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Project: Kerosene Vale Ash repository Stage 2

Ongoing operational noise measurements (May 2016)

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1 Introduction

Aurecon was engaged by EnergyAustralia NSW to carry out ongoing operational noise monitoring for the Kerosene Vale Stage 2 Ash Repository (KVAR) located in Wallerawang, NSW in accordance with Project Approval Application No. 07_0005. The noise measurements were carried out on Sunday 22 May and Monday 23 May 2016, during the early morning and evening periods as per the requirements outlined in the KVAR Stage 2 Operational Noise and Vibration Management Plan (ONVMP).

1.1 Site details

The project site consists of an Ash Repository which services the nearby Wallerawang Power Station (WPS). During normal operation of the KVAR Stage, the following major noise emissions would be expected.

- Unloading of ash from trucks at the repository.
- Placement and handling of ash at the repository site.
- Operation of trucks on the private haulage road; this includes trucks leaving WPS loaded with ash (travelling north) and returning from the repository empty (travelling south).
- Water pumps operating at the repository.
- Water cart driving around.

However, the site is no longer fully operational and no noise emissions from the location of the KVAR was evident during the site visit.

Figure 1 shows the site layout and location of sensitive receivers relative to the major noise sources which include WPS, as well as major roads in the area. Table 1 outlines the most affected sensitive receivers and their distance to the haulage road.

Table 1: Representative noise measurement locations

Representative sensitive receiver	Distance to haulage road (meters)*
60 Skelly Road	300
10 Skelly Road	270
21 Neubeck Street	145

Note * - distance relates to the property boundary or a point 30 m from the dwelling location

It should be noted that coal supply trucks also utilise the private haulage road. Their noise impacts are not considered to be part of the Stage 2 KVAR works and thus their noise impact is outside the scope of this report. While undertaking noise measurements it is extremely difficult to visually distinguish between coal supply trucks and ash trucks, therefore, for the purpose of prediction of noise emissions from ash trucks alone, EnergyAustralia NSW provides the truck movement numbers for the periods of measurement.

Figure 1 | Site details

2 Noise criteria

The applicable operational noise criteria are outlined in the Project Approval, Application No. 07_0005. The criteria are summarised in Condition 2.15 as follows:

> *2.15 The cumulative operational noise from the ash placement area and ash haulage activity shall not exceed a* ***$L_{Aeq\ (15\ minute)}$ of 40 dB(A)*** *at the nearest most affected sensitive receiver during normal operating hours as defined in condition 2.8.*
>
> *This criterion applies under the following meteorological conditions:*
>
> *a) Wind speeds up to 3 m/s at 10 meters above ground; and/or*
> *b) Temperature inversion conditions of up to 3°C/100 m and source to receiver gradient winds of up to 2 m/s at 10 m above ground level*

Normal operating hours in accordance with Conditions 2.8 are 7:00 am to 10:00 pm Monday to Sunday.

3 Noise measurements

3.1 Measurement methodology

Two types of measurements were carried out at the site:

- Ambient noise measurements and
- Sound exposure level measurements.

The measurements were carried out on Sunday 22 May and Monday 23 May 2016, during the early morning and evening periods, when the noise impacts are likely to be the most significant.

Ambient noise measurements

The ambient compliance noise measurements were conducted using a Larson Davis 831 Type 1 sound level meter which 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 metres and at least 3.5 metres from any reflecting structure other than the ground.

Measurements were undertaken for a period of 15 minutes at each of the selected measurement locations. A Larson Davis CAL200 was utilised to calibrate all sound level meters before and after each series of measurements with no significant calibration drift noted.

The weather during the ambient noise logging ranged from overcast to sunny conditions, and wind speeds were less than 3m/s at ground level. Measurements were generally taken in accordance with the Australian Standard *AS 1055 1997: Acoustics – Description and measurement of environmental noise*.

Sound exposure level (SEL) measurements

The Sound Exposure Level (SEL) measurements were also carried out using the Larson Davis 831 Type 1 sound level meter. SEL is the equivalent one second A-weighted sound level which produces the same sound energy as an actual identified event. The SEL measurement was commenced when a truck/ light vehicle was observed to pass a nominated reference location and stopped when the end of the truck passed a second nominated reference location. The nominated reference locations were identified where the truck could be visually observed.

3.2 Measurement locations

The measurement locations were chosen to represent the three most affected sensitive receivers as outlined in the ONVMP. The three most affected receivers prior to commencement of the measurements were identified based on the information in the Stage 2 Kerosene Vale Ash Repository operational noise review.

Due to the increased background noise level at each of the three monitoring locations it was difficult to assess individual truck noise events. A fourth noise monitoring location identified as Location D and shown in Appendix C, was selected closer to the haulage route to measure individual truck pass-by events. Table 2 and Figure 2 outline the noise measurement locations.

Table 2: Representative noise measurement locations

Measurement location	Measurement distance to haulage road (meters)	Representative sensitive receiver
A	300	60 Skelly Road
B	270	10 Skelly Road
C	145	21 Neubeck Street
D	80	-

Figure 2 | Noise measurement locations

3.3 Conditions during measurements

3.3.1 Operating conditions

EnergyAustralia NSW provided the following information regarding the operations during the noise measurement periods.

- No trucks were operating during any of the measurement periods.

