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Project: Mt Piper Power Station Ash Placement

Lamberts North – Operational Noise Assessment March 2015

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Mt Piper Power Station Ash Placement

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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 the Conditions of Approval. EnergyAustralia 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. Lamberts North 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 noise measurements at two sensitive receiver locations to determine potential noise impacts arising from the operational activities at Lamberts North site.

1.4 Sensitive receivers

The sensitive receivers within the vicinity of the Project and identified for noise impacts within the Operation Noise Management and Monitoring Plan (*ONMMP)* which is 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 1300 m from Castlereagh Highway.	2.5 km East
3	Lamberts North	33.35921ºS 150.04741ºE	Additional location at the south eastern boundary of Lamberts North site	Within the Lamberts North site

[a] Refer to Figure 1 for locations

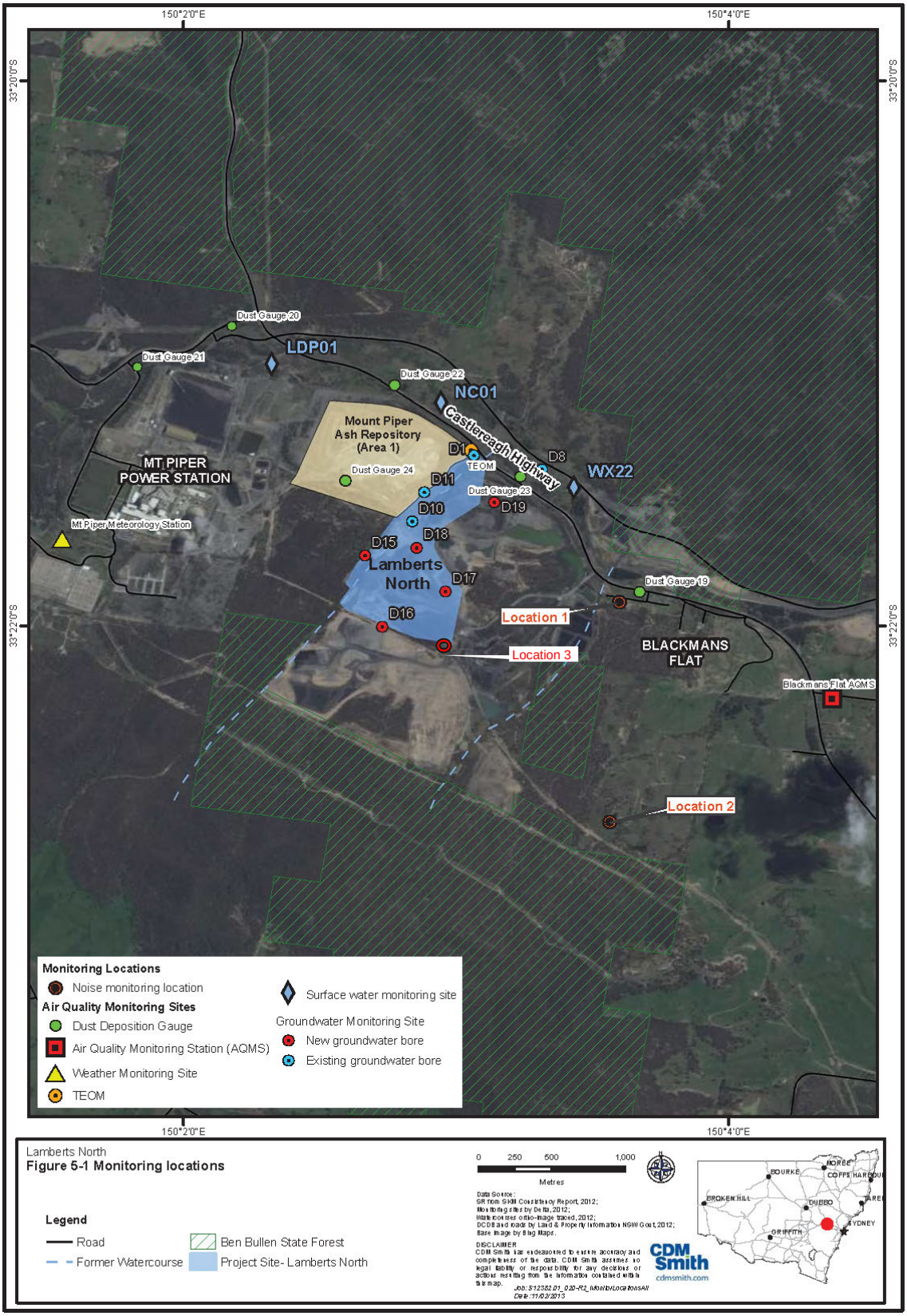


Figure 1 | Environmental noise monitoring locations

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 and ash placement operations at Lamberts North site was occuring during the site visit from 15 – 16 March 2015. No ash placement was occurring at Mt Piper Ash Repository Area 1. 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.

The equipment outlined in Table 2 was sighted 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 previously by Aurecon (January 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 started at 6:00 for a 6:15 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), two dump trucks working in tandem and one light commercial vehicle. One water cart was sighted but was operating occasionally dependant on whether it was required.
- Dump trucks were being loaded near the ash bins and were unloaded at the Lamberts North ash repository site.
- One dozer was operating on the ash stock pile which was visible and audible at monitoring Location 3 near the ash site.
- All activities ceased by 17:00. No activities occurred during the evening or night time period (18:00 – 07:00) at either the Lamberts North or Mt Piper sites.

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

Equipment type	Number of equipment on site during the site visit	Sound Power Level SWL for each equipment type dB(A)[b]
Dozer / Crawler tractor*	1	106
Dump Truck*	2	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 (and visually evident) during our site visit 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. Pine Dale coal mine is located to the north east of the site with operations of equipment and mobile plant.

.

[b] SWL includes adjustment for tonality.

3 Noise criteria

3.1 Conditions of Approval relating to noise

The ONMMP is a sub plan of the OEMP. It 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-D3a(ii) defines 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	$L_{Aeq\ (15\ minute)}$ dB(A)		
	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 day and evening time noise measurements were conducted from 15 – 16 March 2015 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. 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	19.08.2014	19.08.2016
Calibrator	LD	CAL200	6345	-	14.02.2014	14.02.2016

Attended noise measurements were conducted at three locations (as shown in Figure 1) using the Type 1 sound level meter.

4.2 Weather data

Cloudy conditions and wind speeds below 1 m/s were evident at all the three locations on 15 March while cloudy conditions and intermittent wind (< 2 m/s) were prevalent at Location 3 over the measurement period on 16 March. There was no activity during the evening or night time period (18:00 – 07:00) as mentioned in Section 2.2. As stated in the NSW INP, activities at the Lamberts North site during 06:30 – 07:00 are not considered as night time activity as this time period falls under 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-D3a(ii):

[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.

- Wind speeds were less than 3 m/s at 10 m above ground level.
- 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

Multiple 15-minute measurements were undertaken at each Monitoring Location. Table 5 provides a summary of the environmental noise monitoring results for each location. Detailed results of continuous noise measurements over the 15-minute period are shown in Appendix D. A list of operating equipment identified at the Lamberts North site is outlined in Section 2.

