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Ingham Property Development Pty Limited

Report for Ingham Residential Development Tahmoor

Noise Assessment

June 2013

Revision 4

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Executive summary

GHD was commissioned by Ingham Property Development Pty Limited (Ingham) to undertake an assessment of potential noise impacts associated with the proposed residential development located east of the existing Ingham Tahmoor turkey processing plant and irrigation ponds.

The acoustic assessment was undertaken with consideration to the following NSW Office of Environment and Heritage (OEH) guidelines:

- OEH *Industrial Noise Policy* (INP).
- OEH *Noise Guide for Local Government* (NGLG).

Operational Noise

The operational noise assessment suggests that project specific noise goals are expected to be achieved at all times of the day provided that existing operational activities do not change significantly.

Sleep Disturbance

The sleep disturbance noise assessment suggests that criteria will not be exceeded at any of the receivers.

This follows that the proposed residential development area is expected to meet all noise criteria with consideration to the INP and NGLG.

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Glossary for acoustic terms

Term	Description
dB	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels.
DECC	Department of Environment and Climate Change (NSW Government), later known as the Department of Environment Climate Change and Water, and now known as the Office of Environment and Heritage (OEH).
$L_{A90\ (Time)}$	The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise e.g. $L_{A90(15\ min)}$.
$L_{Aeq\ (Time)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{Aeq\ (15\ hr)}$	The L_{Aeq} noise level for the period 7:00 to 22:00 hours.
$L_{Aeq\ (9\ hr)}$	The L_{Aeq} noise level for the period 22:00 to 7:00 hours.
Mitigation	Reduction in severity.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period. This is the level used for assessment purposes.
Receiver	A noise modelling term used to describe a map reference point where noise is predicted. A sensitive receiver would be a home, work place, church, school or other place where people spend time.
Tonality	Noise containing a prominent frequency or frequencies characterised by definite pitch.

1. Introduction

GHD was commissioned by Ingham Property Development Pty Limited (Ingham) to undertake an assessment of potential noise impacts associated with the proposed residential development located east of the existing Ingham turkey processing plant and irrigation ponds in Tahmoor, NSW.

The purpose of the noise assessment is to determine the capability of the study area to support rural residential subdivision (eastern portion of the site), having regard to maintaining the existing operation of the Ingham turkey processing plant to the west.

The acoustic assessment was undertaken with consideration to the following NSW Office of Environment and Heritage (OEH) guidelines:

- OEH *Industrial Noise Policy* (2000) (INP).
- OEH *Noise Guide for Local Government* (2010) (NGLG).

1.1 Scope of works

The scope of work undertaken for this noise impact assessment consisted of the following:

- Initial review of aerial photography identified the site and the relative locations of the proposed subdivision and Ingham's turkey plant operations.
- Unattended noise monitoring was undertaken for a period of one week at two locations within the proposed subdivision.
- Attended measurements were undertaken in the vicinity of Ingham's turkey plant operations to determine the site operational noise emissions. This included measurements of specific noise sources within the premises.
- Noise data was assessed and filtered to remove invalid data due to extraneous noise or adverse weather conditions.
- Based on the monitoring results, applicable noise targets with consideration to the INP were determined.
- Based on site measurements, noise emissions of Ingham's turkey plant operations were modelled with consideration to the requirements of the INP.
- Noise contours of Ingham's turkey plant operations were produced and in-principle noise mitigation measures were recommended.

2. Project description

The site, located to the south of the East Tahmoor lands, comprises of approximately 166.45 hectares that is currently zoned RU4 Rural Small Holding under the Wollondilly Local Environment Plan 2011. This site currently comprises a series of large contiguous rural lots, and occupies an existing duck farm operation. The remainder of the land is used for general grazing. Further, it is noted that the Picton Tahmoor Thirlmere New Urban Lands Planning Proposal seeks to rezone a portion of land in East Tahmoor (to the north of the Ingham's site) from RU4 Rural Small Holdings to R2 Low Density to Residential. The Ingham Planning Proposal compliments the current proposed rezoning to the north of the site, albeit offering a unique and larger form of future residential subdivision on the periphery of the existing township of Tahmoor.

Figure 2-1 shows the site location, surrounding area and subdivision

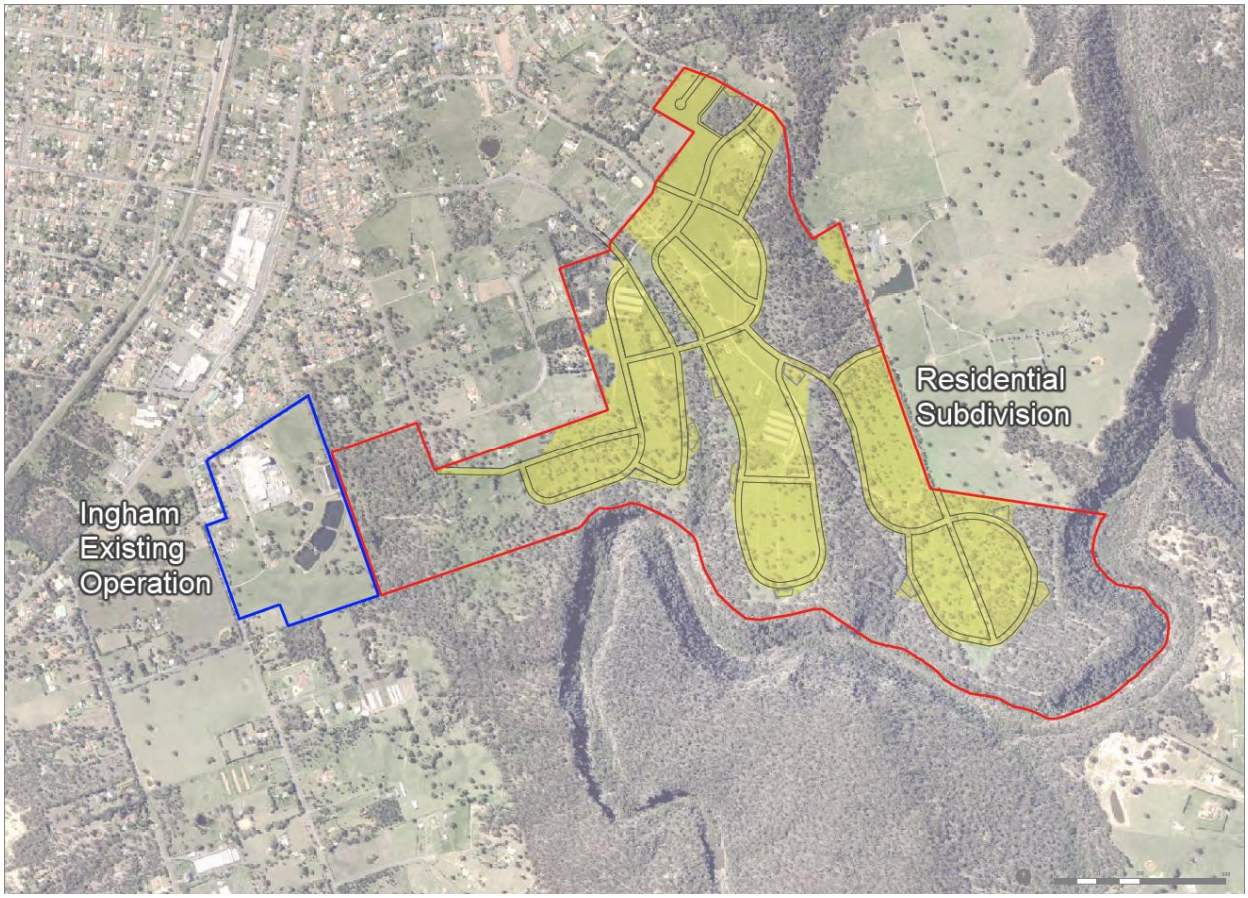


Figure 2-1 Location Wollondilly Shire Council, Tahmoor

Potential noise issues emitted from the Ingham Tahmoor site include:

- Mobile plant movement.
- External mechanical plant.
- Internal mechanical plant.

2.1 Surrounding land use

The subject site is owned by Ingham and is primarily used as duck breeding/farming activities. The areas immediately surrounding the redevelopment zone are primarily undeveloped land to the south, cleared land to the east and scattered residential properties to the north. However, this assessment does acknowledge that the lands to the immediate north and east of the site are the subject of current (and separate) planning proposals.

Based on site visits, the existing ambient noise environment is primarily constituted of the following noise source at the corresponding locations:

- Proposed residential zone:
  - Wind in foliage.
  - Birds.
  - Insects.
  - Domestic noise sources.
- Ingham's turkey plant site:
  - Compressors.
  - Birds.
  - Reverse beepers.
  - Mobile Plant.

2.2 Sensitive receivers

When completed, the proposed residential rezoning area will consist of circa 240 large residential lots. Due to the proximity, these lots may be exposed to noise from Ingham's turkey plant operations. The lots closest to the existing site would be expected to receive the greatest noise impact and have therefore been selected as representative sensitive receivers.

These sensitive receivers are listed in Table 2-1 and shown in Figure 2-2.

Table 2-1 Sensitive receivers

Sensitive Receiver	Minimum distance from project site boundary	Direction from Project Site	Description
R1	925 m	East	Residential
R2	925 m	East	Residential
R3	800 m	East	Residential
R4	750 m	East	Residential
R5	650 m	East	Residential
R6	550 m	East	Residential
R7	500 m	East	Residential
R8	500 m	East	Residential
R9	500 m	East	Residential