3.3.2 Meteorological conditions

The meteorological conditions applicable to the noise survey period are based on meteorological data provided at 15 minute intervals from the Mt Piper weather station. This data is shown in Appendix D.

No rain periods were experienced and no adverse wind was induced on the microphone during the ambient noise and SEL measurements.

3.4 Results

3.4.1 Ambient noise measurements

The results from the 15 minute ambient noise measurements at each of the measurement locations are shown in Table 3.

Table 3: Noise measurement results (15 minute)

Location	Date of measurement	Time	Measured sound pressure level dB(A)					Number of truck Pass-bys and direction of travel[1]		
			L_{Aeq}#	L_{Amax}*	L_{Amin}**	L_{A10}^^	L_{A90}^	North	South	Total
60 Skelly Road (A)	Sunday 22/05/2016	8:43	**43**	74	36	45	38	0	0	0
		18:39	**41**	68	28	41	34	0	0	0
	Monday 23/05/2016	7:31	**44**	64	36	46	38	0	0	0
		20:04	**41**	64	27	41	29	0	0	0
10 Skelly Road (B)	Sunday 22/05/2016	8:25	**45**	69	38	46	40	0	0	0
		19:14	37	48	24	40	30	0	0	0
	Monday 23/05/2016	7:14	**46**	69	38	46	40	0	0	0
		20:41	**55**	84	32	48	35	0	0	0
21 Neubeck Street (C)	Sunday 22/05/2016	8:01	**44**	74	35	46	38	0	0	0
		18:56	**49**	65	27	53	33	0	0	0
	Monday 23/05/2016	6:54	**44**	67	37	46	39	0	0	0
		20:22	**43**	58	31	47	35	0	0	0

Note : 1 - Truck counts include ash trucks and light commercial vehicles.
Exceedances of the $L_{Aeq\ (15\ min)}$ of 40 dB(A) are shown in Bold.

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

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

^^ *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.*

The measured $L_{Aeq\ (15\ min)}$ generally exceeded the assessment criteria of $L_{Aeq\ (15\ min)}$ of 40 dB(A). As there were no truck movements associated with the operation of the KVAR, the KVAR operations did not contribute to the high background noise levels at any of the measured locations. The high noise levels are associated with local noise events such as traffic from surrounding roads and birds/insects.

3.4.2 SEL measurements

The individual truck pass-by noise event (SEL) measurements at Location D (approximately 80 meters from the haulage road) were conducted on 7 November 2011, 21 April 2013 and 31 March 2014. The results are summarised in Table 4. The number of actual truck pass-bys counted during the daytime survey are also summarised in Table 4. These data will be used to predict the noise impact from the truck movement on the sensitive receivers.

Based on the visual site inspection, the grade (slope) of the haulage road rises from south to north. The trucks moving in the northerly direction on the haulage road appear to rev the engine more compared to the trucks moving in the opposite direction and thereby producing a marginally higher SEL as evident in the results summarised in Table 4.

Table 4: SEL noise measurement results at Location D

Date	Truck travelling direction	Average event duration (sec)	Average SEL dB(A)	No. of valid truck event measurements
7/11/2011	South	28.9	68	8
	North	18.1	70	9
21/04/2013	South	24.0	67	5
	North	19.5	70	7
31/04/2014	South	27.7	69	2
	North	28.3	70	2

4 Noise assessment

General observation regarding the ambient noise environment, as well as the truck movements and ash repository operations are described as follows.

- Operational noise from the KVAR site and the truck engine noise was inaudible at the sensitive receiver locations during the attended noise measurements and no ash trucks (only few light commercial vehicles) were visible on the haul road.
- The noise levels at all locations were affected by background noise sources such as bird/insects, domestic animals and domestic noise. Background noise at all sites was dominated by the intermittent traffic noise from nearby Castlereagh Highway and Wolgan Road.

4.1 Location A (60 Skelly Road)

The background noise contributions at Location A were predominantly from the traffic noise from Castlereagh Highway and distant traffic. Faint and intermittent traffic noise from Wolgan Road was also audible.

The haulage road was clearly visible from this location and no coal or ash trucks were visible on the haulage road. Noise from birds and insects also contributed to the ambient noise at this location.

As shown in Table 3, the background noise (L_{A90}) during the measurement was predominantly due to road traffic on the Castlereagh Highway, Wolgan Road and other nearby roads. The background noise was fairly consistent over the two days of measurements except for Monday evening where the background noise was very low (29 dBA).

4.2 Location B (10 Skelly Road)

Contributions to the background noise at Location B were predominantly from birds/insects/animals and traffic on Wolgan Road and Skelly Road.

Traffic noise from Wolgan Road and Skelly Road was clearly audible at this location. The haulage road was clearly visible from this measuring location and no coal or ash truck movement was noticed during the two days of measurements.

Although the background noise (L_{A90} 35 dBA) was fairly low on Monday evening, the measurement shows high L_{Aeq} result (55 dBA) which was due to three instances of car going pass on the Skelly road, very close to the measurement location.

On Sunday and Monday morning, a faint low frequency hum (31.5 - 63 Hz) was audible and appeared to originate from the north westerly direction (towards Blackmans Flat). Background noise levels (L_{A90}) for both mornings shows a consistent 40 dBA, predominantly due to the hum.

4.3 Location C (21 Neubeck Street)

Contributions to the background noise at Location C were predominantly from birds/insects/animals and distant traffic on Wolgan Road and other roads.