Table 5 | Results of environmental noise monitoring

Location	Date	Time	Period	Measured sound Pressure Level, dB(A)				Note
				$L_{Aeq, 15min}$ #	$L_{A10, 15min}$ ^^	$L_{A90, 15min}$ ^	$L_{Amax, 15min}$ *	
Location 1 *(Blackmans Flat)*	15/03/2015	9:23	Day	51	54	37	71	Note 1
	15/03/2015	21:38	Evening	48	52	35	73	
	15/03/2015	22:00	Night	46	49	36	62	
	16/03/2015	8:34	Day	55	58	47	68	
	16/03/2015	18:46	Evening	51	56	37	65	
	16/03/2015	22:34	Night	52	56	30	70	
	16/03/2015	22:49	Night	41	42	30	60	
Location 2 *(Wallerawang)*	15/03/2015	9:45	Day	40	42	36	63	Note 2
	15/03/2015	21:14	Evening	43	45	41	65	
	16/03/2015	8:56	Day	42	43	38	71	
	16/03/2015	18:24	Evening	41	43	39	55	
	16/03/2015	22:08	Night	41	43	34	72	
Location 3 *(South eastern boundary of Lamberts North)*	15/03/2015	8:34	Day	46	50	41	68	Note 3
	15/03/2015	8:49	Day	43	46	39	56	
	16/03/2015	7:40	Day	46	48	39	73	
	16/03/2015	7:55	Day	60	66	41	74	

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 and represents ambient road traffic noise in general.*

^ *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 minimum 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 noises (example dogs barking, conversations etc.) and activities at Mt Piper Power Station. Reverse beeping from mobile plant originating from north western direction (Mt Piper Power Station) was occasionally audible during the Sunday day time measurement. There was no audible noise from the westerly direction (i.e., Centennial coal, Springvale Mine, etc.) during our site attendance.

Instantaneous noise level was measured in the range of L_{AF} 62-58 dBA when a vehicle was passing on Castlereagh Highway. Birds and insects contributed to the $L_{Amax\ 15\ minute}$ of 71-62 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 high compared to Location 1 especially during the evening and night time measurements. There was constant unidentified noise (low frequency hum) originating from south easterly direction at this location, which contributed to the background noise ($L_{A90\ 15\ minute}$ 34 - 41 dBA) during the entire night time measurement period. The unidentified noise could be from the Springvale Coal mine managed by Centennial Coal but was not confirmed.

Noise contribution during the 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 localization using binaural hearing during the attended measurement, there was no evidence of noise originating from 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 are considered to be minimal or insignificant.

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 varies and included sources such as engine noise from the dump trucks, reverse beeps from dozer/ trucks, bucket bangs of dozer, loading of ash in the dump truck, etc.

5 Noise assessment

The results of the measured noise levels at the sensitive receiver boundaries (Location 1 and Location 2) can be found in Table 5. As discussed in Section 4, equivalent sound pressure levels (L_{Aeq}) at both the receiver locations were dominated by traffic noise and noise from nearby coal mines. Operational noise from Lamberts North was inaudible at both the sensitive locations. As the operational noise contribution from the Lamberts North was inaudible, we undertook a desktop based noise prediction to conclusively assess 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 6:00 (6:00 meeting for a 6:15 start) until 17:00 during our site visit. There were no operational activities after 17:00 until 6:00am 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 at the same time simultaneously at Lamberts North.

- Dozer/ Crawler tractor x 1
- Dump trucks x 2
- 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 of machines operating and the intensity and working location of the equipment. It will be 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 during the course of the project.

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 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) and maximum percentage of use during the indicated time frame. In reality the mobile plant operate at much lower capacity during majority of its time 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	Total SWL, dB(A)	Predicted sound pressure level at indicated distance, dB(A)	
		1.4km (Location 1)*	2.5km (Location 2)*
Dozer / Crawler tractor	106	32	27
Dump Truck	107[e]	33	28
Water cart	107	33	28
Light commercial vehicle	106	32	27
Cumulative overall predicted noise level from the operation of the above equipment		38	33

Results of our assessment revealed the following:

- Maximum predicted noise levels 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 we note that CoA E1 for Lamberts North restricts any activities after 8pm on weekday and 5pm on weekends (refer to Section 3.2 for more details).

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	✓	✓	✓
2	Wallerawang	33	✓	✓	✓

✓ Complies with the stipulated noise criteria

^ No operational activity during evening and night time periods.

* Refer to Figure 1 for receiver locations

As evident from Table 7 above, noise associated with the operational activities at Lamberts North complied with the stipulated noise criteria at both the representative locations.

[e] Two dump trucks included

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 appropriate silencer/muffler on the engine exhaust for each truck working at Lamberts North.

7 Conclusion

Attended noise monitoring at Lamberts North has been carried out by Aurecon from 15 - 16 March 2015 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.

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 compared to Location 2 (i.e. Wallerawang) and the maximum equivalent continuous sound pressure level over 15 minutes at Location 1 was measured at $L_{Aeq\ (15minute)}$ 55 dB(A). The measured noise levels were dominated by the intermittent road traffic along Castlereagh Highway and few 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 dB(A).

7.2 Location 2: Wallerawang

The background noise level at the rural residential Location 2 (i.e. Wallerawang) is relatively high compared to Location 1 due to general hum from the nearby coal mines during night time. The main noise 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 localization using binaural hearing during the attended measurement, there was no evidence of noise originating from north westerly direction, thus indicating that noise contribution from Lamberts North to the overall equivalent sound pressure level at this location was negligible. Continuous noise over 15 minutes at Location 2 was measured at $L_{Aeq\ (15minute)}$ 43 dB(A).

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 dB(A).

7.3 Summary

The noise contribution from the operational activities at Lamberts North site cannot be conclusively measured due the presence of other surrounding simultaneous noise sources and activities including activities at Springvale coal mine, road traffic, insects, etc.

Based on the noise survey conducted at Locations 1, 2 and 3 between 15 and 16 March 2015 and calculated noise predictions, the operational 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 (2×10^{-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 (dB(A)) & 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_{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)

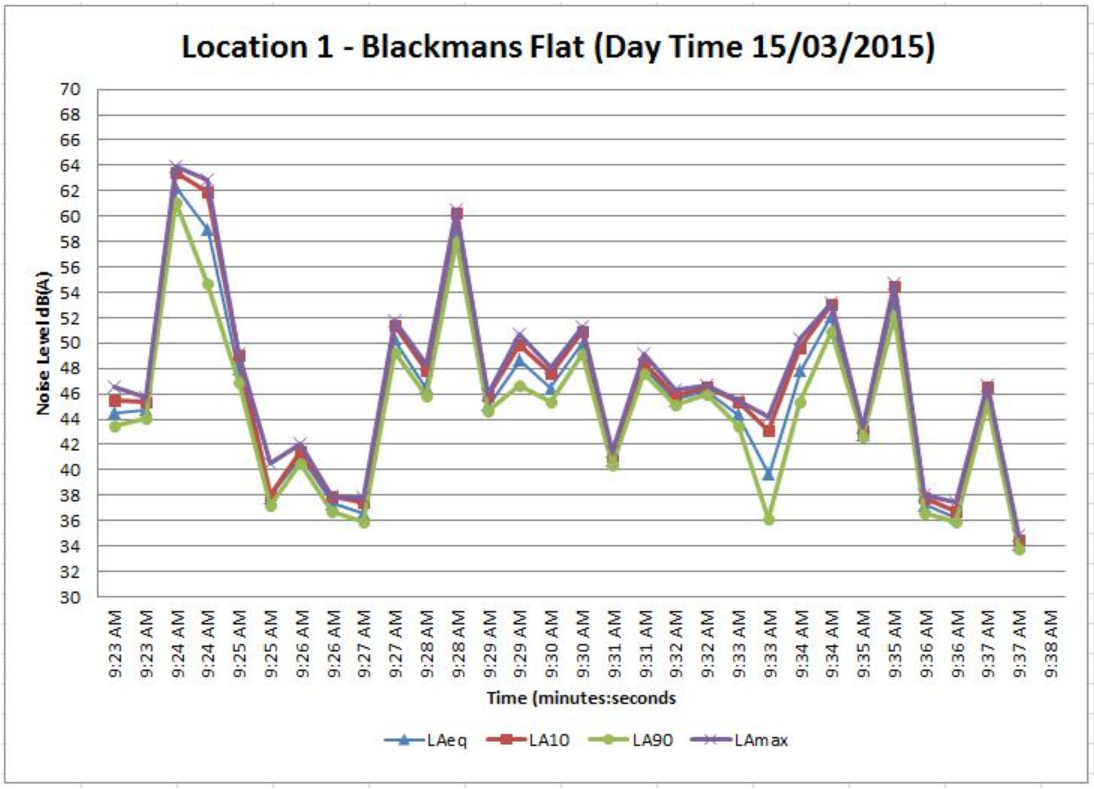
Figure 4 | Photograph of Lamberts North South eastern boundary (Location 3)

