Background Noise Assessment

Cedar Point Quarry

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APPENDICES

1. INTRODUCTION

Advitech Pty Limited was engaged by Greg Alderson & Associates Pty Ltd to prepare a Background Noise Assessment (BNA) to support an amended Environmental Impact Statement (EIS) for a proposed basalt quarry at Cedar Point, near Kyogle, NSW.

It should be noted that this report was prepared by Advitech Pty Limited for Greg Alderson & Associates ("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.

2. BACKGROUND AND OBJECTIVES

2.1 Project Background

In September 2010, Greg Alderson & Associates Pty Ltd prepared an EIS for a proposed basalt quarry at Cedar Point, near Kyogle, NSW. The EIS was referred to the Joint Regional Planning Panel (JRPP) for assessment, where the JRPP subsequently requested a peer review of the EIS to be undertaken. Following the peer review the JRPP formally requested additional information, including further assessment of the background noise environment, noise impacts associated with operation of the quarry, review of proposed mitigation options and proposed methods for compliance monitoring.

2.2 Assessment Methodology

The NSW Industrial Noise Policy (INP) provides a procedure for the assessment of potential noise impacts associated with industrial activities in NSW. The assessment process includes:

- background monitoring to characterise the ambient (existing) noise environment adjacent to the proposed development;
- establishing a Project Specific Noise Level (PSNL) on the basis of background monitoring, to protect adjacent sensitive receivers from both intrusive noise, and impacts on amenity;
- review of regional meteorology to identify prevailing conditions that may enhance the propagation of noise;
- undertake prediction of operational noise impacts at adjacent sensitive receivers under all significant meteorological conditions;
- assess noise impacts by comparing predicted operational noise levels against the PSNL; and
- consider appropriate controls or mitigation options (where required).

A detailed assessment of potential noise impacts was prepared as part of the original NIA and EIS for the Cedar Point Quarry development in 2010 (Greg Alderson & Associates, 2010). The Record of Decision by The Northern Joint Regional Planning Panel (Business Item 2011NTH004 – Kyogle Council – 2011.34 – Establishment and operation of extractive industry, 904 Edenville Road, Cedar Point, 2474), requires:

Further noise assessment, by a qualified noise specialist, in accordance with relevant guidelines, to provide adequate certainty in relation to the predicted effects on private residences, confidence in relation to the likely sources of proposed noise attenuation and mitigation measures, and a sound basis for compliance monitoring if the proposed development is approved.

In response to this decision, Advitech Pty Limited was engaged by Greg Alderson and Associates to undertake additional background monitoring, to characterise the receiving environment at Cedar Point in accordance with the methodology and requirements established in the NSW Industrial Noise Policy (INP). The monitoring was undertaken by Greg Alderson and Associates, with guidance on monitoring design and execution provided by Advitech; data analysis and reporting was also carried out by Advitech.

The objective of this assessment is to provide additional assessment of the receiving environment adjacent to the proposed Cedar Point Quarry, and address potential inadequacies in the original background noise assessment, as identified in the *Peer Review of Cedar Point Quarry Assessment Report* (Umwelt, 2011).

This background noise assessment specifically seeks to address the concerns raised in *Section 4.4.1 Background Noise Data* and *Section 4.4.2 Noise Criteria* of the peer review. To address these issues, this assessment seeks to:

- undertake background monitoring consistent with the requirements established in Section 3 of the INP;
- evaluate the rating background (L_{A90}) and ambient (L_{Aeq}) noise levels, and subsequent determination of PSNL in accordance with the methodology established in Section 2 and Section 3 of the INP;
- compare (and discuss) the PSNL established in the original assessment with the PSNL from the current monitoring data.

It is noted that this assessment seeks only to review the background noise assessment, and hence does not address issues relating to impact assessment (modelling and mitigation design) associated with operational, construction, or transportation noise impacts.

3. REFERENCES

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

1. *AS 1259-1990 - Acoustics: Sound Level Meters*;
2. AS 2706-1984: *Numerical Values: Rounding and interpretation of limiting values;*
3. Greg Alderson and Associates (2010), *Cedar Point Quarry Environmental Impact Statement Lot 3 DP366036 and Lot 12 DP582916, Edenville Road Cedar Point, Kyogle;*
4. NSW Environment Protection Agency (2000). *NSW Industrial Noise Policy*, NSW Environment Protection Agency, Sydney;
5. Umwelt Environmental Consultants (2011). *Peer Review of Cedar Point Quarry Assessment Report.*

4. NOISE ASSESSMENT CRITERIA

4.1 Criteria for Industrial Noise Sources

The NSW *Industrial Noise Policy* (INP) (2000) presents two criteria for the assessment of industrial noise sources; intrusive noise impacts and noise amenity levels. In assessing the noise impact of industrial sources, both components are considered for sensitive receivers. Typically the more stringent of these criteria would be applied as the Project Specific Noise Level (PSNL) for the development as a means of managing intrusive noise impacts and preserving the amenity of the receiving environment.

4.1.1 Intrusive Noise Impacts

The intrusiveness of an industrial noise source is generally considered acceptable if the predicted $L_{Aeq,15minute}$ impact does not exceed the background noise level by more than 5 dB when measured in the absence of the source. The background noise level, or Rating Background Level (RBL), is determined in accordance with Section 3 of the INP and is the median value of the Assessment Background Levels (ABL) determined for the monitoring period. The use of the median accounts for noise level variations over time. The intrusiveness criterion is equal to the RBL + 5dB.

4.1.2 Amenity Noise Level

To limit continuing increases in noise levels, the INP identifies recommended acceptable (and maximum) ambient noise levels for typical receiver areas and land uses. The relevant section of *Table 2.1* of the INP has been reproduced as **Table 1**. Where the existing background noise level from industrial noise sources is close to the Acceptable Noise Level (ANL) for that receiver type, Section 2 of the INP (reproduced as **Table 2**) establishes the requirements for applying a modification factor to account for the existing level of industrial noise. The aim of this component of the INP is to protect against cumulative noise impacts associated with rapid development within the receiving noise environment.

Table 1: Recommended L_{Aeq} noise levels from industrial noise sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended Acceptable Level dB(A)	Recommended Maximum dB(A)
Residential	Rural	Day Evening Night	50 45 40	55 50 45
	Suburban	Day Evening Night	55 45 40	60 50 45
	Urban	Day Evening Night	60 50 45	65 55 50
School - internal	All	Noisiest 1-hr	35	40
Place of worship - internal	All	When in use	40	45
Passive recreation	All	When in use	50	55
Active recreation	All	When in use	55	60
Industrial Premises	All	When in use	70	75

Source: Environment Protection Authority INP Table 2.1 (2000)

Table 2: Modification to Acceptable Noise Level (ANL)

Total Existing L_{Aeq} from Industrial Sources	Maximum L_{Aeq} for Noise from New Sources Alone
≥ Acceptable Noise Level plus 2	If existing noise level is likely to decrease in future: ANL minus 10 If existing noise level is unlikely to decrease in future: Existing level minus 10
Acceptable Noise Level plus 1	Acceptable noise level minus 8
Acceptable Noise Level	Acceptable noise level minus 8
Acceptable Noise Level minus 1	Acceptable noise level minus 6
Acceptable Noise Level minus 2	Acceptable noise level minus 4
Acceptable Noise Level minus 3	Acceptable noise level minus 3
Acceptable Noise Level minus 4	Acceptable noise level minus 2
Acceptable Noise Level minus 5	Acceptable noise level minus 2
Acceptable Noise Level minus 6	Acceptable noise level minus 1
<Acceptable Noise Level minus 6	Acceptable noise level

Source: Environment Protection Authority INP Table 2.2 (2000)

4.1.3 Background Noise Monitoring

Background noise monitoring is undertaken in order to determine the character of the ambient noise environment adjacent to the proposed development. The monitoring locations selected should be:

- representative of the noise environments at sensitive receivers adjacent to the proposed development;
- representative of the times that the proposed development will be operational (i.e. day, evening or night, weekdays and / or weekends); and
- subject to analysis of meteorological influences. Section 3 and Appendix B of the INP provides guidance on exclusion of meteorological influences.

In order to satisfy these requirements, this assessment seeks to apply the *Long Term Monitoring* methodology outlined in Section 3 of the INP.

4.1.4 Project Specific Noise Levels

Project specific noise levels for the development are assigned after determining the relevant noise levels from the intrusiveness and amenity criteria. The project specific noise levels typically reflect the most stringent noise level requirement derived from the intrusiveness and amenity criteria. They set the benchmark against which noise impacts and the need for noise mitigation are assessed.

5. ENVIRONMENTAL NOISE ASSESSMENT

5.1 Monitoring Locations

One (1) ARL316 environmental noise logger, and two (2) Svantek 957 Type 1 Sound level Meters with advanced data logging were used to measure ambient noise levels in the receiving environment adjacent to the proposed development site. The monitoring locations were selected such as to be representative of noise levels typical of the receiving environment(s). Monitoring was undertaken to assess the L_{A90} (background) and L_{Aeq} (ambient) noise levels within the existing noise environment.

The locations at which noise monitoring was undertaken between 19 March and 2 April, 2012 are provided in **Figure 1**. The monitoring locations were established:

- such as to be representative of the most (or potentially most) affected noise sensitive locations in proximity to the proposed development;
- such that they were exposed to noise sources (industrial, transportation or environmental) representative of the ambient noise environment;
- to replicate (as near as practicable) monitoring reported in the original NIA; and
- in such a way as to facilitate secure and safe access to the monitoring equipment.

At each monitoring location, the monitoring equipment was situated as far away as practicable from trees to avoid localised noise produced by wind blowing through foliage. Careful consideration was also given in siting the monitoring equipment to avoid any screening effects from dominant background noise sources, which could result in noise levels not representative of background sources. Justifications for two notable variations from the original monitoring regime are presented below.

5.1.1 Monitoring Location R2

A review of the EIS for the proposed Cedar Point Quarry, indicates that access to Location 3 (R2) (the Lynch property) could not be obtained for the purposes of noise monitoring to support the original NIA. For the purposes of that assessment, noise monitoring was undertaken at a location approximately 55 metres from the (R2) dwelling on the opposite side of Edenville Road.

During monitoring undertaken in March and April, 2012, access was granted to the property by the landholder, and monitoring equipment was established at the most suitable location between the dwelling and the proposed development location. This monitoring point was located within 30m of the dwelling, as required by the INP.

5.1.2 Monitoring Location R1

Due to logistical and resourcing (equipment) constraints, background noise monitoring was not conducted at Receptor 1 (Carlill) as part of the review. The decision to not replicate monitoring at Receptor R1 was justified on the basis that the occupant of this dwelling is associated with the proposed development, and hence presents a reduced risk of sensitivity to noise impacts associated with the development.

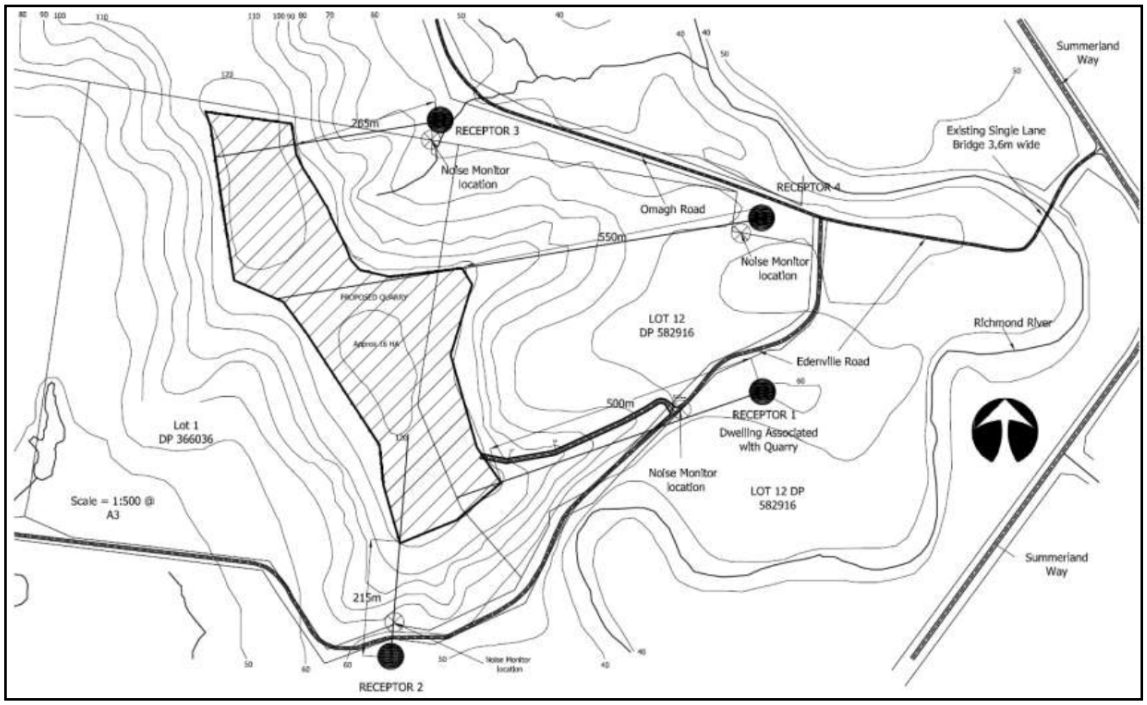


Figure 1: Background monitoring locations (Source: Greg Alderson & Associates, 2010)

5.2 Preliminary Monitoring Results

5.2.1 Summary of Monitoring

Details relevant to the background noise monitoring are provided in **Table 3**.

Table 3: Monitoring details

Measurement Title:	Canty Property	Stuart Property	Lynch Property
Receiver ID	Location 1 (R3)	Location 2 (R4)	Location 3 (R2)
Serial Number	16-299-450	27576	14550
Calibration Date	28/07/11	14/03/12	20/01/12
Run Started	19/03/12 13:09	19/03/12 12:30	19/03/12 13:00
Run Stopped	26/03/12 2:45	02/04/12 9:50	02/04/12 9:40
Frequency Wt	A	A	A
Time Response	Fast	Fast	Fast
Engineering Units	dB(A) SPL	dB(A) SPL	dB(A) SPL
Pre-Mes. Ref	93.9	93.9	94.2
Post-Mes. Ref	94.1[2]	n/a[1]	n/a[1]

Note 1. Pre-measurement and post measurement references were not written to the monitoring results file.

Note 2. Post measurement reference was not taken as logging was terminated prematurely due to battery depletion. A measurement level of 94.1 was returned when the logger was restarted and the reference signal attached.

The continuous noise data loggers are Type 1 loggers (in accordance with *AS 1259 - Acoustics: Sound Level Meters*), and record the following data at 15 minute statistical intervals:

- date and time;
- the equivalent continuous noise level for the interval; and
- statistical noise levels for the monitoring interval.

A meteorological monitoring station was also established at the R3 monitoring location to record local meteorological influences with potential to influence measured noise levels. The meteorological monitoring station records the following parameters:

- date and time;
- wind speed and direction (at 2m above ground level);
- humidity;
- temperature; and
- rainfall.

A summary of the logger deployment and site visits is provided in **Table 4**. This indicates several issues were encountered during the monitoring regime.

Table 4: Monitoring inspection log

Date	Comment	Source
19/3/2012	Monitoring locations established between 12:30 and 13:20 hrs. Windy conditions, road traffic noise significant, barking dogs are audible at R2 and R4.	Greg Alderson & Assoc.
22/3/2012	Visit to confirm instruments are operating (11:00 hrs). Logger battery (external) at R4 in poor condition; battery removed and logger left to run on internal battery. Logger on meteorological station not operational. All other instruments operational.	Greg Alderson & Assoc.
23/3/2012	External battery restored at location R4. New batteries installed in meteorological monitoring station, data feed resumes (13:30hrs). All other instruments operational.	Greg Alderson & Assoc.
2/4/2012	Collect monitoring equipment. Loggers at R2 and R4 operational, stopped at approximately 10:00 hrs. Meteorological monitoring station fallen over; site review indicates that livestock may have been the cause.	Greg Alderson & Assoc.
13/4/2012	Data review by Advitech: Battery of logger at location R3 failed at 02:45 hrs on 26/3/2012, no data available after this time; No data available from meteorological monitoring station at R3 No data available from logger at R4 from 22:45 hrs on 2/4/2012.	Advitech

The loss of local meteorological monitoring data (representative of prevailing conditions in the receiving environment) presents some challenge in ensuring representative interpretation of the data obtained from the noise loggers. Prevailing meteorology has the capacity to significantly influence background noise levels, hence impact on the derivation of RBLs.

To ensure that these potential influences were accounted for, regional meteorological data from the closest Bureau of Meteorology (BoM) Automatic Weather Station (AWS) was applied to the data analysis. Meteorological data from the Casino Airport AWS (ID: 058208, approximately 30km south of the proposed Cedar Point Quarry) was utilised for the purposes of this analysis.

5.2.2 Preliminary Monitoring Results

Following receipt of meteorological data from the Casino Airport AWS, preliminary analysis of the monitoring results was undertaken to evaluate the impact of meteorological exclusions on the dataset, and understand the extent to which noise monitoring results would be rendered invalid when assessed in accordance with the requirements of Appendix B of the INP. The results of this analysis are presented in **Table 5**. It is noted that as all analyses reference a single meteorological dataset, exclusions are applied uniformly to all noise monitoring locations

Table 5: Preliminary results analysis

	Result Valid		
Date	Day (7:00 to 18:00)	Evening (18:00 to 22:00)	Night (22:00 to 7:00)
19/3/2012	Invalid[1]	Invalid	Invalid
20/3/2012	Invalid	Valid	Valid
21/3/2012	Invalid	Valid	Valid
22/3/2012	Invalid	Invalid	Invalid
23/3/2012	Valid	Valid	Valid
24/3/2012	Valid	Valid	Valid
25/3/2012	Invalid	Valid	Valid
26/3/2012[2]	Valid	Valid	Valid
27/3/2012[2]	Invalid	Valid	Invalid
28/3/2012[2]	Invalid	Valid	Valid
29/3/2012[2]	Valid	Valid	Valid
30/3/2012[2]	Invalid	Valid	Valid
31/3/2012[2]	Invalid	Valid	Valid
1/4/2012[2]	Valid	Valid	Invalid
2/4/2012[2]	Invalid[1]		
Valid Results	**5**	**12**	**10**

Note 1: ABLs on these dates invalid due to incomplete monitoring of period associated with logger setup and collection.

Note 2: No ABLs available for the Canty (R3) location on these dates following logger battery failure on 26 March 2012.

The meteorological exclusion rules established in the INP require that 15 minute noise monitoring results be omitted from further analysis where:

- wind speeds at the microphone heights (RL+1.5m) exceed 5m/s; or
- rainfall is observed at the monitoring location.

