.

^^ Bore D4 samples shallow groundwater in a previous open-cut copper, lead and zinc & then coal mine; bore D5 samples groundwater in the abandoned underground coal mine up-gradient of the Mt Piper ash site.

Notes:

**filtered samples for iron and manganese

ANZECC (2000) guidelines for protection of freshwaters, livestock or irrigation water apply to groundwater receiving water bores D8 & D9.

Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness: Ca, Mg in GCB 147, 113 mg/L:

Local guidelines using 90th percentile of pre-placement data in **bold.**

! Lamberts North from pre-placement baseline data October 2012 to August, 2013 at MPGM4/D9 in parenthesis, which do not apply to Mt Piper bores D10 or D11

+ irrigation water moderately tolerant crops; irrigation. Note: Molybdenum drinking is 0.05 mg/L ++ Livestock +++ drinking water

Highlights: Blue: > ANZECC/local guidelines, Yellow: post-median > 90th baseline.

The cause of the concentrations of salts and chloride at bore D10 have been investigated in separate reports for the Mt Piper site and found to be due to a source beneath the water conditioned and brine

conditioned ash layers, and not from the brine conditioned ash itself (Aurecon, 2017b and c). The lack of effects of the brine conditioned ash is consistent with the UTS groundwater modelling by Merrick and Tammetta (1999) and Merrick (2007) which predicted no significant effects on the groundwater or surface water quality at the receiving water sites.

As chloride is the tracer for brine leachates from the Mt Piper area, the trends in chloride concentrations at bores D10 and D11 are shown in Figure 7. This shows that the D10 chloride concentration went over 350 mg/L in early 2013 and D11 in late 2013. The high rainfall event in June and July, 2016 (see Figure 3) caused the chloride to decrease to about 400 mg/L but the chloride at bore D11 remained at about 800 mg/L.

There was a subsequent decrease in chloride at D10 following the high rainfall event in March, 2017 of 175.6 mm. However, the chloride concentration continued to decrease to 545mg/L, even though the period from April to August, 2017 was characterised by below average rainfall (see Figure 3). The chloride at D11 remained high and finished the reporting period at 864 mg/L.

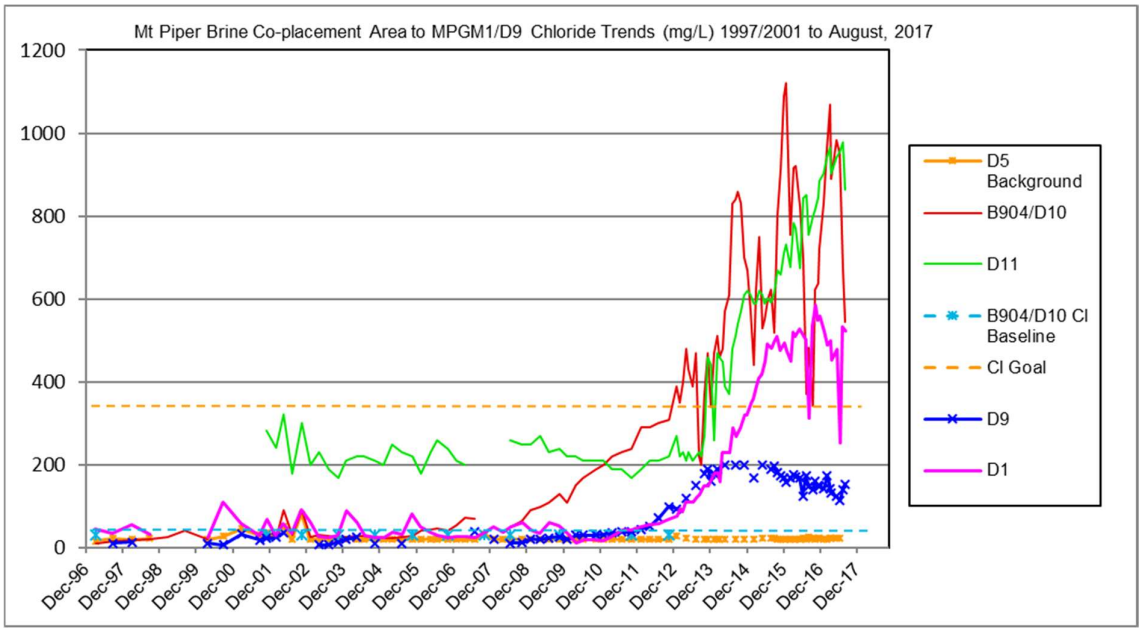

Figure 7. Mt Piper Brine Placement Area Chloride Trends at groundwater bores (MPGM4/D10 and D11), compared to the Background Bore D5, B904/D10 baseline and Environmental Goal of 350 mg/L which apples to the receiving groundwater outside the ash placement area.

These differing responses of D10 and D11 to the heavy rainfall events indicates differing influences of the diluting inflows of low chloride in underground coal mine groundwater that flows to those bores from the western and southern areas outside the ash placement. This is most likely explained by bore D10 being representative of the groundwater flowing from southern underground coal mine goaf areas to Huon Gully, while D11 is indicative of groundwater from the west into the open-cut mine rubble drain. Hence, it is likely that the D11 groundwater is located outside the flow path of the southern underground coal mine groundwater inflows to Huon Gully.

Figure 7 shows that, even though the chloride decreased at D10, it increased at D1 immediately after the March, 2017 rainfall event, indicating some input to Huon Gully from the groundwater sampled at bore D11. A similar increase at D1 occurred after the June and July, 2016 rainfall event.

4. Lamberts North water conditioned ash effects on Surface and Groundwater Quality

As required by the OEMP by CDM Smith (2013), the review undertaken here is for the Lamberts North background groundwater bores D10 and D11 (see the previous Section), the common Mt Piper and Lamberts North seepage detection bore, MPGM4/D1, the receiving water bores D8 and D9 and Neubecks Creek, as well as the Lamberts North groundwater bore D20. The Neubecks Creek final receiving water site, WX22 is compared with its upstream background sites. The data base for these sites has been updated to August, 2017 and changes over time from the pre- to post-placement periods of ash placement at Lamberts North are commented on.

As noted in Table 1, Section 2.5, the local goals for boron, copper, iron and manganese have been increased (shown in parenthesis and bold), but they only apply to the Lamberts North placement (these higher goals do not apply to D10 or D11, which use the existing Mt Piper goals). These Lamberts North only goals were developed using the pre-placement groundwater baseline data from October 2012 to August, 2013 at bore MPGM4/D9. This was necessary to ensure that any increases at the down-gradient bores due to groundwater inflows to Huon Gully from under the Mt Piper area (measured at bores D10 and D11) were not assigned to the Lamberts North site.

The previous report for 2015/16 (Aurecon, 2017a) investigated the source of the nickel increase at bore MPGM4/D1 and was indicated as due to groundwater inflows from the Western Main open-cut coal mine rubble drain, under the northern Mt Piper ash area. Migration of groundwater from the mine void towards bore D1 appears to be due to the general increase in background groundwater levels by about 2m as ash was placed higher at the Mt Piper site (see the groundwater level changes at bore D5 in Figure 6 in Aurecon, 2017c). However, the nickel concentrations were greatly reduced and met its local guideline at the receiving groundwater bore MPGM4/D9, as well as in Neubecks Creek at its receiving water site.

4.1 Lamberts North Rainfall Runoff Water Quality and LN Pond 2

Surface water runoff water quality data for the Lamberts North area during 2016/17 is shown in Attachment 1, part 6b and c and includes water quality data for the lined LN Pond 2 from September, 2016 to August, 2017. The lined pond receives surface runoff from the Mt Piper and Lamberts North ash areas via a retention area on the western side of the Lamberts North area. The runoff is directed into the lined pond by a subsurface drainage line[14].

The chloride, sulphate and trace metal concentrations in the LN Pond 2 runoff water had chloride at about 55 mg/L and sulphate at 750 mg/L and relatively low concentrations of trace metals (Attachment 1, 6c). The water quality data for Brine Sump1 on Benches B1-B4 and B5 in September and January, 2016 and September, 2016 to August, 2017 are shown in Part 6d, which also have relatively low concentrations of trace metals.

On the basis of the lower salinity in bore D20 than in the surrounding bores, it was postulated that the water quality and trace metal concentrations in LN Pond 2 represented the concentrations in rainfall runoff and that some of the runoff entered the groundwater at bore D20, causing the 4-fold decrease in chloride noted in the next Section.

[14] Part 6a shows runoff water quality data from 2012 to 2016.

4.2 Mt Piper groundwater bores in coal mine open-cut and over underground mine workings

An important consideration for assessing the potential effects of the Lamberts North site is the locally mineralised conditions, which vary between the northern and southern areas of the Mt Piper ash placement. The underground and open-cut coal mine map is shown in Figure 8 with the local groundwater bores superimposed in GIS. (The original map of mine workings and its explanation are shown in Attachment 3).

Figure 8 shows that the western and northern areas of the ash were placed in the western Main open-cut mine void (hatched areas), which has a rubble drain at the bottom of the Western Main open-cut coal mine void. The open-cut area extends to the east under Huon Gully. The groundwater bores, B901 (now covered with ash, see Figure 2) and D11 sample the groundwater from the northern void area. The up-gradient, western underground coal mine (D23) groundwater flows into Huon Gully and dilutes the chloride in the D10 plume as it flows under the Lamberts North site towards bore D1 (Figure 2), but can add some mine water related trace metal concentrations to the groundwater.

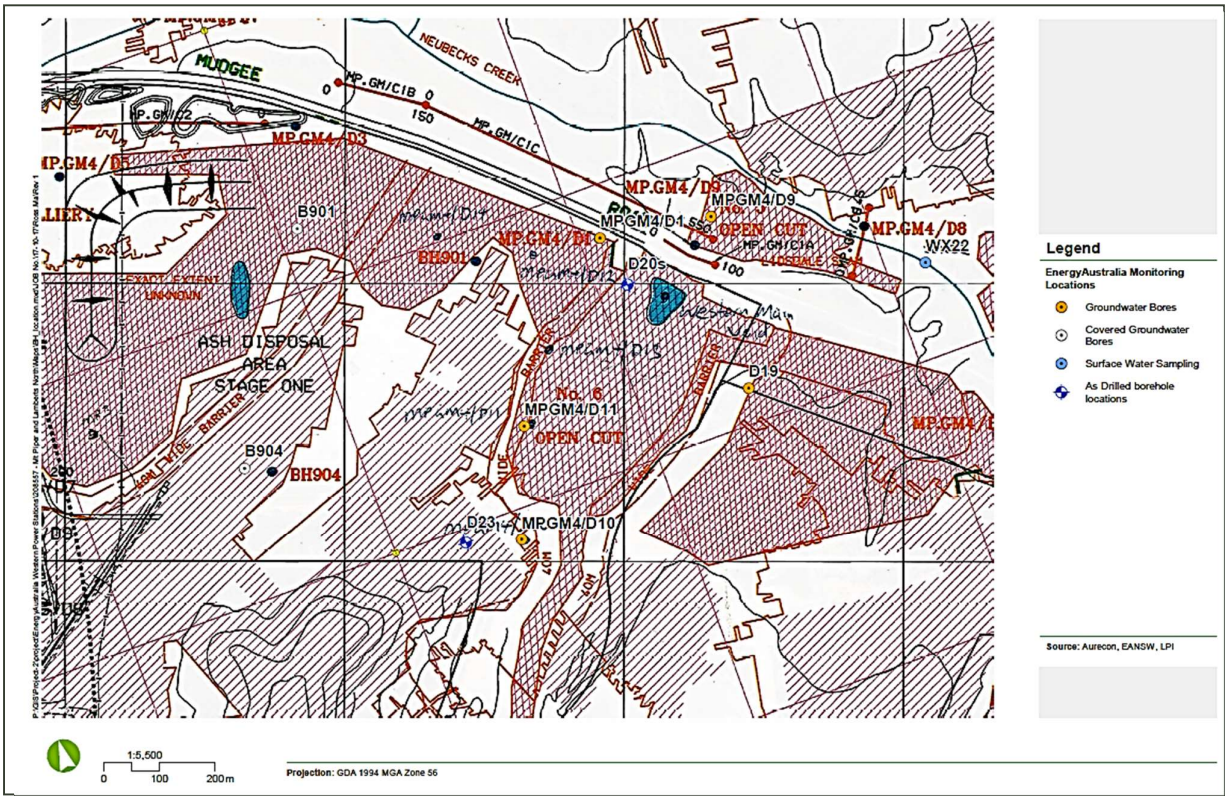

Figure 8. Map of open-cut and underground coal mine workings in the Mt Piper ash placement area with Lamberts North placed in the Huon Gully open-cut mine void over the previous Groundwater Collection Basin (originally the Western Main Void shown in blue)

The groundwater bores, B904 (now covered with ash) and D10 represent the groundwater from the underground mine. Groundwater flows from the southern underground mine workings in a north-eastern direction and enters Huon Gully via the coal barrier near bore D10. Recent reviews of the trace metal data at Mt Piper indicates that, with the increase in local groundwater levels, bore B904

may be influenced by groundwater inflows from the open-cut coal mine void area located to the west of the bore (see Figure 2). This view is based upon bores B901 and B904 having similar, elevated trace metal concentrations, such as nickel while the ash leachates contain very little nickel (Aurecon, 2017b and c).

4.3 Current groundwater quality at bores MPGM4/D1 and D20

Table 3 shows the current groundwater quality for bore D20 at Lamberts North, compared to that at bore D23, which samples the groundwater in the southern underground coal mine that enters Huon Gully upgradient of the Lamberts North placement, as well as with the seepage detection bore D1. The water quality of these bores is compared with the Local Groundwater Guideline trigger values, which apply to the receiving waters.

It is noted that the chloride at D20 is about 4-fold lower than at D1 because the Lamberts North ash is conditioned with relatively low chloride cooling tower water, while the groundwater entering the upper Huon Gully (D10) from the southern area of Mt Piper contains a high chloride source beneath the ash placements. As bore D1 is located down-gradient of D20, it appears that the chloride in the groundwater at D20 is diluted by rainfall runoff from the water conditioned ash areas entering the groundwater beneath the dry ash placement.

Table 3 shows that some of the trace metals at D20 are lower than expected due to ash leachates, such as boron at 1.42 mg/L, cadmium 0.00265 mg/L, copper 0.015 mg/L and selenium at <0.001 mg/L. The low selenium indicates that the elevated trace metals at D20 are from another source, other than the Lamberts North dry ash placement.

Table 3: Average Water Quality for Lamberts North embankment bore MPGM4/D20, Southern Underground coal Mine Groundwater Bore MPGM4/D23 and the Mt Piper Seepage Detection Bore D1 Pre-dry ash placement and Current 2016/17 compared to northern ash area pre-Brine Placement bore B901, Mine Spoil and Water Conditioned Ash Leachates, as well as the Local Groundwater Guideline Trigger Values

Element (mg/L)	Southern Under-ground Mine	LN embankment groundwater	Mt Piper & LN Seepage Detection		Mt Piper ash area background	Mine Spoil Leachate (PPI, 1999)	Cooling tower Blowdown Water Conditioned ^ ash Leachate (PPI, 1999)	ANZECC Guideline Goals for Ground-water # !
	Current D23 Sept, 2016 to Aug, 2017	Current Lamberts North Sept, 2016 to August, 2017	Pre-Lamberts North Oct, 2012 to August, 2013	Current Lamberts North Sept, 2016 to August, 2017	B901 Northern Ash area pre-brine placement 1997 - 2000			
	D23	D20	D1	D1	B901^^			
pH	5.7	6.1	6.2	5.9	6.6	7.6	5.1	6.5-8.0
Cond (µS/cm)	4076	3727	2300	4982	1623	1212	902	2600
TDS	3132	3370	2189	4048	1638	800	736	2000
SO4	1858	2058	1289	2124	948	349	424	1000
Cl	257	112	101	498	30	103	3.8	350
As	0.0012	0.007	0.013	0.011	0.005	0.001	0.013	0.024
B	0.90	1.42	1.8	2.04	3.16	1.475	3.8	0.37**(0.55)!**
Cd	0.0003	0.00265	0.0002	<0.0001	0.0103	0.002	0.022	0.002
Cr	0.006	0.0212	0.001	<0.001	-	0.001	0.003	0.005
Cu	0.0013	0.0152	0.011	<0.001	0.017	0.002	0.167	0.005**(0.0075)!**
Fe*	13.5	1.04	18.0	37.1	6.08	0.097	<0.1	**0.664(15.9)!**
Mn*	3.1	19.6	10.0	15.3	5.66	1.64	0.15	**5.704(8.57)!**
Mo	<0.001	0.003	0.007	<0.001	-	0.003	2.2	0.01
F	0.224	0.23	0.10	0.101	4.45	0.49	7.77	1.5
Ni	0.348	0.545	0.53	0.997	0.92	0.050	0.035	**0.5509**
Pb	0.002	0.012	0.001	<0.001	0.002	0.0002	0.003	0.005
Se	<0.001	<0.001	0.002	<0.001	0.005	0.0115	0.116	0.005
Zn	0.383	0.315	0.047	0.120	3.88	0.366	0.117	**0.908**

^Water conditioned ash leachates from PPI (1999) adjusted for effects of conditioning with cooling tower blowdown water from Table 2 in Aurecon (2016)

^^ Data from Table 5 and Attachment 1, part 4 in Aurecon (2017c)

* filtered samples for iron and manganese

ANZECC (2000) guidelines for protection of freshwaters, livestock or irrigation water apply to groundwater receiving water bores D8 & D9. Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness: Local guidelines using 90th percentile of pre-placement data in **bold.**

! Lamberts North from pre-placement baseline data October 2012 to August, 2013 at MPGM4/D9 in parenthesis, which do not apply to Mt Piper bores D10 or D11

Highlights: Blue: > ANZECC/local guidelines, Yellow: post-median > 90th baseline.

The potential source of the trace metals at D20 was investigated by comparing the results at D20 with the Mt Piper open-cut mine bores B904 and B901 and the background bores D4 and D5 (see Figure 5). Bores B904 and B901 show the mineralised conditions in the Mt Piper ash placement area before brine conditioned ash began. These bores are included because they can potentially affect the water quality in Huon Gully beneath the Lamberts North site.

The relatively high nickel concentration at D20 indicates that the open-cut mine groundwater at B901 has migrated into the Huon Gully (Table 3, Column 3 compared to column 6), beneath the Lamberts North site, as the groundwater levels have increased with more ash placed at Mt Piper (Figure 4 shows a 2m rise even at the background bore D5).

Another possibility is that the compacted mine spoil, beneath the Lamberts North ash area, has become saturated with groundwater (the groundwater level in the mine spoil is about 5m below the bottom of the ash). This may have caused physio-chemical changes, causing dissolution of pyrites in the mine spoil with production of the elevated concentration of sulphate at D20 but with low chloride. The much lower chloride indicates that the main source of the sulphate is not from the upper Huon Gully/Mt Piper area and, by consequence, is not the main source of trace metals at D20.

The map of coal mine workings in the Mt Piper/Lamberts North ash placement areas (Figure 8) also provides a likely explanation of the significant increase in nickel and chloride at bore D1 since 2012/13 (Tale 3, column 5) to be much higher than at D20 (column 3). The following suggests a possible scenario for these increases:

- Figure 7 shows that bore D11 has an increasing concentration of chloride, while that at D10 is highly variable due to being in the path of mitigating low chloride flows from the southern underground mine groundwater measured at bore D23.
- Bore D11 has elevated concentrations of chloride (900 mg/L) and nickel (0.908 mg/L), so the source of these elements is similar to that for those at D10. The chloride is most likely from the saline area at the base of the southern Mt Piper area, with most of the nickel from inflows from the western open-cut void into the western part of the underground mine near B904 (see Figure 8).
- Figure 8 shows that D11 is just beyond the coal barrier between the eastern underground mine and the Huon Gully open-cut, indicating seepage through the barrier. This implies that the eastern underground groundwater has similar water quality as at D11 and has migrated there with the local groundwater rise.
- Bore D1 is located down-gradient from the eastern underground mine, so the increase in chloride to 498 mg/L at D1 (column 5 in Table 3) indicates that some groundwater from the eastern underground coal mine may have also seeped into the open-cut mine area between the underground mine and D1, where there is no coal barrier. The corresponding increase in nickel at bore D1 since 2012/13 supports this view of groundwater movements and water quality changes shown in Table 3.

Figure 5 indicates that the groundwater from the coal mines follow the dip in the coal seam to the north-east and may flow towards bore D1 by joining the D10 plume as it leaves Huon Gully on its way towards the receiving water bore D9. This is discussed in the next Section.

4.4 Current groundwater quality at the receiving water bores

Table 4 shows the pre-dry ash placement and current groundwater quality for the receiving groundwater bores D8 and D9 at Lamberts North, compared to the local coal waste/chitter area groundwater bore D19.

Bore D9 is the closest to the seepage detection bore D1 and the salinity and sulphate concentrations have increased to be higher than the pre-placement concentrations such that they now exceed the ANZECC Groundwater Guidelines or Local Goals. The chloride at this bore has also increased, and now the post-50th percentile exceeds the pre-placement 90th percentile, giving a warning that the D10 chloride plume has reached D9 (see Figure 7).

Under the current conditions, the salinity, sulphate and chloride concentrations at D8, on the northern side of Neubecks Creek, are now lower than during the pre-placement period. Other than commonly low pH in the area, all the elements at D8 met the ANZECC Guidelines or Local Goals.

The trace metal concentrations at bore D9 met the ANZECC Groundwater Guidelines or Local Goals, other than for boron. The boron increase at D9 to 0.67 mg/L (compared to the pre-placement of 0.47 mg/L and the local guideline of 0.55 mg/L) appears to come from bore D1, which most likely gained its concentration from upgradient influences, such as bores D10 and D11, as well as the northern open-cut coal mine void bore B901. It is unlikely that the Lamberts North ash placement made a significant contribution to the boron because the D20 concentration was lower than the other potential sources.

Although manganese increased to be above its preplacement concentration, the metal is common in the area and the increase is likely an indication of local coal mine related groundwater movements in the area rather than an indication of Lamberts North ash leachates, which are very low (column 8 in Table 3).

Table 4: Average Water Quality for Mt Piper and Lamberts North receiving water bores during Pre- placement (October, 2012 to August, 2013) and current 2016/17 Periods compared to background coal mine spoil/coal waste conditions at Bore MPGM4/D19 and ANZECC Groundwater Guidelines or Local Goals (including Lamberts North Pre-placement 90th Percentile Goals)

Element (mg/L)	Mt Piper & LN Groundwater Receiving Waters					
	Pre- Lamberts North Oct, 2012 to August, 2013	Current Lamberts North Sept, 2016 to August, 2017	Pre- Lamberts North Oct, 2012 to August, 2013	Current Lamberts North Sept, 2016 to August, 2017	Mine Spoil/ Coal Waste at D19 Sept, 2016 to August, 2017	ANZECC Guideline Goals for Ground-water # !
	D8	D8	D9	D9	D19	
pH	5.9	5.4	6.1	5.9	5.9	6.5-8.0
Cond (µS/cm)	525	363	2000	2777	5831	2600
TDS	393	266	1675	2193	4670	2000
SO4	216	142	1048	1409	2830	1000
Cl	18.3	11.9	116	144	460	350
As	0.001	<0.001	0.002	<0.001	0.010	0.024
B	0.063	0.052	0.47	0.67	2.37	0.37**(0.55)**
Cd	0.0003	0.0001	0.0002	0.0001	0.0002	0.002
Cr	0.001	0.001	0.001	0.001	0.0405	0.005
Cu	0.005	0.001	0.005	0.0012	0.012	0.005**(0.0075)**
Fe*	0.17	0.62	8.26	10.51	26.2	**0.664(15.9)**
Mn*	1.34	1.16	7.73	10.1	12.1	**5.704(8.57)**
Mo	<0.01	<0.001	<0.01	<0.001	0.002	0.01
F	0.10	0.021	0.13	0.09	0.124	1.5
Ni	0.098	0.051	0.273	0.327	0.953	**0.5509**
Pb	0.002	<0.001	0.003	<0.001	0.0236	0.005
Se	0.002	<0.001	0.002	<0.001	<0.001	0.005
Zn	0.083	0.059	0.120	0.114	0.393	**0.908**

Notes: *filtered samples for iron and manganese

ANZECC (2000) guidelines for protection of freshwaters, livestock or irrigation water apply to groundwater receiving water bores D8 & D9.
Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness:
Local guidelines using 90th percentile of pre-placement data in **bold**

! Lamberts North from pre-placement baseline data October 2012 to August, 2013 at MPGM4/D9 in **parenthesis**, which do not apply to bores D10 or D11
Highlights: Blue: > ANZECC/local guidelines, Yellow: post-median > 90th pre-placement baseline.

Groundwater at the mine spoil/coal waste bore D19 had salinity, sulphate and chloride concentrations higher than at D9 and similar to that at bore D1. They all exceeded the 50th > 90th warning level in 2014 and the chloride at that bore has increased from an average of 186 mg/L, during the pre-placement period, to the current concentration of 460 mg/L. The flow path shown in Figure 5 indicates

that the bore D10 plume may be flowing around the compacted mine spoil in Huon Gully and causing the increase at D19.

4.5 Neubecks Creek Surface Water Quality

The dry ash placement at Lamberts North was not a significant source of salinity or trace metals to Neubecks Creek during 2014/15 (Aurecon, 2016) or during 2015/16 (Aurecon, 2017a) when all the water quality and trace metal guidelines in the creek were met. Due to the large decrease in chloride from that at bore D1 to D9 shown in Figure 7, and the understanding that most of the D9 groundwater flows beneath Neubecks Creek (see Figure 6, Section 3.3), the Lamberts North dry ash placement is not expected to be a significant contributor to the salinity or trace metals at the creek's receiving water site during the current reporting period.

The variations in chloride at the Neubecks Creek receiving water site, WX22, are used as an indication of the effects of groundwater inflows from Huon Gully, beneath the Lamberts North placement, as well as from the ash itself, as potentially indicated by the recent measurements at bore D20. Those concentrations are compared to the creek background concentrations at LDP1, as well as the concentrations in bore D20 groundwater, near the bottom level of the ash placement, and the upgradient groundwater bores D1 and D9 in Figure 9.

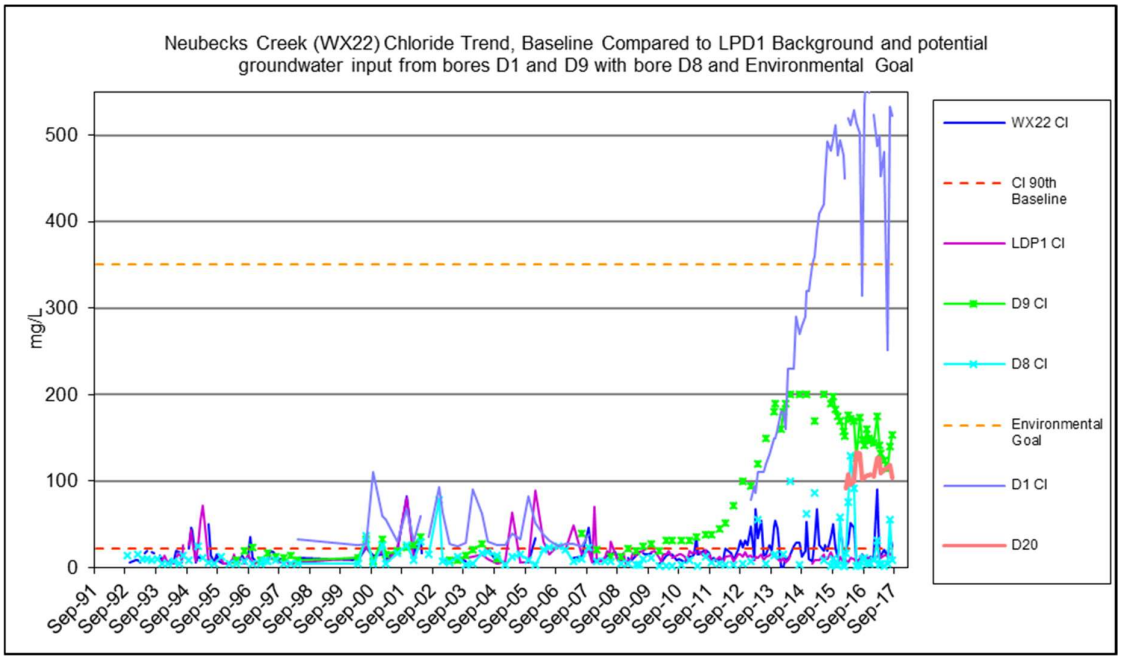

Figure 9. Chloride Trends in Neubecks Creek (WX22) Compared to its 90th percentile baseline, LDP1 background concentrations, D20 groundwater at the bottom level of the ash placement and groundwater receiving water bores MPGM4/D8 and D9, as well as potential input from bore D1 and Environmental Chloride Goal

Figure 9 shows the sharp decrease in chloride at D1, due to the recent heavy rainfall events (Figure 3), which corresponds with the decrease in chloride at bore D10 (Figure 7) and confirms the connection between the chloride plume in Huon Gully with bores D1 and D9. However, Figure 9 shows that the chloride increase at D9 was lower than expected compared, with that at D1, and is consistent with low chloride, local coal mine groundwater inflows of the D9 area. The much lower chloride concentrations in Neubecks Creek appear to reflect the view that most of the flows of

groundwater pass under the creek (Figure 6). In addition, any groundwater that does seep into the creek are diluted by the stream flows as they vary with rainfall runoff.