Figure 5 | Photograph of Lamberts North South eastern boundary with dump truck and dozer operating

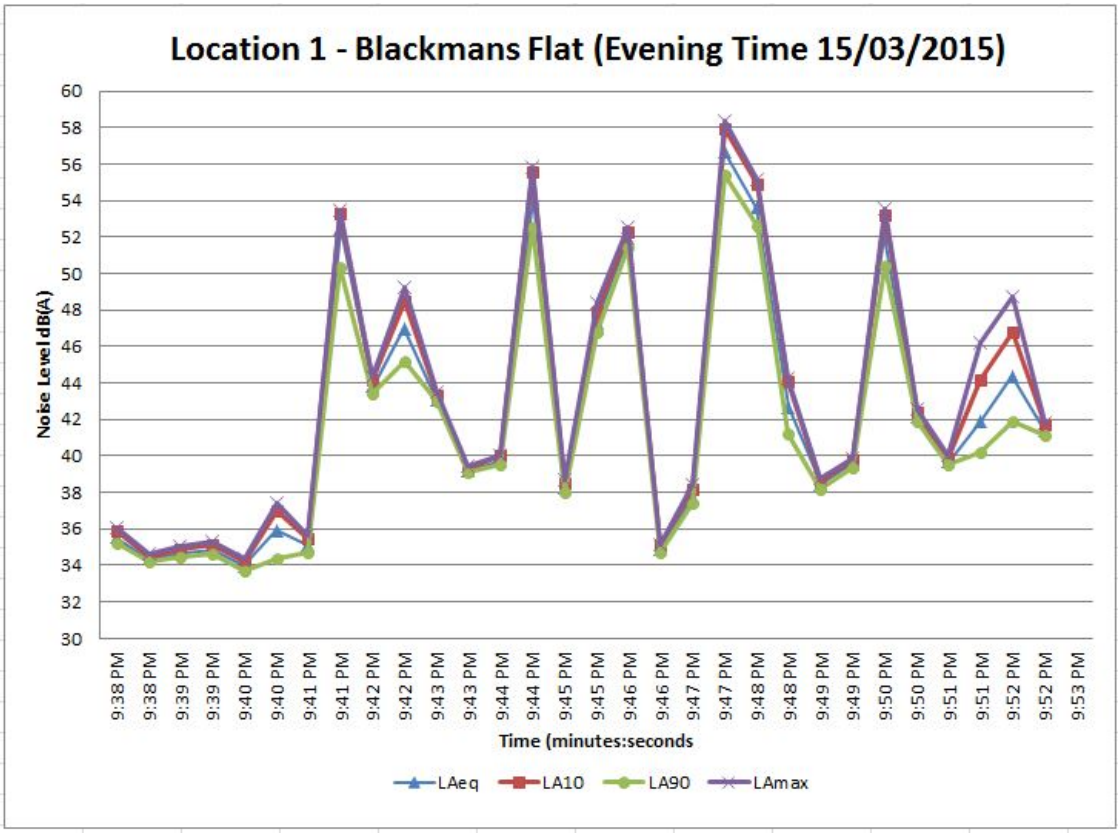
Appendix C
Lamberts North location map

Appendix D
Noise monitoring graphs

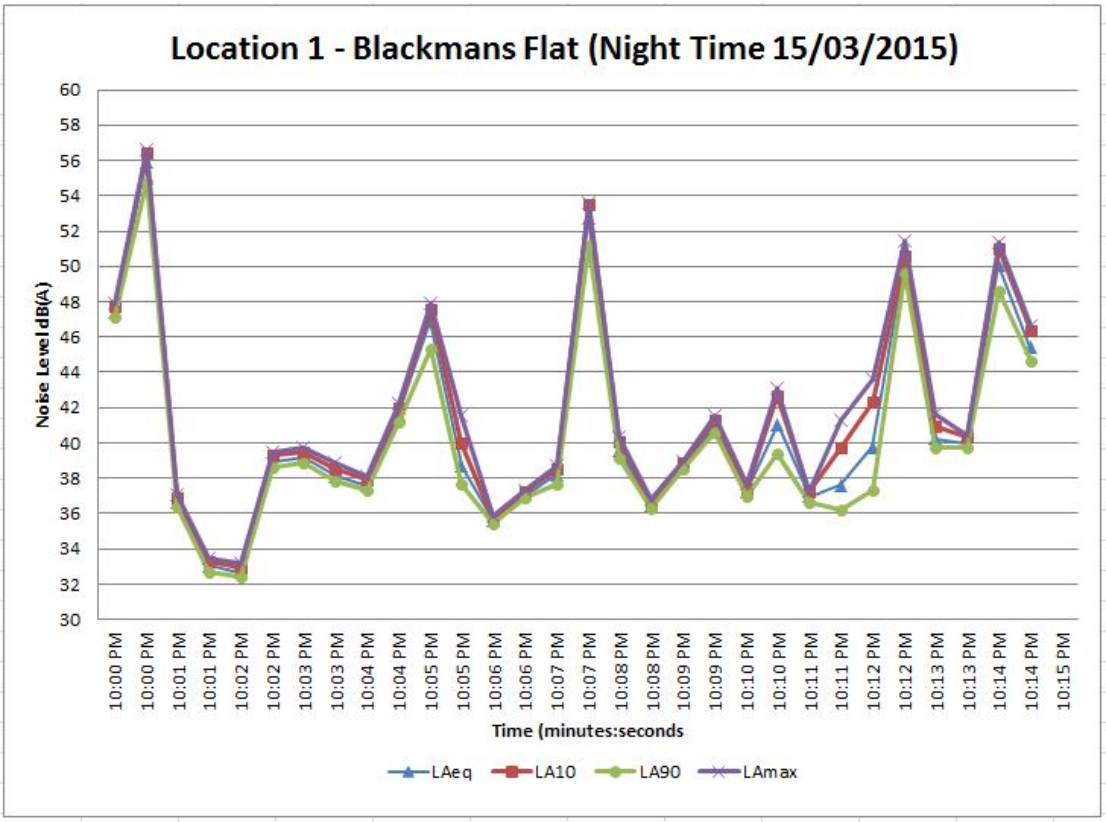
Location 1 – Residential property at Blackmans Flat (Day 15/03/2015)



