Resource Recovery and Recycling Centre

Wetherill Park NSW

Noise and Vibration Impact Assessment

January 2017

Prepared for

Bettergrow Pty Ltd

Global Acoustics

Noise and Vibration Analysis and Solutions

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Resource Recovery & Recycling Centre, Wetherill Park NSW

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EXECUTIVE SUMMARY

Global Acoustics was engaged by Bettergrow Pty Ltd to carry out a noise and vibration impact assessment for a proposed resource recovery and recycling centre at 24 Davis Road, Wetherill Park NSW.

Construction Noise

A worst case construction scenario was developed that considered all construction equipment operating concurrently and continuously at full power. Such a scenario is unlikely to eventuate.

Predicted construction noise levels were below relevant construction noise criteria at the nearest industrial and residential receivers to the site. No construction noise impact is predicted.

Operational Noise

A model of the proposed site was developed, including separate morning shoulder/day (6am to 6pm) and evening/night period scenarios (6pm to 6am).

The morning shoulder/day period scenario considered a potential worst case operating configuration, including all four operating areas operating concurrently at full capacity. All roller doors on processing buildings were considered to be open, and peak period trucking movements were included. As such, this is considered a conservative scenario, and resulting noise levels from the site should typically be less than predicted. Predicted operational noise levels were below relevant noise criteria at the nearest industrial receivers to the site, and, were 7 dB or more below relevant criteria at the nearest residential receivers to the site.

The evening/night period scenario considered worst case trucking movements. No processing activities are proposed for this period. Predicted operational noise levels were below relevant noise criteria at the nearest industrial receivers to the site, and, were well below relevant criteria at the nearest residential receivers to the site. General traffic movements on site would not be audible at residential locations.

No operational noise impact is predicted.

Sleep Disturbance

Sleep disturbance impact was assessed by inclusion of a point source with L_{Amax} sound power of 120 dB to represent possible impact noise associated with unloading material on site during the night period, and, concurrently with operational activities during the morning shoulder period. The source was located in an exposed location in an elevated area of the site. Model predictions were well below the sleep disturbance screening criterion, indicating sleep disturbance impact is unlikely.

Road Traffic Noise

The majority of traffic accessing the site will do so directly via The Horsley Drive, Elizabeth Street and Davis Road. This route remains entirely within the industrial zone until The Horsley Drive. With consideration of

high traffic volumes on The Horsley Drive, it is assumed road traffic noise criteria are already exceeded. The predicted increase to existing road traffic noise due to traffic generated by the proposal is approximately 0.1 dB, which is insignificant and would be imperceptible to the human ear. Relative to the high traffic volumes already present on The Horsley Drive, traffic generated by the proposal would have negligible acoustic impact.

Vibration

No vibration impact is predicted at residential receivers due to separation distances from the site of typically 1,500 metres or more. Vibration data was not available to allow a detailed assessment of potential vibration impact to neighbouring industrial premises. It is recommended vibration testing of vibration generating equipment be undertaken upon commissioning to ensure relevant limits are achieved at the nearest industrial receivers. In the unlikely event that limits are exceeded, mitigation controls should be implemented.

Summary

Results of this assessment indicate noise and vibration generated by the proposal would have little to no impact on the nearest residential receivers to the site. These are located more than 1,500 metres away, and there are a substantial number of industrial premises and buildings along the propagation path. It is considered highly unlikely proposed operations would be discernible at residential locations.

Model predictions at the site boundary are less than recommended noise amenity criteria for industrial premises. The premises immediately to the west is a metal recycling operation, which currently generates relatively high noise levels. Premises located east of the subject site all have a solid concrete wall adjoining the common boundary, which form the rear walls of the buildings located along that boundary. Predicted external noise levels at the front of those buildings are typically 20 dB or more below the amenity criterion, and, are less than day period background noise levels (RBL) measured at the subject site.

From an acoustics perspective, the proposed site is considered a good location for an operation of this nature. Compliance with relevant assessment noise level targets is predicted for all activities.

Global Acoustics Pty Ltd

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1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Bettergrow Pty Ltd (Bettergrow) trading as Greenspot (the Applicant) to carry out a noise and vibration impact assessment for a proposed resource recovery and recycling centre. The subject site is located at 24 Davis Road, Wetherill Park, NSW on Lot 18 on Plan DP249417. The Project area is situated within an existing industrial area to the south of Prospect Reservoir. The site has previously been utilised for the manufacture of asphalt. The area is within the Fairfield City Local Government Area. The site is located in an IN1 (General Industrial) zone in accordance of the Fairfield Local Environmental Plan 2013. The location of the subject site in a regional context is shown in Figure 1. An aerial view of the subject site is shown in Figure 2. A site plan showing proposed locations of buildings and processing areas is shown in Figure 3.

The proposal involves receival and processing of up to 200,000 tonnes per annum (tpa) of materials at the site. The recovered resources would be transferred either directly to end markets, or to other facilities or processors for value adding to achieve maximum value for beneficial use. The facility is also proposed to act as a distribution centre for recycled materials, and, for the distribution and marketing of bulk landscape supplies including barks, sands and aggregates.

The following waste streams are proposed to be processed at the facility:

- Hydro-excavation and drill muds/fluids for consolidation and removal from site for use as structural fill or as a feedstock within a soil conditioner and compost manufacturing;
- Bulk landscaping supplies for distribution into the surrounding areas; and
- Garden organics, commingled food and garden organics, and, food waste.

Detailed below are the approximate amounts of waste for each stream to be received at the site per year:

- 60,000 tonnes of hydro-excavation and drill mud/fluids;
- 40,000 tonnes of bulk landscaping supplies;
- 70,000 tonnes of garden organics (GO) or combined GO and food organics (FOGO); and
- 30,000 tonnes of other source-separated commercial and industrial (C+I) organics.

The site will be open for receival of material 24 hours per day, 7 days per week, and will be actively staffed 6 days per week (including public holidays) between the hours of 6:00am to 10:00pm. Processing activities will be undertaken during the morning shoulder and day periods (6:00am to 6:00pm).

A complete description of the proposed operation is included in the EIS main volume that this Noise Impact Assessment accompanies.

The primary purpose of this assessment is to determine potential noise and vibration impact at the nearest residential and industrial receivers to the site. The assessment considers construction, operational and transport noise impacts associated with the proposal. This assessment has been based on plans and information provided by Bettergrow.

This assessment has been prepared in accordance with the relevant guidelines contained in the NSW Industrial Noise Policy (INP), NSW Interim Construction Noise Guideline (ICNG), NSW Road Noise Policy (RNP), NSW Assessing Vibration: a Technical Guideline and NSW draft Industrial Noise Guideline (dING).

1.2 Terminology & Abbreviations

Some definitions of terminology and abbreviations, which may be used in this report, are provided in Table 1.

Table 1: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{A10}	The noise level which is exceeded for 10 percent of the time, which is approximately the average of the maximum noise levels
L_{A90}	The level exceeded for 90 percent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
ABL	Assessment background level (ABL), the 10^{th} percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. Estimated from wind speed and sigma theta data
SC	Stability Class. Estimated from wind speed and sigma theta data
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am
rms	Root mean square
VPH	Vehicles per hour; the number of vehicles travelling on a section of road per hour.

Figure 1: Site Location, Regional Context (shown with red outline)

Figure 2: Site Location (shown with red outline)

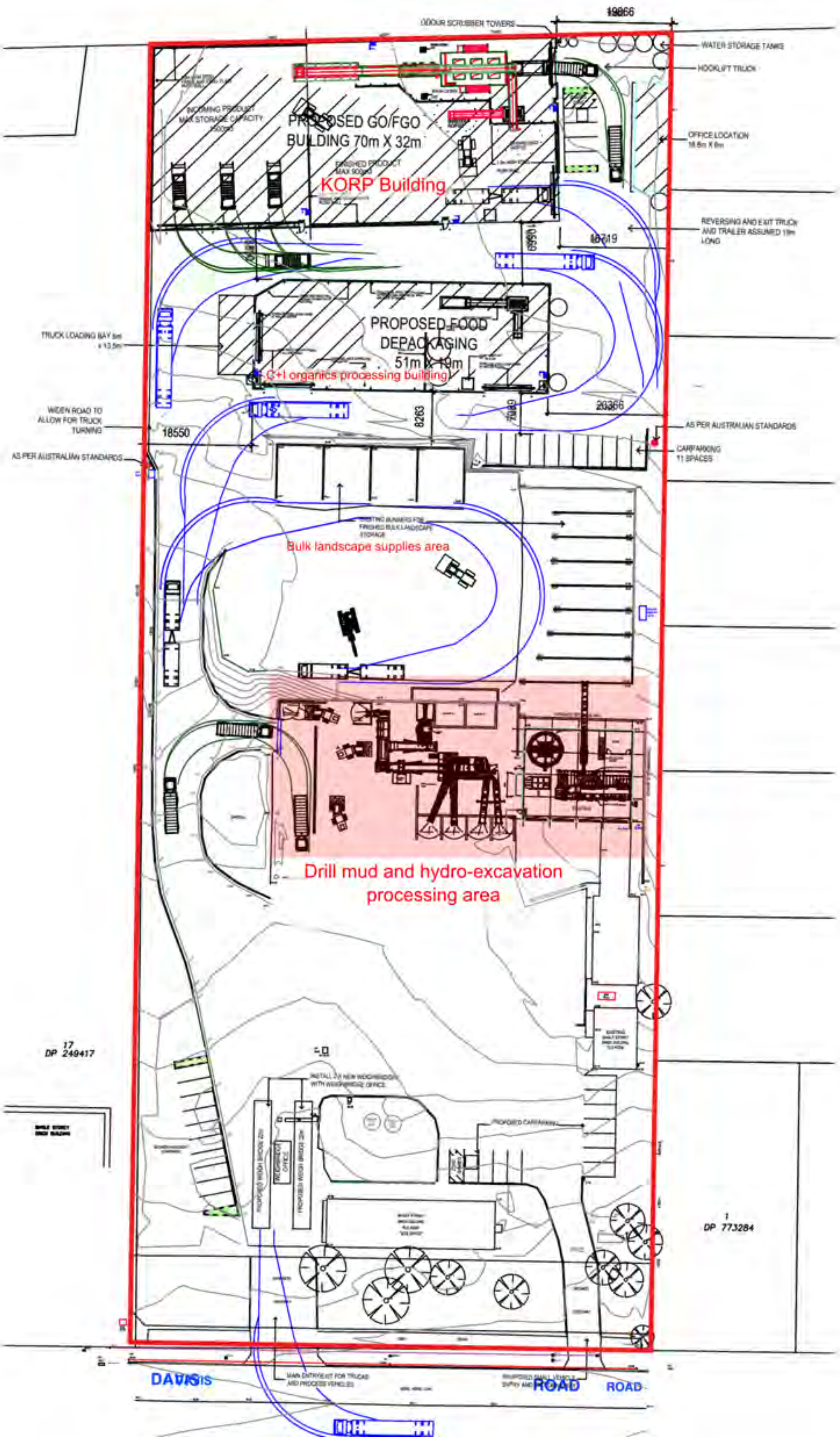

Figure 3: Overall Site Plan

2 CRITERIA

2.1 Existing Environment

The Project area is situated within an existing industrial area, in an IN1 (General Industrial) zone in accordance with the Fairfield Local Environmental Plan 2013.

The area has mixed heavy and light industrial businesses, and bulky goods storage. Prospect reservoir is located to the north. The areas south, east and west of the subject site are all industrial.

The nearest private residential receivers are located approximately 1,500 metres to the south of the subject site on Maugham Crescent, Wetherill Park. These residences are located immediately south of the industrial estate, and approximately 170 metres north of The Horsely Drive, an arterial road with high traffic flows.

Approximate distances to the nearest residential receivers in all directions from the site are indicated in Table 2, and shown in Figure 4.

Figure 4: Modelled Residential Receivers

Table 2: NEAREST RESIDENTIAL RECEIVERS

Location ID	Distance (m)	Direction (degrees)	Address
R01	1,500	170	13 Maugham Crescent, Wetherill Park
R02	2,000	135	164 Chifley Street, Wetherill Park
R03	2,300	110	54 Eyre Street, Smithfield

Location ID	Distance (m)	Direction (degrees)	Address
R04	2,200	85	5 Hyland Road, Greystanes
R05	1,800	260	38-50 Trivet Street, Wetherill Park
R06	2,400	225	73 Castlereagh Street, Bossley Park

Directly adjoining the project site to the west is a metal recycling operation, which generates relatively high noise levels when operating.

Adjoining the subject site to the east are commercial type storage sheds; these are the nearest industrial receivers to the subject site. A location on the lot boundary of each of the neighbouring industrial premises was included in the models. These locations are shown in Figure 5.

Figure 5: Modelled Industrial Receivers

2.1.1 Unattended Monitoring

An unattended noise monitoring survey was undertaken around the subject site from 2 February 2016 to 11 February 2016 inclusive. Monitoring was undertaken at two locations, as listed in Table 3.

Table 3: UNATTENDED MONITORING LOCATIONS

Location ID	Monitoring Location
NM1	Subject site
NM2 (adjacent R01)	21 Maugham Crescent, Wetherill Park

The NM1 logging location is shown in Figure 2. The NM2 location is shown in Figure 6.

2.1.2 Unattended Monitoring Equipment

Equipment used to measure and record environmental noise levels are listed in Table 4; copies of calibration certificates are provided in Appendix A. The loggers were configured to provide a statistical noise data summary every 15 minutes.

Table 4: MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
ARL Ngara Noise Data Logger	878041	27/01/2018
ARL Ngara Noise Data Logger	87801F	13/11/2017
Rion NC73 Sound Level Calibrator	11248306	30/04/2017

Figure 6: NM2 Logger Location, 21 Maugham Crescent, Wetherill Park

2.1.3 Background Monitoring Results

Table 5 and Table 6 provide a summary of noise logger data for the two locations. Graphs are provided in Appendix B. Bureau of Meteorology (BOM) data from the Horsely Park automatic weather station (station 067119) was used for processing logger data.