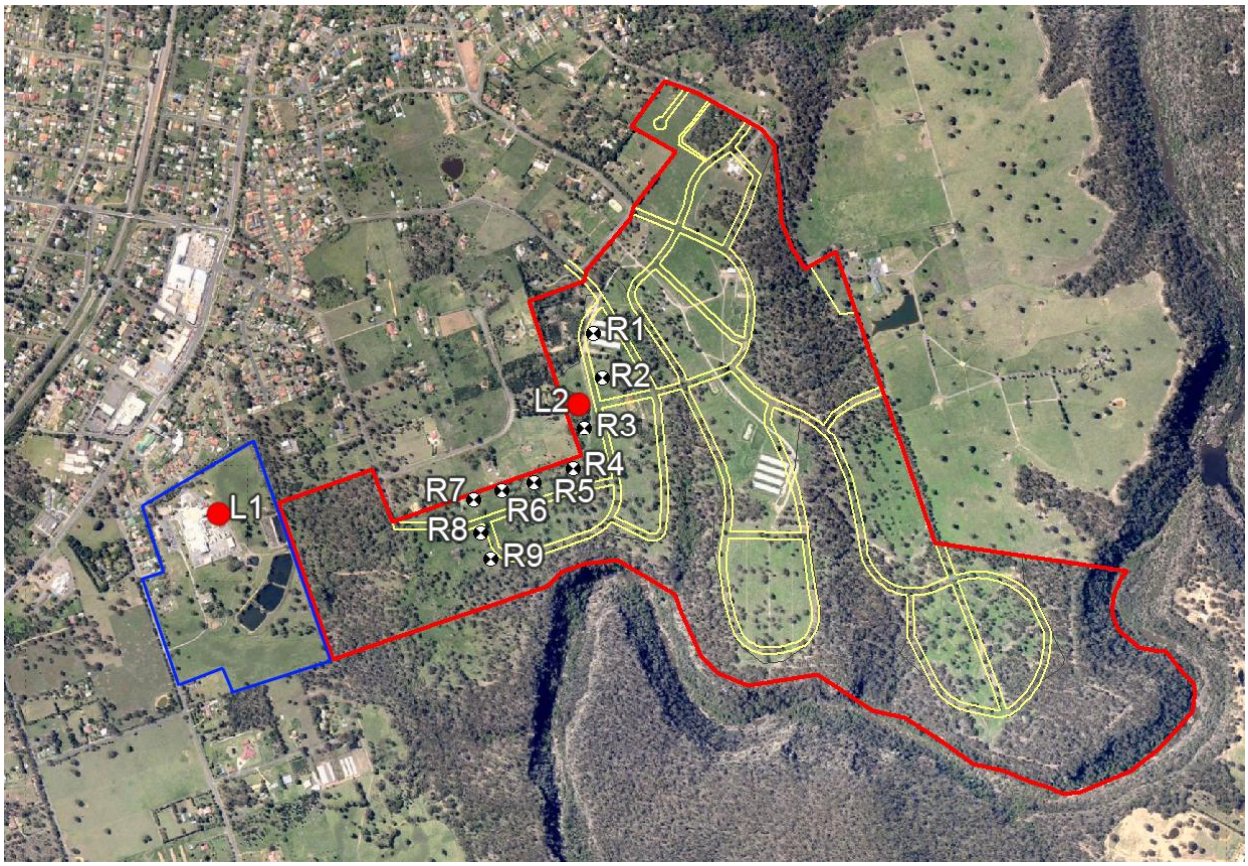


Figure 2-2 Aerial photograph - Sensitive receivers and monitoring locations

3. Existing environment

3.1 Noise monitoring methodology

3.1.1 Unattended noise monitoring

Long term noise monitoring was conducted within Ingham turkey plant operations (Location 1) and the proposed development site (Location 2). Long term monitoring was conducted using Rion NL-21 and Rion NL-22 noise loggers. The purpose of the noise logging was to characterise the existing noise environment in the vicinity of the subject site. The monitoring locations are shown in Figure 2-2. Care was taken to position loggers away from noise sources not indicative of the existing environment such as pumps and compressors.

Logged noise data was reviewed and filtered to exclude any anomalous data and data taken during periods of rain and/or wind speeds greater than 5m/s. Meteorological data for the monitoring period was sourced from the Bureau of Meteorology Camden Weather Station (22 km north of the site).

Field calibration checks were undertaken immediately before and after measurement periods, the result of which were considered acceptable.

Table 3-1 provides the details of the noise logging equipment used and measurement locations.

Table 3-1 Noise logger equipment information

Logger Specification	Location 1		Location 2	
Equipment	RION NL-22		RION NL-21	
Serial Number	00365350		00376380	
Calibration Check	*94.2/94.0@1kHz*		*94/94@1kHz*	
Location	Ingham's turkey processing plant		Ingham's planning proposal site	
Measurement	Started	Ceased	Started	Ceased
	17/07/2012 13:00	25/07/2012 09:45	17/07/2012 14:00	25/07/2012 11:30
Weighting/Response	A/Fast		A/Fast	

3.1.2 Operator attended noise monitoring

Operator attended noise monitoring was conducted at the two unattended logger locations on the 17 July 2012 for 15-minute durations immediately following logger placement to identify ambient noise sources and validate logger data. Measurements were conducted with consideration to AS 1044-1997 *Acoustics – Description Measurement of Environment Noise*.

Instantaneous noise levels for operator identified noise sources were observed and noted during measurements.

Noise measurements were conducted using a Bruel & Kjaer 2250 Sound Level Meter (SLM) calibrated using a Bruel & Kjaer 4231 sound level calibrator with a sound pressure level of 94 dB at 1 kHz immediately before and after measurements. The response of the SLM was considered acceptable. Noise instrument details are provided in Table 3-2.

Table 3-2 Attended monitoring instrumentation details

Instrument	Serial Number	Calibration Due Date
Bruel & Kjaer 2250 SLM	2506887	05/07/2013
Bruel & Kjaer 4231 Acoustic Calibrator	2542101	05/07/2013

3.2 Summary of noise monitoring results

Attended and unattended noise monitoring results as well as site observations indicates that the existing noise environment at the proposed site is dominated by noise sources typical of a rural environment. These include birds, insects and domestic noise. The operational site was inaudible at the proposed development area.

3.2.1 Operator attended noise monitoring results

A summary of attended noise monitoring results is provided in Table 3-3.

Table 3-3 Attended noise monitoring results, 17 July 2012

Location	Measurement Start Time	Measured Noise Levels dB(A)			
		L_{90}	L_{10}	L_1	L_{eq}
Ingham Tahmoor site	17/07/12 12:55	55	57	63	56
	25/07/12 10:09	52	55	58	54
	25/07/12 10:31	47	52	62	51
Proposed site	17/07/12 13:49	32	37	46	36

3.2.2 Unattended noise logging results

A summary of the calculated background L_{A90} (day, evening and night) noise levels for the monitoring period at Location 1 and Location 2 are provided in Table 3-4 and Table 3-7.

Table 3-4 Location 1 – Background L_{A90} noise levels, dB(A)

Date	Location 1		
	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
Tuesday-17-Jul-12	54	55	54
Wednesday-18-Jul-12	55	54	54
Thursday-19-Jul-12	54	55	55
Friday-20-Jul-12	54	55	54
Saturday-21-Jul-12	53	54	54
Sunday-22-Jul-12	53	54	54
Monday-23-Jul-12	56	55	55
Tuesday-24-Jul-12	53	54	54
Wednesday-25-Jul-12	55	-	-
Rating Background Level (RBL)	**54**	**54**	**54**

Note: '-' Indicates that insufficient data measurements were taken during this period or excluded due to wind or rain influence.

Table 3-5 Location 2 – Background L_{A90} noise levels, dB(A)

Date	Location 2		
	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
Tuesday-17-Jul-12	32	36	31
Wednesday-18-Jul-12	36	34	34
Thursday-19-Jul-12	31	35	33
Friday-20-Jul-12	31	36	34
Saturday-21-Jul-12	34	34	32
Sunday-22-Jul-12	32	35	33
Monday-23-Jul-12	31	34	34
Tuesday-24-Jul-12	28	33	33
Wednesday-25-Jul-12	37	-	-
Rating Background Level (RBL)	**32**	**35**	**33**

Note: '-' Indicates that insufficient data measurements were taken during this period or excluded due to wind or rain influence.

Table 3-6 Location 1 – Existing LAeq noise levels, dB(A)

Date	Location 1		
	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
Tuesday-17-Jul-12	56	56	56
Wednesday-18-Jul-12	57	55	56
Thursday-19-Jul-12	57	56	56
Friday-20-Jul-12	57	55	55
Saturday-21-Jul-12	56	55	55
Sunday-22-Jul-12	55	55	56
Monday-23-Jul-12	57	55	56
Tuesday-24-Jul-12	56	55	56
Wednesday-25-Jul-12	58	-	-
Overall L_{Aeq}	**57**	**55**	**56**

Note: '-' Indicates that insufficient data measurements were taken during this period or excluded due to wind or rain influence.

Table 3-7 Location 2 – Existing LAeq noise levels, dB(A)

Date	Location 2		
	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
Tuesday-17-Jul-12	46	42	39
Wednesday-18-Jul-12	45	40	43
Thursday-19-Jul-12	45	39	41
Friday-20-Jul-12	45	41	38
Saturday-21-Jul-12	45	38	40
Sunday-22-Jul-12	44	39	39
Monday-23-Jul-12	46	37	39
Tuesday-24-Jul-12	54	37	42
Wednesday-25-Jul-12	49	-	-
Overall L_{Aeq}	**48**	**39**	**40**

Note: '-' Indicates that insufficient data measurements were taken during this period or excluded due to wind or rain influence.

Appendix A shows statistical noise data in graphical form.

4. Project specific noise criteria

4.1 Operational noise criteria

Operational noise criteria applicable to the proposed site were determined with consideration to the OEH INP.

The INP provides guidance on the assessment of operational noise impacts. The guideline includes both Intrusive and Amenity criteria which are designed to protect receivers from noise significantly louder than the background level, and to limit the total noise level from all sources near a receiver.

Intrusive noise limits set by the INP control the relative audibility of operational noise compared to the background level. The Amenity criteria limit the total level of extraneous noise. Both sets of criteria are calculated and the more stringent of the two in each time period applies.

The Amenity criteria are determined based on the overall acoustic characteristics of the receiver area and the existing level of noise, excluding other noises that are uncharacteristic of the usual noise environment. Residential receiver areas are characterised into 'urban', 'suburban', 'rural' or other categories based on land uses and the existing level of noise from industry, commerce, and road traffic.

The indicative noise amenity category 'suburban residence' has been adopted for this Project. Table 2.2 in the INP provides modifications to the amenity criteria for existing levels of industrial noise. As there is no existing L_{Aeq} noise level from industrial sources at the receiver location no Table 2.2 modifications have been applied.

Where the same number applies to the amenity and intrusive criteria, the intrusive criteria would typically be more stringent because it is determined over the much shorter period of 15 minutes. In cases where the predicted amenity noise level is lower than the intrusive level for the proposed development, the proponent needs to ensure that both levels will be satisfied.

The rating background levels have been taken from Section 3.2 (Location 2). The project specific noise criteria for residential receivers are provided in Table 4-1. These are applicable to the entire proposed development noise impacts (cumulative).

Table 4-1 Project specific noise levels – Off-site sensitive receivers

Criterion	INP Project Specific Noise Levels dB(A)		
	Day (7 am to 6 pm)	**Evening** (6 pm to 10 pm)	**Night** (10 pm to 7 pm)
A: Rating Background Level ($_{period}$)	32	35	33
B: Intrusiveness criteria (A + 5dB) ($L_{Aeq, 15min}$)	37	37[1]	37[1]
C: Suburban amenity criteria ($L_{Aeq, period}$)	55	45	40
D: Amenity criteria: (INP Table 2.2 Adjusted) ($L_{Aeq, period}$)	NA	NA	NA
INP project specific criteria ($L_{Aeq, 15 minute}$)	**37**	**37[1]**	**37[1]**

[1] The values for evening and night have been adjusted according to the INP application notes to ensure the evening and night time intrusive criteria are not higher than the day time level.

The processing plant operation would operate during day and evening periods. This is assumed to include all operational noise sources that may have an impact on sensitive receivers. As the operational hours includes all time periods (day, evening and night) all criteria are applicable to this project.

4.2 Sleep disturbance

OEH NGLG provides guidelines for assessing sleep disturbance from short-term noise events. To assess potential disturbance during night-time hours (10.00 pm to 7.00 am), Section 2.4.5 of the NGLG recommends that $L_{A1,1min}$ levels outside a bedroom window should not exceed the background level by more than 15 dB.

Table 4-2 presents the sleep disturbance assessment goals developed from the lowest night-time RBL in Table 3-5.

Table 4-2 Sleep disturbance criteria dB(A)

Location	Existing Night RBL dB(A)	Sleep Disturbance Criteria dB(A) $L_{A1,1min}$
Location 2	32	47

5. Operational noise impact assessment

5.1 Noise modelling software

Acoustic modelling was undertaken using Computer Aided Noise Abatement (CadnaA) to predict the effects of site related noise from the proposed development.

CadnaA is a computer program for the calculation, assessment and prognosis of noise propagation. CadnaA calculates environmental noise propagation according to ISO 9613-2 *Acoustics – Attenuation of sound during propagation outdoors*. Ground absorption, reflection, terrain and relevant shielding objects are taken into account in the calculations.

The proposed development has been modelled based on available data at the time of the assessment.

5.2 Validation

Operational noise of the processing plant site determined from attended noise monitoring was used as an input to the operational noise model. The predicted operational levels were then compared to the unattended noise levels at location 1. This comparison showed that the model was within a 2 dB(A) variance. This is acceptable and therefore is validated for the purpose of this assessment.