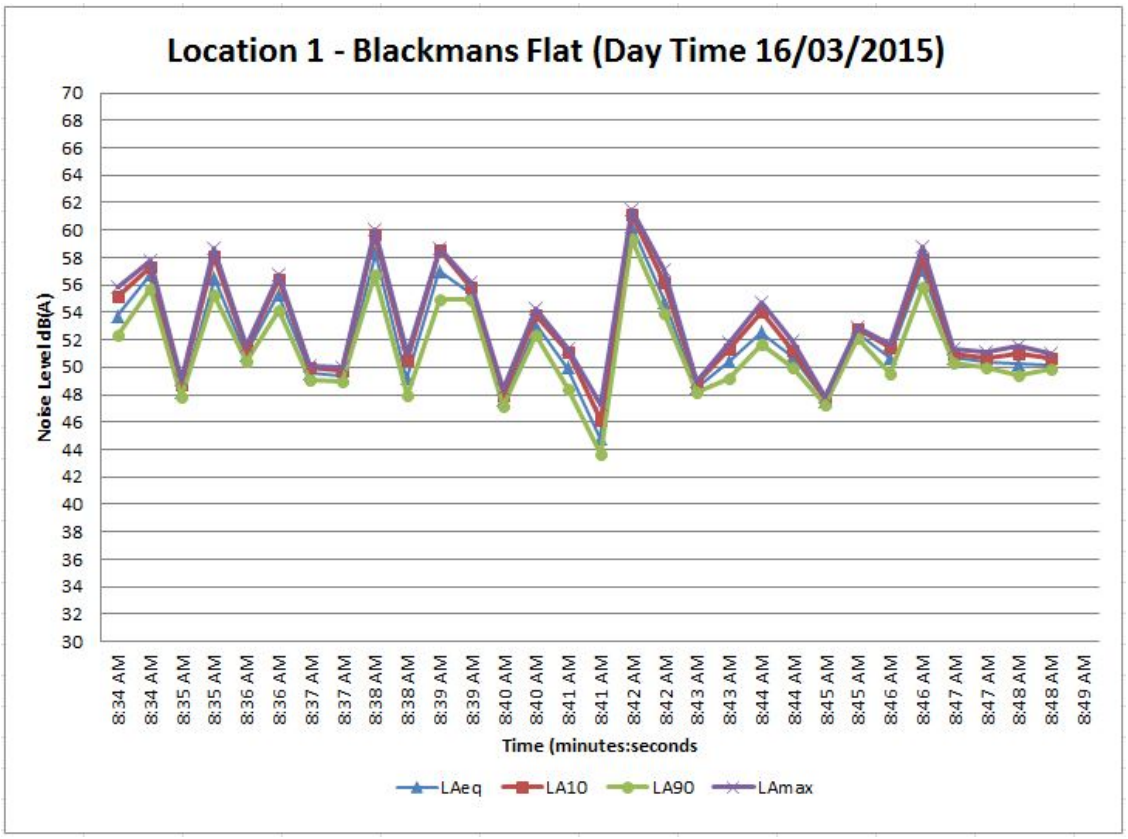
Location 1 – Residential property at Blackmans Flat (Evening time 15/03/2015)



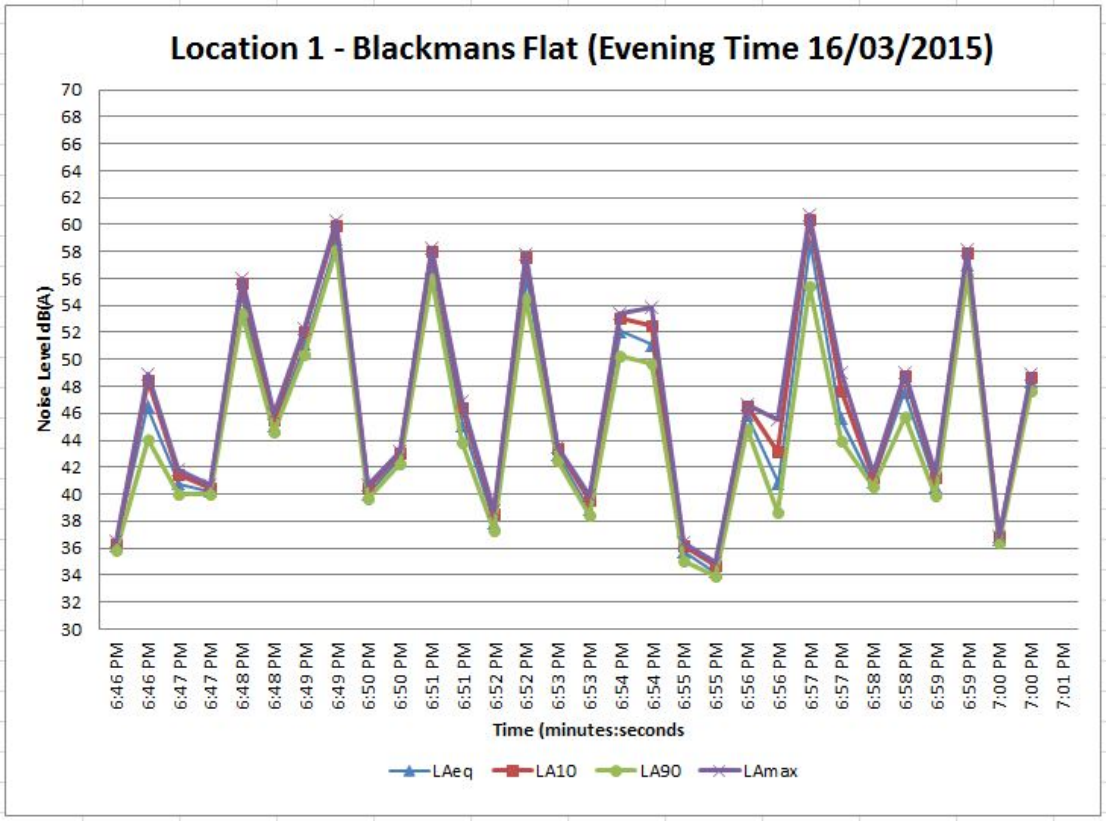
Location 1 – Residential property at Blackmans Flat (Night time 15/03/2015)



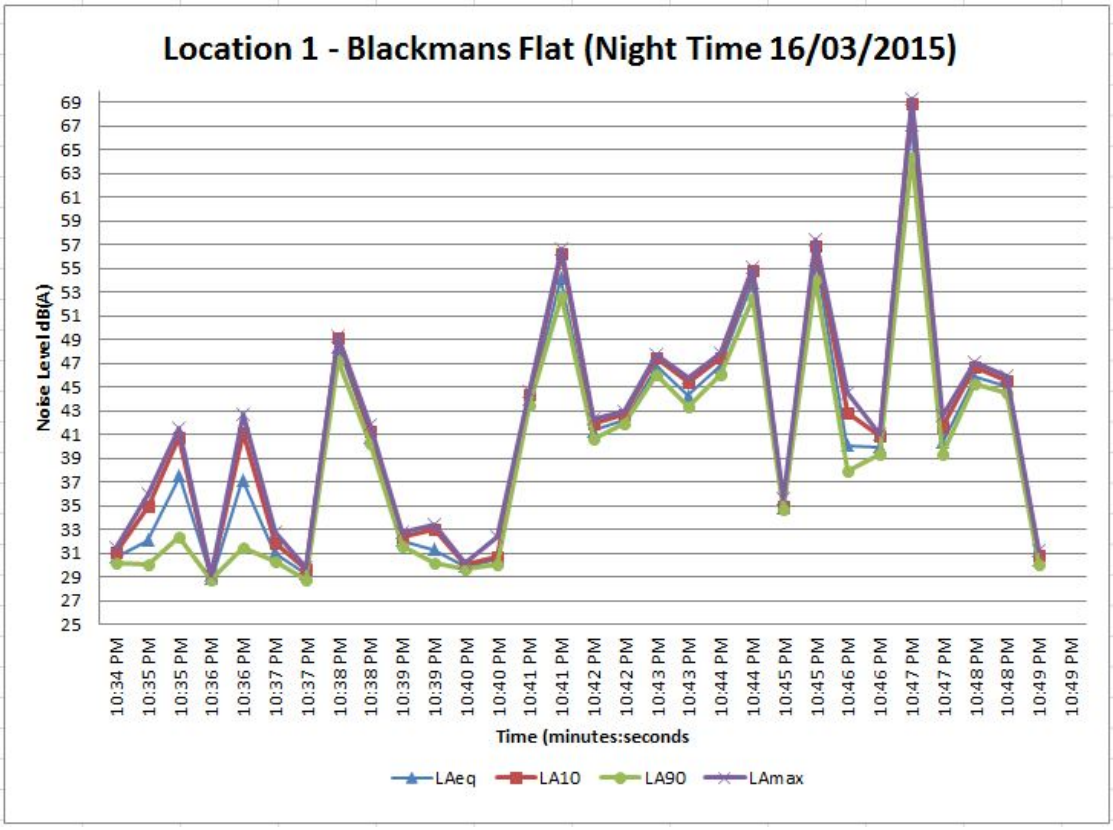
Location 1 – Residential property at Blackmans Flat (Day time 16/03/2015)