Table 5: AVERAGE LOGGED NOISE LEVELS – NM1 (Subject Site)

Site	Period	L_{Aeq} dB	L_{A10} dB	L_{A90} dB	RBL dB[1]
Location NM1	Day	59	61	54	49
	Evening	52	52	48	46
	Night	51	53	47	44

Notes *1: Rating Background Level(RBL).*

2: L_{Aeq} are logarithmic average; and

3: Day: 7:00am to 6:00pm ~ Evening: 6:00pm to 10:00pm ~ Night: 10:00pm to 7:00am

Table 6: AVERAGE LOGGED NOISE LEVELS – NM2 (21 Maugham Crescent)

Site	Period	L_{Aeq} dB	L_{A10} dB	L_{A90} dB	RBL dB[1]
Location NM2	Day	56	60	48	46
	Evening	56	58	52	45
	Night	58	61	51	43

Notes *1: Rating Background Level(RBL).*

2: L_{Aeq} are logarithmic average; and

3: Day: 7:00am to 6:00pm ~ Evening: 6:00pm to 10:00pm ~ Night: 10:00pm to 7:00am

2.2 Attended Noise Monitoring

Attended noise monitoring was conducted at the subject site to quantify the existing noise environment, including noise contributions from existing industrial noise sources.

Measurements were performed in accordance with the Environment Protection Authority (EPA) 'Industrial Noise Policy' (INP) guidelines and Australian Standard AS1055 ' Acoustics, Description and Measurement of Environmental Noise'. Atmospheric condition measurement was also undertaken during attended monitoring. The duration of the measurement was 15 minutes.

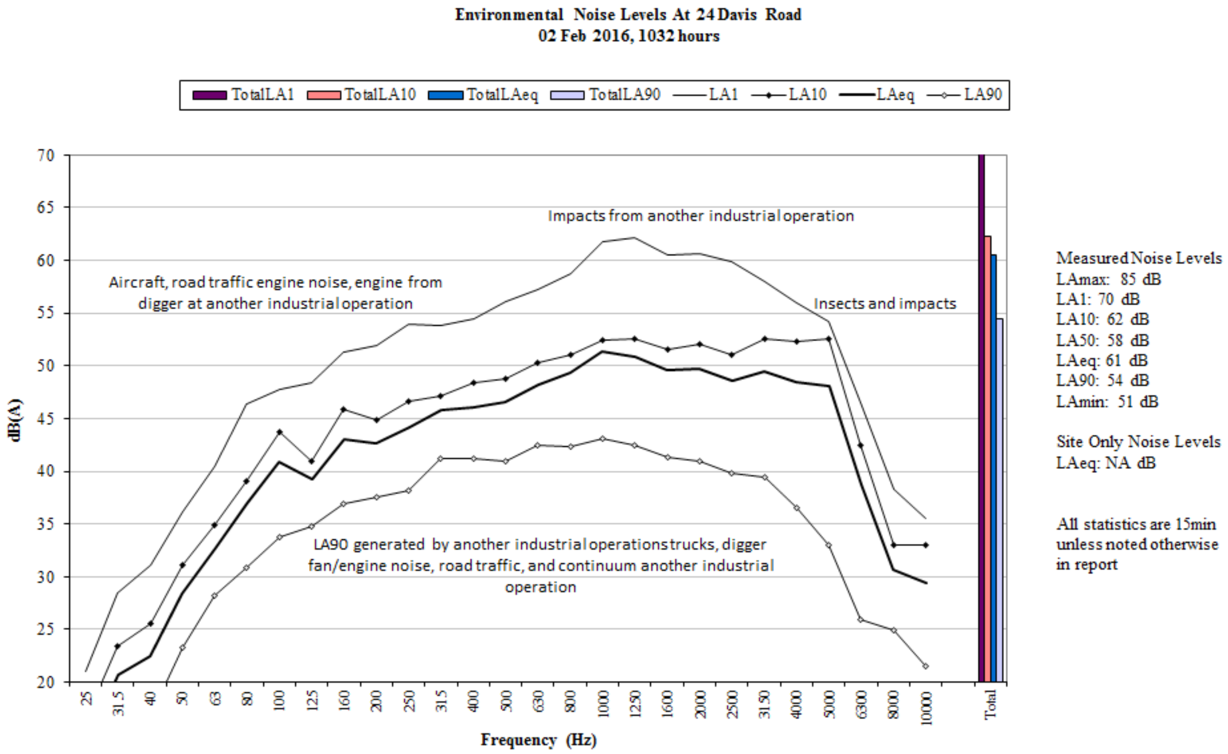

Figure 7: Environmental Noise Levels - NM1

Another industrial operation west of the subject site was primarily responsible for measured levels. Impact noise from the industrial operation generated the measured L_{Amax} and L_{A1}. Truck deliveries, excavators and processing at that site primarily generated measured L_{A10} and L_{Aeq}. Insects contributed to measured L_{A10} and L_{Aeq}. The measured L_{A90} was generated by engine and fan noise from excavators and trucks, combined with road traffic engine noise on Davis Road, and continuum from a different industrial operation.

Birds, aircraft, reverse alarms and road traffic tyre noise were regularly audible.

The estimated existing industrial $L_{Aeq,15minute}$ was 59 dB. Analysis of unattended monitoring data indicates the day period industrial $L_{Aeq,15hour}$ over the logging period ranged from 54 to 59 dB. The measured $L_{Aeq,15minute}$ during attended monitoring is consistent with the upper end of that range.

2.3 Operational Noise Criteria

The INP states that objectives for environmental noise are '*to account for intrusive noise and … to protect the amenity of particular land uses*'. To achieve these objectives, limits are specified where the '*intrusiveness criterion essentially means that the equivalent continuous (energy-average) noise level of the source should not be more than 5 decibels (dB) above the measured background level*'. Amenity is protected by '*noise criteria specific to land use and associated activities*'. Amenity criteria '*relate only to industrial-type noise and do not include road, rail or community noise*'.

Applicable intrusiveness and amenity limits are derived independently. These are then compared to determine project specific noise levels (PSNL).

The intrusiveness criterion is expressed as:

$L_{Aeq,15minute}$ RBL + 5

Where $L_{Aeq,15\ minute}$ is the L_{Aeq} noise level from the source, measured over 15 minutes and RBL is the rating background level. In accordance with the INP, where the RBL is less than L_{A90} 30 dB, a value of L_{A90} 30 dB can be adopted. In this assessment, the default minimum for the day period of L_{A90} 35 dB from the NSW draft Industrial Noise Guideline (dING) has been adopted for some receiver areas.

An amenity criterion caps industrial noise levels. Amenity criteria are recommended for various land uses. According to the INP, an urban area is an area with an acoustical environment that:

- is dominated by 'urban hum' or industrial source noise;
- has through traffic with characteristically heavy and continuous traffic flows during peak periods;
- is near commercial districts or industrial districts; or
- has any combination of the above.

Where 'urban hum' means the aggregate sound of many unidentifiable, mostly traffic-related sound sources. This area may be located in either a rural, rural-residential or residential zone, as defined on an LEP or other planning instrument.

The nearest residential area to the subject site (Maugham Crescent) meets these criteria, and is classified urban in accordance with INP definitions. Recommended amenity limits from the INP for residences in urban areas are shown in Table 7.

Table 7 URBAN AMENITY CRITERIA, $L_{Aeq,period}$ dB

Period	Acceptable	Maximum
Day	60	65
Evening	50	55
Night	45	50

Table 8 summarises amenity criteria that apply at assessed industrial receiver boundaries.

Table 8: AMENITY CRITERIA FOR OTHER LAND USES, $L_{Aeq,period}$ dB

Type of Receiver	Period	Acceptable	Maximum
Industrial	When in use	70	75

Table 9 and Table 10 summarise intrusiveness and amenity criteria that apply for the morning shoulder, day, evening and night periods for NM2/R01 and other residential receiver locations respectively. The lower of the two (intrusiveness or amenity) apply and are adopted as project specific noise levels (PSNL). Intrusiveness criteria are based on measured background levels as per Section 2.1.3 of this report.

A review of measured data for the night period indicates sources other than road traffic noise may have affected background levels. The two lowest Assessment Background Levels (ABL) of L_{A90} 39 dB, measured on the nights of 4 and 6 February 2016, have been adopted in place of RBL for the night period.

Background noise logging was not undertaken at residential receiver locations further from the site than NM2. It is acknowledged that background levels at these locations may be lower than for NM2 due to increased distance from major roads such as The Horsley Drive. For these locations, default minimum background levels outlined in the dING have been adopted. These are L_{A90} 35 dB for the day period, and L_{A90} 30 dB for the evening and night periods.

Table 9: PROJECT SPECIFIC NOISE LEVELS – NM2/R01

Period[1,2]	RBL L_{A90} dB	Intrusiveness Criterion $L_{Aeq,15minute}$ dB	Acceptable Amenity Criterion[3] $L_{Aeq,period}$ dB	Project Specific Noise Levels $L_{Aeq,15minute}$ dB
Morning shoulder	-	-	-	47 [3]
Day	46	51	60	51
Evening	45	50	50	50
Night	39 [2]	44	45	44

Notes:

1. *Day 7:00 am 6:00 pm ~ Evening: 6:00 pm to 10:00 pm ~ Night: the remaining periods;*
2. *Lowest measured ABL adopted in place of RBL. Refer to Section 2.1.3; and*
3. *The morning shoulder (5.00am to 7.00am) has been adopted as the midpoint between day and night periods, as per section 3.3 of the INP.*

Table 10: PROJECT SPECIFIC NOISE LEVELS – OTHER RESIDENTIAL RECEIVERS

Period[1,2]	RBL L_{A90} dB	Intrusiveness Criterion $L_{Aeq,15minute}$ dB	Acceptable Amenity Criterion[3] $L_{Aeq,period}$ dB	Project Specific Noise Levels $L_{Aeq,15minute}$ dB
Morning shoulder	-	-	-	37 [2]
Day	35	40	60	40
Evening	30	35	50	35

Period[1,2]	RBL L_{A90} dB	Intrusiveness Criterion $L_{Aeq,15minute}$ dB	Acceptable Amenity Criterion[3] $L_{Aeq,period}$ dB	Project Specific Noise Levels $L_{Aeq,15minute}$ dB
Night	30	35	45	35

Notes:

1. *Day 7:00 am 6:00 pm ~ Evening: 6:00 pm to 10:00 pm ~ Night: the remaining periods; and*
2. *The morning shoulder (5.00am to 7.00am) has been adopted as the midpoint between day and night periods, as per section 3.3 of the INP.*

It should be noted that PSNL derived for these other residential locations is considered conservative, and background noise levels in these areas are likely to be higher than the adopted default minimums.

Industrial premises neighbouring the subject site are assessed against an assessment level of $L_{Aeq,period}$ 70-75 dB. It is noted that existing industrial noise source L_{Aeq} are more than 10 dB below this level, so could not logarithmically add to noise generated by the project to cause exceedance of this criterion.

2.4 Sleep Disturbance Criteria

EPA INP application notes provide guidance on setting sleep disturbance criteria. The application notes state that a review of sleep disturbance research included in the 'NSW Road Noise Policy' (RNP) (DECCW[1] 2011) "concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance".

The EPA recognises that a sleep disturbance criterion based on the $L_{A1,1minute}$ not exceeding background noise levels by more than 15 dB is not ideal. However, as there is insufficient evidence to determine an alternate criterion, the EPA continues to use it as a guide to identify the likelihood of sleep disturbance. This means that where this criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required. A detailed analysis should cover the maximum noise level, and, the number of occurrences during the night period.

As an initial assessment of sleep disturbance, a criterion of background (RBL) plus 15 dB has been adopted. The derived criterion for each receiver is presented in Table 11.

Table 11: SLEEP DISTURBANCE CRITERIA - L_{Amax} dB

Receiver	RBL L_{A90} dB	Adjustment	Criterion
NM2/R01	39 [2]	+15	54
Other residential receivers	30	+15	45

Notes:

1. *Day 7:00 am 6:00 pm ~ Evening: 6:00 pm to 10:00 pm ~ Night: the remaining periods; and*
2. *Lowest measured ABL adopted in place of RBL. Refer to Section 2.1.3.*

1Now the Environment Protection Authority.

2.5 Construction Noise Criteria

The NSW Interim Construction Noise Guideline (ICNG, July 2009), prepared by the NSW Environment Protection Authority (EPA), specifically relates to construction, maintenance and renewal activities. The guideline suggests that for short-term construction (not more than three weeks), a qualitative assessment will suffice and for longer-term construction, a quantitative assessment is required, with comparison to relevant criteria.

The anticipated duration of construction for the Project is 6 weeks. As the proposed construction period exceeds three weeks, a quantitative assessment is required.

The ICNG recommended noise levels for various land uses are shown in Table 12.

Based on measured RBL presented in Table 6, the construction noise criterion for private residential receiver R01 is $L_{Aeq,15minute}$ 56 dB for work undertaken during standard construction hours. For construction work performed outside standard construction hours, criteria of $L_{Aeq,15minute}$ 51, 50 and 47 dB apply for the day, evening and night periods respectively (refer Table 9).

For other residential receivers, a construction noise criterion of $L_{Aeq,15minute}$ 45 dB applies for work undertaken during standard construction hours. For construction work performed outside standard construction hours, criteria of $L_{Aeq,15minute}$ 40, 35 and 35 dB apply for the day, evening and night periods respectively.

For industrial premises surrounding the subject site, a construction noise criterion of $L_{Aeq,15minute}$ 75 dB applies. As this criterion applies at the most affected point of the premises, compliance with this criterion is required at the subject site boundary, where this is common with neighbouring industrial receivers.

Table 12: CONSTRUCTION NOISE AT RESIDENCES AND OTHER LAND USES, $L_{Aeq,15minute}$ dB

Time of Day	Criterion	Notes
Residential premises Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays and public holidays	Noise affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq,15minutes}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:

Time of Day	Criterion	Notes
		1. time identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences). 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Offices, retail outlets	70 dB(A)	External noise level at most affected point of the premises.
Industrial premises	75 dB(A)	External noise level at most affected point of the premises.

2.6 Traffic Noise Criteria

In 2011 the NSW state government department responsible for the environment (the Department of Environment, Climate Change and Water[2]) released the NSW Road Noise Policy (RNP). The RNP outlines traffic noise criteria applicable to this project. The policy applies different noise limits dependent upon the road category and type of project/land use.