The mechanical equipment and plant used in the operational model are shown in Table 5-1.

Table 5-1 Mechanical equipment and plant

Equipment	Quantity
Refrigeration compressor	3
Cooling Tower	1
Air compressor	2
Vacuum compressor	1
Offal and feather collector	2
Heating compressor	3
Compressor	1
Forklift (electronic)	2
Forklift (petrol)	2
Heavy mover	1
Road Lorry	2

5.3 Model configuration

Digital terrain contours (2 m and 10 m ground contours) and cadastral data were utilised in the model. Architectural drawings were also used to model the building layout and dimensions.

The following assumptions were made with regard to the model configuration:

- A general ground absorption coefficient of 0.5 was used throughout the model.
- Atmospheric conditions of 20˚C and 70% humidity was used.

Sound power levels for mechanical equipment and plant were calculated from attended measurements conducted during the site visit. Where equipment was unable to be measured, data was sourced from British Standard BS5228 - *Code of Practice for Noise and Vibration on Construction and Open Sites Part 1: Noise*, and attended noise monitoring. This data is presented in Table 5-2. This report is confined to the assessment of the development area and area in east Tahmoor. The model is configured such that it focuses on these areas only.

Table 5-2 Sound power levels (Lw)

Noise Source	Source of data	Lw dB(A)	Sound Power Level dB(A)								
			Octave Ban Centre Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
Road Lorry 39t 270kW (full)	BS5228	109	-	98	94	93	98	105	101	100	91
Forklift [Typ. Height 2m]	BS5228	85	78	78	78	78	78	78	78	78	78
Road Lorry 39t 320kW (empty)	BS5228	105	-	83	91	94	95	98	99	97	92
Refrigeration compressor	Measurement	93	36	48	68	76	88	88	86	81	68
Cooling tower	Measurement	86	51	64	71	77	81	79	77	76	71
Air compressor	Measurement	98	49	63	77	87	92	91	92	87	82
Compressor	Measurement	94	42	51	69	83	89	86	90	84	75
Vacuum Compressor	Measurement	74	30	42	63	62	67	70	67	62	55
Offal and feather collectors	Measurement	86	41	53	69	72	78	82	80	75	68

Noise Source	Source of data	Lw dB(A)	Sound Power Level dB(A)								
			Octave Ban Centre Frequency (Hz)								
			31.5	63	125	250	500	1k	2k	4k	8k
Boiler compressor	Measurement	73	27	36	47	53	61	65	68	68	64
Heavy mover	Measurement	85	44	63	69	74	78	81	78	73	66
Bird receiver opening	Measurement	93	45	66	74	85	89	86	87	79	67
Pallet receiver opening	Measurement	92	47	57	66	72	79	84	87	87	84
Conveyer opening	Measurement	87	41	55	70	76	79	81	81	78	72
Product load/unload opening	Measurement	86	46	51	77	74	77	84	78	69	57
Forklift load/unload opening	Measurement	87	54	52	75	74	79	84	80	73	61

Note:

(-) Denotes data not available

5.3.1 Modelling scenario

GHD has assumed that all mechanical plant operates continuously throughout the day. The mechanical plant and the internal to external plant openings have been placed according to locations determined during site visits. The noise sources used are shown in Table 5-2, time corrections were applied to mobile plant to account for the intermittent nature of the noise source.

5.3.2 Sleep disturbance assessment

Based on site attended noise monitoring, typical L_{Amax} noise levels due to operational noise is 10 dB(A) higher than measured L_{Aeq} values. Sleep disturbance was conservatively assessed by adjusting the L_{Aeq} modelled results by the above 10 dB(A) difference to account for short-term maximum noise events.

5.4 Predicted results

Predicted noise levels from the processing plant operations are summarised in Table 5-3 and Table 5-4. Figure 5-1 depicts the noise contour lines generated by the turkey plant operational noise corresponding to the INP and Sleep Disturbance criteria. Figure 5-2 shows the same impacts but by increments of 5dB(A) from 35dB(A).

Table 5-3 Predicted sounds pressure levels – Site operations – dB(A)

Receiver	Noise Impact, $L_{Aeq(15min)}$ dB(A)	Criteria $L_{Aeq(15min)}$ dB(A) (day, evening and night)	Comply with Criteria
R1	30	37	Yes
R2	29	37	Yes
R3	26	37	Yes
R4	26	37	Yes
R5	30	37	Yes
R6	32	37	Yes
R7	35	37	Yes
R8	33	37	Yes
R9	31	37	Yes

Table 5-3 indicates that project specific noise criteria should not be exceeded at any time of the day.

Table 5-4 Sleep disturbance criteria – Site operations – dB(A)

Receiver	Noise Impact $L_{A1(1min)}$ dB(A)	Sleep Disturbance Criteria $L_{A1(1min)}$ dB(A)	Comply With Criteria
R1	40	47	Yes
R2	39	47	Yes
R3	36	47	Yes
R4	36	47	Yes
R5	40	47	Yes
R6	42	47	Yes
R7	45	47	Yes
R8	43	47	Yes
R9	41	47	Yes

Table 5-4 indicates that the sleep disturbance criteria should not be exceeded at any of the sensitive receiver locations within the proposed development. Figure 5-1 indicates that the exclusion zone provided within the subdivision layout design provides a suitable noise buffer. Noise sensitive receivers beyond this zone are anticipated to receive noise levels which are less than the project specific criteria.

The above conclusions are valid for the proposed site only as the background noise levels provided in this report are site-specific and, therefore, so are the noise targets. Higher or lower background noise levels experienced at other locations surrounding the subject site will lead to potentially different noise limits. As such, the buffer zone inbuilt in the subdivision layout is not necessarily appropriate outside the subject subdivision.