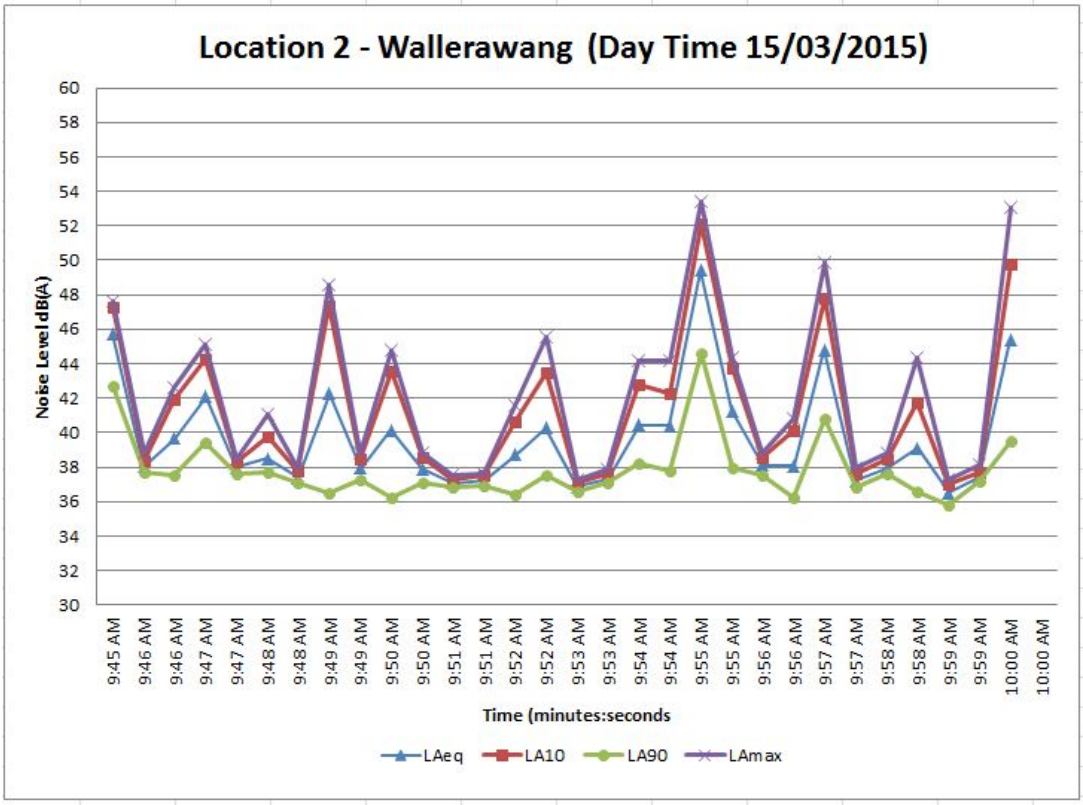
Location 1 – Residential property at Blackmans Flat (Evening time 16/03/2015)



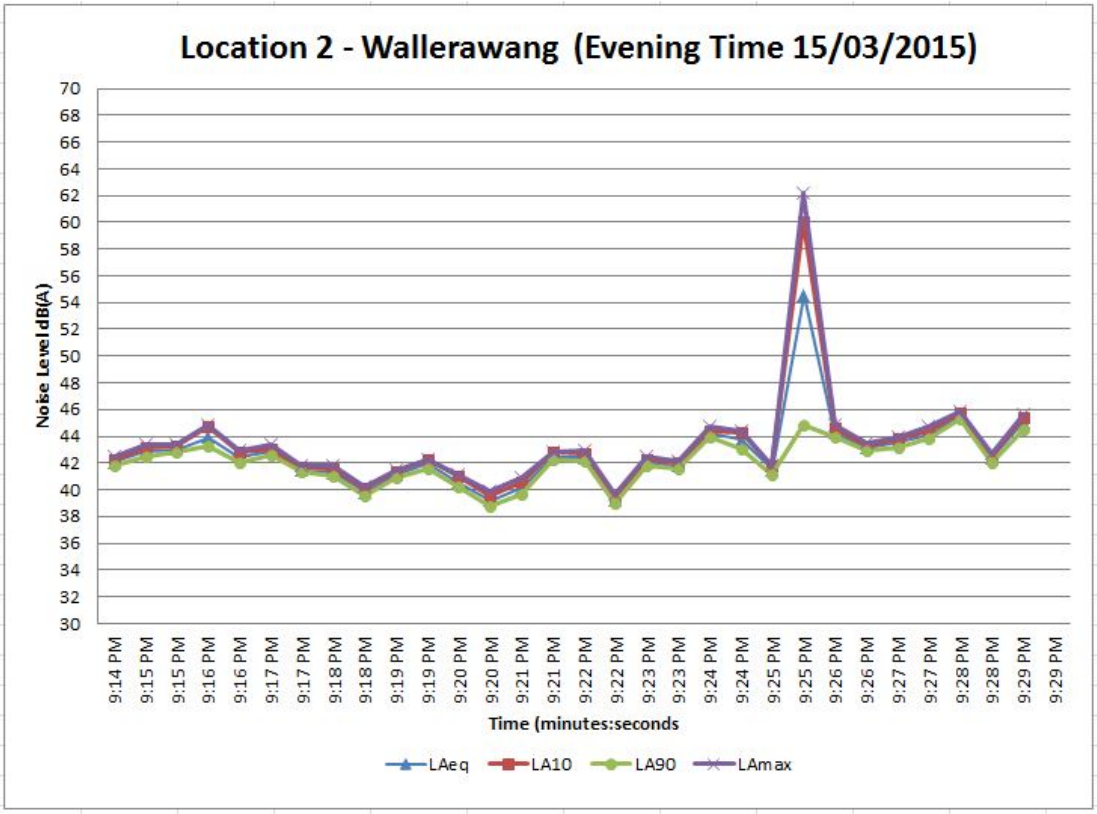
Location 1 – Residential property at Blackmans Flat (Night time 16/03/2015)