The justification for these exclusions is that these factors would serve to increase measured $L_{A90,15minute}$ noise levels, which in turn artificially raise the ABL, RBL, and subsequently, the PSNL. The same exclusion rules also define the extent to which these exclusions may be made, before the dataset for the assessment period (i.e. 'day' period on a particular date) must be excluded on the grounds that insufficient representative data was captured. These specific exclusion conditions are identified in Figure B.1 of the INP.

Following the application of these exclusion rules, evaluation of the dataset against the requirements established in Table 3.1 of the INP may be carried out to determine the validity of the monitoring results, and hence, the validity of any noise criteria based on these results. In accordance with these requirements, a sufficiently robust background noise assessment must be supported by the:

> *Equivalent of one weeks' worth of valid data covering the days and times of operation of the development*

This requirement is interpreted as meaning that 7 days' worth of valid results are required to calculate a robust PSNL. On the basis of the preliminary analysis, the monitoring results for the Day period do not meet this requirement.

5.3 Influence of Meteorological Exclusions

Further analysis of the influence of Day period meteorology was undertaken on the basis of guidance contained in Appendix B1.3 of the INP relating to the application of meteorological exclusion rules. This guidance indicates that data assessed as 'invalid' may be retained in the analysis where:

> *It can be ascertained that the affected samples are not within the expected quieter times of an assessment period (day / evening / night) - that is those time periods where the lowest tenth percentile background noise level might occur….For these cases the affected samples need not be removed from the data set before the tenth percentile is determined…*

On this basis, the Day period monitoring results were subject to further analysis to identify 'quiet' periods, identify the times of day that meteorological exclusions took effect, and evaluate the potential influence of these conditions on measured noise levels, and subsequent ABLs.

This analysis is broadly justified, as the application of regional (as opposed to local) meteorological monitoring data is likely to render a greater proportion of the monitoring data invalid, as:

- the Casino Airport monitoring data reports wind speed data at 10m above ground level, whereas the intent of the INP is to exclude strong winds with potential to influence local levels local to the monitoring location, measured at the microphone height;
- in lieu of local monitoring data (which is not available due to issues with the onsite station), the BoM data represents the best available source of meteorological information. While representative of prevailing conditions regionally, this data may not be representative of local conditions, particularly with regard to the spatial distribution of meteorological effects;
- the data exclusion rules relating to wind speed and rainfall are intended to exclude noise data where these results are affected by meteorological influences (rather than sources representative of the local noise environment), it is considered that detailed review of the relationship between measured noise levels and meteorological exclusions is justified.

It is noted that this analysis is restricted to the Day period, as:

- preliminary assessment of evening and night periods indicates that the monitoring regime captured sufficient data such that it may be considered valid; and
- the Cedar Point Quarry is proposed to operate only during the Day period, hence background monitoring (and assessment of results) is required only for this period.

On this basis, the following assessment methodology was applied to the analysis of monitoring data for each monitoring location:

1. the meteorological rules were applied to the dataset, allowing the preliminary ABLs and RBLs to be calculated (noting which of these data were invalid);
2. the 15 minute noise and meteorological run charts data were compiled for each 24 hour period, and those results subject to meteorological exclusions identified to enable further assessment;
3. the results for each day period were overlain on a single graph to identify any diurnal trends in measured noise levels between 7:00 and 18:00. The 10th percentile noise level for each 15 minute period was calculated for the dataset, to provide an indication of those periods subject to lower noise levels. This assisted in identification of 'quieter' periods in the assessment period;
4. each of the 24 hour charts (and times that meteorological exclusions were applied) was reviewed to determine whether:
    a) noise levels were observed to change (or deviate from trends) during periods of meteorological exclusion; and
    b) INP defined meteorological exclusions served to remove data observed during the 'quieter' periods of the day.
5. where it was considered that the meteorological exclusions (or noise data observed at these times) were unlikely to significantly influence the ABL for that period, that ABL was considered 'Valid' for the purposes of this assessment;
6. following validation of each of the ABLs, re-assessment and comparison of the preliminary and assessed RBLs (and their validity) was undertaken.

Each monitoring location was assessed on this basis, with the results presented below.

5.3.1 Assessment of Lynch (R2) Monitoring Results

The 24hr meteorological and noise monitoring results for the Lynch (R2) monitoring location are provided in **Appendix I**. These results were used to prepare an analysis of measured $L_{A90,15minute}$ noise levels during the day period, presented in **Figure 2**. This analysis indicates that, applying the 10^{th} percentile background noise level as an indicator of trends in daily background noise levels, 'quieter' periods at this monitoring location are observed to occur between approximately 8:00 and 11:00.

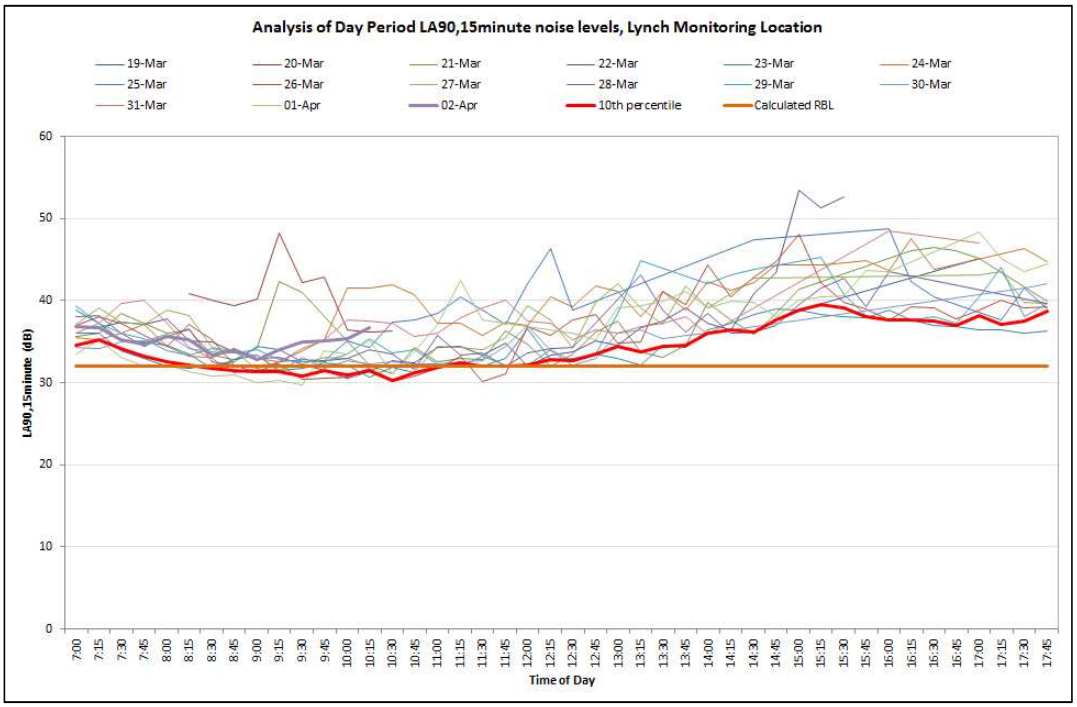


Figure 2: Analysis of $L_{A90,15minute}$ results, Lynch (R2) property

Detailed review of 24 hour run charts (presented in **Appendix I**) was undertaken to evaluate whether meteorological influences were actually observed to manifest in measured noise levels, or whether meteorological exclusions were observed to occur during the 'quieter' times of day at this location. Where the response to each of these investigations was 'no', the meteorological influences were considered to be not relevant to the analysis, and the noise monitoring results validated accordingly. A summary of this analysis is presented in **Table 6**.

Table 6: Data validity for (R2) - Lynch property

Time Period (commencing 7:00 am)	Review of Meteorological Conditions	Data Validity
19/03/2012	Wind effects present throughout record, data only available from 1230 onwards due to site establishment.	ABL Invalid
20/03/2012	Rainfall occurring between 0700 and 0800. Increasing wind effects during the day, exclusions apply from mid-morning. $L_{A90,15minute}$ increasing with strengthening wind, suggesting meteorological impact.	ABL Invalid
21/03/2012	Wind related impacts observed from approximately midday onwards. Possible rain affects from 0915 to 1015, and wind from 1400; exclusion of these results causes minor change (-0.4dB) in calculated ABL. Wind effects are observed outside of typical quiet time, and exclusion of rainfall impact serves to reduce ABL. Re-assessed result may be conservatively applied as ABL.	Re-assessed ABL Valid
22/03/2012	Wind effects observed from approximately 1300; levels during quiet periods free of meteorological impacts. Exclusion of met affected results has minor influence (-0.5dB) on ABL. Re-assessed result may be conservatively applied as ABL.	Re-assessed ABL Valid

Time Period (commencing 7:00 am)	Review of Meteorological Conditions	Data Validity
23/03/2012	Light winds and no rainfall observed, noise levels do not appear to respond to meteorological data. Background noise levels increase from 1400 suggesting meteorological impact. Exclusion of met affected results has minor influence (-0.1dB) on ABL. Preliminary analysis indicates results are valid.	Original ABL Valid
24/03/2012	Wind speeds exceeded 5m/s on several occasions during the afternoon; background noise levels increasing from 1000 suggest meteorological impact. Exclusion of met affected results has significant influence (-0.9dB) on ABL.	Re-assessed ABL Valid
25/03/2012	Increasing wind speeds appear to increase background noise levels from approximately 1000. Exclusion of met affected results has significant influence (-0.6dB) on ABL.	Re-assessed ABL Valid
26/03/2012	Increasing wind speeds appear to increase background noise levels from approximately 1200. Exclusion of met affected results has minor influence (-0.4dB) on ABL. Preliminary analysis indicates results are valid.	Original ABL Valid
27/03/2012	Increasing wind speeds appear to increase background noise levels from approximately 1200. Exclusion of met affected results has minor influence (-0.2dB) on ABL. Re-assessed result conservatively applied as ABL.	Re-assessed ABL Valid
28/03/2012	Potential rainfall and increasing wind speeds from approximately 1245 appear to influence background noise levels. Exclusion of met affected results has minor influence (-0.3dB) on ABL. Re-assessed result conservatively applied as ABL.	Re-assessed ABL Valid
29/03/2012	Potential rainfall and increasing wind speeds from approximately 1300 appear to influence background noise levels. Exclusion of met affected results has minor influence (-0.2dB) on ABL. Preliminary analysis indicates results are valid.	Original ABL Valid
30/03/2012	Increasing wind speeds appear to increase background noise levels from approximately 1400. Exclusion of met affected results has no influence (-0.0dB) on ABL. Preliminary analysis indicates results are valid.	Original ABL Valid
31/03/2012	Increasing wind speeds appear to increase background noise levels from approximately 1400. Exclusion of met affected results has no influence (-0.1dB) on ABL. Preliminary analysis indicates results are valid.	Original ABL Valid
1/4/2012	Increasing wind speeds appear to increase background noise levels from approximately 1100. Exclusion of met affected results has minor influence (-0.2dB) on ABL. Preliminary analysis indicates results are valid.	Original ABL Valid
2/4/2012	Data logger collected at 1015, incomplete monitoring record.	ABL Invalid

Table 7 summarises the ABLs calculated during the preliminary and additional stages of data analysis; bold figures denote those results that were determined to be valid, either by automated exclusion or detailed validation techniques.

Table 7: Calculation of RBLs, Lynch (R2)

Date	Preliminary	Detailed Review
19/03/2012	39.5	38.8
20/03/2012	36.3	38.0
21/03/2012	32.7	**32.2**
22/03/2012	32.1	**31.7**
23/03/2012	**31.7**	**31.6**
24/03/2012	**33.9**	**33.0**
25/03/2012	32.6	**32.0**
26/03/2012	**30.7**	**30.4**
27/03/2012	31.8	**31.6**
28/03/2012	32.3	**32.0**
29/03/2012	**32.5**	**32.2**
30/03/2012	32.3	**32.3**
31/03/2012	32.9	**32.8**
1/4/2012	**30.9**	30.2
RBL (median of ABLs)	31.7	**32.0**

The results of this assessment indicate that, following detailed validation of (or modification to) ABLs, the evaluated RBL for this monitoring location is higher than that determined during the preliminary assessment process. This result indicates that the evaluated RBL was not influenced by *elevated noise levels associated with localised meteorological influences* (rather the RBL was suppressed by excessive exclusions), and the RBL calculated from detailed review may therefore be considered representative of the RBL for the receiving environment. **Figure 3** presents a graphical summary of calculated Day period noise and ABLs.

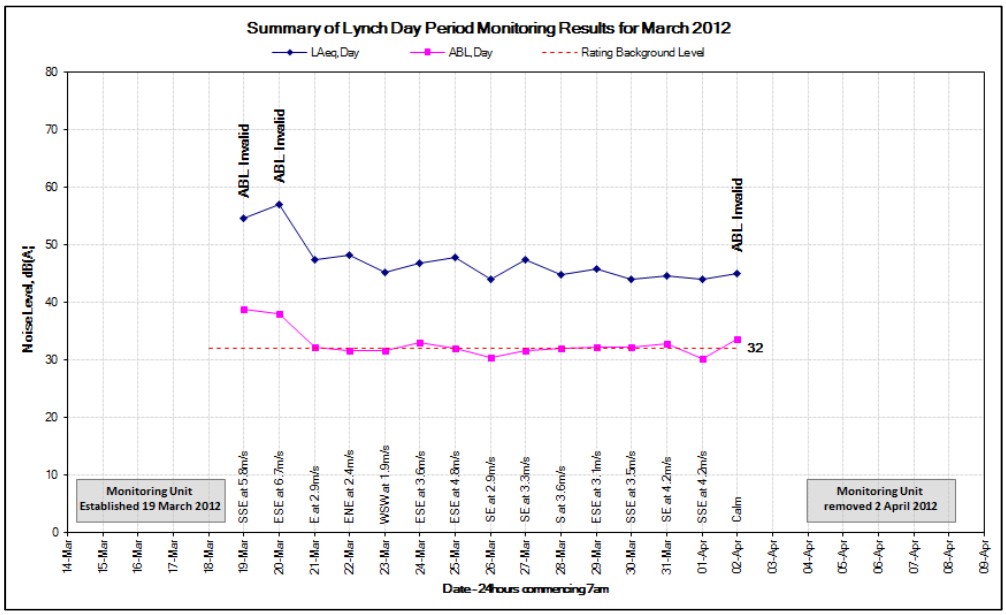


Figure 3: Summary Day period monitoring results, Lynch (R2)

5.3.2 Assessment of Canty (R3) Monitoring Results

The 24hr meteorological and noise monitoring results for the Canty (R3) monitoring location are provided in **Appendix II**. These results were used to prepare an analysis of measured $L_{A90,15minute}$ noise levels during the day period, presented in **Figure 4**. This analysis indicates that, applying the 10th percentile background noise level as an indicator of trends in daily background noise levels, 'quieter' periods at this monitoring location are observed to occur between approximately 10:00 and 14:00.

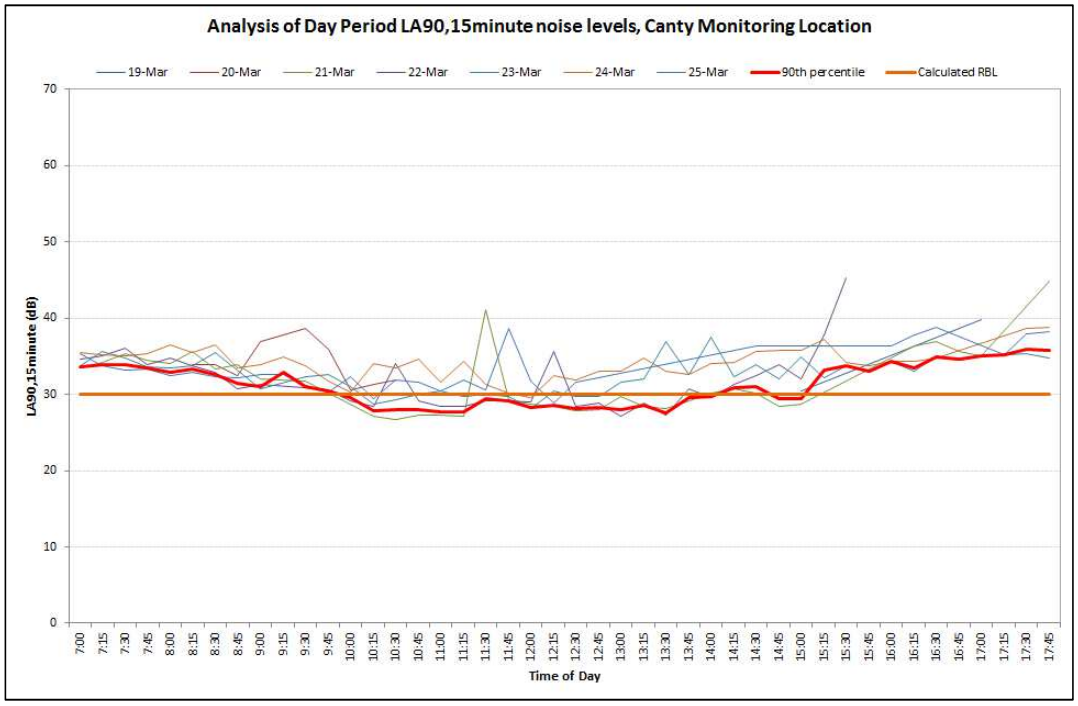


Figure 4: Analysis of $L_{A90,15minute}$ results, Canty (R3) property

Detailed review of 24 hours run charts (presented in **Appendix II**) was undertaken to evaluate whether meteorological influences were actually observed to manifest in measured noise levels, or whether meteorological exclusions were observed to occur during the 'quieter' times of day at this location. Where the response to each of these investigations was 'no', the meteorological influences were considered to be not relevant to the analysis, and the noise monitoring results validated accordingly. A summary of this analysis is presented in **Table 8**.