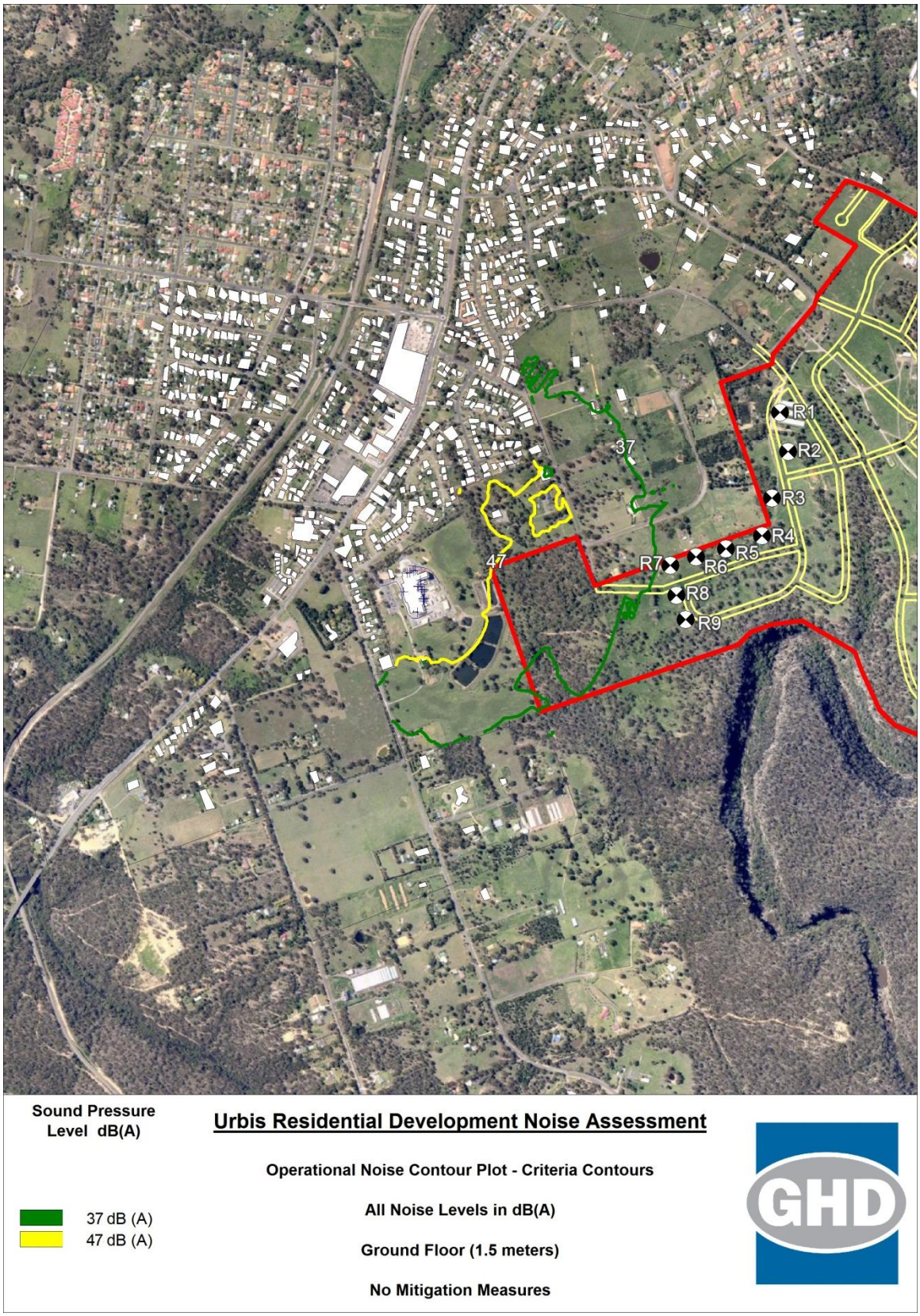


Figure 5-1 Operational Noise Contour Map – Criteria Contours

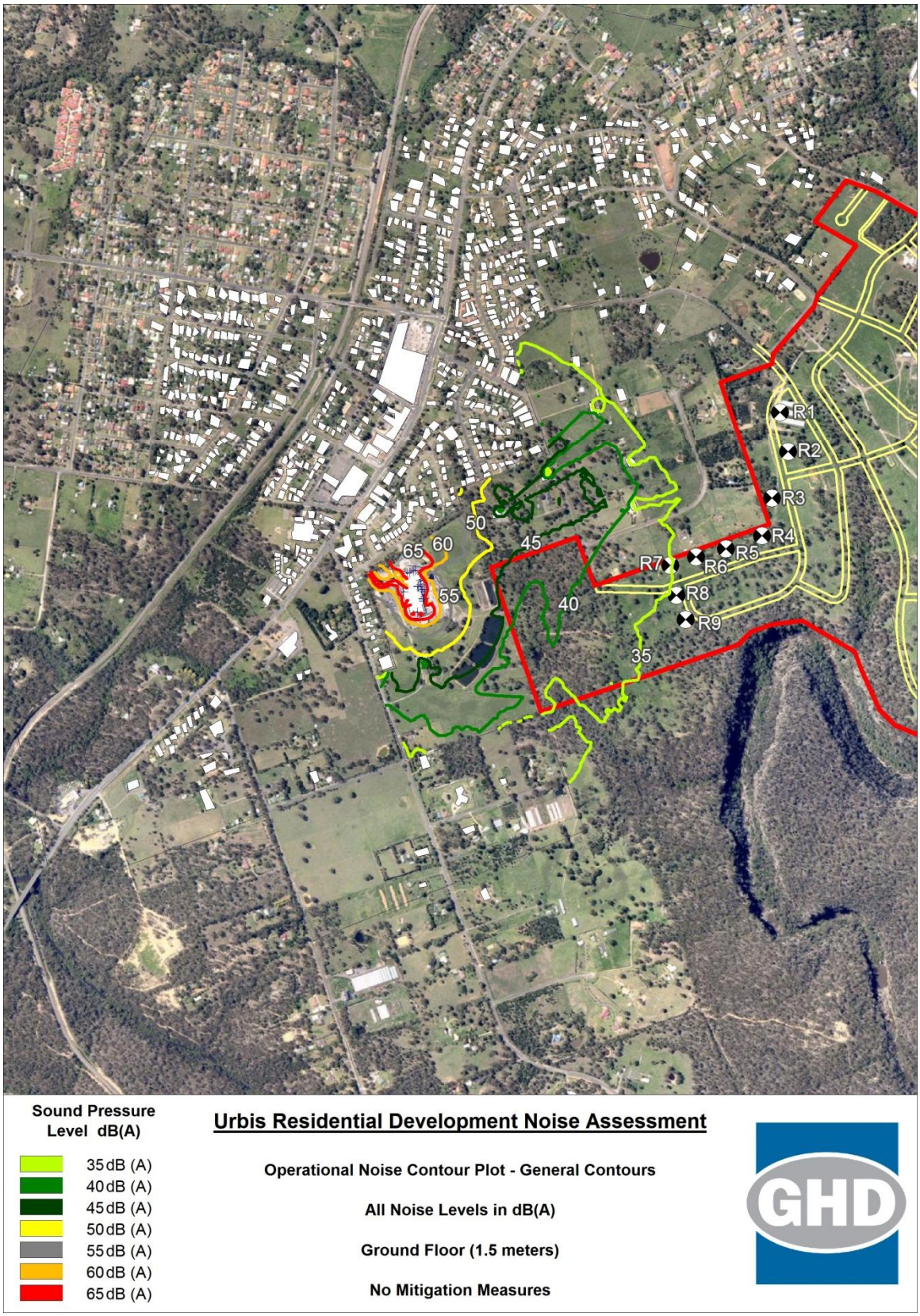


Figure 5-2 Operational Noise Contour Map – General Contours

6. Conclusion

GHD has undertaken an assessment of potential noise impacts associated with the proposed residential development located east of the existing turkey processing plant and irrigation ponds.

The acoustic assessment, including noise prediction modelling, was undertaken with consideration to the following NSW Office of Environment and Heritage (OEH) guidelines:

- OEH *Industrial Noise Policy* (INP)
- OEH *Noise Guide for Local Government* (NGLG)

Noise logging was undertaken to assist with establishing the project specific noise levels for the site. The results of logging and the relevant noise criteria are presented in Section 3 and 4 respectively.

Noise levels of the operations at the existing processing plant were measured on site for input into the noise model which provided noise level predictions at the nearest proposed noise sensitive receivers.

The main findings of this noise impact assessment are as follows:

Operational noise

The results of the operational noise assessment presented in Section 5.4 indicate that noise levels produced by the existing processing plant facility are anticipated to be within project specific noise goals during the day, evening and night time periods of 37 dB(A) $L_{eq\ 15\text{-}minute}$ at the proposed nearby noise sensitive receivers.

Sleep disturbance

The sleep disturbance noise assessment suggests that the night time sleep disturbance criterion of 47dB(A) $L_{1,\ 1\text{-}minute}$ will not be exceeded at any of the receivers.

The buffer zone inbuilt in the proposed subdivision provides a suitable noise buffer. Noise sensitive receivers beyond this zone are anticipated to receive noise levels which are less than the project specific and sleep disturbance criteria.

The proposed residential development area is anticipated to be acceptable from a noise perspective in relation to the Ingham turkey processing plant facility with consideration to the INP and NGLG.

7. Limitations

This Noise Impact Assessment ("Report"):

- Has been prepared by GHD Pty Ltd ("GHD") for Ingham Property Development Pty Limited.
- May only be used and relied on by Ingham Property Development Pty Limited.
- Must not be copied to, used by, or relied on by any person other than Ingham Property Development Pty Limited without the prior written consent of GHD.
- May only be used for the purpose of assessing the noise impacts of the proposed development (and must not be used for any other purpose).

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than Ingham Property Development Pty Limited arising from or in connection with this Report.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in Section 1.1 of this Report.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking services and preparing the Report ("Assumptions"), including (but not limited to):

- Assumptions provided in Sections 5.

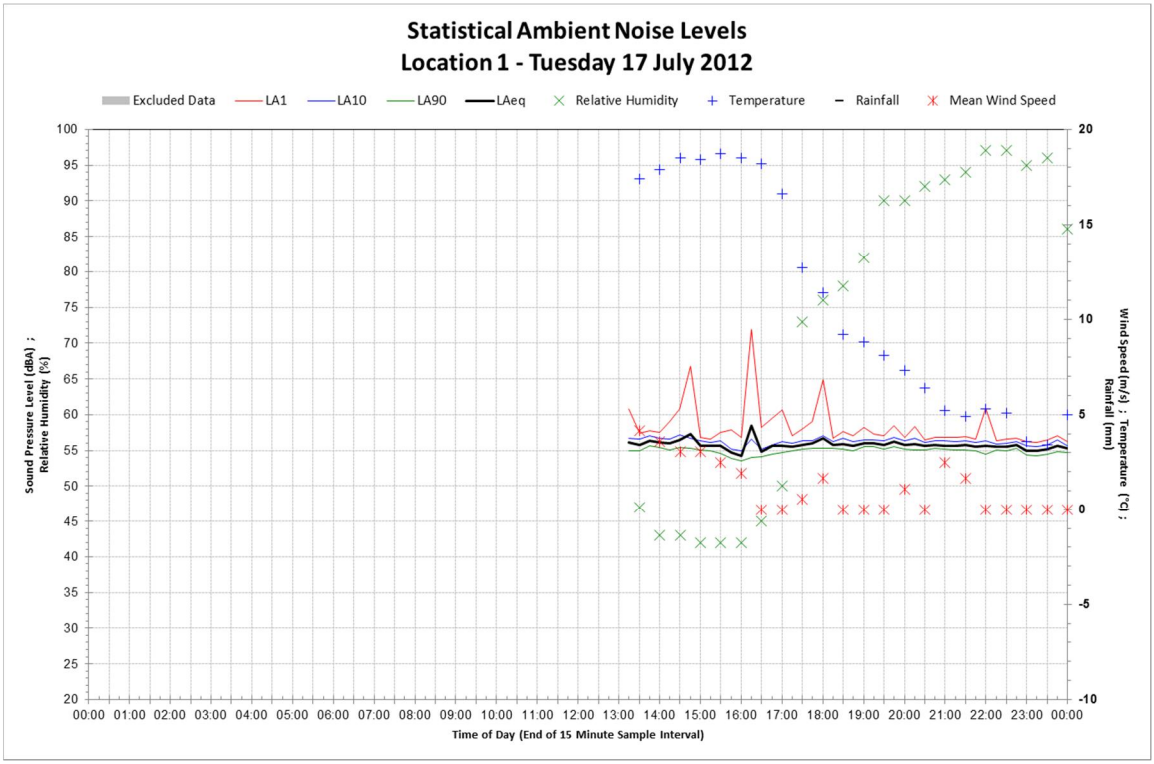
GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.

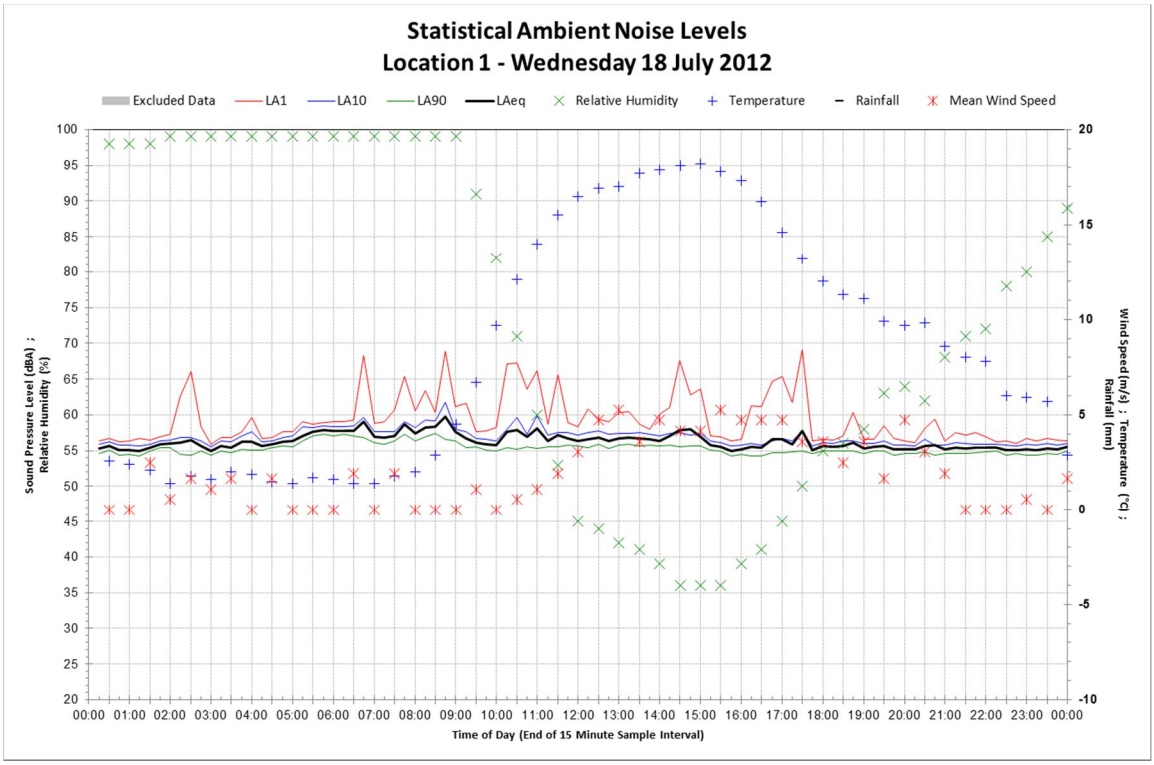
It is not the intention of the assessment to cover every element of the acoustical environment, but rather to conduct the assessment with consideration to the prescribed work scope. In particular, it should be noted that this report does not include assessment of noise impacts on the proposed residential part of the subject development.

