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Environmental Noise Assessment

October to December 2014

Wilpinjong Coal Mine

10 February, 2015

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1. INTRODUCTION

Advitech Pty Limited was engaged by Peabody Energy Australia to collate, analyse and report on continuous environmental noise monitoring in the rural community adjacent to the Wilpinjong Coal Mine (WCM). The objective of the environmental monitoring is to assess the mining noise impacts on adjacent sensitive receivers and determine if these impacts meet consent conditions specified in the Environmental Protection Licence (EPL 12425) and Project Approval (PA 05_0021).

This report presents continuous noise data at the Wandoona, Araluen and Central Wollar monitoring locations, for the period 1 October to 31 December, 2014 (the monitoring period).

It should be noted that this report was prepared by Advitech Pty Limited for Peabody Energy Australia ("the customer") in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

1.1 Objectives

The objective of this report is to monitor mining noise impacts in the receiving environment and determine if these impacts generally comply with consent conditions, as specified in the Project Approval (05_0021). In accordance with provisions established in Section 5 of the WCM Noise Management Plan (NMP), WCM utilise:

- operator attended monitoring to evaluate compliance with statutory noise criteria; and
- real time unattended monitoring to assist with ongoing management of noise impacts.

Analysis of continuous monitoring data contained in this report is provided to assist with evaluation of the performance of mine noise management practices. Where this analysis identifies noise levels approaching (or exceeding) the noise criteria, supplementary operator attended monitoring would be employed to evaluate compliance with the Project Approval.

On this basis, analysis of continuous unattended noise monitoring data is not presented as an assessment of compliance.

1.2 Environmental Monitoring Program

Environmental noise monitoring was undertaken in the area surrounding the WCM using three SentineX continuous monitoring systems. The monitoring systems were located at the following properties as shown in **Figure 1:**

- SentineX 31- Wandoona monitoring location (1 October to 31 December, 2014);
- SentineX 30 – Araluen Lane (1 October to 31 December, 2014); and
- SentineX 33 - Central Wollar (1 October to 31 December, 2014).

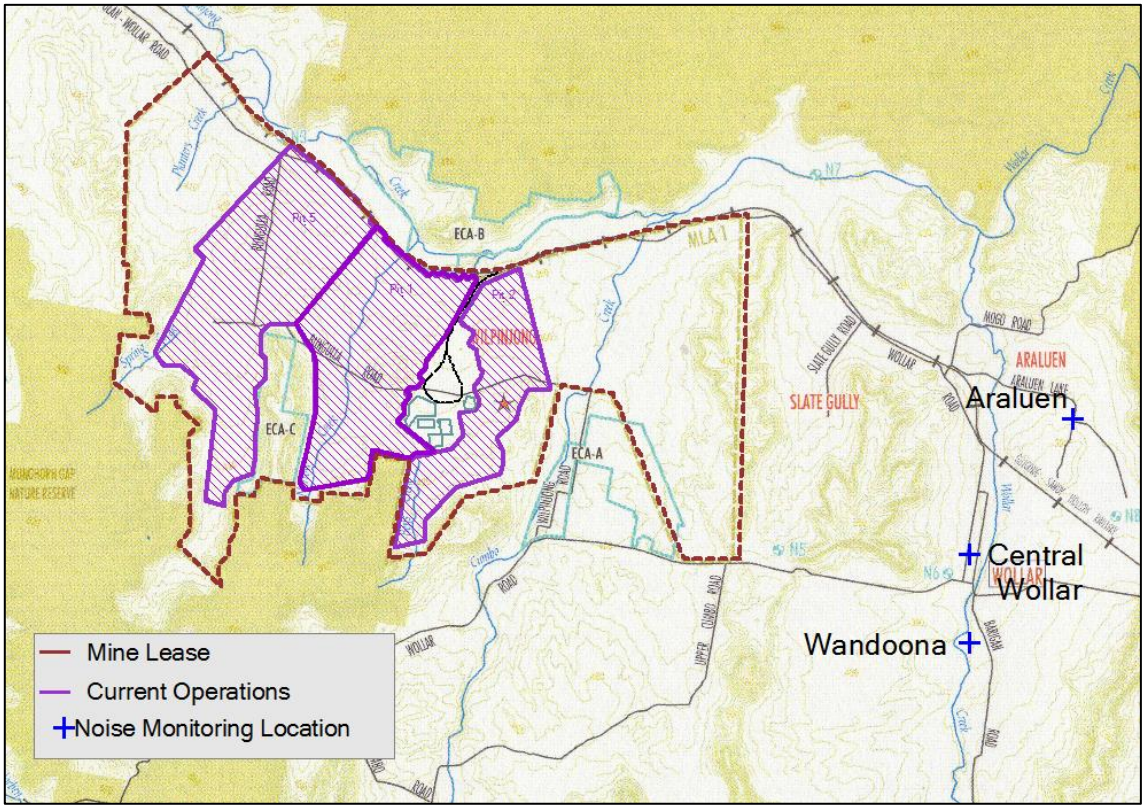

Figure 1: Location Map
(Source: Adapted from Wilpinjong Coal Project EIS, Appendix D, Resource Strategies)

1.3 Mining Operations

Mining of ROM Coal at WCM involves conventional drill and blast, truck and shovel open cut extractive methods with on-site coal handling. Approved mining operations include:

- extraction of up to 28 Mbcm of waste rock by dozer pushing or 'throw blasting', including progressive rehabilitation of mine rock waste emplacements;
- selective mining of coal and haulage to the ROM stockpile (ROM Coal Production rate of up to 15 Mtpa);
- 24 hour operation of the Coal Handling and Processing Plant (CHPP) capable of processing up to 8.5 Mtpa of ROM coal; and
- loading of product coal and transport by rail with up to a maximum of 10 laden trains per day leaving the mine along the Sandy Hollow – Gulgong railway.

2. NOISE MONITORING PROGRAM

2.1 Continuous Environmental Noise Monitoring

Noise monitoring was undertaken using three SentineX continuous monitoring systems in the receiving environment adjacent to WCM operations. The SentineX unit is a remote noise monitoring system which provides near-real time data access via a dedicated website. The noise monitoring system (including a Type 1 sound level meter) records the following parameters:

- 15 minute statistical data (L_{A1}, L_{A10}, and L_{A90});
- $L_{Aeq,15minute}$ and $L_{Aeq,period}$ noise levels;
- $L_{Aeq,1minute}$ in 1/3 octave;
- $L_{Aeq,15minute}$ in the 20 to 630 Hz range ($L_{Aeq,LF}$);
- digital audio recording 24 hours per day; and
- wind direction, wind speed, temperature, humidity and rainfall.

2.1.1 Assessment Criteria

Wilpinjong Coal Mine (WCM) operates in accordance with conditions established in EPL 12425 and PA 05_0021. Noise criteria are designated under these instruments to ensure operations at the mine do not negatively impact on the surrounding environment with regard to noise. **Table 1** details the noise performance criteria for each monitoring location.

Table 1: Environmental noise limits (dB(A))

Criteria	Central Wollar	Araluen	Wandoona
$L_{Aeq,15minute}$			
Day	36	35	35
Evening	35	35	35
Night	35	35	35
$L_{Aeq,period}$*			
Night	40	40	40
$L_{A1.1minute}$	45	45	45

*Acceptable $L_{Aeq,night}$ noise level for Rural receiver types, as established in Section 2 of the INP.

The EPL states:

- a day is defined as the period from 7 am to 6 pm Monday to Saturday, and 8 am to 6 pm Sundays and public holidays;
- an evening is defined as the period from 6 pm to 10 pm; and
- a night is defined as the period from 10 pm to 7 am Monday to Saturday, and 10 pm to 8 am Sundays and public holidays.

The EPL also stipulates the location of the monitoring equipment. Noise from the WCM is to be measured at the most affected point on or within the residential boundary or at the most affected point within 30 metres (m) of the dwelling where the dwelling is more than 30 m from the boundary.

The EPL and Project Approval state the noise limits identified in **Table 1** apply under meteorological conditions of:

- wind speeds of up to 3 m/s at 10 m above ground level; or
- temperature inversion conditions of up to 4.5°C/100 m and wind speeds of up to 2 m/s at 10 m above ground level.

Direct measurement of vertical temperature gradient is used to monitor and evaluate atmospheric stability and inversion strength at WCM. The temperature lapse rate is calculated on the basis of temperature measurement data from sensors installed on a meteorological tower (at RL+2 m and RL +58 m) located within the WCM Rail Loop. For the purposes of this assessment, noise level data is also considered invalid if measured during periods of rainfall in accordance with Section 3.4 of the NSW Industrial Noise Policy (INP).

3. ASSESSMENT OF METEOROLOGICAL DATA

Meteorological data from the WCM meteorological station was analysed by assessment period (day, evening, and night) for wind speed, wind direction, rainfall and atmospheric stability. A summary of meteorological results is presented in **Table 2**.

Table 2: Meteorological data summary results

Property	Period	Frequency
Data Availability	All	100%
Adverse Meteorology	All	34%
Rainfall	All	2%
Wind, >3ms	Day	47%
	Evening	45%
	Night	21%
Measured Lapse >+4.5degC/100m	Night	27%

3.1 Assessment of Wind-rose Data

Calm conditions (<0.4 m/s) were experienced for approximately 12% of the monitoring period (all periods) and 25% during the night. **Figure 2** and **Figure 3** indicate winds were observed more frequently from the northwest, north and east during 'all periods' and the night period.

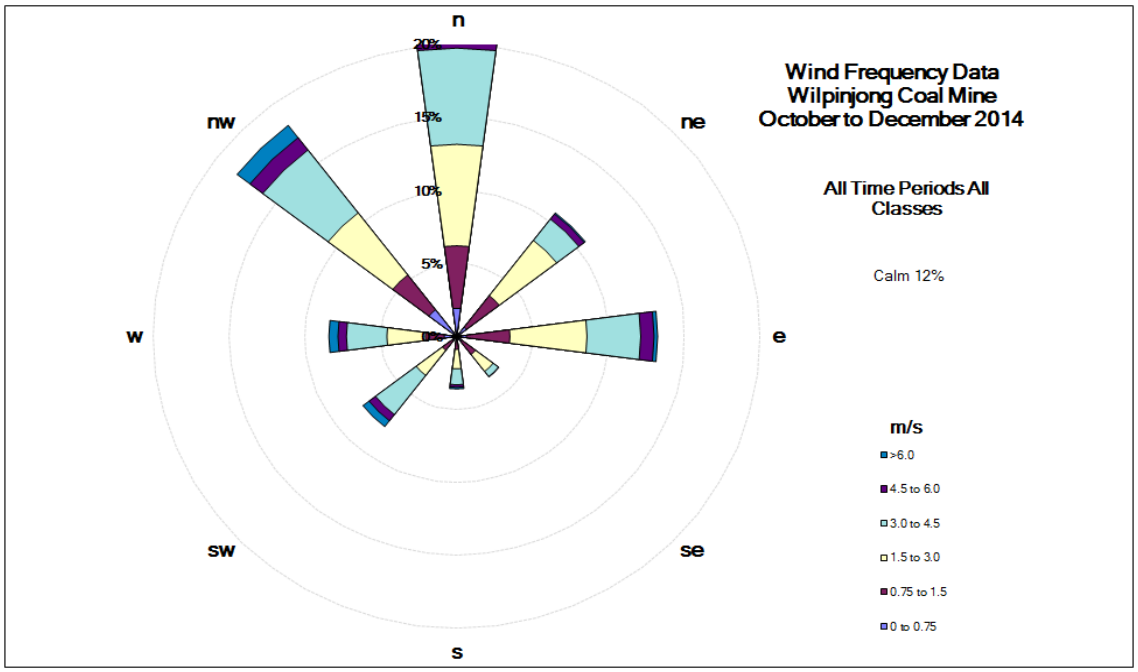

Figure 2: Wind rose for all periods, all classes

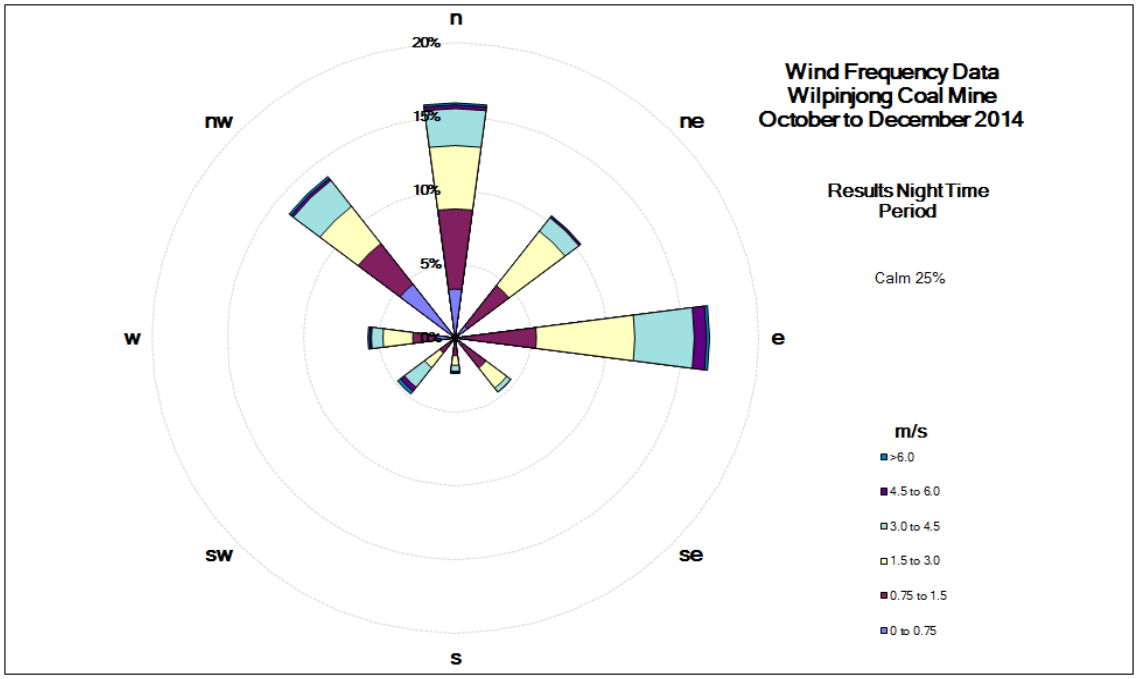

Figure 3: Wind rose for night period, all classes

3.2 Assessment of Atmospheric Stability Data

Analysis of the prevailing atmospheric stability conditions during the October to December, 2014 period is presented in **Figure 4**. Atmospheric stability classes for the period October to December, 2014, were evaluated in accordance with the sigma-theta methodology presented in Appendix E of the NSW Industrial Noise Policy. The results indicate moderate (F-class) and strong (G-class) temperature inversions (and associated potential for enhanced noise propagation) were present for approximately 30% of the night during the monitoring period.