Dogs at the nearest residential property substantially affected the ambient noise levels (due to intermittent barking) measured at this location. Traffic noise from Wolgan Road was clearly audible and also contributed to the ambient noise levels.

The haulage road was not clearly visible from this location because of an earth mound and heavy vegetation blocking the line of sight; however no truck engine noise was audible during the entire survey.

Background noise (L_{A90}) during the Sunday and Monday morning measurement was observed to be higher than the rest of the measurements, predominantly due to dog in the nearest residence barking during the measurement period.

4.4 Location D

The noise data collected at Location D (Figure 2 and Appendix C) measured the SEL of individual truck pass-by events on 7 November 2011, 22 April 2013 and 31 April 2014 (See Table 4).

This location is closest to the truck haulage road and as such, each truck pass-by was the dominant noise source (clearly audible above other ambient noise sources) during these monitoring events.

5 Analysis and recommendations

5.1 Data analysis

As can be observed from the summary of noise measurements presented above, the existing ambient noise levels $L_{Aeq\ (15\ min)}$ exceed the assessment criteria of $L_{Aeq\ (15\ min)}$ of 40 dB(A) on most of the occasions. This section deals with noise prediction based on the number of truck movements (worst case scenario) for any worst case 15 minute period.

To assess the impact of the ash truck noise emissions, the influence of individual truck pass-by noise events have to be taken into account. $L_{Aeq\ (15\ min)}$ noise level was predicted based on the SEL measurement results (shown in Table 4) and the number of truck movements provided by EnergyAustralia NSW.

The predicted noise levels take into account the total number of truck pass-bys (including ash trucks and small commercial vehicles) and the distance of the noise source from the receiver. The assessment included the calculated barrier effect (- 2dBA) at Location C due to the earth mound located on the northern side of the site which blocks the line of sight between 21 Neubeck Street and the haulage road, therefore attenuating the noise from haulage road. Generally, trucks operate at a constant rate, with approximate 15-20 minute circuits for each truck. Table 5 provides a summary of truck pass-bys based on information collected during a previous site visit.

Table 5: Truck movement data

Periods	Information collected during site visit on 30-31 March 2014	
	Total number of trucks pass bys/ 45 minutes	Average number of trucks pass bys/ 15 minutes
Morning 30/03/2014	7	2.3
Evening 30/03/2014	2	0.7
Morning 31/03/2014	7	**2.3**[#]
Evening 31/03/2014	3	1.0

Note: Figure in **bold** is the worst-case truck movement (most frequent) used to predict the noise contribution from the truck movements (shown in Table 6)
Maximum number of truck pass- bys as per information collected during the site visit.

As shown in Table 5, the maximum number of truck pass-bys was during the morning period on both 30/03/2014 and 31/03/2014. The lowest truck pass-bys was during the evening period on 30/03/2014. The noise emissions from the KVAR are considered to be below the assessment criteria as they were predominantly inaudible during the noise survey and could not be distinguished.

Table 6 provides the noise predictions from haulage trucks alone at the nearest sensitive receivers based on SEL measurements. The prediction is calculated from the movement of ash trucks based on the worst case scenario (i.e. 2.3 truck pass-bys during any 15 minute period).

Table 6: Noise predictions from truck movements based on SEL measurements

Sensitive receiver	Distance to haulage road (m)	No. of average truck movements per 15min	Predicted $L_{Aeq\ (15\ min)}$ (dBA)	Criteria $L_{Aeq\ (15\ min)}$ (dBA
60 Skelly Road	300	2.3	32	40
10 Skelly Road	270	2.3	33	40
21 Neubeck Street *	145	2.3	37*	40

Note * - Includes the calculated barrier attenuation (-2dBA) provided by the earth mound blocking direct line of sight between the residence and haulage road.

Based on the worst case scenario the noise impact from truck movements complies with noise criteria of $L_{Aeq\ (15\ min)}$ of 40 dB(A) at all the sensitive receiver locations.

There were no truck movements during this current noise survey, therefore the operational noise emissions from the Stage 2 KVAR is considered compliant with Condition 2.15 of the Project Approval.

6 Conclusion

Aurecon conducted operational noise monitoring for the Stage 2 KVAR located in Wallerawang, NSW. The noise measurements were carried out at the three most affected sensitive receiver locations on Sunday 22 May and Monday 23 May 2016, in the early morning and evening in accordance with the KVAR Stage 2 ONVMP.

The assessment criteria of $L_{Aeq\ (15\ minute)}$ of 40 dB(A) from all ash haulage and placement associated operational noise emissions at the nearest sensitive receivers is outlined in the Project Approval, Application No. 07_0005.