Table 13 presents noise criteria from the RNP for various road categories.

Table 13: ROAD TRAFFIC NOISE CRITERIA - dB

Road Category	Type of Project/Land use	Day	Night
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq,1hour}$ 55 (external)	$L_{Aeq,1hour}$ 50 (external)
Sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15hour}$ 60	$L_{Aeq,9hour}$ 55

The RNP also includes relative increase criteria, which are primarily intended to protect existing quiet areas from excessive changes in amenity due to noise from a road project or from additional traffic generated by land use developments.. An EPA application note states:

2Now the Environment Protection Authority

- *...for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.*

In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. A relative increase in road traffic noise levels has been considered in this assessment.

2.7 Vibration Criteria

Vibration criteria in NSW are outlined in the guideline Assessing Vibration: A Technical Guideline, published by the NSW Department of Environment and Conservation (2006).

2.7.1 Construction Vibration

Vibration generated by short term construction works such as vibrating roller compaction, pile driving and rock/concrete breaking (if required), are generally assessed as intermittent activities.

When assessing vibration for intermittent activities, the guideline recommends use of the vibration dose value (VDV). The VDV is given by the fourth root of the integral with respect to time of the fourth power of the acceleration after it has been weighted. This is the root-mean-quad approach.

VDV criteria are included in Table 2.4 of the guideline, and are reproduced below:

Table 2.4 Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.
2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.
Source: BS 6472–1992

Construction plant is successfully operated on many sites in NSW with similar proximity to neighbouring buildings as will occur for the proposal. Structural damage to neighbouring industrial premises should not result provided general best practice work methods are employed. The nearest residential receivers to the site are approximately 1,500 metres away; vibration impact would not occur over that distance. Construction vibration is not discussed further in this report.

2.7.2 Operational Vibration

Operational vibration sources proposed include shredding and screening equipment associated with FOGO and C+I organics processing, truck loading activities, and, screens and a centrifuge in the drilling mud and hydro-excavation waste processing area. These sources have potential to operate over the course of the day period, and are therefore assessed as continuous vibration sources in accordance with the vibration guideline. This type of vibration is assessed on the basis of weighted rms acceleration values. Table 2.2 of the vibration guideline is reproduced below as Figure 8.

Continuous vibration criteria for workshops listed in Table 2.2 of the guideline are deemed the most applicable to neighbouring industrial premises.

Vibration data was not available for proposed equipment. It is recommended vibration testing of vibration generating equipment be undertaken upon commissioning to ensure relevant limits are achieved at the nearest industrial receivers. In the unlikely event that limits are exceeded, mitigation controls should be implemented.

No measurable vibration will result at residences due to substantial separation distances from the site.

Table 2.2 Preferred and maximum weighted rms values for continuous and impulsive vibration acceleration (m/s^2) 1–80 Hz

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration					
Critical areas[2]	Day- or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration					
Critical areas[2]	Day- or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am
2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472–1992

Figure 8: Table 2.2 of Assessing Vibration: A Technical Guideline

3 NOISE MODEL PARAMETERS

Noise levels were calculated using DataKustik CadnaA noise modelling software to quantify likely noise levels resulting from proposed operational and construction activities.

3.1 Receivers

The nearest residential receivers in each direction from the subject site were assessed. These are listed in Table 2, and shown in Figure 8. Industrial receivers in the area around the subject site were assessed by quantifying likely noise levels at the nearest point on the property boundary.

3.2 Topography

Bettergrow provided detailed topographic contours for the subject site. These were combined with less detailed contours for the surrounding region to provide a 3-dimensional terrain map for modelling purposes.

Existing buildings in the area immediately surrounding the subject site were included in the models as barriers. There are a significant number of additional industrial buildings between the subject site and residential areas which were conservatively omitted from the models. These buildings would increase the level of barrier attenuation relative to what has been considered in this assessment. On this basis, model predictions can be considered conservative, and it is likely actual received levels would be significantly lower than predicted.

3.3 Atmospheric Conditions

Section 5 of the INP provides procedures for considering meteorological effects. The effects of gradient winds, drainage flow winds and temperature inversions need to be considered. Wind effects need to be assessed when wind is considered to be a feature of the area. Wind is considered a feature of the area when source-to-receiver wind speeds (at 10m height) of 3 m/s or less occur for more than 30 percent of the time in any time period, in any season.

Detailed assessment of meteorological data was omitted from this assessment. A simplified approach was adopted whereby INP default worst-case meteorological conditions modelled. These included:

- Source to receiver winds at 3 metres per second for all time periods; and
- Stability class F with calm winds for the morning shoulder and night periods.

Drainage flow winds are not considered a feature of the area due to the relatively flat nature of the terrain, and were not included.

3.4 Noise Sources and Equipment Sound Power

The site is divided into four primary operating areas. Noise sources and sound power for each area are outlined in the following sections.

Sound power of equipment included in the modelling assessment were derived either from direct measurement of equivalent equipment at other Bettergrow facilities, from data provided by equipment manufacturers, or from the Global Acoustics technical library.

3.4.1 Food Organics and Garden Organics Processing

Garden Organics (GO) or combined GO and Food Organics (FOGO) from kerbside collections will be delivered to the subject site by the contractor's kerbside collection vehicles. Deliveries will be unloaded within the Kerbside Organics Receival and Processing (KORP) building at the rear of the site through one of three high-speed roller doors. Unloaded material will first be checked and decontaminated for gross contamination by staff operating a single, rubber-tyred front-end loader. Gross contamination will be stockpiled within the building before being loaded into skip bins also located inside the building for disposal at landfill. Following gross decontamination, organics will be effectively "loosened" following their compaction inside collection vehicles. De-compacted material will be moved from the de-compacter unit up an inclined conveyor to an elevated picking station, where secondary, smaller pieces of contamination will be manually removed by plant operators and dropped down chutes into a skip bin below for disposal at landfill. From the picking station, organics will be moved by rubber conveyor to a slow-speed shredder to prepare a mulched material ready for composting. Once shredded, organics will be moved again by conveyor to a screen, which bounces over-sized organics off its deck for collection, whilst at the same time permitting finely shredded material to be moved to the short-term stockpile area within the enclosed building via front end loader. Collected oversized material will be returned to the beginning of the process line to be rechecked for contamination and re-shredded to maximise resource recovery.

The KORP building is fully enclosed, with two roller doors on the eastern facade, and three roller doors on the southern facade. It is envisaged that roller doors will typically remain closed during processing; however, all five doors were modelled as fully open to conservatively predict noise emission under worst case potential operating conditions. Demonstrated compliance for this scenario indicates compliance for the more typical configuration with doors closed.

The KORP building is located at the rear of the site as shown in Figure 3, and has dimensions 70 x 32 metres. Walls are to be concrete panel, and the roof is to be sheet metal with polycarbonate sheeting.

A building acoustics model was developed to calculate the external sound power of each facade and each door opening, which were in turn included in the environmental noise model for the site. Sources included within the building and sound power levels adopted are listed in Table 14.

Trucking movements to and from the KORP building are discussed in Section 3.4.5.

Table 14: 15 MINUTE SOUND POWER DATA – KORP BUILDING

Plant Item		Octave Band Sound Power Spectrum, L_{eq} dB									Total L_{eq} dB	
Description	**Quantity**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Lin**	**A wt**
Truck and dog	1	-	102	99	96	93	95	94	88	86	**106**	**100**
Excavator (20 tonne)	1	-	112	113	101	99	93	89	84	79	**116**	**102**
Loader (Volvo L120 or equivalent)	2	-	110	99	90	87	89	82	77	68	**110**	**93**
Skip truck	2	-	102	99	96	93	95	94	88	86	**106**	**100**
Shredder	1	-	88	98	92	94	91	88	90	74	**102**	**97**
Screen	1	-	111	101	98	97	95	94	101	90	**112**	**104**
Telehandler	1	-	110	99	90	87	89	82	77	68	**110**	**93**
Bobcat	1	-	110	99	90	87	89	82	77	68	**110**	**93**
Forklift	1	-	110	107	100	98	99	96	91	84	**113**	**103**

3.4.2 Source-separated Commercial and Industrial (C+I) Organics Processing

Source-separated commercial and industrial (C+I) organics will be processed within a separate building immediately to the south of the KORP building (refer to Figure 3).

The C+I organics processing building is fully enclosed, with one roller door on each of the southern and western facades. It is envisaged that roller doors will typically remain closed during processing; however, both doors were modelled as fully open to conservatively predict noise emission under worst case potential operating conditions. Demonstrated compliance for this scenario indicates compliance for the more typical configuration with doors closed.

The C+I organics processing building has dimensions 51 x 19 metres. Walls and roof are to be sheet metal.

A building acoustics model was developed to calculate the external sound power of each facade and each door opening, which were in turn included in the environmental noise model for the site. Sources included within the building and sound power levels adopted are listed in Table 15.

Table 15: 15 MINUTE SOUND POWER DATA – C+I ORGANICS PROCESSING BUILDING

Plant Item		Octave Band Sound Power Spectrum, L_{eq} dB									Total L_{eq} dB	
Description	**Quantity**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Lin**	**A wt**
Telehandler	1	-	110	99	90	87	89	82	77	68	**110**	**93**
Forklift	1	-	110	107	100	98	99	96	91	84	**113**	**103**
Skip truck	2	-	102	99	96	93	95	94	88	86	**106**	**100**
Shredder	1	-	88	98	92	94	91	88	90	74	**102**	**97**
Screen	1	-	111	101	98	97	95	94	101	90	**112**	**104**

A forklift and a delivery truck were also modelled outside the building adjacent the western facade. Trucking movements to and from the C+I organics processing building are discussed in Section 3.4.5.

3.4.3 Bulk Landscape Supplies Area

A Volvo L150 front end loader or equivalent with a high lift bucket was modelled operating in the bulk landscape area. The loader will be used for moving landscape material and loading trucks.

Table 16: 15 MINUTE SOUND POWER DATA – BULK LANDSCAPE SUPPLIES

Plant Item		Octave Band Sound Power Spectrum, L_{eq} dB									Total L_{eq} dB	
Description	**Quantity**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Lin**	**A wt**
Loader (Volvo L150 or equivalent)	1	100	112	101	92	89	91	84	79	70	**113**	**95**

Trucking movements to and from the bulk landscape area are discussed in Section 3.4.5.

3.4.4 Drill Mud and Hydro Excavation Waste Processing

Processing of drilling muds and hydro-excavation waste will be undertaken towards the front of the site. The location of the processing area is shown in Figure 3. Figure 9 illustrates the proposed arrangement of equipment within the processing area.

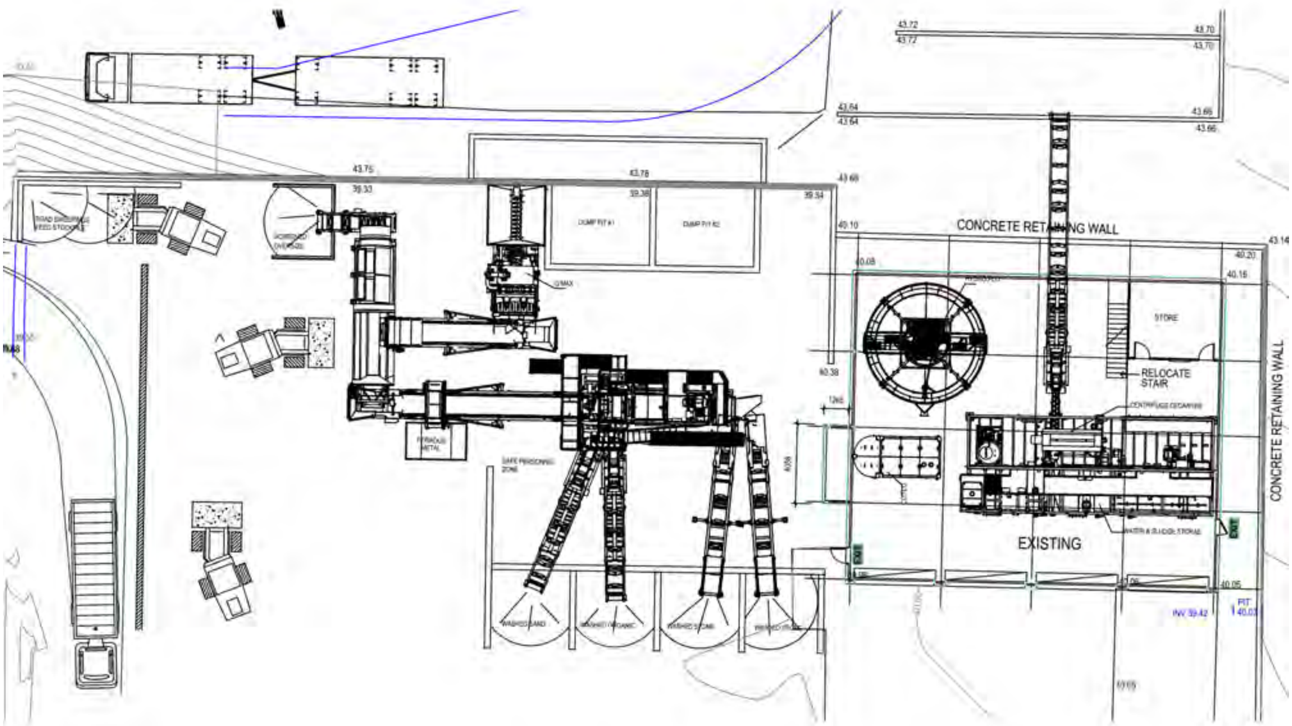

Figure 9: Drill Mud and Hydro Excavation Waste Processing Area

Process Description

Dry, wet and 'semi-dry' waste is deposited into a ground pit directly from the gully suckers/road sweepers/vacuum tankers. This allows an excavator to load the solid material into the reception hopper placed overhead. A variable speed drive will control the screw feeder feed and hence the rate of material onto the inclined feed conveyor. The feed material is then conveyed to a wash box and fluidised by the addition of the recycled process water and then is discharged into the AggMax attrition system.

The first element of the AggMax is a Rotomax. The Rotomax has twin counter rotating shafts to scrub contaminated material. At the same time, any light weight organic waste or plastic is removed using an integrated upward flow classification system.