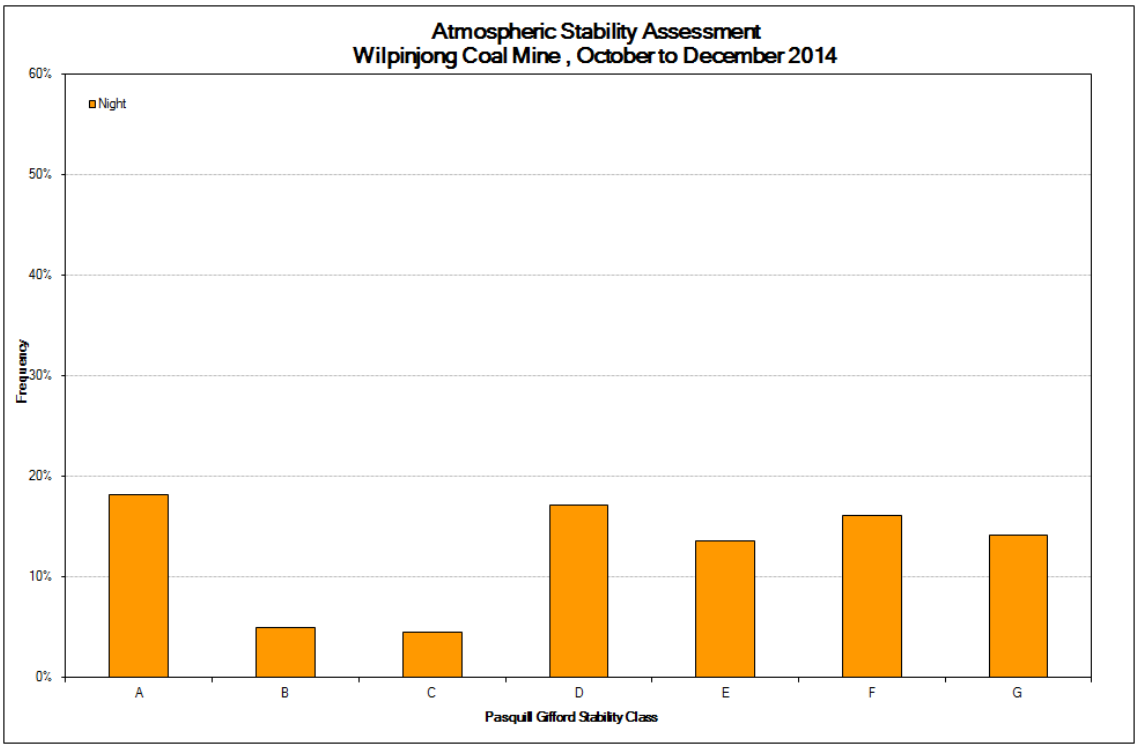

Figure 4: Assessment of temperature inversion frequency

Additional analysis of temperature inversion strength and frequency from direct measurement data was undertaken for the monitoring period and is presented in **Figure 5**. This analysis demonstrates that temperature inversion conditions (lapse rates > +4.5˚C/100m) were observed at a lower frequency than indicated by application of the sigma theta method.

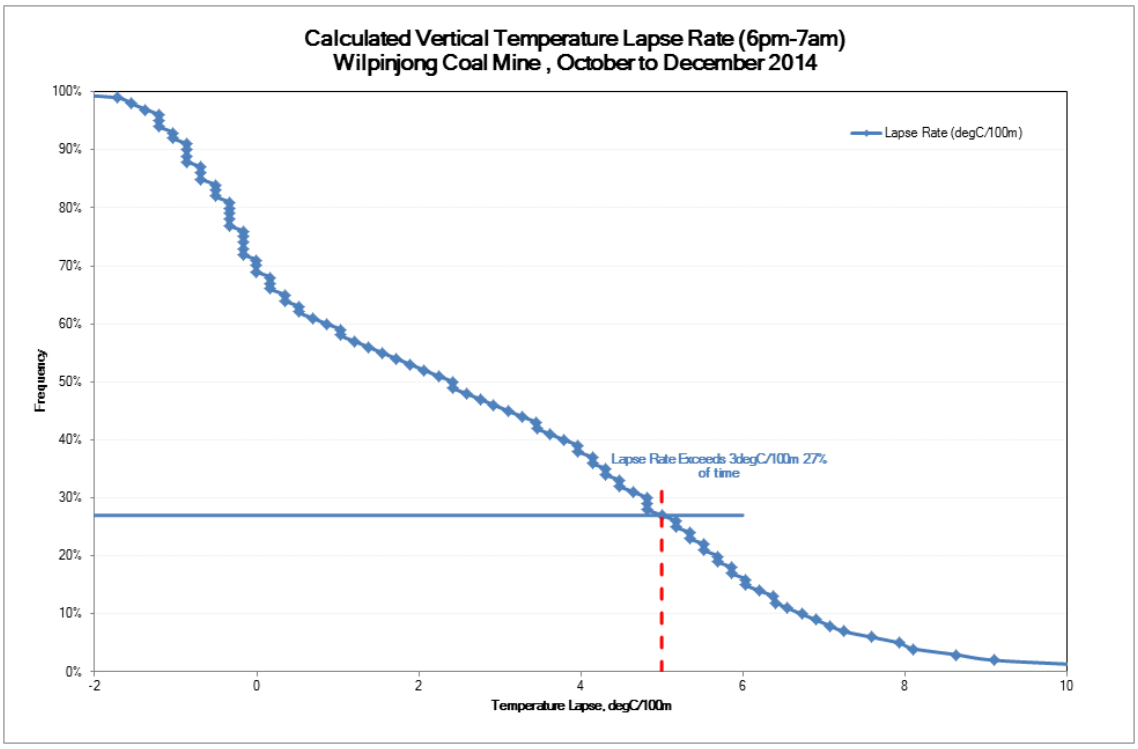

Figure 5: Temperature lapse rates, direct measurement analysis

4. CONTINUOUS NOISE MONITORING DATA

4.1 Data Filtering and Exclusion Rules

4.1.1 Meteorological Exclusions

Monitoring data is compiled as a statistical cumulative frequency distribution histogram to show the percentage of time during the monitoring period that noise limits are exceeded. When filtered to exclude data captured during periods of adverse meteorology, the cumulative distribution curves for $L_{AeqLF,15minute}$ noise levels are compared to the noise limits for that receiver specified in the EPL. Justification for the application of the L_{AeqLF} descriptor is provided in **Section 4.1.2**.

The following rules are applied to exclude continuous monitoring data based on adverse meteorology:

1. 10 m wind speed greater than 3 m/s (observed at the WCM meteorological station); or
2. presence of vertical temperature lapse rates exceeding 3°C/100 m (as indicated by G-class Pasquill Gifford atmospheric stability or direct measurement data); or
3. rainfall (observed by the SentineX unit at the receiver location).

Conditions 1 and 2 are applied in accordance with Condition L6.4 of the EPL. The application of Condition 3 is not expressed in the WCM Project Approval or EPL; however, application of this exclusion rule is recommended in Section 3.4 the INP:

> *Noise monitoring should not be conducted (or the data should be excluded) when average wind speeds (over 15 minute periods or shorter) at microphone height are greater than 5 m/s, or when rainfall occurs. Exceptions to this rule are allowed, provided the proponent is able to show that the wind induced noise on the microphone, and sound levels due to rain are at least 10 dB below the noise levels (that is, background and/or ambient) under investigation.*

4.1.2 Application of the L_{Aeq} and L_{AeqLF} Descriptors

The L_{Aeq} descriptor describes the energy equivalent average noise level, and is influenced by extraneous noise sources including livestock and early morning bird activity, and often represents an over-estimate of the contribution from mining operations. The low frequency noise component (L_{AeqLF}) comprises noise in the 20 Hz to 630 Hz range, and is considered representative of the contribution of measured noise levels associated with mining operations.

4.1.3 Conditional Data Exclusion

The WCM Noise Monitoring Programme (NMP) outlines additional criteria against which extraneous noise impacts may be routinely excluded from the monitoring data. These conditional exclusion rules facilitate a means of determining the impact of non-mining sources on measured noise levels and assessing the contribution of mining noise. The conditional rules are applied to the *as measured* monitoring data and exclude results if:

1. the L_{AeqLF} exceeds the L_{A90} by more than 5 dB; or
2. the L_{AeqLF} is greater than the L_{A10}; or
3. the L_{AeqLF} exceeds the previous L_{AeqLF} by more than 7 dB.

Condition 1 can be applied because mine related noise is considered to be continuous and would be expected to influence the L_{A90}. If the L_{AeqLF} is elevated but the L_{A90} remains low, the noise source is considered to be transient and unlikely to be related to mining operations.

Condition 2 can be applied because the L_{A10} is influenced only by short term or intermittent noises such as barking dog or traffic noise. If the L_{AeqLF} exceeds the L_{A10}, it is likely to be a transient source located close to the monitor and unlikely to be related to mining operations.

Condition 3 seeks to remove data associated with transient noise sources that cause a rapid increase followed by a corresponding decrease in noise levels in excess of what could be reasonably attributable to continuous mining noise.

It is important to note that analysis of noise impacts using cumulative frequency distribution curves for filtered monitoring data does not identify the source of noise; only that specified noise levels have been exceeded.

4.2 Measured $L_{AeqLF,15minute}$ Cumulative Noise Level Results

4.2.1 Assessment of Wandoona Monitoring Data

Figure 6 shows the cumulative distribution curves for the $L_{AeqLF\ 15minute}$ noise levels of the day, evening and night time periods at the Wandoona monitoring location. Application of standard data exclusion rules outlined in **Section 4.1** led to the exclusion of 51% of the continuous monitoring data (all periods). **Figure 6** indicates that 'as measured' $L_{AeqLF,15minute}$ noise levels at the Wandoona monitoring location were above the 35 dB(A) night period criteria for 10% of the monitoring period.