Table 8: Data validity for (R3) – Canty property

Time Period (commencing 7:00 am)	Review of Meteorological Conditions	Data Validity
19/03/2012	Wind effects present throughout record, data only available from 1200 onwards due to site establishment.	ABL Invalid
20/03/2012	Increasing wind effects during the day, exclusions apply after 1045. $L_{A90,15minute}$ appears to increase at times of increasing wind speed, suggesting meteorological impact.	ABL Invalid
21/03/2012	Decreasing noise levels from early to mid-morning, consistent with quiet periods. Strengthening wind from approximately 1500 appears to lift $L_{A90,15minute}$ results. Exclusion of met affected results has no influence (0.0dB) on ABL. Original result applied as ABL.	Original ABL Valid

Time Period (commencing 7:00 am)	Review of Meteorological Conditions	Data Validity
22/03/2012	Decreasing noise levels from early to mid-morning, consistent with quiet periods. Strengthening wind and / or rainfall from approximately 1500 appears to lift $L_{A90,15minute}$ results. Exclusion of met affected results has no influence (0.0dB) on ABL. Original result applied as ABL.	Original ABL Valid
23/03/2012	Single (preliminary) data exclusion from rainfall event at 0915. Light winds observed, noise levels do not appear to respond strongly to meteorology. $L_{A90,15minute}$ results gently increase from 1400, however similar responses not observed in $L_{A10,15minute}$ or $L_{Aeq,15minute}$ results, hence source of increasing $L_{A90,15minute}$ results considered unlikely to be meteorological. Further analysis (exclusion of these results) yields minor influence (-0.4dB) on ABL. Re-assessed result conservatively applied as ABL.	Re-assessed ABL Valid
24/03/2012	Decreasing noise levels from early to mid-morning, consistent with quiet periods. Strengthening wind from approximately 1500 appears to lift $L_{A90,15minute}$ results, however similar responses not observed in $L_{A10,15minute}$ or $L_{Aeq,15minute}$ results. Source of increasing $L_{A90,15minute}$ results considered unlikely to be meteorological. Further analysis (exclusion of these results) yields minor influence (-0.3dB) on ABL. Re-assessed result conservatively applied as ABL.	Re-assessed ABL Valid
25/03/2012	Decreasing noise levels from early to mid-morning, consistent with quiet periods. Strengthening wind from approximately 1300 appears to lift $L_{A90,15minute}$ results. Exclusion of met affected results has minor influence (-0.1dB) on ABL. Re-assessed result conservatively applied as ABL.	Re-assessed ABL Valid

Table 9 summarises the ABLs calculated during the preliminary and additional stages of data analysis; bold figures denote those results that were determined to be valid, either by automated exclusion or detailed validation techniques.

Table 9: Calculation of RBLs, Canty (R3)

Date	Preliminary	Detailed Review
19/03/2012	31.3	30.7
20/03/2012	31.2	32.3
21/03/2012	27.3	**27.3**
22/03/2012	28.5	**28.5**
23/03/2012	**29.8**	**29.4**
24/03/2012	31.6	**31.3**
25/03/2012	30.5	**30.4**
RBL (median of ABLs)	29.8	29.4

The results of this assessment indicate that, following detailed validation of (or modification to) ABLs, the evaluated RBL for this monitoring location is marginally lower than that determined during the preliminary assessment process. Notwithstanding this, the calculated RBL (in both instances) is less than 30dB(A). In accordance with advice established in Section 3.1.2 of the INP, where the RBL for a day, evening or night period is calculated to be less than 30dB(A), the RBL for that assessment period will be set at 30dB(A).

Figure 5 presents a graphical summary of calculated Day period noise and ABLs.

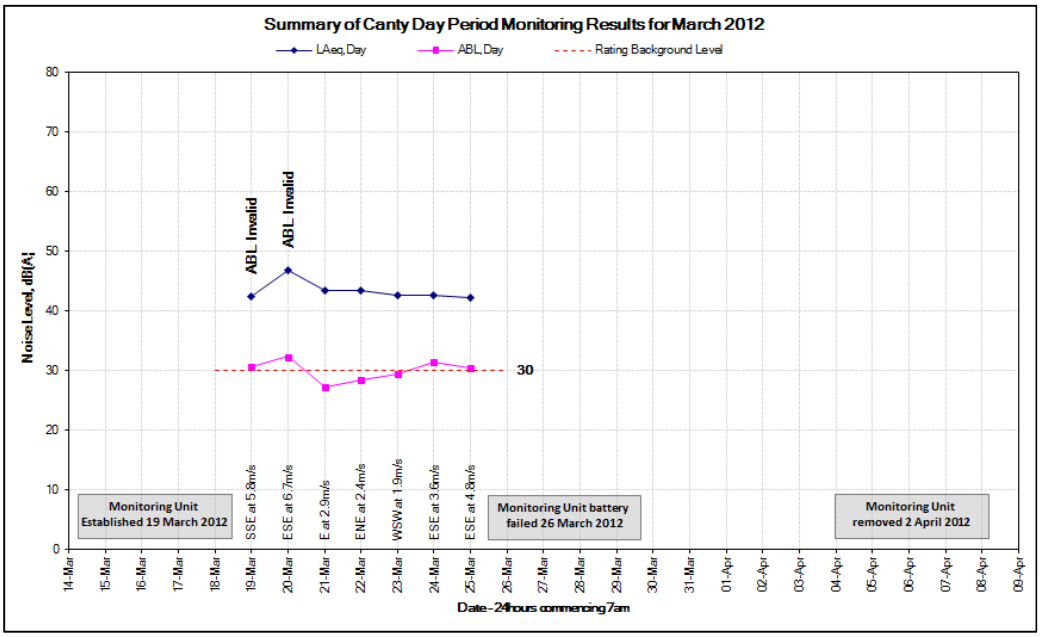


Figure 5: Summary Day period monitoring results, Canty (R3)

5.3.3 Assessment of Stuart (R4) Monitoring Results

The 24hr meteorological and noise monitoring results for the Stuart (R4) monitoring location are provided in **Appendix III**. These results were used to prepare an analysis of measured $L_{A90,15minute}$ noise levels during the day period, presented in **Figure 6**. This analysis indicates that, applying the 10th percentile background noise level as an indicator of trends in daily background noise levels, 'quieter' periods at this monitoring location are observed to occur between approximately 11:00 and 17:00.

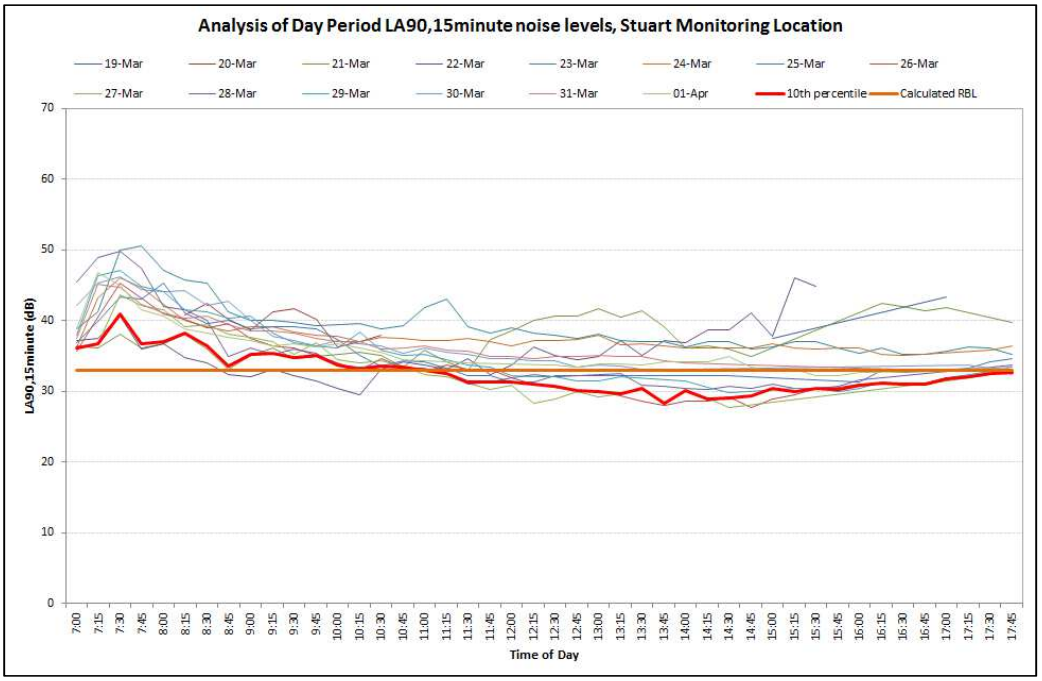


Figure 6: Analysis of $L_{A90,15minute}$ results, Stuart (R4) property

Detailed review of 24 hours run charts (presented in **Appendix III**) was undertaken to evaluate whether meteorological influences were actually observed to manifest in measured noise levels, or whether meteorological exclusions were observed to occur during the 'quieter' times of day at this location. Where the response to each of these investigations was 'no', the meteorological influences were considered to be not relevant to the analysis, and the noise monitoring results validated accordingly. A summary of this analysis is presented in **Table 10**.

Table 10: Data validity for (R4) – Stuart property

Time Period (commencing 7:00 am)	Review of Meteorological Conditions	Data Validity
19/03/2012	Wind effects present throughout record, data only available from 1200 onwards due to site establishment.	ABL Invalid
20/03/2012	Rainfall occurring between 0700 and 0800. Increasing wind effects during the day, exclusions apply after 1045. $L_{A90,15minute}$ appear to increase at times of increasing wind speed, suggesting meteorological impact.	ABL Invalid
21/03/2012	Showers occurring during morning period with negligible effect on noise levels. While automated exclusions occur only after 1500, wind strength appears to lift $L_{A90,15minute}$ results from 1200 to 1400, and 1500 to 1800. Exclusion of met affected results has significant influence (-0.7dB) on ABL. Re-assessed result conservatively applied as ABL.	Re-assessed ABL Valid
22/03/2012	Increasing $L_{A90,15minute}$ results coincide with strengthening winds from 1200, and rainfall from 1545. However, $L_{A90,15minute}$ results follow trend of decreasing noise levels during mid-morning, bottoming out at 30dB(A) before met impacts take effect. Exclusion of met affected results has significant influence (-0.7dB) on ABL. Re-assessed result conservatively applied as ABL.	Re-assessed ABL Valid
23/03/2012	Light winds observed, noise levels do not appear to respond to meteorology. No meteorological exclusions were applied.	Original ABL Valid
24/03/2012	Wind speeds exceeded 5m/s on several occasions during the afternoon period with no discernible effect on background noise levels. No meteorological exclusions were applied. Recalculated ABL following amended meteorological exclusions.	Re-assessed ABL Valid
25/03/2012	Wind speeds exceeded 5m/s during the afternoon period with no observable increase in background noise levels. Although strong winds were observed during 'quiet' period, noise levels do not appear to respond to this variable. No meteorological exclusions were applied. Recalculated ABL following amended meteorological exclusions.	Re-assessed ABL Valid
26/03/2012	Light winds observed, noise levels do not appear to respond to meteorology. No meteorological exclusions were applied.	Original ABL Valid
27/03/2012	Increasing wind speeds during the day, preliminary exclusions apply after 1430. Although strong winds were observed during 'quiet' period, noise levels do not appear to respond to this variable. No meteorological exclusions were applied. Recalculated ABL following amended meteorological exclusions.	Re-assessed ABL Valid
28/03/2012	Isolated rainfall events, increasing later in the afternoon. Strengthening wind from 1600 appears to elevate $L_{A90,15minute}$ results slightly, however no exclusions or significant met effects observed during quieter period of day (mid-late afternoon). Results from 1130 to 1330 were excluded to (conservatively) ensure potential rainfall / wind impacts do not elevate ABL. Exclusion of met affected results has no influence (0.0dB) on ABL. Re-assessed result conservatively applied as ABL.	Re-assessed ABL Valid

Time Period (commencing 7:00 am)	Review of Meteorological Conditions	Data Validity
29/03/2012	Isolated rainfall events and wind speeds exceeding 5m/s occurring during early afternoon (1315 to 1415). Slight increase in background noise levels at this time; exclusion or retention of these four results does not alter resulting ABL.	Original ABL Valid
30/03/2012	Increasing wind speeds during the day, preliminary exclusions apply after approximately 1400. Although strong winds were observed during 'quiet' period, $L_{A90,15minute}$ noise levels do not appear to respond to this variable. No meteorological exclusions were applied. Recalculated ABL following amended meteorological exclusions.	Re-assessed ABL Valid
31/03/2012	Increasing wind speeds during the day, preliminary exclusions apply after approximately 1400. Although strong winds were observed during 'quiet' period, $L_{A90,15minute}$ noise levels do not appear to respond to this variable. No meteorological exclusions were applied. Recalculated ABL following amended meteorological exclusions.	Re-assessed ABL Valid
1/4/2012	Increasing wind speeds during the day, preliminary exclusions apply after intermittently from 1100. Although strong winds were observed during 'quiet' period, $L_{A90,15minute}$ noise levels do not appear to respond to this variable. No meteorological exclusions were applied. Recalculated ABL following amended meteorological exclusions	Re-assessed ABL Valid
2/4/2012	No monitoring data collected for this period.	No ABL

Table 11 summarises the ABLs calculated during the preliminary and additional stages of data analysis; bold figures denote those results that were determined to be valid, either by automated exclusion or detailed validation techniques.

Table 11: Calculation of RBLs, Stuart (R4)

Date	Preliminary	Detailed Review
19/03/2012	38.1	38.3
20/03/2012	37.0	38.4
21/03/2012	34.4	**33.7**
22/03/2012	32.1	**31.4**
23/03/2012	**35.8**	**35.8**
24/03/2012	**36.1**	**35.9**
25/03/2012	32.1	**31.0**
26/03/2012	**28.8**	**28.8**
27/03/2012	29.0	**29.0**
28/03/2012	30.5	**30.5**
29/03/2012	**30.5**	**30.4**
30/03/2012	33.3	**32.9**
31/03/2012	34.3	**33.1**
1/4/2012	**32.8**	**32.7**
RBL (median of ABLs)	32.8	**32.1**

The results of this assessment indicate that, following detailed validation (or modification to) ABLs, the evaluated RBL for this monitoring location is lower than that determined during the preliminary assessment process. This result indicates that the RBL calculated during preliminary analysis was influenced by meteorological influences, insofar as the automated exclusion rules served to exclude data during quiet period (where meteorological influence was unlikely to have actually generated any impact), thus artificially raising the ABLs.

On the basis of detailed validation of meteorological influences, the re-assessed RBL may be considered representative of the RBL for the receiving environment without significant meteorological influences. It should be noted however, that this view presents a conservative analysis, as meteorological influences are (to some extent) part of the ambient noise environment (long term analysis of regional conditions to identify *significant* meteorological scenarios is beyond the scope of this assessment). **Figure 7** presents a graphical summary of calculated Day period noise and ABLs.

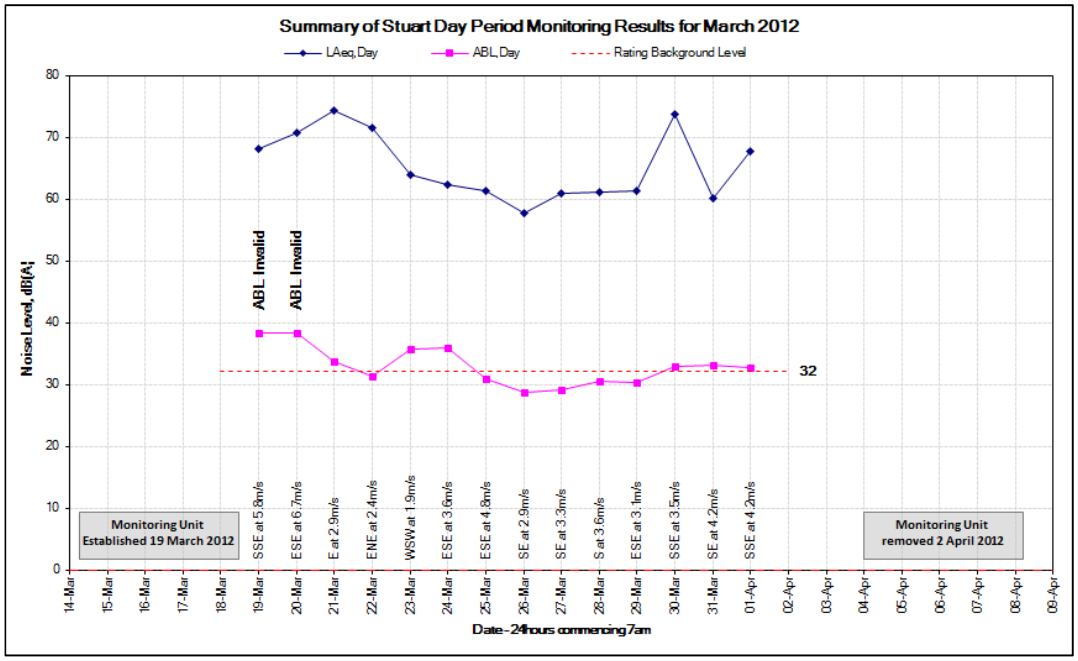


Figure 7: Summary Day period monitoring results, Stuart (R4)

5.4 Assessment of Results

5.4.1 Rating Background Level and Intrusiveness Criteria

Following analysis presented in **Section 5.3**, the RBLs for each of the monitoring locations is summarised in **Table 12**.

Table 12: RBL and intrusiveness criteria

Location	RBL	Intrusiveness Criteria
Lynch (R2)	32	37
Canty (R3)	30	35
Stuart (R4)	32	37

It is acknowledged that the RBL for the Canty (R3) monitoring location is calculated on the basis of only 5 valid day period monitoring results, and thus fails to satisfy the INP criteria of a *weeks worth of valid monitoring data*. Notwithstanding this, the INP establishes an artificial RBL floor of 30dB(A); consequently, the addition of further valid monitoring results to the RBL calculation at this location would only serve to increase the RBL and resultant intrusiveness criteria. On this basis, while technically invalid, the RBL is considered to conservatively represent an appropriate indicator of background noise levels.

5.4.2 Ambient Noise Levels and Amenity criteria

The analysis, specifically review of meteorological influences and relevance of exclusions presented in **Section 5.3** was extended to the analysis of ambient (L_{Aeq}) noise levels; summary analysis of ambient noise levels for each Day assessment period (denoted by $L_{Aeq,period}$ levels) is presented in the summary charts **Figure 3**, **Figure 5** and **Figure 7**. These results represent the logarithmic average of $L_{Aeq,15minute}$ results for each day period, following the same meteorological exclusions applied to the analysis of $L_{A90,15minute}$ results.

Section 3.2 of the INP defines the existing L_{Aeq} noise level as being equal to the logarithmic average of individual $L_{Aeq,15\ minute}$ levels for each assessment period, and notes that the L_{Aeq} noise level relates only to the contribution from industrial noise sources (as opposed to total noise levels). Following meteorological exclusions, the existing L_{Aeq} noise level for the day period at each monitoring location was calculated, and is presented in **Table 13**. It is noted that L_{Aeq} noise levels for the Day period only are presented, as the Cedar Point Quarry is proposed only to operate during this time.

Table 13: Existing L_{Aeq} noise levels and amenity criteria

Location	Lynch (R2)	Canty (R3)	Stuart (R4)
Existing $L_{Aeq,day}$	51	45	68
Assessed Industrial Contribution	41	35	58
Acceptable (Rural)	50		58
Amenity Criteria	50	50	50

The analysis presented in **Table 13** indicates that existing L_{Aeq} noise levels at each of the monitoring locations vary about the acceptable noise level for the Rural receiver type. Based on review of monitoring data, it is considered that L_{Aeq} noise levels are likely influenced by exposure to road traffic or environmental noise sources. The assumption that the measured L_{Aeq} level is representative of an existing industrial noise contribution is somewhat flawed, as review of the surrounding environment indicates that significant sources of industrial noise are unlikely to be present. In order to determine the amenity criteria, the existing industrial noise contribution and acceptable noise level was subject to further review, presented below.