Table 5: Average Surface Water Quality for Neubecks Creek at Mt Piper Holding Pond Background Licence Discharge LDP01, Lamberts North NC01 Background and the Receiving Water Site WX22 Compared to ANZECC Surface Water Guidelines or Local Goals (including Lamberts North Pre-placement 90th Percentiles)

Element (mg/L)	Neubecks Creek Surface Water Monitoring						Surface Water Guidelines or Goals#
	Mt Piper Holding Pond Background		Lamberts North Ash Placement Background		Surface Water Receiving Water Site		
	Pre-LDP01 Background Oct, 2012 – Aug 2013**	Current LDP01 Sept, 2015 –Aug 2016**	Pre-NC01 Background Oct, 2012 –Aug 2013**	Current NC01 Sept, 2015 –Aug 2016**	Pre-WX22 Background Oct, 2012 – Aug 2013**	Current WX22 Sept, 2015 –Aug 2016**	
pH	7.5	7.9	7.1	6.9	7.3	7.3	6.5 – 8.0
Cond/ (uS/cm)	440	423	310	279	620	471	2200
TDS	290	286	170	187	390	295	1500^
SO4	120	103	73	60	210	119	1000 ++
Cl	12	12	10	11	26	22.4	350 +
As	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.024
B	0.05	0.07	0.05	0.032	0.16	0.053	0.37
Cd	<0.0002	<0.0001	<0.0002	<0.0001	<0.0002	<0.0001	0.00085
Cr	<0.001	0.0014	<0.001	<0.001	<0.001	<0.001	0.002
Cu**	0.016	0.005	0.002	0.002	0.002	0.001	0.0035 **(0.005)!**
Fe*	0.060	0.03	0.06	0.37	0.04	0.117	0.3+++
Mn*	0.034	0.09	0.19	0.36	0.55	0.32	1.9
Mo	<0.01	0.003	0.01	<0.001	<0.01	<0.001	0.01+
F	0.2	0.131	0.16	0.081	0.1	0.12	1.5+++
Ni	0.09	0.006	0.004	0.003	0.023	0.015	0.017 **(0.051)!**
Pb	0.002	0.001	<0.001	<0.001	<0.001	<0.001	0.005
Se	<0.002	<0.001	<0.002	<0.001	<0.002	<0.001	0.005
Zn**	0.045	0.026	0.026	0.009	0.026	0.010	**0.116**

* filtered samples for iron and manganese
** See Attachment 1 for aluminium, copper and zinc tested on filtered samples
^ River salinity from 0.68 x 2200 uS/cm low land river conductivity protection of aquatic life
# ANZECC (2000) guidelines for protection of freshwaters, livestock or irrigation water. Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness: Ca, Mg in Neubecks Creek 19.7, 11.8 mg/L, respectively. Local guidelines using 90th percentile of pre-placement data in **bold**
! Lamberts North pre-placement 90th percentile from October 2012 to August 2013 data at WX22 and NC01 in **parenthesis** (does not apply to LDP01)
+ irrigation water moderately tolerant crops; irrigation. Note: Molybdenum drinking is 0.05 mg/L ++ Livestock +++ drinking water
Highlights: Blue: > ANZECC/local guidelines, Yellow: post-median > 90th pre-placement baseline.

Table 5 summarises the water quality and trace metal characteristics in Neubecks Creek. There were no exceedances of the Local or ANZECC (2000) guideline trigger values at the WX22 receiving water site during the reporting period. All the salinity and chloride concentrations, as well as most of the

trace metal concentrations were lower than the pre-placement concentrations. The upstream site, NC01, for aquatic life monitoring had a minor increase in iron above the local trigger while the creek background site, LDP01, met all the Local or ANZECC (2000) guideline trigger values.

From the above water quality observations, the monitoring of aquatic life in Neubecks Creek, for potential effects of the dry ash placement is summarised in the next Section and discussed in the context of the above water quality monitoring results. The likely effects of the Lamberts North ash placement on aquatic life are then discussed in Section 5.

4.6 Aquatic Life Monitoring in Neubecks Creek

The OEMP requires that at least one pre-placement and two post-placement aquatic life surveys be undertaken in Neubecks Creek for assessment of the potential effects of the Lamberts North water conditioned ash placement.

Cardno (2016) undertook the second post-placement sampling in December, 2015 and found that none of the statistical tests for the spring 2015 data indicated any change through time at NCR1 (upstream of the Lamberts North site and adjacent to Mt Piper) and NCR2 (near the receiving water site WX22) that could conclusively be attributed to an impact of the Lamberts North dry ash placement. A similar finding was found by the first post-placement study (Cardno, 2014).

Sampling for the fourth post-placement period also found no significant effects on the aquatic life. Although the conditions of the OEMP may have been met, EnergyAustralia would not be meeting the requirements under the Lamberts North Conditions of Approval if the Ecological monitoring was ceased.

Due to the consistent findings for three years, no specific mitigation, impact minimisation or ameliorate actions were recommended.

Cardno (2017) recommended further monitoring should be undertaken as planned in spring of 2016, 2017, 2018 and 2019 to maximise the suitability of comparisons among data collected following Project commencement and between these data and baseline data collected in spring 2012. However, further monitoring is unlikely to find any different result for the following reasons presented in Cardno (2017):

1 None of the statistical tests indicated any change in biotic indices from the pre-placement period in 2012/13 to the fourth post-placement period in 2017 at the Neubecks Creek receiving water aquatic life monitoring site NCR2, which is located near WX22, that could be due to an effect of the dry ash placement.

2 Cardno (2017) noted that the lack of significant differences between the upstream and downstream sites in Neubecks Creek for the three post placement periods is due to the prevailing coal mine related inputs to the creek and other catchment related issues. These inputs are most likely the cause of the poor macroinvertebrate conditions, comprising pollution sensitive taxa that have been observed during the December, 2016 and earlier monitoring.

3 Cardno (2016 and 2017) used the default ANZECC/ARMCANZ (2000) 95% Species Protection Trigger Values to compare the trace metal data at the creek water quality sites, rather than use the approved local guidelines for the Lamberts North ash placement, which take into account the mineralised background conditions. The default trigger values are for slightly to moderately modified catchments while Neubucks Creek is a highly modified catchment. The inappropriate use of trigger values is not considered to give a proper

assessment of the potential effects of the Lamberts North ash placement on Neubecks Creek[15].

Cardno (2016 and 2017) has suggested the power generation effects have contributed to the poor conditions in the creek. However, creek water quality monitoring for the Mt Piper Power Station brine conditioned ash placement shows no significant effects on the water quality in the creek.

[15] Cardno (2016) inappropriately compared the trace metal concentrations to the default ANZECC (2000) trigger values, which are based on concentrations of bioavailable dissolved ionic concentrations (eg.,Ni2+) rather than with the approved locally derived trigger values based on total “acid extractable” (unfiltered) trace metal concentrations.

5. Discussion

The investigation of potential effects of the Lamberts North dry ash placement on the local surface and groundwater undertaken during the 2016/17 reporting period, together with the additional groundwater data collected at bore MPGM4/D20 in the Lamberts North embankment, has provided a better understanding of the groundwater processes in the area. From these investigations, it has been indicated that the northern Mt Piper area of the open-cut coal mine void is contributing some trace metals to the southern end of Huon Gully, via the rubble drain, such as boron and nickel, which then flow to bores D1 and D9 downgradient of Huon Gully. These inputs are in addition to those coming from the southern area underground coal mine groundwater, which flows beneath the southern Mt Piper ash placement area into the upper Huon Gully. This inflow is also enhanced with boron and nickel, and apparently from the south-western open-cut coal mine void entering the underground mine through cracks in the coal barrier between the mines.

Investigations have also shown chloride in the groundwater entering the upper Huon Gully is from a source beneath the southern layers of water conditioned and brine conditioned ash (Aurecon, 2017b and c). Examination of the groundwater data for Lamberts North, including bore MPGM4/D20 indicates that the chloride and associated trace metals are diluted as they flow down Huon Gully by lower concentrations in mine water inflows from the western areas. In addition, rainfall runoff from the Mt Piper and Lamberts North ash placements has diluted the chloride and trace metals at the Lamberts North bore, D20, as the runoff seeps into the groundwater beneath the Lamberts North placement. Consequently, the chloride concentrations are significantly reduced and the boron concentration at the receiving groundwater bore, D9, only slightly exceeded the local guideline during both the 2015/16 and 2016/17 reporting periods.

Although there were elevated concentrations of some trace metals in the mine spoil beneath the Lamberts North site, the absence of selenium indicates they were unlikely to be due to the ash placement, but may have come from the compacted mine spoil under the ash. The mine spoil is saturated with groundwater and the elevated concentrations may be due to release from pyrites in the mine spoil. However, with dilution of the groundwater by rainfall runoff seeping into the groundwater beneath the ash layer, the trace metal concentrations have decreased to a lower level and did not significantly affect the trace metals at the down-gradient bores D1 or D9.

The large decrease in chloride from bore D10 to D9 suggests that the water flowing in Neubecks Creek seeps into the groundwater sampled at D9 as it flows under the creek. Consequent to the various enrichments and dilution processes, and the groundwater flows from Huon Gully mostly beneath Neubecks Creek, there were no exceedances of the Local/ANZECC (2000) trigger values at the receiving water site in Neubecks Creek.

Accordingly, as no adverse effects of the Lamberts North site have been identified, no ameliorative measures were indicated.

6. Conclusions

The 2016/17 assessment of effects of the Lamberts North water conditioned dry ash placement on the receiving surface water and groundwater has led to the following conclusions:

1 The effects of the Lamberts North water conditioned ash leachates on groundwater are indicated as low due to limited rainfall infiltration through the compacted ash and dilution as the rainfall runoff seeps into the groundwater under the ash via the retention basin

2 ANZECC (2000) and locally derived guideline trigger values for trace metals, other than mine water related boron and manganese, continued to be met at the groundwater receiving water bore MPGM4/D9

3 The salinity and sulphate at D9 most likely came from a salinity source beneath the water conditioned and brine conditioned ash layers at the southern Mt Piper brine co-placement area. The slight increase in boron appeared to originate from the south-western open-cut mine void entering the southern underground coal mine groundwater through cracks in the coal barrier

4 No exceedances of the local and ANZECC guidelines at D8, other than the commonly low pH for in the area

5 Chloride, salinity and trace metals continued to comply with the local/ANZECC trigger values for the Neubecks Creek receiving water site.

The acceptable levels of water quality and trace metals at WX22 are consistent with the aquatic life study, which found no significant differences in macroinvertebrates at the upstream and downstream sampling sites in Neubecks Creek.

7. Recommendations

From the review of water quality data collected during 2016/17, the following recommendations are made for the water conditioned ash placement at the Lamberts North ash storage area:

As effects of elevated trace metal concentrations in the mine spoil beneath the Lamberts North ash placement on receiving waters appears to be effectively controlled by various low concentration inflows and rainfall runoff, it is recommended to assess the potential benefits of additional rainfall runoff recharge of the local groundwater. This may involve consideration of changes to the management of rainfall runoff as the Lamberts North and Mt Piper ash areas are merged and its re-direction into a recharge area for the upper Huon Gully.

Additional recommendations are:

1 Continue the routine monthly monitoring at all the groundwater bores, including the recently installed bores MPGM4/D23 and D20, as well as at Neubecks Creek, to confirm they meet the requirements of the Operational Environmental Water Management Plan.

2 Consider revision of the groundwater monitoring once the Lamberts North and Mt Piper ash areas are merged and the rainfall runoff arrangements have been modified.

8. References

ANZECC, 1995. Guidelines for Groundwater Protection in Australia. National Water Quality Management Strategy, Commonwealth of Australia. Australian and New Zealand Environmental Conservation Council, ACT.

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Attachment 1

Surface and Groundwater Data for October, 2012 to August, 2015

1. a) Water Quality Data and Summary for Neubecks Creek WX22 and

   b) Mt Piper Power station Licence Discharge Point LDP01 with

   c) Neubecks Creek background site for Lamberts North NC01

2. Water Quality Data and Summary for Mt Piper Groundwater Receiving Water Bores and MPGM4/D8 and MPGM 4/D9

3. Water Quality Data and Summary for Mt Piper Groundwater Seepage Detection Bore MPGM4/D1

4. Water Quality Data and Summary for Mt Piper Ash Placement Area Groundwater Bores MPGM4/D10 and MPGM4/D11

5. Water Quality Data and Summary for Lamberts North Groundwater Bores MPGM4/D15, MPGM4/D16, MPGM4/D17, MPGM4/D18 and MPGM4/D19 with underground coal mine background groundwater bore MPGM4/D23

6. Lamberts North Water Conditioned Ash Runoff Pond Water Quality October, 2012 to July, 2014 for Ponds LN1 and LN2 and mine water seepage (no data for 2015). LN runoff sump 1 and drainage line in 2016.

1. Water Quality Data and Summary for Neubecks Creek WX22 and Lamberts North Power station Licence Discharge Point

1a. Water Quality Data and Summary for Neubecks Creek WX22

Pre-Water conditioned ash Placement - Background Summary Data in Neubecks Creek at WX22 October, 2012 - August, 2013 (mg/L)																					
	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	<0.001	0.11	0.01	68.0	0.001	0.18	0.034		50	0.0002	32		703	0.001		0.003	0.001	0.18	0.07	<0.00005	7	
Maximum	<0.001	0.61	0.01	86.0	0.001	0.47	0.062		83	0.0002	67		1300	0.002		0.009	0.003	0.70	0.32	<0.00005	11	
Minimum	<0.001	0.02	<0.01	51.0	<0.001	0.06	0.016		26	<0.00002	9		330	<0.001		<0.001	<0.001	<0.01	0.02	<0.00005	4	
90th Percentile	<0.001	0.21	0.01	85.0	0.001	0.28	0.058		81	0.0002	54		1100	0.001		0.005	0.002	0.38	0.07	<0.00005	9	
Pre-50th Percentile Trend	<0.001	0.06	0.01	61.0	0.001	0.16	0.032		48	0.0002	26		620	0.001		0.002	0.001	0.10	0.04	<0.00005	6	
ANZECC 2000	0.00005	0.055	0.055		0.024	0.370	0.700			0.00085	350		2200	0.002		0.0035 **(0.005)**		1.5	0.3	0.00006		

Continued…Pre-Water conditioned ash Placement - Background Summary Data in Neubecks Creek at WX22 October, 2012 - August, 2013 (mg/L)																					
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	TDS	TFR	Turbidity	V	Zn	Zn-f	DO	Temp
Average	35	0.83	0.007	48		0.023	<1	<0.5	0.41	0.001	7.2	0.01	0.002	253	455		6.22		0.040	0.012	10.8	
Maximum	63	3.30	0.010	110		0.060	<1	<0.5	0.70	0.003	7.6	0.02	0.002	570	880		31.00		0.190	0.040	15.3	
Minimum	15	0.14	<0.001	22		0.006	<1	<0.5	0.35	<0.001	6.8	<0.001	<0.002	86	210		1.50		0.005	0.005	8.2	
90th Percentile	62	1.50	0.010	76		0.051	<1	<0.5	0.50	0.002	7.5	0.01	0.002	450	800		9.10		0.040	0.022	14.2	
Pre-50th Percentile Trend	31	0.55	0.010	40		0.0155	<1	<0.5	0.35	0.001	7.3	0.01	0.002	210	390		3.60		0.026	0.007	10.1	
ANZECC 2000		1.900	0.010		10.0	0.017 **(0.051)**		0.015	0.250 **(0.55)**	0.005	6.5-8.0	0.020 **(0.030)**	0.005	1000	1500	10.0 **(19.0)**	10.0		0.116			

Neubecks Creek WX22 Water conditioned ash Placement Water Quality Data September 2015 to August 2016																					
Sample Date	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	Cu-f	F	Fe	Hg	K:	Li
28-Sep-16	0.0005	0.28	0.06	54	0.001	0.06	0.018		19.3	0.0001	11.7		290	0.001	0.001	0.001	0.07	0.079	0.00002	4.05	
26-Oct-16	0.0005	0.12	0.005	71	0.001	0.025	0.017		24.7	0.0001	12.4		336	0.001	0.001	0.001	0.093	0.065	0.00002	3.98	
23-Nov-16	0.0005	0.11	0.02	82	0.001	0.025	0.014		22.8	0.0001	8		283	0.001	0.001	0.001	0.121	0.13	0.00002	3.17	
07-Dec-16	0.0005	0.06	0.005	106	0.001	0.025	0.014		31.3	0.0001	12.5		394	0.001	0.001	0.001	0.131	0.199	0.00002	3.1	
18-Jan-17	0.0005	0.13	0.005	137	0.001	0.025	0.016		33.7	0.0001	12.5		464	0.001	0.001	0.001	0.196	0.2	0.00002	3.14	
22-Feb-17	0.0005	0.04	0.005	119	0.001	0.15	0.024		86	0.0001	89.8		1380	0.001	0.001	0.001	0.206	0.047	0.00002	7.72	
22-Mar-17	0.0005	1.83	0.09	50	0.002	0.08	0.026		18	0.0001	10.6		261	0.002	0.005	0.001	0.102	0.152	0.00002	5.34	
05-Apr-17	0.0005	0.29	0.02	87	0.001	0.08	0.018		23.3	0.0001	14.5		348	0.001	0.001	0.001	0.164	0.079	0.00002	5.24	
24-May-17	0.0005	0.1	0.005	72	0.001	0.025	0.018		27.7	0.0001	21.1		393	0.001	0.002	0.001	0.125	0.087	0.00002	6.81	
28-Jun-17	0.0005	0.03	0.005	36	0.001	0.06	0.02		26.1	0.0001	13.1		454	0.001	0.001	0.001	0.063	0.153	0.00002	4.35	
26-Jul-17	0.0005	0.02	0.005	66	0.001	0.06	0.022		33.1	0.0001	37.4		573	0.004	0.001	0.001	0.107	0.126	0.00002	4.59	
23-Aug-17	0.0005	0.02	0.005	66	0.001	0.025	0.018		26.3	0.0001	25		475	0.001	0.001	0.001	0.088	0.091	0.00002	4.51	
28-Sep-16	0.0005	0.28	0.06	54	0.001	0.06	0.018		19.3	0.0001	11.7		290	0.001	0.001	0.001	0.07	0.079	0.00002	4.05	

Continued…Neubecks Creek WX22 Water conditioned ash Placement Water Quality Data September 2016 to August 2017																						
Sample Date	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	TDS	TFR	Turbidity	V	Zn	Zn-f	DO	Temp	Rainfall
28-Sep-16	12	0.047	0.001	14	0.005	0.005	0.01	0.1	0.001	7.27		0.0001	67.6	8.7	191	13.5	0.005	0.005	0.005	11.4	16.5	20.8
26-Oct-16	15	0.079	0.001	16.2	0.005	0.005	0.04	0.3	0.001	7.39		0.0001	78.1	10.5	172	3.8	0.005	0.005	0.005	11.8	14.4	30.9
23-Nov-16	13.1	0.203	0.001	15.1	0.007	0.005	0.06	0.4	0.001	7.33		0.0001	42.7	18.1	175	6.2	0.005	0.005	0.005	9.3	14.3	64.1
07-Dec-16	19.1	0.441	0.001	21.3	0.015	0.005	0.04	0.3	0.001	7.51		0.0001	67.3	18.4	267	2.9	0.005	0.005	0.005	8.8	17.5	113.2
18-Jan-17	22.4	0.745	0.001	29.1	0.024	0.005	0.005	0.3	0.001	7.28		0.0001	80.8	22.6	333	4.5	0.005	0.011	0.006	6.4	17.9	184.2
22-Feb-17	71.8	0.878	0.001	105	0.068	0.005	0.03	0.4	0.001	7.58		0.0001	551	19.5	932	7.1	0.005	0.035	0.025	8.5	17.3	66.2
22-Mar-17	9.47	0.14	0.001	13.4	0.01	0.005	0.04	0.6	0.004	7.15		0.0004	57.9	19	216	195	0.005	0.024	0.005	7.9	15.8	28.1
05-Apr-17	13.8	0.398	0.001	22.8	0.01	0.005	0.005	0.3	0.001	7.21		0.0003	62.3	13.7	302	16.5	0.005	0.005	0.005	9.66	12.6	29
24-May-17	15.6	0.298	0.001	27.8	0.008	0.005	0.03	0.4	0.001	7.35		0.0001	85	9.3	210	7	0.005	0.005	0.005	11.1	11.57	109
28-Jun-17	16.1	0.259	0.001	27.8	0.009	0.005	0.04	0.1	0.001	7.1		0.0001	56.2	7.7	126	1.5	0.005	0.007	0.006	12.1	4.6	24.4
26-Jul-17	22.6	0.226	0.001	30	0.014	0.005	0.005	0.1	0.001	7.11		0.0001	155	4.6	335	2	0.005	0.01	0.008	13	7.85	
23-Aug-17	17.7	0.093	0.001	28.4	0.007	0.005	0.005	0.2	0.001	7.36		0.0001	124	3.4	280	1.4	0.005	0.005	0.005	15	6.1	35
28-Sep-16	12	0.047	0.001	14	0.005	0.005	0.01	0.1	0.001	7.27		0.0001	67.6	8.7	191	13.5	0.005	0.005	0.005	11.4	6.4	21.8

Neubecks Creek WX22 Post- water conditioned ash Placement summary September 2016 - August 2017 (mg/L)																						
	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND µS/cm	Cr	Cu	Cu-f	F	Fe	Hg	K	Ag	
Maximum	0.0005	0.25	0.019	79	0.0011	0.05	0.019		31.0	0.0001	22.4		471	0.001	0.001	0.001	0.122	0.12	0.00002	4.7	0.0005	
Minimum	0.0005	1.83	0.090	137	0.0020	0.15	0.026		86.0	0.0001	89.8		1380	0.004	0.005	0.001	0.206	0.2	0.00002	7.7	0.0005	
50th Percentile	0.0005	0.02	0.005	36	0.0010	0.025	0.014		18.0	0.0001	8.0		261	0.001	0.001	0.001	0.063	0.047	0.00002	3.1	0.0005	
Post-90th Percentile Trend	0.0005	0.105	0.005	72	0.0010	0.0425	0.018		26.2	0.0001	12.8		394	0.001	0.001	0.001	0.114	0.1085	0.00002	4.4	0.0005	

Neubecks Creek WX22 Post- water conditioned ash Placement summary September 2016 - August 2017 (mg/L)																				
	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	TDS		Turbidity	V	Zn	Zn-f	DO	Temp
Average	20.7	0.32	0.001	29.2	0.015	0.005	0.026	0.3	0.001	7.3		0.0001	119	13.0	295	21.8	0.005	0.010	0.007	10.4	
Maximum	71.8	0.878	0.001	105.0	0.068	0.005	0.060	0.6	0.004	7.6		0.0004	551	22.6	932	195.0	0.005	0.035	0.025	15.0	
Minimum	9.5	0.047	0.001	13.4	0.005	0.005	0.005	0.1	0.001	7.1		0.0001	43	3.4	126	1.4	0.005	0.005	0.005	6.4	
90th Percentile	15.9	0.2425	0.001	25.3	0.010	0.005	0.030	0.3	0.001	7.3		0.0001	73	12.1	242	5.4	0.005	0.005	0.005	10.4	
Pre-50th Percentile Trend	22.6	0.71	0.001	29.9	0.023	0.005	0.040	0.4	0.001	7.5		0.0003	152	19.5	335	16.2	0.005	0.023	0.008	12.9	

1b. Water Quality Data and Summary for Mt Piper Power station Licence Discharge Point

Pre-Water conditoned ash Placement - Background summary Data at Mt Piper Power Station Licence Discharge Point LMP01 October, 2012 - August, 2013 (mg/L)																						
Sample Date	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Ave	<0.001	0.43	0.03	80	0.001	0.05	0.030	<0.001	34	0.0002	13		464	0.001		0.016	0.005	0.2	0.06	<0.00005	6	
Max	<0.001	1.10	0.10	91	0.001	0.07	0.041	<0.001	43	0.0003	18		570	0.002		0.07	0.012	0.4	0.34	<0.00005	8	
Min	<0.001	0.13	0.01	52	0.001	0.03	0.022	<0.001	24	<0.00002	8		370	<0.001		0.005	0.001	0.1	<0.01	<0.00005	5	
90th Baseline	<0.001	0.72	0.05	91	0.001	0.06	0.035	<0.001	39	0.0003	16		560	0.001		0.029	0.008	0.3	0.10	<0.00005	7	
Pre-50th Percentile Trend	<0.001	0.4	0.01	81	0.001	0.05	0.029	<0.001	33	0.0002	12		440	0.001		0.008	0.003	0.2	0.02	<0.00005	6.6	
ANZECC 2000	0.00005	0.055	0.055		0.024	0.370	0.700			0.00085	350		2200	0.002		0.0035 **(0.005)**		1.5	0.3	0.00006		

Continued..... Background summary data – Mt Piper Power Station Licence Discharge Point LDP01 October, 2012 – August, 2013 (mg/L)																			
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn
Average	21	0.070	0.007	29		0.009				0.002	7.6	0.028	0.002	128		292	35.9		0.045455
Maximum	31	0.190	0.010	35		0.010				0.008	7.9	0.080	0.002	180		400	100.0		0.070
Minimum	12	0.002	0.002	23		0.006				0.001	7.3	0.010	0.002	90		210	7.3		0.030
90th Percentile	30	0.165	0.01	34		0.010				0.0045	7.9	0.050	0.002	172		380	75.0		0.060
Pre-50th Percentile Trend	21	0.034	0.01	30		0.010				0.0015	7.5	0.020	0.002	120		290	28.0		0.040
ANZECC 2000		1.900	0.010		10.0	0.017 **(0.051)**		0.015	0.250 **(0.55)**	0.005	6.5-8.0	0.020 **(0.030)**	0.005	1000	1500	10.0 **(19.0)**	10.0		0.116

Mt Piper Power Station Licence Discharge Point LDP01 Water conditioned ash Placement Water Quality Data September, 2016 to August, 2017 (mg/L)																						
Date	**Ag**	**Al**	**Al-f**	**ALK**	**As**	**B**	**Ba**	**Be**	**Ca:**	**Cd**	**Cl:**	**Co**	**COND uS/cm**	**Cr**	**Cr-6**	**Cu**	**Cu-f**	**F**	**Fe**	**Hg**	K:	Li
22/09/2016	0.0005	2.25	0.06	52	0.001	0.025	0.029	0.001	18.5	0.0001	7.9		250	0.002	0.002	0.007	0.002	0.087	0.08	0.00002	4.36	
20/10/2016	0.0005	0.45	0.01	87	0.001	0.05	0.023	0.001	32.3	0.0001	13		460	0.001	0.001	0.004	0.002	0.108	0.017	0.00002	5.64	
17/11/2016	0.0005	2.8	0.04	59	0.001	0.09	0.031	0.001	19.1	0.0001	6.57		230	0.002	0.002	0.01	0.002	0.09	0.049	0.00002	4.94	
14/12/2016	0.0005	0.28	0.01	97	0.001	0.025	0.027	0.001	34.8	0.0001	11.3		580	0.001	0.001	0.004	0.002	0.114	0.024	0.00002	5.87	
25/01/2017	0.0005	0.58	0.03	82	0.001	0.025	0.028	0.001	26.7	0.0001	8.08		340	0.001	0.001	0.006	0.003	0.232	0.056	0.00002	5.26	
15/02/2017	0.0005	0.24	0.02	112	0.001	0.14	0.023	0.001	32.9	0.0001	12.7		464	0.001	0.001	0.005	0.002	0.202	0.022	0.00002	6.3	
15/03/2017	0.0005	0.3	0.01	100	0.001	0.07	0.03	0.001	36.5	0.0001	16.3		540	0.001	0.001	0.005	0.003	0.144	0.018	0.00002	6.96	
27/04/2017	0.0005	0.47	0.01	80	0.001	0.16	0.034	0.001	32.8	0.0001	11.3		451	0.001	0.001	0.005	0.003	0.127	0.007	0.00002	5.48	
17/05/2017	0.0005	0.25	0.01	97	0.001	0.025	0.028	0.001	31.3	0.0001	14.1		460	0.001	0.001	0.004	0.002	0.173	0.014	0.00002	6.5	
21/06/2017	0.0005	0.25	0.01	88	0.001	0.025	0.025	0.001	32.8	0.0001	14		430	0.001	0.001	0.005	0.002	0.115	0.022	0.00002	6.13	
19/07/2017	0.0005	0.17	0.01	102	0.001	0.025	0.027	0.001	32.4	0.0001	16.3		490	0.001	0.001	0.003	0.002	0.111	0.013	0.00002	6.59	
16/08/2017	0.0005	0.4	0.01	74	0.001	0.2	0.02	0.001	26.6	0.0001	12.1		380	0.004	0.004	0.006	0.003	0.071	0.03	0.00002	6.22	