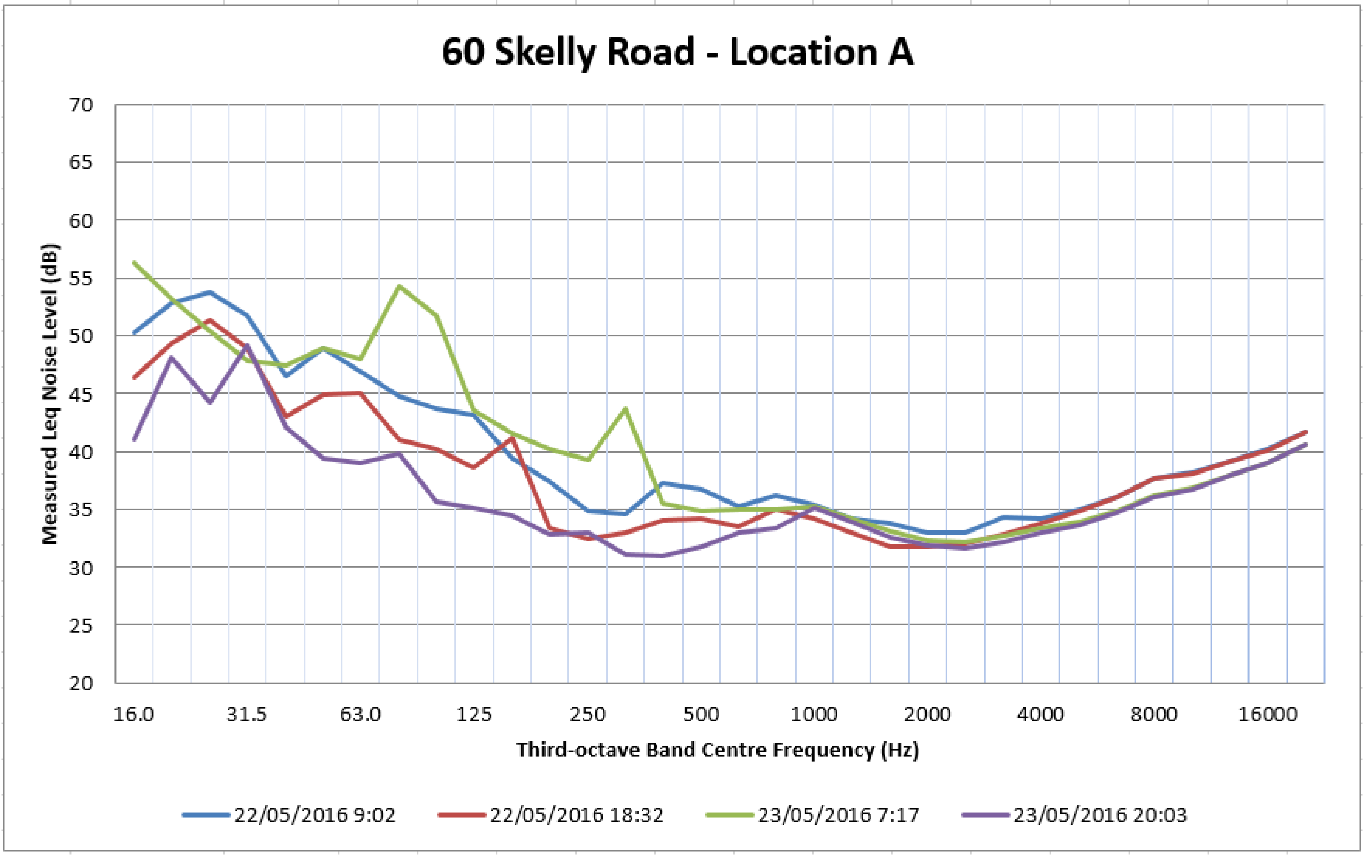
The primary contributor to the background and ambient noise levels at all measurement locations was the traffic noise on the nearby roads.

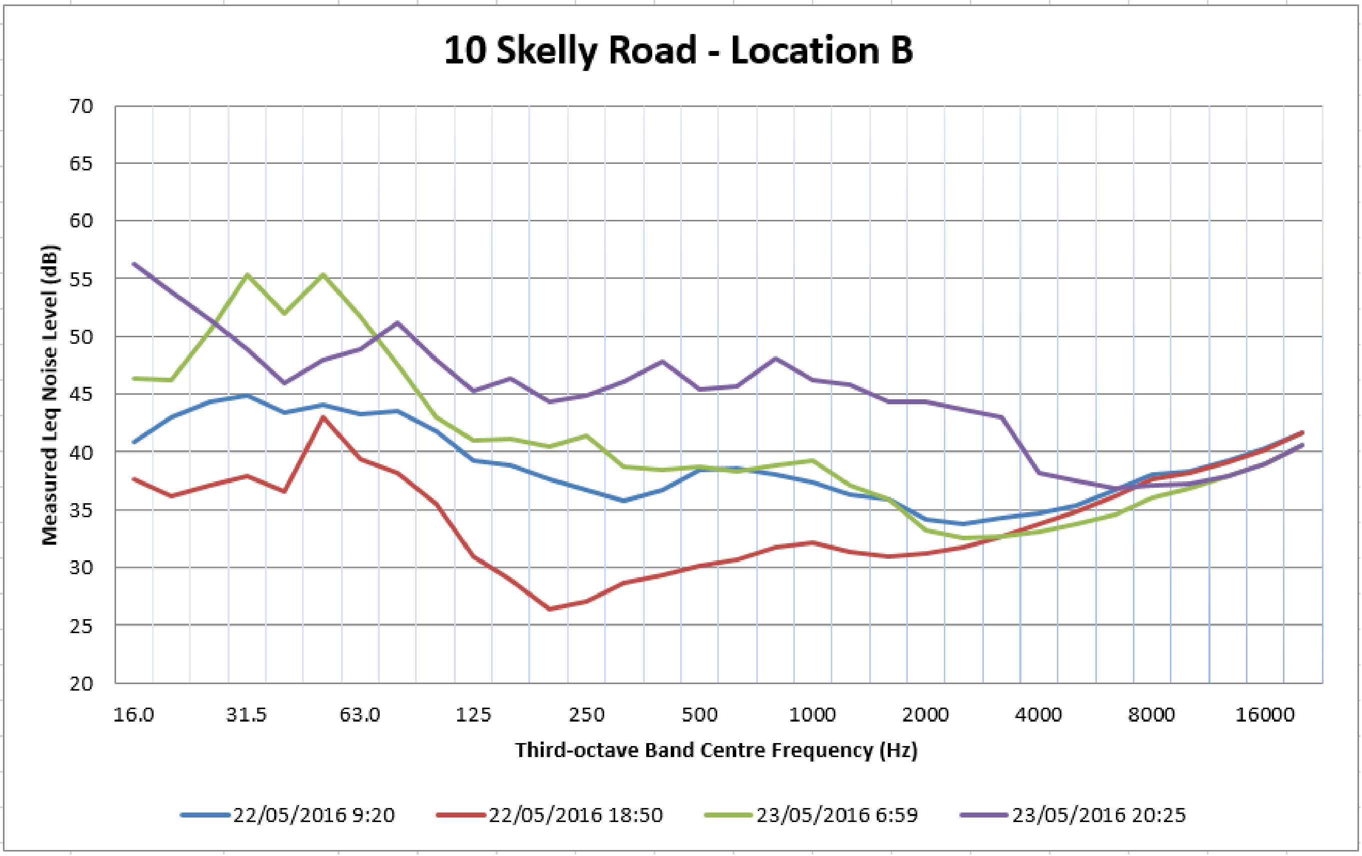
Based on the noise predictions calculated the noise resulting from the operation of trucks/ light commercial vehicles from the Stage 2 KVAR are considered compliant with the Conditions of Approval.