The lightweight organic, plastic and liberated fines will be flumed to a dual ‘organic screen’, which will remove water and fines from the waste material which is then pumped to the fines washing section. The waste, dewatered material will be discharged into the ‘organic matter/trash’ bay.

The remaining aggregate material in the Rotomax will be discharged onto a dewatering chute which will permit fine aggregate to pass through the polyurethane screening media and flumed to the fines washing section.

All material <5mm will be collected in a sump from where it will be pumped to a variable concentration Hydrocyclone positioned over the second side of the dual ‘organic screen’. The Hydrocyclone technology accurately (>90%) separates the -75 micron aggregate material (specific gravity of 2.65). The Hydrocyclone will also remove lightweight organics from sand. Sand is discharged from the cyclone underflow onto the dewatering screen.

The silts, lightweight organics and clays from the Hydrocyclone pass via gravity directly into an AquaCycle thickener for the primary phase of water treatment. Upon entry into the AquaCycle the material is mixed with a small volume of flocculent, prepared in the integrated flocculation station. This material then enters into the AquaCycle tank where it rapidly flocculates fine particles producing a thick sludge which settles to the bottom of the tank. The recycled water overflows the top of the tank, passes through an oil & heavy metal absorbent sponge, and is sent to the recycled water storage tank for re-circulation around the system.

Meanwhile a set of rakes rotate along the bottom of the tank to condition the sludge into the centre and preventing the sludge from setting. The rakes also send data on rake resistance back to the central PLC control panel which automatically starts and stops the main sludge pump at pre-set parameters. The thickened sludge is then sent to a buffer tank for further treatment by the filter press.

A suitably sized sludge buffer tank is installed to ensure the continued smooth running of the processing plant. The buffer tank is fitted with stainless steel agitators which constantly agitate the sludge preventing settlement & ensuring a homogeneous sludge is presented to the centrifuge. The centrifuge decanter with automatic sequencing and discharge speed control is controlled by a touch screen electronic control panel.

The Centrifuge will further dewater the sludge, producing a filter cake (approximately 45-55% dry solid) which will be discharged underneath ready for disposal.

Fixed Plant Noise Sources

Coarse material will be processed externally. The equipment supplier provided noise data obtained by a suitably qualified acoustic consultant via direct measurement of an equivalent operation in England, where the processing was performed in an external environment. Measurement was performed at 13 locations around the plant at an offset distance of 10 metres. Sound pressure level results were provided for each position, and a log average sound pressure level for the full operation. The average measured sound pressure level was L_{Aeq} 79 dB.

A separate CadnaA model was developed to determine a suitable sound power for the external plant. A vertical area source was created, and allocated a sound power and frequency spectrum based on a crushing and screening plant from the Global Acoustics technical library. The size and shape of the vertical area source corresponded to the height and perimeter shape of the proposed plant configuration. The sound power was then calibrated such that predicted sound pressure levels at an offset distance of 10 metres around the plant equalled the average measured around the equivalent plant arrangement. The calibrated vertical area source was then imported to the primary site noise model.

One 20 tonne excavator, one Volvo L150 front end loader (or equivalent) and a bobcat were modelled operating in the external processing area.

Plant quantities and sound power levels adopted are listed in Table 17.

Table 17: 15 MINUTE SOUND POWER DATA – EXTERNAL PROCESSING PLANT

Plant Item		**Octave Band Sound Power Spectrum, L_{eq} dB**									**Total L_{eq} dB**	
Description	**Quantity**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Lin**	**A wt**
External processing plant	1	107	110	103	105	105	104	104	104	98	**115**	**111**
Excavator (20 tonne)	1	-	112	113	101	99	93	89	84	79	**116**	**102**
Loader (Volvo L150 or equivalent)	1	100	112	101	92	89	91	84	79	70	**113**	**95**
Bobcat	1	-	110	99	90	87	89	82	77	68	**110**	**93**

Fines processing and water treatment will be performed internally within an existing building adjacent the eastern boundary of the site. The building is fully enclosed, with three roller doors on the southern facade. Doors were modelled as fully open to conservatively predict noise emission under worst case potential operating conditions. Demonstrated compliance for this scenario indicates compliance for the more typical configuration with doors closed. The building has dimensions 16 x 19 metres. Walls and roof are sheet metal.

The hydro-cyclone, or centrifuge decanter, is the primary noise source associated with this process. A building acoustics model was developed to calculate the external sound power of each facade and each door opening of this building, which were in turn included in the environmental noise model for the site.

The equipment supplier provided noise data obtained by a suitably qualified acoustic consultant via direct measurement of an equivalent operation, enclosed within a building of similar construction in England. Data included 1/3 octave spectra measured at various positions around the plant, calculated sound power, and sound pressure level measured within the open doors of the building. Provided sound power and frequency spectra were used for model input; resulting sound powers for the door openings corresponded to measured sound power of the doors at the existing facility providing a degree of model calibration.

The sources included within the building and the sound power level adopted are listed in Table 18.

Table 18: 15 MINUTE SOUND POWER DATA – FINES PROCESSING BUILDING

Plant Item		Octave Band Sound Power Spectrum, L_{eq} dB									Total L_{eq} dB	
Description	**Quantity**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Lin**	**A wt**
Centrifuge	1	-	110	99	90	87	89	82	77	68	**115**	**102**

Trucking movements to and from the processing area are discussed in Section 3.4.5.

3.4.5 Vehicle Movements

Bettergrow provided anticipated daily vehicle movements for the site, including an hourly distribution of traffic movements by vehicle category, and, the area within the site each vehicle will service. These data are reproduced in Figure 10.

The hour commencing at 1pm was identified as representing the worst case period during the day period for trucking, with a total of 38 movements (19 trucks) over the hour.

The hour commencing at 6am was identified as representing the worst case period during the evening and night periods for trucking, with a total of 19 movements (9.5 trucks) over the hour.

Trucking to each of the processing areas was modelled by creating a line source along the route of travel, where the total sound power of the line source was calculated using the total 15-minute sound power of a road truck operating at 1500rpm, with adjustments for the number of trucks on each route, and the duration of movement based on an average speed of 10 km/h. An average sound power was adopted representing the various truck type that will utilise the site, and is based on measured sound power of a Mitsubishi FV458 operating at 1500rpm. The 15-minute sound power level adopted is listed in Table 19.

Table 19: 15 MINUTE SOUND POWER DATA – DELIVERY/COLLECTION TRUCK

Plant Item	Octave Band Sound Power Spectrum, L_{eq} dB									Total L_{eq} dB	
Description	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Lin**	**A wt**
Delivery/collection truck (1500rpm)	-	102	99	96	93	95	94	88	86	**106**	**100**

The quantity of trucks modelled on each operating route are listed in Table 20.

Table 20: TRUCK QUANTITIES PER HOUR

Processing Area	**Truck Quantity per Hour**	
	Day Period	**Evening/Night Periods**
FOGO	9	4
C+I Organics	3	1
Bulk Landscaping	4	3
Drill mud and hydro-excavation waste	4	2

Additionally, a point source was included at the unload point for each area, which was based on the full 15-minute sound power of a truck with a duration correction to account the time required to unload.

	Hydro Exc & Drill Mud					Estimated arrival and departure times for site vehicles based on Peak daily movements only. Numbers shown are a total of both in and out movements by vehcile category and operation																							
	Average		Peak		Total Peak	Monday to Friday a.m.												Monday to Friday p.m.											
Vehicle Type	in	out	in	out	Movements	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00
Semi Tippers 25 tonne	3	3	4	4	8							1	1			2	2		1	1									
4, 6 or 8 wheeler sucker trucks	38	38	46	46	92	4	4	4	4	4	4	2		2	4		4	8	4	6	8	10	11	4	1	1	1	1	1
Semi Sucker trucks	7	7	9	9	18								1	2	2	2	2			2	2	3	2						
Semi liquid tankers	0	0	0	0	0																								
	Bulk Landscape Materials																												
	Average		Peak		Total Peak																								
Vehicle Type	in	out	in	out	Movements																								
pay load	5	2	6	3	9						2	1			2			3	1										
19m B' Doubles	3	0	4	0	4					2																		2	
6 or 8 wheeler rigid	10	10	15	15	30						4	8	8	4			3	3											
Semi Tippers 25 tonne	1	1	2	2	4							2						2											
	GO and comingled Food and Garden Organics																												
	Average		Peak		Total Peak																								
Vehicle Type	in	out	in	out	Movements																								
6 or 8 wheeler with Hook lift bin	1	1	1.5	1.5	3											2	1												
Truck and Dog 32 t	3	6	5	8	13						4	3			1			2	1			2							
Side arm Council kerbside collection	32	32	42	42	84						4	15	15	10				15	15	10									
19m B' Doubles	0	3	0	4	4					2																		2	
	Food Organics																												
	Average		Peak		Total Peak																								
Vehicle Type	in	out	in	out	Movements																								
6 or 8 wheeler Hook lift bin or murrels	8	8	10	10	20				2	3							4	4	4	2	1								
pay load	1	1	1	1	2							1	1																
Side arm Council kerbside collection	2	2	3	3	6							1	2	1				1	1										
Tortliners / Flat top	0.5	0.5	1.5	1.5	3						1	1							0.5	0.5									
Semi liquid tankers	1.5	1.5	2	2	4					2						2													
	Miscallaneous																												
	Average		Peak		Total Peak																								
Vehicle Type	in	out	in	out	Movements																								
Staff Cars	20	20	22	22	44	2				18	1	1							8	5	5	2	2						
Visitor Cars	2	2	4	4	8									2			2	2		2									
Fuel Deliveries	1	1	1	1	2							2																	
Total movements by Hour						6	4	4	6	31	20	38	28	21	9	8	18	40	35.5	28.5	16	17	15	4	1	1	1	5	1

Figure 10:Projected Peak Traffic Movements

3.4.6 Construction Plant

Table 21 lists quantities and modelled sound power of plant included in the construction noise assessment. These were sourced from the Global Acoustics technical library of representative sound powers. Sources were distributed over the construction areas required for the KORP and C+I organics buildings, and, the drill mud and hydro-excavation processing area.

Table 21: 15 MINUTE SOUND POWER DATA – CONSTRUCTION PLANT

Plant Item		**Octave Band Sound Power Spectrum, L_{eq} dB**									**Total L_{eq} dB**	
Description	**Quantity**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**Lin**	**A wt**
Excavator (20 tonne)	3	-	112	113	101	99	93	89	84	79	**116**	**102**
Crane	2	-	112	108	100	98	93	91	92	82	**114**	**101**
Telehandler	2	-	112	113	101	99	93	89	84	79	**116**	**102**
Concrete truck	1	-	107	101	99	103	100	95	87	78	**110**	**104**
Delivery truck	2	-	107	101	99	103	100	95	87	78	**110**	**104**
Dozer	1	-	106	115	116	110	106	102	96	87	**120**	**113**
Loader	1	-	112	101	92	89	91	84	79	70	**113**	**95**
Roller	1	-	105	109	108	106	107	100	93	91	**114**	**110**

4 OPERATIONAL NOISE ASSESSMENT

4.1 Construction

The construction scenario included sources as listed in Table 21. This is considered a representative worst case construction scenario, as it considers all construction equipment operating continuously at full power. Such a scenario is unlikely to eventuate.

Figure 11 and Figure 12 present maximum envelope noise contours for the construction scenario, for industrial receivers surrounding the subject site and nearest residential receivers respectively. Specific $L_{Aeq,15minute}$ levels at points on the site boundary, and, adjacent residential receivers are indicated by text boxes containing dB values.

Model results indicate:

- Predicted construction noise levels are below relevant construction noise criteria at the nearest industrial receivers to the site. The criterion for industrial receivers is $L_{Aeq,15minute}$ 75 dB. The noise contour figure shows the 75 dB contour line is contained within the boundary of the subject site; and
- Predicted construction noise levels are well below relevant criteria at the nearest residential receivers to the site.

4.2 Day Period and Morning Shoulder Operation

The model scenario for the morning shoulder and day periods considers a potential worst case operating scenario, and includes all four operating areas operating concurrently at full capacity. All roller doors on processing buildings are considered to be open, and peak period trucking movements are included. As such, this is considered a conservative scenario, and resulting noise levels from the site should typically be less than predicted.

Figure 13 and Figure 14 present maximum envelope noise contours for the worst case morning shoulder/day period scenario, for industrial receivers surrounding the subject site and nearest residential receivers respectively. Predicted $L_{Aeq,period}$ levels at points on the boundary of neighbouring industrial premises are presented in Table 22. Predicted $L_{Aeq,15minute}$ levels at residential receivers are presented in Table 23.

Table 22: MORNING SHOULDER/DAY PERIOD RESULTS, INDUSTRIAL RECEIVERS – $L_{Aeq,period}$ dB

Receiver ID	Criterion	Prediction	Exceedance
C01	70	60	Nil
C02	70	59	Nil
C03	70	64	Nil
C04	70	66	Nil

Receiver ID	Criterion	Prediction	Exceedance
C05	70	64	Nil
C06	70	58	Nil
C07	70	53	Nil
C08	70	54	Nil
C09	70	43	Nil
C10	70	70	Nil
C11	70	56	Nil
C12	70	58	Nil
C13	70	59	Nil
C14	70	60	Nil
C15	70	57	Nil
C16	70	58	Nil
C17	70	38	Nil
C18	70	38	Nil
C19	70	39	Nil
C20	70	38	Nil
C21	70	38	Nil
C22	70	38	Nil
C23	70	36	Nil
C24	70	66	Nil
C25	70	64	Nil

Table 23: MORNING SHOULDER/DAY PERIOD RESULTS, RESIDENTIAL RECEIVERS – $L_{Aeq,15minute}$ dB

Receiver ID	Criteria (morning shoulder/day period)	Prediction	Exceedance
R01	47/51	31	Nil
R02	37/40	22	Nil
R03	37/40	19	Nil
R04	37/40	24	Nil
R05	37/40	30	Nil
R06	37/40	<25	Nil

Model results indicate:

- Predicted operational noise levels are below relevant noise criteria at the nearest industrial receivers to the site; and
- Predicted operational noise levels are 7 dB or more below relevant criteria at the nearest residential

receivers to the site.