Continued.....Mt Piper Power Station Licence Discharge Point LDP1 Water Conditioned Ash Placement Water Quality Data September, 2016 to August, 2017 (mg/L)																				
Date	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f	DO
22/09/2016	10.8	0.064	0.001	11.9	0.01	0.005	0.13	0.8	0.004	7.7		0.0008	71		229	267	0.005	0.048	0.012	10.5
20/10/2016	24.5	0.084	0.001	18.3	0.007	0.005	0.04	0.3	0.001	8		0.0006	130		280	52.9	0.005	0.017	0.0025	10
17/11/2016	11.9	0.035	0.001	15	0.008	0.005	0.11	0.9	0.005	7.7		0.0009	63		276	319	0.005	0.052	0.007	8.7
14/12/2016	25.9	0.047	0.002	24.6	0.004	0.005	0.09	0.4	0.001	7.9		0.0003	130		290	27.2	0.005	0.01	0.0025	7.4
25/01/2017	15.5	0.094	0.003	20.4	0.006	0.005	0.18	0.7	0.001	8.7		0.0006	90		248	47.6	0.005	0.041	0.022	6.2
15/02/2017	20.6	0.06	0.004	26	0.004	0.005	0.06	0.4	0.001	7.91		0.0006	97.4		312	19.5	0.005	0.013	0.0025	7.1
15/03/2017	21.3	0.071	0.003	31.3	0.005	0.005	0.18	0.4	0.001	7.7		0.0006	140		374	38	0.005	0.015	0.0025	7.3
27/04/2017	21.2	0.41	0.003	33.9	0.007	0.005	0.18	0.6	0.001	7.72		0.0006	103		298	50.7	0.005	0.027	0.014	8.5
17/05/2017	19.7	0.082	0.004	32.3	0.003	0.005	0.17	0.7	0.001	7.9		0.0005	110		338	23.8	0.005	0.022	0.013	10.4
21/06/2017	18.4	0.068	0.003	29.9	0.004	0.005	0.15	0.4	0.001	7.9		0.0003	110		252	9.7	0.005	0.021	0.01	11.3
19/07/2017	19.5	0.06	0.004	26.7	0.004	0.005	0.13	0.3	0.001	8.1		0.0003	120		288	7.2	0.005	0.017	0.013	13.5
16/08/2017	13	0.02	0.004	27.9	0.006	0.005	0.2	0.5	0.001	8		0.0004	68		242	33.4	0.005	0.032	0.008	11.5

Mt Piper Power Station Licence Discharge Point LDP01 Post-water conditioned ash Placement Summary September, 2016 to August, 2017 (mg/L)																					
	Ag	Al	Al-f	ALK	As	B	Ba	Ag	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	0.0005	0.70	0.019	86	0.0010	0.07	0.027	0.001	30	0.0001	12.0		423	0.001	0.001	0.005	0.002	0.13	0.02933	0.0	5.9	
Maximum	0.0005	2.8	0.060	112	0.0010	0.2	0.034	0.001	37	0.0001	16.3		580	0.004	0.004	0.010	0.003	0.232	0.08000	0.0	7.0	
Minimum	0.0005	0.17	0.010	52	0.0010	0.025	0.020	0.001	19	0.0001	6.6		230	0.001	0.001	0.003	0.002	0.071	0.00700	0.0	4.4	
50th Percentile	0.0005	0.35	0.010	88	0.0010	0.0375	0.028	0.001	32	0.0001	12.4		456	0.001	0.001	0.005	0.002	0.1145	0.02200	0.0	6.0	
Post-90th Percentile Trend	0.0005	2.08	0.039	102	0.0010	0.16	0.031	0.001	35	0.0001	16.1		535	0.002	0.002	0.007	0.003	0.20	0.05530	0.0	6.6	

Continued……Mt Piper Power Station Licence Discharge Point LDP01 Post-water conditioned ash Placement Summary September, 2016 to August, 2017 (mg/L)																					
	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f	DO	TSS
Average	18.5	0.09	0.003	24.9	0.006	0.005	0.135	0.5	0.002	7.9		0.0005	103		286	74.7	0.005	0.026	0.009	9.4	47.2
Maximum	25.9	0.41	0.004	33.9	0.010	0.005	0.200	0.9	0.005	8.7		0.0009	140		374	319.0	0.005	0.052	0.022	13.5	220.0
Minimum	10.8	0.02	0.001	11.9	0.003	0.005	0.040	0.3	0.001	7.7		0.0003	63		229	7.2	0.005	0.010	0.003	6.2	4.0
50th Percentile	19.6	0.066	0.003	26.4	0.006	0.005	0.140	0.5	0.001	7.9		0.0006	107		284	35.7	0.005	0.022	0.009	9.4	18.0
Post-90th Percentile Trend	24.2	0.09	0.004	32.2	0.008	0.005	0.180	0.8	0.004	8.1		0.0008	130		335	245.6	0.005	0.047	0.014	11.5	148.0

1C. *Water Quality Data and Summary for Neubecks Creek at upstream site NC01*

Neubecks Creek NC01 Pre-water conditioned ash Placement - Background summary Data October, 2012 – August, 2013 (mg/L)																						
	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	<0.001	0.33	0.03	71	0.001	0.04	0.032	<0.001	23	0.0002	10		310	0.001		0.002	0.002	0.16	0.18	<0.00005	4.2	
Maximum	<0.001	0.73	0.08	94	0.001	0.05	0.042	<0.001	40	0.0002	15		540	0.002		0.005	0.003	0.30	0.55	<0.00005	6.3	
Minimum	<0.001	0.06	0.01	34	0.001	0.02	0.024	<0.001	4	<0.00002	5		85	0.000		0.001	0.001	0.10	0.02	<0.00005	2.0	
90th Percentile	<0.001	0.49	0.07	87	0.001	0.05	0.042	<0.001	35	0.0002	13		470	0.001		0.004	0.002	0.21	0.38	<0.00005	6.0	
Pre-50th Percentile Trend	<0.001	0.37	0.02	70	0.001	0.05	0.029	<0.001	24	0.0002	10		310	0.001		0.002	0.002	0.15	0.06	<0.00005	4.0	

Continued……..Neubecks Creek NC01 Pre- water conditioned ash Placement - Background summary Data October, 2012 – August, 2013 (mg/L)																						
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f	Ammonia Nitrogen	DO
Average	14	0.23	0.007	19		0.004	<1	<0.5	0.46	0.001	7.1	0.02	0.002	72		184	15.7		0.022	0.006	<0.1	8.0
Maximum	27	1.00	0.020	27		0.005	<1	<0.5	0.70	0.002	7.4	0.03	0.002	156		280	40.0		0.039	0.012	<0.1	14.3
Minimum	3	0.01	0.005	8		0.003	<1	<0.5	0.35	<0.001	6.5	0.00	<0.002	4		61	5.7		0.005	0.005	<0.1	1.7
90th Percentile	24	0.31	0.010	26		0.005	<1	<0.5	0.55	0.002	7.4	0.03	0.002	130		280	19.0		0.031	0.007	<0.01	11.7
Pre-50th Percentile Trend	14	0.19	0.005	22		0.005	<1	<0.5	0.45	0.001	7.1	0.02	0.002	73		170	17.0		0.026	0.005	<0.01	7.5
ANZECC 2000		1.9	0.010		10.0	0.017 (0.051)			0.250 (0.55)	0.005	6.5-8.0	0.020 (0.030)	0.005	1000		1500			0.116		0.013	

Neubecks Creek Upstream NC01 Water conditioned ash Placement Water Quality Data September, 2016 – August, 2017 (mg/L)																					
Date	Ag	Al	Al-f	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	Cu-f	F	Fe	Hg	K:	Li
21-Sep-16	0.0005	1.52	0.23	41	0.001	0.025	0.028	0.0005	13.6	0.0001	8.22		197	0.001	0.003	0.002	0.005	0.125	0.00002	3.5	
19-Oct-16	0.0005	0.31	0.1	62	0.001	0.025	0.028	0.0005	20.8	0.0001	11.5		299	0.001	0.002	0.001	0.063	0.137	0.00002	4.01	
16-Nov-16	0.0005	1.71	0.14	44	0.001	0.05	0.028	0.0005	11.3	0.0001	6.12		171	0.003	0.006	0.001	0.062	0.171	0.00002	3.34	
14-Dec-16	0.0005	0.41	0.17	61	0.001	0.025	0.03	0.0005	17.8	0.0001	9.16		252	0.001	0.002	0.001	0.089	0.38	0.00002	2.87	
25-Jan-17	0.0005	0.26	0.09	37	0.001	0.025	0.036	0.0005	15.3	0.0001	8.5		232	0.001	0.001	0.001	0.062	0.61	0.00002	2.88	
15-Feb-17	0.0005	0.41	0.13	34	0.001	0.025	0.031	0.0005	6.45	0.0001	10		107	0.001	0.001	0.001	0.049	0.944	0.00002	2.07	
15-Mar-17	0.0005	0.12	0.005	45	0.001	0.025	0.034	0.0005	25.4	0.0001	15.8		379	0.001	0.001	0.001	0.105	0.292	0.00002	5.24	
27-Apr-17	0.0005	0.28	0.05	60	0.001	0.025	0.03	0.0005	15.5	0.0001	9.34		227	0.001	0.001	0.001	0.087	0.639	0.00002	3.24	
17-May-17	0.0005	0.25	0.02	75	0.001	0.025	0.031	0.0005	21.8	0.0001	11.9		341	0.001	0.002	0.001	0.11	0.315	0.00002	5.14	
21-Jun-17	0.002	0.1	0.005	72	0.001	0.08	0.028	0.0005	26.8	0.0001	13.5		358	0.001	0.001	0.001	0.106	0.36	0.00002	4.9	
19-Jul-17	0.0005	0.07	0.005	84	0.001	0.025	0.028	0.0005	24.4	0.0001	14.8		404	0.001	0.002	0.001	0.13	0.239	0.00002	4.93	
16-Aug-17	0.0005	0.11	0.005	71	0.001	0.025	0.028	0.0005	24	0.0004	14		384	0.001	0.002	0.001	0.102	0.185	0.00002	5.08	

Continued…… Neubecks Creek Upstream NC01 Water conditioned ash Placement Water Quality Data September, 2016 – August, 2017 (mg/L)																						
Date	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f	Ammonia Nitrogen	DO
21-Sep-16	7.92	0.015	0.001	10.6	0.004	0.005	0.06	0.6	0.002	7.39		0.0003	41.4		162	113	0.005	0.017	0.008	7.92		10.2
19-Oct-16	14.4	0.083	0.001	13.3	0.003	0.005	0.005	0.3	0.001	7.07		0.0002	63.4		205	12.6	0.005	0.009	0.005	14.4		9.2
16-Nov-16	6.29	0.125	0.001	10.1	0.005	0.005	0.04	0.5	0.002	6.85		0.0004	27.4		221	138	0.005	0.022	0.005	6.29		8.7
14-Dec-16	11.8	0.217	0.001	14.8	0.003	0.005	0.02	0.4	0.001	6.91		0.0001	45.9		192	13.2	0.005	0.005	0.005	11.8		4.9
25-Jan-17	8.65	0.588	0.001	13.9	0.004	0.005	0.02	0.4	0.001	6.51		0.0001	59.8		156	9.6	0.005	0.008	0.005	8.65		3.3
15-Feb-17	3.69	0.661	0.001	7.99	0.002	0.005	0.005	0.5	0.001	6.77		0.0001	3.09		89	19.2	0.005	0.005	0.005	3.69		2.1
15-Mar-17	14.9	0.329	0.001	25.7	0.004	0.005	0.03	0.2	0.001	6.87		0.0001	109		246	8	0.005	0.008	0.005	14.9		5.7
27-Apr-17	8.68	1.34	0.002	17.4	0.005	0.005	0.005	0.3	0.001	6.79		0.0001	29.1		107	15.5	0.005	0.008	0.015	8.68		2.1
17-May-17	12.1	0.372	0.001	26.2	0.003	0.005	0.005	0.5	0.001	7.04		0.0002	72.7		176	11.6	0.005	0.006	0.005	12.1		6.2
21-Jun-17	14.7	0.242	0.001	26.1	0.002	0.005	0.02	0.2	0.001	6.7		0.0001	81.6		238	10.9	0.005	0.005	0.005	14.7		7.2
19-Jul-17	14.6	0.228	0.001	22.2	0.003	0.005	0.01	0.1	0.001	6.99		0.0001	103		241	6.4	0.005	0.008	0.005	14.6		9.3
16-Aug-17	13.4	0.158	0.001	26.4	0.002	0.005	0.005	0.1	0.001	7.08		0.0001	91.1		214	10	0.005	0.005	0.005	13.4		9.8

Neubecks Creek NC01 Post-water conditioned ash Placement Summary Data September, 2015 – August, 2016 (mg/L)																					
	Ag	Al	Al-f	Ca:	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	Cu-f	F	Fe	Hg	K:	Li
Average	0.0006	0.46	0.079	57	0.0010	0.03	0.030	0.001	18.6	0.0001	11.1		279	0.001	0.002	0.001	0.081	0.37	0.00002	3.9	
Maximum	0.0020	1.71	0.230	84	0.0010	0.08	0.036	0.001	26.8	0.0004	15.8		404	0.003	0.006	0.002	0.130	0.944	0.00002	5.2	
Minimum	0.0005	0.07	0.005	34	0.0010	0.025	0.028	0.001	6.5	0.0001	6.1		107	0.001	0.001	0.001	0.005	0.125	0.00002	2.1	
90th Percentile	0.0005	0.27	0.070	61	0.0010	0.025	0.029	0.001	19.3	0.0001	10.8		276	0.001	0.002	0.001	0.088	0.3035	0.00002	3.8	
Pre-50th Percentile Trend	0.0005	1.41	0.167	75	0.0010	0.05	0.034	0.001	25.3	0.0001	14.7		384	0.001	0.003	0.001	0.110	0.64	0.00002	5.1	

Continued…….. Neubecks Creek NC01 Post-water conditioned ash Placement Summary Data September, 2015 – August, 2016 (mg/L)																				
	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Total Nitrogen	Pb	pH	Total Phosphorus	Se	SO4:	Temp	TDS	Turbidity	V	Zn	Zn-f	Ammonia Nitrogen	DO
Average	10.9	0.36	0.001	17.9	0.003	0.005	0.019	0.3	0.001	6.9		0.0002	61		187	30.7	0.005	0.009	0.006		6.6
Maximum	14.9	1.34	0.002	26.4	0.005	0.005	0.060	0.6	0.002	7.4		0.0004	109		246	138.0	0.005	0.022	0.015		10.2
Minimum	3.7	0.015	0.001	8.0	0.002	0.005	0.005	0.1	0.001	6.5		0.0001	3		89	6.4	0.005	0.005	0.005		2.1
90th Percentile	12.0	0.235	0.001	16.1	0.003	0.005	0.015	0.4	0.001	6.9		0.0001	62		199	12.1	0.005	0.008	0.005		6.7
Pre-50th Percentile Trend	14.7	0.65	0.001	26.2	0.005	0.005	0.039	0.5	0.002	7.1		0.0003	102		241	103.6	0.005	0.016	0.008		9.8

2. Water Quality Data and Summary for Mt Piper Groundwater Receiving Water Bores and MPGM4/D8 and MPGM 4/D9

MPGM4/D8 Pre-water conditioned ash Placement - Background summary Data October, 2012 – August, 2013 (mg/L)																					
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li	
Average	<0.001	0.46		0.001	0.063	0.048		78	0.0003	18.3		525	0.001		0.005	0.10	0.17	<0.00005	8.0		
Maximum	<0.001	0.72		0.001	0.180	0.080		180	0.0004	56.0		1200	0.001		0.010	0.10	0.47	<0.00005	20.0		
Minimum	<0.001	0.03		<0.001	0.010	0.032		21	<0.0002	5.0		290	<0.001		0.003	<0.10	<0.01	<0.00005	2.0		
90th Percentile	<0.001	0.71		0.001	0.138	0.068		153	0.0004	41.3		933	0.001		0.009	0.10	0.38	<0.00005	16.1		
Pre-50th Percentile Trend	<0.001	0.55		0.001	0.030	0.040		56	0.0002	6.0		305	0.001		0.003	0.10	0.02	<0.00005	5.0		
ANZECC 2000	<0.001	0.39		0.001	0.025	0.03		37	0.0002	16		480	0.002		0.001	0.2	0.01	<0.00005	3		

Continued……. MPGM4/D8 - Background Summary October, 2012 – August, 2013 (mg/L)																		
	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Average	1.34	0.01	23.3		0.098			0.002	5.9	0.002	216		393		2.1		904.3	0.083
Maximum	4.90	0.01	59.0		0.270			0.003	6.3	0.002	514		940		2.3		904.4	0.160
Minimum	0.06	<0.001	6.0		0.040			<0.001	5.6	<0.002	110		200		2.0		904.1	0.050
90th Percentile	3.50	0.01	47.3		0.201			0.003	6.21	0.002	396		727		2.3		904.4	0.130
Pre-50th Percentile Trend	0.20	0.01	14		0.041			0.002	5.85	0.002	120		215		2.1		904.3	0.060

MPGM4/D8 Water conditioned ash Placement Water Quality Data September, 2016 – August, 2015 (mg/L)

Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
29-Sep-16	0.0005	0.35	8	0.0005	0.07	0.032		15.5	0.0001	11.1		230	0.001	0.002	0.013	0.071	0.00002	1.48	
27-Oct-16	0.0005	0.19	8	0.0005	0.05	0.032		21	0.0001	5.87		302	0.001	0.001	0.019	0.062	0.00002	1.93	
24-Nov-16	0.0005	0.12	7	0.0005	0.025	0.034		21.7	0.0001	5.05		295	0.001	0.001	0.011	0.03	0.00002	1.8	
8-Dec-16	0.0005	0.07	8	0.0005	0.1	0.035		21.8	0.0001	4.31		304	0.001	0.001	0.025	0.023	0.00002	1.81	
19-Jan-17	0.0005	0.12	8	0.0005	0.025	0.04		23.7	0.0001	8.33		366	0.001	0.001	0.018	0.099	0.00002	2.34	
23-Feb-17	0.0005	0.18	12	0.0005	0.14	0.058		47.1	0.0001	30.8		700	0.001	0.001	0.021	0.529	0.00002	4.51	
23-Mar-17	0.0005	0.62	12	0.0005	0.025	0.032		13.2	0.0001	4.2		156	0.001	0.003	0.026	0.215	0.00002	2.45	
6-Apr-17	0.0005	0.53	6	0.0005	0.025	0.032		14.4	0.0001	2.8		221	0.001	0.001	0.02	0.108	0.00002	2.49	
25-May-17	0.0005	0.55	5	0.0005	0.025	0.028		16	0.0001	2.35		217	0.001	0.002	0.017	0.068	0.00002	2.21	
30-Jun-17	0.0005	0.58	7	0.003	0.025	0.031		17.2	0.0001	4.05		261	0.001	0.001	0.015	0.076	0.00002	2.11	
27-Jul-17	0.0005	0.09	23	0.0005	0.13	0.038		50.1	0.0001	54.9		960	0.001	0.001	0.036	0.669	0.00002	5.77	
24-Aug-17	0.0005	0.17	10	0.0005	0.025	0.028		18.8	0.0001	9.26		348	0.001	0.001	0.025	0.034	0.00002	2.25	

Continued….MPGM4/D8 Water conditioned ash Placement Water Quality Data September, 20156– August, 2017 (mg/L)

Date	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
29-Sep-16	11.1	0.052	0.001	4.96	0.029			0.001	5.58	0.0001	89.1		182	0.005	1.9		904.5	0.039
27-Oct-16	15.8	0.184	0.001	9.96	0.036			0.001	5.44	0.0001	118		182	0.005	2		904.4	0.045
24-Nov-16	16.1	0.154	0.001	7.73	0.04			0.001	5.25	0.0001	118		206	0.005	2.1		904.3	0.048
8-Dec-16	17.1	0.526	0.001	7.83	0.076			0.001	5.31	0.0001	125		188	0.005	2.2		904.2	0.053
19-Jan-17	19.6	0.3	0.001	12.4	0.066			0.001	5.34	0.0001	139		332	0.005	2.4		904.0	0.076
23-Feb-17	37	1.21	0.001	38.9	0.114			0.001	5.37	0.0001	283		568	0.005	2.6		903.8	0.117
23-Mar-17	5.85	0.016	0.001	3.75	0.018			0.003	5.74	0.0002	46.3		117	0.005	1.9		904.5	0.031
6-Apr-17	11.1	0.02	0.001	5.69	0.028			0.001	5.26	0.0001	84.3		186	0.005	2.3		904.1	0.036
25-May-17	11.1	0.024	0.001	5.62	0.027			0.001	5.31	0.0001	85.3		169	0.005	2.3		904.1	0.043
30-Jun-17	13.4	0.139	0.001	8.39	0.039			0.001	5.26	0.0001	104		197	0.005	2.4		904.0	0.059
27-Jul-17	41.8	1.8	0.001	59.7	0.1			0.001	5.59	0.0001	388		646	0.005	2.5		903.9	0.109
24-Aug-17	15.9	0.241	0.001	13.5	0.04			0.001	5.34	0.0001	124		222	0.005	2.4		904.0	0.051

MPGM4/D8 – Post-water conditioned ash Summary September, 20136– August, 2017 (mg/L)

	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND uS/cm	Cr	Cu	F	Fe-filtered	Hg	K	Li
Ave	0.0005	0.30	9.5	0.001	0.055	0.035		23.4	0.0001	11.9		363	0.001	0.001	0.02	0.17	0.00002	2.6	
Max	0.0005	0.62	23.0	0.003	0.140	0.058		50.1	0.0001	54.9		960	0.001	0.003	0.04	0.67	0.00002	5.8	
Min	0.0005	0.07	5.0	0.001	0.025	0.028		13.2	0.0001	2.4		156	0.001	0.001	0.01	0.02	0.00002	1.5	
50th Investigation Trigger	0.0005	0.19	8.0	0.001	0.025	0.032		19.9	0.0001	5.5		299	0.001	0.001	0.02	0.07	0.00002	2.2	
Post-90th for Trend	0.0005	0.58	12.0	0.001	0.127	0.040		44.8	0.0001	28.8		667	0.001	0.002	0.03	0.50	0.00002	4.3	

Continued…….. MPGM4/D8 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)

	Mg	Mn-filtered	Mo	Na	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	18.0	0.39	0.001	14.9	0.051			0.001	5.4	0.0001	142		266	0.005	2.3		904.2	0.059
Max	41.8	1.80	0.001	59.7	0.114			0.003	5.7	0.0002	388		646	0.005	2.6		904.5	0.117
Min	5.9	0.02	0.001	3.8	0.018			0.001	5.3	0.0001	46		117	0.005	1.9		903.8	0.031
50th Investigation Trigger	15.9	0.17	0.001	8.1	0.040			0.001	5.3	0.0001	118		193	0.005	2.3		904.1	0.050
Post-90th for Trend	35.3	1.14	0.001	36.4	0.098			0.001	5.6	0.0001	269		544	0.005	2.5		904.5	0.106

2b MPGM4/D9

MPGM4/D9 – Pre-water conditioned ash Background Summary October, 2012 – August, 2013 (mg/L)

	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.06	45	0.002	0.47	0.055		178	0.0002	116		2000	0.001		0.005	0.13	8.26	<0.00005	13.5	
Max	<0.001	0.08	52	0.003	0.56	0.060		210	0.0002	150		2200	0.001		0.009	0.20	18.00	<0.00005	15.0	
Min	<0.001	0.03	40	0.002	0.36	0.044		150	0.0002	94		1700	<0.001		<0.001	<0.10	0.02	<0.00005	13.0	
90th Baseline	<0.001	0.075	50	0.003	0.55	0.059		204	0.0002	141		2170	0.001		0.0075	0.18	15.90	<0.00005	14.4	
Pre-50th for Trend	<0.001	0.055	44	0.002	0.49	0.058		175	0.0002	110		2050	0.001		0.0035	0.10	7.50	<0.00005	13.0	

Continued… .MPGM4/D9 – Pre-water conditioned ash Background Summary October, 2012 – August, 2013 (mg/L)

	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	133	7.73	0.01	135		0.273			0.003	6.1	0.002	1048		1675		1.5		908.1	0.120
Max	170	8.90	0.01	180		0.340			0.004	6.3	0.002	1200		1800		1.7		908.3	0.220
Min	110	6.60	<0.001	100		0.210			0.001	5.8	<0.002	940		1500		1.4		908.0	0.070
90th Baseline	158	8.57	0.01	168		0.328			0.004	6.3	0.002	1170		1800		1.6		908.2	0.184
Pre-50th for Trend	125	7.70	0.01	130		0.270			0.003	6.2	0.002	1025		1700		1.5		908.2	0.096

MPGM4/D9 Water conditioned ash Placement Water Quality Data September, 2016 – August, 2017 (mg/L)

Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
28/09/2016	0.0005	0.005	101	0.002	0.5	0.029		181	0.0001	141		2728	0.001	0.001	0.05	21.6	0.00002	15.4	
26/10/2016	0.0005	0.07	87	0.001	0.52	0.03		224	0.0001	160		2794	0.001	0.001	0.05	6.25	0.00007	14.9	
23/11/2016	0.0005	0.03	91	0.001	0.44	0.034		208	0.0001	150		2722	0.001	0.001	0.1	15.1	0.00013	16.9	
7/12/2016	0.0005	0.08	103	0.002	0.6	0.038		224	0.0002	147		2904	0.001	0.001	0.25	21.3	0.00007	16.5	
18/01/2017	0.0005	0.02	117	0.001	0.76	0.035		220	0.0001	144		2963	0.001	0.001	0.214	18	0.00002	17.6	
22/02/2017	0.0005	0.09	112	0.001	0.78	0.035		214	0.0001	175		2910	0.001	0.001	0.1	19.3	0.00002	19.2	
22/03/2017	0.0005	0.11	115	0.001	0.84	0.037		197	0.0001	142		2910	0.001	0.001	0.072	5.68	0.00012	16.4	
5/04/2017	0.0005	0.05	128	0.001	0.75	0.039		202	0.0001	132		2910	0.001	0.003	0.026	14.3	0.00002	19.5	
24/05/2017	0.0005	0.05	101	0.001	0.84	0.036		216	0.0001	124		2780	0.001	0.001	0.05	1.39	0.00002	19.4	
28/06/2017	0.0005	0.1	82	0.001	0.68	0.032		164	0.0001	114		2420	0.001	0.001	0.05	0.43	0.00002	15.7	
26/07/2017	0.0005	0.05	79	0.001	0.7	0.027		165	0.0002	140		2560	0.001	0.001	0.102	0.63	0.00002	15.2	
23/08/2017	0.0005	0.05	86	0.001	0.66	0.03		178	0.0001	154		2720	0.001	0.001	0.064	2.19	0.00002	15.8	

Continued….MPGM4/D9 Water conditioned ash Placement Water Quality Data September, 2016 – August, 2017 (mg/L)

Date	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
28/09/2016	182.9	10.10	0.001	179.8	0.327			0.001	5.9	0.0001	1409		2193	0.005	1.9		907.8	0.114
26/10/2016	208.0	11.80	0.001	210.0	0.366			0.001	6.0	0.0001	1790		2820	0.005	2.2		908.3	0.146
23/11/2016	156.0	8.74	0.001	142.0	0.280			0.001	5.8	0.0001	1210		1880	0.005	1.4		907.5	0.072
7/12/2016	183.5	10.20	0.001	182.0	0.333			0.001	5.9	0.0001	1400		2135	0.005	2.0		907.7	0.124
18/01/2017	203.7	11.18	0.001	204.4	0.362			0.001	5.9	0.0001	1630		2598	0.005	2.2		908.2	0.145
22/02/2017	182.9	10.10	0.001	179.8	0.327			0.001	5.9	0.0001	1409		2193	0.005	1.9		907.8	0.114
22/03/2017	208.0	11.80	0.001	210.0	0.366			0.001	6.0	0.0001	1790		2820	0.005	2.2		908.3	0.146
5/04/2017	156.0	8.74	0.001	142.0	0.280			0.001	5.8	0.0001	1210		1880	0.005	1.4		907.5	0.072
24/05/2017	183.5	10.20	0.001	182.0	0.333			0.001	5.9	0.0001	1400		2135	0.005	2.0		907.7	0.124
28/06/2017	203.7	11.18	0.001	204.4	0.362			0.001	5.9	0.0001	1630		2598	0.005	2.2		908.2	0.145
26/07/2017	182.9	10.10	0.001	179.8	0.327			0.001	5.9	0.0001	1409		2193	0.005	1.9		907.8	0.114
23/08/2017	208.0	11.80	0.001	210.0	0.366			0.001	6.0	0.0001	1790		2820	0.005	2.2		908.3	0.146