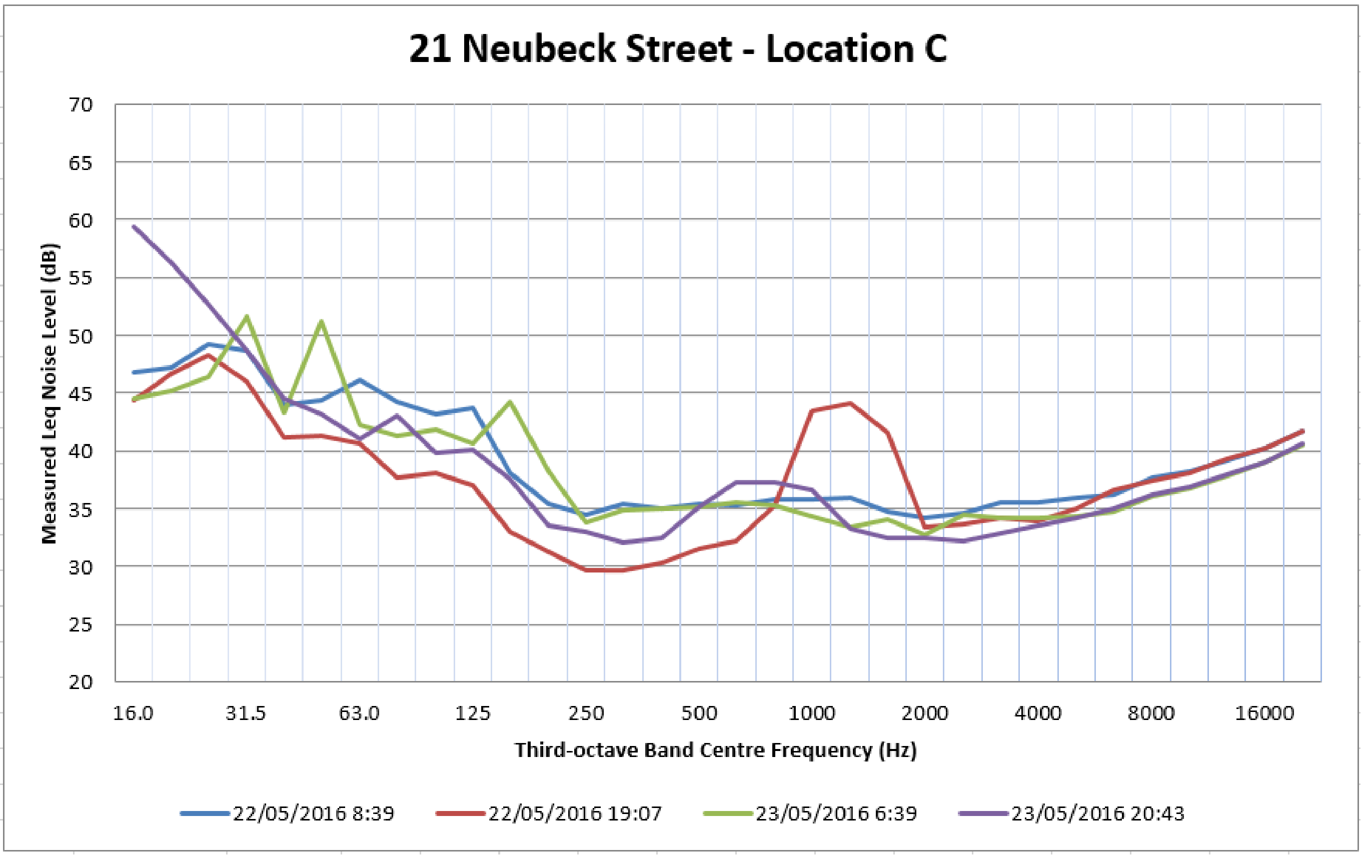
7 References

- Kerosene Vale Stage 2 Ash Repository, Operational Environmental Management Plan (OEMP), Parsons Brinckerhoff, April 2009, which includes:
  - Appendix A: KVAR Stage 2 Operations, Operational Noise and Vibration Management Plan (ONVMP), Parsons Brinckerhoff, April 2009
- Project Approval (PA), Application: No 07_0005, Delta Electricity, 26 November 2008, Department of Planning
- Stage 2 Kerosene Vale Ash Repository operational noise review, Parsons Brinckerhoff, September 2009.
- Office of Environment & Heritage (OEH) *Interim Construction Noise Guideline (ICNG).*
- Office of Environment & Heritage (OEH) *Industrial Noise Policy (INP)*.
- Australian Standard *AS 1055 1997: Acoustics – Description and measurement of environmental noise*.

Appendix A
Measured noise spectra


60 Skelly Road - Location A
Measured Leq Noise Level (dB)
70
65
60
55
50
45
40
35
30
25
20
16.0
31.5
63.0
125
250
500
1000
2000
4000
8000
16000
Third-octave Band Centre Frequency (Hz)
22/05/2016 9:02
22/05/2016 18:32
23/05/2016 7:17
23/05/2016 20:03


10 Skelly Road - Location B
Measured Leq Noise Level (dB)
70
65
60
55
50
45
40
35
30
25
20
16.0
31.5
63.0
125
250
500
1000
2000
4000
8000
16000
Third-octave Band Centre Frequency (Hz)
22/05/2016 9:20
22/05/2016 18:50
23/05/2016 6:59
23/05/2016 20:25


21 Neubeck Street - Location C
Measured Leq Noise Level (dB)
70
65
60
55
50
45
40
35
30
25
20
16.0
31.5
63.0
125
250
500
1000
2000
4000
8000
16000
Third-octave Band Centre Frequency (Hz)
22/05/2016 8:39
22/05/2016 19:07
23/05/2016 6:39
23/05/2016 20:43

Appendix B
Glossary of terms

Term	Definition
Sound Pressure Level	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 (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%.