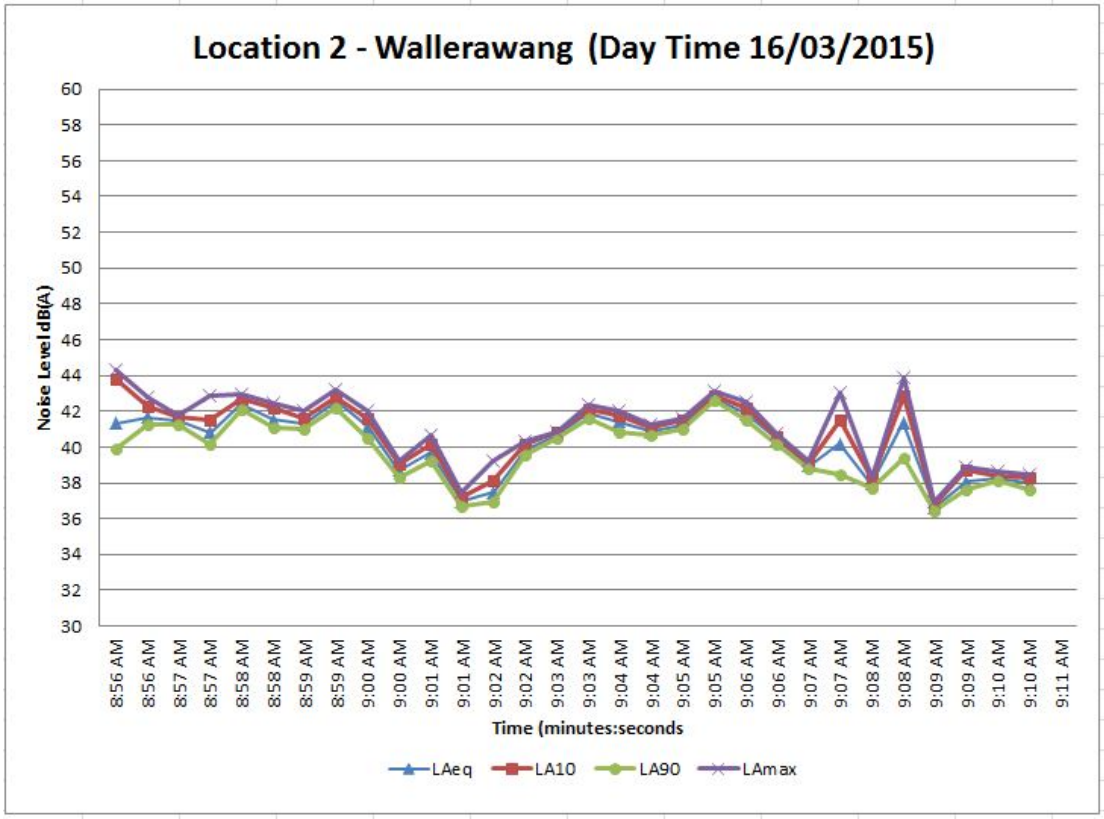
Location 2 – Residential property at Blackmans Flat (Day time 15/03/2015)



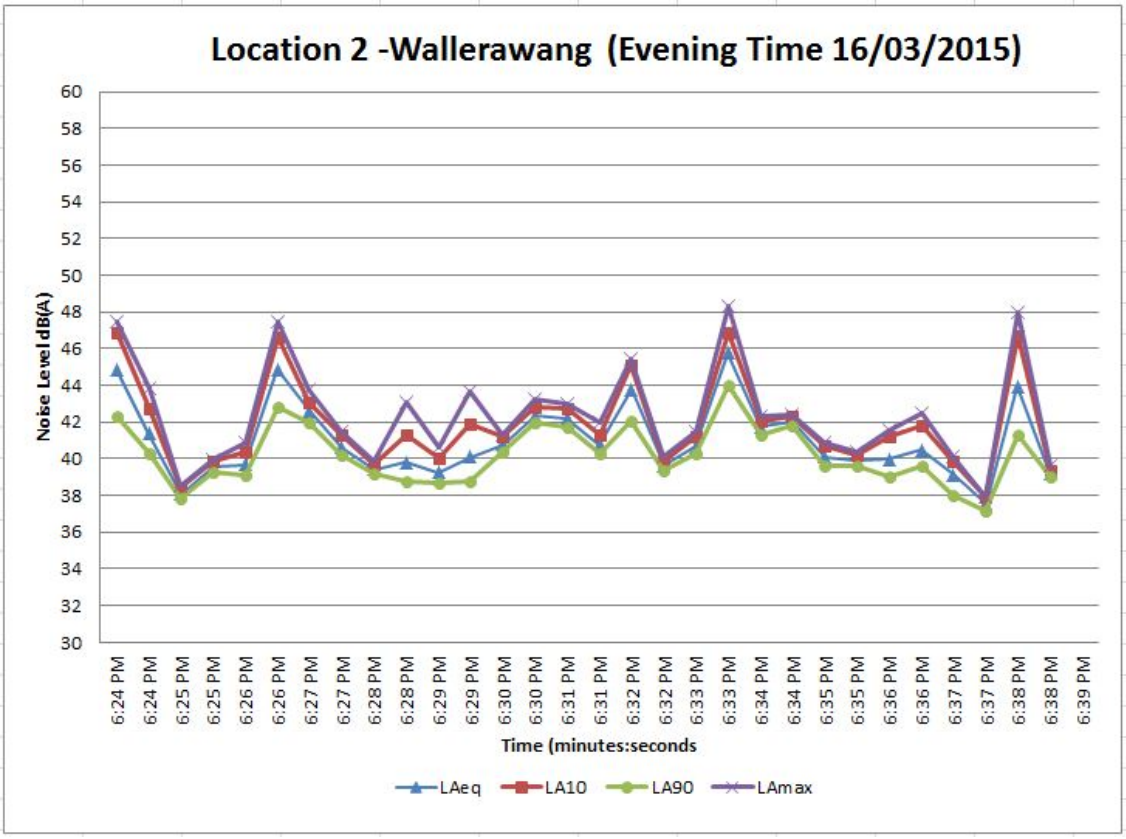
Location 2 – Residential property at Blackmans Flat (Evening time 15/03/2015)



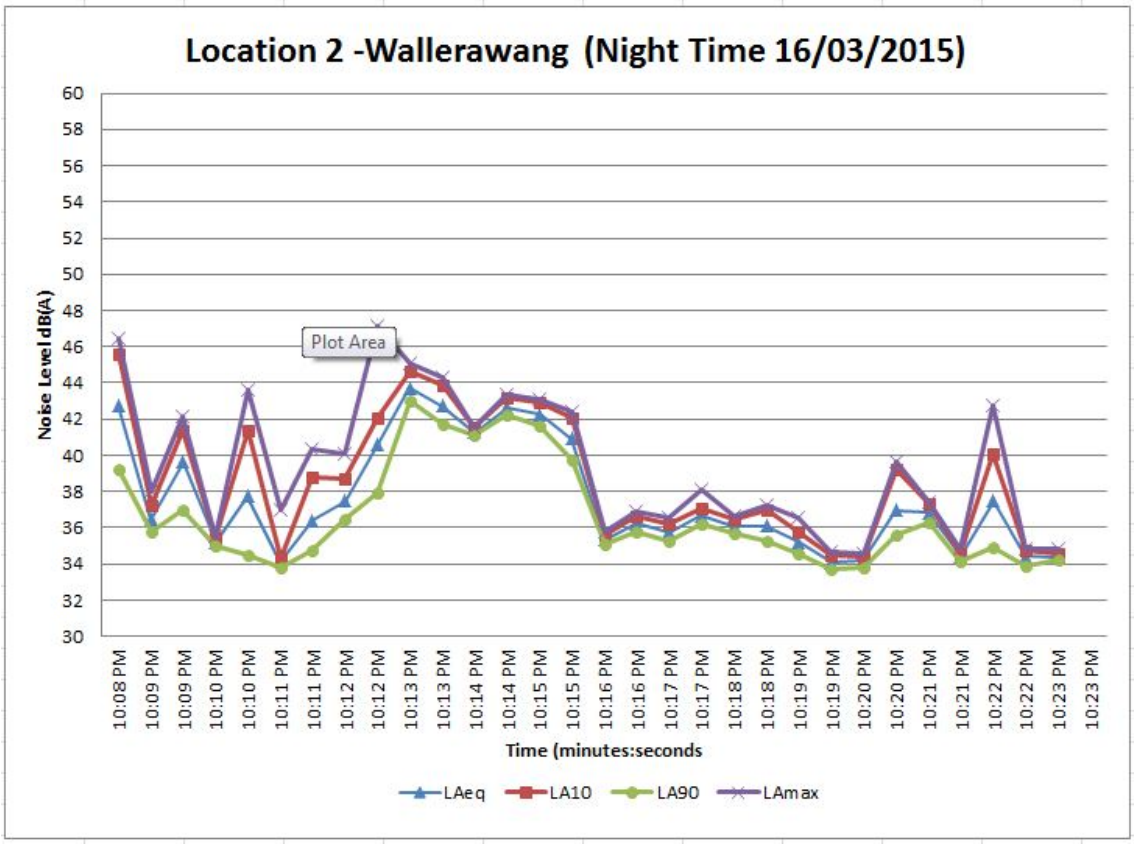
Location 2 – Residential property at Wallerawang (Day time 16/03/2015)



