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Project: Kerosene Vale Ash Repository Stage 2

Ongoing operational noise measurements

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Document prepared by:

Aurecon Australia Pty Ltd
ABN 54 005 139 873
Level 2, 116 Military Road
Neutral Bay NSW 2089
PO Box 538
Neutral Bay NSW 2089
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

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1. Introduction

Aurecon was engaged by Delta Electricity to carry out ongoing operational noise monitoring for the Kerosene Vale Stage 2 Ash Repository (KVAR) located in Wallerawang, NSW. The noise measurements were carried out on Sunday 6 November and Monday 7 November 2011, during the early morning and evening periods as per the requirements outlined in the KVAR Stage 2 Operations, 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). The major noise emissions associated with the Stage 2 KVAR works are:

- Unloading of ash from trucks at the repository.
- Placement and handling of ash at the repository site.
- Operation of trucks on the private haul road; trucks leave WPS loaded with ash (travelling north) and return from the repository empty (travelling south)

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

Table 1 Representative noise measurement locations

Representative sensitive receiver	Distance (m) to haulage road*
60 Skelly Road	330
10 Skelly Road	240
21 Neubeck Street	160

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 haul 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.

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 an* $L_{Aeq\ (15\ minute)}$ ***of 40 dBA*** *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 op 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 and sound exposure levels. The measurements were carried out on Sunday 6 November and Monday 7 November 2011, during the early morning and evening periods, when the noise impacts are likely to be the most significant.

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. The measurement period at each location consisted of 15 minutes. A Larson Davis CAL200 was utilised to calibrate all sound level meters before and after each series of measurements. The weather during the noise logging ranged from overcast to sunny periods.

The Sound Exposure Level (SEL) measurements were also carried out 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. SEL is the equivalent A-weighted sound level which, if it lasted for one second, would produce the same sound energy as the actual event. The measurement was commenced when the truck was observed to pass a consistent location and stopped when the end of the truck passed a second consistent location. The reference locations were identified where the truck could be visually observed.

During both types of measurements no rain periods were experienced. Minimal wind was induced on the microphone with any light breeze periods being significantly below the 5 m/s threshold.

3.2 Measurement locations

The measurement locations were chosen to represent the three most affected sensitive receivers as outlined in the Operational Noise and Vibration Management Plan (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 noise monitoring locations it was difficult to assess individual truck noise events (discussed below). A fourth noise monitoring location 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 (m) to haulage road	Representative sensitive receiver
A	300	60 Skelly Road

Measurement location	Measurement distance (m) to haulage road	Representative sensitive receiver
B	270	10 Skelly Road
C	160	21 Neubeck Street
D	95	-

Figure 2 Noise measurement locations

General observation regarding ambient noise environment as well as the truck movements and ash repository operations are described as follows. Individual truck noise varied significantly between trucks. The noise emissions were dependant on the speed travelled, driving technique and direction of travel. The variances were apparent even between the same types of vehicles. Truck pass-by numbers were higher during the morning period on both measurement days when compared to the evening truck counts. Operational noise from the Ash Repository was seldom audible at the noise sensitive receiver locations during all the attended noise measurements.

The noise levels at all locations were affected by other ambient noise sources such as bird life, domestic animals, background noise from the Wallerawang Power Station as well as intermittent traffic noise from nearby Castlereagh Highway and Wolgan Road. Due to these other noise sources not all of the truck events were clearly audible, or could be distinguished from the ambient noise levels.

3.2.1 Location A

Noise measurements at Location A were affected by bird noise as well as foliage noise. There was direct exposure to the truck noise as the trucks could be visually identified. Individual truck pass by events were observed to generate peak noise levels of up to 50 dBA. The use of airbrakes by some drivers was clearly audible. Bird life reached instantaneous noise levels in excess of 60 dBA. Background hum from the nearby power station as well as traffic noise from Castlereagh Highway was clearly audible with the sound pressure levels dependant on the time of day and meteorological conditions.

3.2.2 Location B

Location B was similar to Location A with measurements also affected by bird life and audible levels from the power station and highway. Other noise sources included domestic animal noise. Individual vehicle pass-bys along Wolgan Road, were clearly audible.

3.2.3 Location C

Location C was the closest position to the haulage road (representative of a noise-sensitive receiver), however there was no direct line of site of the trucks. An earth mound directly to the east of the property boundary acts as an acoustic barrier. This made it difficult at time to identify truck movement. Other audible noise sources during the noise survey included workshop activities, domestic gardening. Despite the increased distance (approximately 1300 m) to the Wallerawang Power Station, background hum was still clearly audible.