L_{Cpk}	The peak C-weighted sound pressure level for a time interval.

Term	Definition
$L_{Cmax,T}$	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}).
Sound Exposure Level (SEL)	Sound exposure level abbreviated as SEL and L_{AE}, is the total noise energy produced from a single noise event. The Sound Exposure Level is a metric used to describe the amount of noise from an event such as an individual aircraft flyover. It is computed from measured dB(A) sound levels. The Sound Exposure Level is the integration of all the acoustic energy contained within the event.

Appendix C
Site photograph

Figure 3 | Location D

Appendix D
Weather data

Table 7: Meteorological conditions during noise survey

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
22/05/2016	0:00	0	1.20	321.3	11.3	96
22/05/2016	0:15	0	1.04	251.1	11.3	96
22/05/2016	0:30	0	0.92	175.4	11.3	96
22/05/2016	0:45	0	0.99	154.6	11.3	96
22/05/2016	1:00	0	1.15	202.2	11.2	96
22/05/2016	1:15	0	0.89	165.2	11.2	96
22/05/2016	1:30	0	0.98	276.5	11.0	96
22/05/2016	1:45	0	0.81	269.6	10.9	96
22/05/2016	2:00	0	0.50	247.7	10.9	96
22/05/2016	2:15	0	1.18	262.5	10.6	96
22/05/2016	2:30	0	0.70	233.4	10.5	96
22/05/2016	2:45	0	0.53	145.4	10.3	96
22/05/2016	3:00	0	0.65	218.9	10.2	97
22/05/2016	3:15	0	0.86	289.0	10.1	97
22/05/2016	3:30	0	0.54	199.9	10.0	97
22/05/2016	3:45	0	0.58	218.5	9.9	97
22/05/2016	4:00	0	0.77	280.2	9.6	97
22/05/2016	4:15	0	0.64	262.3	9.4	97
22/05/2016	4:30	0	0.90	276.0	9.0	97
22/05/2016	4:45	0	0.55	256.1	8.8	97
22/05/2016	5:00	0	0.88	244.3	8.6	97
22/05/2016	5:15	0	0.88	228.8	7.7	98
22/05/2016	5:30	0	1.03	218.1	7.0	98
22/05/2016	5:45	0	0.90	232.3	6.2	98
22/05/2016	6:00	0	1.04	242.8	5.9	98