5.4.2.1 Assessment of Lynch (R2) and Canty (R3) Monitoring Data

In the absence of any observed contribution from industrial sources, the existing industrial L_{Aeq} contribution at the Lynch (R2) and Canty (R3) monitoring locations was evaluated to be equal to the measured $L_{Aeq\ minus\ 10dB}$.

As the evaluated existing industrial L_{Aeq} is observed to be less than the acceptable noise level by more than 6dB(A), following the modification rules established in Table 2.2 of the INP, the amenity criteria is set at a level equal to the acceptable noise level.

5.4.2.2 Assessment of Stuart (R4) Monitoring Data

In the absence of any observed contribution from industrial sources, the existing industrial L_{Aeq} contribution at the Stuart (R4) monitoring location was evaluated to be equal to the measured L_{Aeq} minus 10dB. As the measured L_{Aeq} at the Stuart (R4) monitoring location was:

- more than 10dB(A) above the acceptable noise level; and
- considered to be significantly affected by road traffic noise,

The acceptable noise level was replaced with the $L_{Aeq,period(traffic)}$ minus 10dB goal level, in accordance with guidance provided in Section 2.2.3 of the INP. This modification may be applied in instances where traffic noise impacts generate impacts in excess of the acceptable noise level for specific receiving environments. Following application of the modification rules established in Table 2.2 of the INP, the amenity criteria is set at 8dB(A) below the $L_{Aeq,period(traffic)}$ minus 10dB goal level.

While this assessment does not provide specific analysis to support the assumption that the receiving environment is Rural in character, anecdotal evidence exists to support this hypothesis; influences associated with livestock and barking dogs were noted in available operator observations, early morning peaks (indicative of bird activity), increasing levels in the evening (suggesting influences associated with insect noise), and very low RBLs were observed.

Notwithstanding this, it is considered that the consequence of challenging assumptions relating to receiver type or existing industrial contributions would not generate significant alteration to the amenity criteria, as:

- designation of the receiving environment at Suburban or Urban (rather than Rural) would serve to increase the acceptable noise levels (as the acceptable noise level increases, so does the potential amenity criteria); and
- **Table 14** presents analysis of the amenity criteria on the basis of the assumption the measured L_{Aeq} noise levels are representative of existing industrial contribution (a worst case assumption). This analysis indicates that the amenity criteria would range from 42 to 48dB(A). When considered in the context of the Intrusiveness Criteria, it can be seen that the amenity criteria remain significantly higher, and are not likely to be adopted as a PSNL. Consequently, any risk that the assumptions relating to existing industrial L_{Aeq} contributions may pose to inflation of the PSNL are considered minor.

Table 14: Existing L_{Aeq} noise levels and amenity criteria

Location	Lynch (R2)	Canty (R3)	Stuart (R4)
Existing $L_{Aeq,day}$	51	45	68
Assessed Industrial Contribution	51	45	68
Acceptable (Rural)	50		58
Amenity Criteria	42	48	48
Intrusiveness Criteria	37	35	37

On the basis of this assessment, it is considered that the amenity criteria presented in **Table 13** are derived in accordance with the provisions established in the INP, and may therefore be considered representative of the amenity criteria associated with the proposed development.

5.4.3 Project Specific Noise Levels

In accordance with guidance presented in Section 2.4 of the INP, the PSNL for proposed industrial development should typically be established as the most stringent of the intrusiveness and amenity criteria. On the basis of background monitoring data and analysis presented as part of this assessment, the PSNL for the proposed Cedar Point Quarry are provided in **Table 15**.

Table 15: Project Specific Noise Levels

Location	Intrusiveness Criteria ($L_{Aeq,15minute}$)	Amenity Criteria ($L_{Aeq,period}$)	PSNL
Lynch (R2)	37	50	37
Canty (R3)	35	50	35
Stuart (R4)	37	50	37

5.5 Assessment of PSNL

Analysis presented in **Table 16** provides a comparison of PSNL determined as part of the original NIA for the Cedar Point Quarry, and as part of this background noise assessment.

Table 16: Comparison of PSNL

	PSNL	
Location	Original NIA (2011)	BNA (2012)
Carlill (R1)	40[1] / (40.5[2])	n/a
Lynch (R2)	39[1] / (39.2[2])	37
Canty (R3)	39[1] / (38.9[2])	35
Stuart (R4)	42[1] / (42.3[2])	37

Note 1: PSNL rounded to whole number in accordance with methodology presented in AS 2706-1984: *Numerical Values: Rounding and interpretation of limiting values*

Note 2: PSNL as presented in original NIA.

It is noted that monitoring for the purposes of this assessment was not undertaken at the Carlill (R1) monitoring location; constraints associated with equipment availability, combined with advice that the property is (in effect) project related served to exclude this location from the monitoring effort. While beyond the scope of this assessment, a relevant PSNL may be inferred on the basis of the comparison of results presented in **Table 16.**

The results of this assessment suggest that RBLs (and subsequent PSNL) are between 2 and 5 dB(A) lower than those results presented as part of the original NIA. The peer review (*Umwelt 2011*) summarises that the EIS and NIA provide insufficient evidence to support the validity of the PSNL; in preparing this assessment, no additional supporting information relating to monitoring or derivation of the PSNL was sighted, hence further discussion of the validity of these results would be only speculative in nature.

Notwithstanding this, the intent of long term monitoring to evaluate ambient noise levels is to facilitate an understanding of, and acknowledge the variability in noise levels (and associated project risk) in time. The results presented in the original NIA and this BNA provide some indication of the potential distribution of noise criteria.

6. CONCLUSION

In September 2010, Greg Alderson & Associates Pty Ltd prepared an EIS for a proposed basalt quarry at Cedar Point, near Kyogle, NSW. The EIS was referred to the Joint Regional Planning Panel (JRPP) for assessment, where the JRPP subsequently requested a peer review of the EIS to be undertaken. Following the peer review the JRPP formally requested additional information, including further assessment of the background noise environment, noise impacts associated with operation of the quarry, review of proposed mitigation options and proposed methods for compliance monitoring.

Advitech Pty Limited was engaged by Greg Alderson and Associates in response to this decision, to undertake additional background monitoring and characterise the receiving environment at Cedar Point in accordance with the methodology and requirements established in the NSW Industrial Noise Policy (INP).

The objective of this assessment was to provide additional analysis of the receiving environment adjacent to the proposed Cedar Point Quarry, and address potential inadequacies in the original background noise assessment, as identified in the *Peer Review of Cedar Point Quarry Assessment Report* (Umwelt, 2011).

Background monitoring was undertaken between 19 March and 2 April 2012, however this effort was subject to several equipment faults which resulted in loss of both noise and meteorological monitoring data. To address these constraints, meteorological monitoring data from the Bureau of Meteorology (BoM) AWS at Casino Airport (30km south of the monitoring location) was applied to the analysis, along with detailed review of potential meteorological influences.

The results of this analysis returned sufficient ABL results to allow a robust assessment of RBLs at each of the monitoring locations. While carried out in accordance with background noise assessment methodologies established by the INP, the validity of the applied methodology was also subject to quantitative review. This review, carried out as a sensitivity analysis, demonstrated that negligible differences between RBLs calculated on the basis of valid and invalid data (as defined by the INP) were observed.

Analysis of existing L_{Aeq} noise levels was also undertaken, and the amenity criteria for each monitoring location determined. Additional analysis considered risks associated with assumptions relating to receiver type and potential traffic noise influences, but demonstrated that the analysis presented a conservative amenity criterion.

The PSNL for all monitoring locations were determined on the basis of the intrusiveness criteria. Comparison of the PSNL determined as part of this Background Noise Assessment (BNA) and the original NIA (Greg Alderson and Assoc., 2010) indicates that the criteria in both instances were determined on the basis of the intrusiveness criteria, however the PSNL calculated in accordance with the INP methodology and proposed as following this assessment were between 2 and 5 dB(A) lower than the original NIA, as summarised in **Table 17.**

Table 17: Project specific noise levels

Location	Intrusiveness Criteria ($L_{Aeq,15minute}$)	Amenity Criteria ($L_{Aeq,period}$)	PSNL (Advitech 2012)	PSNL (Greg Alderson & Assoc. 2010
Carlill (R1)	n/a	n/a	n/a	40
Lynch (R2)	37	50	37	39
Canty (R3)	35	50	35	39
Stuart (R4)	37	50	37	42

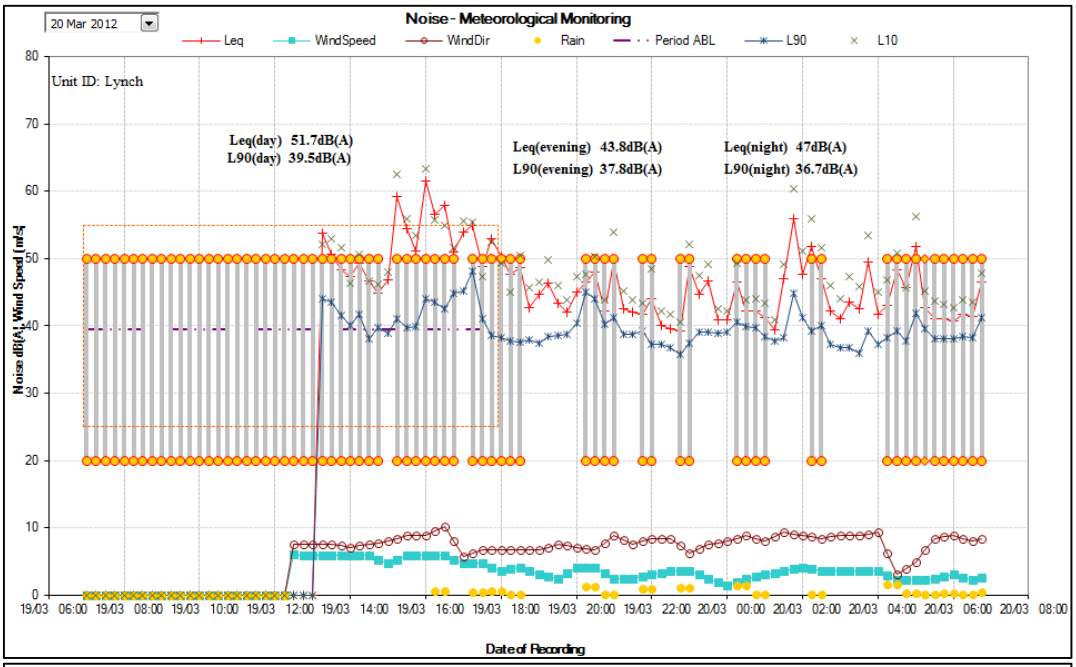
Notwithstanding this, the intent of long term monitoring to evaluate ambient noise levels is to facilitate an understanding of, and acknowledge the variability in noise levels (and associated project risk) in time. The results presented in the original and NIA and this BNA provide some indication of the potential distribution of noise criteria.

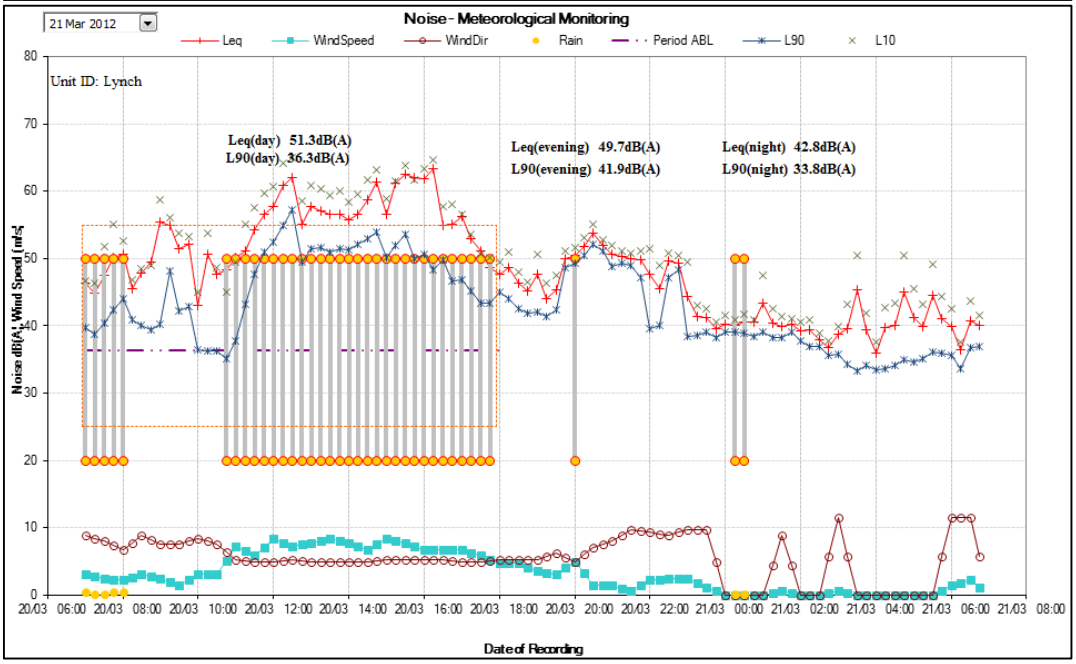
While the objective of this BNA was to undertake monitoring and determine the relevant PSNL (in accordance with the methodology presented in the INP), the departure from PSNL reported in the original NIA draws attention to potential variability of background noise levels in the receiving environment. It is also noted that analysis presented within this assessment applies necessarily conservative assumptions (where required) in order to validate the monitoring data, and hence tends to present lower RBLs than may otherwise be obtained.

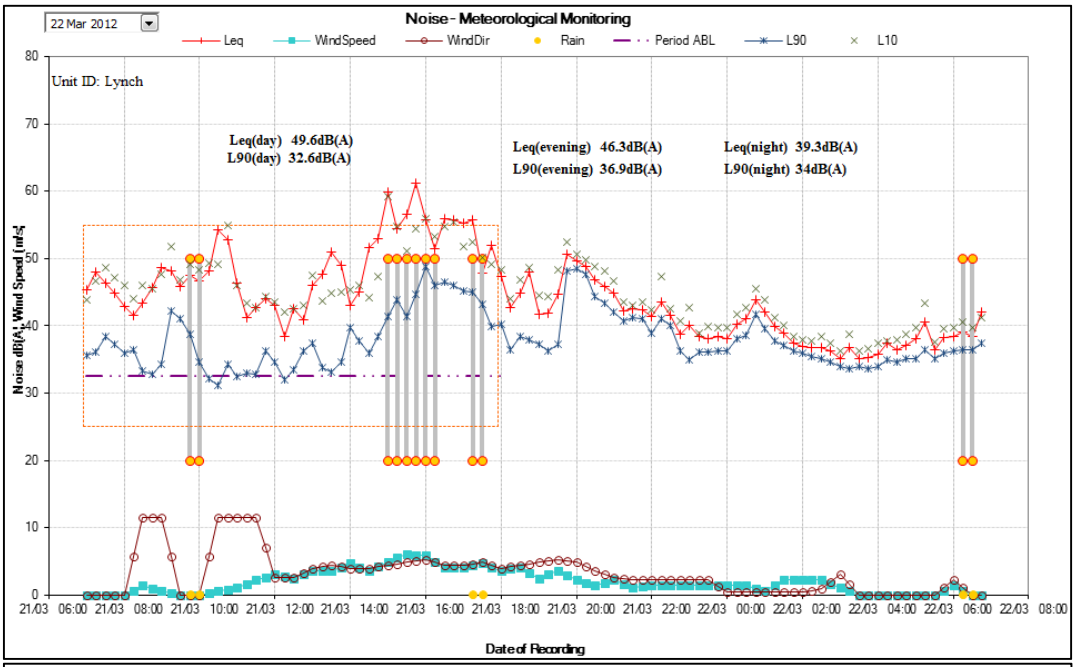
While this BNA cannot offer a valid interpretation of the original PSNL, and it is beyond the scope to resolve a single PSNL from the two PSNLs presented, it is considered that the PSNL derived from this assessment resides at the conservative end of the range of potential PSNLs.