4.3 Evening and Night Period Operation

The model scenario for the evening and night periods considers worst case trucking movements as described in Section 3.4.5. No processing activities are proposed for these periods, except for the hour between 6am and 7am, which is assessed as the morning shoulder period in Section 4.2.

Figure 15 presents maximum envelope noise contours for the worst case evening/night period scenario, for industrial receivers surrounding the subject site. A figure is not included for the nearest residential receivers, as model predictions are less than $L_{Aeq,15minute}$ 15 dB for all receivers.

Predicted $L_{Aeq,period}$ levels at points on the boundary of neighbouring industrial premises are presented in Table 24. Predicted $L_{Aeq,15minute}$ levels at residential receivers are presented in Table 23.

Table 24: EVENING/NIGHT PERIOD RESULTS, INDUSTRIAL RECEIVERS – $L_{Aeq,period}$ dB

Receiver ID	Criterion	Prediction	Exceedance
C01	70	34	Nil
C02	70	40	Nil
C03	70	46	Nil
C04	70	47	Nil
C05	70	46	Nil
C06	70	37	Nil
C07	70	41	Nil
C08	70	42	Nil
C09	70	36	Nil
C10	70	57	Nil
C11	70	40	Nil
C12	70	41	Nil
C13	70	44	Nil
C14	70	46	Nil
C15	70	43	Nil
C16	70	40	Nil
C17	70	22	Nil
C18	70	20	Nil
C19	70	20	Nil
C20	70	19	Nil
C21	70	19	Nil
C22	70	19	Nil
C23	70	18	Nil

Receiver ID	Criterion	Prediction	Exceedance
C24	70	55	Nil
C25	70	51	Nil

Table 25: EVENING/NIGHT PERIOD RESULTS, RESIDENTIAL RECEIVERS – $L_{Aeq,15minute}$ dB

Receiver ID	Criteria (evening/night period)	Prediction	Exceedance
R01	50/44	<15	Nil
R02	35/35	<15	Nil
R03	35/35	<15	Nil
R04	35/35	<15	Nil
R05	35/35	<15	Nil
R06	35/35	<15	Nil

Model results indicate:

- Predicted operational noise levels are below relevant noise criteria at the nearest industrial receivers to the site. The highest $L_{Aeq,period}$ predicted on the site boundary is 57 dB; and
- Predicted operational noise levels are well below relevant criteria at the nearest residential receivers to the site. General traffic movements on site would not be audible at residential locations.

4.4 Sleep Disturbance

Two sleep disturbance scenarios were considered:

1. Outside of the morning shoulder period, assessed by inclusion of a point source with L_{Amax} sound power of 120 dB to represent possible impact noise associated with unloading material on site during the night period. The source was located in an exposed location in an elevated area on the site; and
2. Within the morning shoulder period, assessed by inclusion of a point source with L_{Amax} sound power of 120 dB to represent possible impact noise associated with unloading material on site during the morning shoulder period. The source was located in an exposed location in an elevated area on the site, and was combined with the morning shoulder operational scenario.

Figure 16 presents maximum envelope noise contours for the two sleep disturbance scenarios, for nearest residential receivers to the site. Table 26 presents model predictions for the nearest residential receivers to the site.

Table 26: SLEEP DISTURBANCE RESULTS, RESIDENTIAL RECEIVERS – L_{Amax} dB

Receiver ID	Criterion	Prediction	Exceedance
R01	54	38	Nil
R02	45	30	Nil
R03	45	19	Nil
R04	45	32	Nil
R05	45	36	Nil
R06	45	<30	Nil

Model predictions are well below the sleep disturbance screening criterion indicating sleep disturbance impact is unlikely.

4.5 Modifying Factors

Section 4 of the INP requires consideration of modifying factors. These are characteristics of noise received at residential receptor locations that could result in more annoyance than would normally occur from that level. The modifying factors are tonal noise, low frequency noise, impulsive noise, intermittent noise and duration (if single event).

None of the noise sources proposed are known to exhibit any of these characteristics; therefore it is considered unlikely that modifying factor penalties would result. Further, model predictions are more than 5 dB below relevant criteria, so if any penalty was deemed to apply, no exceedance of noise assessment criteria should result.

Figure 11: Near Field Noise Contours - Construction $L_{Aeq,15minute}$ dB

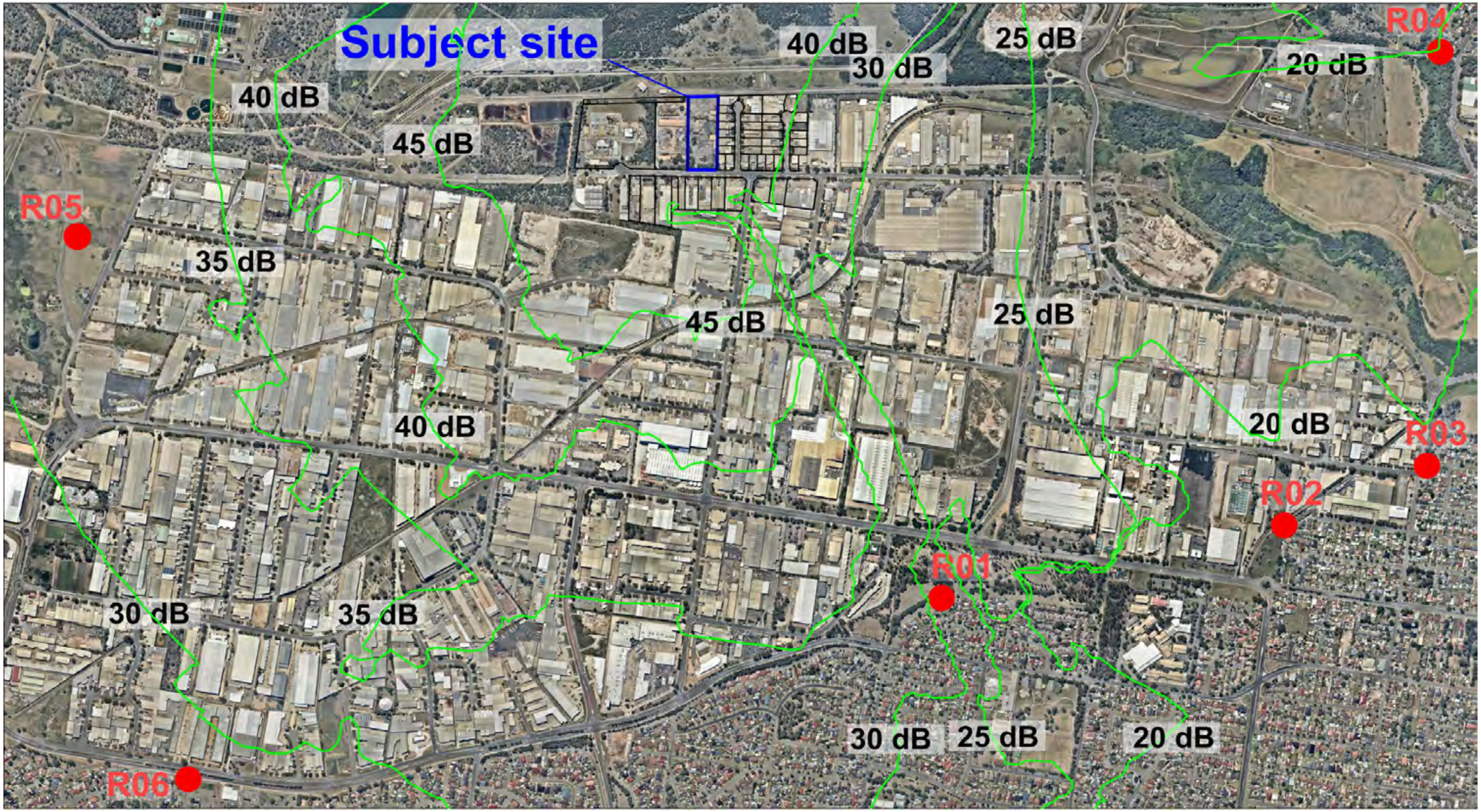

Figure 12: Far Field Noise Contours - Construction $L_{Aeq,15minute}$ dB

Figure 13: Near Field Noise Contours - Operational Morning Shoulder/Day Period $L_{Aeq,period}$ dB

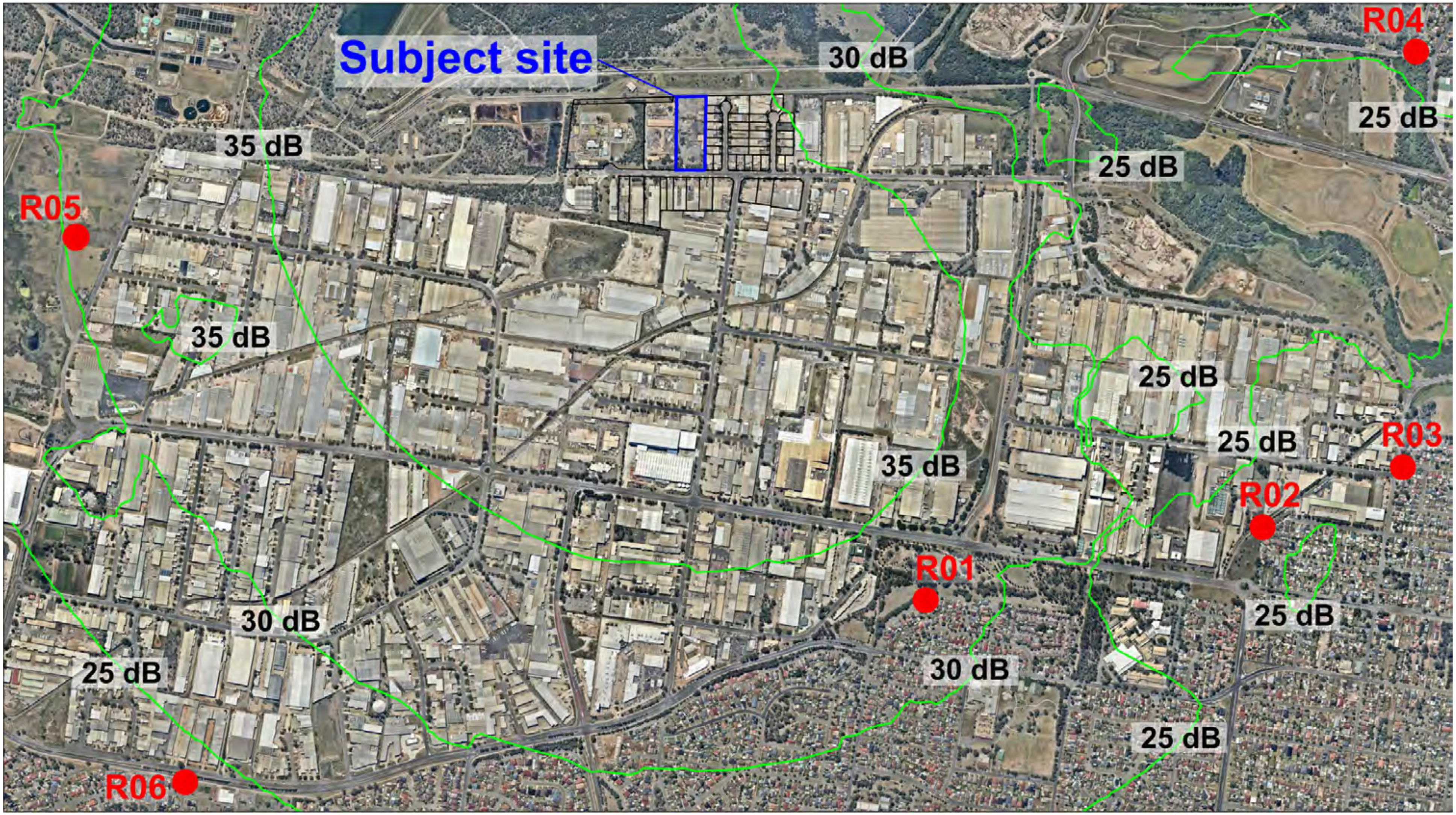

Figure 14: Far Field Noise Contours - Operational Morning Shoulder/Day Period $L_{Aeq,15minute}$ dB

Figure 15: Near Field Noise Contours - Operational Evening/Night Period $L_{Aeq,period}$ dB