MPGM4/D9 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L

Date	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
Ave	0.0005	0.06	100	0.001	0.673	0.034		199	0.0001	143.6		2777	0.001	0.001	0.09	10.51	0.00005	16.9	
Max	0.0005	0.11	128	0.002	0.840	0.039		224	0.0002	175.0		2963	0.001	0.003	0.25	21.60	0.00013	19.5	
Min	0.0005	0.01	79	0.001	0.440	0.027		164	0.0001	114.0		2420	0.001	0.001	0.03	0.43	0.00002	14.9	
50th Percentile	0.0005	0.05	101	0.001	0.690	0.035		205	0.0001	143.0		2787	0.001	0.001	0.07	10.28	0.00002	16.5	
Post-90th Percentile Trend	0.0005	0.10	117	0.002	0.834	0.038		224	0.0002	159.4		2910	0.001	0.001	0.20	21.10	0.00012	19.4	

Continued……. MPGM4/D9 – Post-water conditioned ash Summary September, 2016– August, 2017 (mg/L)

Date	Mg	Mn-filtered	Mo	Na	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	182.9	10.10	0.001	179.8	0.327			0.001	5.9	0.0001	1409		2193	0.005	1.9		907.8	0.114
Max	208.0	11.80	0.001	210.0	0.366			0.001	6.0	0.0001	1790		2820	0.005	2.2		908.3	0.146
Min	156.0	8.74	0.001	142.0	0.280			0.001	5.8	0.0001	1210		1880	0.005	1.4		907.5	0.072
50th Percentile	183.5	10.20	0.001	182.0	0.333			0.001	5.9	0.0001	1400		2135	0.005	2.0		907.7	0.124
Post-90th Percentile Trend	203.7	11.18	0.001	204.4	0.362			0.001	5.9	0.0001	1630		2598	0.005	2.2		908.2	0.145

3. Water Quality Data and Summary for Groundwater Seepage Detection Bore MPGM4/D1

MPGM4/D1 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.07	108	0.013	1.8	0.038		254	0.0002	101		2300	0.001		0.011	0.10	18.0	<0.00005	18	
Max	<0.001	0.36	130	0.017	2.1	0.045		290	0.0002	130		2400	0.002		0.073	0.1	37	<0.00005	19	
Min	<0.001	0.01	92	0.011	1.6	0.032		220	<0.0002	69		2100	0.001		0.001	0.1	5.3	<0.00005	16	
90th Baseline	<0.001	0.157	130	0.0162	1.94	0.0434		282	0.0002	122		2400	0.0013		0.0254	0.1	33	<0.00005	19	
Pre-50th Trend	<0.001	0.03	100	0.012	1.80	0.038		260	0.0002	110		2400	0.001		0.0025	0.1	17.0	<0.00005	18	

Continued..... MPGM4/D1 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	177	10	0.007	126		0.53			0.001	6.2	0.002	1289		2189		2.1		910.5	0.047
Max	200	12	0.010	150		0.62			0.004	6.3	0.002	1400		2500		2.5		910.8	0.065
Min	150	8.5	<0.001	100		0.43			0.001	6.1	<0.002	1100		1900		1.8		910.1	0.030
90th Baseline	200	11.2	0.01	142		0.604			0.0022	6.3	0.002	1400		2420		2.4		910.8	0.061
Pre-50th Trend	180	10.0	0.010	130		0.52			0.001	6.1	0.002	1300		2200		2.0		910.6	0.048

MPGM4/D1 Water conditioned ash Placement Water Quality Data September, 2016 – August, 2017 (mg/L)																			
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND µS/cm	Cr	Cu	F	Fe-filtered	Hg	K	Li
28/09/2016	0.0005	0.63	97	0.009	2.19	0.043		417	0.0001	535		5091	0.001	0.001	0.1	36.6	0.00002	40.6	0.0005
26/10/2016	0.0005	0.38	148	0.012	2.24	0.034		419	0.0001	586		5332	0.001	0.001	0.1	34.3	0.00002	33.9	0.0005
23/11/2016	0.0005	0.13	124	0.01	1.84	0.032		433	0.0001	549		5177	0.001	0.001	0.1	37.2	0.00002	42.6	0.0005
7/12/2016	0.0005	0.18	130	0.008	2.28	0.032		409	0.0001	560		5183	0.001	0.001	0.25	38	0.00002	37.1	0.0005
18/01/2017	0.0005	0.37	135	0.01	2.12	0.034		404	0.0001	523		5016	0.001	0.001	0.066	42.6	0.00002	36.3	0.0005
22/02/2017	0.0005	0.14	136	0.01	2.09	0.033		385	0.0001	488		4900	0.001	0.001	0.084	41.9	0.00002	41	0.0005
22/03/2017	0.0005	0.04	137	0.008	2.18	0.029		355	0.0001	500		4790	0.001	0.001	0.078	20.2	0.00002	32.6	0.0005
5/04/2017	0.0005	0.27	150	0.01	1.76	0.032		345	0.0001	452		4610	0.001	0.001	0.051	27.9	0.00002	39.3	0.0005
24/05/2017	0.0005	0.76	151	0.01	1.83	0.029		361	0.0001	480		4680	0.001	0.001	0.1	42.4	0.00002	38	0.0005
28/06/2017	0.0005	0.005	143	0.022	1.91	0.033		361	0.0001	252		4740	0.001	0.001	0.1	38.6	0.00002	40.8	0.0005
26/07/2017	0.0005	0.46	155	0.012	2.02	0.042		359	0.0002	533		4970	0.002	0.002	0.087	42.1	0.00002	33.3	0.0005
23/08/2017	0.0005	0.18	188	0.009	2.00	0.034		389	0.0001	522		5290	0.001	0.001	0.1	41.7	0.00002	37	0.0005

Continued….MPGM4/D1 Water conditioned ash Placement Water Quality Data September, 2016 – August, 2017 (mg/L)																		
Date	Mg	Mn-filtered	Mo	Na	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
28/09/2016	289	16.8	0.001	385	1.09			0.0005	5.87	0.0002	2530		4050	0.005	1.7		910.9	0.139
26/10/2016	286	17.5	0.001	464	1.17			0.0005	5.87	0.0001	2480		4040	0.005	1.9		910.7	0.145
23/11/2016	301	15.8	0.001	419	1			0.0005	5.91	0.0001	2210		4140	0.005	1.9		910.7	0.123
7/12/2016	296	16.7	0.001	451	1.07			0.0005	5.88	0.0001	2380		4140	0.005	2.1		910.5	0.129
18/01/2017	290	16	0.001	468	1.09			0.0005	5.9	0.0001	2230		4550	0.005	2.3		910.3	0.133
22/02/2017	279	14.1	0.001	428	1.03			0.0005	5.86	0.0001	2100		4350	0.005	2.7		909.9	0.124
22/03/2017	255	14.8	0.001	408	0.962			0.0005	5.84	0.0001	2000		3480	0.005	2.8		909.8	0.109
5/04/2017	252	13.4	0.001	406	0.858			0.0005	5.86	0.0002	1900		3870	0.005	2.7		909.9	0.108
24/05/2017	257	13.8	0.001	392	0.877			0.0005	5.86	0.0001	2120		3450	0.005	2.8		909.8	0.101
28/06/2017	263	14.8	0.001	408	0.922			0.0005	5.89	0.0001	1100		3780	0.005	2.9		909.7	0.103
26/07/2017	261	14.1	0.001	426	0.925			0.001	5.87	0.0002	2230		4240	0.005	2.4		910.2	0.113
23/08/2017	281	15.6	0.001	455	0.972			0.0005	5.8	0.0001	2210		4490	0.005	2.8		909.8	0.113

MPGM4/D1 – Post-water conditioned ash Summary September, 2016– August, 2017 (mg/L)																			
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND mS/m	Cr	Cu	F	Fe-filtered	Hg	K	Li
Ave	0.0005	0.30	141	0.011	2.04	0.034		386	0.0001	498		4982	0.0011	0.0011	0.10	36.96	0.00002	37.7	
Max	0.0005	0.76	188	0.022	2.28	0.043		433	0.0002	586		5332	0.0020	0.0020	0.25	42.60	0.00002	42.6	
Min	0.0005	0.01	97	0.008	1.76	0.029		345	0.0001	252		4610	0.0010	0.0010	0.05	20.20	0.00002	32.6	
50th Investigation Trigger	0.0005	0.23	140	0.010	2.06	0.033		387	0.0001	523		4993	0.0010	0.0010	0.10	38.30	0.00002	37.6	
Post-90th for Trend	0.0005	0.61	155	0.012	2.24	0.041		419	0.0001	559		5279	0.0010	0.0010	0.10	42.37	0.00002	41.0	

Continued..... MPGM4/D1 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)																		
Date	Mg	Mn-filtered	Mo	Na	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	276	15.3	0.001	426	0.997			0.001	5.9	0.0001	2124		4048	0.005	2.4		910.2	0.120
Max	301	17.5	0.001	468	1.170			0.001	5.9	0.0002	2530		4550	0.005	2.9		910.9	0.145
Min	252	13.4	0.001	385	0.858			0.001	5.8	0.0001	1100		3450	0.005	1.7		909.7	0.101
50th Investigation Trigger	280	15.2	0.001	423	0.986			0.001	5.9	0.0001	2210		4095	0.005	2.6		910.1	0.118
Post-90th for Trend	295	16.8	0.001	463	1.090			0.001	5.9	0.0002	2470		4476	0.005	2.8		910.7	0.138

4. Water Quality Data and Summary for Ash Placement Area Groundwater Bores MPGM4/D10 and MPGM4/D11

MPGM4/D10 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)

Date	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	1.06	32	0.001	3.46	0.024		308	0.005	382		4533	0.001		0.012	1.7	3.71	<0.00005	88	
Max	<0.001	1.90	44	0.001	5.10	0.035		380	0.008	480		5500	0.002		0.028	2.5	11.00	<0.00005	110	
Min	<0.001	0.63	13	<0.001	1.90	0.018		230	0.004	220		3100	0.001		0.001	1.4	0.38	<0.00005	54	
90th Baseline	<0.001	1.34	40	0.001	4.86	0.031		348	0.007	472		5180	0.002		0.026	2.0	7.64	<0.00005	102	
Pre-50th for Trend	<0.001	1.00	34	0.001	3.50	0.023		320	0.005	390		4600	0.001		0.005	1.6	2.50	<0.00005	92	
ANZECC 2000	0.00005	0.055		0.024	0.37 (0.55)	0.700			0.002	350		2600	0.005		0.005 (0.0075)	1.50	0.664 (15.9)	0.00006		

Continued……. MPGM4/D10 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)

Date	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	208	7.3	0.007	623		0.69			0.007	5.6	0.007	2456		4267		13.5		912.6	1.333
Max	270	8.9	0.01	780		0.82			0.015	5.9	0.010	2900		5100		13.8		913.3	1.700
Min	140	4.5	0.001	390		0.46			0.003	5.4	0.004	1800		2700		12.8		912.3	1.000
90th Baseline	254	8.9	0.01	756		0.80			0.009	5.7	0.010	2820		5100		13.7		913.0	1.700
Pre-50th for Trend	210	7.7	0.01	620		0.69			0.005	5.6	0.007	2600		4500		13.6		912.5	1.200
ANZECC		5.704(8.57)	0.010		10.0	0.5509			0.005	6.5 -8.0	0.005	1000(1170)		2000					0.908

MPGM4/D10 Water conditioned ash Placement Water Quality Data September, 2015 – August, 2016 (mg/L)

Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
29-Sep-16	0.0005	0.1	87	0.001	1.68	0.016		179	0.0028	342		4820	0.002	0.001	13.4	0.1	0.00002	92.5	
27-Oct-16	0.0005	0.1	87	0.001	2.81	0.018		299	0.0052	622		7286	0.0005	0.0005	12.7	0.25	0.00002	125	
24-Nov-16	0.0005	0.07	89	0.001	2.6	0.017		262	0.005	638		7620	0.0005	0.0005	9.65	0.567	0.00002	141	
7-Dec-16	0.0005	0.08	89	0.001	3.52	0.017		290	0.0059	722		8258	0.0005	0.0005	11	0.325	0.00002	142	
19-Jan-17	0.0005	0.1	98	0.001	3.94	0.016		314	0.0066	830		9242	0.0005	0.0005	7.6	0.785	0.00002	172	
23-Feb-17	0.0005	0.11	104	0.001	4.53	0.019		346	0.0085	959		10630	0.0005	0.002	4.96	0.578	0.00002	209	
22-Mar-17	0.0005	0.1	96	0.001	5.02	0.016		352	0.0081	1070		11130	0.0005	0.0005	1.67	0.444	0.00002	206	
5-Apr-17	0.0005	0.09	104	0.001	3.38	0.015		307	0.0069	890		10360	0.0005	0.0005	4.1	0.684	0.00002	218	
25-May-17	0.0005	0.09	90	0.001	4.11	0.016		349	0.008	982		10880	0.0005	0.002	1.75	0.62	0.00002	208	
29-Jun-17	0.0005	0.09	92	0.001	3.86	0.017		306	0.0077	949		10080	0.0005	0.0005	2.55	0.687	0.00002	209	
26-Jul-17	0.0005	0.09	77	0.0005	2.62	0.015		233	0.0043	675		8000	0.0005	0.0005	0.435	8.95	0.00002	142	
23-Aug-17	0.0005	0.08	82	0.0005	2.2	0.018		232	0.0046	545		7530	0.0005	0.0005	0.33	9.99	0.00002	126	

Continued….MPGM4/D10 Water conditioned ash Placement Water Quality Data September, 2015 – August, 2016 (mg/L)

Date:	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
9-Sep-15	161	4.35	0.0005	627	0.574			0.002	5.65	0.0012	2160		3920	0.005	13.2		912.9	0.957
15-Oct-15	258	6.61	0.0005	1190	0.914			0.004	5.59	0.0022	3480		6060	0.005	13.7		912.4	1.31
11-Nov-15	288	6.34	0.0005	1150	0.797			0.004	5.69	0.0023	3630		6530	0.005	13.7		912.4	1.05
23-Dec-15	316	7.41	0.0005	1320	0.985			0.004	5.65	0.0029	4000		7190	0.005	14		912.1	1.22
14-Jan-16	358	7.98	0.0005	1570	0.976			0.004	5.62	0.0033	4530		8150	0.005	14.3		911.8	1.15
25-Feb-16	424	8.72	0.0005	1760	1.14			0.006	5.56	0.0036	5040		9140	0.005	14.7		911.4	1.25
23-Mar-16	428	9.55	0.002	2110	1.12			0.004	5.64	0.0038	5760		9190	0.005	14.9		911.2	1.2
14-Apr-16	396	8.49	0.001	1500	0.941			0.006	5.58	0.0035	4810		8890	0.005	14.6		911.5	1.02
25-May-16	423	8.64	0.0005	1800	1.04			0.005	5.51	0.0043	5340		9630	0.005	14.9		911.2	1.09
23-Jun-16	384	8.37	0.0005	1710	0.948			0.004	5.55	0.0037	5860		8460	0.005	14.8		911.3	1
27-Jul-16	256	5.71	0.002	1250	0.699			0.003	5.54	0.0021	3740		6590	0.005	14.4		911.7	0.893
24-Aug-16	241	5.37	0.0005	1270	0.702			0.003	5.48	0.002	3450		6240	0.005	14.2		911.9	0.861

MPGM4/D10 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)

Date	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
Ave	0.0005	0.09	91	0.001	3.36	0.017		289	0.0061	769		8820	0.0006	0.0008	5.85	2.00	0.00002	165.9	
Max	0.0005	0.11	104	0.001	5.02	0.019		352	0.0085	1070		11130	0.0020	0.0020	13.40	9.99	0.00002	218.0	
Min	0.0005	0.07	77	0.001	1.68	0.015		179	0.0028	342		4820	0.0005	0.0005	0.33	0.10	0.00002	92.5	
50th Investigation Trigger	0.0005	0.09	90	0.001	3.45	0.017		303	0.0063	776		8750	0.0005	0.0005	4.53	0.60	0.00002	157.0	
Post-90th for Trend	0.0005	0.10	103	0.001	4.49	0.018		349	0.0081	980		10855	0.0005	0.0019	12.53	8.13	0.00002	209.0	

Continued……. MPGM4/D10 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)

Date	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	328	7.3	0.001	1438	0.903			0.004	5.6	0.0029	4317		7499	0.005	14.3		911.8	1.083
Max	428	9.6	0.002	2110	1.140			0.006	5.7	0.0043	5860		9630	0.005	14.9		912.9	1.310
Min	161	4.4	0.001	627	0.574			0.002	5.5	0.0012	2160		3920	0.005	13.2		911.2	0.861
50th Investigation Trigger	337	7.7	0.001	1410	0.945			0.004	5.6	0.0031	4265		7670	0.005	14.4		911.7	1.070
Post-90th for Trend	424	8.7	0.002	1796	1.112			0.006	5.7	0.0038	5718		9185	0.005	14.9		912.4	1.247

MPGM4/D11 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
Date	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cr-6	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.11	737	0.003	1.02	0.833		207	0.0002	227		2278	0.003		0.005	0.53	0.07	<0.00005	54	
Max	<0.001	0.29	900	0.008	2.30	1.400		340	0.0002	270		3200	0.005		0.015	0.80	0.28	<0.00005	61	
Min	<0.001	0.01	200	0.001	0.66	0.350		170	<0.0002	210		1800	0.001		0.001	0.20	0.01	<0.00005	45	
90th Baseline	<0.001	0.21	892	0.007	1.74	1.080		292	0.0002	238		2880	0.004		0.011	0.73	0.16	<0.00005	59	
Pre-50th for Trend	<0.001	0.07	840	0.001	0.78	0.850		180	0.0002	220		2100	0.003		0.004	0.50	0.03	<0.00005	55	

Continued……. MPGM4/D11 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																		
Date	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	94	2.2	0.008	221		0.055			0.005	7.1	0.002	345		1433		25.1		912.4	0.045
Max	170	11.0	0.010	290		0.140			0.024	7.6	0.002	1700		2100		25.8		914.0	0.080
Min	76	0.2	<0.001	200		0.030			0.001	6.4	0.002	10		1200		23.5		911.7	0.014
90th Baseline	138	7.6	0.010	242		0.100			0.011	7.3	0.002	1036		1620		25.64		912.9	0.080
Pre-50th for Trend	77	0.4	0.010	210		0.039			0.002	7.2	0.002	110		1400		25.2		912.3	0.040

MPGM4/D11 Water conditioned ash Placement Water Quality Data September, 2016 – August, 2017 (mg/L)																			
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND µS/cm	Cr	Cu	F	Fe-filtered	Hg	K	Li
29-Sep-16	0.0005	0.02	96	0.008	2.96	0.022		574	0.0001	798		8604	0.003	0.001	0.25	61.4	0.00002	98.2	
27-Oct-16	0.0005	0.06	163	0.008	2.97	0.037		567	0.0001	814		8488	0.002	0.001	0.25	69.8	0.00002	80.1	
24-Nov-16	0.0005	0.005	105	0.008	2.49	0.019		610	0.0001	845		8700	0.001	0.001	0.25	75.1	0.00002	99.5	
7-Dec-16	0.0005	0.02	119	0.006	3.32	0.024		594	0.0001	884		8920	0.001	0.001	0.5	78.4	0.00002	88.2	
19-Jan-17	0.0005	0.01	124	0.008	3.09	0.022		618	0.0001	903		9180	0.001	0.001	0.25	67.5	0.00002	86.4	
23-Feb-17	0.0005	0.005	110	0.008	2.92	0.02		602	0.0001	943		9150	0.001	0.001	0.107	62.9	0.00002	107	
22-Mar-17	0.0005	0.005	119	0.006	3.16	0.019		578	0.0001	965		9470	0.001	0.001	0.286	39.7	0.00002	94.5	
5-Apr-17	0.0005	0.005	127	0.008	2.33	0.018		554	0.0001	903		9320	0.001	0.001	0.5	64.1	0.00002	101	
25-May-17	0.0005	0.005	132	0.006	3.26	0.015		617	0.0001	942		9640	0.001	0.001	0.25	81.6	0.00002	126	
29-Jun-17	0.0005	0.01	135	0.012	2.79	0.018		605	0.0001	956		9260	0.001	0.001	0.1	93.5	0.00002	116	
27-Jul-17	0.0005	0.005	150	0.01	2.83	0.018		578	0.00005	977		9620	0.0005	0.0005	0.084	107	0.00002	89.6	
24-Aug-17	0.0005	0.005	208	0.01	2.66	0.019		537	0.00005	864		9620	0.0005	0.0005	0.085	102	0.00002	88.1	

Continued….MPGM4/D11 Water conditioned ash Placement Water Quality Data September, 2016 – August, 2017 (mg/L)																		
Date	Mg	Mn-filtered	Mo	Na	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
29-Sep-16	355	17.7	0.0005	1000	0.846			0.0005	6.18	0.0003	4270		7220	0.005	24.6		912.8	0.118
27-Oct-16	346	17.5	0.0005	1170	0.866			0.0005	6.17	0.0001	4180		7650	0.005	25.1		912.3	0.11
24-Nov-16	382	16.3	0.0005	1080	0.819			0.0005	6.19	0.0001	4370		7930	0.005	25.1		912.3	0.104
7-Dec-16	384	16.3	0.0005	1180	0.895			0.0005	6.25	0.0002	4560		7250	0.005	25.4		912.0	0.12
19-Jan-17	400	19.3	0.0005	1310	0.962			0.0005	6.29	0.0002	4580		8440	0.005	25.8		911.6	0.117
23-Feb-17	398	15.7	0.0005	1250	0.937			0.0005	6.14	0.0003	4710		8760	0.005	26.1		911.3	0.137
22-Mar-17	396	18.6	0.0005	1430	1.01			0.0005	6.06	0.0002	4910		8850	0.005	26.5		910.9	0.137
5-Apr-17	402	16.4	0.0005	1070	0.862			0.0005	6.11	0.0003	4620		6460	0.005	26		911.4	0.118
25-May-17	423	17	0.0005	1330	0.966			0.0005	6.1	0.0003	4820		8990	0.005	26.3		911.1	0.145
29-Jun-17	406	17.8	0.0005	1280	0.928			0.0005	6.15	0.0002	5430		7180	0.005	25.3		912.1	0.149
27-Jul-17	388	16.5	0.002	1260	0.913			0.0005	6.12	0.0002	4590		8730	0.005	26		911.4	0.139
24-Aug-17	393	17	0.0005	1400	0.886			0.0005	6.11	0.0001	4530		8120	0.005	25.8		911.6	0.14

MPGM4/D11 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)																			
Date	Ag	Al	ALK	As	B	Ba	Be	Ca	Cd	Cl	Co	COND uS/cm	Cr	Cu	F	Fe-filtered	Hg	K	Li
Ave	0.0005	0.01	132	0.008	2.90	0.021		586	0.0001	900		9164	0.0012	0.0009	0.24	75.25	0.00002	97.9	
Ave	0.0005	0.06	208	0.012	3.32	0.037		618	0.0001	977		9640	0.0030	0.0010	0.50	107.00	0.00002	126.0	
Max	0.0005	0.01	96	0.006	2.33	0.015		537	0.0001	798		8488	0.0005	0.0005	0.08	39.70	0.00002	80.1	
Min	0.0005	0.01	126	0.008	2.94	0.019		586	0.0001	903		9220	0.0010	0.0010	0.25	72.45	0.00002	96.4	
50th Investigation Trigger	0.0005	0.02	162	0.010	3.25	0.024		616	0.0001	964		9620	0.0019	0.0010	0.48	101.15	0.00002	115.1	
Post-90th for Trend	0.0005	0.01	132	0.008	2.90	0.021		586	0.0001	900		9164	0.0012	0.0009	0.24	75.25	0.00002	97.9	

Continued……. MPGM4/D11 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)																		
Date	Mg	Mn-filtered	Mo	Na	Ni	NO2	NO3	Pb	pH	Se	SO4	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	389	17.2	0.001	1230	0.908			0.001	6.2	0.0002	4631		7965	0.005	25.7		911.7	0.128
Max	423	19.3	0.002	1430	1.010			0.001	6.3	0.0003	5430		8990	0.005	26.5		912.8	0.149
Min	346	15.7	0.001	1000	0.819			0.001	6.1	0.0001	4180		6460	0.005	24.6		910.9	0.104
50th Investigation Trigger	395	17.0	0.001	1255	0.904			0.001	6.1	0.0002	4585		8025	0.005	25.8		911.6	0.129
Post-90th for Trend	406	18.5	0.001	1393	0.966			0.001	6.2	0.0003	4901		8841	0.005	26.3		912.3	0.145

5. **Lamberts North Groundwater Bores MPGM4/D19 and D20 with underground coal mine background groundwater bore MPGM4/D23**

MPGM4/D19 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	0.55	25.0	0.001	1.35	0.021		226	0.0006	186		2836	0.003	0.009	0.06	0.07	<0.00005	31	
Max	<0.001	2.70	25.0	0.002	1.60	0.030		250	0.0009	214		3000	0.004	0.017	0.10	0.63	<0.00005	35	
Min	<0.001	0.06	<25	<0.001	1.20	0.016		210	0.0003	160		2600	0.002	0.002	0.05	0.01	<0.00005	27	
90th Baseline	<0.001	0.74	25.0	0.002	1.50	0.027		250	0.0007	200		2900	0.004	0.015	0.06	0.03	<0.00005	34	
Pre-50th for Trend	<0.001	0.31	25.0	0.001	1.30	0.020		230	0.0006	190		2800	0.002	0.009	0.05	0.01	<0.00005	30	

Continued……. MPGM4/D19 – Pre-water conditioned ash Summary October, 2012 – August, 2013 (mg/L)																		
	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	159	0.54	0.004	306	0.23			0.005	6.1	0.002	1513		2445		7.6		910.0	0.58
Max	170	1.30	0.005	340	0.33			0.012	6.3	0.002	1600		2800		8.2		910.5	0.94
Min	140	0.11	0.0005	260	0.14			0.003	5.7	<0.002	1400		2100		7.1		909.4	0.35
90th Baseline	170	0.9	0.005	320	0.3			0.008	6.3	0.002	1600		2700		8.0		910.3	0.733
Pre-50th for Trend	159	0.54	0.004	306	0.23			0.005	6.1	0.002	1513		2445		7.6		910.0	0.58

MPGM4/D19 Water conditioned ash data September, 2016 – August, 2017 (mg/L)																			
Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
29-Sep-16	0.0005	0.38	125	0.003	2.04	0.016		213	0.0001	332		4744	0.008	0.001	0.05	22.3	0.00002	49	
26-Oct-16	0.0005	0.52	141	0.005	2	0.02		252	0.0001	354		4785	0.007	0.002	0.1	18.6	0.00002	40.4	
23-Nov-16	0.0005	0.38	120	0.004	1.76	0.031		238	0.0001	346		4773	0.006	0.002	0.1	18.8	0.00002	51.9	
07-Dec-16	0.0005	0.73	126	0.005	2.17	0.029		258	0.0001	361		4926	0.008	0.002	0.25	19	0.00002	46.6	
18-Jan-17	0.0005	2.72	128	0.017	2.1	0.079		279	0.0001	384		5228	0.046	0.019	0.12	17.3	0.00002	48.4	
23-Feb-17	0.0005	4.8	112	0.017	2.37	0.099		311	0.0001	492		5640	0.036	0.03	0.11	26.5	0.00006	65	
23-Mar-17	0.0005	3.77	114	0.017	2.72	0.105		314	0.0001	477		6080	0.101	0.026	0.091	22.7	0.00005	57.2	
06-Apr-17	0.0005	1.74	129	0.008	1.98	0.05		333	0.0002	480		6170	0.037	0.01	0.118	29.6	0.00002	67.2	
24-May-17	0.0005	1.74	111	0.011	2.68	0.055		366	0.0002	549		6630	0.021	0.014	0.1	34.1	0.00002	82.2	
30-Jun-17	0.0005	1.5	126	0.01	2.84	0.05		363	0.0003	579		6810	0.046	0.015	0.1	35	0.00006	83	
26-Jul-17	0.0005	1.35	121	0.01	2.88	0.057		346	0.0004	600		7120	0.048	0.011	0.098	33.3	0.00002	66.1	
23-Aug-17	0.0005	2.18	150	0.01	2.86	0.061		323	0.0002	563		7070	0.122	0.012	0.25	36.9	0.00002	66.8	