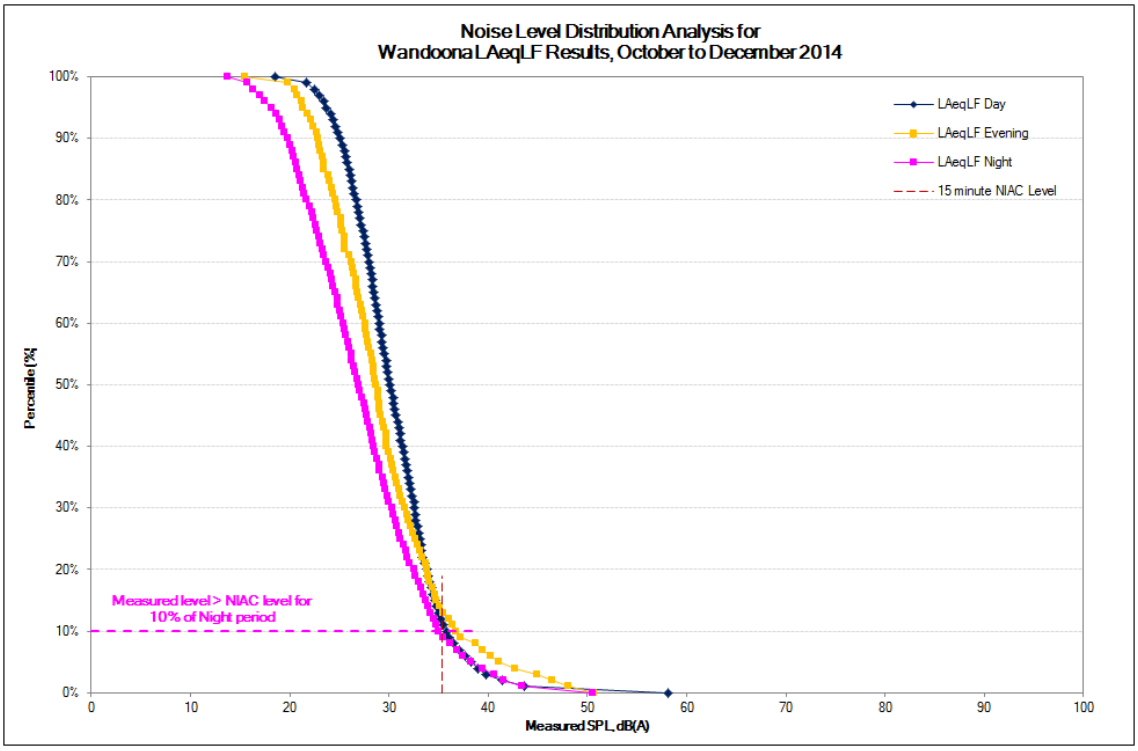

Figure 6: Day, evening and night noise levels at the Wandoona monitoring location

4.2.2 Assessment of Araluen Monitoring Data

Figure 7 shows the cumulative distribution curves for the $L_{AeqLF\ 15minute}$ noise levels for the day, evening and night time periods at the Araluen monitoring location. Application of standard data exclusion rules outlined in **Sections 4.1.1** and **4.1.3** led to the exclusion of 51% of the continuous monitoring data. Following exclusion of data based on standard meteorological and extraneous source impacts, **Figure 7** shows that the measured noise levels at the Araluen monitoring location were above the 35 dB(A) criteria for 5% of the night during the monitoring period.

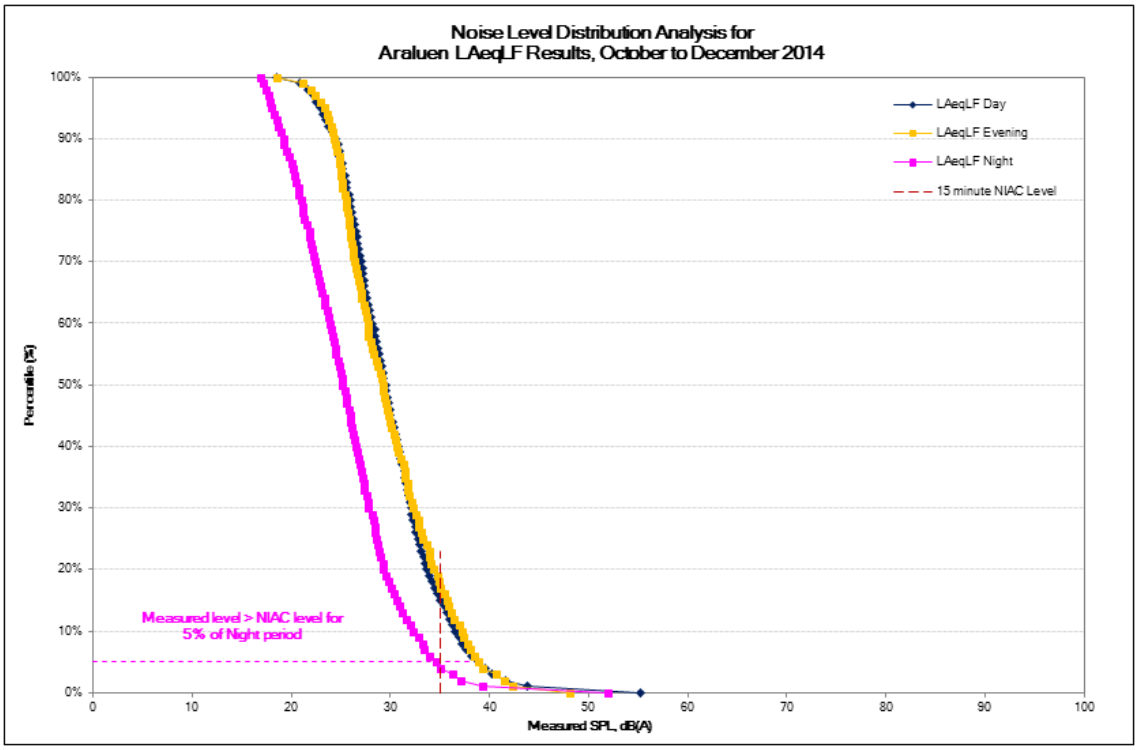

Figure 7: Day, evening and night noise levels at the Araluen monitoring location

4.2.3 Assessment of Central Wollar (SentineX33) Monitoring Data

Figure 8 shows the cumulative distribution curves for the $L_{AeqLF\ 15minute}$ noise levels for the day, evening and night time periods at the Central Wollar monitoring location. Application of standard data exclusion rules outlined in **Sections 4.1.1** and **4.1.3** led to the exclusion of 55% of the continuous monitoring data. Following exclusion of data based on standard meteorological and extraneous source impacts, **Figure 8** shows that the measured noise levels at the Central Wollar monitoring location were above the 35 dB(A) criteria for 20% of the night during the monitoring period.

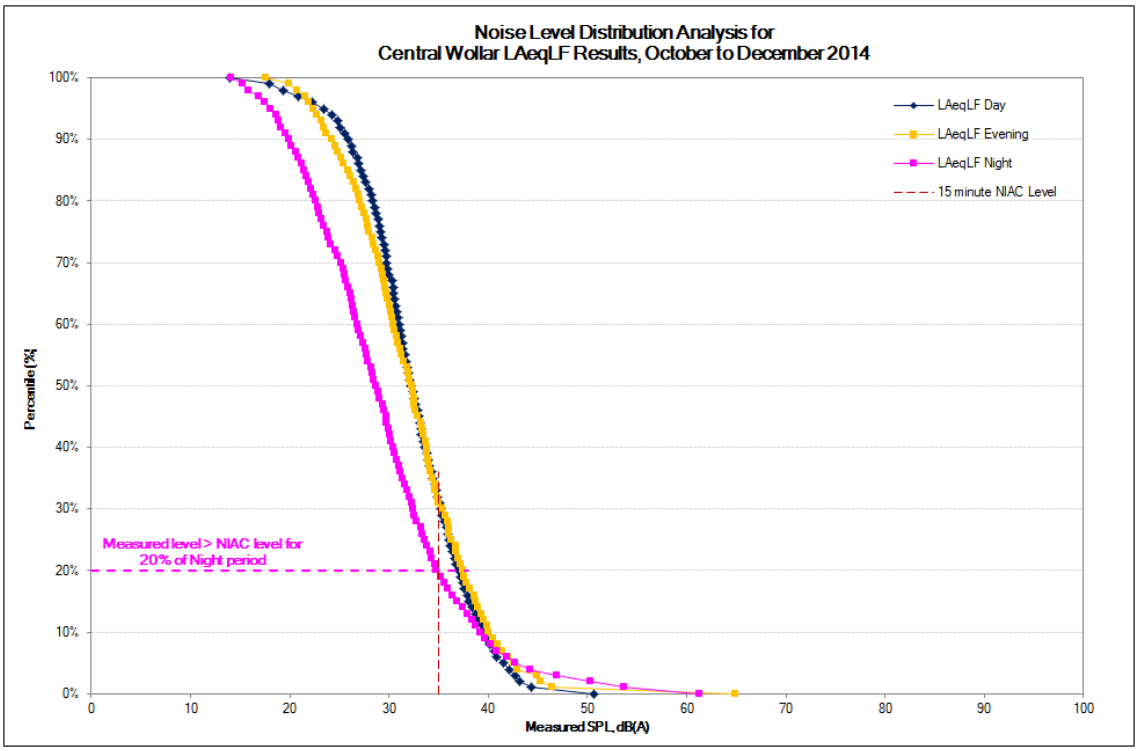

Figure 8: Day, evening and night noise levels at the Central Wollar monitoring location

4.2.4 Summary of $L_{AeqLF,15minute}$ Cumulative Noise Level Results

A summary of the cumulative distribution analysis presented in **Table 3** shows the measured exceedence rates for the monitoring period. It should be noted that this analysis provides no indication of the source of the measured noise levels.

Table 3: Measured night-time exceedence

Location	Noise Criteria dB(A)	Valid Data	Measured Exceedence
Wandoona	$L_{Aeq15minute,night}$ > 35 dB(A)	49%	10%
Araluen	$L_{Aeq15minute,night}$ > 35 dB(A)	49%	5%
Central Wollar	$L_{Aeq15minute,night}$ > 35 dB(A)	45%	20%

4.3 Assessed $L_{AeqLF,\ 15minute}$ Exceedence Rate

Following the assessment of 'as measured' noise levels presented in **Section 4.2**, review of recorded audio was undertaken for each result found to exceed the $L_{Aeq,15minute}$ criteria, to determine the source(s) that have contributed to the measured noise level. Results were excluded from the dataset where extraneous (non-mining) sources were found to dominate the noise environment.

The remaining data was reanalysed in accordance with the methods presented in **Section 4.2,** and cumulative distribution curves representative of mining impacts were produced. The 'assessed' exceedence rate is considered representative of the contribution from WCM to the receiving environment.

4.3.1 Assessment of Wandoona Monitoring Data

Figure 9 shows the 'as measured' and 'assessed' cumulative distribution curves for the $L_{AeqLF\ 15minute}$ noise levels for the night period at the Wandoona monitoring location. The 'as measured' curve for the night period is reproduced from **Figure 6**, and is presented as a comparison to the 'assessed' impact.

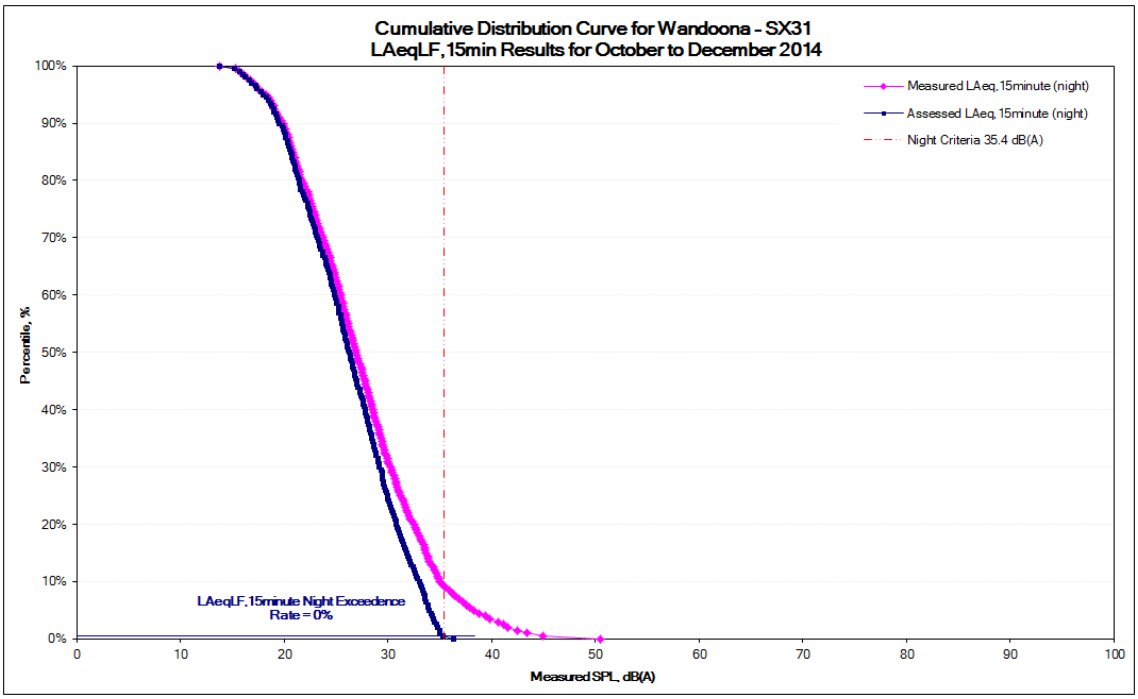

Figure 9: Assessed night time noise levels at the Wandoona monitoring location

Figure 9 indicates that assessed noise levels at the Central Wollar monitoring location did exceed the 35 dB(A) criteria on two occasions during the night period, as shown in **Table 4**, as a result of mining related operations. Remaining noise impacts were attributed to extraneous noise sources including gusting wind, livestock, birds, thunder, insects and the passage of trains on the Sandy Hollow to Gulgong railway

Table 4: Observed exceedence events, Wandoona

Location	Night Period	Wind Speed (m/s)	Wind Direction	Noise Sources
Wandoona	5/11/2014 3:00 (36.3)	Calm	-	General mine hum
Wandoona	11/12/2014 4:15 (35.7)	1.1	N	General mine hum

4.3.2 Assessment of Araluen Monitoring Data

Figure 10 indicates that assessed noise levels at the Araluen monitoring location did not exceed the 35 dB(A) criteria during the night period.