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
22/05/2016	6:15	0	0.82	237.2	5.9	98
22/05/2016	6:30	0	0.84	249.7	5.5	98
22/05/2016	6:45	0	0.80	231.1	5.1	98
22/05/2016	7:00	0	1.06	230.8	4.5	98
22/05/2016	7:15	0	1.16	224.2	4.4	98
22/05/2016	7:30	0	0.61	200.2	5.0	98
22/05/2016	7:45	0	0.44	128.3	6.8	98
22/05/2016	8:00	0	0.66	124.5	8.1	98
22/05/2016	8:15	0	0.59	106.1	9.3	97
22/05/2016	8:30	0	0.62	107.1	10.5	96
22/05/2016	8:45	0	0.44	140.3	12.5	91
22/05/2016	9:00	0	1.21	203.9	14.6	82
22/05/2016	9:15	0	2.53	294.3	15.5	72
22/05/2016	9:30	0	3.17	303.5	15.4	70
22/05/2016	9:45	0	1.97	290.9	15.7	70
22/05/2016	10:00	0	2.46	285.8	16.4	67
22/05/2016	10:15	0	2.45	216.8	17.9	63
22/05/2016	10:30	0	2.20	260.9	18.2	61
22/05/2016	10:45	0	2.00	227.0	18.8	59
22/05/2016	11:00	0	3.13	292.0	19.2	56
22/05/2016	11:15	0	3.34	273.9	19.5	55
22/05/2016	11:30	0	3.08	259.7	19.8	54
22/05/2016	11:45	0	3.23	301.5	19.8	54
22/05/2016	12:00	0	3.26	294.9	19.9	52
22/05/2016	12:15	0	3.18	281.5	20.1	51
22/05/2016	12:30	0	3.36	279.9	20.0	51
22/05/2016	12:45	0	4.62	253.0	19.9	50
22/05/2016	13:00	0	4.25	252.0	20.1	50
22/05/2016	13:15	0	3.82	268.1	20.3	50
22/05/2016	13:30	0	2.99	276.3	20.1	51
22/05/2016	13:45	0	3.88	264.0	20.3	50
22/05/2016	14:00	0	3.40	268.1	19.8	51
22/05/2016	14:15	0	3.82	265.0	19.7	51
22/05/2016	14:30	0	3.44	281.6	20.0	50
22/05/2016	14:45	0	3.34	265.8	19.9	50
22/05/2016	15:00	0	3.33	273.6	19.4	51

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
22/05/2016	15:15	0	3.34	266.9	19.3	52
22/05/2016	15:30	0	2.96	282.5	19.2	52
22/05/2016	15:45	0	2.59	276.5	18.9	54
22/05/2016	16:00	0	2.06	260.1	19.2	54
22/05/2016	16:15	0	2.23	279.5	18.6	55
22/05/2016	16:30	0	1.25	287.6	17.8	58
22/05/2016	16:45	0	0.95	284.0	15.3	67
22/05/2016	17:00	0	1.59	248.5	13.8	73
22/05/2016	17:15	0	1.43	239.9	12.8	78
22/05/2016	17:30	0	1.43	258.3	11.7	81
22/05/2016	17:45	0	1.63	248.3	11.2	83
22/05/2016	18:00	0	1.68	239.8	10.6	87
22/05/2016	18:15	0	1.59	240.6	10.9	87
22/05/2016	18:30	0	1.22	241.9	10.6	88
22/05/2016	18:45	0	1.57	241.4	9.8	90
22/05/2016	19:00	0	1.68	249.9	10.2	90
22/05/2016	19:15	0	1.72	250.7	10.1	91
22/05/2016	19:30	0	1.58	247.3	10.0	91
22/05/2016	19:45	0	1.76	252.0	9.8	92
22/05/2016	20:00	0	1.46	239.4	9.6	92
22/05/2016	20:15	0	1.75	244.0	9.2	94
22/05/2016	20:30	0	1.84	236.4	9.5	94
22/05/2016	20:45	0	1.61	252.0	9.1	95
22/05/2016	21:00	0	1.43	240.1	8.6	95
22/05/2016	21:15	0	1.15	232.4	8.6	95
22/05/2016	21:30	0	1.71	259.0	8.5	96
22/05/2016	21:45	0	1.56	240.8	8.5	96
22/05/2016	22:00	0	1.40	252.1	8.0	96
22/05/2016	22:15	0	1.22	283.1	8.2	96
22/05/2016	22:30	0	1.28	305.0	8.5	97
22/05/2016	22:45	0	0.95	231.4	8.6	97
22/05/2016	23:00	0	0.77	99.1	8.6	96
22/05/2016	23:15	0	0.98	249.3	8.0	97
22/05/2016	23:30	0	1.24	257.7	8.3	97
22/05/2016	23:45	0	1.04	301.1	8.3	97
23/05/2016	0:00	0	0.74	279.0	8.0	97

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
23/05/2016	0:15	0	0.63	281.7	8.2	97
23/05/2016	0:30	0	0.88	272.2	7.9	97
23/05/2016	0:45	0	1.13	307.8	7.9	97
23/05/2016	1:00	0	1.23	267.6	7.9	97
23/05/2016	1:15	0	1.37	171.5	8.9	97
23/05/2016	1:30	0	1.83	300.3	10.3	97
23/05/2016	1:45	0	2.27	316.2	13.0	92
23/05/2016	2:00	0	2.16	313.8	13.1	88
23/05/2016	2:15	0	1.87	329.1	13.1	87
23/05/2016	2:30	0	2.00	314.3	13.2	86
23/05/2016	2:45	0	1.91	272.4	13.1	85
23/05/2016	3:00	0	1.98	218.5	12.7	86
23/05/2016	3:15	0	2.25	192.2	12.5	86
23/05/2016	3:30	0	2.03	201.3	12.4	86
23/05/2016	3:45	0	1.92	151.5	12.3	86
23/05/2016	4:00	0	1.92	164.7	11.7	87
23/05/2016	4:15	0	1.33	268.6	10.3	90
23/05/2016	4:30	0	0.99	172.8	9.2	92
23/05/2016	4:45	0	1.12	174.1	9.0	94
23/05/2016	5:00	0	0.99	243.7	8.5	95
23/05/2016	5:15	0	1.21	216.2	8.5	95
23/05/2016	5:30	0	1.28	208.3	8.2	96
23/05/2016	5:45	0	1.54	315.0	10.3	95
23/05/2016	6:00	0	1.61	264.7	11.5	90
23/05/2016	6:15	0	1.46	209.8	11.7	89
23/05/2016	6:30	0	1.62	291.4	11.8	87
23/05/2016	6:45	0	1.26	221.0	11.2	88
23/05/2016	7:00	0	1.05	225.8	11.5	89
23/05/2016	7:15	0	2.17	283.8	12.6	86
23/05/2016	7:30	0	2.59	305.3	14.2	80
23/05/2016	7:45	0	3.27	294.1	15.2	76
23/05/2016	8:00	0	3.72	288.7	15.8	74
23/05/2016	8:15	0	4.70	295.0	16.0	72
23/05/2016	8:30	0	5.40	299.4	16.3	71
23/05/2016	8:45	0	5.76	281.4	16.5	69
23/05/2016	9:00	0	6.99	271.5	16.1	69