Continued……. MPGM4/D19 Water conditioned ash data September, 2016 – August, 2017 (mg/L)																		
Date:	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
29-Sep-16	179	10	0.001	567		0.757			0.003	6.03	0.0002	2400		3700	0.005	9.1		908.5
26-Oct-16	182	10.4	0.001	685		0.776			0.006	5.97	0.0002	2250		3300	0.005	9.2		908.4
23-Nov-16	197	10.4	0.001	605		0.767			0.006	5.95	0.0003	2220		3560	0.005	9.2		908.4
07-Dec-16	207	10.5	0.001	683		0.856			0.008	5.97	0.0002	2340		3290	0.005	9.4		908.2
18-Jan-17	230	11.4	0.002	752		0.964			0.038	5.98	0.0007	2370		4590	0.005	9.4		908.2
23-Feb-17	259	11.5	0.002	779		1.01			0.038	5.91	0.0012	2720		4970	0.02	9.7		907.9
23-Mar-17	258	12.8	0.004	787		1.06			0.037	5.85	0.0009	2820		5460	0.02	9.7		907.9
06-Apr-17	277	13	0.002	856		0.962			0.021	5.94	0.0007	2970		3850	0.005	9.6		908.0
24-May-17	298	13.5	0.002	914		1.05			0.03	5.87	0.0007	3240		5880	0.005	9.8		907.8
30-Jun-17	305	14.5	0.003	947		1.11			0.037	5.85	0.0012	3520		5220	0.005	9.9		907.7
26-Jul-17	288	13.8	0.004	952		1.04			0.029	5.85	0.0006	3490		6120	0.005	9.8		907.7
23-Aug-17	289	13.9	0.003	1010		1.08			0.03	5.82	0.0007	3620		6100	0.005	9.8		907.7

MPGM4/D19 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
Ave	0.0005	1.82	125	0.010	2.37	0.054		300	0.0002	460		5831	0.0405	0.0120	0.12	26.18	0.00003	60.3	
Max	0.0005	4.80	150	0.017	2.88	0.105		366	0.0004	600		7120	0.1220	0.0300	0.25	36.90	0.00006	83.0	
Min	0.0005	0.38	111	0.003	1.76	0.016		213	0.0001	332		4744	0.0060	0.0010	0.05	17.30	0.00002	40.4	
50th Percentile	0.0005	1.62	126	0.010	2.27	0.053		313	0.0001	479		5860	0.0365	0.0115	0.10	24.60	0.00002	61.1	
Post-90th Percentile Trend	0.0005	3.67	140	0.017	2.86	0.097		361	0.0003	577		7044	0.0957	0.0253	0.24	34.91	0.00006	80.7	

Continued……. MPGM4/D19 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)																		
	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	247	12.1	0.002	795	0.953			0.024	5.9	0.0006	2830		4670	0.008	9.6		908.1	0.393
Max	305	14.5	0.004	1010	1.110			0.038	6.0	0.0012	3620		6120	0.020	9.9		908.5	0.472
Min	179	10.0	0.001	567	0.757			0.003	5.8	0.0002	2220		3290	0.005	9.1		907.7	0.271
50th Percentile	259	12.2	0.002	783	0.987			0.030	5.9	0.0007	2770		4780	0.005	9.7		908.0	0.438
Post-90th Percentile Trend	297	13.9	0.004	952	1.078			0.038	6.0	0.0012	3517		6078	0.019	9.8		908.4	0.465

MPGM4/D20 Water conditioned ash data September, 2016– August, 2017 (mg/L)

Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
28-Sep-16	<0.001	3.15	411	0.006	1.74	0.074		275	0.002	104		3662	0.022	0.015	0.278	1.38	0.00004	25.1	
26-Oct-16	<0.001	3.29	404	0.007	1.3	0.086		309	0.0019	107		3664	0.027	0.014	0.262	1.33	0.00004	23.4	
24-Nov-16	<0.001	4.93	374	0.01	1.21	0.119		298	0.0029	106		3635	0.024	0.02	0.21	1.22	0.00005	25.3	
07-Dec-16	<0.001	2.92	353	0.005	1.04	0.068		301	0.0019	108		3672	0.021	0.011	0.193	1.25	0.00004	23.5	
18-Jan-17	<0.001	3.69	382	0.008	1.03	0.1		302	0.0027	105		3648	0.036	0.017	0.257	0.8	0.00006	22.7	
23-Feb-17	<0.001	4.17	320	0.009	2.32	0.101		278	0.0027	126		3810	0.014	0.016	0.201	0.35	0.00004	24.7	
22-Mar-17	<0.001	4.17	320	0.009	2.32	0.101		278	0.0027	126		3810	0.014	0.016	0.201	0.35	0.00004	24.7	
06-Apr-17	<0.001	3.93	374	0.005	1.43	0.073		277	0.0024	109		3710	0.022	0.011	0.342	1.59	0.00004	28.8	
24-May-17	<0.001	3.25	357	0.006	1.17	0.077		302	0.003	113		3740	0.007	0.013	0.223	0.93	0.00004	26.6	
29-Jun-17	<0.001	5.21	350	0.01	1.25	0.12		303	0.0048	116		3760	0.03	0.022	0.125	1.06	0.0001	26.5	
26-Jul-17	<0.001	2.74	348	0.006	1.2	0.077		284	0.0023	119		3800	0.012	0.012	0.302	1.04	0.00004	22.3	
23-Aug-17	<0.001	4.83	403	0.007	1.01	0.101		282	0.0025	104		3810	0.025	0.015	0.195	1.14	0.00004	20.1	

Continued……. MPGM4/D20 Water conditioned ash data September, 20156– August, 2017 (mg/L)

Date:	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
28-Sep-16	325	16.4	0.002	139	0.526			0.01	6.15	0.0007	2200		3100	<0.01	17		912.09	0.262	325
26-Oct-16	339	17.9	0.001	143	0.525			0.01	6.11	0.0004	2030		3000	<0.01	17.1		911.99	0.292	339
24-Nov-16	354	18.3	0.001	140	0.536			0.016	6.12	0.0007	1980		3290	<0.01	17		912.09	0.31	354
07-Dec-16	369	18.5	0.003	153	0.519			0.009	6.08	0.0005	2050		3500	<0.01	17		912.09	0.285	369
18-Jan-17	372	20.1	0.002	148	0.52			0.013	6.16	0.0007	1960		3630	<0.01	17.2		911.89	0.285	372
23-Feb-17	324	22.5	0.005	189	0.712			0.014	5.91	0.0007	2060		3580	<0.01	17.1		911.99	0.325	324
22-Mar-17	324	22.5	0.005	189	0.712			0.014	5.91	0.0007	2060		3580	<0.01	17.1		911.99	0.531	324
06-Apr-17	344	19	0.002	171	0.53			0.009	6.06	0.0007	1980		3660	<0.01	17.1		911.99	0.327	344
24-May-17	356	19.8	0.001	159	0.481			0.01	6.07	0.0006	2060		2920	<0.01	17.3		911.79	0.279	356
29-Jun-17	361	20.8	0.004	160	0.516			0.018	6.09	0.001	2180		3150	<0.01	17.4		911.69	0.331	361
26-Jul-17	340	19.5	0.003	153	0.479			0.01	6.06	0.0006	2110		3530	<0.01	17.4		911.69	0.281	340
23-Aug-17	346	19.9	0.001	140	0.485			0.012	6.02	0.0006	2020		3500	<0.01	17.4		911.69	0.275	346

MPGM4/D20 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)

	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	3.86	366	0.007	1.42	0.091		291	0.0027	112		3727	0.0212	0.0152	0.23	1.04	0.00005	24.5	
Max	<0.001	5.21	411	0.010	2.32	0.120		309	0.0048	126		3810	0.0360	0.0220	0.34	1.59	0.00010	28.8	
Min	<0.001	2.74	320	0.005	1.01	0.068		275	0.0019	104		3635	0.0070	0.0110	0.13	0.35	0.00004	20.1	
50th Percentile	<0.001	3.81	366	0.007	1.23	0.093		291	0.0026	109		3725	0.0220	0.0150	0.22	1.10	0.00004	24.7	
Post-90th Percentile Trend	<0.001	4.92	404	0.010	2.26	0.117		303	0.0030	125		3810	0.0297	0.0197	0.30	1.38	0.00006	26.6	

Continued……. MPGM4/D20 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)

	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	346	19.6	0.003	157	0.545			0.012	6.1	0.0007	2058		3370	#DIV/0!	17.2		911.9	0.315
Max	372	22.5	0.005	189	0.712			0.018	6.2	0.0010	2200		3660	0.000	17.4		912.1	0.531
Min	324	16.4	0.001	139	0.479			0.009	5.9	0.0004	1960		2920	0.000	17.0		911.7	0.262
50th Percentile	345	19.7	0.002	153	0.523			0.011	6.1	0.0007	2055		3500	#NUM!	17.1		912.0	0.289
Post-90th Percentile Trend	368	22.3	0.005	187	0.694			0.016	6.1	0.0007	2173		3625	#NUM!	17.4		912.1	0.331

MPGM4/D23 Water conditioned ash data September, 2016– August, 2017 (mg/L)																			
Date:	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
28-Sep-16	0.0005	0.59	78	0.001	1.18	0.017		171	0.0004	267		4154	0.006	0.002	0.2	14.9	0.00004	64.1	
26-Oct-16	0.0005	1.62	69	0.001	1.32	0.015		161	0.0002	290		4249	0.006	0.001	0.287	15.4	0.00004	87.9	
24-Nov-16	0.0005	0.33	136	0.001	0.65	0.017		177	0.0002	177		3351	0.004	0.001	0.2	9.59	0.00004	52.2	
07-Dec-16	0.0005	0.46	67	0.001	1.6	0.022		227	0.0004	346		4851	0.013	0.001	0.199	16.4	0.00004	69.6	
18-Jan-17	0.0005	0.47	75	0.001	1.6	0.02		257	0.001	422		5651	0.007	0.002	0.319	18.2	0.00004	78.4	
23-Feb-17	0.0005	0.15	83	0.001	0.79	0.018		181	0.0002	212		3670	0.002	0.002	0.217	17.6	0.00004	55.8	
22-Mar-17	0.0005	0.09	80	0.001	0.64	0.015		160	0.0003	196		3370	0.003	0.001	0.107	11.4	0.00004	41	
06-Apr-17	0.0005	0.45	103	0.001	0.96	0.019		200	0.0003	278		4320	0.006	0.001	0.245	13.3	0.00004	65.6	
24-May-17	0.0005	0.36	77	0.001	0.59	0.014		194	0.0002	192		3420	0.001	0.001	0.178	16.1	0.00004	49.4	
29-Jun-17	0.0005	0.34	71	0.003	0.59	0.018		181	0.0002	186		3360	0.007	0.001	0.1	18.7	0.00004	47.4	
26-Jul-17	<0.001	0.15	122	0.001	0.44	0.02		196	0.0004	247		3970	0.007	0.001	0.139	5.94	0.00004	38	
23-Aug-17	<0.001	0.33	132	0.001	0.44	0.023		191	0.0003	274		4550	0.008	0.001	0.5	4.24	0.00004	40.9	

Continued……. MPGM4/D23 Water conditioned ash data September, 20156– August, 2017 (mg/L)																			
Date:	Mg:	Mn	Mo	Na:	NFR	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
28-Sep-16	117	3.53	0.001	534		0.323			0.002	5.62	0.0003	1880		2880	0.01	22.9		912.9	0.326
26-Oct-16	135	3.8	0.001	775		0.32			0.002	5.56	0.0003	1960		3230	0.01	23.4		912.4	0.296
24-Nov-16	106	2.44	0.001	432		0.242			0.002	5.85	0.0002	1410		2360	0.01	23.3		912.5	0.24
07-Dec-16	162	4.51	0.001	731		0.4			0.002	5.67	0.0004	2260		4020	0.01	23.8		912.0	0.368
18-Jan-17	201	5.14	0.001	905		0.534			0.004	5.58	0.0006	2530		4860	0.01	24		911.8	0.502
23-Feb-17	115	2.65	0.001	526		0.335			0.001	5.62	0.0002	1630		3030	0.01	24.4		911.4	0.428
22-Mar-17	96.8	2.52	0.001	449		0.323			0.001	5.64	0.0002	1440		2310	0.01	25.3		910.5	0.466
06-Apr-17	142	3.45	0.001	638		0.363			0.002	5.69	0.0004	1970		3370	0.01	24.2		911.6	0.358
24-May-17	104	2.44	0.001	439		0.322			0.001	5.63	0.0003	1690		2430	0.01	24.6		911.2	0.476
29-Jun-17	105	2.5	0.001	438		0.357			0.002	5.59	0.0002	1630		2400	0.01	24.5		911.3	0.536
26-Jul-17	110	2.32	0.001	559		0.296			0.001	5.85	0.0003	1850		3090	<0.01	24.1		911.7	0.31
23-Aug-17	117	2.33	0.001	699		0.356			0.001	5.87	0.0004	2040		3600	<0.01	23.9		911.9	0.285

MPGM4/D23 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)																			
	Ag	Al	ALK	As	B	Ba	Be	Ca:	Cd	Cl:	Co	COND uS/cm	Cr	Cu	F	Fe	Hg	K:	Li
Ave	<0.001	3.86	366	0.007	1.42	0.091		291	0.0027	112		3727	0.0212	0.0152	0.23	1.04	0.00005	24.5	
Max	<0.001	5.21	411	0.010	2.32	0.120		309	0.0048	126		3810	0.0360	0.0220	0.34	1.59	0.00010	28.8	
Min	<0.001	2.74	320	0.005	1.01	0.068		275	0.0019	104		3635	0.0070	0.0110	0.13	0.35	0.00004	20.1	
50th Percentile	<0.001	3.81	366	0.007	1.23	0.093		291	0.0026	109		3725	0.0220	0.0150	0.22	1.10	0.00004	24.7	
Post-90th Percentile Trend	<0.001	4.92	404	0.010	2.26	0.117		303	0.0030	125		3810	0.0297	0.0197	0.30	1.38	0.00006	26.6	

Continued……. MPGM4/D23 – Post-water conditioned ash Summary September, 2016 – August, 2017 (mg/L)																		
	Mg:	Mn	Mo	Na:	Ni	NO2	NO3	Pb	pH	Se	SO4:	Temp	TFR	V	WL1	WL2	WLAHD	Zn
Ave	126	3.1	0.001	594	0.348			0.002	5.7	0.0003	1858		3132	0.010	24.0		911.8	0.383
Max	201	5.1	0.001	905	0.534			0.004	5.9	0.0006	2530		4860	0.010	25.3		912.9	0.536
Min	97	2.3	0.001	432	0.242			0.001	5.6	0.0002	1410		2310	0.010	22.9		910.5	0.240
50th Percentile	116	2.6	0.001	547	0.329			0.002	5.6	0.0003	1865		3060	0.010	24.1		911.8	0.363
Post-90th Percentile Trend	160	4.4	0.001	771	0.396			0.002	5.9	0.0004	2238		3978	0.010	24.6		912.5	0.499

6a. Lamberts North Water Conditioned Ash Runoff Pond LN Pond 1 and LN Pond 2 Water Quality 2012 to 2014

Lamberts North Pond 1							
Date	pH	Conductivity (uS/cm)	TDS (mg/L)	Temperature °C	TSS	Chloride	Sulphate
2/09/2013	7.6	330	300		12	9	100
3/11/2013	7.2	600	360		860	15	240
5/02/2014	7.4	1800	1500		800	54	900
10/04/2014	8	1000	680		14	30	140
30/04/2014	7.9	1300	880		4	37	480
18/07/2014	8.2	2000	1600		7	92	920
30/07/2014	7.4	2400	2100		4	82	1000
Average	7.7	1347	1060		243	46	540

Lamberts North Pond 2							
Date	pH	Conductivity (uS/cm)	TDS (mg/L)	Temperature °C	TSS	Chloride	Sulphate
2/09/2013	7	2800	2300		2	130	140
3/11/2013	8.4	2000	1700		16	110	1100
5/02/2014	8.1	2700	2300		2	130	1300
10/04/2014	7.7	810	560		43	29	310
30/04/2014	8.1	1300	900		26	45	460
18/07/2014	8.1	2000	1500		36	88	890
Average	7.9	1935	1543		21	89	700

Customer Analytical Services
Gate 5 / 3 Anderson Street Botany NSW 2019
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Final - Report Number: 1211489
LLS INDUSTRIAL C/- MT PIPER POWER
BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0150139749 **Ship To**: 0150139749
Representative: Clive Stacey

Sample Number	AW044094
Date Sampled	18-Jul-2014
Date Received	24-Jul-2014
Date Completed	7-Aug-2014
Date Authorised	7-Aug-2014

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN GW Collection 1

Water

Cations Metals	Test Method	Filtered	Total
Chromium Hexavalent (Cr)	External		<0.01 mg/L
Aluminium (Al)	*CA14106		0.1 mg/L
Antimony (Sb)	External		<0.001 mg/L
Arsenic (As)	External		0.001 mg/L
Barium (Ba)	*CA14106		0.04 mg/L
Boron (B)	*CA14106		1 mg/L
Cadmium (Cd)	*CA14106		<0.01 mg/L
Calcium (Ca)	*CA14106		120 mg/L
Chromium (Cr)	*CA14106		<0.01 mg/L
Cobalt (Co)	*CA14106		0.01 mg/L
Copper (Cu)	*CA14106		<0.01 mg/L
Iron (Fe)	*CA14106	<0.01 mg/L	0.14 mg/L
Lead (Pb)	*CA14106		<0.01 mg/L
Magnesium (Mg)	*CA14106		79 mg/L
Manganese (Mn)	*CA14106		0.25 mg/L
Mercury (Hg)	External		<0.00005 mg/L
Nickel (Ni)	*CA14106		0.07 mg/L
Potassium (K)	*CA14106		35 mg/L
Selenium (Se)	External		0.008 mg/L
Silver (Ag)	External		<0.001 mg/L
Sodium (Na)	*CA14106		240 mg/L
Zinc (Zn)	*CA14106		0.08 mg/L

Anions Test Method: *CA15000	Filtered
Fluoride (F)	1 mg/L
Chloride (Cl)	92 mg/L
Bromide (Br)	<1 mg/L
Sulfate (SO4)	920 mg/L
Nitrate (N)	1.9 mg/L
Nitrite (N)	<0.3 mg/L

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN GW Collection 1

Alkalinity **Test Method: *CA12121**		**Total**
Total Alkalinity (CaCO3)		100 mg/L
Phenolphthalein Alkalinity (CaCO3)		<25 mg/L
Bicarbonate (CaCO3)		100 mg/L

Physical	**Test Method**	**Total**
Conductivity at 25°C	*CA12121	2000 µS/cm
pH @ 25°C	*CA12121	8.2 pH Units
Total Suspended Solids @ 105°C	*CA12119	7 mg/L
Total Dissolved Solids @ 180°C	*CA12120	1600 mg/L

External Analysis Performed By: Australian Laboratory Services. NATA Accreditation no. 825. Report Number: ES1417084. Report Date: 7-Aug-2014
Chromium, Hexavalent (Cr)

External Analysis Performed By: National Measurement Institute. NATA Accreditation no. 198. Report Number: RN1031365. Report Date: 4-Aug-2014
Total ICP

Customer Analytical Services
Gate 5 / 3 Anderson Street Botany NSW 2019
Phone: (612) 9392 3708 Fax: (612) 9392 3722 Email: customeranalyticalservices@nalco.com

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Final - Report Number: 1211489
LLS INDUSTRIAL C/- MT PIPER POWER
BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0150139749 **Ship To:** 0150139749
Representative: Clive Stacey

Sample Number	AW044095
Date Sampled	18-Jul-2014
Date Received	24-Jul-2014
Date Completed	7-Aug-2014
Date Authorised	7-Aug-2014

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN Pond 2 Big Pond

Water

Cations - Metals	Test Method	Filtered	Total
Chromium Hexavalent (Cr)	External		<0.01 mg/L
Aluminium (Al)	*CA14106		0.2 mg/L
Antimony (Sb)	External		<0.001 mg/L
Arsenic (As)	External		0.001 mg/L
Barium (Ba)	*CA14106		0.04 mg/L
Boron (B)	*CA14106		1 mg/L
Cadmium (Cd)	*CA14106		<0.01 mg/L
Calcium (Ca)	*CA14106		120 mg/L
Chromium (Cr)	*CA14106		<0.01 mg/L
Cobalt (Co)	*CA14106		<0.01 mg/L
Copper (Cu)	*CA14106		<0.01 mg/L
Iron (Fe)	*CA14106	<0.01 mg/L	0.32 mg/L
Lead (Pb)	*CA14106		<0.01 mg/L
Magnesium (Mg)	*CA14106		74 mg/L
Manganese (Mn)	*CA14106		0.08 mg/L
Mercury (Hg)	External		<0.00005 mg/L
Nickel (Ni)	*CA14106		0.04 mg/L
Potassium (K)	*CA14106		35 mg/L
Selenium (Se)	External		0.006 mg/L
Silver (Ag)	External		<0.001 mg/L
Sodium (Na)	*CA14106		240 mg/L
Zinc (Zn)	*CA14106		0.03 mg/L

Anions Test Method: *CA15000	Filtered
Fluoride (F)	1 mg/L
Chloride (Cl)	88 mg/L
Bromide (Br)	<1 mg/L
Sulfate (SO4)	890 mg/L
Nitrate (N)	2.0 mg/L
Nitrite (N)	<0.3 mg/L

Analytical Report

This sample was analysed as received. the results being as follows:

Sampling point: LN Pond 2 Big Pond

Alkalinity **Test Method: *CA12121**	**Total**
Total Alkalinity (CaCO3)	100 mg/L
Phenolphthalein Alkalinity (CaCO3)	<25 mg/L
Bicarbonate (CaCO3)	100 mg/L

Physical	**Test Method**	**Total**
Conductivity at 25°C	*CA12121	2000 µS/cm
pH @ 25°C	*CA12121	8.1 pH Units
Total Suspended Solids @ 105°C	*CA12119	36 mg/L
Total Dissolved Solids @ 180°C	*CA12120	1500 mg/L

External Analysis Performed By: Australian Laboratory Services. NATA Accreditation no. 825. Report Number: ES1417084. Report Date: 7-Aug-2014
Chromium, Hexavalent (Cr)

External Analysis Performed By: National Measurement Institute. NATA Accreditation no. 198. Report Number: RN1031365. Report Date: 4-Aug-2014
Total ICP

Customer Analytical Services
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Phone: (612) 9392 3708 Fax: (612) 9392 3722 Email: customeranalyticalservices@nalco.com

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Final - Report Number: 1211489
LLS INDUSTRIAL C/- MT PIPER POWER
BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0150139749 **Ship To:** 0150139749
Representative: Clive Stacey

Sample Number	AW044096
Date Sampled	18-Jul-2014
Date Received	24-Jul-2014
Date Completed	7-Aug-2014
Date Authorised	7-Aug-2014

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN Pond 2 Seepage Inflow

Water

Cations - Metals	Test Method	Filtered	Total
Chromium Hexavalent (Cr)	External		<0.01 mg/L
Aluminium (Al)	*CA14106		<0.1 mg/L
Antimony (Sb)	External		<0.001 mg/L
Arsenic (As)	External		0.002 mg/L
Barium (Ba)	*CA14106		0.01 mg/L
Boron (B)	*CA14106		2 mg/L
Cadmium (Cd)	*CA14106		<0.01 mg/L
Calcium (Ca)	*CA14106		130 mg/L
Chromium (Cr)	*CA14106		<0.01 mg/L
Cobalt (Co)	*CA14106		<0.01 mg/L
Copper (Cu)	*CA14106		<0.01 mg/L
Iron (Fe)	*CA14106	<0.01 mg/L	0.04 mg/L
Lead (Pb)	*CA14106		<0.01 mg/L
Magnesium (Mg)	*CA14106		75 mg/L
Manganese (Mn)	*CA14106		0.57 mg/L
Mercury (Hg)	External		<0.00005 mg/L
Nickel (Ni)	*CA14106		0.13 mg/L
Potassium (K)	*CA14106		47 mg/L
Selenium (Se)	External		0.010 mg/L
Silver (Ag)	External		<0.001 mg/L
Sodium (Na)	*CA14106		310 mg/L
Zinc (Zn)	*CA14106		0.13 mg/L

Anions Test Method: *CA15000	Filtered
Fluoride (F)	2 mg/L
Chloride (Cl)	110 mg/L
Bromide (Br)	<1 mg/L
Sulfate (SO4)	1100 mg/L
Nitrate (N)	2.8 mg/L
Nitrite (N)	<0.3 mg/L

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: LN Pond 2 Seepage Inflow

Alkalinity **Test Method: *CA12121**	**Total**
Total Alkalinity (CaCO3)	120 mg/L
Phenolphthalein Alkalinity (CaCO3)	<25 mg/L
Bicarbonate (CaCO3)	120 mg/L

Physical	**Test Method**	**Total**
Conductivity at 25°C	*CA12121	2400 µS/cm
pH @ 25°C	*CA12121	7.8 pH Units
Total Suspended Solids @ 105°C	*CA12119	5 mg/L
Total Dissolved Solids @ 180°C	*CA12120	1800 mg/L

External Analysis Performed By: Australian Laboratory Services. NATA Accreditation no. 825. Report Number: ES1417084. Report Date: 7-Aug-2014
Chromium, Hexavalent (Cr)

External Analysis Performed By: National Measurement Institute. NATA Accreditation no. 198. Report Number: RN1031365. Report Date: 4-Aug-2014
Total ICP

Customer Analytical Services
Gate 5 / 3 Anderson Street Botany NSW 2019
Phone: (612) 9382 3708 Fax: (612) 9382 3722 Email: customeranalyticalservices@nalco.com

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LLS INDUSTRIAL C/- MT PIPER POWER
BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0150139749 **Ship To:** 0150139749
Representative: Clive Stacey

Sample Number	AW045000
Date Sampled	30-Jul-2014
Date Received	22-Aug-2014
Date Completed	15-Sep-2014
Date Authorised	18-Sep-2014

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: MPiper - Ramberts Nth Seepage Collection Drain

Water

Cations - Metals	Test Method	Filtered	Total
Mercury (Hg)	*CA14500		<0.00005 mg/L
Aluminium (Al)	*CA14106		<0.1 mg/L
Barium (Ba)	*CA14106		0.03 mg/L
Beryllium (Be)	*CA14106		<0.01 mg/L
Boron (B)	*CA14106		<1 mg/L
Cadmium (Cd)	*CA14106		<0.01 mg/L
Calcium (Ca)	*CA14106		200 mg/L
Chromium (Cr)	*CA14106		<0.01 mg/L
Cobalt (Co)	*CA14106		<0.01 mg/L
Copper (Cu)	*CA14106		<0.01 mg/L
Iron (Fe)	*CA14106	<0.01 mg/L	0.06 mg/L
Lead (Pb)	*CA14106		<0.1 mg/L
Magnesium (Mg)	*CA14106		230 mg/L
Manganese (Mn)	*CA14106		0.06 mg/L
Molybdenum (Mo)	*CA14106		<0.1 mg/L
Nickel (Ni)	*CA14106		<0.01 mg/L
Potassium (K)	*CA14106		18 mg/L
Sodium (Na)	*CA14106		140 mg/L
Strontium (Sr)	*CA14106		0.65 mg/L
Titanium (Ti)	*CA14106		<0.01 mg/L
Vanadium (V)	*CA14106		<0.01 mg/L
Zinc (Zn)	*CA14106		<0.01 mg/L
Antimony (Sb)	*CA14503		0.001 mg/L
Arsenic (As)	*CA14503		<0.001 mg/L
Cadmium (Cd)	*CA14503		<0.0002 mg/L
Lead (Pb)	*CA14503		<0.001 mg/L
Selenium (Se)	*CA14503		0.009 mg/L
Silver (Ag)	*CA14503		<0.001 mg/L

Analytical Report

This sample was analysed as received, the results being as follows:

Sampling point: MPiper - Ramberts Nth Seepage Collection Drain

Anions **Test Method: *CA15000**	**Filtered**
Chloride (Cl)	82 mg/L
Sulfate (SO4)	1000 mg/L

Alkalinity **Test Method: *CA12121 (CA11113)**	**Total**
Total Alkalinity (CaCO3)	500 mg/L
Phenolphthalein Alkalinity (CaCO3)	<25 mg/L
Bicarbonate (CaCO3)	500 mg/L

Physical	**Test Method**	**Total**
Conductivity at 25°C	*CA12121 (CA11116)	2400 µS/cm
pH @ 25°C	*CA12121 (A-4.4)	7.4 pH Units
Total Suspended Solids @ 105°C	*CA12119	4 mg/L
Total Dissolved Solids @ 180°C	*CA12120	2100 mg/L

Regulatory Comments

CA14106 according to APHA 3030 E, F & 3120 B

Titanium by CA14106 - NATA Accreditation does not cover the performance of this service

CA12120 according to APHA 2540 C

Customer Analytical Services
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Phone: (612)8870 8433 Email: customeranalyticalservices@nalco.com

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Final - Report Number: 1907639
LEND LEASE C/-MOUNT PIPER POWER
BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0500092084 **Ship To**: 0500092084
Representative: CLIVE STACEY

Sample Number	AW060819
Date Sampled	16-Nov-2016
Date Received	23-Nov-2016
Date Completed	2-Dec-2016
Date Authorised	5-Dec-2016

Summary Report

This sample was analysed as received, the results being as follows:

Sampling point: MP LN DRAINAGE

Testing Laboratory: ALS Environmental
Water

Cations - Metals	Test Method	Filtered	Total
Aluminium (Al)	EG005T		612 mg/L
Antimony (Sb)	EG005T		<0.01 mg/L
Barium (Ba)	EG005T		<0.1 mg/L
Beryllium (Be)	EG005T		0.37 mg/L
Boron (B)	EG005T		31.6 mg/L
Cadmium (Cd)	EG005T		0.153 mg/L
Calcium (Ca)	ED093T		435 mg/L
Chromium (Cr)	EG005T		0.17 mg/L
Cobalt (Co)	EG005T		0.50 mg/L
Copper (Cu)	EG005T		0.50 mg/L
Iron (Fe)	EG005F	<0.05 mg/L	
Iron (Fe)	EG005T		11.4 mg/L
Lead (Pb)	EG005T		0.02 mg/L
Magnesium (Mg)	ED093T		100 mg/L
Manganese (Mn)	EG005T		14.9 mg/L
Molybdenum (Mo)	EG005T		0.03 mg/L
Nickel (Ni)	EG005T		1.37 mg/L
Potassium (K)	ED093T		375 mg/L
Silica (SiO2)	ED040T		85.4 mg/L
Sodium (Na)	ED093T		394 mg/L
Strontium (Sr)	EG005T		14.8 mg/L
Titanium (Ti)	EG005T		<0.01 mg/L
Vanadium (V)	EG005T		0.02 mg/L
Zinc (Zn)	EG005T		4.58 mg/L

Authorised by Mohammad Sjam
Chemist

Customer Analytical Services
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Phone: (612)8870 8433 Email: customeranalyticalservices@nalco.com

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BOULDER ROAD
PORTLAND NSW 2847 AUSTRALIA
Sold To: 0500092084 **Ship To**: 0500092084
Representative: CLIVE STACEY

Sample Number	AW060819
Date Sampled	16-Nov-2016
Date Received	23-Nov-2016
Date Completed	2-Dec-2016
Date Authorised	5-Dec-2016

Summary Report

This sample was analysed as received, the results being as follows:

Sampling point: MP LN DRAINAGE

Testing Laboratory: ALS Environmental

Anions **Test Method: ED009-X**	**Filtered**
Chloride (Cl)	96.7 mg/L
Sulfate (SO4)	1840 mg/L

Alkalinity **Test Method: ED037-P**	**Total**
Total Alkalinity (CaCO3)	76 mg/L
Phenolphthalein Alkalinity (CaCO3)	<1 mg/L

Physical	**Test Method**	**Total**
Conductivity at 25°C	EA010-P	3680 µS/cm
pH @ 25°C	EA005-P	7.04 pH Units
Total Suspended Solids @ 105°C	EA025H	24 mg/L
Total Dissolved Solids @ 180°C	EA015H	2940 mg/L

Testing services provided by: ALS Environmental. NATA accreditation number 825. Refer attached document for ALS Environmental NATA accredited report.