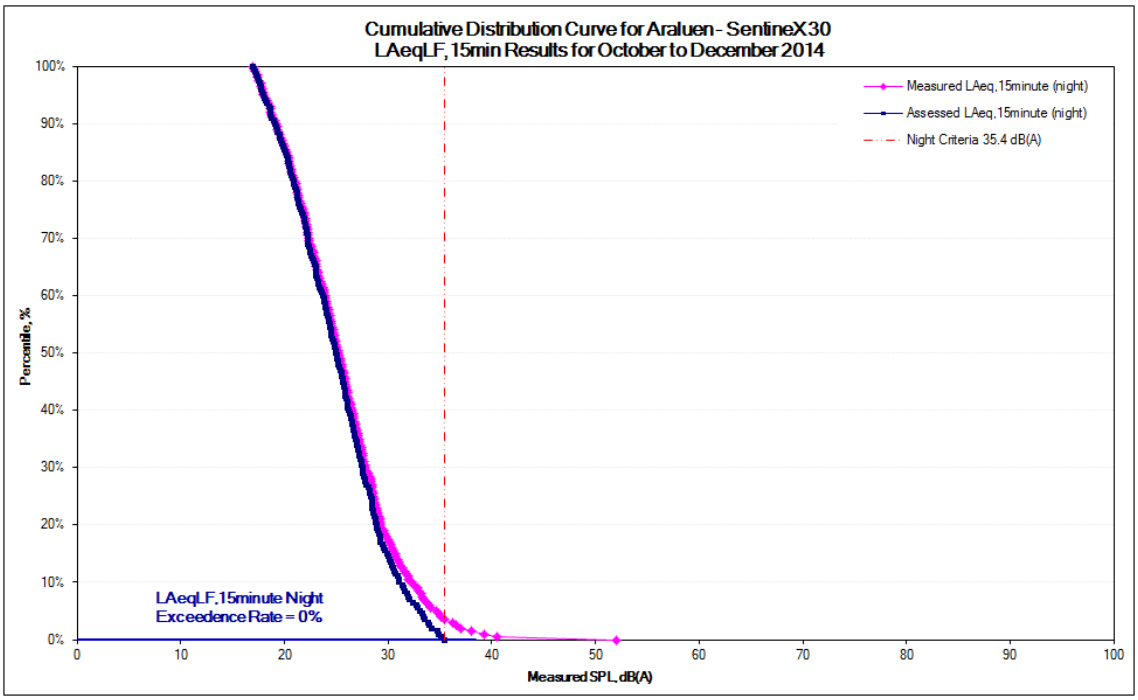

Figure 10: Assessed night time noise levels at the Araluen monitoring location

4.3.3 Assessment of Central Wollar (SentineX33) Monitoring Data

Figure 11 shows the 'as measured' and 'assessed' cumulative distribution curves for the $L_{AeqLF\ 15minute}$ noise levels for the night period at the Central Wollar monitoring location. The 'as measured' curve for the night period is reproduced from **Figure 8**, and is presented as a comparison to the 'assessed' impact.

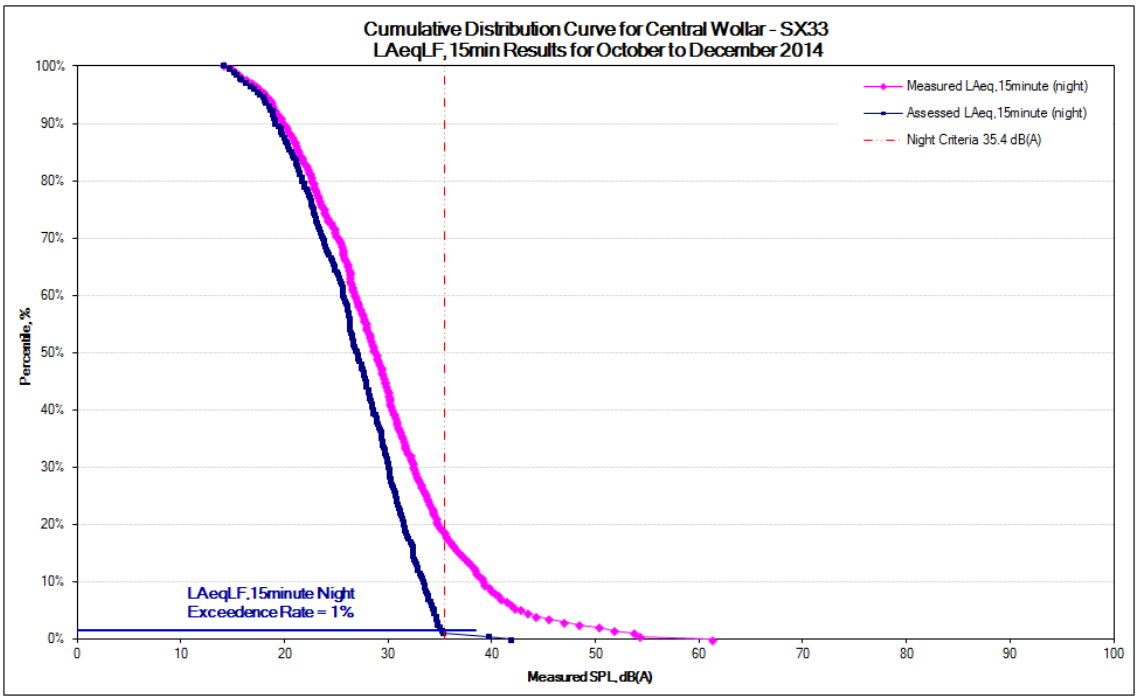

Figure 11: Assessed night time noise levels at the Central Wollar (SentineX33) monitoring location

Figure 11 indicates that assessed noise levels at the Central Wollar monitoring location did exceed the 35 dB(A) criteria on 12 occasions during the night period, as shown in **Table 5**, as a result of mining related operations. Remaining noise impacts were attributed to extraneous noise sources including the passage of trains on the Sandy Hollow to Gulgong railway, aircraft noise, birds, gusting wind, insects, and road traffic noise.

Table 5: Observed exceedence events, Central Wollar

Location	Night Period	Wind Speed (m/s)	Wind Direction	Noise Sources
Central Wollar	9/11/2014 4:15 (36.0)	Calm	-	Mine hum & track clatter
Central Wollar	17/11/2014 22:45 (37.9)	1.8	SW	Engine noise & horn
Central Wollar	17/11/2014 23:00 (41.0)	0.4	N	Engine noise & horn
Central Wollar	18/11/2014 0:00 (39.7)	0.7	N	Engine noise & horn
Central Wollar	18/11/2014 1:15 (35.7)	Calm	-	Engine noise & horn
Central Wollar	18/11/2014 4:45 (41.5)	0.7	N	Engine noise & horn
Central Wollar	18/11/2014 5:00 (40.6)	0.7	W	Engine noise & horn
Central Wollar	18/11/2014 6:15 (41.9)	Calm	-	Engine noise & horn
Central Wollar	25/11/2014 0:15 (40.7)	2.5	WNW	Engine Noise
Central Wollar	25/11/2014 0:30 (35.6)	2.0	NW	Engine Noise
Central Wollar	24/12/2014 2:15 (39.8)	1.0	N	Mine hum & track clatter
Central Wollar	24/12/2014 2:30 (38.8)	0.8	N	Mine hum & track clatter

Please note that the noise levels presented in **Table 5** do not provide an analysis of the mine contribution, but represent the total $L_{AeqLF\ 15minute}$ noise levels measured at the nearby sensitive receiver. The $L_{AeqLF\ 15minute}$ noise levels presented in **Table 5** include audible mining noise; however, environmental and transportation noise including gusting wind, road noise and livestock, may also contribute to overall noise levels.

4.3.4 Summary of $L_{AeqLF,15minute}$ Cumulative Noise Level Results

A summary of the cumulative distribution analysis presented in **Table 6** indicates the assessed exceedence rates for the monitoring period were lower than the measured exceedence rates. The assessed exceedence rate is based on monitoring data free of influence from extraneous noise sources.

Table 6: Assessed Night-Time Exceedence Rates

Location	Noise Criteria dB(A)	Measured Exceedence	Assessed Exceedence
Wandoona	$L_{Aeq15minute,night}$ > 35 dB(A)	10 %	<1 %
Araluen	$L_{Aeq15minute,night}$ > 35 dB(A)	5 %	0 %
Central Wollar	$L_{Aeq15minute,night}$ > 35 dB(A)	20 %	1 %

4.4 $L_{Aeq,period}$ Cumulative Noise Results

Analysis of 15 minute average monitoring results presented in **Section 4.3** indicates that measured noise levels at the monitoring location are subject to influence from extraneous (non-mining) noise sources. To assist in identifying noise sources contributing to the amenity of the receiving environment, analysis of average night period ($L_{Aeq,night}$) noise levels is undertaken.

The $L_{Aeq,night}$ monitoring results are calculated on the basis of $L_{Aeq,15minute}$ data, and are used as a means of demonstrating the relative contribution from mining noise sources to total measured noise levels. As the reported $L_{AeqLF,period}$ noise level is calculated on the basis of previously assessed $L_{AeqLF,15minute}$ monitoring results, it is considered representative of the assessed upper limit of potential mine noise impact. To ensure recorded data is representative of the noise environment, periods with less than 2 hours of valid data due to meteorological conditions have been excluded from this analysis.

For the purposes of this analysis, the *acceptable* night period noise level of 40 dB(A) (for Rural receiver types, as established in the INP) is adopted to facilitate assessment of potential impacts. To provide feedback relating to those noise sources contributing to measured noise levels above the acceptable level in this receiving environment, review of recorded audio was undertaken where total (L_{AeqLF}) noise levels were observed to exceed 40 dB(A).

4.4.1 Assessment of Wandoona Monitoring Data

The data presented in **Figure 12** to **Figure 14** (Wandoona) is based on measured $L_{Aeq,15minute}$ noise level results following standard data exclusion as discussed in **Section 4.1** and exclusion of data influenced by non-mining sources following audio review as discussed in **Section 4.3**.