3.2.4 Location D

The noise data collected at Location D measured the Sound Exposure Levels (SEL) of individual truck pass-by events. At this closer location to the truck haulage road, each truck pass-by was clearly audible above other ambient noise sources.

3.3 Operating and meteorological conditions

Delta Electricity has provided the following information regarding the operations during the noise survey.

- The ash silos were at approximately 83 – 85% capacity during the noise survey.
- Two trucks were operating at a constant rate, with approximate 15 minute circuits for each truck. From 7am – 10pm daily this is the constant mode of operation. This signifies that the worst case

ash truck movements that could occur within a 15 minute periods are 4 drive-bys (2 in the northern direction, 2 in the southern direction)

The meteorological conditions during the noise survey based on 5 minute data from the Mount Piper weather station are shown in Table 3. The weather station details are as follows:

- Location – South: 33° 21' 46.0", East: 150° 01' 21.0"
- Elevation – 956 m
- Anemometer height – 10 m above ground level

Table 3 Meteorological conditions during noise survey

Time and date	Wind speed (m/s)	Wind direction (deg)	Relative Humidity (%)	Temp (°C)	Net Rad (W/m^2)	Atmospheric Stability*
6/11/2011 7:30	1.7	8	71	17.9	112	B
6/11/2011 7:35	2.2	17	67	18.5	116	C
6/11/2011 7:40	2.8	15	66	18.5	105	C
6/11/2011 7:55	2.4	17	65	18.9	108	B
6/11/2011 8:00	2.3	9	65	18.9	132	A
6/11/2011 8:05	1.4	326	65	18.9	47	A
6/11/2011 8:25	1.6	333	67	19.0	259	A
6/11/2011 8:30	2.9	340	65	19.5	210	C
6/11/2011 8:35	2.7	349	65	19.7	162	C
6/11/2011 18:30	2.5	301	70	18.6	21	B
6/11/2011 18:35	2.0	312	71	18.5	6	A
6/11/2011 18:40	1.5	301	72	18.3	-1	A
6/11/2011 18:50	2.4	301	74	18.0	-12	C
6/11/2011 18:55	1.7	324	74	18.0	-17	B
6/11/2011 19:00	1.1	326	75	17.9	-25	A
6/11/2011 19:10	1.6	334	76	17.6	-37	C
6/11/2011 19:15	1.3	348	76	17.5	-38	B
6/11/2011 19:20	0.9	329	77	17.4	-37	A
7/11/2011 7:30	3.1	250	81	17.6	118	B
7/11/2011 7:35	3.1	273	80	17.8	93	B

Time and date	Wind speed (m/s)	Wind direction (deg)	Relative Humidity (%)	Temp (°C)	Net Rad (W/m^2)	Atmospheric Stability*
7/11/2011 7:40	4.1	255	80	17.7	97	C
7/11/2011 7:50	3.3	257	80	17.7	100	C
7/11/2011 7:55	4.5	277	80	17.5	93	D
7/11/2011 8:00	3.1	281	81	17.5	46	B
7/11/2011 8:10	2.8	294	82	17.2	28	B
7/11/2011 8:15	2.7	287	82	17.2	47	A
7/11/2011 8:20	3.3	273	82	17.1	73	B
7/11/2011 20:55	0.8	191	77	18.7	-44	B
7/11/2011 21:00	0.9	189	78	18.4	-43	B
7/11/2011 21:05	1.5	205	79	18.1	-44	D
7/11/2011 21:15	0.8	142	79	17.8	-44	A
7/11/2011 21:20	0.7	268	80	17.6	-44	A
7/11/2011 21:25	1.0	228	81	17.4	-45	C
7/11/2011 21:35	1.0	258	83	16.9	-42	C
7/11/2011 21:40	1.3	261	84	16.7	-42	C
7/11/2011 21:45	0.5	240	85	16.6	-41	A

Note *: Atmospheric stability class is determined using Sigma Theta data (not shown) and applying the Pasquill method. Pasquill-Gifford stability classes range from: A being highly Unstable, D neutral and G extremely stable.

As can be observed from the above meteorological data, the wind speeds were predominately low during the noise survey, with atmospheric stability predominantly ranging from unstable to neutral.

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 4.