Authorised by Mohammad Sjam
Chemist

6b. LN runoff collection sump 1 2016

Sample ID		MP LN SUMP 1 stability wall	MP LN SUMP 1 stability wall
Date Sampled		25/01/2016	12/02/2016
Laboratory Report		aw056035	aw056336
Date Tested			
pH		7.58	7.54
Conductivity (uS/cm)		2280	2700
TDS (mg/L)	[gravimetric]	1480	1890
Temperature °C			
TSS	mg/L	85	22
Chloride	mg/L	69.1	78
Sulphate	mg/L	953	1090
Total Alkalinity (CaCO3) mg/L		102	172
Phenophthalein Alkalinity mg/L		1	1
BiCarbonate mg/L		102	172
Nitrate	mg/L	0.56	0.76
Nitrite	mg/L	0.01	0.01
Hg	mg/L	0.00004	0.00004
Al	mg/L	4.24	3.07
Ba	mg/L	0.1	0.1
B	mg/L	3.7	4.6
Ca	mg/L	185	194
Cr	mg/L	0.01	0.01
Co	mg/L	0.02	0.01
Cu	mg/L	0.01	0.01
Fe	mg/L	0.05	0.05
Fe	mg/L Unfiltered)		
Mg	mg/L	51	64
Mn	mg/L	0.54	0.74
Ni	mg/L	0.13	0.14
K	mg/L	58	72
SiO2	mg/L		
Na	mg/L	276	292
Zn	mg/L	0.34	0.33
Sb	mg/L	0.016	0.021
As	mg/L	0.005	0.005
Cd	mg/L	0.022	0.0209
Pb	mg/L	0.003	0.001
Se	mg/L	0.04	0.07
Ag	mg/L	0.001	0.001

6c. Water Quality Data for LN Pond 2 September, 2016 to August, 2017

Sample ID		Lamberts North North Pond 2	Lamberts North North Pond 2	Lamberts North LN Pond 2	Lamberts North LN Pond 2	Lamberts North LN Pond 2	Lamberts North LN Pond 2	Lamberts North LN Pond 2	Lamberts North LN Pond 2	Lamberts North LN Pond 2	Lamberts North LN Pond 2
Date Sampled		2/09/2016	16/11/2016	9/01/2017	3/02/2017	24/03/2017	11/05/2017	17/05/2017	21/06/2017	26/07/2017	28/08/2017
pH		7.53	7.61	8.3	8.13	7.7	7.9	8.1	8.2	8.4	8.3
Conductivity (uS/cm)		953	1160	2320	2520	1600	1700	1600	1900	2100	2200
TDS (mg/L)	[gravimetric]	690	811	1710	1840	1200	1150	1110	1350	1400	1450
TSS	mg/L	58	14	14	12	136	11	23	15	36	28
Chloride	mg/L	26.4	33.9	75.2	92.7	48.3	45.7	45.3	51.1	57.6	69.9
Sulphate	mg/L	410	427	838	1010	719	715	668	805	936	964
Total Alkalinity (CaCO3)	mg/L	58	74	93	101	57	85	86	97	102	107
Phenophthalein Alkalinity	mg/L	1	<1	1	1	1	1	1	1	1	1
Nitrate	mg/L						1.25	1.57	2.24	1.68	1.81
Nitrite	mg/L						1.02	1.07	0.13	0.01	0.01
Hg	mg/L										
Al	mg/L		0.41				0.18		0.32		
Sb	mg/L		0.01				0.001		0.01		
Ba	mg/L		0.01				0.01		0.1		
B	mg/L		1.3				2.4		2.9		
Be	mg/L								0.01		
bromide	mg/L						0.426	0.187	0.396	0.403	0.902
Cd	mg/L								0.005		
Ca	mg/L		58				82		103		
Cr	mg/L		0.01				0.01		0.01		
Co	mg/L		0.01				0.01		0.01		
Cu	mg/L		0.01				0.02		0.01		
Fe	mg/L		0.05				0.05		0.05		
Fe	mg/L		0.36				0.11		0.16		
fluoride	mg/L						1.48	2.62	0.517	1.04	2.59
Pb	mg/L		0.01				0.001		0.01		
Mg	mg/L		31				37		44		
Mn	mg/L		0.22				0.09		0.06		
Mo									0.07		
Ni	mg/L		0.02				0.03		0.03		
K	mg/L		18				28		32		
SiO2	mg/L		9.2				9.4		10.8		
Na	mg/L		130				188		286		
Sr									1.3		
Ti									0.01		
Va									0.01		

Zn	mg/L		0.02				0.02		0.02		
As	mg/L						0.002				
Cd	mg/L		0.005				0.0004				
Se	mg/L						0.01				
Ag	mg/L										

6d. Water Quality Data for Brine Sump1 on Benches B1-B4 and B5 September, January, 2016 and September, 2016 to August, 2017

Sample ID		Brine sump 1 on B1-B4	Brine sump 1 on B1-B4	Brine sump 1 on B1-B5	Brine sump 1 on B1-B4	Brine sump 1 on B1-B4	Brine sump 1 on B1-B5	Brine sump 1 on B5	Brine sump 1 on B5
Date		25/01/2016	2/09/2016	16/11/2016	9/01/2017	3/02/2017	24/03/2017	17/07/2017	28/08/2017
pH		7.3	6.48	7.2	7.56	7.31	7.00	7.80	7.50
Conductivity (uS/cm)		182	54	477	1,380	1,290	830	1,000	970
TDS (mg/L)	[gravimetric]	103	55	312	852	878	478	644	650
TSS	mg/L	50	56	625	1,240	882	42	170	27
Chloride	mg/L	4.36	1	16	46	41	21	37	31
Sulphate	mg/L	45.1	9	141	425	468	364	380	370
Total Alkalinity (CaCO3) mg/L		28	12	40	98	109	33	56	70
Phenophthalein Alkalinity mg/L		1	1		1	1	1	1	1
Nitrate	mg/L	0.03						1	
Nitrite	mg/L	0.01						0	
Total P	mg/L			0.13					
Hg	mg/L	0.00004							
Al	mg/L	0.85		2.75					
Ba	mg/L	0.1		0.01					
B	mg/L	0.1		0.2					
Br	mg/L							0.668	0.391
Ca	mg/L	11		17					
Cr	mg/L	0.01		0.01					
Co	mg/L	0.01		0.01					
Cu	mg/L	0.05		0.03					
Fe	mg/L	0.06		0.05					
Fe	mg/L (unfiltered)			0.82					
Fl	mg/L							0.397	0.754
Mg	mg/L	3		7					
Mn	mg/L	0.06		0.04					

Ni	mg/L	0.01		0.01					
K	mg/L	4		8					
SiO2	mg/L			5.8					
Na	mg/L	20		64					
Zn	mg/L	0.01		0.05					
Sb	mg/L	0.001		0.01					
As	mg/L	0.005							
Cd	mg/L	0.0001		0.005					
Pb	mg/L	0.001		0.01					
Se	mg/L	0.01							
Ag	mg/L	0.001							
NO3	mg/L								0.37
NO2	mg/L								0.03

Attachment 2

Lithgow Rainfall Data from January, 2000 to August, 2016 (mm/month) from Bureau of Meteorology

Year(s)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
2000	57	22.2	271.4	50.6	53.4	32.2	37.4	51.2	43	75	119.2	59	871.6
2001	105.4	90.6	89.6	84.4	28.8	9	63.2	30.8	46.4	58.8	80	26.6	713.6
2002	87.8	187	69.4	40.2	67.6	22.6	16.8	17	21.2	3	22	47.2	601.8
2003	3.6	135	41.8	38.4	54	43.2	20.6	0	18.6	82.4	121	68.8	627.4
2004	35	98.2	22.4	10.4	35.2	16.2	30.2	50.8	34.8	118.4	113.8	88.6	654
2005	102.8	104.6	55.8	28.6	14.2	117.2	59.2	24.6	87.6	116.5	159.4	48.4	918.9
2006	146.6	32.6	6.4	6.8	6.8	6.8	54.2	5.8	59.2	3.2	32.2	72.7	433.3
2007	92.6	141.4	72.1	44.6	56.6	223	24.9	65.4	9	37.8	134.7	67	969.1
2008	102	84.6	47.6	59.8	11	60.9	37.1	43.6	88.2	66.2	83.3	113.2	797.5
2009	25.2	165.8	28	74.5	80.9	44.5	35.9	48.8	63	69	23.6	81.5	740.7
2010	76.4	119.2	85.1	35.8	54.4	40.9	73.5	73.5	52.4	70.9	122.8	164.6	969.5
2011	114	57.2	77.2	41.2	51.2	72.4	24.6	58.7	78.4	46.2	168	96	885.1
2012	57.1	152.6	189.8	44.4	30.6	81.8	49.8	21.2	48.6	20.8	30.9	64.1	791.7
2013	64.1	113.2	184.2	66.2	28.1	29	24.4	23.2	36.8	21.8	95.2	34.2	720.4
2014	13.6	74	143.8	63	14	43.2	24.2	24.2	27.9	60.7	21.8	174.3	684.7
2015	124.8	31	35	184	31	26	44.6	31.6	12.6	37.2	67.2	57.2	682.2
2016	166.6	46.6	36.8	6.6	20.6	170	102	61.8					

Attachment 3

a) Map of Coal Mine workings in the Mt Piper Ash Placement Area

b) Mt Piper Power Station and Lamberts North Groundwater Bore Collar and Pipe Height Survey results for:

i) December, 2011 with Bores MPGM4/D9 and D19 Levels in 2012

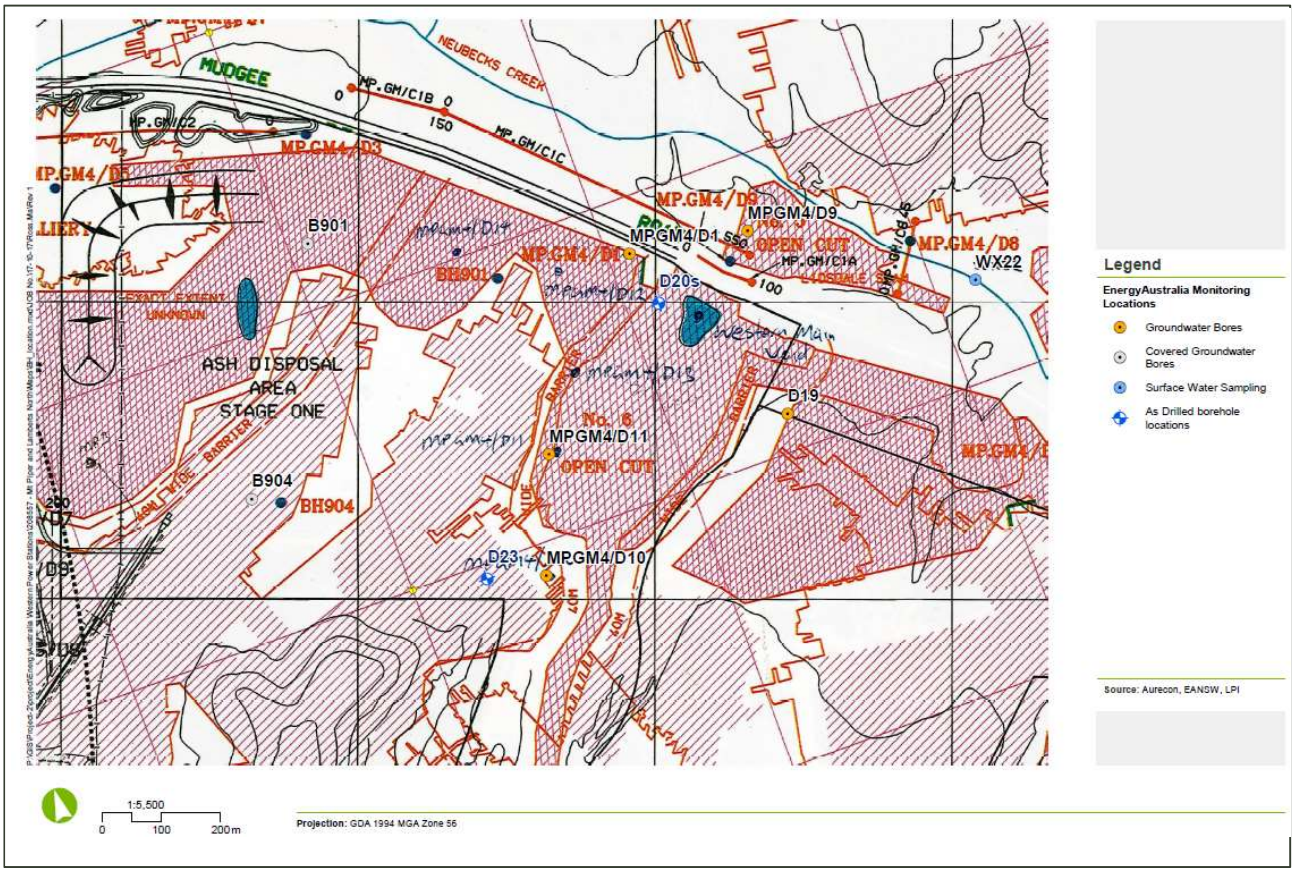
i) Groundwater Level Survey 20th March, 2014 including water level of SW3 Pond and underground coal mine water seepage point into Huon Gully

c) Bore logs for MPGM4/D20 (Lamberts North embankment), D23 southern underground coal mine and MPGM4/D1

a) Map of Coal Mine workings in the Mt Piper Ash Placement Area

(Bores B901 and MPGM4/D11 sample western Main open-cut groundwater; B904, MPGM4/D10 and D23 sample underground goaf coal mine groundwater; D20 is in the Lamberts North wall embankment)

Note: Recent bore locations are based on GPS co-ordinates, so the mine map and original hand marked bore locations do not always correspond.



i) Groundwater Bore Survey results December, 2011					
Bore Name	**Easting**	**Northing**	**Ground level RLm**	**Top of pipe RLm**	**Pipe Height m**
MPGM4/D1	225603.983	6305355.123	911.973	912.603	0.63
MPGM4/D3	225168.952	6305718.268	919.834	920.014	0.18
MPGM4/D4	224609.58	6305939.21	919.38	919.64	0.26
MPGM4/D5	224727.822	6305772.088	925.347	925.787	0.44
MPGM4/D8	226000.54	6305241.889	905.899	906.449	0.55
MPGM4/D9*	225686.68	6305313.55	909.566	909.664	0.098
MPGM4/D11	225312.635	6305090.199	937.344	937.48	0.15
MPGM4/D10	225241.559	6304897.926	925.932	926.087	0.14
MPGM4/D19**			916.947	917.607	0.66

January 2012

**from CDM Smith (2012) and Delta Electricity May 2013.

ii) Groundwater Level Survey 20th March, 2014

MT PIPER POWER STATION WATER MONITORING

Survey Date 20/03/14

Notes			
Vertical Datum is 'Australian Height Datum' (AHD)			
Horizontal Datum is Map Grid Australia (MGA)			
Origin for Survey PM 69965	MGA East 224266.86	MGA North 6306197.29	AHD Height 934.946

D 10	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225241.71	6304897.87	925.95
TOP OF CONDUIT	225241.69	6304897.87	926.06

	MGA EAST	MGA NORTH	AHD HEIGHT	Comments
MINE WATER SEEPAGE POINT INTO HUON GULLY	225242.29	6304874.82	923.16	Ground wet but little seepage
	225248.59	6304873.18	920.02	Seepage flowing
POND WATER LEVEL	225279.48	6304894.09	915.34	

D 11	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225312.69	6305090.30	937.30
TOP OF CONDUIT	225312.67	6305090.30	937.37

D 15	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225027.57	6304669.51	940.18
TOP OF CONDUIT	225027.46	6304669.58	940.83

D 16	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225090.33	6304252.03	921.11
TOP OF CONDUIT	225090.35	6304251.90	921.82

D 17	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225454.95	6304437.14	935.69
TOP OF CONDUIT	225454.86	6304437.13	936.50

D 18	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225278.06	6304710.02	932.18
TOP OF CONDUIT	225278.00	6304709.93	932.79

POND SW3	MGA EAST	MGA NORTH	AHD HEIGHT
WATER LEVEL	225142.93	6304987.14	932.53

iii) Groundwater Bores MPGM4/D20 and D23 Installatiion 8th December, 2015

MT PIPER POWER STATION WATER MONITORING

Survey Date 20/03/14

Notes			
Vertical Datum is 'Australian Height Datum' (AHD)			
Horizontal Datum is Map Grid Australia (MGA)			
Origin for Survey PM 69965	MGA East 224266.86	MGA North 6306197.29	AHD Height 934.946

D 20	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225571.00	6305271.00	928.42
TOP OF CONDUIT			929.09

D 23	MGA EAST	MGA NORTH	AHD HEIGHT
GROUND	225146.00	6304925.00	935.28
TOP OF CONDUIT			935.84

c) Bore logs for MPGM4/D20 and MPGM4/D1

Borehole No: D20

Engineering Log - Borehole

SHEET 1 OF 3

Client	Energy Australia	Project No.	245409
Project	Mount Piper D10 Chloride Investigation	Logged By	JK
Location	Mount Piper Power Station	Checked By	ML

Started Drilling	8.12.15	Northing	6305271.00	Slope	90°	Equipment	Sonic Rig
Completed Drilling	8.12.15	Easting	225571.00	Bearing	---	Ground Level	928.42 AHD

DRILLING				MATERIAL DESCRIPTION				TESTING, SAMPLING & OTHER INFORMATION			
Method	Water	RL (m)	Depth (m)	Graphic Log	Classification	Description of Soil (soil type: plasticity/grainsize, colour and other components)	Moisture Condition	Consistency	Tests	Samples	Additional Comments (material origin, pocket penetrometer values, investigation observations)	Well Details
		928	0			FILL: Silty CLAY: low to medium plasticity, dark grey, brown, with fine to medium grained angular gravel					FILL 0 - 0.5 concrete seal with steel monument	
		927	1									
		926	2									
		925	3									
		924	4									
		923	5				<PL	St				
		922	6									
		921	7									
		920	8									
		919	9									
			10									

Remarks:

Well Legend:

Cement Seal | Slough Backfill: 1 pipe group, 1 pipe | Bentonite Seal | Blank PVC Pipe with Sand Backfill | Slotted PVC Pipe with Sand Backfill | Slough at Bottom of Hole

AURECON SYD LIB 05.GLB Log WW BOREHOLE & WELL LOG MOUNT PIPER LOGS.GPJ <<DrawingFile>> 20/04/2016 14:38 8.30.002 Developed by Datgel

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Engineering Log - Borehole

Client	Energy Australia	Project No.	245409
Project	Mount Piper D10 Chloride Investigation	Logged By	JK
Location	Mount Piper Power Station	Checked By	ML

Started Drilling	8.12.15	Northing	6305271.00	Slope	90°	Equipment	Sonic Rig
Completed Drilling	8.12.15	Easting	225571.00	Bearing	---	Ground Level	928.42 AHD

DRILLING				MATERIAL DESCRIPTION					TESTING, SAMPLING & OTHER INFORMATION			
Method	Water	RL (m)	Depth (m)	Graphic Log	Classification	Description of Soil (soil type: plasticity/grainsize, colour and other components)	Moisture Condition	Consistency	Tests	Samples	Additional Comments (material origin, pocket penetrometer values, investigation observations)	Well Details
		918	11			FILL: Silty CLAY: low to medium plasticity, dark grey, brown, with fine to medium grained angular gravel *(continued)*					FILL	
		917	12									
		916	13			FILL: Silty CLAY: medium plasticity, dark grey, with siltstone and shale fragments	<PL					
		915	14									
		914	15					St				
		913	16									
	02/02/16	912	17									
		911	18									
		910	19				>>PL					
		909	20									

Remarks:

Well Legend:

Cement Seal | Slough Backfill: 1 pipe group, 1 pipe | Bentonite Seal | Blank PVC Pipe with Sand Backfill | Slotted PVC Pipe with Sand Backfill | Slough at Bottom of Hole

aurecon

Borehole No: D20

Engineering Log - Borehole

Client	Energy Australia	Project No.	245409
Project	Mount Piper D10 Chloride Investigation	Logged By	JK
Location	Mount Piper Power Station	Checked By	ML

Started Drilling	8.12.15	Northing	6305271.00	Slope	90°	Equipment	Sonic Rig
Completed Drilling	8.12.15	Easting	225571.00	Bearing	---	Ground Level	928.42 AHD

DRILLING				MATERIAL DESCRIPTION					TESTING, SAMPLING & OTHER INFORMATION			
Method	Water	RL (m)	Depth (m)	Graphic Log	Classification	Description of Soil (soil type: plasticity/grainsize, colour and other components)	Moisture Condition	Consistency	Tests	Samples	Additional Comments (material origin, pocket penetrometer values, investigation observations)	Well Details
		908	21			FILL: Silty CLAY: medium plasticity, dark grey, with siltstone and shale fragments *(continued)* COAL: Dark grey, low strength, slightly weathered					BEDROCK 20 - 21 Bentonite Plug	
		907	22			Borehole D20 Terminated at 21.00 m					Borehole terminated at target depth	
		906	23									
		905	24									
		904	25									
		903	26									
		902	27									
		901	28									
		900	29									
		899	30									

Remarks:

Well Legend:

Cement Seal | Slough Backfill: 1 pipe group, 1 pipe | Bentonite Seal | Blank PVC Pipe with Sand Backfill | Slotted PVC Pipe with Sand Backfill | Slough at Bottom of Hole

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Borehole No: D23

Engineering Log - Borehole

SHEET 1 OF 4

Client	Energy Australia	Project No.	245409
Project	Mount Piper D10 Chloride Investigation	Logged By	JK
Location	Mount Piper Power Station	Checked By	ML

Started Drilling	17.12.15	Northing	6304925.00	Slope	90°	Equipment	Sonic Rig
Completed Drilling	17.12.15	Easting	225146.00	Bearing	---	Ground Level	935.28 AHD

DRILLING				MATERIAL DESCRIPTION					TESTING, SAMPLING & OTHER INFORMATION			
Method	Water	RL (m)	Depth (m)	Graphic Log	Classification	Description of Soil (soil type: plasticity/grainsize, colour and other components)	Moisture Condition	Consistency	Tests	Samples	Additional Comments (material origin, pocket penetrometer values, investigation observations)	Well Details
		935	0			FILL: CLAY: medium plasticity, brown, with fine to medium angular shale gravel					FILL	
		934	1		CI	CLAY: medium plasticity, orange, grey	<PL	St to VSt			RESIDUAL SOIL	
		933	2									
		932	3									
		931	4									
		930	5			COAL: black, low strength, distinctly weathered					BEDROCK	
		929	6									
		928	7			SHALE: dark grey, slightly weathered, medium to high strength						
		927	8									
		926	9									
			10									

Remarks:

Well Legend:

Cement Seal | Slough Backfill: 1 pipe group, 1 pipe | Bentonite Seal | Blank PVC Pipe with Sand Backfill | Slotted PVC Pipe with Sand Backfill

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Engineering Log - Borehole

Client	Energy Australia	Project No.	245409
Project	Mount Piper D10 Chloride Investigation	Logged By	JK
Location	Mount Piper Power Station	Checked By	ML

Started Drilling	17.12.15	Northing	6304925.00	Slope	90°	Equipment	Sonic Rig
Completed Drilling	17.12.15	Easting	225146.00	Bearing	---	Ground Level	935.28 AHD

DRILLING				MATERIAL DESCRIPTION				TESTING, SAMPLING & OTHER INFORMATION			
Method	Water	RL (m)	Depth (m)	Graphic Log	Classification	Description of Soil (soil type: plasticity/grainsize, colour and other components)	Moisture Condition	Consistency	Tests	Samples	Additional Comments (material origin, pocket penetrometer values, investigation observations)	Well Details
		925	11			SHALE: dark grey, slightly weathered, medium to high strength *(continued)*						
		924	12			SILTSTONE: grey, slightly weathered, high strength						
		923	13									
		922	14									
		921	15									
		920	16									
		919	17									
		918	18									
		917	19									
		916	20									

Remarks:

Well Legend:

Cement Seal | Slough Backfill: 1 pipe group, 1 pipe | Bentonite Seal | Blank PVC Pipe with Sand Backfill | Slotted PVC Pipe with Sand Backfill

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Borehole No: D23

Engineering Log - Borehole

SHEET 3 OF 4

Client	Energy Australia	Project No.	245409
Project	Mount Piper D10 Chloride Investigation	Logged By	JK
Location	Mount Piper Power Station	Checked By	ML

Started Drilling	17.12.15	Northing	6304925.00	Slope	90°	Equipment	Sonic Rig
Completed Drilling	17.12.15	Easting	225146.00	Bearing	---	Ground Level	935.28 AHD

DRILLING				MATERIAL DESCRIPTION					TESTING, SAMPLING & OTHER INFORMATION			
Method	Water	RL (m)	Depth (m)	Graphic Log	Classification	Description of Soil (soil type: plasticity/grainsize, colour and other components)	Moisture Condition	Consistency	Tests	Samples	Additional Comments (material origin, pocket penetrometer values, investigation observations)	Well Details
	02/02/16	915	21			SILTSTONE: grey, slightly weathered, high strength *(continued)*						
		914	22			CORE LOSS 3.00m (21.00-24.00) No return						
		913	23									
		912	24									
		911	25			SANDSTONE: fine to medium grained, grey, slightly weathered, medium to high strength						
		910	26									
		909	27									
		908	28									
		907	29									
		906	30									

Remarks:

Well Legend:

Cement Seal | Slough Backfill: 1 pipe group, 1 pipe | Bentonite Seal | Blank PVC Pipe with Sand Backfill | Slotted PVC Pipe with Sand Backfill