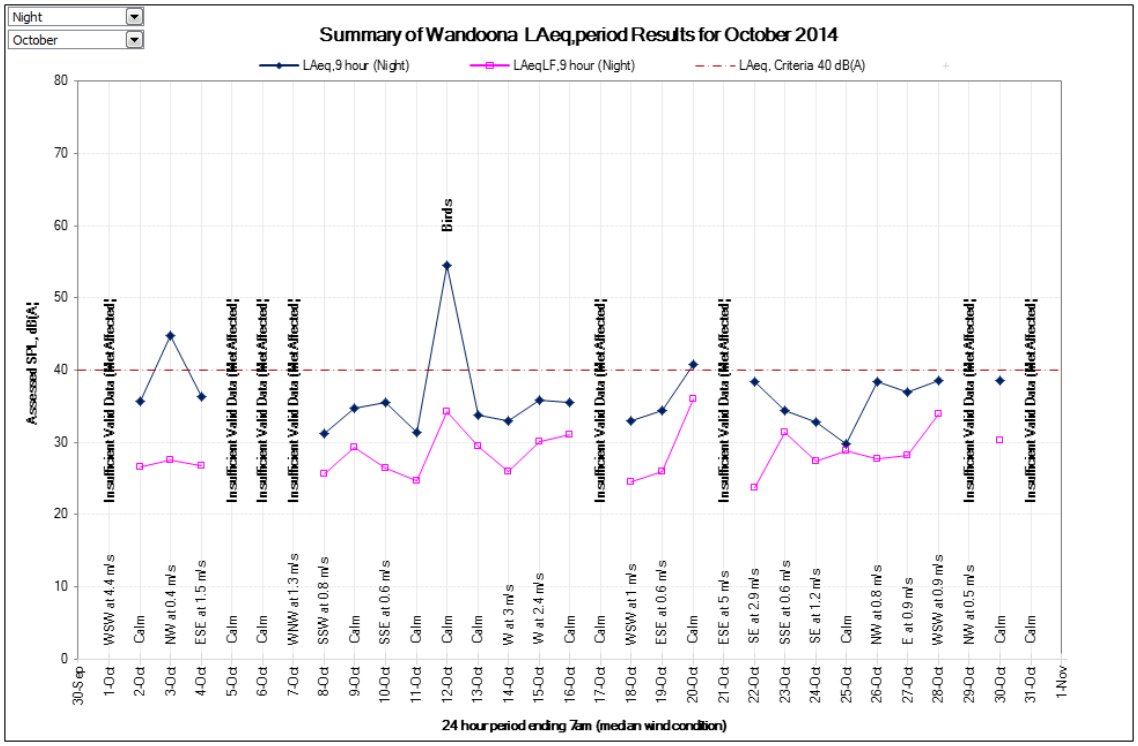

Figure 12: Night time noise levels at the Wandoona property, October 2014

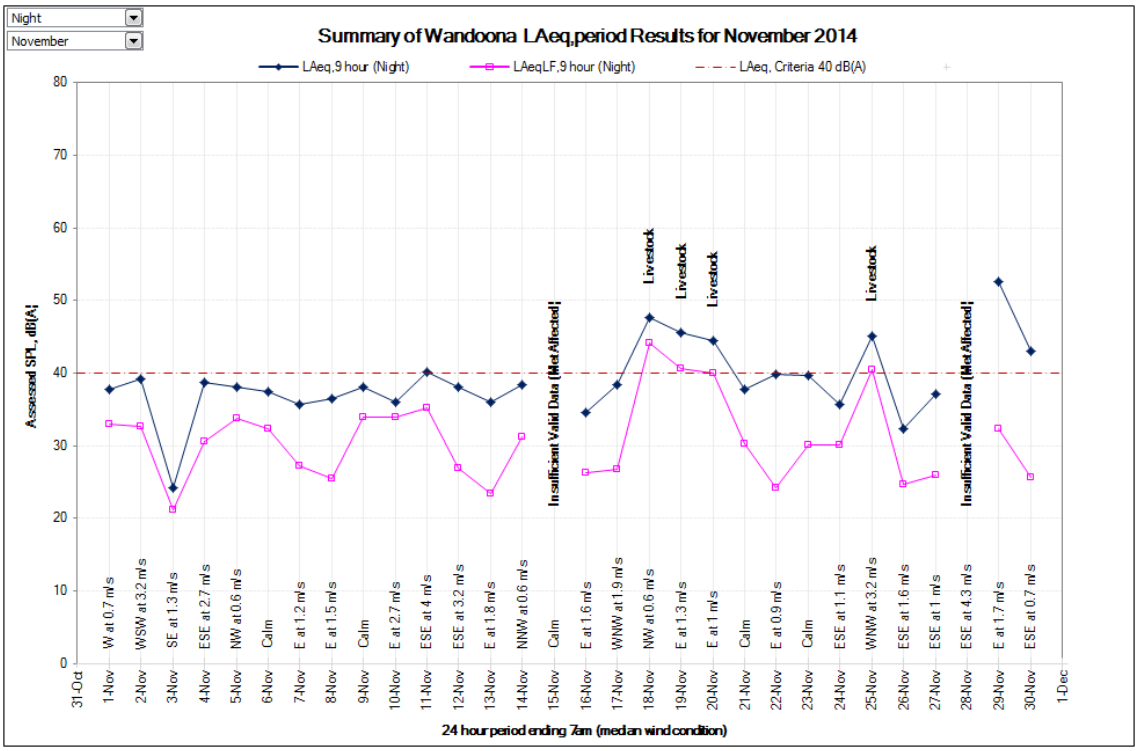

Figure 13: Night time noise levels at the Wandoona property, November 2014

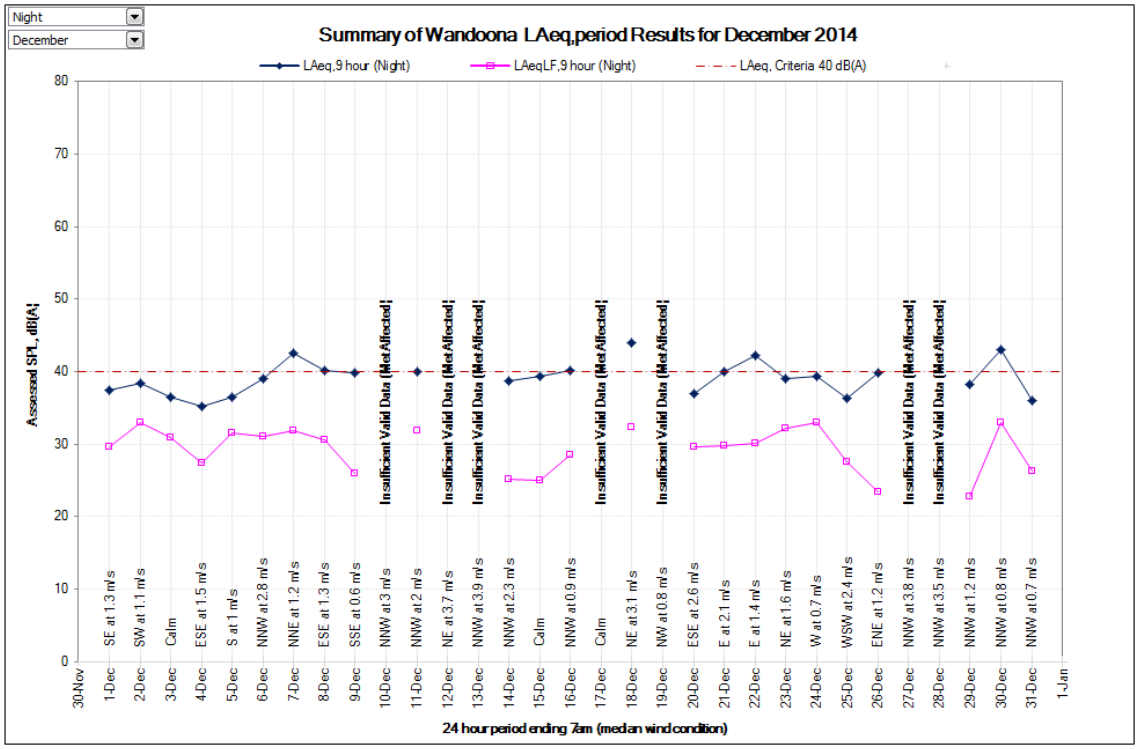

Figure 14: Night time noise levels at the Wandoona property, December 2014

The results presented in **Figure 12** to **Figure 14** (Wandoona) indicate that night time cumulative $L_{AeqLF,period}$ noise levels exceeded the 40 dB(A) acceptable night period noise level on four occasions during the monitoring period. A review of recorded audio indicated that livestock was responsible for the elevated noise levels at these times.

4.4.2 Assessment of Araluen Monitoring Data

The data presented in **Figure 15** to **Figure 17** (Araluen) is based on measured $L_{Aeq,15minute}$ noise level results following standard data exclusion as discussed in **Section 4.1,** and exclusion of data influenced by non-mining sources following audio review as discussed in **Section 4.3**.

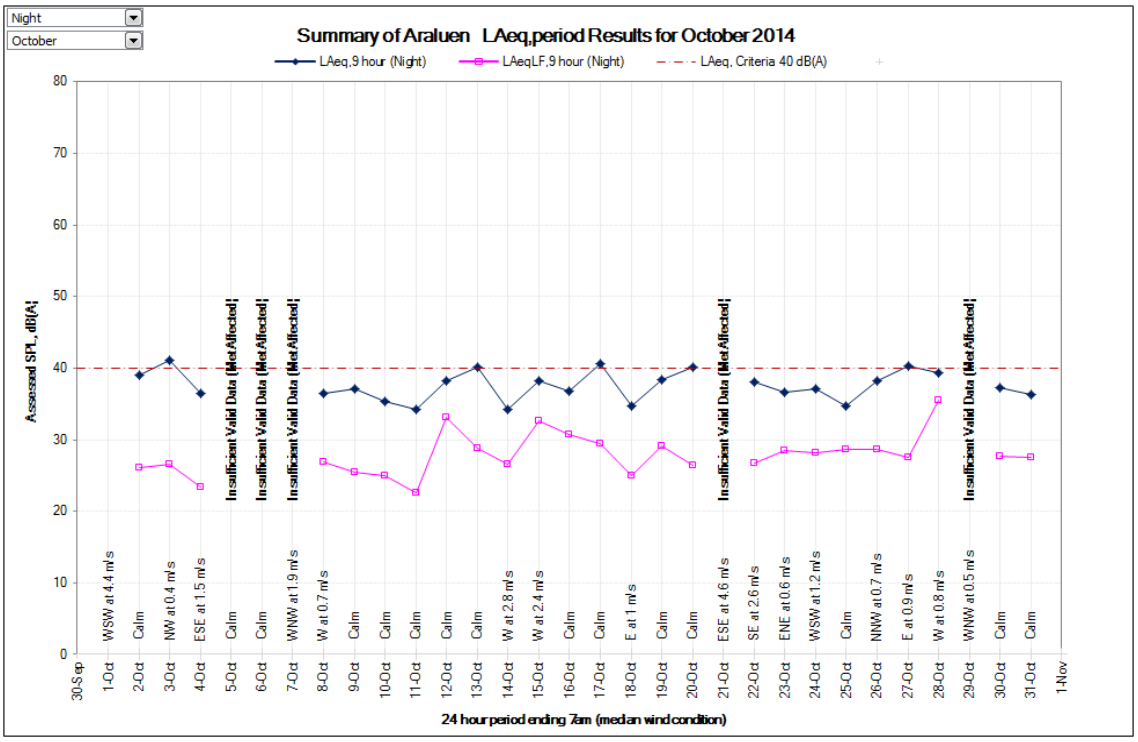

Figure 15: Night time noise levels at the Araluen monitoring location, October 2014

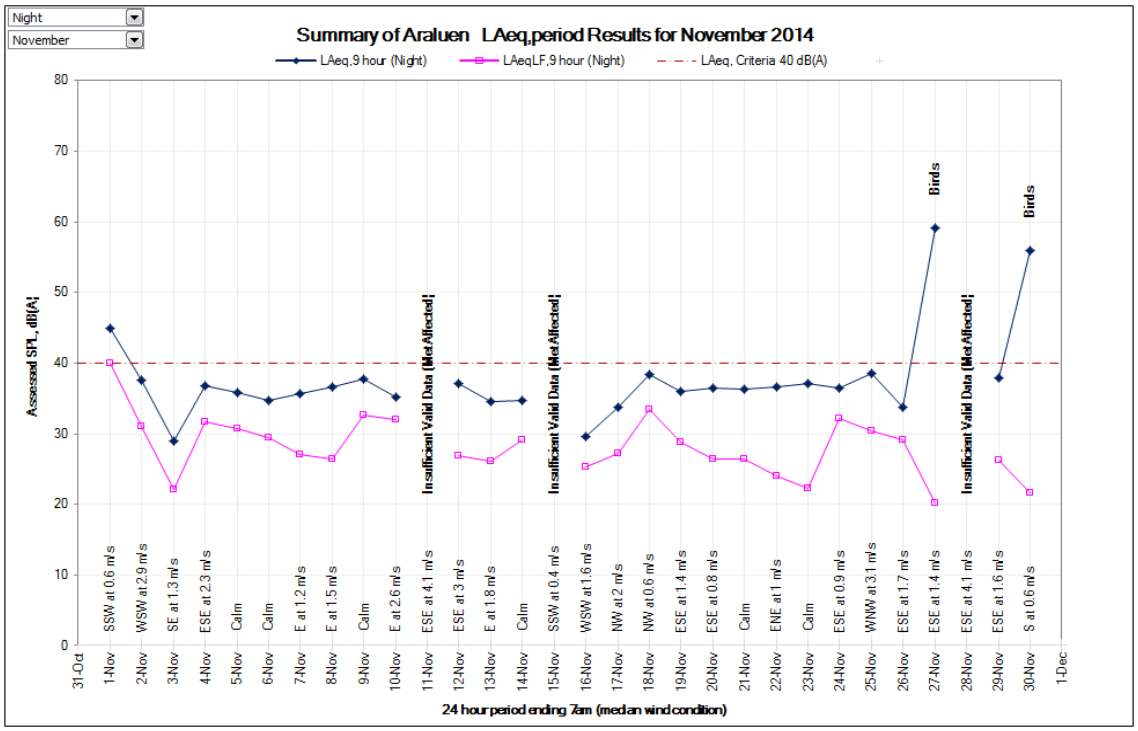

Figure 16: Night time noise levels at the Araluen monitoring location, November 2014

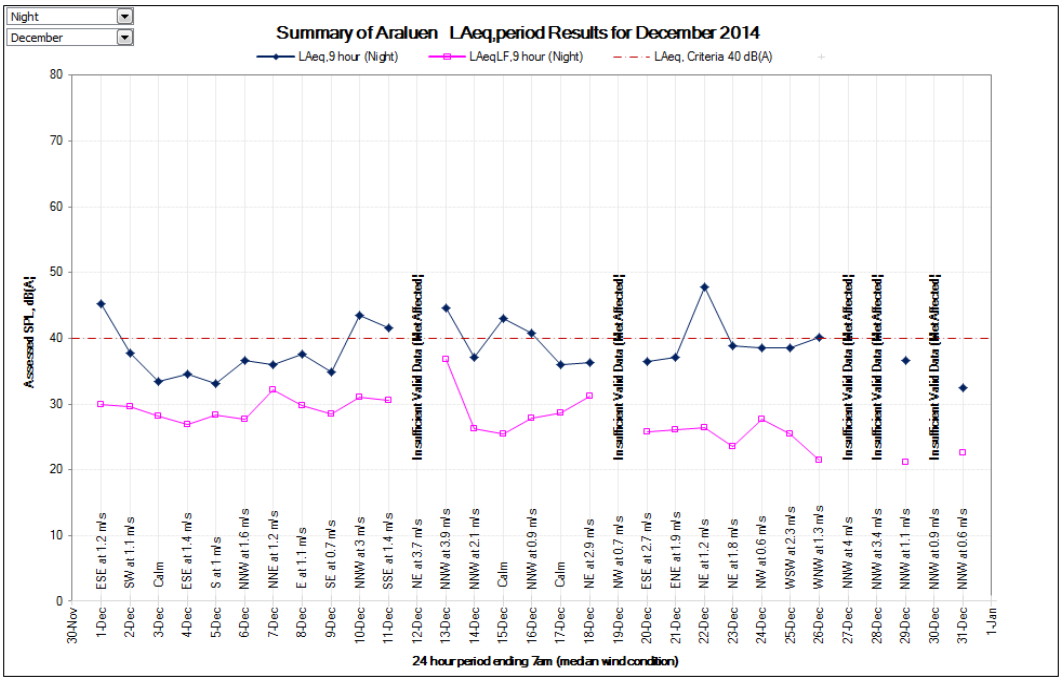

Figure 17: Night time noise levels at the Araluen monitoring location, December 2014

The results presented in **Figure 15** and **Figure 17** (Araluen) indicate that night time cumulative $L_{AeqLF,period}$ noise levels did not exceed the 40 dB(A) acceptable night period noise level during the monitoring period.