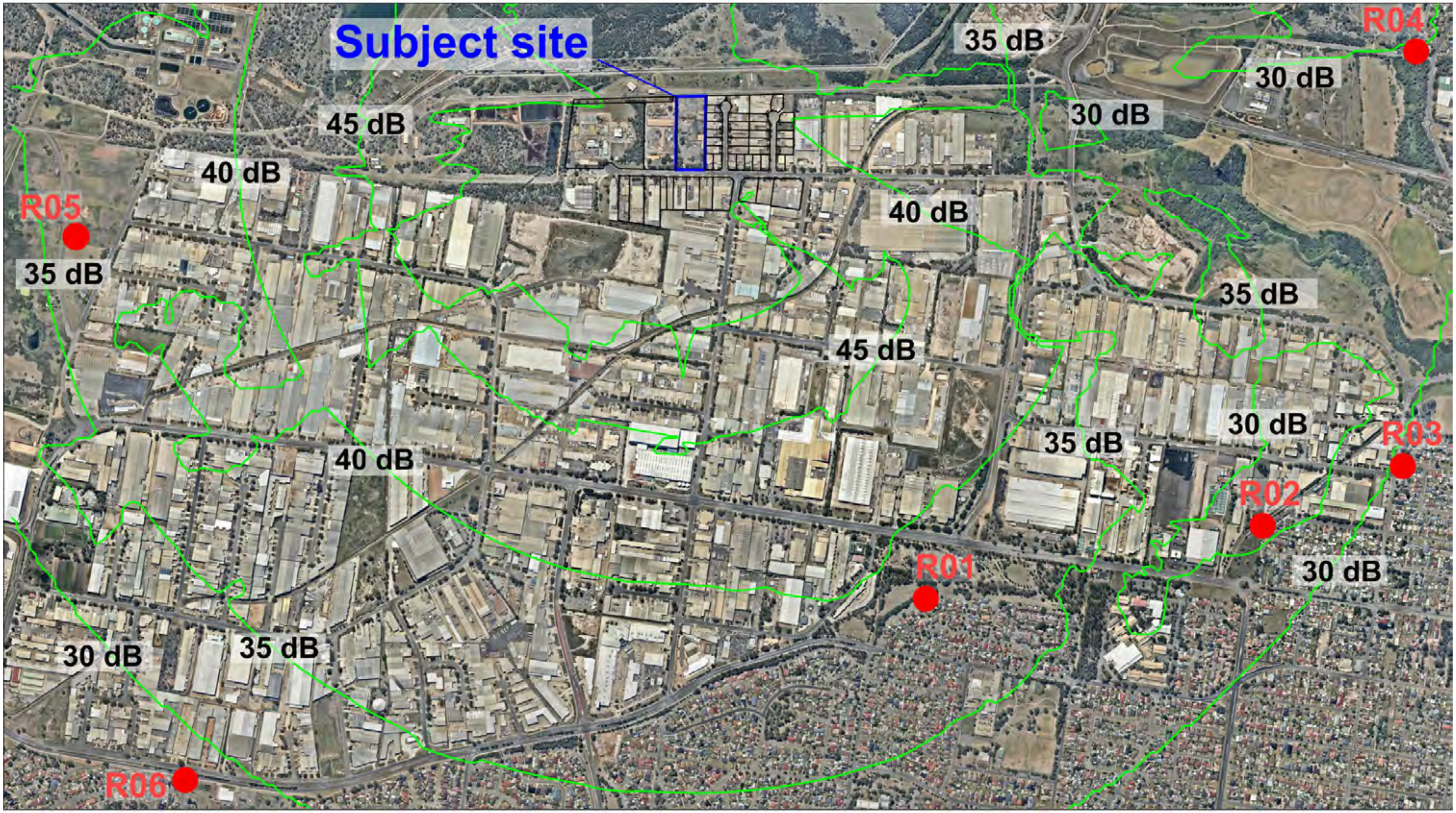

Figure 16: Far Field Noise Contours - Sleep Disturbance L_{Amax} dB

5 ROAD TRAFFIC ASSESSMENT

Bettergrow has advised that the majority of traffic accessing the subject site will do so directly via The Horsley Drive, Elizabeth Street and Davis Road. This route remains entirely within the industrial zone until The Horsley Drive.

Annual average daily traffic (AADT) volumes for The Horsley Drive were sourced from the online Roads and Maritime Services Volume Viewer for the year 2009. The traffic counter location was located on The Horsley Drive approximately 500 metres east of Elizabeth Street as shown in Figure 17.

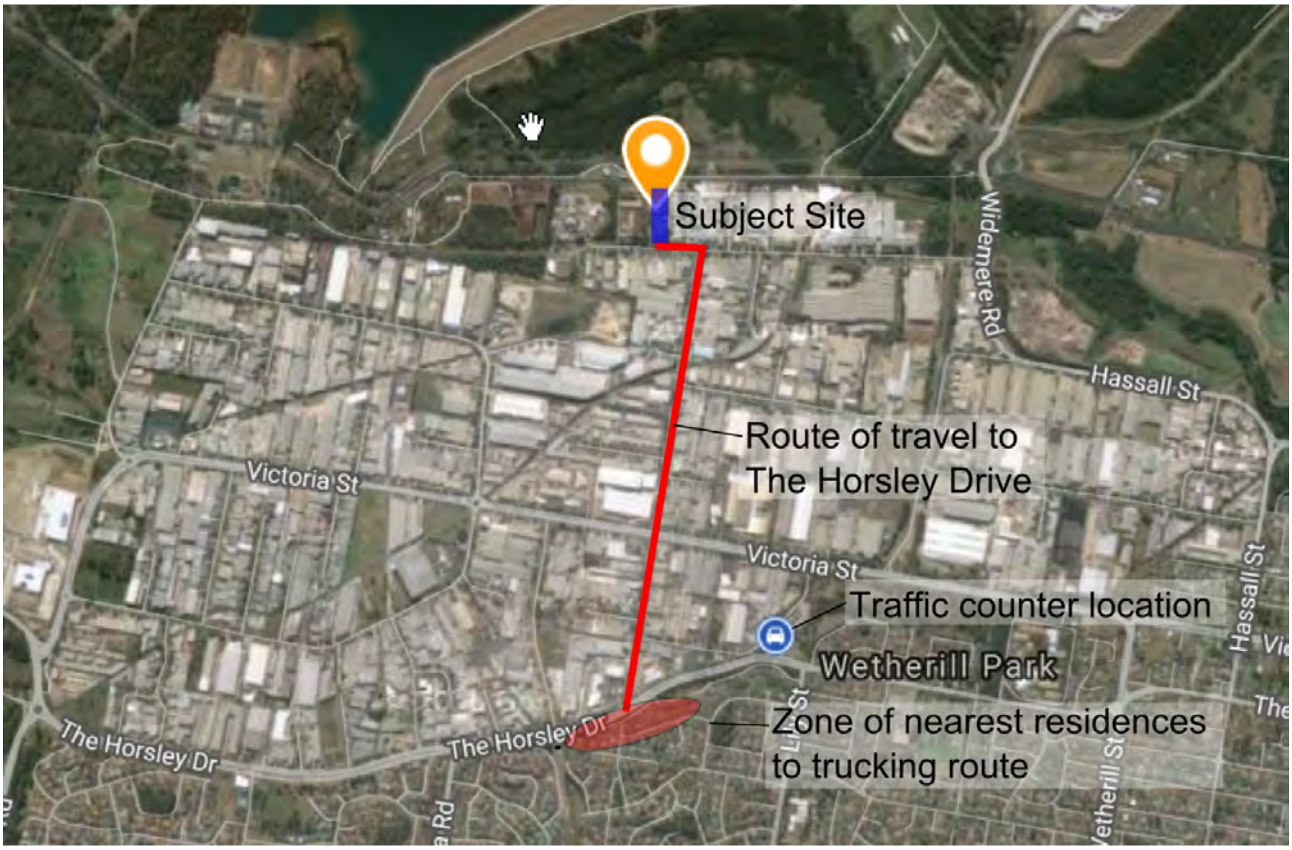

Figure 17: Site traffic route of travel

With consideration of high traffic volumes on The Horsley Drive, it is assumed road traffic noise criteria are already exceeded. Assessment is therefore made against the relative increase criterion, which limits increases to existing noise levels from new development to 2 dB.

Total AADT for The Horsely Drive in 2009 was 21,295 vehicles per day. Total peak daily movements for the subject site are 358 vehicles per day, which represents an increase of 1.7 percent. In acoustic terms, this represents an increase of less than 0.1 dB, which is insignificant and would be imperceptible to the human ear. Relative to the high traffic volumes already present on The Horsley Drive, traffic generated by the proposal would have negligible acoustic impact.

6 SUMMARY

Global Acoustics was engaged by Bettergrow Pty Ltd to carry out a noise and vibration impact assessment for a proposed resource recovery and recycling centre at 24 Davis Road, Wetherill Park NSW.

6.1 Construction Noise

A worst case construction scenario was developed that considered all construction equipment operating concurrently and continuously at full power. Such a scenario is unlikely to eventuate.

Predicted construction noise levels were below relevant construction noise criteria at the nearest industrial and residential receivers to the site. No construction noise impact is predicted.

6.2 Operational Noise

A model of the proposed site was developed, including separate morning shoulder/day (6am to 6pm) and evening/night period scenarios (6pm to 6am).

The morning shoulder/day period scenario considered a potential worst case operating configuration, including all four operating areas operating concurrently at full capacity. All roller doors on processing buildings were considered to be open, and peak period trucking movements were included. As such, this is considered a conservative scenario, and resulting noise levels from the site should typically be less than predicted. Predicted operational noise levels were below relevant noise criteria at the nearest industrial receivers to the site, and, were 7 dB or more below relevant criteria at the nearest residential receivers to the site.

The evening /night period scenario considered worst case trucking movements as described in Section 3.4.5. No processing activities are proposed for these periods. Predicted operational noise levels were below relevant noise criteria at the nearest industrial receivers to the site, and, were well below relevant criteria at the nearest residential receivers to the site. General traffic movements on site would not be audible at residential locations.

No operational noise impact is predicted.

6.3 Sleep Disturbance

Sleep disturbance impact was assessed by inclusion of a point source with L_{Amax} sound power of 120 dB to represent possible impact noise associated with unloading material on site during the night period, and, concurrently with operational activities during the morning shoulder period. The source was located in an exposed location in an elevated area of the site. Model predictions were well below the sleep disturbance screening criterion, indicating sleep disturbance impact is unlikely.

6.4 Road Traffic Noise

The majority of traffic accessing the site will do so directly via The Horsley Drive, Elizabeth Street and Davis

Road. This route remains entirely within the industrial zone until The Horsley Drive. With consideration of high traffic volumes on The Horsley Drive, it is assumed road traffic noise criteria are already exceeded. The predicted increase to existing road traffic noise due to traffic generated by the proposal is approximately 0.1 dB, which is insignificant and would be imperceptible to the human ear. Relative to the high traffic volumes already present on The Horsley Drive, traffic generated by the proposal would have negligible acoustic impact.

6.5 Vibration

No vibration impact is predicted at residential receivers due to separation distances from the site of typically 1,500 metres or more. Vibration data was not available to allow a detailed assessment of potential vibration impact to neighbouring industrial premises. It is recommended vibration testing of vibration generating equipment be undertaken upon commissioning to ensure relevant limits are achieved at the nearest industrial receptors. In the unlikely event that limits are exceeded, mitigation controls should be implemented.

6.6 Closure

Results of this assessment indicate noise and vibration generated by the proposal would have little to no impact on the nearest residential receivers to the site. These are located more than 1,500 metres away, and there are a substantial number of industrial premises and buildings along the propagation path. It is considered highly unlikely proposed operations would be discernible at residential locations.

Model predictions at the site boundary are less than recommended noise amenity criteria for industrial premises. The premises immediately to the west is a metal recycling operation, which currently generates relatively high noise levels. Premises located east of the subject site all have a solid concrete wall adjoining the common boundary, which form the rear walls of the buildings located along that boundary. Predicted external noise levels at the front of those buildings are typically 20 dB or more below the amenity criterion, and, are less than day period background noise levels (RBL) measured at the subject site.

From an acoustics perspective, the proposed site is considered a good location for an operation of this nature. Compliance with relevant assessment noise level targets is predicted for all activities.

Global Acoustics Pty Ltd

APPENDIX

A CALIBRATION CERTIFICATES

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter

IEC 61672-3.2006

Calibration Certificate

Calibration Number C16016

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : ARL Ngara
Instrument Serial Number : 878041
Microphone Serial Number : 320464
Pre-amplifier Serial Number : 28168

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	21.9°C	**Ambient Temperature :**	21.9°C
Relative Humidity :	52.6%	**Relative Humidity :**	57%
Barometric Pressure :	99.56kPa	**Barometric Pressure :**	99.52kPa

Calibration Technician : Dennis Kim
Calibration Date : 27/01/2016
Secondary Check: Corey Stewart
Report Issue Date : 27/01/2016

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10: Self-generated noise	*Pass*	14: Level linearity on the reference level range	*Pass*
11: Acoustical tests of a frequency weighting	*Pass*	15: Level linearity incl. the level range control	*Pass*
12: Electrical tests of frequency weightings	*Pass*	16: Toneburst response	*Pass*
13: Frequency and time weightings at 1 kHz	*Pass*	17: Peak C sound level	*Pass*
		18: Overload Indication	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2002 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002 and because the periodic tests of IEC 61672-3:2006 cover only a limited subset of the specifications in IEC 61672-1:2002.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.120dB*	*Temperature*	*±0.3°C*
12.5kHz	*±0.165dB*	*Relative Humidity*	*±4.1%*
16kHz	*±0.245dB*	*Barometric Pressure*	*±0.1kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.121dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

NATA
WORLD RECOGNISED ACCREDITATION

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

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Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter

AS 1259.1:1990 - AS 1259.2:1990

Calibration Certificate

Calibration Number C15580

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : ARL Ngara
Instrument Serial Number : 87801F
Microphone Serial Number : 316671
Pre-amplifier Serial Number : 27809

Atmospheric Conditions
Ambient Temperature : 20.5°C
Relative Humidity : 52.9%
Barometric Pressure : 99.16kPa

Calibration Technician : Dennis Kim
Calibration Date : 13/11/2015
Secondary Check: Kate Alchin
Report Issue Date : 13/11/2015
Approved Signatory : [signature] Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	*Pass*	10.3.4: Inherent system noise level	*Pass*
10.2.3: Frequency weighting	*Pass*	10.4.2: Time weighting characteristic F and S	*Pass*
10.3.2: Overload indications	*Pass*	10.4.3: Time weighting characteristic I	*Pass*
10.3.3: Accuracy of level range control	*Pass*	10.4.5: R.M.S performance	*Pass*
8.9: Detector-indicator linearity	*Pass*	9.3.2: Time averaging	*Pass*
8.10: Differential level linearity	*Pass*	9.3.5: Overload indication	*Pass*

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.120dB*	*Temperature*	*±0.3°C*
12.5kHz	*±0.165dB*	*Relative Humidity*	*±4.1%*
16kHz	*±0.245dB*	*Barometric Pressure*	*±0.1kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.098dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

The sound level meter under test has been shown to conform to the type 1 requirements for periodic testing as described in AS 1259.1:1990 and AS 1259.2:1990 for the tests stated above.

NATA WORLD RECOGNISED ACCREDITATION

This calibration certificate is to be read in conjunction with the calibration test report.

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Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

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Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Calibrator

IEC 60942-2004

Calibration Certificate

Calibration Number C15199

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
THORNTON NSW 2322

Equipment Tested/ Model Number : Rion NC-73
Instrument Serial Number : 11248306

Atmospheric Conditions
Ambient Temperature : 21.9°C
Relative Humidity : 58.9%
Barometric Pressure : 100.9kPa

Calibration Technician : Corey Stewart
Calibration Date : 30/04/2015
Secondary Check: Sandra Minto
Report Issue Date : 04/05/2015

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
5.2.2: Generated Sound Pressre Level	*Pass*	5.3.2: Frequency Generated	*Pass*
5.2.3: Short Term Fluctuation	*Pass*	5.5: Total Distortion	*Pass*

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2004 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.09dB*	*Temperature*	*±0.3°C*
Short Term Fluct.	*±0.02dB*	*Relative Humidity*	*±4.1%*
Frequency	*±0.01%*	*Barometric Pressure*	*±0.1kPa*
Distortion	*±0.26%*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

NATA WORLD RECOGNISED ACCREDITATION

This calibration certificate is to be read in conjunction with the calibration test report.