AURECON SYD LIB 05.GLB Log WW BOREHOLE & WELL LOG MOUNT PIPER LOGS.GPJ <<DrawingFile>> 16/02/2016 10:32 8.30.002 Developed by Datgel

aurecon

Borehole No: D23

Engineering Log - Borehole

SHEET 4 OF 4

Client	Energy Australia	Project No.	245409
Project	Mount Piper D10 Chloride Investigation	Logged By	JK
Location	Mount Piper Power Station	Checked By	ML

Started Drilling	17.12.15	Northing	6304925.00	Slope	90°	Equipment	Sonic Rig
Completed Drilling	17.12.15	Easting	225146.00	Bearing	---	Ground Level	935.28 AHD

DRILLING				MATERIAL DESCRIPTION					TESTING, SAMPLING & OTHER INFORMATION			
Method	Water	RL (m)	Depth (m)	Graphic Log	Classification	Description of Soil (soil type: plasticity/grainsize, colour and other components)	Moisture Condition	Consistency	Tests	Samples	Additional Comments (material origin, pocket penetrometer values, investigation observations)	Well Details
		905	31			SANDSTONE: fine to medium grained, grey, slightly weathered, medium to high strength *(continued)*						
		904	32									
		903	33									
		902	34			Borehole D23 Terminated at 33.00 m					Borehole terminated at target depth	
		901	35									
		900	36									
		899	37									
		898	38									
		897	39									
		896	40									

Remarks:

Well Legend:

Cement Seal | Slough Backfill: 1 pipe group, 1 pipe | Bentonite Seal | Blank PVC Pipe with Sand Backfill | Slotted PVC Pipe with Sand Backfill

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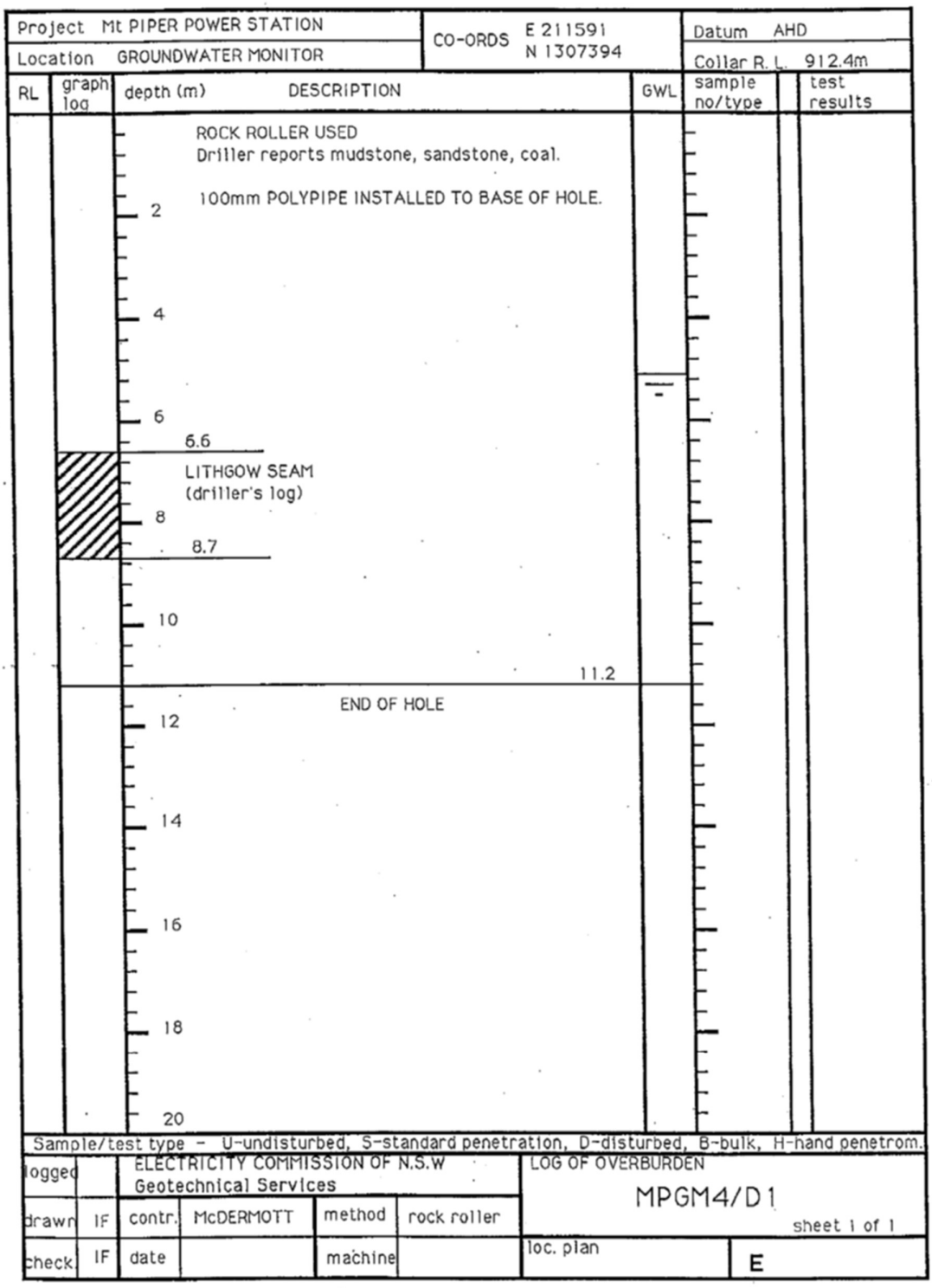
Bore Log MPGM4/D1



Attachment 4

Assessment Criteria – Local baseline and ANZECC (2000) Trigger values for Groundwater receiving waters and Neubecks Creek (Aurecon, 2011) in OEMP by CDM Smith (2013)

Assessment Criteria – Local baseline and ANZECC (2000) Trigger values for Groundwater receiving waters and Neubecks Creek (Aurecon, 2011) in OEMP by CDM Smith (2013)

Table 7-3: Assessment Criteria – Local baseline and ANZECC (2000) Trigger values for Groundwater receiving waters and Neubecks Creek (Aurecon, 2011)

Element	Groundwater Collection Basin Pre-placement 90th Percentile	Groundwater ANZECC or Local Guidelines #	Neubecks Creek at WX22 Pre-placement 90th Percentile	Surface Water ANZECC or Local Guidelines #
General Water Quality (mg/L)				
pH		6.5 – 8.0	6.7-7.8	6.5 – 8.0
Cond/ (uS/cm)	1576	2600^	894	2200
TDS	1306	2000	580	1500^
Cl	31.5	350	22	350+
SO4	824	1000	332	1000 ++
Trace Metals (mg/L)				
As	0.001	0.024	<0.001	0.024
Ag	<0.001	0.00005	-	0.00005
Ba	0.037	0.7	0.029	0.7+++
Be	0.001	0.1	<0.001	0.1
B	0.244	0.37	0.09	0.37
Cd	0.002	0.002	<0.001	0.00085
Cr	0.001	0.005	<0.001	0.002
Cu	0.001	0.005	<0.001	0.0035
F	0.435	1.5	0.338	1.5+++
Fe	0.664	0.664	0.281	0.3+++
Hg	<0.0001	0.00006	-	0.00006
Mn	5.704	5.704	0.72	1.9
Mo	0.001	0.01	<0.001	0.01+
Ni	0.356	**0.5509**	0.005	0.017
Pb	0.001	0.005	<0.001	0.005
Se	0.002	0.005	<0.001	0.005
Zn	0.908	**0.908**	0.061	**0.116**

Notes: * High detection limits used when determining the baseline concentrations. ^ 2000 mg/L TDS/0.77 for groundwater; 0.68 x 2200 uS/cm low land river conductivity protection of aquatic life. # ANZECC (2000) guidelines for protection of freshwaters, livestock, irrigation water or drinking water. Local guideline based upon 90th percentile pre-brine placement (**shown in bold**). Cadmium, Chromium, Copper, lead, nickel and zinc adjusted for effects of hardness: Current Ca, Mg in GCB 147, 113 mg/L: in Neubecks Creek 19.7, 11.8 mg/L, respectively. + Irrigation water moderately tolerant crops; irrigation. Note: Molybdenum drinking is 0.05 mg/L ++ Livestock +++ drinking water.

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Aurecon offices are located in:
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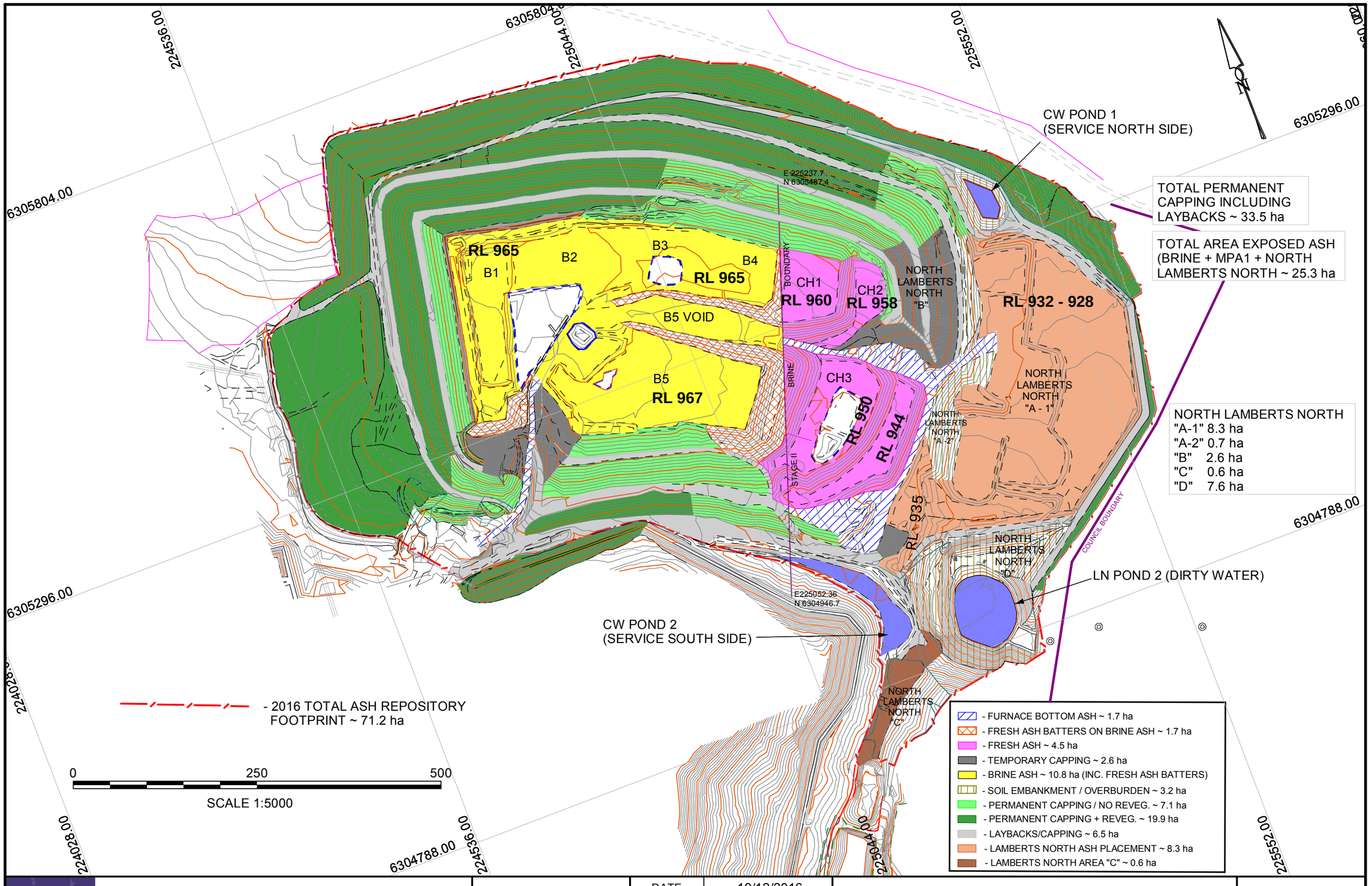
Appendix E

Mt Piper Ash Repository & Lamberts North Rehabilitation Plan



CEH SURVEY
CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
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ABN: 68 056 544 551 Office: (02) 6351 2281
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DATE	19/12/2016
AMENDED	31/01/2017
SURVEYOR	BN/RS
DRAWN	GM/TH
CHECKED	GM/JA

LEND LEASE SERVICES PTY. LTD

MT PIPER - ASH PLACEMENT PLANNING ZONES
SURVEY FOOTPRINT - 16TH DECEMBER 2016

SCALE - 1:5000 DATUM: MGA 56/AHD

DRAWING No:

MPA PLACEMENT PLANNING AREAS

CCAD6 JOB & DWG:
MPA1216 areas - MPA1216 AREAS

Border size = 370mm x 267mm on A3 paper.

Appendix F

Lamberts North Internal Noise Audit August 2017

Internal Environmental Audit Report

Lamberts North Project

Prepared by: Antony Nolan

Date: September 2017

Contents

1. Introduction

An environmental audit was conducted to confirm environmental compliance with the Department of Planning and Environment (DPE) Conditions of Approval (CoA) for the Mt Piper Ash Repository Project 09_0186-Lamberts North. CoA B8 required Delta Electricity (now privatised EnergyAustralia NSW) to develop and implement a Compliance Tracking Program to track and report on compliance with all CoA's. In particular, B8 c) requires a program of independent environmental auditing with audits *"carried out in accordance with ISO 19011:2002 - Guidelines for Quality and or Environmental Management Systems Auditing" with* non-compliances to be rectified as per B8 d).

2. Audit Objectives, Criteria & Scope

The audit objective was to assess compliance with:

- Environmental mitigation measures stated in Operation Environmental Management Plans (OEMP) in relation to noise;
- Environmental management protocols and controls stated in the Operational Environmental Management Plan (OEMP) in relation to noise;
- Relevant Project Approval conditions contained in the NSW Planning Approval of 16 February 2012.

The scope of the audit was to assess the standard of compliance with documented requirements / procedure(s) and to make recommendations, where appropriate, to enable improved environmental performance. This internal audit was conducted as part of the internal audit program specified for EMSAP-16 Internal Audit and the Lamberts North Compliance Tracking Plan that requires a 6 monthly audit be performed by the Environmental Representative. The scope of the audit was limited to implementation of obligations, commitments and environmental practices either at the time of the audit or in the preceding period.

3. Methodology

The on-site audit was conducted by Antony Nolan, *Environment O*fficer for the Lamberts North project. The audit methodology consisted of:

- An audit opening meeting
- Completion of the audit, using the Audit Checklist to record the audit findings following
- Interviews with Energy Australia NSW personnel / contractors / suppliers;
- Examination of data, records, reports and checklists;
- Review of procedures and processes used;
- Site Inspections.
- An audit closing meeting;
- Completion of the audit report.

3.1.1 Documents considered

A number of documents have been considered in preparing this Audit Report. This includes the following:

- Project Approval for the construction and operation of new ash placement areas at Lamberts South and Lamberts North from the Mt Piper Power Station dated 16 February 2012
- Noise Management and Monitoring Plan 2013 (NMMP)
- Environmental Protection Licence (EPL) 13007.
- Repository Management Plan (Mt Piper) 2017
- Energy Australia Mt Piper Calibration Reports 2017
- Lamberts North Operational Noise Assessments 2016-2017

The audit was undertaken in accordance with ISO 19011:2002 – Guidelines for Quality and/or Environmental Management Systems Auditing.

3.2 Checklist preparation

A checklist for the site audit was prepared based on the review of the documents listed in Section 3.1.1.

3.3 Opening meeting

An Audit opening meeting was held at 9.30am on Monday 12 October 2015 at Mt Piper Power Station. The meeting was attended by:

- Coleen Milroy (Audit Leader)
- Antony Nolan (Auditor, Energy Australia)
- Ben Eastwood (NSW Environment Lead, EnergyAustralia NSW)
- Wayne Gaynor (Mechanical & External Plant Leader, EnergyAustralia NSW)
- Jane Aiken (Environmental Team Leader / Scientist, Lend Lease)

3.4 Site inspection/Interviews

An inspection of the Lamberts North site was undertaken on 25 August 2017 by Antony Nolan. The auditor was accompanied by Coleen Milroy and Jane Aiken (Lend Lease). Prior to the inspection relevant documentation was reviewed and interviews were undertaken with relevant staff.

Those interviewed included:

- Jane Aiken (Environmental Team Leader / Scientist, Lend Lease)
- Des Strait (Lend Lease)
- Wayne Gaynor (WG) (Contract Administrator for Lend Lease, EnergyAustralia NSW).
- Ben Eastwood (BE) (NSW Environment Leader, EnergyAustraliaNSW).
- Alicia De Vos (A/Senior Environment officer, Energy Australia)
- Steve Thompson (Senior Environment Officer, Energy)
- Akil Lau (Acoustic Engineer, Aurecon)

3.5 Audit report

Section 4 of the report provides a summary of the findings described in more detail in the checklists in Appendix A.

Table 1 defines the terminology used in the checklists and identifies the action required with respect to audit findings.

Table 1 – Definitions and action required

Audit Finding	Definition and Actions
Compliant	There is sufficient and appropriate evidence to demonstrate the particular requirement has been complied with and is within the scope of the audit.
Non-compliance	Clear evidence has been collected to demonstrate the particular requirement has not been complied with and is within the scope of the audit.
Partial compliance	Key aspects of requirement have been met, recommendations provided to ensure ongoing compliance is achieved
Observation	An observation made which does not directly relate to conformance.
Not applicable	A requirement of an audited item has an activation or timing requirement that had not been sufficiently triggered at the time of the audit; therefore a determination of compliance could not be made.

4. Compliance with Conditions of Approval

4.1 Conditions of Approval

This section addresses Conditions of Approval D3 and aims to *"assess compliance with the requirements of this approval (09_0186), and other licences and approvals that apply to the project".* A review of compliance with the Conditions of Approval is provided in **Appendix A.**

4.2 Status of compliance

The audit found that the operation of Lamberts North was generally undertaken in accordance with the requirements of the Conditions of Approval. Two conditions relating to the NMMP under the OEMP were assessed to be non compliant.

Relevant licences have been obtained and works are being undertaken generally in accordance with the requirements of the licences. Evening and night time limits are also included in Conditions of Approval E7 D3a(ii), however no operations are permissible after 18:00, unless in an emergency. Lend Lease advised no emergency ash haulage was conducted during the reporting period.

Monitoring reports March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the noise limits set out in Conditions of Approval E7.

The audit found that Lend Lease has a schedule in place for the maintenance of plant and equipment as required by the NMMP.

No noise complaints relating to the Lamberts North operations have been recorded during the 2016-2017 operation period, suggesting that the measures in place are effective.

Table 2 – Summary of non compliance and observations

Ref	Non Compliance	Recommendation
15	Section 6.3.4 of the NMMP requires all plant and equipment used on the Project shall meet the typical noise levels presented in Table A1 of AS 2436. No evidence was available to determine whether plant and equipment onsite comply with noise levels detailed in Table A1 of AS2436.	It is recommended an assessment be undertaken to verify if all plant and equipment comply with the typical noise levels presented in Table A1 of AS 2436 by 1 August 2018.
34	Section 6.3.5.5 of the NMMP states a review of the NMMP shall be undertaken every 3 years to determine effectiveness of mitigation measures and the monitoring commitments.	It is recommended a formal review of the Lamberts North Noise Management and Monitoring Plan is undertaken.
Ref	**Observation**	**Recommendation**
35	Section 6.3.5.5 of the NMMP permits the reduction in monitoring frequency if no noise complaints are received for three consecutive reporting periods.	As no noise complaints have been received for the operation it is recommended a reduction in noise monitoring frequency be considered.

5. Conclusion

The audit was carried out generally in accordance with the requirements of ISO 19011:2002 Guidelines for Quality and or Environmental Management Systems Auditing.

Monitoring reports March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the noise limits set out in Conditions of Approval E7. No noise complaints relating to the Lamberts North operations have been recorded during the 2016-2017 period operation indicates that the measures in place are effective.

Two conditions were found to be non compliant against the NMMP. The first non compliance relates to the failure to conduct a review of the NMMP for every three years of operation. The second non compliance relates to the failure to compare sound output from plant and equipment against typical noise levels presented in Australian Standard 2436 Guide to noise and vibration control on construction, demolition and maintenance sites.

The non compliances can be characterised as administrative issues which can be readily rectified and do not present a material compliance risk to the Lamberts North project. It is recognised that the sensitivity of the adjoining areas to noise effects has decreased in recent years due to the purchase and removal of several homes in the Blackmans Flat village by Centennial Coal.

APPENDIX A

Table A: Audit Checklist see attachment

EnergyAustralia NSW

Internal Audit Form

This Proforma forms part of the OHS and Environmental Management Systems of EnergyAustralia NSW and is to be used in conjunction with DES SA 001-24 OHS Auditing and EMSAP-16 Internal Audit.

PART A – Audit Details

1. BASIS & OBJECTIVES

The audit was conducted in accordance with DES SA 001-24 OHS Auditing and EMSAP-16 Internal Audit.

System Procedure_____	Other (provide detail): (provide detail):

Note: *if a System Procedure was the audit subject, a copy should be provided as an attachment to this Audit Report.*

The audit was conducted on:	28/08/2017	**Audit Team Leader:**	Coleen Milroy
The audit team comprised: (Audit Team Members)	Tony Nolan		

The objectives of the audit were to:

- Confirm EnergyAustralia NSW's level of compliance on the Lamberts North ash repository project, with a particular focus on the general Noise Management and Monitoring Plan (NMMP) document
- Confirm Lend Lease's level of compliance on the Lamberts North ash repository project as principal contractor for the repository, with a particular focus on the general NMMP document
- Complete inspection of site to confirm compliance with general requirements of NMMP and Project Conditions of Approval
- Confirm EnergyAustralia NSW's level of compliance on the Lamberts North ash repository project, with a particular focus on the Project Conditions of Approval

2. SCOPE & METHODOLOGY

The scope of the audit was to assess the standard of compliance with documented requirements / procedure(s) and to make recommendations, where appropriate, to enable improved environmental performance. This internal audit was conducted as part of the internal audit program specified for EMSAP-16 Internal Audit.

The audit methodology consisted of:

- An audit "entry" meeting;
- Completion of the audit, using the Audit Checklist to record the audit findings following *(Note: checklist may be modified to suit actual audit methodology):*
  - Interviews with EnergyAustralia NSW personnel / contractors / suppliers;
  - Examination of data, records, reports and checklists;
  - Review of procedures and processes used;
  - Field Inspections.
- An audit "exit" meeting;
- Completion of the audit report.

PART B – Audit Checklist

3. PLANNING	
	Tick Box (√) if Completed
Confirm audit scope, objectives and methodology.	✓
Appoint Audit Team.	✓
Brief audit team on audit scope, objectives and methodology.	✓
Confirm audit timing, access requirements, personnel required, etc. with area to be audited.	✓
Prepare audit checklist / protocols.	✓
Review previous audit findings (if available and relevant).	✓
4. AUDIT COMPLETION	
	Tick Box (√) if Completed
Conduct Audit Entry meeting / record attendees.	✓
Complete audit utilising the audit checklist / protocol documenting audit findings, evidence sighted to verify audit findings, areas inspected, personnel interviewed, records inspected, etc.	✓
Assess the audit findings and categorise the level of compliance against the documented procedure or process – that is: "*Comply" / "Non-compliance" / "Observation*".	✓
Consolidate audit findings and recommendations.	✓
Conduct Audit Exit meeting/record attendees.	
Prepare draft audit report.	✓
EnergyAustralia NSW Manager SHE to review draft audit report prior to the report being finalised.	
Finalise audit report – Lead Auditor to sign and date.	
Distribute audit report, with original copy to the SHE Systems Officer, which is to include the original marked up checklists detailing the audit findings / comments.	
Prepare non-conformance report including a copy of the audit recommendations as an attachment to the non-conformance form.	
Enter audit recommendations into Ellipse for follow up corrective / preventative action.	

PART C – Audit Outcomes

WG- Wayne Gaynor, JA- Jane Aiken, AD- Alicia De Vos, BE- Ben Eastwood

5. FINDINGS

Number	Reference	Description of Clause	Interviewee	Compliance *C= Comply* *PC= Partial Compliance* *NC = Non Compliance* *O = Observation*	Evidence Sighted / Comments *(For example: Documents / Field Inspections / Records / Test Certificates, Checklists, etc.)*
1.0	Project approval (2012) Schedule 2 CoA D3 (b) Operational Noise Management Plan	As part of the OEMP for the project, required under condition D2 of this approval, the Proponent shall 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 shall be prepared in consultation with the EPA and include, but not necessarily be limited to: 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.	AD	C	Correspondence in the objective database indicated the draft Lamberts North OEMP was submitted to the EPA on the 27 February 2013 for consultation with a reply received from the EPA on the 1 March 2013. A letter from DPE confirmed the Lamberts North OEMP was approved on the 2 May 2013.
2.0	Project approval (2012) Schedule 2 CoA E6 Operational hours	The Proponent shall notify nearby sensitive receivers (as defined in the Operational Noise Management Plan 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.	JA	C	The requirement to notify sensitive receivers for out of hours work is yet to be triggered. Lendlease staff advised there is sufficient capacity in the system without doing out of hours haulage at Lamberts North.
3.0	Project approval (2012) Schedule 2 CoA E7 Operational noise	The cumulative operational noise from the ash placement area and ash haulage activity shall not exceed the following LAeq(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	AD	C	Monitoring reports March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the limits set out in Conditions of Approval E7.
4.0	Project approval (2012) Schedule 2 CoA E8 Operational noise	To determine compliance with the LAeq(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.	AD	C	The Lamberts North Operational Noise Assessment May 2017 indicates attended and unattended noise measurements were conducted from 30 April – 1 May 2017 at the boundary of the nearest residential properties for Location 1. The monitoring description for Location 2 indicates it is situated on a rural property southeast of Lamberts North and approximately 1300 m from Castlereagh Highway.

	5. FINDINGS				
Number	**Reference**	**Description of Clause**	**Interviewee**	**Compliance** *C= Comply* *PC= Partial Compliance* *NC = Non Compliance* *O = Observation*	**Evidence Sighted / Comments** *(For example: Documents / Field Inspections / Records / Test Certificates, Checklists, etc.)*
5.0	Project approval (2012) Schedule 2 CoA E9 Operational noise	For the purposes of monitoring noise from the premises to determine compliance with the noise limits: a) Class 1 or 2 noise monitoring equipment as defined by AS IEC61672.1- 2004 and ASIEC61672.2-2004, or other noise monitoring equipment accepted by the EPA in writing, must be used; b) the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment; c) the meteorological data to be used for determining meteorological conditions is the data recorded by the meteorological weather station at the premises; and d) stability category temperature inversion conditions are to be determined by the sigmatheta method referred to in Part E4 of Appendix E to the NSW Industrial Noise Policy.	AD	C	The Lamberts North Operational Noise Assessment dated May 2017 described statistical noise measurements including the averaged A-weighted noise levels (LAeq), maximum A-weighted noise levels (LAmax) and statistical A-weighted LA90 and LA10 noise levelsc were conducted using a Larson Davis 831 Type 1 sound level meter equipped with a LD PRM831 pre-amplifier and a PCB 377B02 ½" microphone. Appendix E of the report contained a weather summary from the Mt Piper weather station.
6.0	Project approval (2012) Schedule 2 CoA E10 Operational noise	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.	JA	C	Lend Lease staff advised that trucks in use at Lamberts North currently operate with the manufactures standard noise attenuation equipment. The access procedure MP-PC-733 details access protocols, communication requirements and the speed limit of 20 km/per hour applies to all vehicles operating in the Lamberts North Ash Repository.
7.0	Project approval (2012) Schedule 2 CoA E12 Ongoing operational noise	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 *New South Wales Industrial Noise Policy* (EPA, 2000) 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 Director-General 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 Operational Noise Management Plan referred to in condition D3 (a) of this approval.	AD	C	Correspondence in the objective database indicated the draft Lamberts North OEMP was submitted to the EPA on the 27 February 2013 for consultation with a reply received from the EPA on the 1 March 2013. A letter from DPE confirmed the Lamberts North OEMP was approved on the 2 May 2013. Detail on the noise monitoring program is provided in section 6.3.5 of the Lamberts North operational environmental management plan. Monitoring reports March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the limits set out in Conditions of Approval E7.