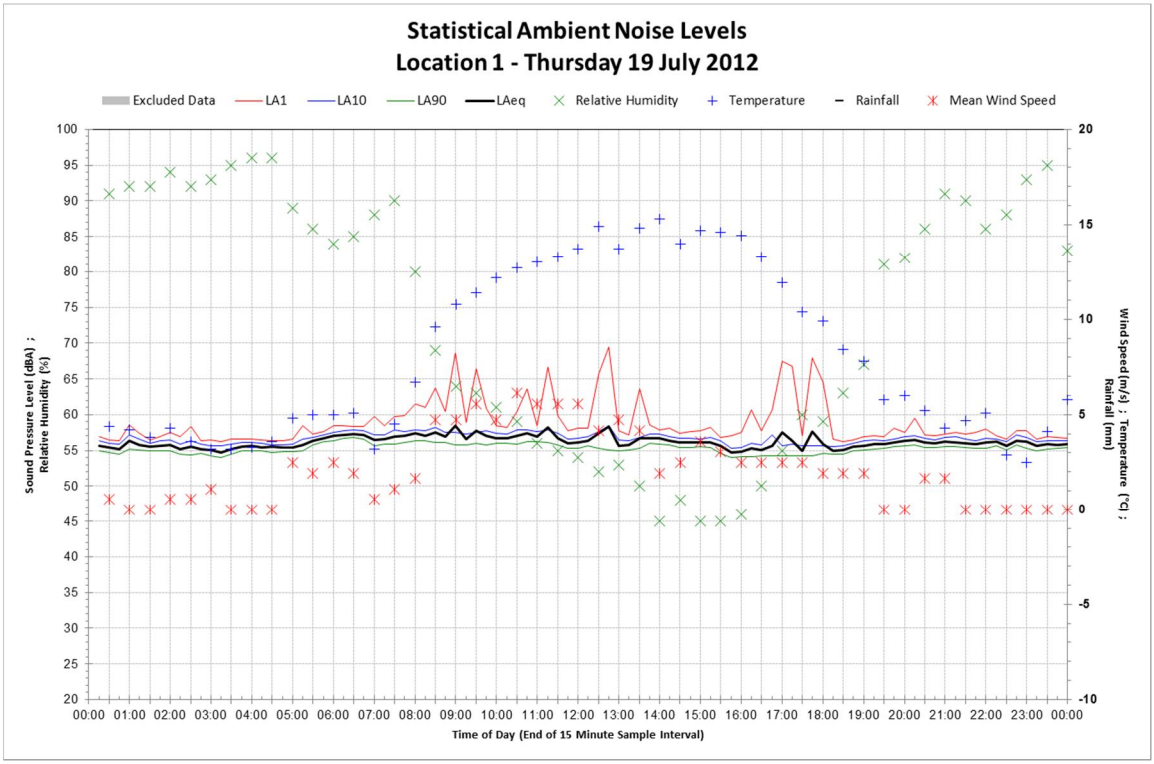
The findings of the acoustic assessment represent the findings apparent at the date and time of the monitoring and the conditions of the area at that time. It is the nature of environmental monitoring that not all variations in environmental conditions can be accessed and all uncertainty concerning the conditions of the ambient noise environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

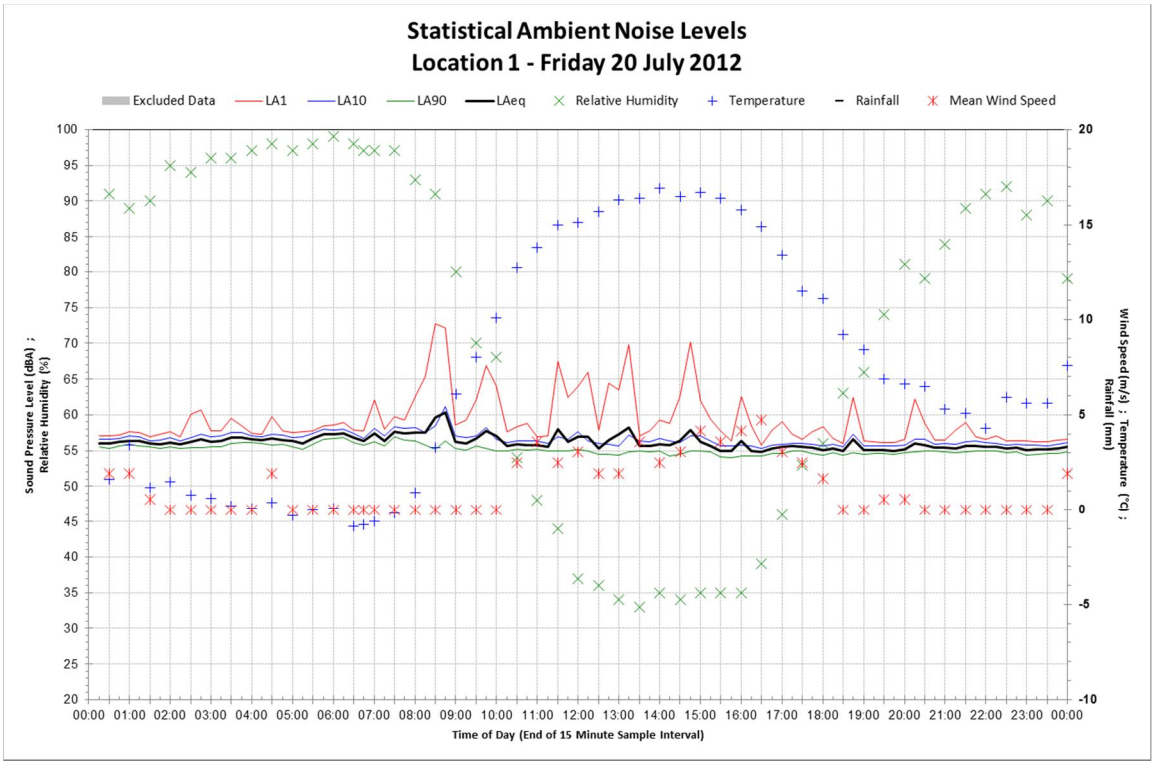
Appendix A

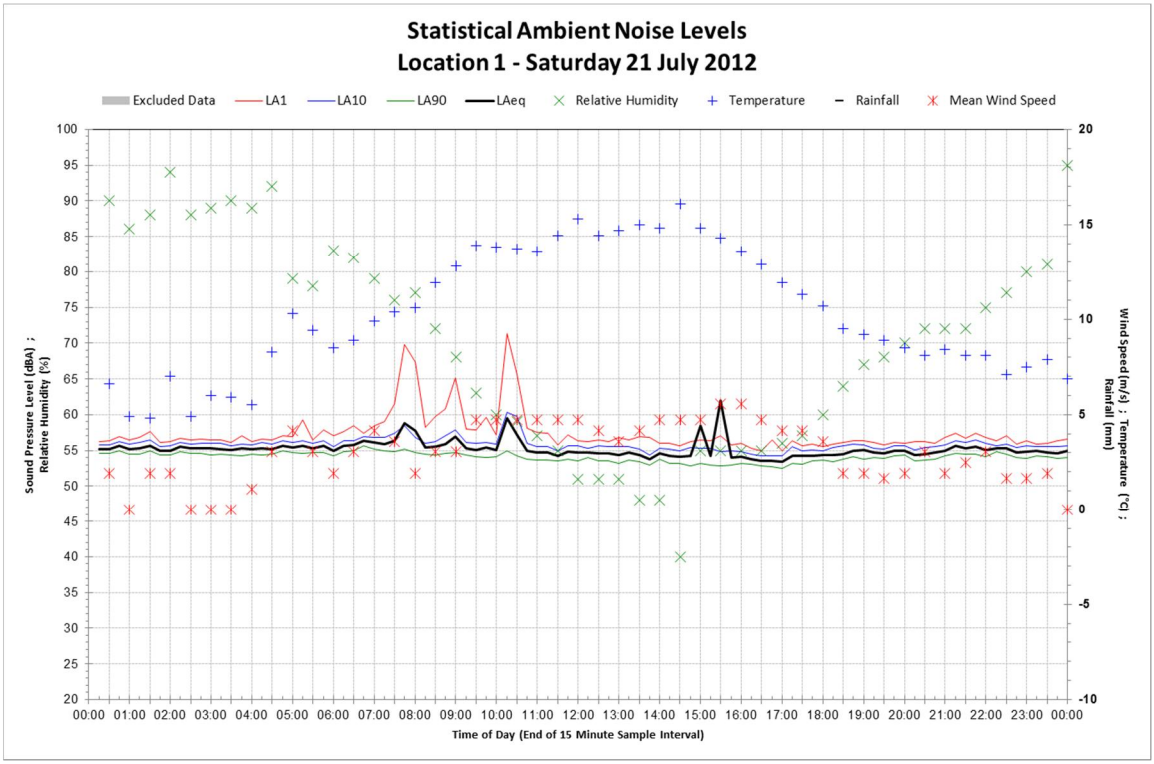
Noise monitoring charts

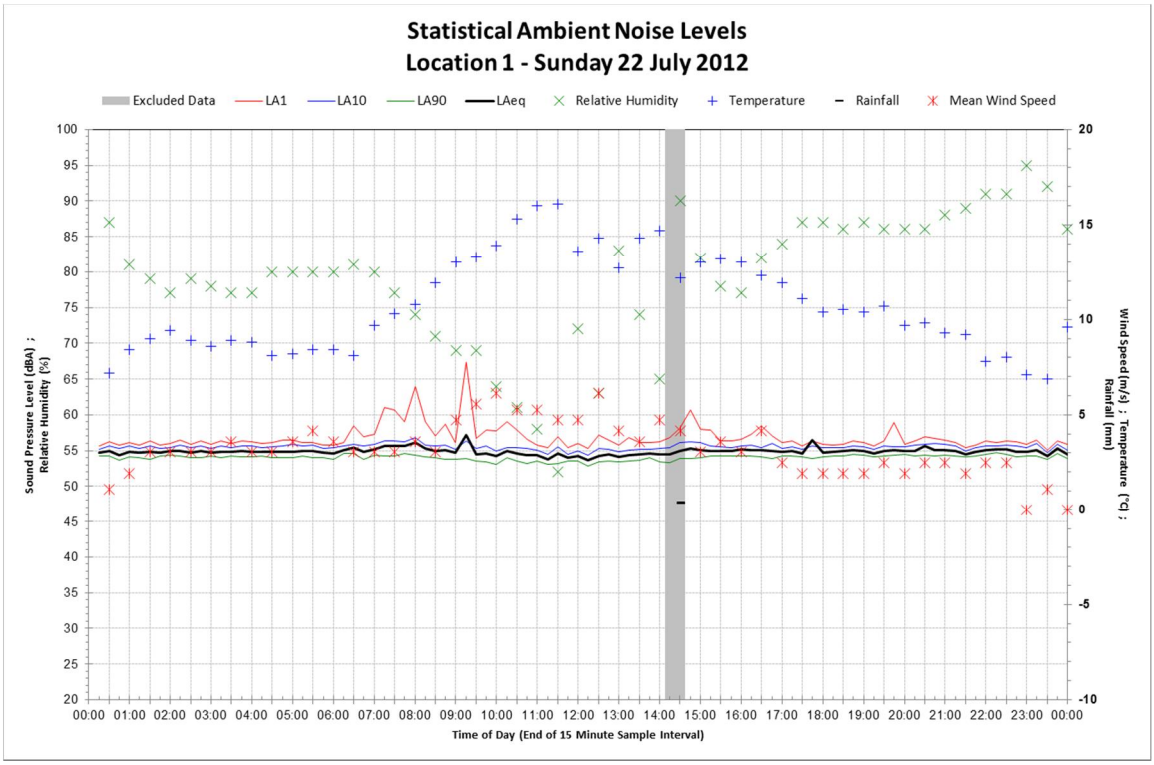

Statistical Ambient Noise Levels
Location 1 - Tuesday 17 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