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Accredited for compliance with ISO/IEC 17025.

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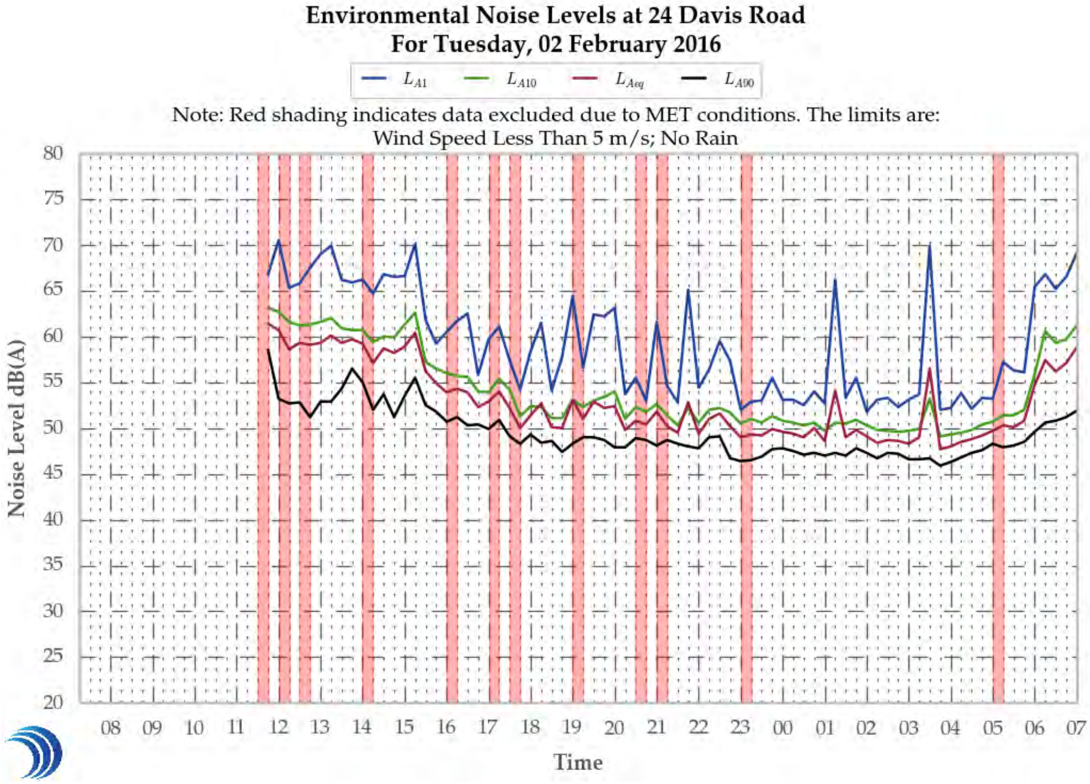
APPENDIX

B LOGGER GRAPHS


Environmental Noise Levels at 24 Davis Road
For Tuesday, 02 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80
75
70
65
60
55
50
45
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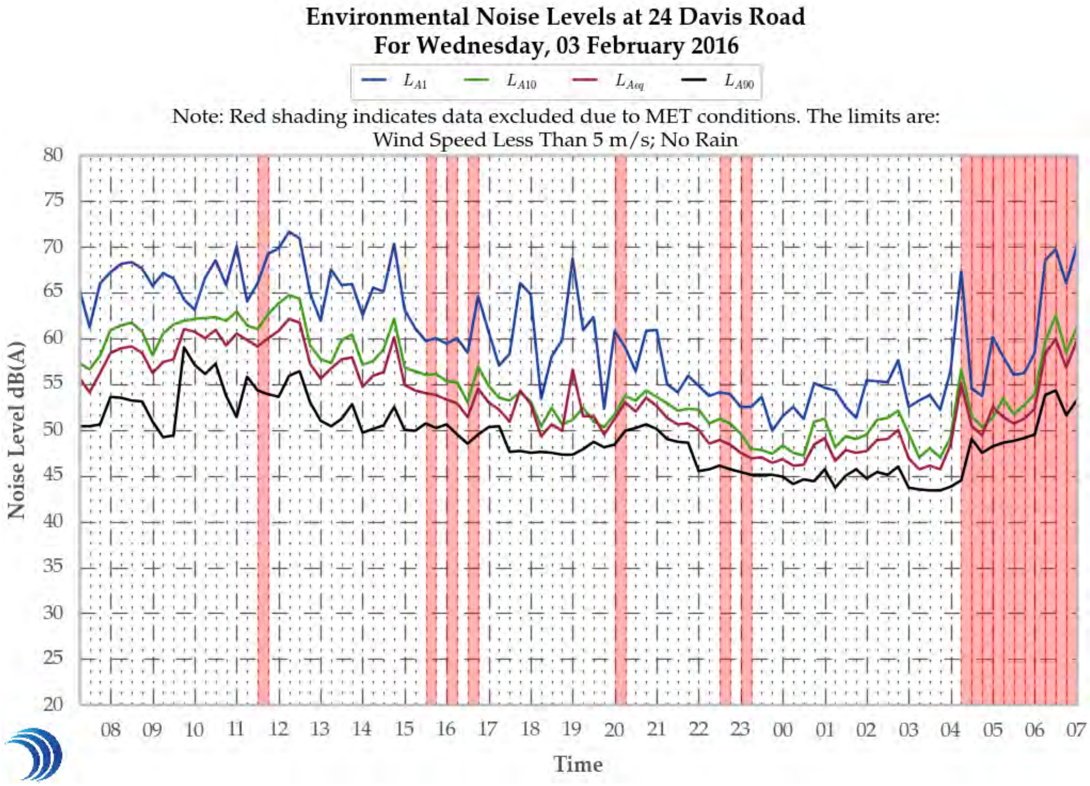
35
30
25
20
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time


Environmental Noise Levels at 24 Davis Road
For Wednesday, 03 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80
75
70
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60
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20
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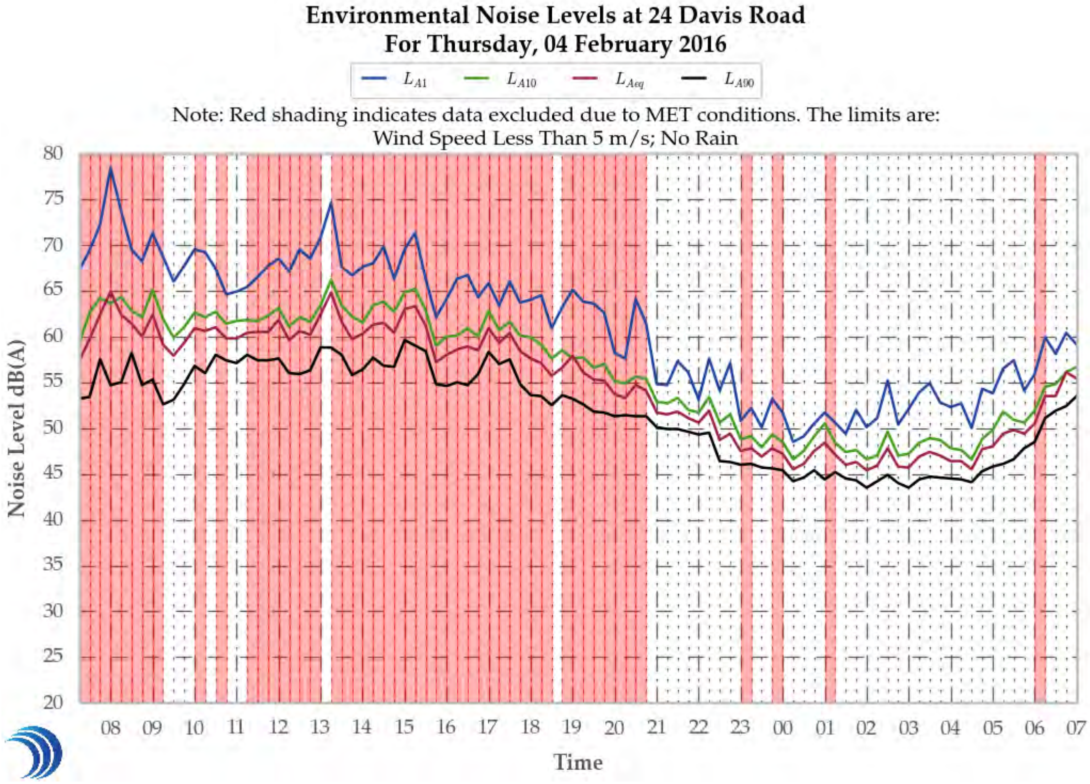
Time


Environmental Noise Levels at 24 Davis Road
For Thursday, 04 February 2016
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Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
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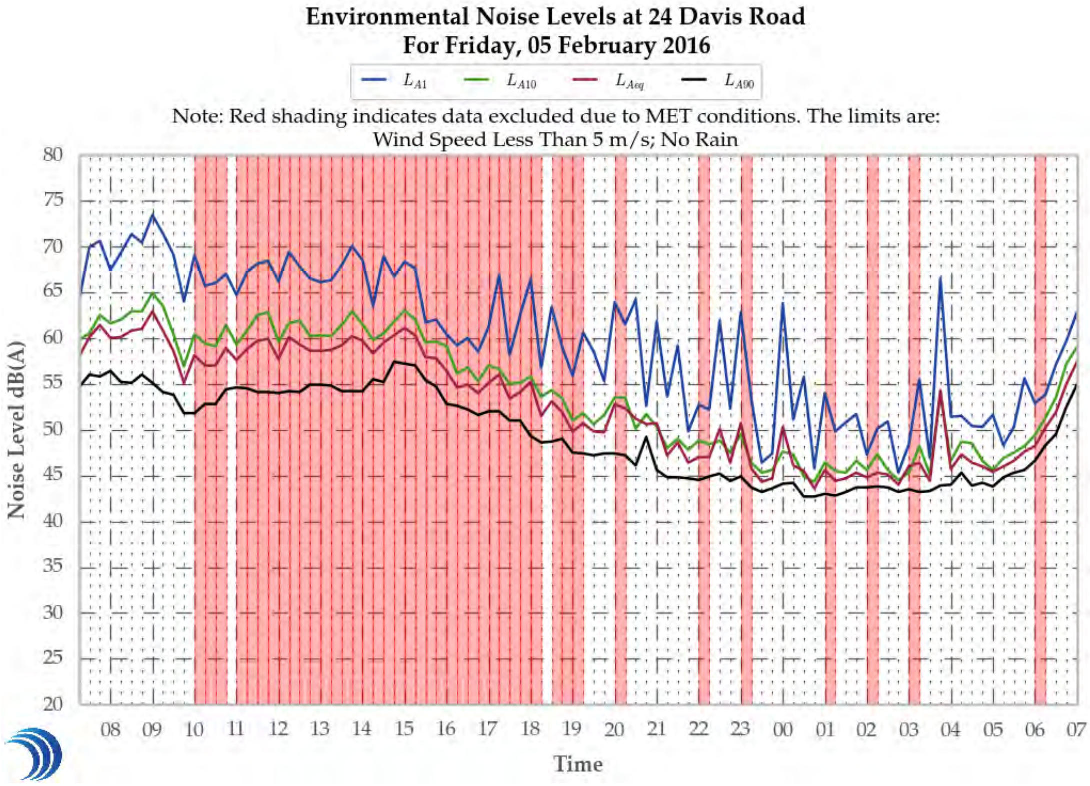
Time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For Friday, 05 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
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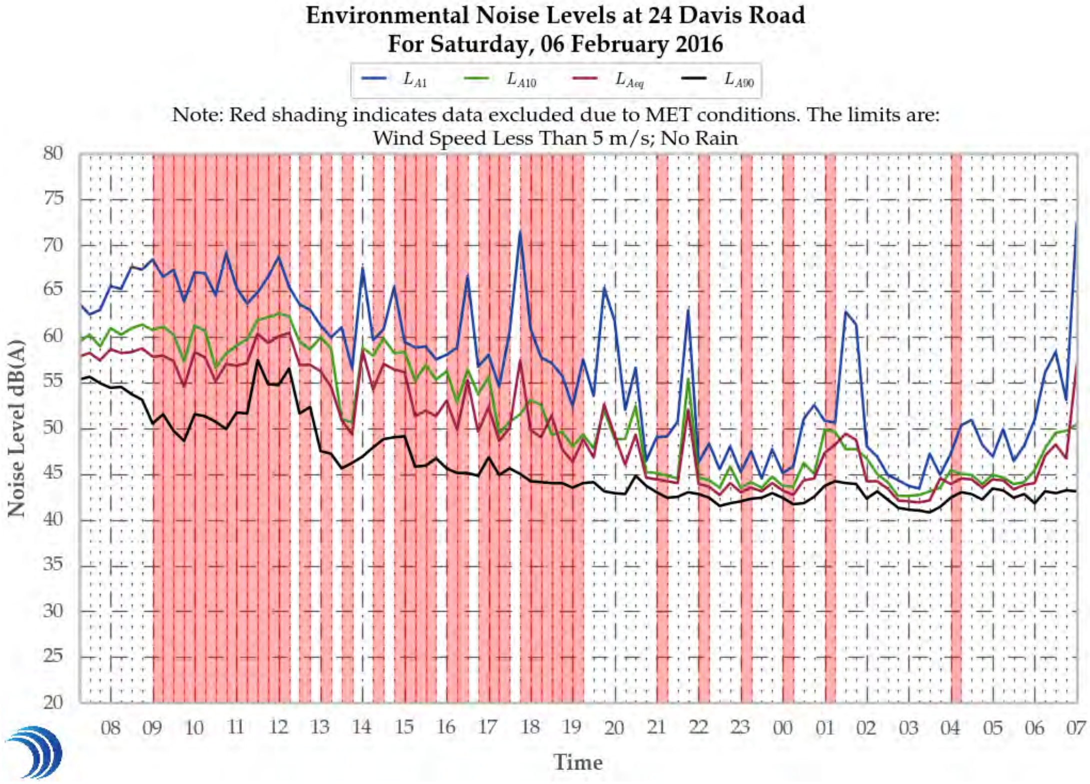
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time