4.4.3 Assessment of Central Wollar (SentineX33) Monitoring Data

The data presented in **Figure 18** to **Figure 20** (Central Wollar) is based on measured $L_{Aeq,15minute}$ noise level results following standard data exclusion as discussed in **Section 4.1,** and exclusion of data influenced by non-mining sources following audio review as discussed in **Section 4.3**.

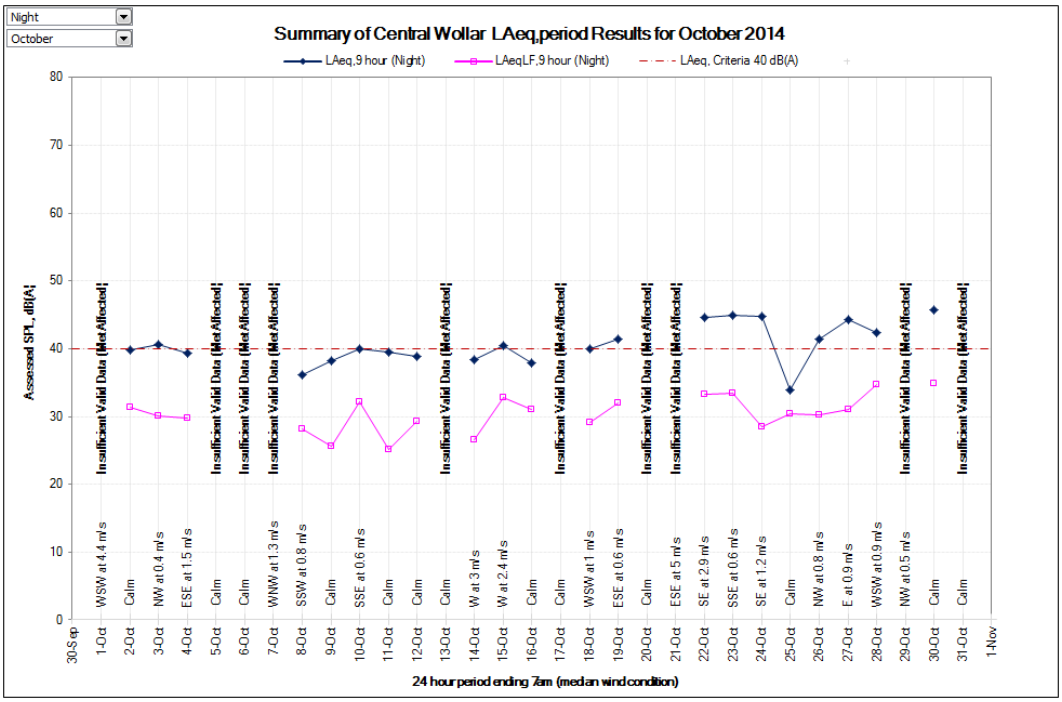

Figure 18: Night time noise levels at the Central Wollar monitoring location, October 2014

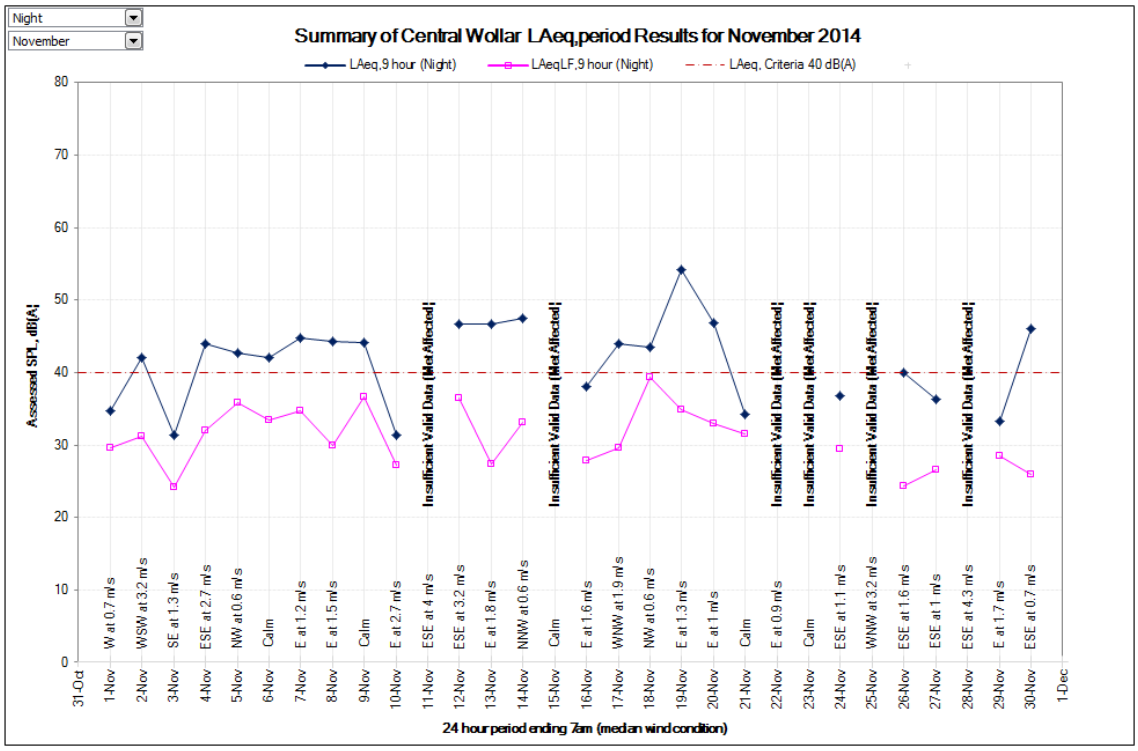

Figure 19: Night time noise levels at the Central Wollar monitoring location, November 2014

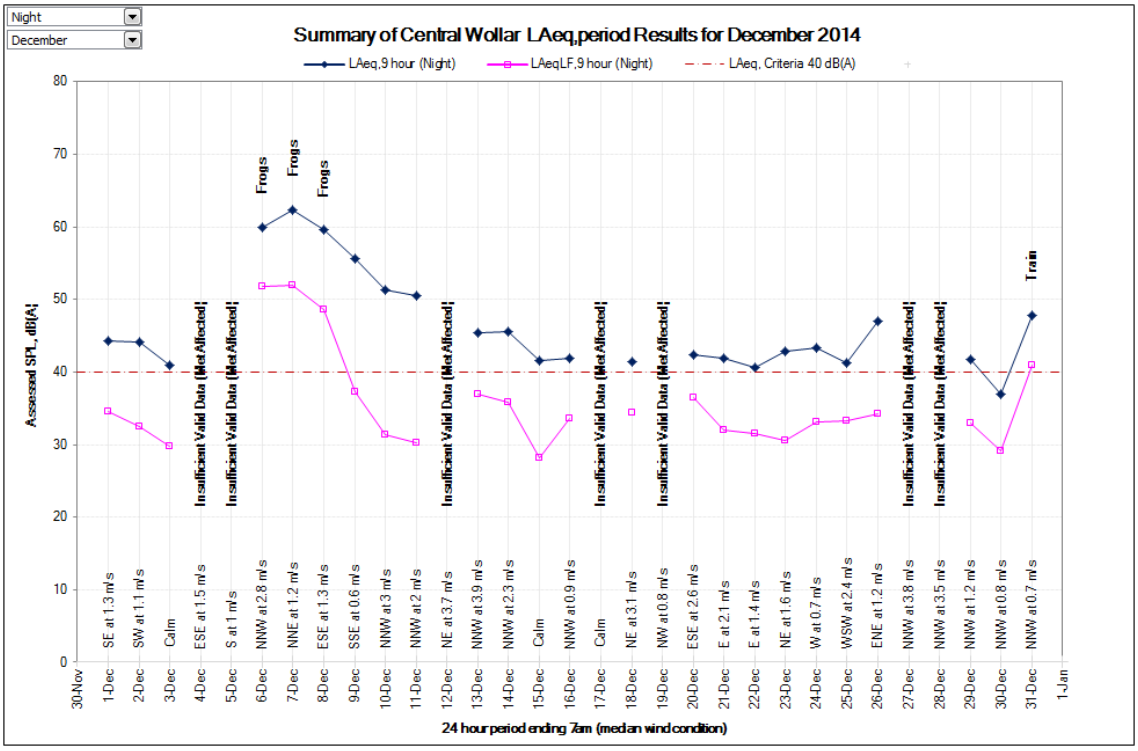

Figure 20: Night time noise levels at the Central Wollar monitoring location, December 2014

The results presented in **Figure 18** to **Figure 20** (Central Wollar) indicate that night time cumulative $L_{AeqLF,period}$ noise levels exceeded the 40 dB(A) acceptable night period noise level on four occasions during the monitoring period. A review of recorded audio indicated that frogs calling were responsible for the elevated noise levels on three of these occasions, and train passage on the Sandy Hollow to Gulgong railway was responsible for the elevated noise levels on one occasion.

4.5 $L_{A1,1minute}$ Sleep Disturbance Results

The SentineX monitoring unit randomly selects a 15 minute period each night to measure the $L_{A1,1minute}$ noise levels. The maximum $L_{A1,1minute}$ noise level and the time it was measured is recorded with the corresponding statistical data for the interval.

The $L_{A1,1minute}$ noise level is the full spectrum noise level. It should be noted that it is potentially influenced by noise sources other than mining operations, such as barking dogs, livestock and insects. Audio review was carried out to identify active noise sources where the $L_{A1,1minute}$ was greater than the sleep disturbance criteria of 45 dB(A). The $L_{A1,1minute}$ results were filtered to exclude those measured during periods of adverse meteorology as discussed in **Section 4.1**.

4.5.1 Assessment of Wandoona Monitoring Data

The results presented in **Figure 21** to **Figure 23** represent the maximum $L_{A1,1minute}$ and corresponding $L_{A90,1minute}$ results for the Wandoona monitoring location.

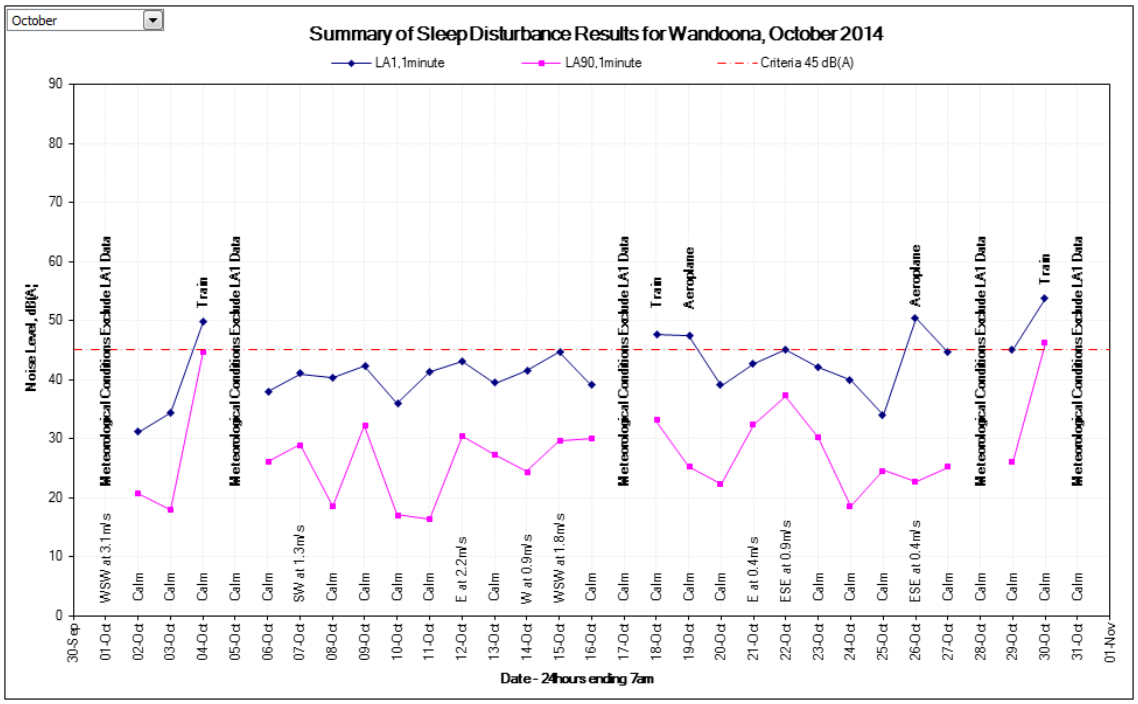

Figure 21: $L_{A1,1minute}$ noise levels at the Wandoona monitoring location, October 2014