Table 4 Noise measurement results (15 minute)

Location	Date	Time	Sound pressure level (dBA)				Trucks Pass-bys and direction of travel*		
			L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}	North	South	Total
C	06/11/2011	07:30	44	67	45	37	4	7	11
B	06/11/2011	07:55	44	62	46	38	9	7	16
A	06/11/2011	08:24	43	60	46	38	6	9	15
A	06/11/2011	18:29	41	56	43	38	4	3	7
B	06/11/2011	18:48	41	60	44	36	3	4	7
C	06/11/2011	19:09	44	65	45	38	2	5	7
A	07/11/2011	07:29	46	62	47	43	6	5	11
B	07/11/2011	07:49	47	67	49	40	7	6	13
C	07/11/2011	08:08	44	67	46	38	3	8	11
A	07/11/2011	20:56	41	61	41	37	1	2	3
B	07/11/2011	21:15	40	61	42	37	2	2	4
C	07/11/2011	21:35	43	59	44	39	1	1	2

Note * - truck counts include both coal and ash trucks

The measured $L_{Aeq\ (15\ min)}$ is generally in excess of the assessment criteria of $L_{Aeq\ (15\ min)}$ of 40 dBA. The high noise levels are associated with local noise events such mainly bird noise and traffic noise levels from surrounding roads as well as some truck pass-bys along the haulage route. The high background noise level is predominantly associated with the Wallerawang Power Station operation.

3.4.2 SEL measurements

The individual truck pass-by noise event measurements at Location D are summarised in Table 5.

Table 5 SEL noise measurement results at Location D

Truck travelling direction	Average event time (s)	Average SEL (dBA)	No. of valid truck event measurements
South	28.9	68	8
North	18.1	70	9

4. Data analysis

As can be observed from the results presented in Table 4, the existing ambient noise levels (L_{Aeq}) are predominantly in excess of the assessment criteria of $L_{Aeq\ (15\ min)}$ of 40 dBA. The background noise

(L_{A90}) from the consistent noise sources during all of the noise measurements was also very close assessment criteria. This signifies that noise emissions from the truck movements and ash repository operation cannot be determined based on ambient noise measurements.

To assess the impact of the ash truck noise emissions individual truck pass-by noise events have to be taken into account. Based on the SEL measurement results (shown in Table 5), a $L_{Aeq\ (15\ min)}$ noise level was predicted, which takes into account the number of ash truck pass-bys, distance noise correction and any potential barrier effects. These predictions are shown in Table 6 below.

The noise emissions from the ash repository are considered to be below the assessment criteria as they were predominantly not audible during the noise survey and could not distinguished.

Table 6 Noise predictions from truck movements based on SEL measurements

Sensitive receiver	Distance to haulage road (m)	No. of truck movements	Predicted $L_{Aeq\ (15\ min)}$ (dBA)	Criteria $L_{Aeq\ (15\ min)}$ (dBA
60 Skelly Road	330	4, (2 N, 2 S)	35	40
10 Skelly Road	240	4, (2 N, 2 S)	38	40
21 Neubeck Street	160	4, (2 N, 2 S)	36*	40

Note * - includes barrier attenuation from earth mound of approximately 5 dBA

It can be seen from the above result that the predicted $L_{Aeq\ (15\ min)}$ noise emissions based on the SEL measurements satisfy the required assessment criteria. Therefore the operational noise emissions from the Stage 2 KVAR are considered compliant to the Conditions of Approval.

5. Conclusion

Aurecon conducted ongoing operational noise monitoring for the Kerosene Vale Stage 2 Ash Repository (KVAR) located in Wallerawang, NSW. The noise measurements were carried out at the three most affected sensitive receiver locations on Sunday 6 November and Monday 7 November 2011. The assessment criteria are outlined in the Project Approval, Application No. 07_0005, with the criteria consisting of $L_{Aeq\ (15\ minute)}$ of 40 dBA from all ash haulage and placement associated operational noise emissions at the nearest sensitive receivers.

The ambient noise measurements identified significant other noise sources in the area. This meant that the noise emissions from the Stage 2 KVAR activities could not be sufficiently distinguished from the other ambient noise sources to carry out an assessment. Additional Sound Exposure Levels of individual truck pass-by events at a closer distance to the truck haulage road were carried out. Based on the SEL measurement results, a $L_{Aeq\ (15\ min)}$ noise level was predicted at each of the assessment sensitive noise receiver. The predicted noise levels took into account only truck movements associated with Stage 2 KVAR works and excluded any coal truck noise. The predicted noise level at each of the noise receivers showed compliance with assessment criteria, thus the operational noise emissions from the Stage 2 KVAR are considered compliant to the Conditions of Approval.

6. 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

Aurecon Australia Pty Ltd
ABN 54 005 139 873
Level 2, 116 Military Road
Neutral Bay NSW 2089
PO Box 538
Neutral Bay NSW 2089
Australia

T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

Aurecon offices are located in:
Angola, Australia, Bahrain, Botswana, China, Ethiopia, Hong Kong, Indonesia, Lesotho, Libya, Malawi, Mozambique, Namibia, New Zealand, Nigeria, Philippines, Singapore, South Africa, Swaziland, Tanzania, Thailand, Uganda, United Arab Emirates, Vietnam.