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
23/05/2016	9:15	0	6.71	294.8	15.8	70
23/05/2016	9:30	0	5.47	308.2	15.9	71
23/05/2016	9:45	0	5.78	301.7	16.3	70
23/05/2016	10:00	0	5.35	280.2	16.5	70
23/05/2016	10:15	0	6.55	328.5	16.4	69
23/05/2016	10:30	0	5.90	273.3	16.7	70
23/05/2016	10:45	0	5.96	270.4	17.1	68
23/05/2016	11:00	0	6.47	252.7	17.0	68
23/05/2016	11:15	0	6.73	251.9	15.5	73
23/05/2016	11:30	0	6.55	248.5	14.4	77
23/05/2016	11:45	0	5.20	264.2	13.5	82
23/05/2016	12:00	0	5.15	266.8	12.3	88
23/05/2016	12:15	0	6.00	239.3	11.9	82
23/05/2016	12:30	0	5.70	255.1	12.2	65
23/05/2016	12:45	0	3.33	298.5	13.3	59
23/05/2016	13:00	0	4.76	273.7	14.1	53
23/05/2016	13:15	0	5.61	252.8	14.3	51
23/05/2016	13:30	0	4.89	272.0	14.0	52
23/05/2016	13:45	0	5.34	259.8	13.8	54
23/05/2016	14:00	0	4.90	267.8	14.0	51
23/05/2016	14:15	0	7.72	244.7	13.4	51
23/05/2016	14:30	0	6.01	257.5	13.4	49
23/05/2016	14:45	0	6.30	263.3	12.9	47
23/05/2016	15:00	0	5.68	254.8	12.9	47
23/05/2016	15:15	0	5.98	264.1	12.6	48
23/05/2016	15:30	0	4.49	242.6	12.4	49
23/05/2016	15:45	0	5.18	277.4	12.3	46
23/05/2016	16:00	0	6.77	269.8	11.7	46
23/05/2016	16:15	0	6.39	272.5	11.2	47
23/05/2016	16:30	0	4.77	255.4	10.5	51
23/05/2016	16:45	0	2.00	228.4	9.9	54
23/05/2016	17:00	0	1.92	205.8	9.5	55
23/05/2016	17:15	0	1.88	242.7	9.1	58
23/05/2016	17:30	0	1.03	217.2	8.5	60
23/05/2016	17:45	0	1.32	251.0	7.5	64
23/05/2016	18:00	0	1.43	216.8	7.4	66

Date	Time	Rainfall (mm)	Wind Speed 10m above ground (m/s)	Wind Direction (deg.)	Temp (°C)	Relative humidity (%)
23/05/2016	18:15	0	1.01	225.4	6.7	69
23/05/2016	18:30	0	1.88	269.4	6.9	69
23/05/2016	18:45	0	1.61	265.4	6.8	69
23/05/2016	19:00	0	1.56	248.9	6.5	69
23/05/2016	19:15	0	1.83	255.7	7.0	68
23/05/2016	19:30	0	2.09	265.0	6.8	69
23/05/2016	19:45	0	1.18	265.4	6.1	71
23/05/2016	20:00	0	1.78	269.5	6.1	73
23/05/2016	20:15	0	1.86	258.9	6.3	73
23/05/2016	20:30	0	1.74	250.9	6.3	73
23/05/2016	20:45	0	1.80	256.9	6.0	75
23/05/2016	21:00	0	0.77	165.5	5.5	77
23/05/2016	21:15	0	0.77	210.3	4.9	81
23/05/2016	21:30	0	1.30	222.6	5.3	80
23/05/2016	21:45	0	0.78	178.0	5.2	81
23/05/2016	22:00	0	1.45	196.2	5.3	81
23/05/2016	22:15	0	2.17	258.3	5.6	81
23/05/2016	22:30	0	1.09	206.9	5.3	81
23/05/2016	22:45	0	1.01	209.1	4.9	83
23/05/2016	23:00	0	0.98	80.3	4.4	84
23/05/2016	23:15	0	0.91	125.4	4.2	85
23/05/2016	23:30	0	0.88	91.0	3.9	85
23/05/2016	23:45	0	0.95	139.2	3.8	86

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