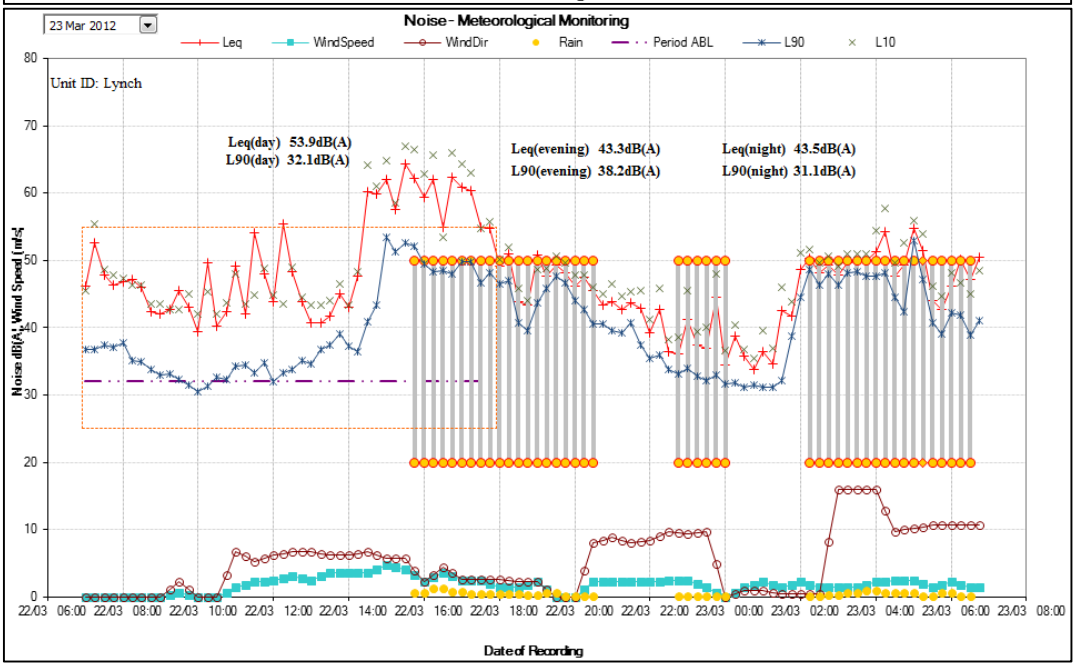
Appendix I

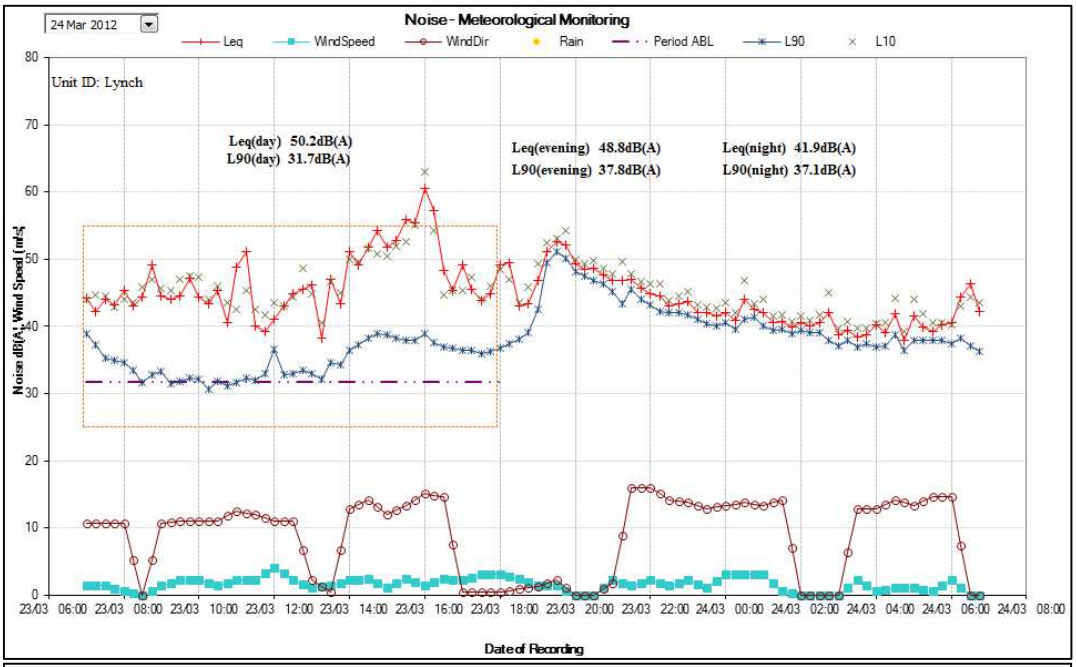
Lynch (R2)
Monitoring Results

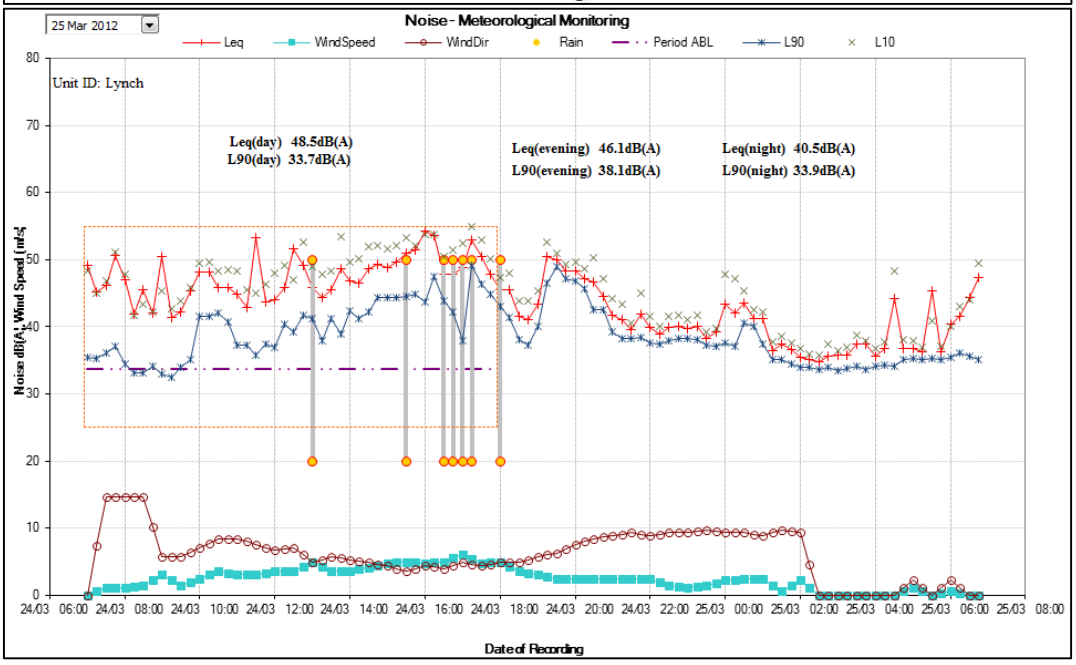

20 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 51.7dB(A)
L90(day) 39.5dB(A)
Leq(evening) 43.8dB(A)
L90(evening) 37.8dB(A)
Leq(night) 47dB(A)
L90(night) 36.7dB(A)
Noise dB(A), Wind Speed [m/s]
Date of Recording

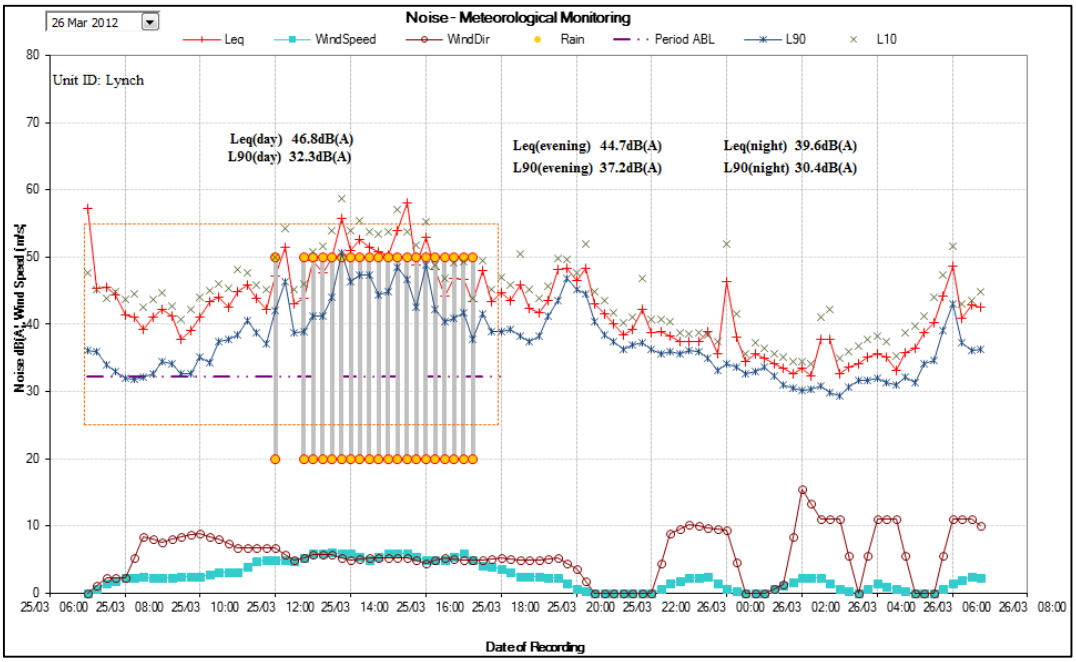

21 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 51.3dB(A)
L90(day) 36.3dB(A)
Leq(evening) 49.7dB(A)
L90(evening) 41.9dB(A)
Leq(night) 42.8dB(A)
L90(night) 33.8dB(A)
Noise dB(A), Wind Speed [m/s]
Date of Recording

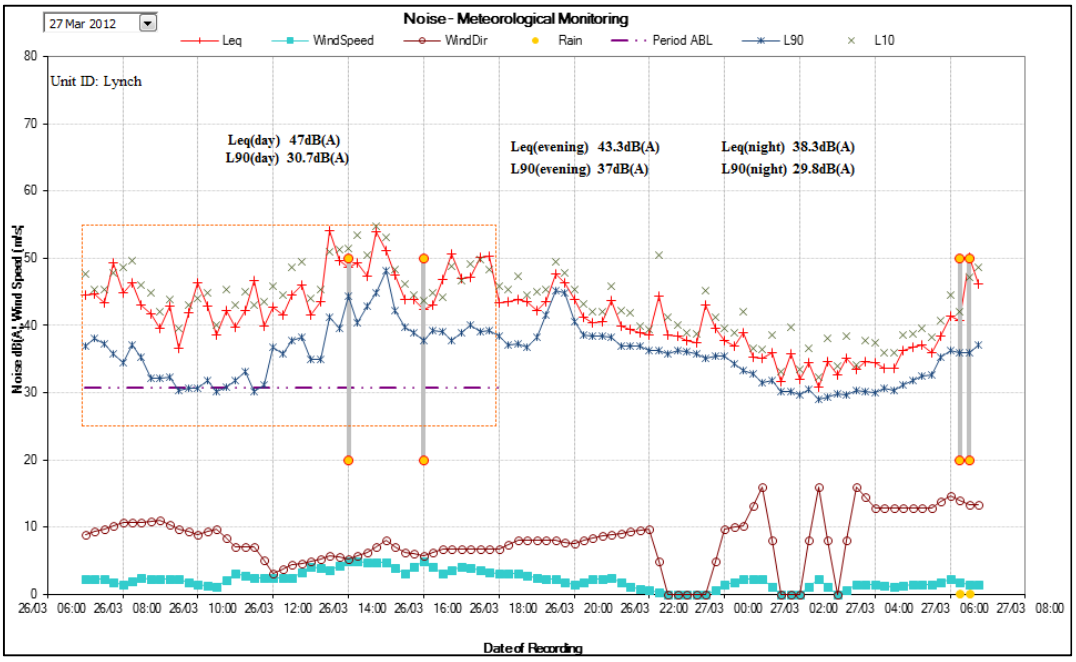

22 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 49.6dB(A)
L90(day) 32.6dB(A)
Leq(evening) 46.3dB(A)
L90(evening) 36.9dB(A)
Leq(night) 39.3dB(A)
L90(night) 34dB(A)
Noise dB(A); Wind Speed [m/s]
Date of Recording

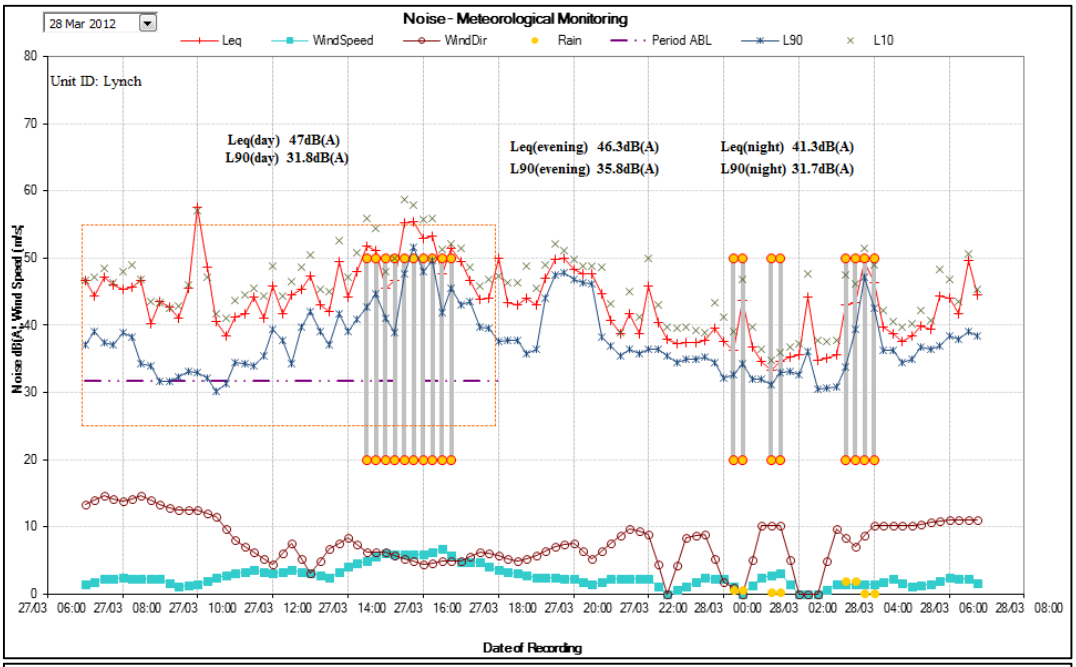

23 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 53.9dB(A)
L90(day) 32.1dB(A)
Leq(evening) 43.3dB(A)
L90(evening) 38.2dB(A)
Leq(night) 43.5dB(A)
L90(night) 31.1dB(A)
Noise dB(A); Wind Speed [m/s]
Date of Recording

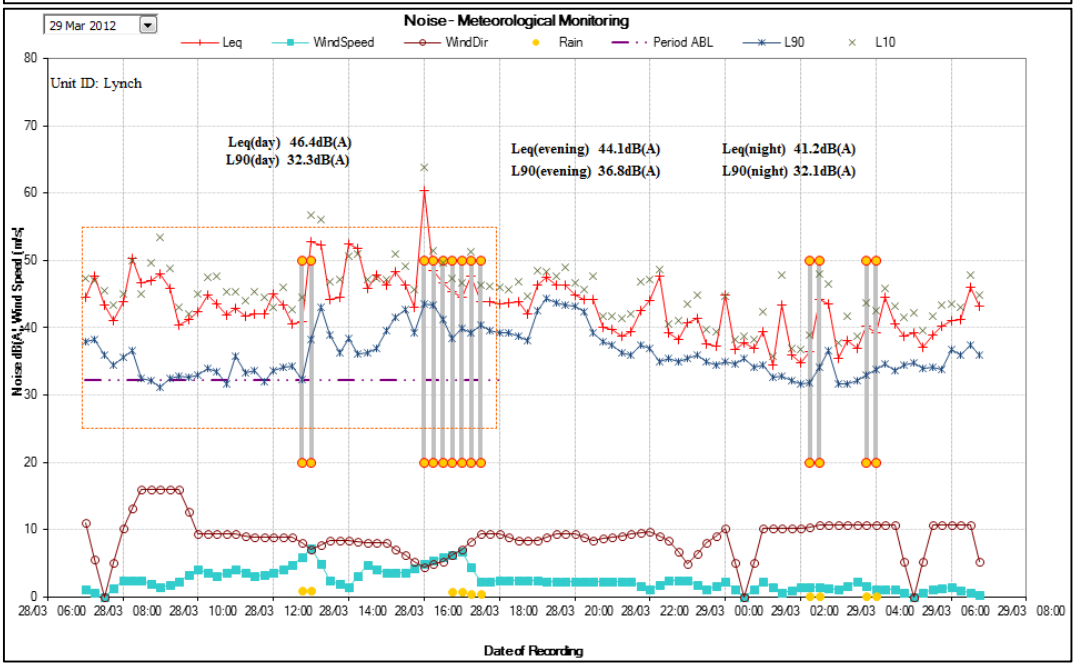

24 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 50.2dB(A)
L90(day) 31.7dB(A)
Leq(evening) 48.8dB(A)
L90(evening) 37.8dB(A)
Leq(night) 41.9dB(A)
L90(night) 37.1dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

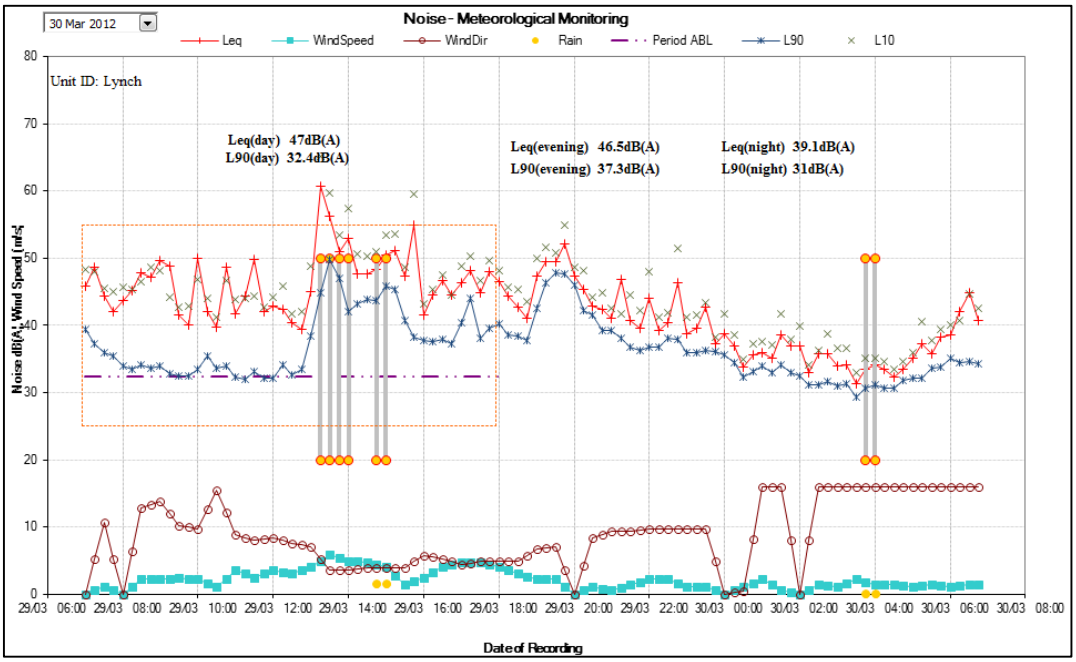

25 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 48.5dB(A)
L90(day) 33.7dB(A)
Leq(evening) 46.1dB(A)
L90(evening) 38.1dB(A)
Leq(night) 40.5dB(A)
L90(night) 33.9dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