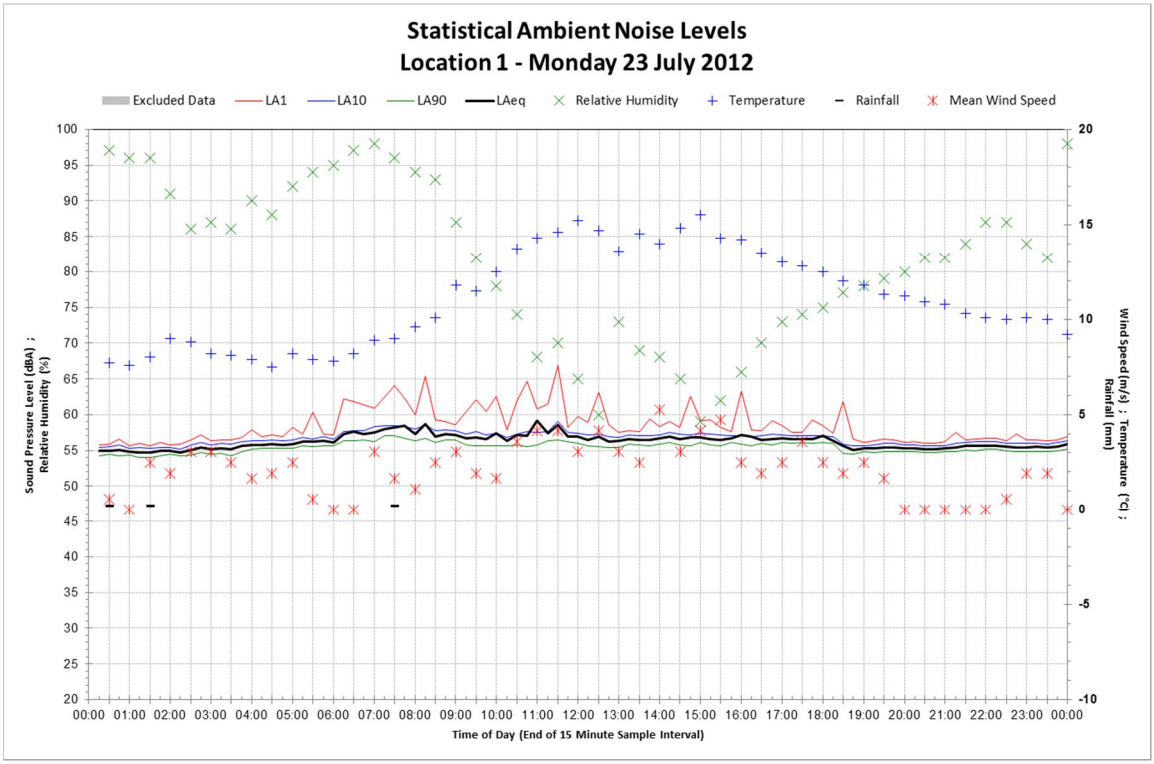

Statistical Ambient Noise Levels
Location 1 - Wednesday 18 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

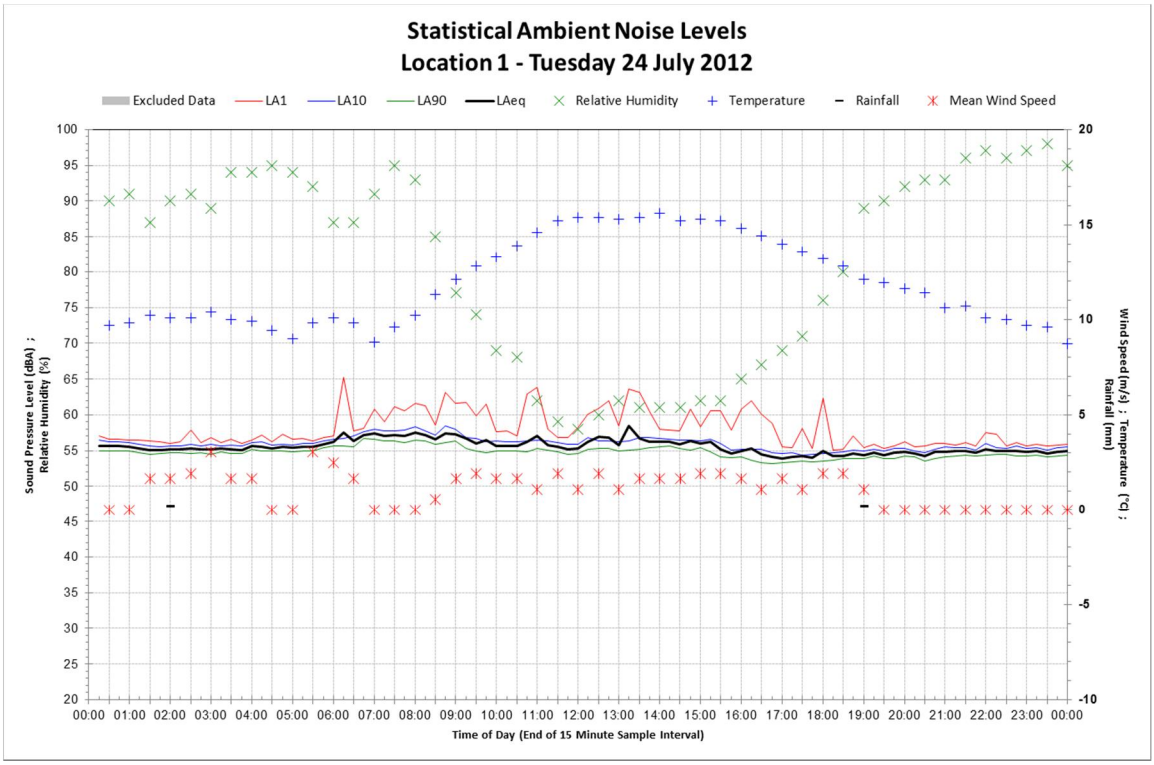

Statistical Ambient Noise Levels
Location 1 - Thursday 19 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

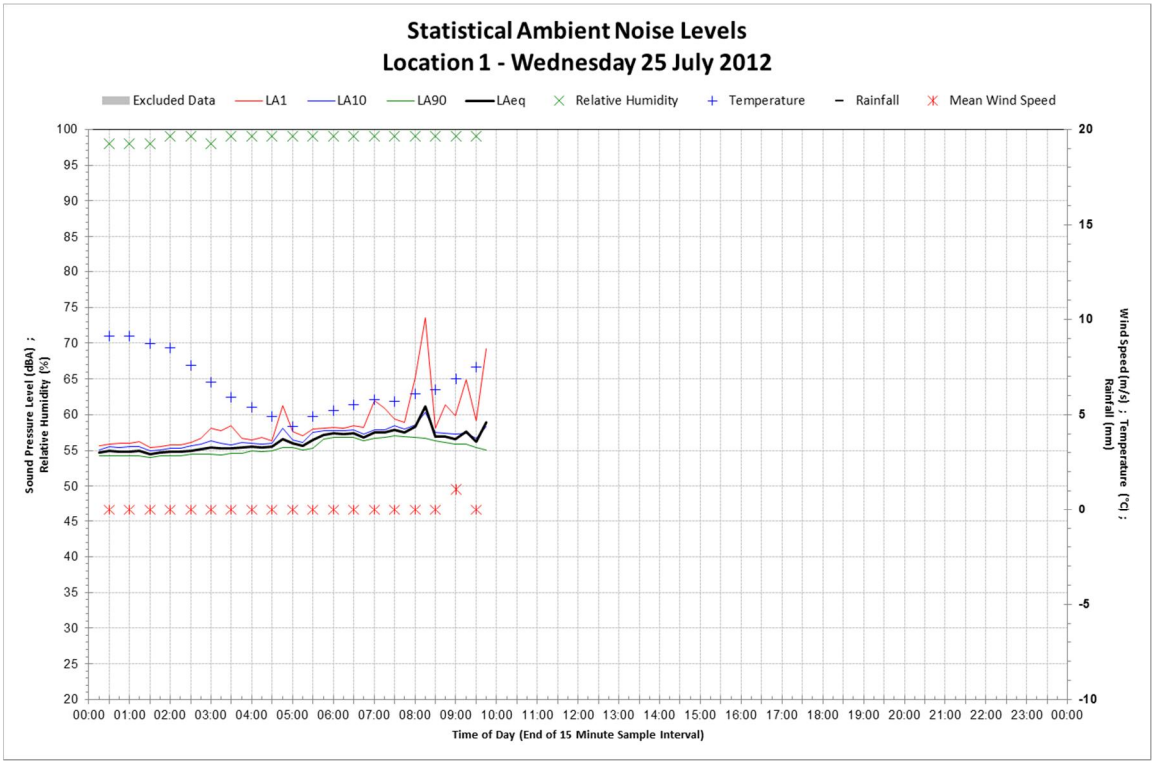

Statistical Ambient Noise Levels
Location 1 - Friday 20 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

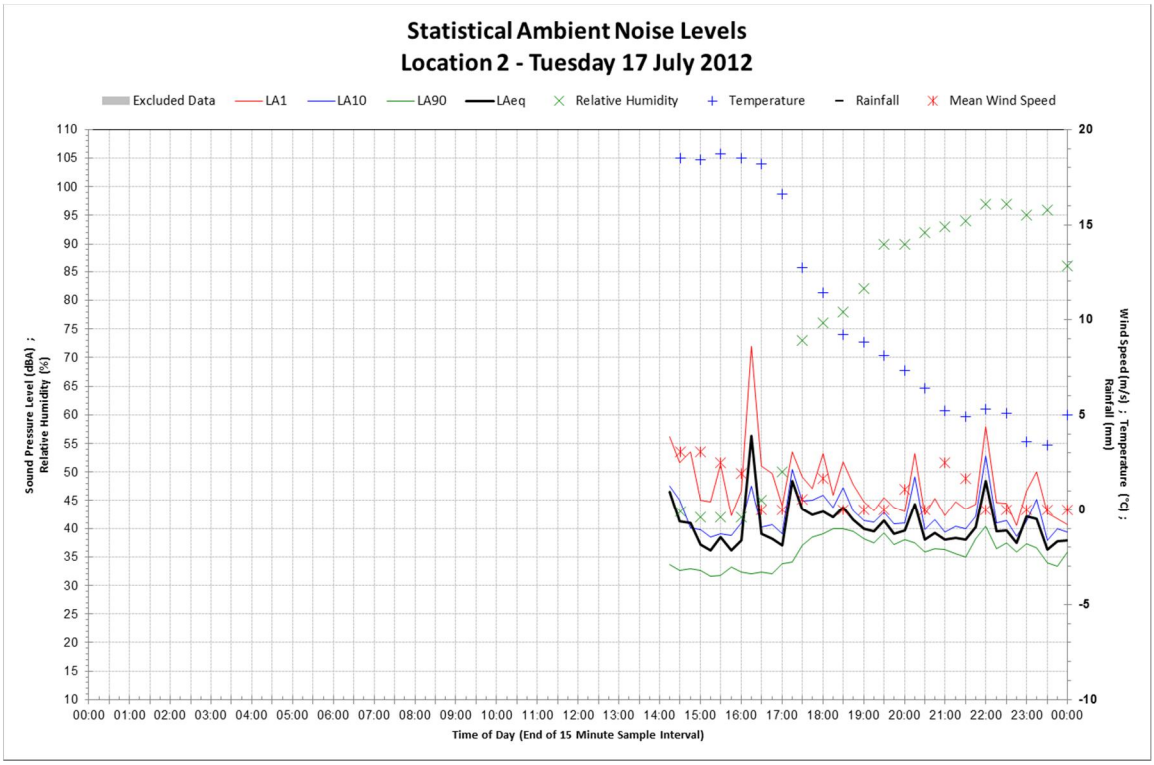

Statistical Ambient Noise Levels
Location 1 - Saturday 21 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