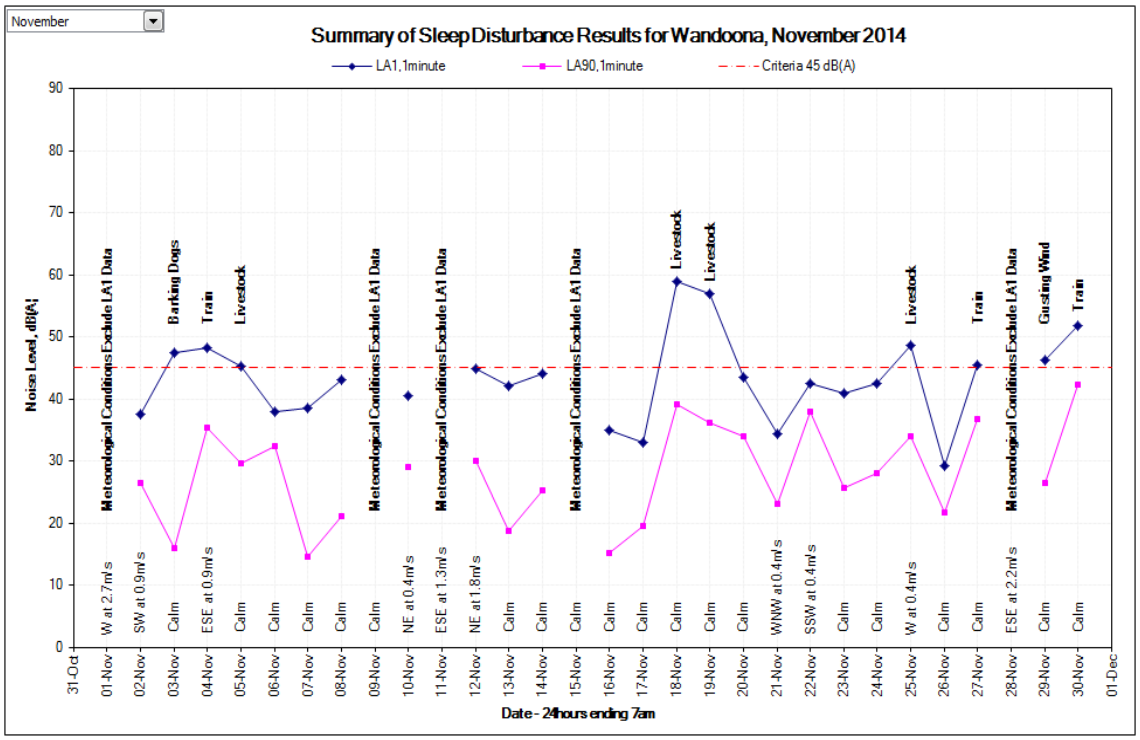

Figure 22: $L_{A1,1minute}$ noise levels at the Wandoona monitoring location, November 2014

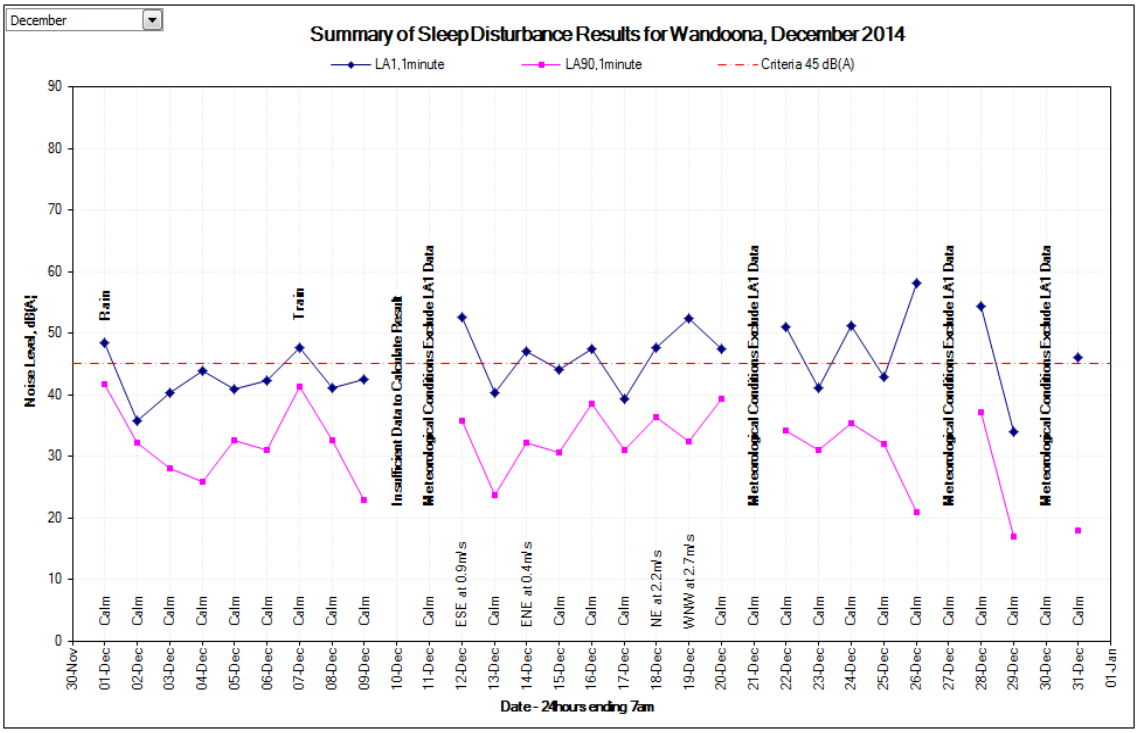

Figure 23: $L_{A1,1minute}$ noise levels at the Wandoona monitoring location, December 2014

The $L_{A1,1minute}$ result was excluded from the assessment on 14 occasions due to adverse meteorology. The $L_{A1,1minute}$ noise levels did exceed the 45 dB(A) criteria; however, review of recorded audio indicates that the majority of exceedences were the result of environmental noise sources including barking dogs, livestock, gusting wind, aircraft and the passage of trains on the Gulgong to Sandy Hollow railway. Mining noise was not observed to exceed the Sleep Disturbance criteria level during the monitoring period.

4.5.2 Assessment of Araluen Monitoring Data

The results presented in **Figure 24** to **Figure 26** represents the maximum $L_{A1,1minute}$ and corresponding $L_{A90,1minute}$ results for the Araluen monitoring location.

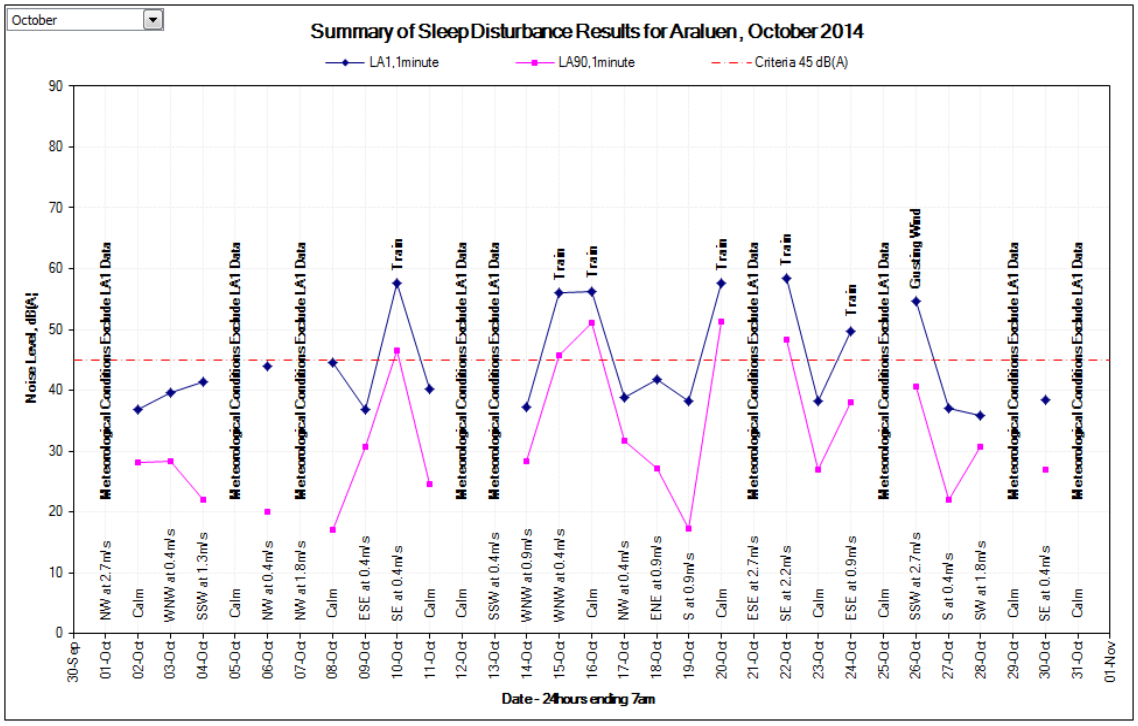

Figure 24: $L_{A1,1minute}$ noise levels at the Araluen monitoring location, October 2014

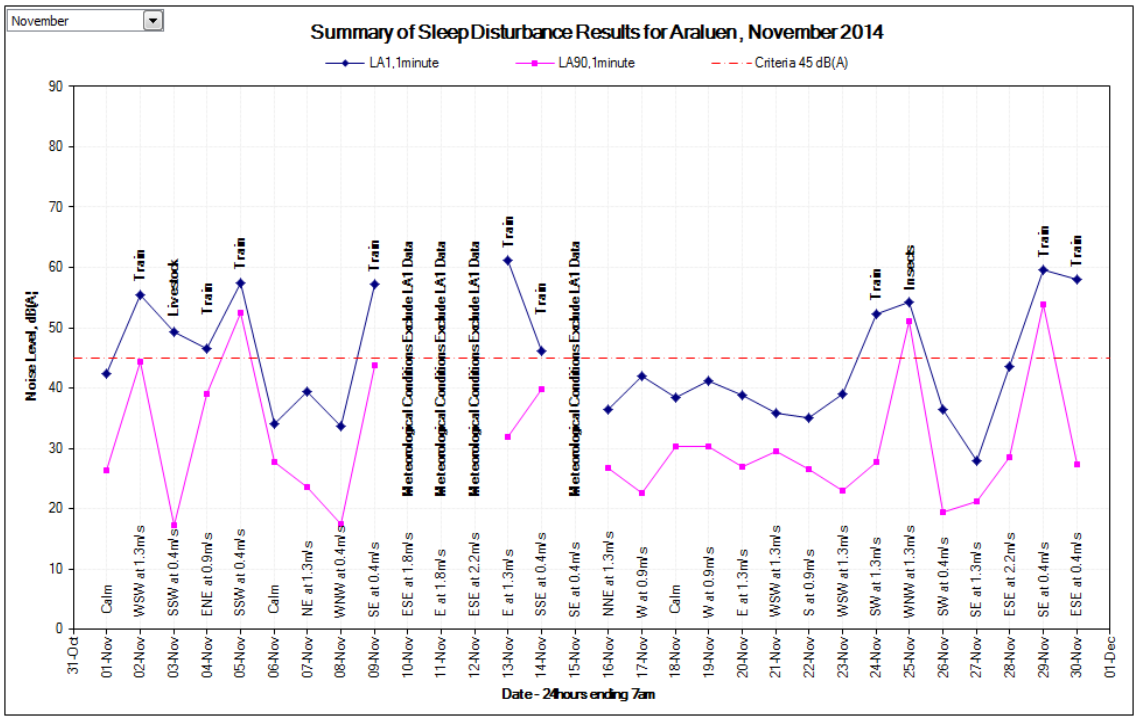

Figure 25: $L_{A1,1minute}$ noise levels at the Araluen monitoring location, November 2014

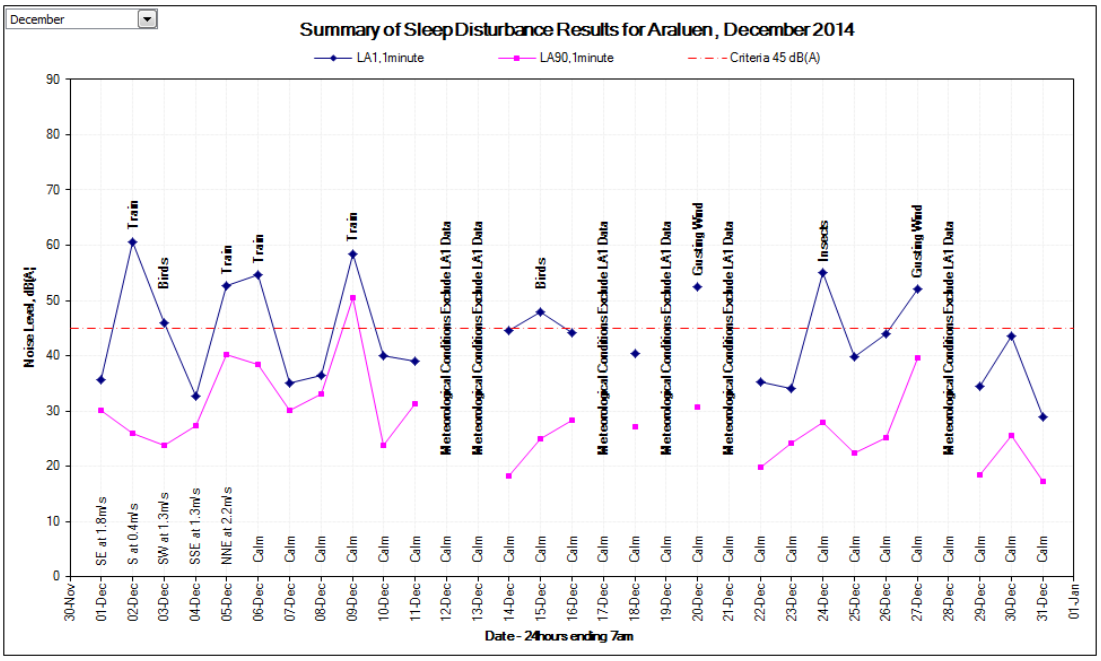

Figure 26: $L_{A1,1minute}$ noise levels at the Araluen monitoring location, December 2014

The $L_{A1,1minute}$ result was excluded from the assessment on 19 occasions due to adverse meteorology. The $L_{A1,1minute}$ noise levels did exceed the 45 dB(A) criteria; however, review of recorded audio indicates that birds, insects, livestock, gusting wind and the passage of trains on the Gulgong to Sandy Hollow railway were the dominant L_{A1} noise sources. Mining noise was not observed to exceed the Sleep Disturbance criteria level during the monitoring period.