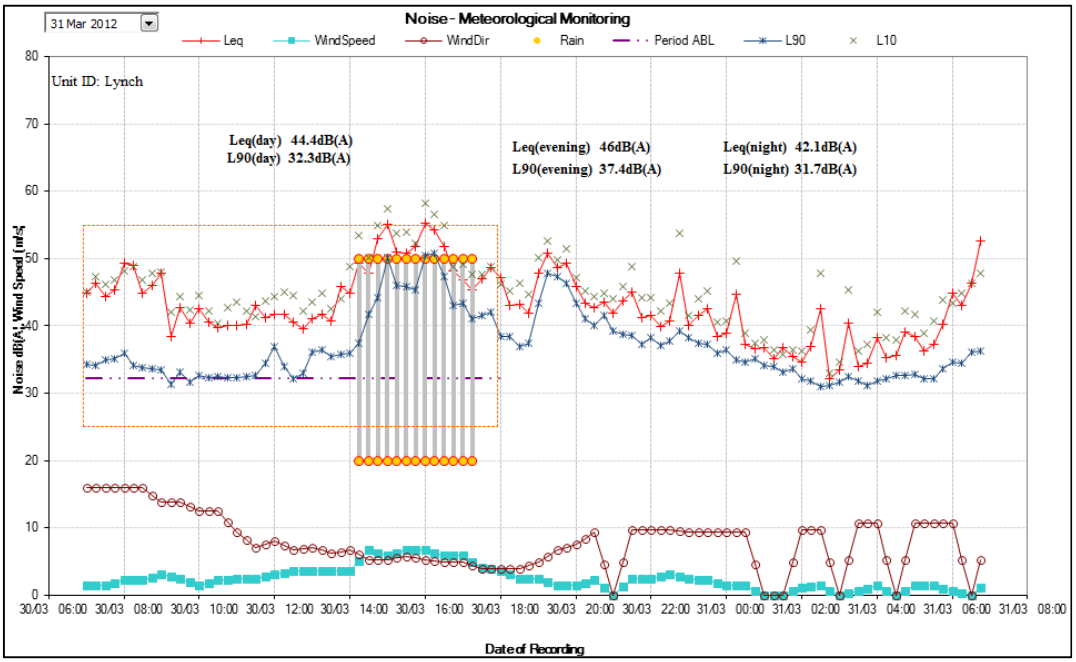

26 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 46.8dB(A)
L90(day) 32.3dB(A)
Leq(evening) 44.7dB(A)
L90(evening) 37.2dB(A)
Leq(night) 39.6dB(A)
L90(night) 30.4dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

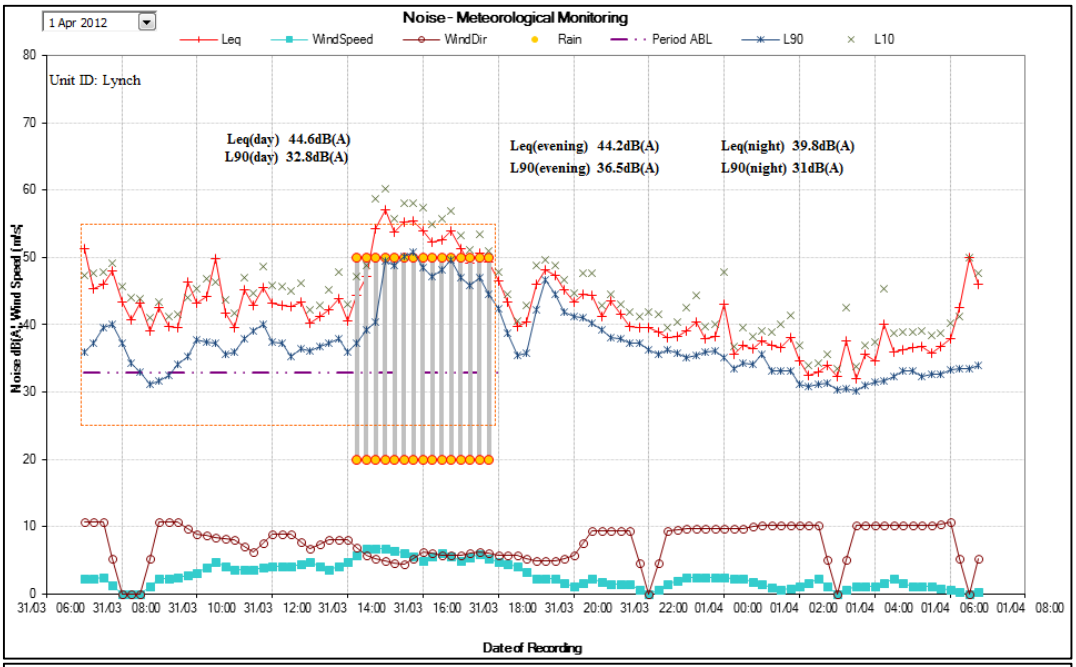

27 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 47dB(A)
L90(day) 30.7dB(A)
Leq(evening) 43.3dB(A)
L90(evening) 37dB(A)
Leq(night) 38.3dB(A)
L90(night) 29.8dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

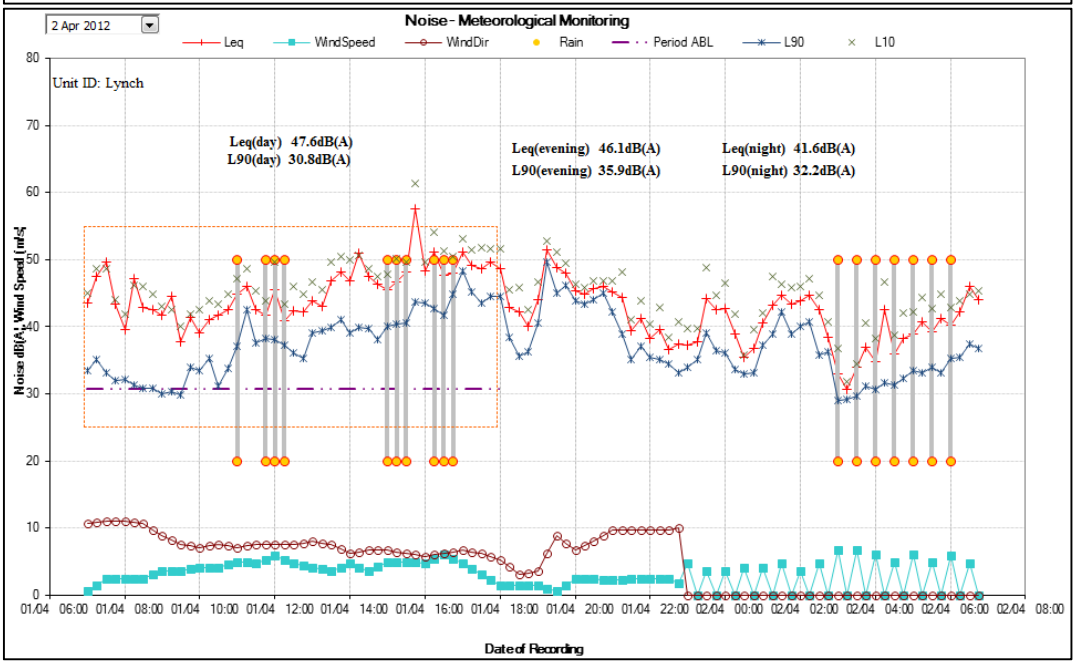

28 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 47dB(A)
L90(day) 31.8dB(A)
Leq(evening) 46.3dB(A)
L90(evening) 35.8dB(A)
Leq(night) 41.3dB(A)
L90(night) 31.7dB(A)
Noise dB(A); Wind Speed [m/s]
Date of Recording


29 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 46.4dB(A)
L90(day) 32.3dB(A)
Leq(evening) 44.1dB(A)
L90(evening) 36.8dB(A)
Leq(night) 41.2dB(A)
L90(night) 32.1dB(A)
Noise dB(A); Wind Speed [m/s]
Date of Recording


30 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 47dB(A)
L90(day) 32.4dB(A)
Leq(evening) 46.5dB(A)
L90(evening) 37.3dB(A)
Leq(night) 39.1dB(A)
L90(night) 31dB(A)
Noise dB(A); Wind Speed [m/s]
Date of Recording

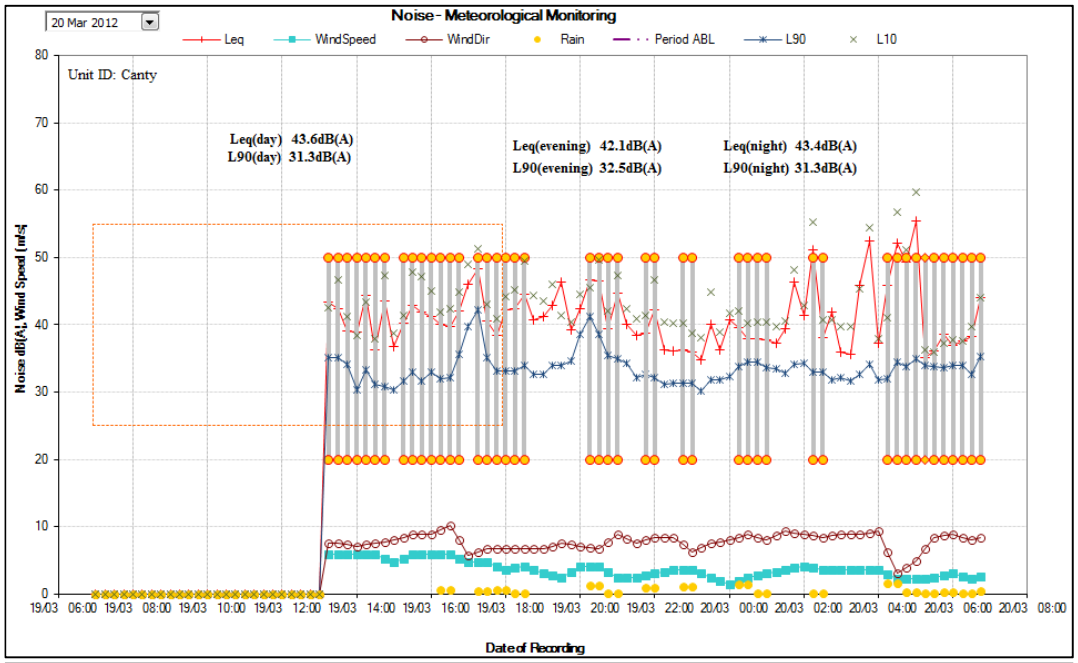

31 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 44.4dB(A)
L90(day) 32.3dB(A)
Leq(evening) 46dB(A)
L90(evening) 37.4dB(A)
Leq(night) 42.1dB(A)
L90(night) 31.7dB(A)
Noise dB(A); Wind Speed [m/s]
Date of Recording

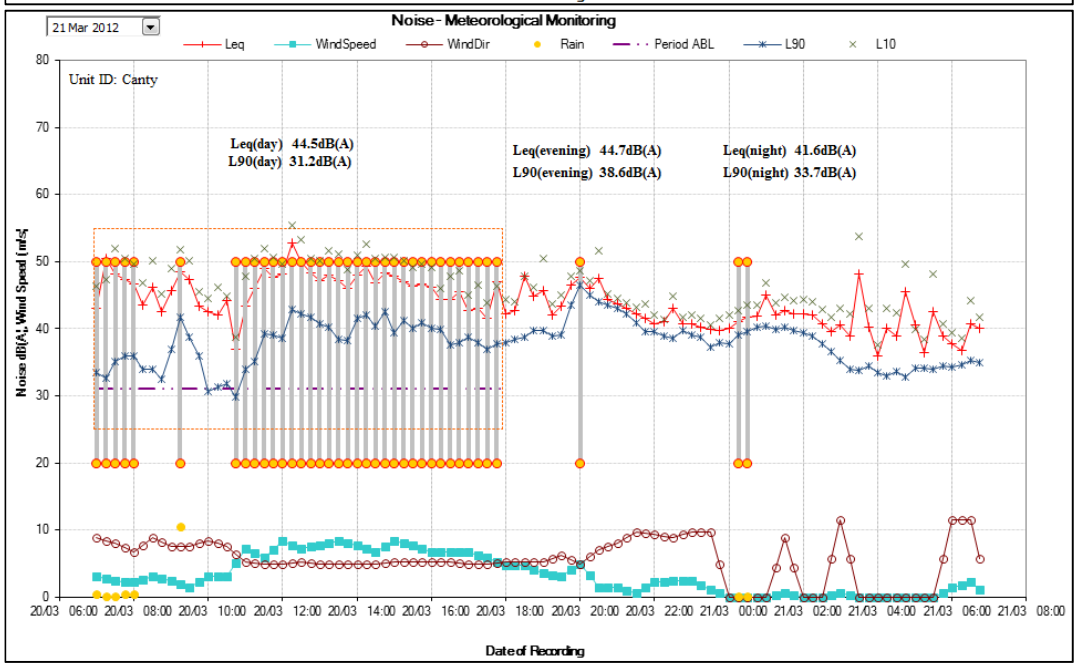

1 Apr 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 44.6dB(A)
L90(day) 32.8dB(A)
Leq(evening) 44.2dB(A)
L90(evening) 36.5dB(A)
Leq(night) 39.8dB(A)
L90(night) 31dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

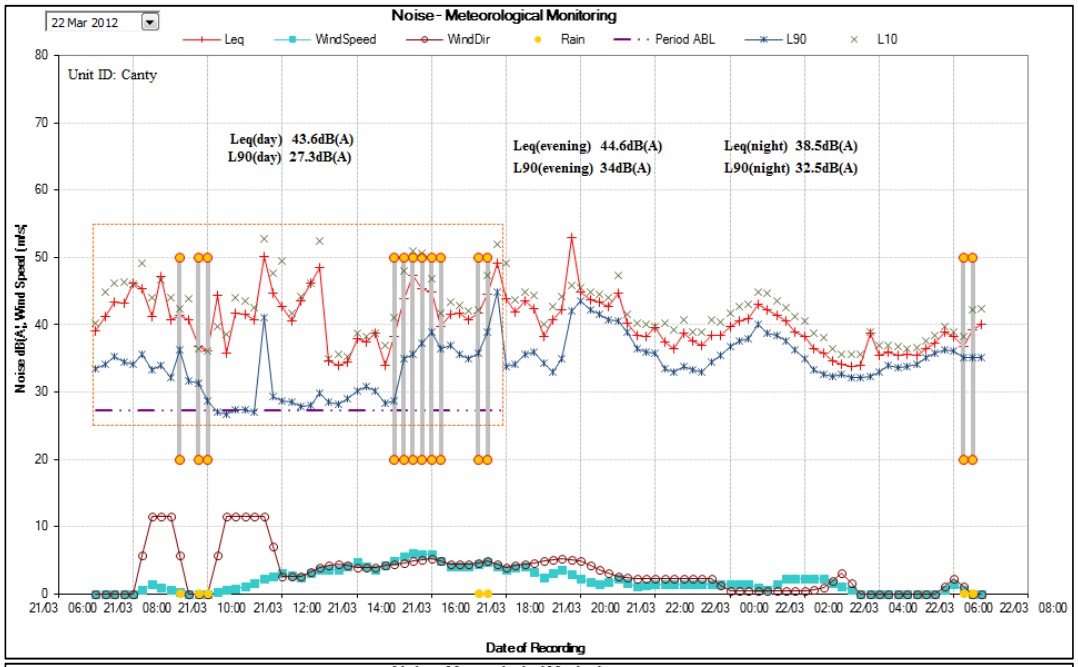

2 Apr 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Lynch
Leq(day) 47.6dB(A)
L90(day) 30.8dB(A)
Leq(evening) 46.1dB(A)
L90(evening) 35.9dB(A)
Leq(night) 41.6dB(A)
L90(night) 32.2dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