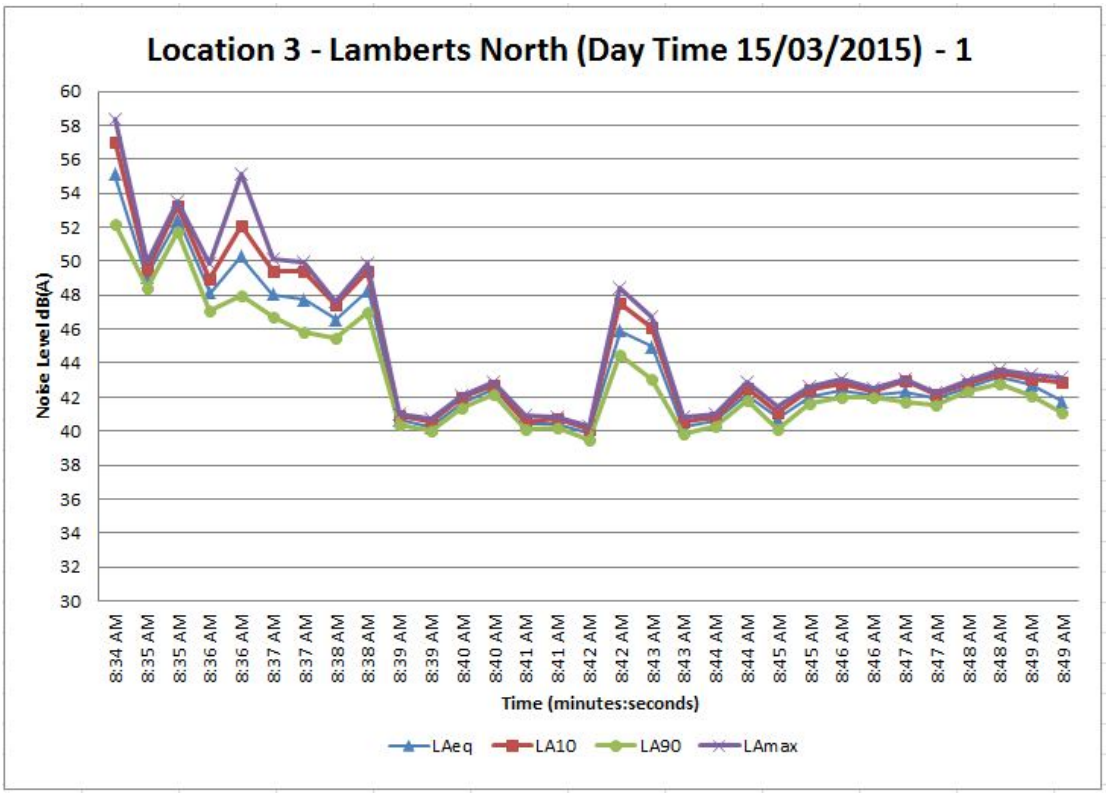
Location 2 – Residential property at Wallerawang (Evening time 16/03/2015)

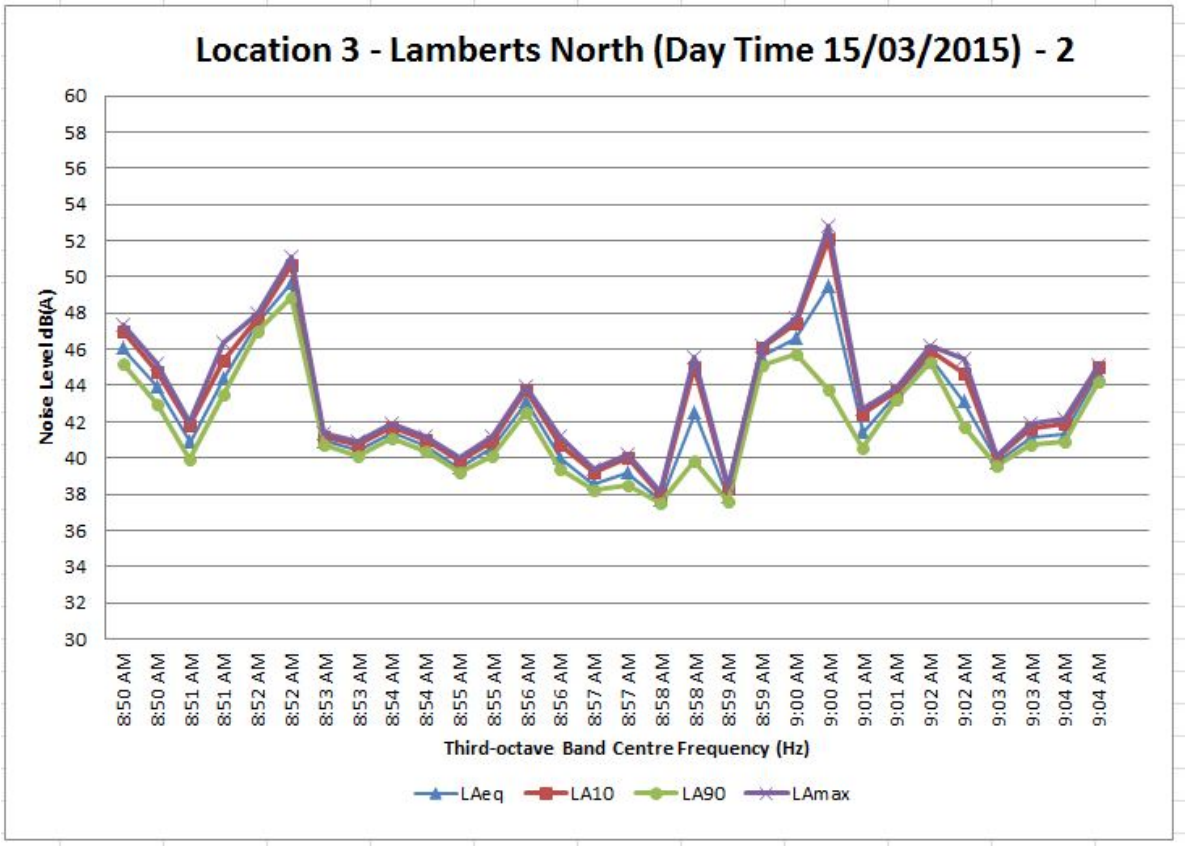


Location 2 – Residential property at Wallerawang (Night time 16/03/2015)