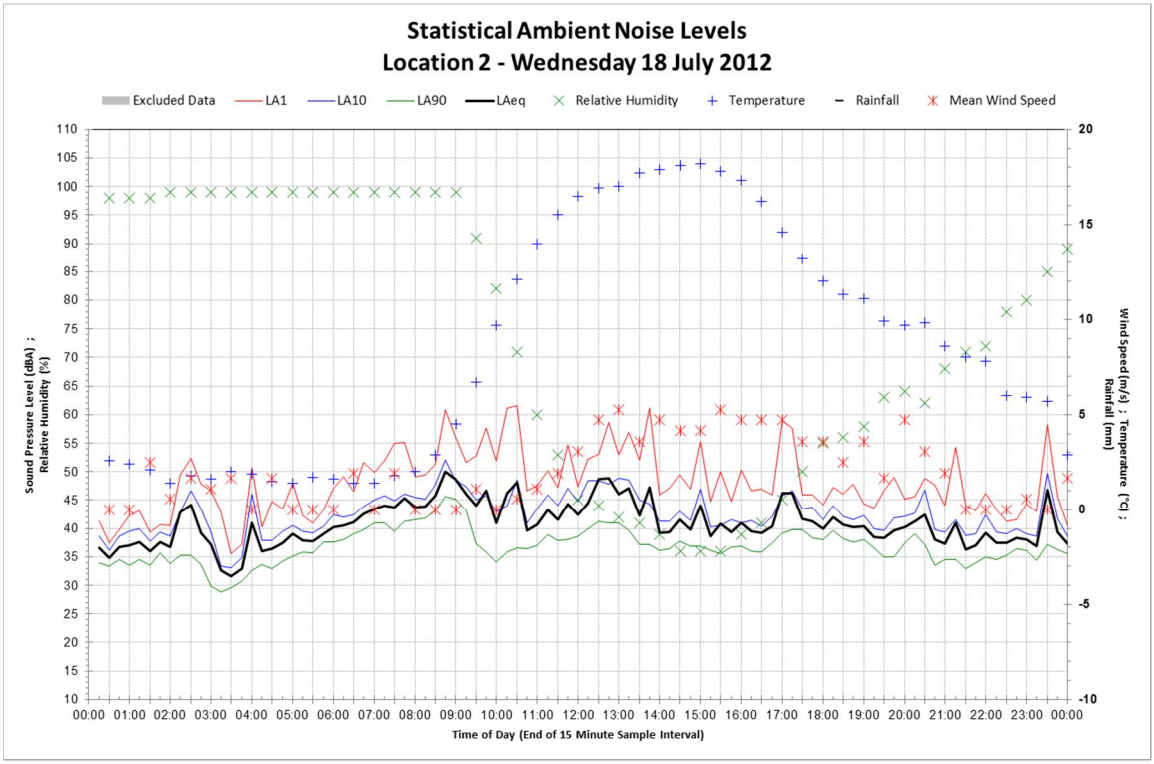

Statistical Ambient Noise Levels
Location 1 - Sunday 22 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

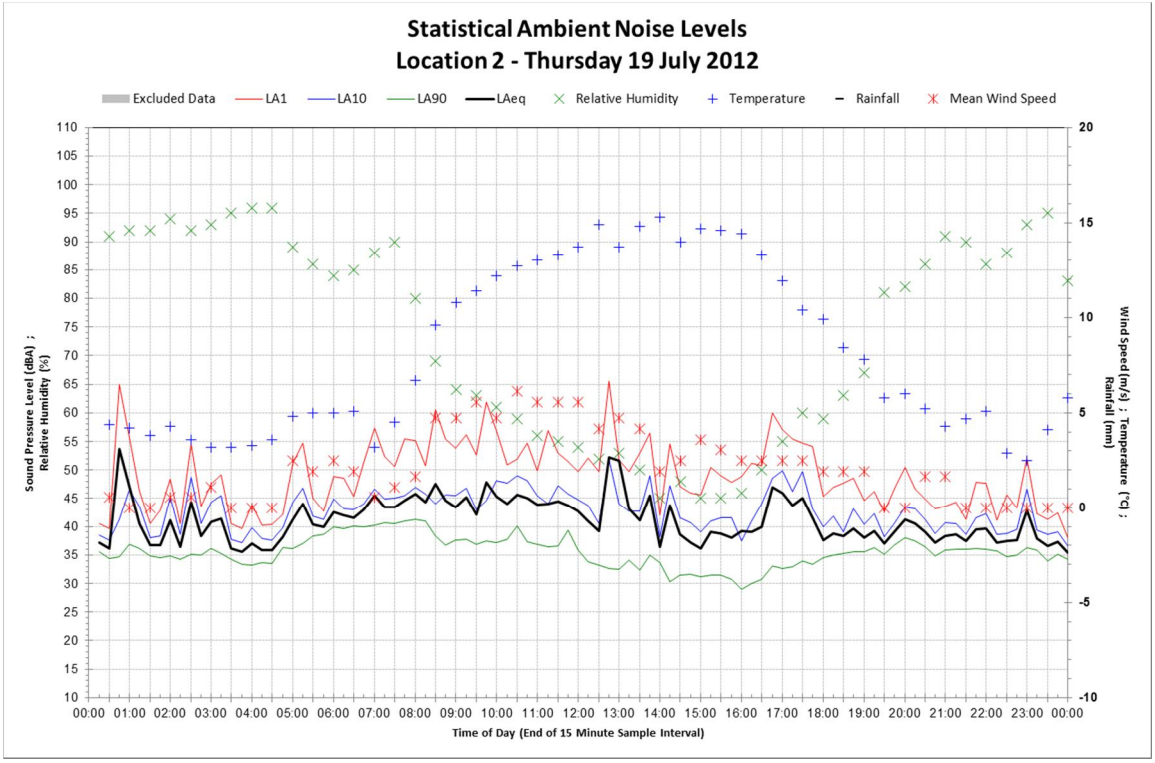

Statistical Ambient Noise Levels
Location 1 - Monday 23 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

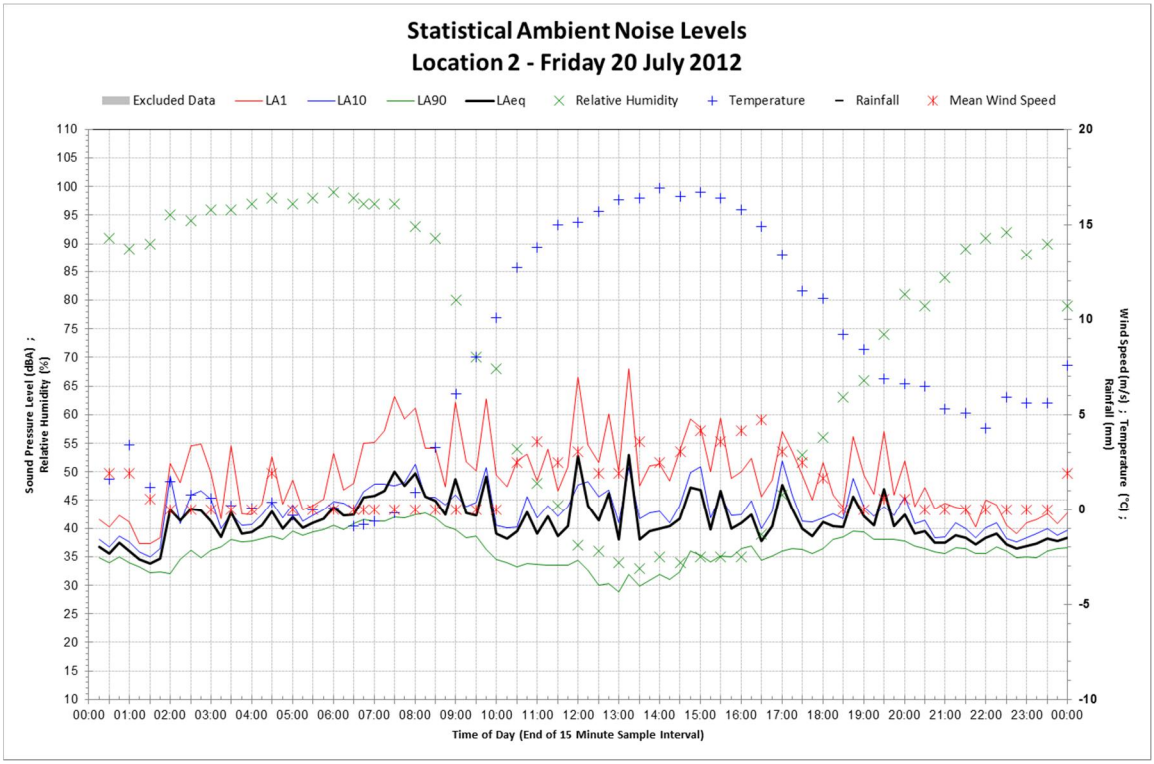

Statistical Ambient Noise Levels
Location 1 - Tuesday 24 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

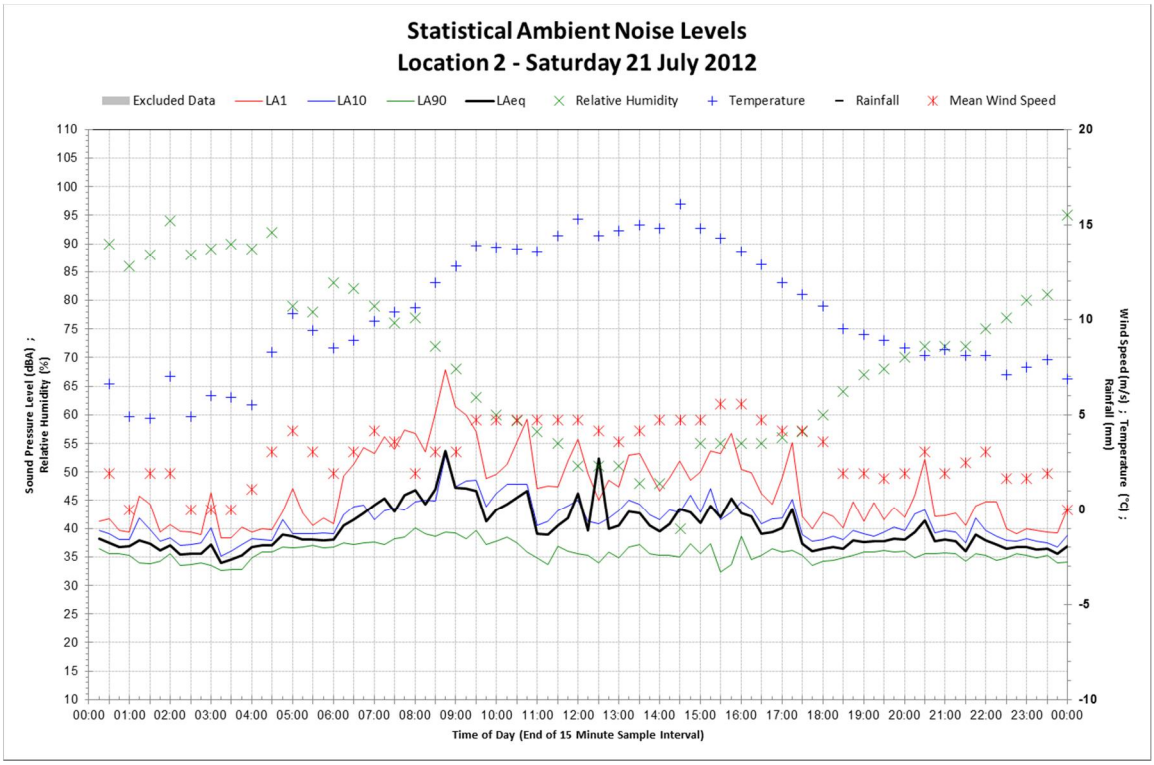

Statistical Ambient Noise Levels
Location 1 - Wednesday 25 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