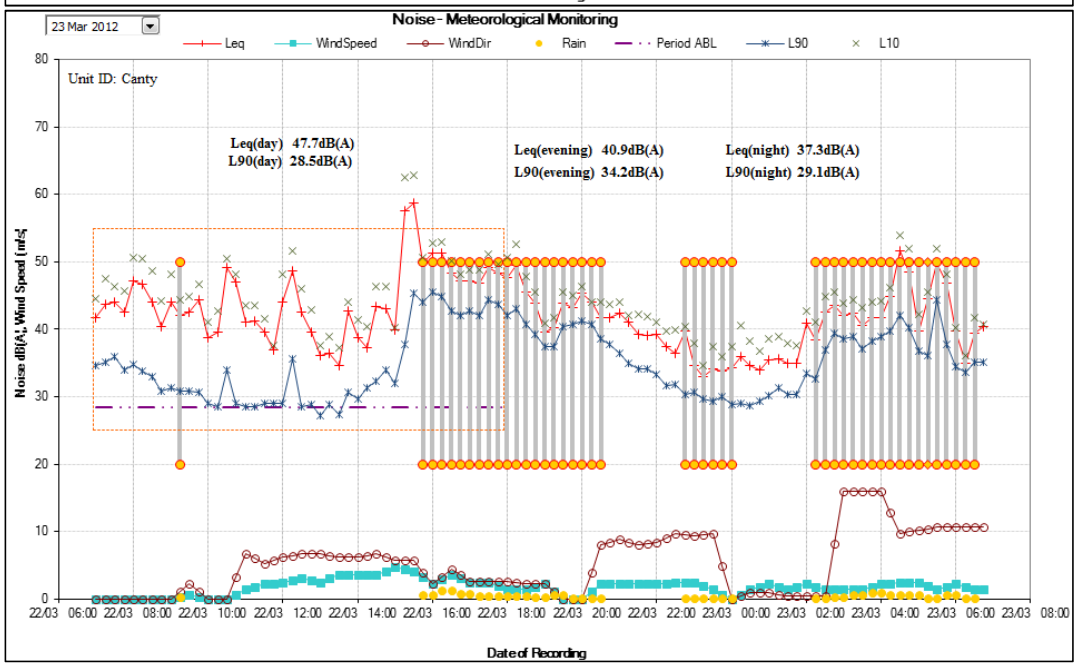
Appendix II

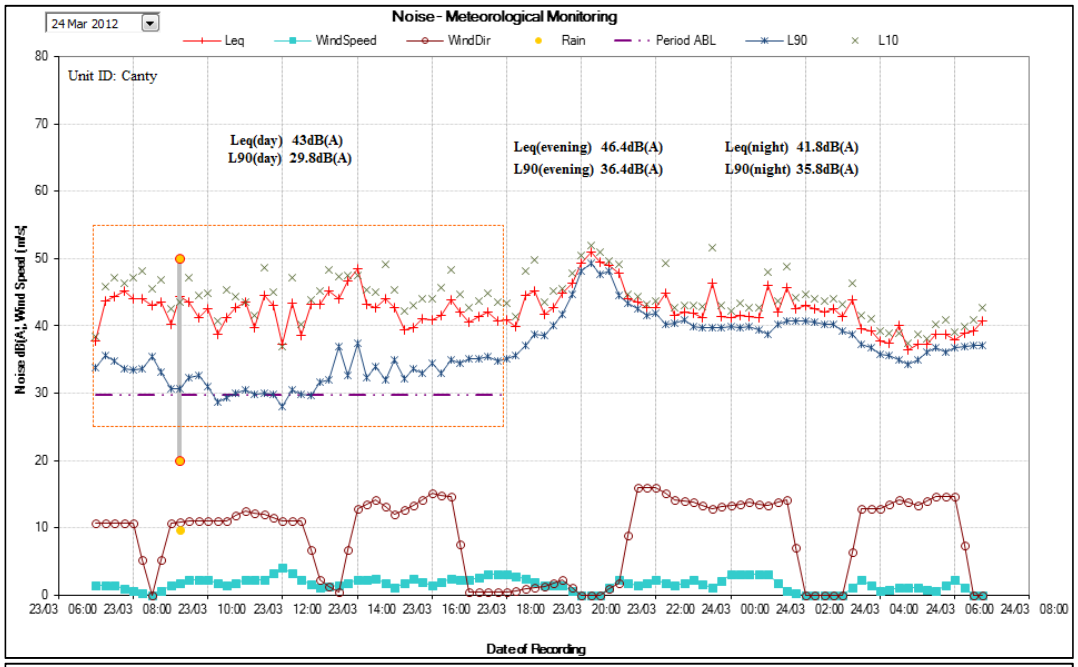
Canty (R3)
Monitoring Results

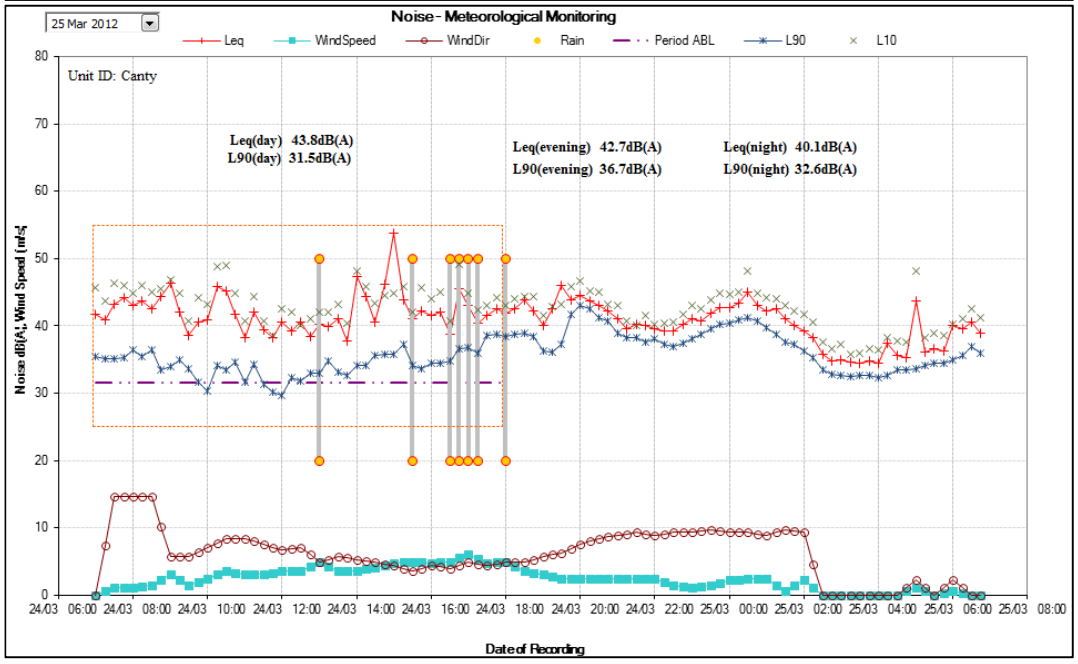

20 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Canty
Leq(day) 43.6dB(A)
L90(day) 31.3dB(A)
Leq(evening) 42.1dB(A)
L90(evening) 32.5dB(A)
Leq(night) 43.4dB(A)
L90(night) 31.3dB(A)
Noise dB(A), Wind Speed [m/s]
Date of Recording


21 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Canty
Leq(day) 44.5dB(A)
L90(day) 31.2dB(A)
Leq(evening) 44.7dB(A)
L90(evening) 38.6dB(A)
Leq(night) 41.6dB(A)
L90(night) 33.7dB(A)
Noise dB(A), Wind Speed [m/s]
Date of Recording


22 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Canty
Leq(day) 43.6dB(A)
L90(day) 27.3dB(A)
Leq(evening) 44.6dB(A)
L90(evening) 34dB(A)
Leq(night) 38.5dB(A)
L90(night) 32.5dB(A)
Noise dB(A), Wind Speed [m/s]
Date of Recording

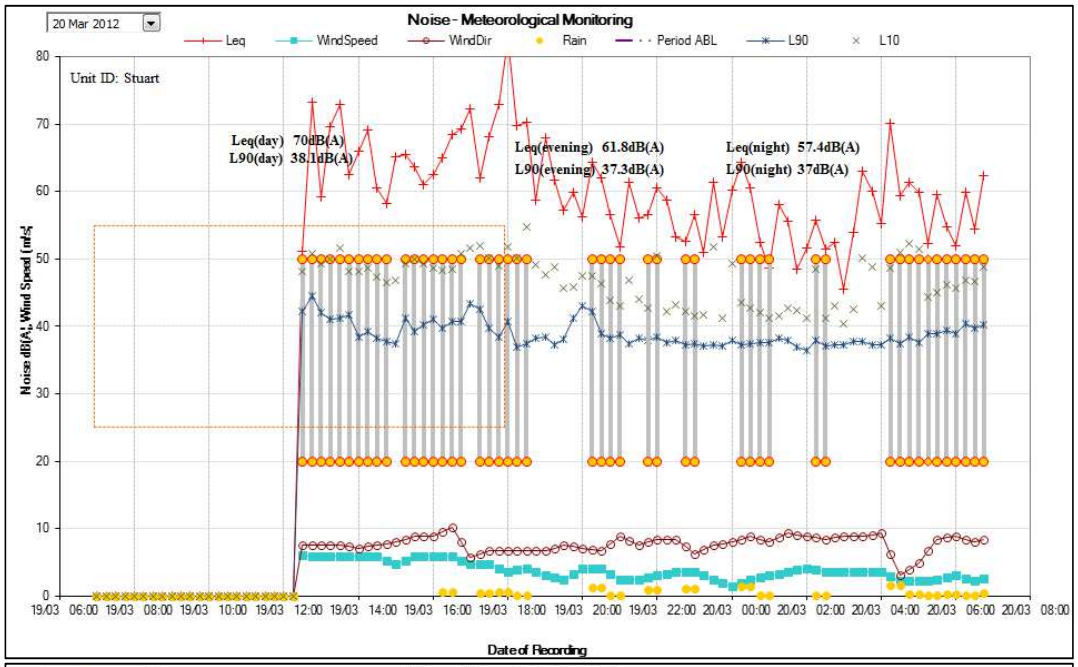

23 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Canty
Leq(day) 47.7dB(A)
L90(day) 28.5dB(A)
Leq(evening) 40.9dB(A)
L90(evening) 34.2dB(A)
Leq(night) 37.3dB(A)
L90(night) 29.1dB(A)
Noise dB(A), Wind Speed [m/s]
Date of Recording

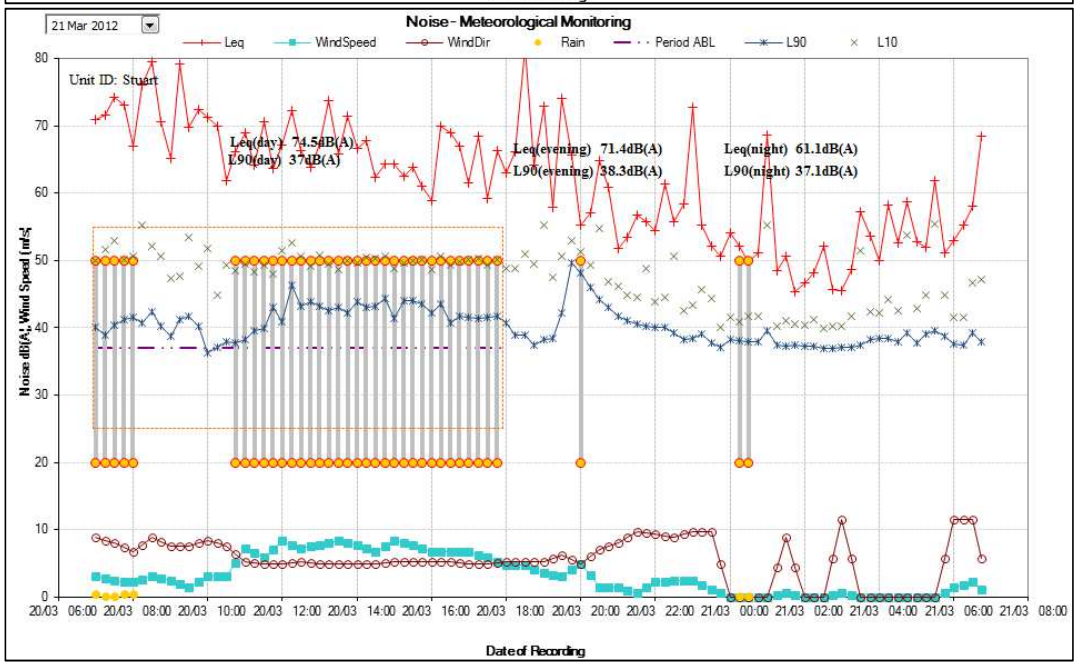

24 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Canty
Leq(day) 43dB(A)
L90(day) 29.8dB(A)
Leq(evening) 46.4dB(A)
L90(evening) 36.4dB(A)
Leq(night) 41.8dB(A)
L90(night) 35.8dB(A)
Noise dB(A), Wind Speed (m/s)
Date of Recording

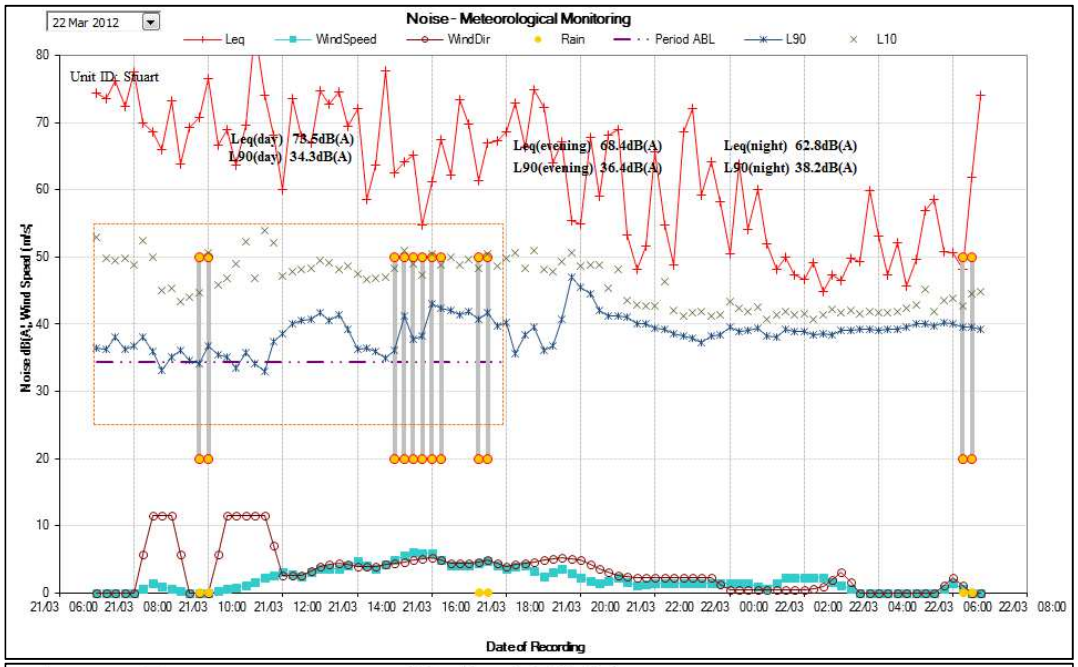

25 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Canty
Leq(day) 43.8dB(A)
L90(day) 31.5dB(A)
Leq(evening) 42.7dB(A)
L90(evening) 36.7dB(A)
Leq(night) 40.1dB(A)
L90(night) 32.6dB(A)
Noise dB(A), Wind Speed (m/s)
Date of Recording

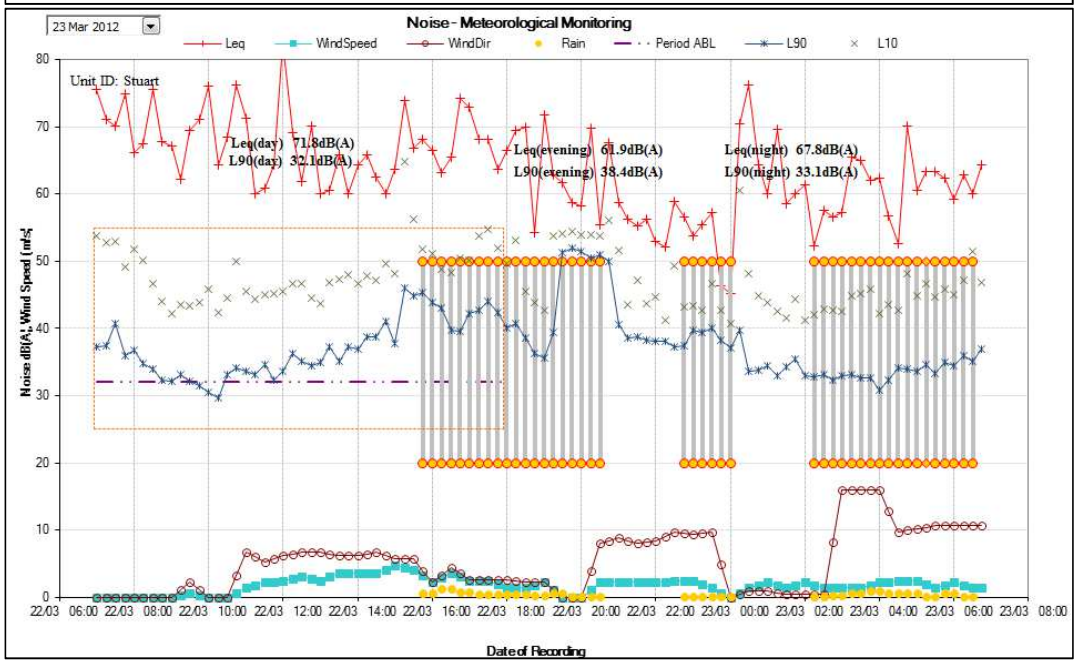
Appendix III

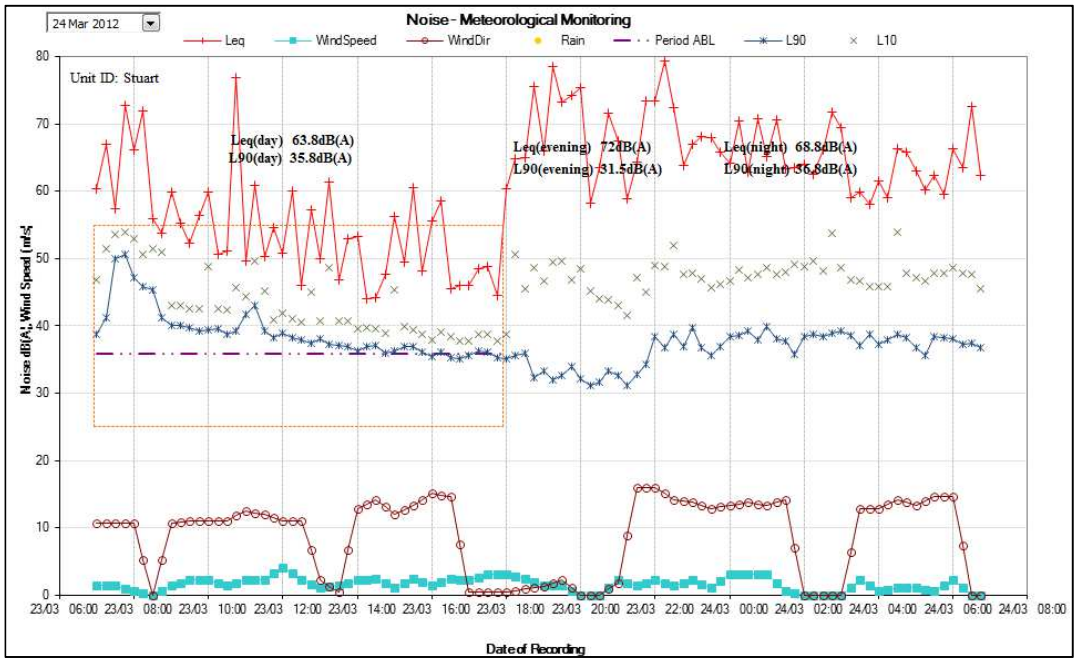
Stuart (R4)
Monitoring Results

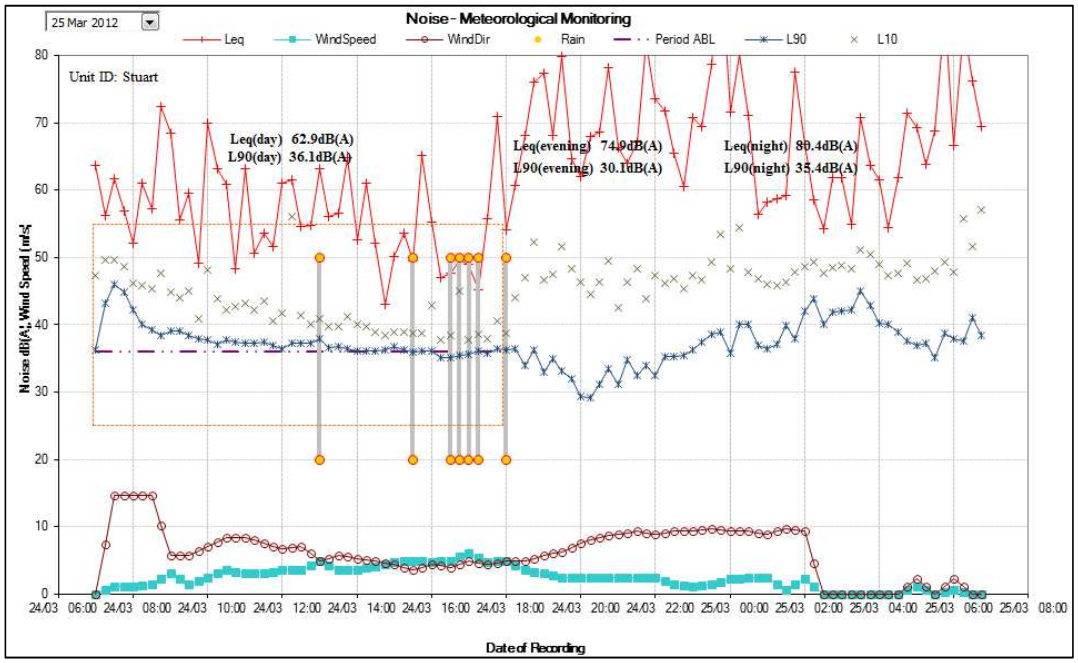

20 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 70dB(A)
L90(day) 38.1dB(A)
Leq(evening) 61.8dB(A)
L90(evening) 37.3dB(A)
Leq(night) 57.4dB(A)
L90(night) 37dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