4.5.3 Assessment of Central Wollar (SentineX33) Monitoring Data

The results presented in **Figure 27** to **Figure 29** represents the maximum $L_{A1,1minute}$ and corresponding $L_{A90,1minute}$ results for the Central Wollar monitoring location during the monitoring period.

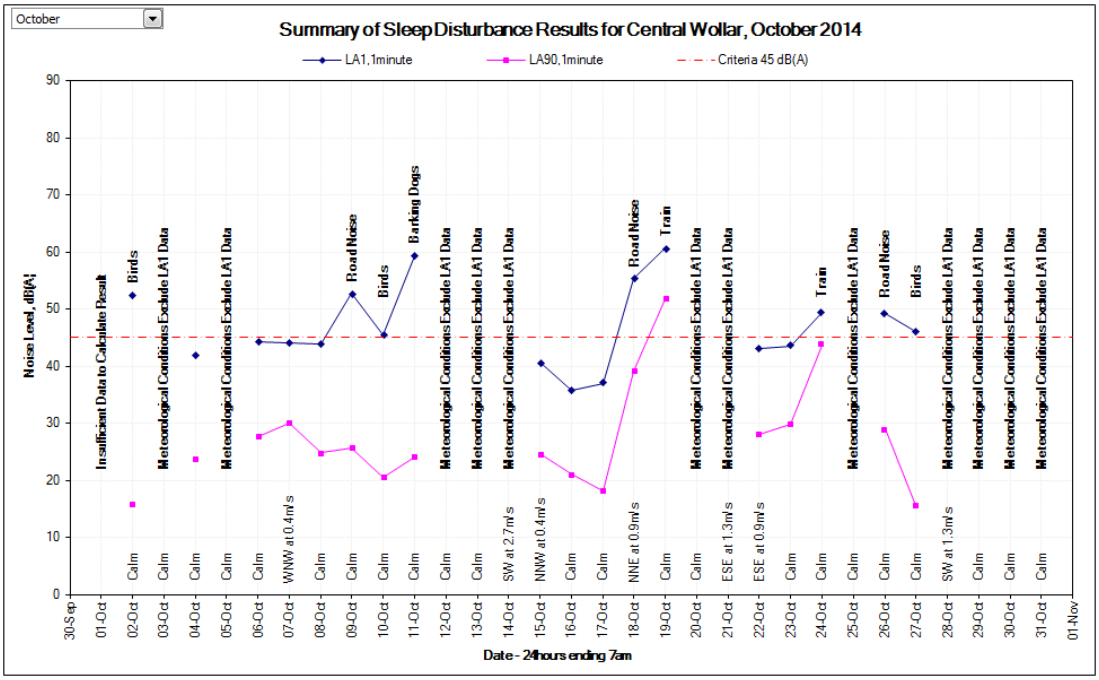

Figure 27: $L_{A1,1minute}$ noise levels at the Central Wollar monitoring location, October 2014

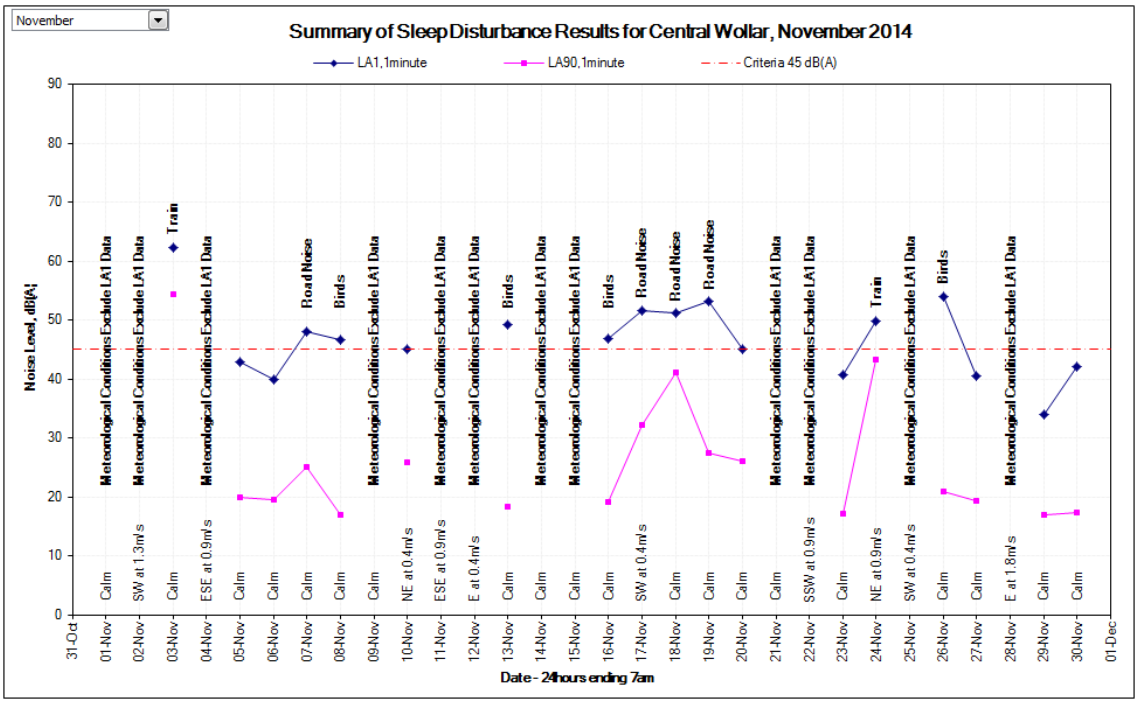

Figure 28: $L_{A1,1minute}$ noise levels at the Central Wollar monitoring location, November 2014

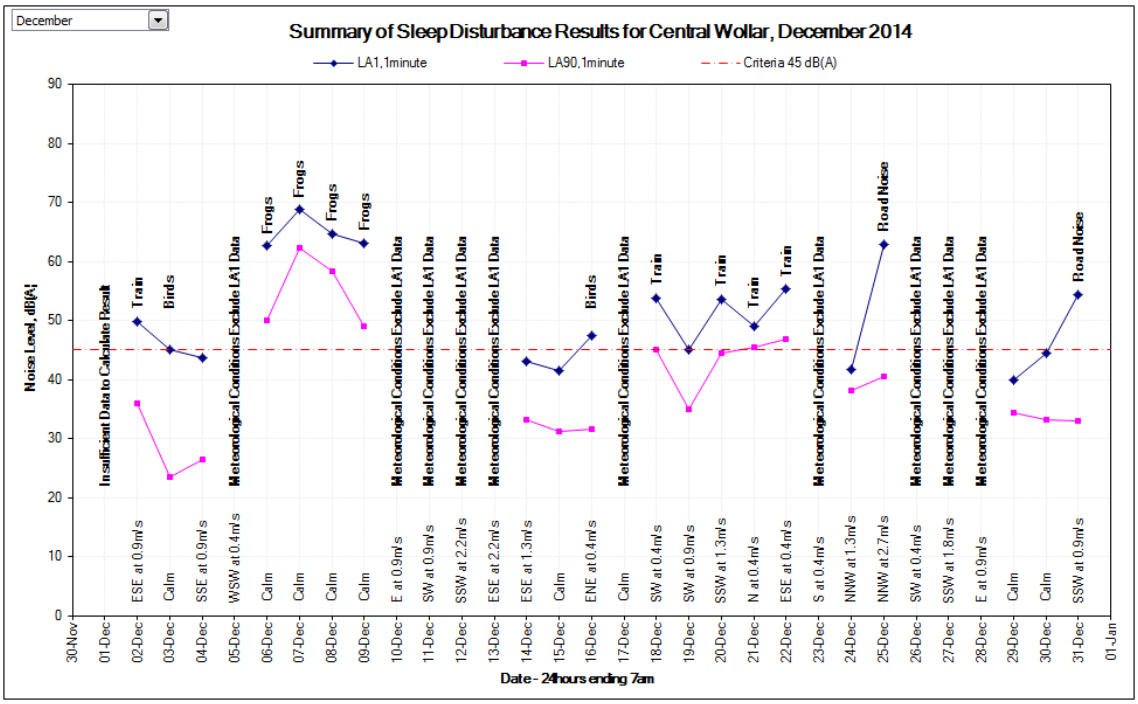

Figure 29: $L_{A1,1minute}$ noise levels at the Central Wollar monitoring location, December 2014

The $L_{A1,1minute}$ result was excluded from the assessment on 34 occasions due to adverse meteorology. The $L_{A1,1minute}$ noise levels did exceed the 45 dB(A) criteria; however, review of recorded audio indicates that environmental noise sources including passing road traffic, barking dogs, birds, frogs and the passage of trains contribute significantly to the L_{A1} noise environment at this location. Mining noise was not observed at any time during audio review.

5. DISCUSSION

Advitech Environmental was engaged by Peabody Energy Australia to collate, analyse and report on continuous environmental noise monitoring in the rural community adjacent to the Wilpinjong Coal Mine (WCM). The objective of the environmental monitoring is to assess the mining noise impacts on adjacent sensitive receivers and determine if these impacts meet consent conditions specified in the Environmental Protection Licence (EPL 12425) and Project Approval (PA 05_0021).

The $L_{Aeq,LF,15minute}$ cumulative distribution curve shows that measured night time noise levels were below the relevant criteria 80% of the time at the Central Wollar monitoring location, 90% of the time at the Wandoona monitoring location, and 95% of the time at the Araluen monitoring location.

Further assessment of monitoring data presented in **Section 4.3** resulted in the exclusion of measurement data not considered to be influenced by mining operations. The $L_{Aeq,15minute}$ night time noise level was above the criteria for less than 2% of the time due to mining noise at the Central Wollar monitoring location and <1% at the Araluen monitoring location. Noise levels attributable to mining operations were not observed above the criteria at the Wandoona monitoring location.

Assessment of noise impacts for the October to December, 2014, monitoring period indicates that mining operations contributed to noise levels above the $L_{AeqLF,15minute\ (night)}$ criteria on two occasion at the Wandoona monitoring location and twelve occasions at the Central Wollar location. Mining operations were not observed to contribute to noise levels above the $L_{AeqLF,15minute\ (night)}$ criterion at the Araluen monitoring location.

Review of $L_{AeqLF,period}$ (as specified in the INP for rural receivers) results indicate that the night time noise levels attributable to mining operations were not observed above the criteria during the monitoring period at any of the locations surveyed.

The $L_{A1,1minute}$ (applied to assess sleep disturbance) results indicate that animal noise, transportation movements and meteorological influences dominate the noise environment at all monitoring locations. Mine operations did not contribute to measured noise levels above the sleep disturbance criteria during the monitoring period.

6. REFERENCES

The following information was used in the preparation of this report:

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AS 2706-1984: *Numerical Values: Rounding and interpretation of limiting values.*

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Protection of the Environment Operations (Noise Control) Regulation 2008 (Schedule 2: Testing Procedures).

Richard Heggie and Associates (2005). *Wilpinjong Coal Project Environmental Impact Statement: Appendix D Construction, Operations and Transportation Noise and Blasting Impact Assessment*, Resource Strategies.

Wilpinjong Coal Mine Noise Monitoring Program (dated July 2009).

Wilpinjong Coal Project Approval (05-0021).

Wilpinjong Coal Project (WCM) EPL (12425).