	5. FINDINGS				
Number	**Reference**	**Description of Clause**	**Interviewee**	**Compliance** *C= Comply* *PC= Partial Compliance* *NC = Non Compliance* *O = Observation*	**Evidence Sighted / Comments** *(For example: Documents / Field Inspections / Records / Test Certificates, Checklists, etc.)*
8.0	Project approval (2012) Schedule 2 CoA E13 Ongoing operational noise	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 Director-General 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 Director-General 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 Director General. The Proponent shall implement all reasonable and feasible mitigation measures in accordance with the requirements of the Director-General.	AD	C	Not activated. Monitoring reports March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the limits set out in Conditions of Approval E7.
9.0	Project approval (2012) Schedule 2 CoA E14 Ongoing operational noise	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.	AD	C	Not applicable. Monitoring reports March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the limits set out in Conditions of Approval E7.
10.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.2 Sensitive receivers	The term 'sensitive receiver' used in this plan refers to all 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.	AD	C	Reviewed copies of the Lamberts North Operational Noise Assessment dated May 2017 verified the sensitive receivers known as location 1 and location 2 are included in the compliance monitoring program.
11.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.3.1 Approved operational conditions	Operational hours associated with the project shall be undertaken during the following hours (CoA E1): Monday to Friday: 6am – 8pm Saturday to Sunday: 6am – 5pm.	JA	C	Lend Lease demonstrated how operations at Lamberts North are scheduled. A weekly instruction details the scope of work to be undertaken for the week and daily operational log sheets record the actual work time.
12.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures	Performance targets: • Achieve compliance with the noise criterion stated in the Projects Conditions of Approval E7. • Zero substantiated noise complaints relating to the Lamberts North project. Performance indicators: • Results of noise testing carried out in accordance with this sub plan demonstrate compliance. • Number of substantiated noise related complaints relating to Lamberts North Operations.	AD	C	A review of the complaints data extracted from the ellipse information system confirmed there is no history of noise complaints associated with the Lamberts North Operations. Monitoring reports March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the limits set out in Conditions of Approval E7.

	5. FINDINGS				
Number	**Reference**	**Description of Clause**	**Interviewee**	**Compliance** *C= Comply* *PC= Partial Compliance* *NC = Non Compliance* *O = Observation*	**Evidence Sighted / Comments** *(For example: Documents / Field Inspections / Records / Test Certificates, Checklists, etc.)*
13.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (1)	Operational noise levels shall not exceed the following at the all private receivers at Blackmans flat or any other sensitive receiver between the hours of: Day (7am- 6pm) 42 * Evening (6pm- 10pm) 38* Night (10pm- 7am) 35* *L Aeq (15 minutes) db (A)	AD	C	Monitoring reports March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the limits set out in Conditions of Approval E7.
14.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (2)	Operational activities associated with the project shall only be undertaken during the following hours (unless otherwise approved by the Director-General): 6.00 am to 8.00 pm, Mondays to Fridays, inclusive; and 6.00 am to 5.00 pm on Saturdays, Sundays and public holidays	JA	C	The daily operations sheet was sighted.
15.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (3)	All plant and equipment used on the Project shall meet the typical noise levels presented in Table A1 of AS 2436	AD	NC	The assessment to verify that all plant and equipment used on the Project shall meet the typical noise levels presented in Table A1 of AS 2436 is yet to be completed. It is recommended this assessment be conducted during the next operational noise assessment for Mt Piper.
16.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (4)	Ongoing noise monitoring shall be carried at a 6 month frequency from commencement of operation by a qualified noise specialist in accordance with Conditions of Approval E7, E8 & E9 and the EPA approved Operational Noise monitoring program.	AD	C	A review of the objective database determined operational noise monitoring is being undertaken by an acoustic engineer from Aurecon on a six monthly basis.
17.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (5)	Operation logs and control system data shall be kept to indicate hours of ash haulage.	JA	C	Lend Lease provided evidence of the operation logs and control system data.
18.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (6)	Site inductions and ongoing training shall include information on potential noise issues of current operations.	JA	C	Energy Australia has contracted out the operational management of the Lamberts North Ash Repository Ash to LendLease. A review of the Ash and Dust Repository Safety Induction confirmed the induction contains relevant information on noise compliance associated with the induction.

	5. FINDINGS				
Number	**Reference**	**Description of Clause**	**Interviewee**	**Compliance** *C= Comply* *PC= Partial Compliance* *NC = Non Compliance* *O = Observation*	**Evidence Sighted / Comments** *(For example: Documents / Field Inspections / Records / Test Certificates, Checklists, etc.)*
19.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (7)	A complaints register including noise shall be maintained	AD	C	All incidents and complaints and entered into the Ellipse information system administered by Energy Australia.
20.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (8)	Where possible, noise barriers will be used to reduce noise impacts to sensitive receivers this may include but not limited to noise reducing benching.	AD	C	The May 2017 Lamberts North Operational Noise Assessment report indicated the worst case modelling predicted that noise levels would comply with the day and evening time criteria at both Location 1 and Location 2. The predicted noise levels were calculated (based on sound propagation through geometric spreading) at a distance based on worst case noise emission levels (i.e. maximum sound power levels) without considering any barrier effects from the undulating surrounding terrain. Further, noise monitoring results since monitoring commenced in 2013 indicate compliance with operation noise limits detailed in condition E7. In addition to the above, the nearest sensitive receiver to monitoring site 1 was purchased by Centennial Coal and has since been removed from the site.
21.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (9)	All equipment shall be adequately maintained and kept in good operating order.	DS	C	Maintenance schedules, work orders and invoices sighted. All vehicle maintenance is recorded in the MEX database which ensures that vehicles are maintained annually but also when defects are logged. Large ash haulage equipment (ie excavators, trucks etc) are maintained by Komatsu
22.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (11)	Use of rubber-tyred equipment where appropriate.	JA	C	Sighted rubber tyred dump trucks in operation at Lamberts North.
23.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (12)	Maintenance of plant reversing alarms at the minimum safe level or alternate methods described in AS 2436, Section 3.5.	DS	C	Lend Lease advised scheduled services on plant is completed to manufactures service requirements that is inclusive of reverse alarms.

	5. FINDINGS				
Number	**Reference**	**Description of Clause**	**Interviewee**	**Compliance** *C= Comply* *PC= Partial Compliance* *NC = Non Compliance* *O = Observation*	**Evidence Sighted / Comments** *(For example: Documents / Field Inspections / Records / Test Certificates, Checklists, etc.)*
24.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (13)	Noise reduction equipment will be applied to ash trucks where necessary as described in AS 2436, Section 4.5.3.	DS	C	Lend Lease advised all plant in use have the manufactures muffler system installed.
25.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (14)	Drivers shall obey all existing haul road speed limits enforceable by either the principle contractor or Energy Australia.	JA	C	The Lend Lease access protocol procedure MP-PC-733 limits traffic movement to authorised vehicles only in the Lamberts North Repository domain. To ensure the safety of all and any persons working in this area prior notification is necessary. All workers need to have completed the Ash & Dust Repository Site Induction and sign onto the log sheet in the control room prior to entering the site.
26.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (15)	Trucks will be routinely inspected and maintained to ensure the operational efficiency and implement the noise reduction devices	DS	C	Lend Lease provided current samples of maintenance schedules, work orders and invoices for plant and equipment.
27.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (16)	An Operational Noise Review, shall be carried out to confirm the operational impacts of the project in consultation with the EPA. This shall be carried out in accordance with the Condition E11.	AD	C	Records in the objective database indicate an operational noise review was undertaken in September 2013 that confirmed the Lamberts North operation complied with the limits set out in Conditions of Approval E7. A letter from Energy Australia dated 9/10/2013 to the EPA indicated a copy of the operational noise review was attached for their review.
28.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (17)	A noise report shall be provided by a qualified noise specialist to identify results of noise monitoring survey	AD	C	Records of operational noise monitoring reports for Lamberts North indicate they have been prepared by an acoustic engineer from Aurecon.
29.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (18)	Energy Australia shall forward to the NSW EPA and the Director-General a report containing any non-compliance in relation to noise within 14 days of conducting the noise assessment.	AD	C	Not activated. Monitoring reports September 2013, March 2014, September 2014, March 2015, September 2015, March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the limits set out in Conditions of Approval E7.

	5. FINDINGS				
Number	**Reference**	**Description of Clause**	**Interviewee**	**Compliance** *C= Comply* *PC= Partial Compliance* *NC = Non Compliance* *O = Observation*	**Evidence Sighted / Comments** *(For example: Documents / Field Inspections / Records / Test Certificates, Checklists, etc.)*
30.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (19)	Energy Australia shall notify the EPA prior to undertaking any emergency ash haulage or placement operations outside the hours of operation (stipulated in section 1.3.1 of this plan). A log must be recorded and kept for any emergency ash haulage or ash placement activities.	AD	C	Not activated. Emergency ashing operations at Lamberts North are managed according to the Emergency Ashing Mt Piper procedure (MP-PC-735 Emergency Ashing Mt Piper (P2). To date, no emergency ash haulage has been required for Lamberts North Operation.
31.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (20)	Energy Australia shall notify the Director-General in writing within seven days or undertaking any emergency ash haulage or operation stipulated in the condition E1	AD	C	Not activated. Emergency ashing operations at Lamberts North are managed according to the Emergency Ashing Mt Piper procedure (MP-PC-735 Emergency Ashing Mt Piper (P2). To date, no emergency ash haulage has been required for Lamberts North Operation.
32.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3 (21)	Energy Australia shall notify the nearby sensitive receivers as defined by this plan, prior to 8.00pm where it known that emergency ash haulage or placement operations will be required outside the hours of operation.	AD	C	Not activated. Emergency ashing operations at Lamberts North are managed according to the Emergency Ashing Mt Piper procedure (MP-PC-735 Emergency Ashing Mt Piper (P2). To date, no emergency ash haulage has been required for Lamberts North Operation.
33.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.4 Management and Mitigation measures Table 6-3	In an emergency situation that involves a breakdown of plant and/or equipment in the ash placement areas, that will limit or prevent ash storage from Mt Piper power station, Energy Australia shall then notify the Director- General in writing within seven days of undertaking any emergency haulage or placement operations outside the hours of operation stipulated in condition E1	AD	C	Not activated. Emergency ashing operations at Lamberts North are managed according to the Emergency Ashing Mt Piper procedure (MP-PC-735 Emergency Ashing Mt Piper (P2). To date, no emergency ash haulage has been required for Lamberts North Operation.
34.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.5.5 Management and Mitigation measures Table 6-6	The Operation Noise Management and Monitoring Plan (this plan) shall be reviewed every 3 years to determine effectiveness of mitigation measures and the monitoring commitments.	AD	NC	No formal review of the Lamberts North Noise Management and Monitoring Plan has been conducted since its approval on the 2 May 2013.
35.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.5.5 Management and Mitigation measures Table 6-6	If Energy Australia does not receive any noise complaints in three consecutive reporting periods then Energy Australia can reduce their noise monitoring frequency. If a complaint is received after the frequency has been reduced Energy Australia will investigate the complaint via additional noise surveys.	AD	O	There is no record of any noise complaint being received that is associated with the Lamberts North Ash Repository. Therefore as no complaint has been received for more than three consecutive reporting periods the operation may reduce the monitoring frequency as permitted in the noise management and monitoring plan.

	5. FINDINGS				
Number	**Reference**	**Description of Clause**	**Interviewee**	**Compliance** *C= Comply* *PC= Partial Compliance* *NC = Non Compliance* *O = Observation*	**Evidence Sighted / Comments** *(For example: Documents / Field Inspections / Records / Test Certificates, Checklists, etc.)*
36.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.5.5 Management and Mitigation measures Table 6-7	Energy Australia shall review the periodic noise monitoring reports and implement recommendations where feasible and practicable. In addition Energy Australia shall report any results and recommendations to the Ash repository contractor as part of their monthly meetings	WG	C	Confirmed that monitoring results are discussed with Lend Lease.
37.0	OEMP (2012) Noise Management and monitoring Plan (NMMP) Section 6.3.5.5 Management and Mitigation measures Table 6-7	The Annual Environmental Management Report (AEMR) shall be submitted to the Director-General complete with noise assessment reports carried out during that reporting year. The AEMR can be completed and/or overseen by the Environmental Representative	AD	C	The 2015 Lamberts North Annual Environmental Management Report contained the September 2016 and March 2016 Lamberts North Operations Noise Assessments.
38.0	EPL 130007. M6.1 Recording of pollution complaints	The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.	AD	C	A review of the complaints data extracted from the ellipse information system has confirmed there is no history of noise complaints relating to the Lamberts North Operations.
39.0	EPL 130007. M6.2 Recording of pollution complaints	The record must include details of the following: a) the date and time of the complaint; b) the method by which the complaint was made; c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect; d) the nature of the complaint; e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and f) if no action was taken by the licensee, the reasons why no action was taken.	AD	C	A review of the complaints data extracted from the ellipse information system has confirmed there is no history of noise complaints relating to the Lamberts North Operations. Monitoring reports, March 2016, October 2016, May 2017 indicate that the Lamberts North operations comply with the limits set out in Conditions of Approval E7.
40.0	EPL 13007. O2 Maintenance of plant and equipment	All plant and equipment installed at the premises or used in connection with the licensed activity: a) must be maintained in a proper and efficient condition; and b) must be operated in a proper and efficient manner.	DS	C	The May 2017 Air Monitoring Network Report indicates the Mt Piper Power Station has compliance with the AS/NZ 3580 Method for sampling and analysis of ambient air guide to siting air monitoring equipment.
41.0	EPL 130007. M5.1 Weather monitoring	For licence monitoring point 4 (weather monitoring), the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The licensee must use the units of measure, frequency, averaging period and sampling method specified opposite in the other columns.	ST	C	The May 2017 Air Monitoring Network Report includes data on wind speed, wind direction, sigma theta, ambient temperature, relative humidity, net radiation, barometric pressure, rainfall, evaporation.

6. RECOMMENDATIONS	

Appendix G

Lamberts North Internal Groundwater Audit August 2017

Environmental Audit Report

Lamberts North Project

Prepared by: Coleen Milroy

Date: 27/10/2017

Contents

1. Introduction

An environmental audit was conducted to confirm environmental compliance with the Department of Planning and Environment (DPE) Conditions of Approval (CoA) for the Mt Piper Ash Repository Project 09_0186-Lamberts North. CoA B8 required Delta Electricity (now privatised EnergyAustralia NSW) to develop and implement a Compliance Tracking Program to track and report on compliance with all CoA's. In particular, B8 c) requires a program of independent environmental auditing with audits *"carried out in accordance with ISO 19011:2002 - Guidelines for Quality and or Environmental Management Systems Auditing" with* non-compliances to be rectified as per B8 d).

2. Audit Objectives, Criteria & Scope

The audit objective was to assess compliance with:

- Environmental mitigation measures stated in Operation Environmental Management Plans (OEMP) in relation to groundwater management;
- Environmental management protocols and controls stated in the Operational Environmental Management Plan (OEMP) in relation to groundwater management;
- Relevant Project Approval conditions and statement of commitments contained in the NSW Planning Approval of 16 February 2012.

The scope of the audit was to assess the standard of compliance with documented requirements / procedure(s) and to make recommendations, where appropriate, to enable improved environmental performance. This internal audit was conducted as part of the internal audit program specified for EMSAP-16 Internal Audit and the Lamberts North Compliance Tracking Plan that requires a 6 monthly audit be performed by the Environmental Representative. The scope of the audit was limited to implementation of obligations, commitments and environmental practices either at the time of the audit or in the preceding period.

3. Methodology

The on-site audit was conducted by Coleen Milroy, Environmental Representative for the Lamberts North project. The audit methodology consisted of:

- An audit opening meeting
- Completion of the audit, using the Audit Checklist to record the audit findings following
  - Interviews with EnergyAustralia NSW personnel / contractors;
  - Examination of data, records, reports and checklists;
  - Review of procedures and processes used;
- Completion of the audit report.

The audit was undertaken in accordance with ISO 19011:2002 – Guidelines for Quality and/or Environmental Management Systems Auditing.

3.1.1 Documents considered

A number of documents have been considered in preparing this Audit Report. This includes the following:

- Major Project Application 09_0186
- Mt Piper Ash Placement (two volumes) – Environmental Assessment (EA), prepared by SKM, August 2010.
- Conditions of this approval (dated 16 February 2012).

In addition to the above documents, the following documents were also reviewed for the checklist preparation.

- Lamberts North Ash Placement Project Operation Environmental Management Plan (OEMP) prepared by CDM Smith, dated May 2013.
- Environmental Protection Licence (EPL) 13007.

3.2 Checklist preparation

A checklist for the site audit was prepared based on the review of the documents listed in Section 3.1.1.

3.3 Opening meeting

An Audit opening meeting was held at 12.30pm on Tuesday 22 August 2017 at Mt Piper Power Station. The meeting was attended by:

- Wayne Gaynor (Contract Administrator for Lend Lease, EnergyAustralia NSW)
- Coleen Milroy (Audit Leader)
- Antony Nolan (Auditor)

- Ben Eastwood (Environment Leader)

3.4 Interviews

Relevant documentation was reviewed and interviews were undertaken with relevant staff.

Those interviewed included:

- Jane Aiken (Environmental Team Leader / Scientist, Lend Lease)
- Wayne Gaynor (Contract Administrator for Lend Lease, EnergyAustralia NSW)
- Ben Eastwood (Environment Leader)
- Alicia de Vos (A/Senior Environment Officer)

3.5 Documents and records

Project records and reports reviewed during the audit included the following:

- Lendlease Repository Management Plan_draft (2017)
- Annual Environmental management Report (2017)
- Operation al Environment Management Plan (2012)
- Audit reports applicable to Lamberts North
- Monitoring data:
  - Groundwater monitoring data and assessments
  - Ecological monitoring
  - Weather monitoring
- Records and registers:
  - Incidents register
  - Risk register
  - Complaints register
  - Inspections records ie daily, weekly, monthly
  - Ash moisture content at placement and water usage

3.6 Audit report

Section 4 of the report provides a summary of the findings described in more detail in the checklists in Appendix A.

Table 1 defines the terminology used in the checklists and identifies the action required with respect to audit findings.

Table 1 – Definitions and action required

Audit Finding	Definition and Actions
Compliant **(C)**	There is sufficient and appropriate evidence to demonstrate the particular requirement has been complied with and is within the scope of the audit.
Non-compliance **(NC)**	Clear evidence has been collected to demonstrate the particular requirement has not been complied with and is within the scope of the audit.
Partial compliance **(PC)**	Key aspects of requirement have been met, recommendations provided to ensure ongoing compliance is achieved.
Observation **(O)**	An observation made which does not directly relate to conformance.
Not applicable **(NA)**	A requirement of an audited item has an activation or timing requirement that had not been sufficiently triggered at the time of the audit; therefore a determination of compliance could not be made.

4. Compliance with Conditions of Approval

4.1 Conditions of Approval

This section addresses Conditions of Approval D3 and aims to *"assess compliance with the requirements of this approval (09_0186), and other licences and approvals that apply to the project".* A review of compliance with the Conditions of Approval is provided in **Appendix A.**

4.2 Status of compliance

The audit found that the operation of Lamberts North in regard to groundwater management was generally undertaken in accordance with the requirements of the Conditions of Approval.

Five partial compliances and four observations relating to the Conditions of Approval were identified and are summarised in Table 2.

Table 2 – Summary of compliance

Ref	Partial Compliances	Recommendation
13 and 22	GMMP Section 6.4.2 Groundwater monitoring shall be undertaken in accordance with the Groundwater Monitoring Program in 6.4 of plan. Assessment on trends and results shall be undertaken as part of a site management review process.	It is noted that the groundwater monitoring bores D15 to D18 are not included in the Water Quality assessment performed annually by Aurecon although they are monitored according to the GMMP. Recommend that the justification for their exclusion by Aurecon be confirmed. If it is found to be correct the GMMP will need to be amended to reflect this change. However if the removal of bores D15 to D18 is not justified then the bores need to be included in the annual assessment (as detailed in the GMMP).
24 and 31	GMMP Section 6.4.3 requires that if there is any significant change in the groundwater level as measured by monthly depth measurements, then flow calculations will be undertaken and a rerun of the model considered.	It is noted that no significant groundwater level changes have been detected with the exception of bore D19 that has decreased by approximately 2m (Aurecon, 2017). The cause of this decrease is not known. Recommend that the change in level at bore D19 be investigated further as per the contingency plan.
25	GMMP Section 6.4.3 Groundwater monitoring program	It is noted that the lab contractor samples in accordance with Australian standard for groundwater sampling. However the principal contractor for ash management also take samples but their procedure may not conform to the standard. Recommend ensuring procedure is in place that conforms to groundwater standard for sampling or alternatively utilising specialist who can perform this duty.
Ref	**Observations**	**Recommendation**
2, 20, 26	CoA E15 Groundwater monitoring program requires 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	One new borehole site was established for the project identified as D20, recommend that bore D20 be added to GMMP.

3	Groundwater Management and monitoring Plan (GMMP) Section 6.4.1 requires a contingency plan in the event that groundwater quality exceedances are observed.	Recommend revising GMMP to reflect correct terminology for trigger to remove any ambiguity about the assessment criteria.

4.3 Environment Management

Appendix A. provides the audit checklist used to undertake a targeted assessment of compliance with respect to the Lamberts North Ash repository project. The checklist reviews the effectiveness of the environmental management of the project.

A range of environmental controls were outlined in the Groundwater Management and Monitoring Plan (GMMP).

Five partial compliances were identified by the audit in relation to Section 6.4.2 Management and Mitigation measures of the GMMP and secondly Section 6.4.3 thirdly Groundwater Monitoring Program and thirdly Section 6.4.3.1 Guidelines of the GMMP. Four observations were identified by the audit in relation to environmental management detailed in the GMMP. The first three partial compliances are in regard to groundwater monitoring that is required to be undertaken in accordance with the Groundwater Monitoring Program. It is noted that the groundwater monitoring bores D15 to D18 are not included in the Water Quality assessment performed annually by consultants although they are monitored according to GMMP and the EA sample schedule. The fourth partial compliance is in relation to the requirement for a contingency plan in the event that groundwater quality exceedances are observed. It is noted that no significant groundwater level changes have been detected with the exception of bore D19 that had decreased by approximately 2m (Aurecon, 2017). It is stated in the Water quality Assessment (Aurecon, 2017) that the cause of this decrease is not known. The fifth partial compliance is in relation to groundwater monitoring program. It is noted that the service provider Nalco sample groundwater in accordance with Australian standard for groundwater sampling, however Lendlease also take samples that are included for reporting but their procedures may not conform to the groundwater sampling standard.

The first three observations were in regard to the groundwater monitoring program that requires a) monitoring at established bore sites (or replacement bore sites in the event that existing sites are damaged or lost) as described in the GMMP as per condition D3. However one new borehole site was established for the project identified as D20 that has not been added to GMMP. The fourth observation is in regard to the GMMP requirement for a contingency plan in the event that groundwater quality exceedances are observed. However, the terminology for the trigger is not consistent in the contingency plan.

4.3.1 Recommendations

The recommendations from the finding of this audit are:

- Update the OEMP and the GMMP in consultation with DPE (and other regulators) to reflect the current groundwater network and the frequency of sampling:

- Revise GMMP to reflect consistent terminology for trigger values to remove any ambiguity about the assessment criteria;
- Determine whether the exclusion of analysis and assessment of several bores in the annual Water Quality assessment is confirm if this exclusion can be justified. If it is found to be correct the GMMP will need to be amended to reflect this change. However if the removal of bores D15 to D18 is not justified then the bores need to be included in the annual assessment (as detailed in the GMMP);
- Lamberts North Ash Repository management contractors may be required to develop a procedure that conforms to the groundwater standards and guidelines for sampling or alternatively utilise specialists who can perform this duty;
- The change in level at bore D19 requires further investigation as per the contingency plan requirements.

5. Conclusion

The audit was carried out generally in accordance with the requirements of ISO 19011:2002 Guidelines for Quality and ISO 14001:2004 Guidelines for Environmental Management Systems. The environmental management of the project, including environmental impact mitigation works were generally found to be effective. No complaints or incidents related to the Lambert North ash placement have been reported during operation. The audit found that both Lend Lease and EnergyAustralia NSW have well established inspection schedules and the information was readily available during the audit. Monitoring programs as required by the OEMP and Conditions of Approval are in place and monitoring data is available.

The audit found that the operation of Lamberts North was generally in compliance with the requirements of the approval of the project. Five partial compliances were identified that indicate that EnergyAustralia NSW is generally compliant with the Conditions of Approval. EnergyAustralia NSW should consider the recommendations from this audit to ensure full compliance is achieved for the Project.

Appendix H

Annual Summary of Lend Lease Compliance at Lamberts North

2016-2017 Annual summary of Lend Lease compliance at Lamberts North

	September	October	November	December	January	February	March	April	May	June	July	August
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

C = Compliant NC=Non compliance

Appendix I

Annual EnergyAustralia Community Sponsorships and Donations

EnergyAustralia Community Sponsorships and Donations 2016-2017

Recipient	Reason	Month/Year
Ironfest	Sponsorship of Annual Community Event	March 2016
Portland Art Show	Local art exhibition for Portland and buying work from local artists	April 2016
Lithgow Show Society	Donation to 2016 Lithgow Show	April 2016
St. Josephs School Portland	Hire of Amusement Ride for School Fete	April 2016
Sea Bees Fishing Club	Sponsorship for Annual Fishing Tournament at Lake Lyell	May 2016
Power To Engineering	Sponsorship of Event at Charles Sturt University Bathurst	May 2016
Lithgow City Council	Sponsorship for Halloween Event	June 2016
Barton Park	Assist with creation of sunken oriental garden	July 2016
Mitchell Conservatorium	Provision of Scholarships to local music students	July 2016
Lithgow Pony Club	Refurbishment of Amenities Block	July 2016
Lithgow District Car Club	Development of Motor Sport Park	July 2016
COC Limited	Development of Wolgan Valley Wilderness Rail Trail	July 2016
Cancer Council	Biggest morning tea match monies raised by staff for the Cancer Council	July 2016
Lithgow Community Nursery	Assist with Frost Protection Project	August 2016
Mingaan Aboriginal Corporation	Naidoc Day Celebrations	August 2016
Portland Pool	Assist with supply and installation of solar panels	August 2016
Lithgow High School	Annual Presentation Day	September 2016
La Salle Academy	Annual Presentation Day	September 2016
Zig Zag School	125 Year Anniversary Celebrations	September 2016
Wallerawang Central Acclimatisation Soc	2016 Gone Fishing Day	September 2016
Careflight	Matching Staff Donations 1/1/15 - 31/12/15	September 2016
The Smith Family	Matching Staff Donations 1/1/15 - 31/12/15	September 2016
Lithgow PCYC	Matching Staff Donations 1/1/15 - 31/12/15	September 2016
Hats On For Zara	Matching Staff Donations	September 2016
Lithgow Swimming Club	Twilight Meet 2016	October 2016
Cancer Council	Matching Staff Donations - Daffodil Day	October 2016
Ironfest	Sponsorship of Lithgow Festival of Valley 2016	November 2016
Rydal Show Society	Sponsorship of Annual Show	November 2016

Recipient	Reason	Month/Year
Cullen Bullen Public School	Sponsorship of Annual Award Presentation Day	November 2016
Hampton Public School	Sponsorship of Annual Award Presentation Day	November 2016
Lithgow Public School	Sponsorship of Annual Award Presentation Day	November 2016
Portland Central School	Sponsorship of Annual Award Presentation Day	November 2016
St. Josephs School Portland	Sponsorship of Annual Award Presentation Day	November 2016
Zig Zag Public School	Sponsorship of Annual Award Presentation Day	November 2016
Capertee Public School	Sponsorship of Annual Award Presentation Day	November 2016
Meadow Flat Public School	Sponsorship of Annual Award Presentation Day	November 2016
Wallerawang Public School	Sponsorship of Annual Award Presentation Day	November 2016
Cooerwull Public School	Sponsorship of Annual Award Presentation Day	November 2016
Hartley Advisory Committee	Back to Hartley 2016	November 2016
Royal North Shore	Matching Staff Donations - 01/01/15 - 31/12/15	November 2016
St Patricks School	Sponsorship of annual award presentation day	December 2016
Highlands Steam & Vintage Fair	Sponsorship of Annual Fair (Accrued)	December 2016
Lithgow Oberon Landcare Association	Sponsorship local environment project (Accrued)	December 2016
St.Patricks/St Vincents Days for Girls	Purchase of hygiene kits for women in Timor	December 2016
Bathurst WaterPolo	Purchase Electronic Scoreboard (Accrued)	December 2016
Portland Colts Football Club	Assist with 100 Year Celebrations	December 2016
Mingaan Wiradjuri Aboriginal Corp	Assist with conservation works at 'Blackfellow Hands' (Accrued)	December 2016
Lithgow Show Society	Assist with Annual Show (Accrued)	December 2016
Portland Mens' Shed	Assist with expenses to attend the central west conference	December 2016
Lithgow Army Cadet Unit	Update infrastructure to enable inclusion of disabled youth (Accrued)	December 2016

Recipient	Reason	Month/Year
Cullen Bullen Rural Fire Service	Assist with repairs to Meeting Room (Accrued)	December 2016
Portland Sport & Recreation Club	Assist with purchase of Trailer (Accrued)	December 2016
Lithgow Business Networking Group	Production of maps outlining tourism activities in local area (Accrued)	December 2016
Multiple Sclerosis	Matching Staff donations - Sydney to the Gong Cycle Ride	December 2016
Josephite Foundation	Donation to No Interest Loan Scheme	February 2017
Ironfest	Annual Sponsorship	March 2017