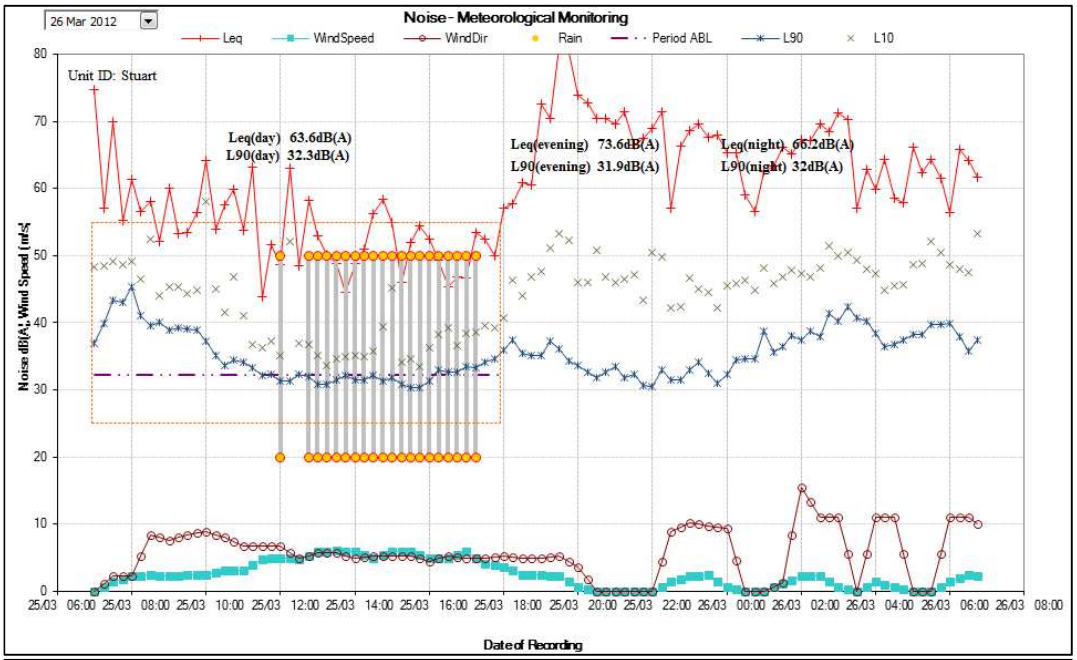

21 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 74.5dB(A)
L90(day) 37dB(A)
Leq(evening) 71.4dB(A)
L90(evening) 38.3dB(A)
Leq(night) 61.1dB(A)
L90(night) 37.1dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

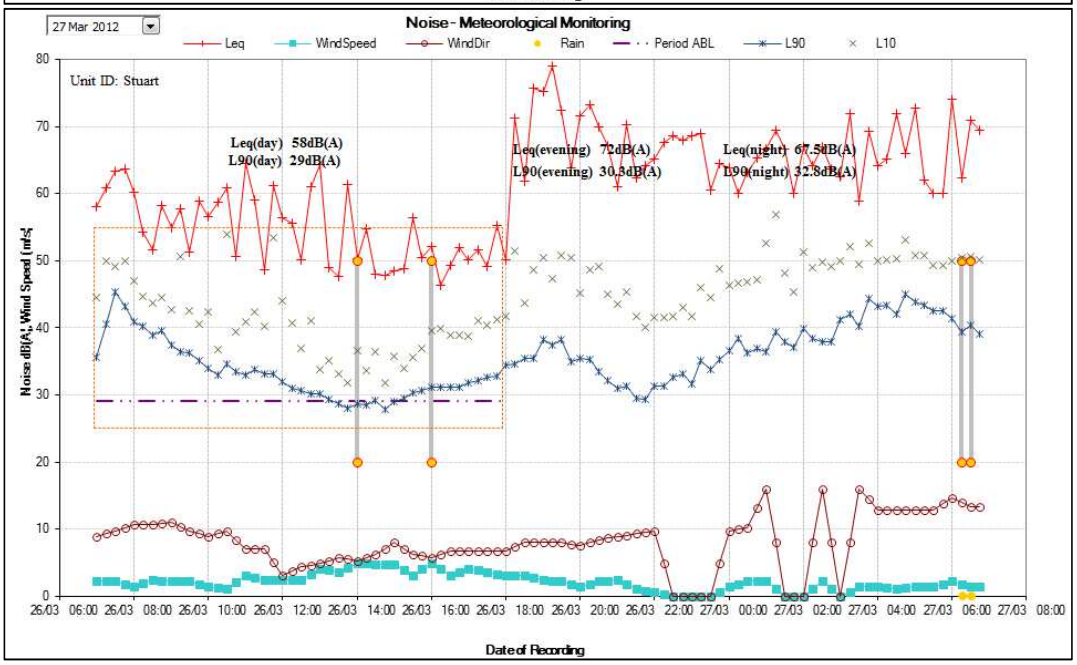

22 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 73.5dB(A)
L90(day) 34.3dB(A)
Leq(evening) 68.4dB(A)
L90(evening) 36.4dB(A)
Leq(night) 62.8dB(A)
L90(night) 38.2dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

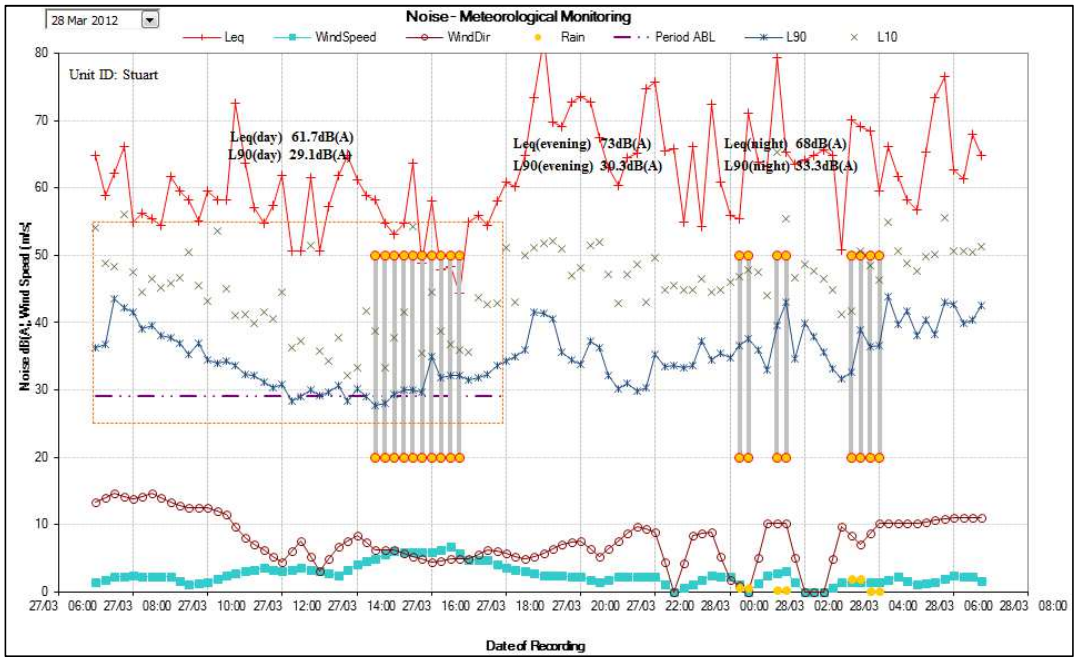

23 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 71.8dB(A)
L90(day) 32.1dB(A)
Leq(evening) 61.9dB(A)
L90(evening) 38.4dB(A)
Leq(night) 67.8dB(A)
L90(night) 33.1dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

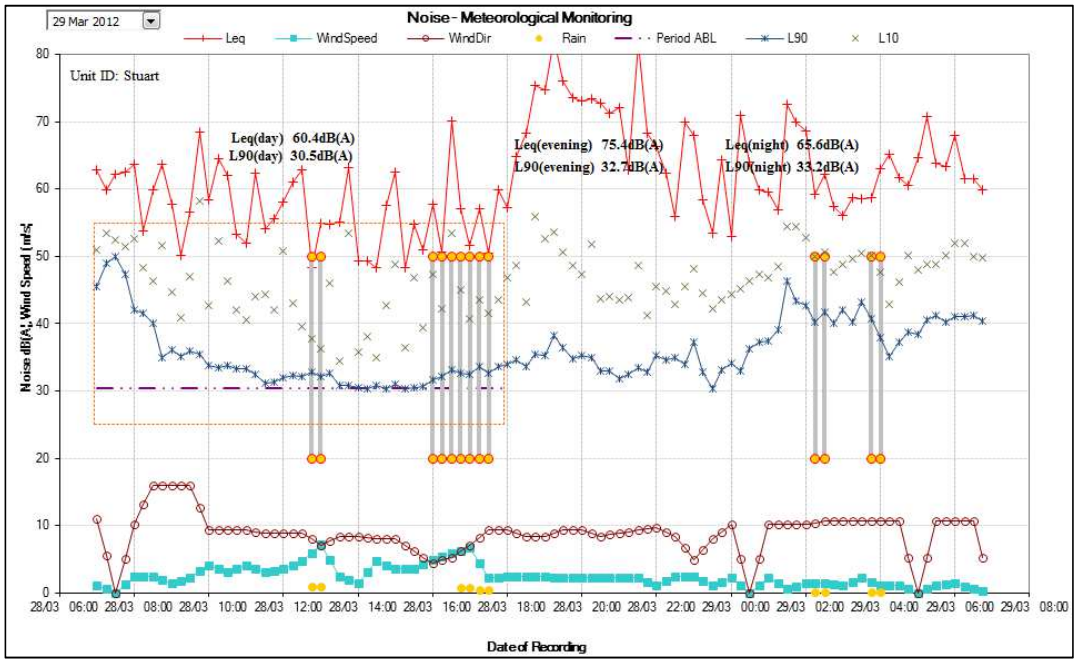

24 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 63.8dB(A)
L90(day) 35.8dB(A)
Leq(evening) 72dB(A)
L90(evening) 31.5dB(A)
Leq(night) 68.8dB(A)
L90(night) 36.8dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

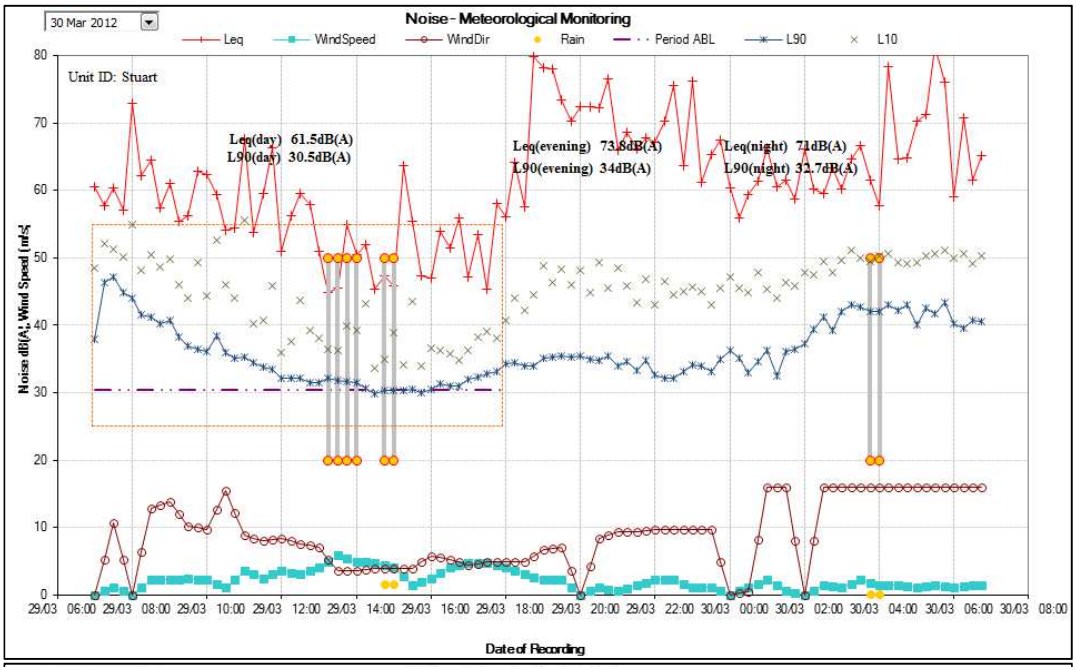

25 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 62.9dB(A)
L90(day) 36.1dB(A)
Leq(evening) 74.9dB(A)
L90(evening) 30.1dB(A)
Leq(night) 80.4dB(A)
L90(night) 35.4dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

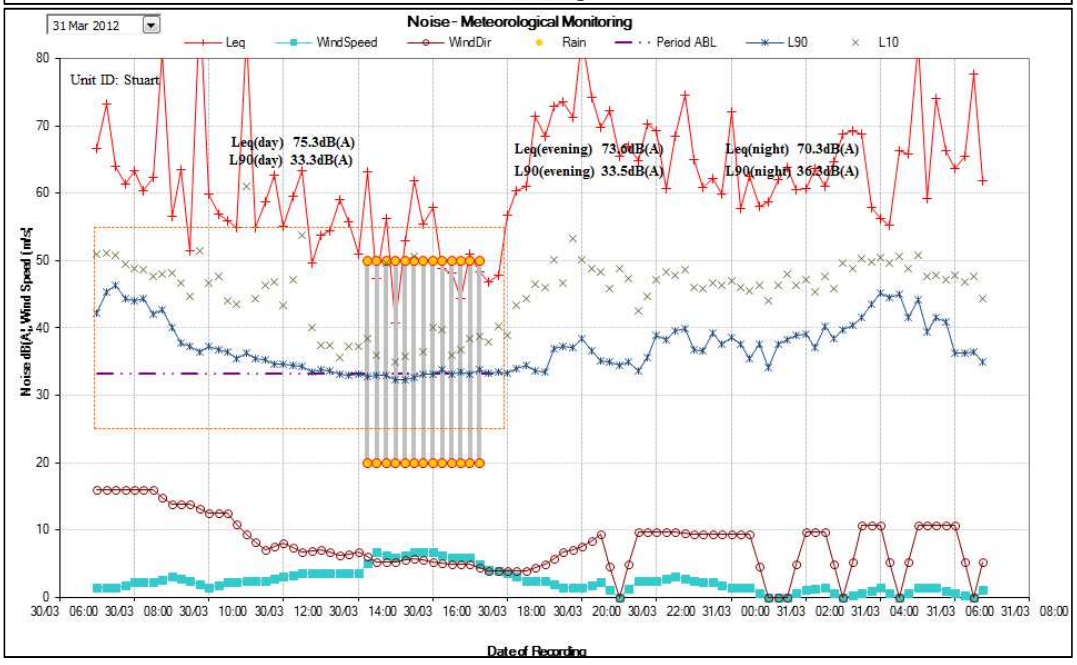

26 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 63.6dB(A)
L90(day) 32.3dB(A)
Leq(evening) 73.6dB(A)
L90(evening) 31.9dB(A)
Leq(night) 66.2dB(A)
L90(night) 32dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording

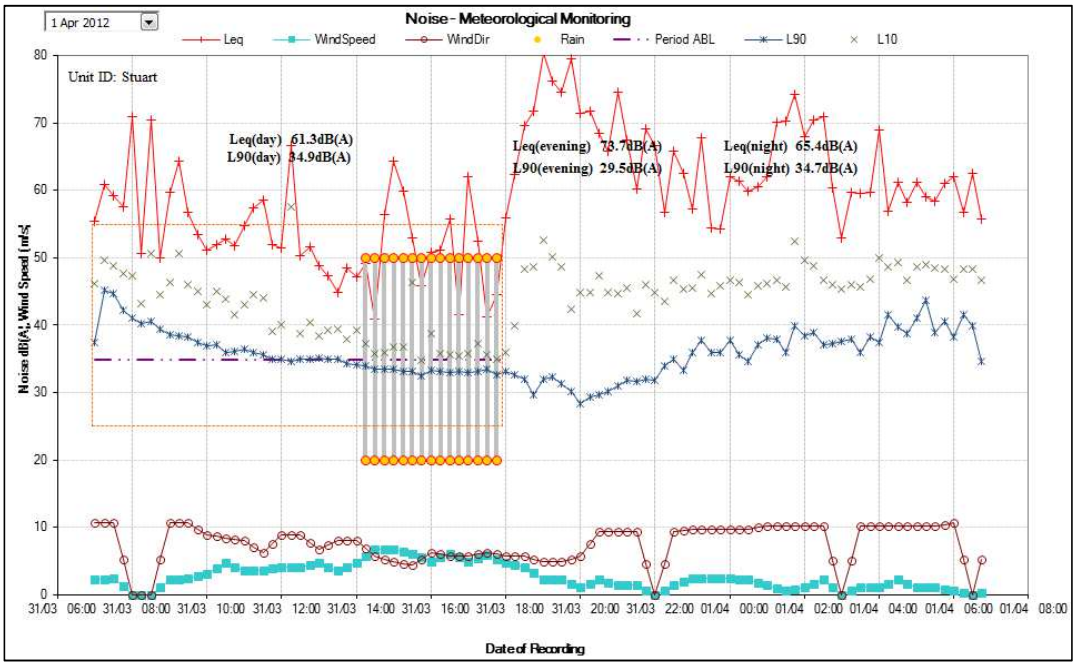

27 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 58dB(A)
L90(day) 29dB(A)
Leq(evening) 72dB(A)
L90(evening) 30.3dB(A)
Leq(night) 67.5dB(A)
L90(night) 32.8dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording


28 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 61.7dB(A)
L90(day) 29.1dB(A)
Leq(evening) 73dB(A)
L90(evening) 30.3dB(A)
Leq(night) 68dB(A)
L90(night) 33.3dB(A)
Noise dB(A), Wind Speed [m/s]
Date of Recording


29 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 60.4dB(A)
L90(day) 30.5dB(A)
Leq(evening) 75.4dB(A)
L90(evening) 32.7dB(A)
Leq(night) 65.6dB(A)
L90(night) 33.2dB(A)
Noise dB(A), Wind Speed [m/s]
Date of Recording


30 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 61.5dB(A)
L90(day) 30.5dB(A)
Leq(evening) 73.8dB(A)
L90(evening) 34dB(A)
Leq(night) 71dB(A)
L90(night) 32.7dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording


31 Mar 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 75.3dB(A)
L90(day) 33.3dB(A)
Leq(evening) 73.6dB(A)
L90(evening) 33.5dB(A)
Leq(night) 70.3dB(A)
L90(night) 36.3dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording


1 Apr 2012
Noise - Meteorological Monitoring
Leq
WindSpeed
WindDir
Rain
Period ABL
L90
L10
Unit ID: Stuart
Leq(day) 61.3dB(A)
L90(day) 34.9dB(A)
Leq(evening) 73.7dB(A)
L90(evening) 29.5dB(A)
Leq(night) 65.4dB(A)
L90(night) 34.7dB(A)
Noise dB(A); Wind Speed (m/s)
Date of Recording