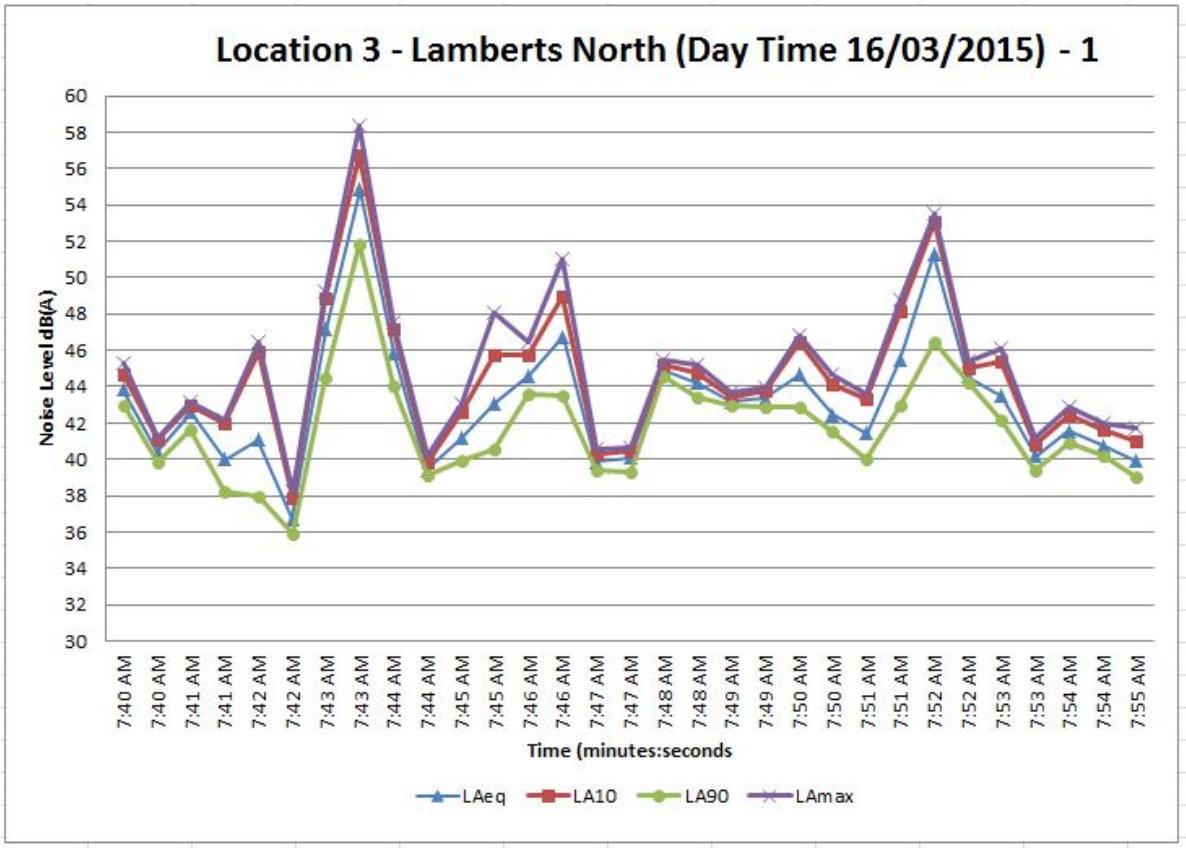


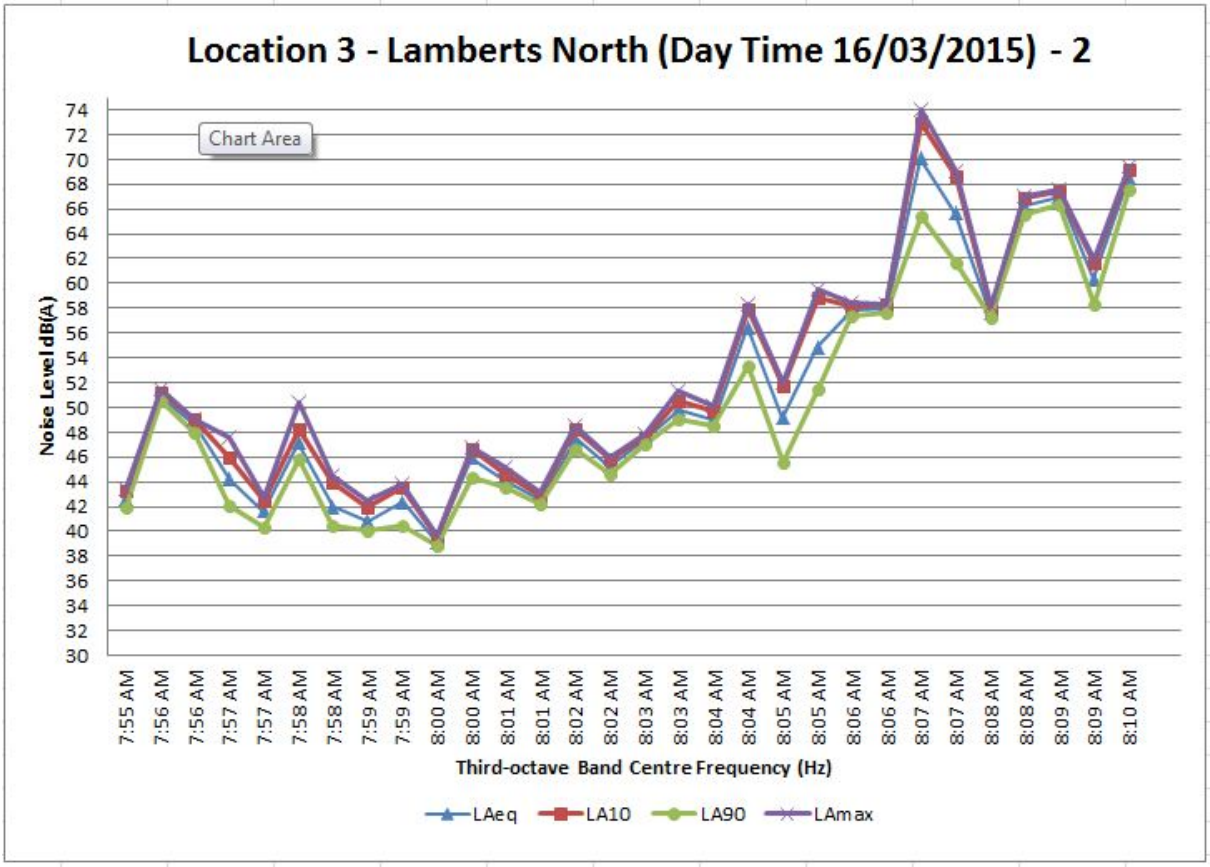
Location 3 – Lamberts South Eastern site boundary (Day time 15/03/2015)





Location 3 – Lamberts South Eastern site boundary (Day time 16/03/2015)




Location 3 - Lamberts North (Day Time 16/03/2015) - 2
Chart Area
Noise Level dB(A)
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
7:55 AM
7:56 AM
7:56 AM
7:57 AM
7:57 AM
7:58 AM
7:58 AM
7:59 AM
7:59 AM
8:00 AM
8:00 AM
8:01 AM
8:01 AM
8:02 AM
8:02 AM
8:03 AM
8:03 AM
8:04 AM
8:04 AM
8:05 AM
8:05 AM
8:06 AM
8:06 AM
8:07 AM
8:07 AM
8:08 AM
8:08 AM
8:09 AM
8:09 AM
8:10 AM
Third-octave Band Centre Frequency (Hz)
LAeq
LA10
LA90
LAmax

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