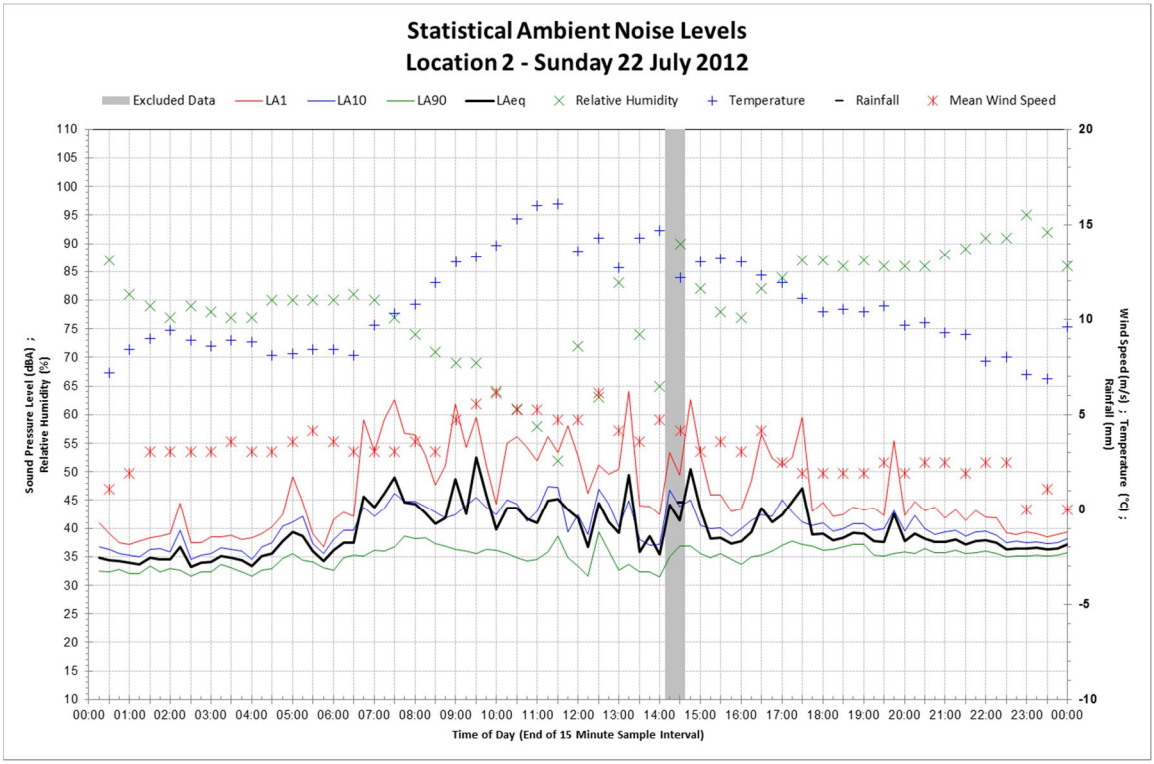

Statistical Ambient Noise Levels
Location 2 - Tuesday 17 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

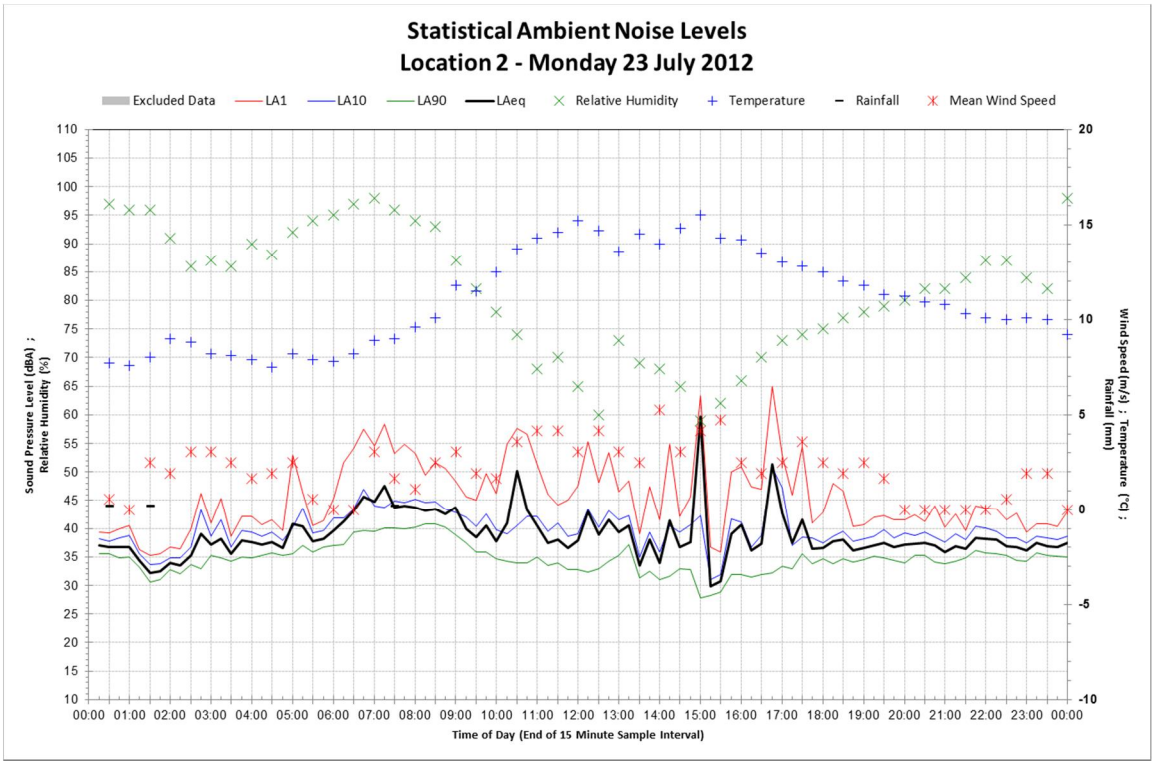

Statistical Ambient Noise Levels
Location 2 - Wednesday 18 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

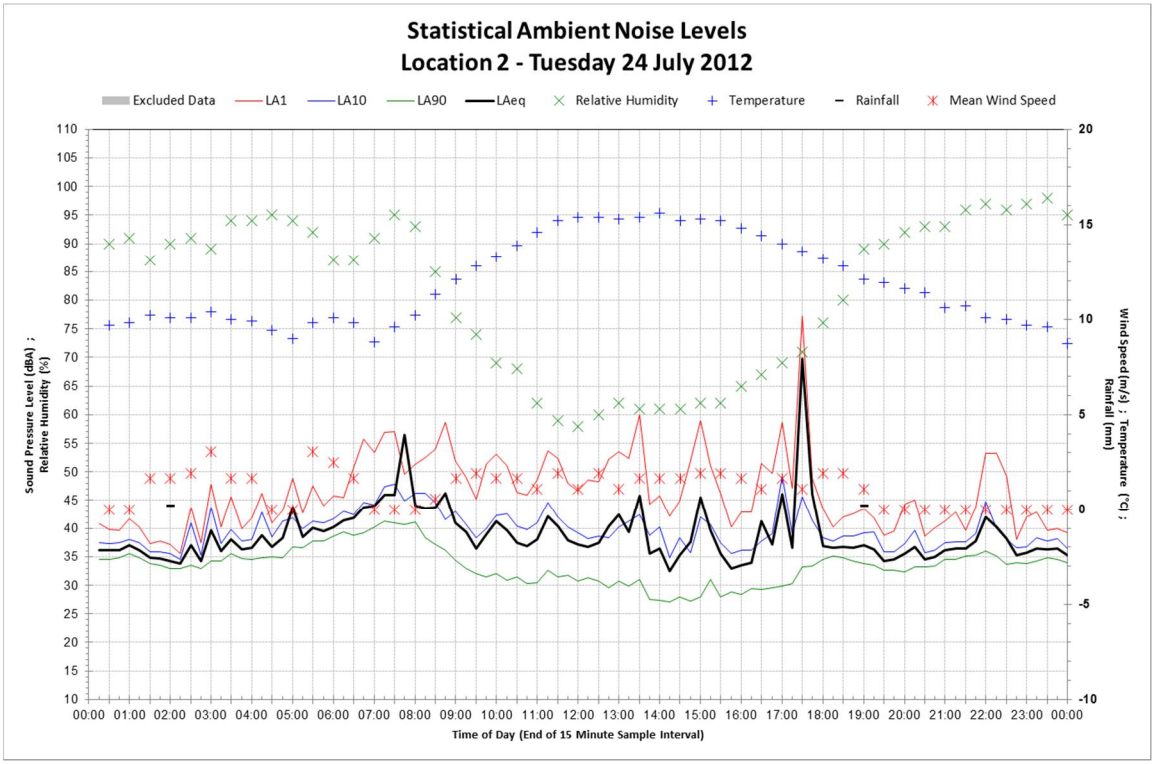

Statistical Ambient Noise Levels
Location 2 - Thursday 19 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

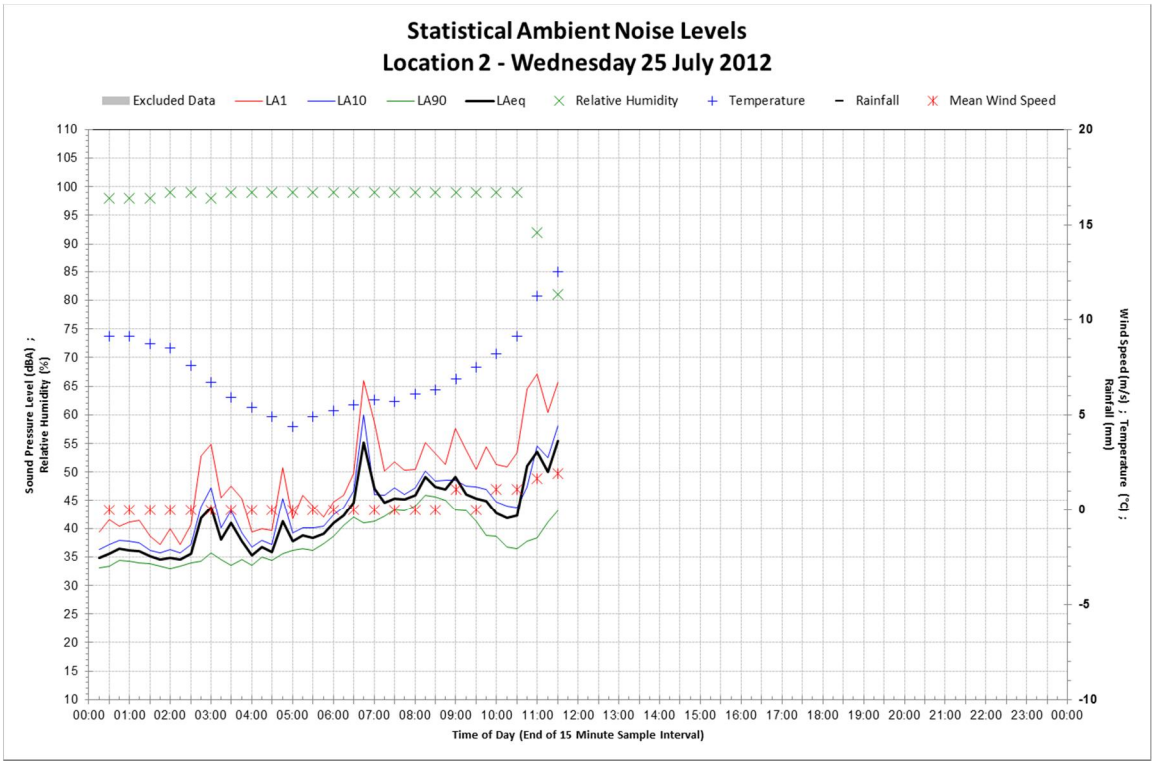

Statistical Ambient Noise Levels
Location 2 - Friday 20 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Location 2 - Saturday 21 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Location 2 - Sunday 22 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Location 2 - Monday 23 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Location 2 - Tuesday 24 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Location 2 - Wednesday 25 July 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
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1	J Tjia	S Ritchie	*S Ritchie*	C Evenden	*V Chavand*	01/02/2013
2	J Tjia	V Chavand	*V Chavand*	V Chavand	*V Chavand*	04/06/2013
3	J Tjia	V Chavand	*V Chavand*	V Chavand	*V Chavand*	06/06/2013
4	J.Tjia	V Chavand		V Chavand		31/07/2013