Environmental Noise Levels at 24 Davis Road
For Saturday, 06 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80
75
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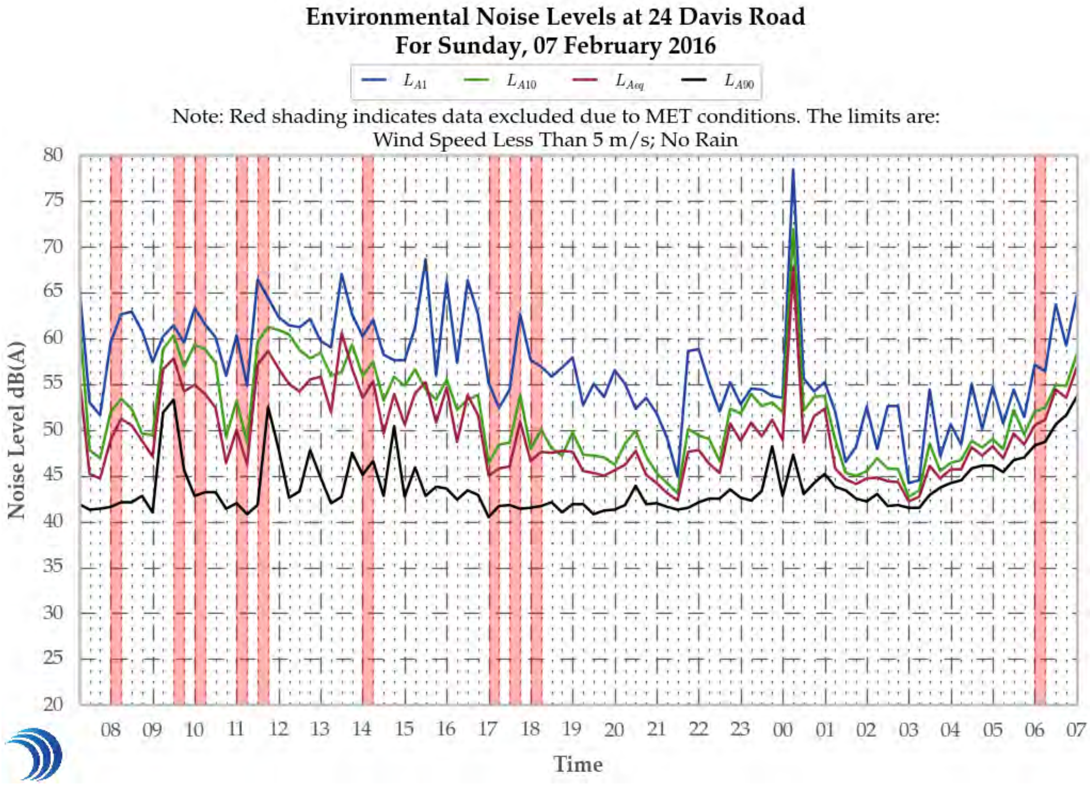
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time


Environmental Noise Levels at 24 Davis Road
For Sunday, 07 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80
75
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35
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20
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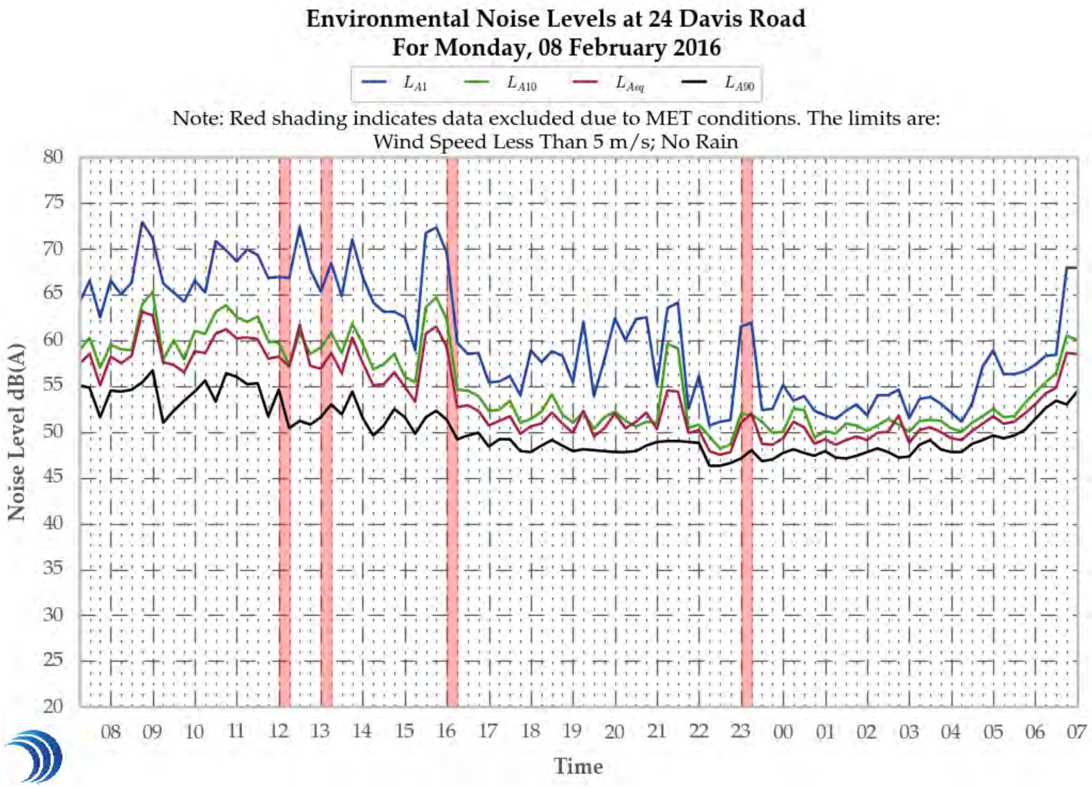
Environmental Noise Levels at 24 Davis Road
For Monday, 08 February 2016
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Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
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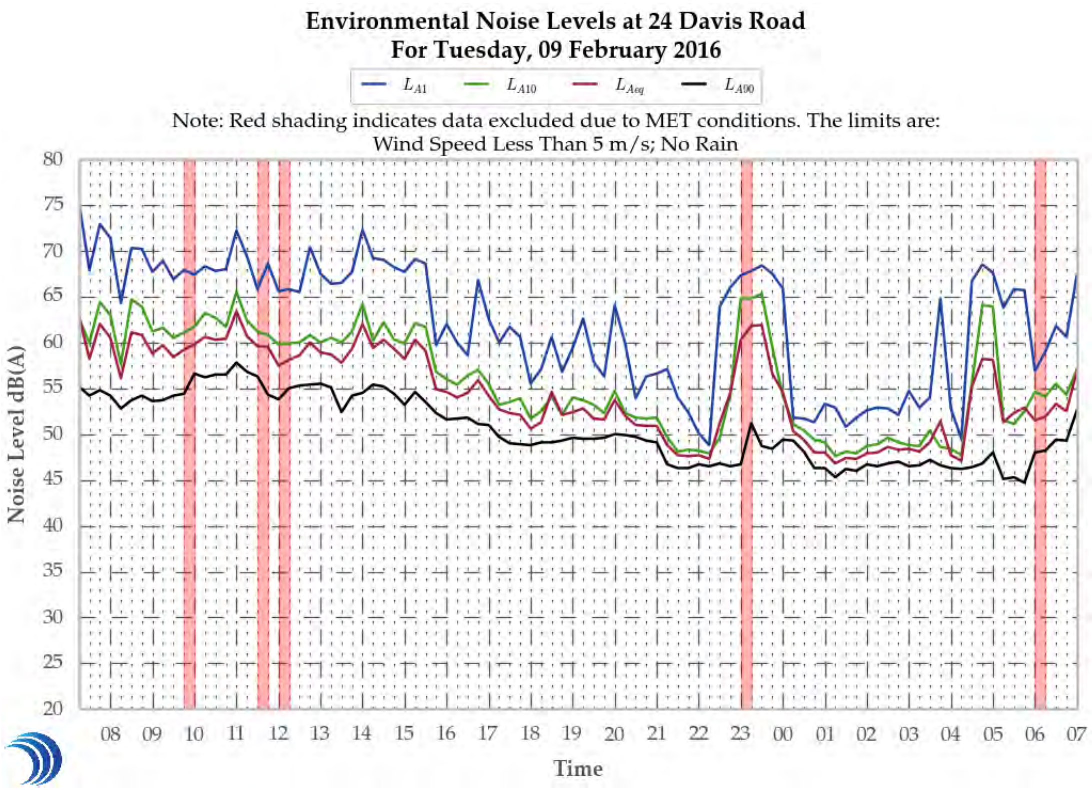
Environmental Noise Levels at 24 Davis Road
For Tuesday, 09 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
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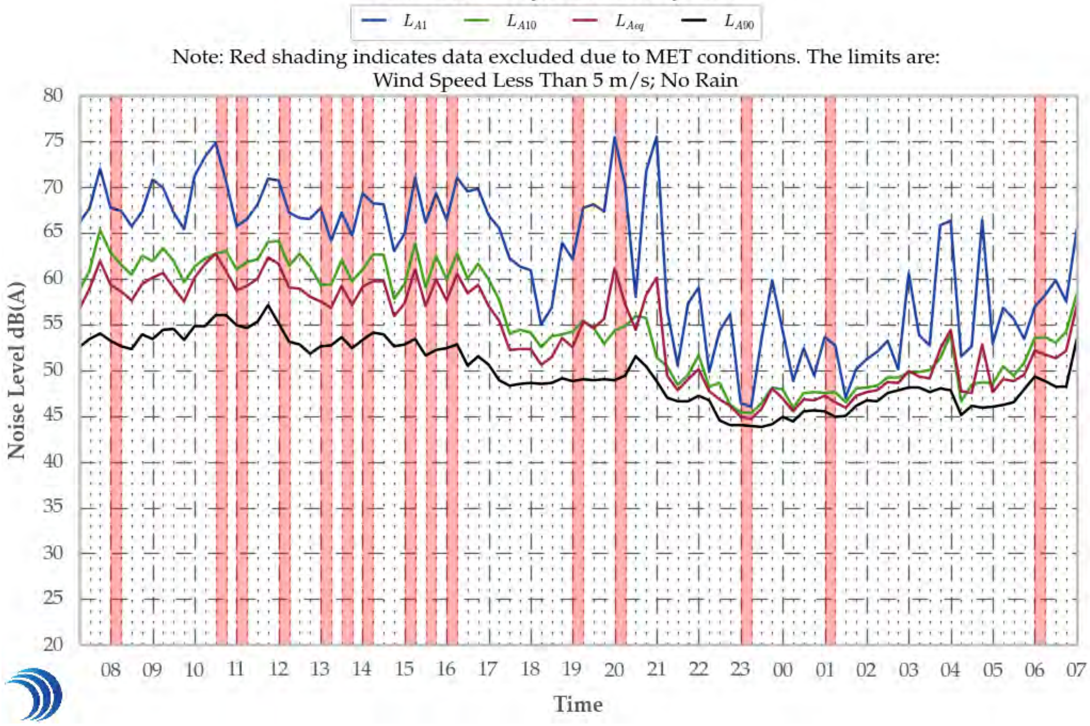
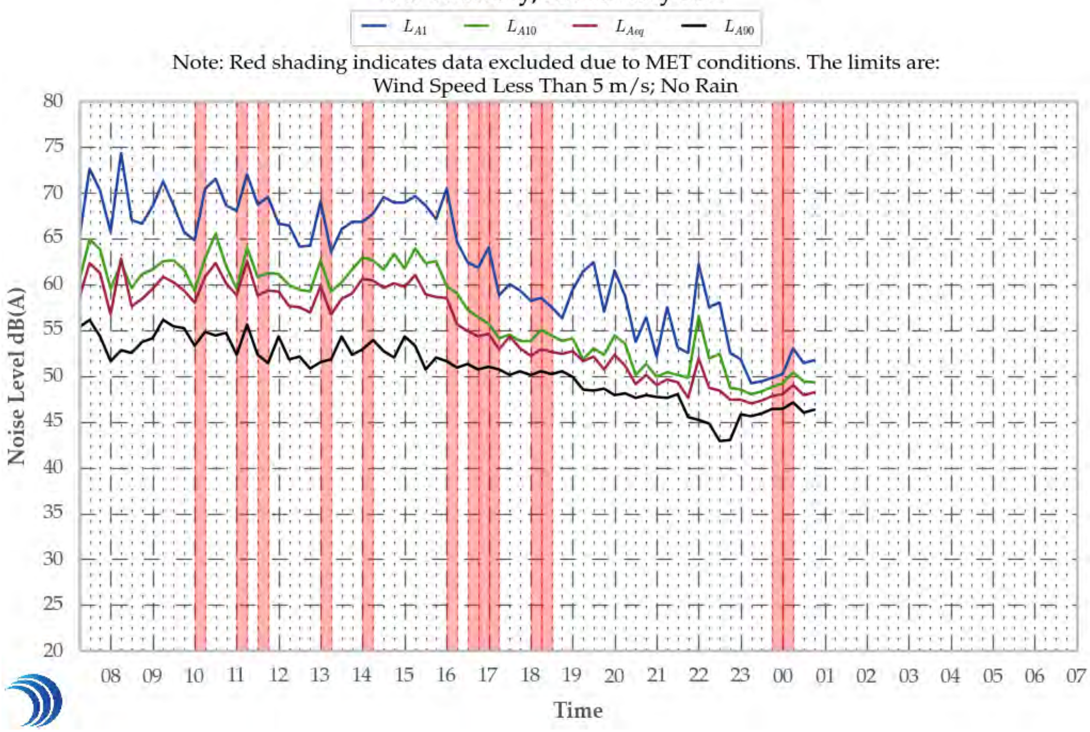
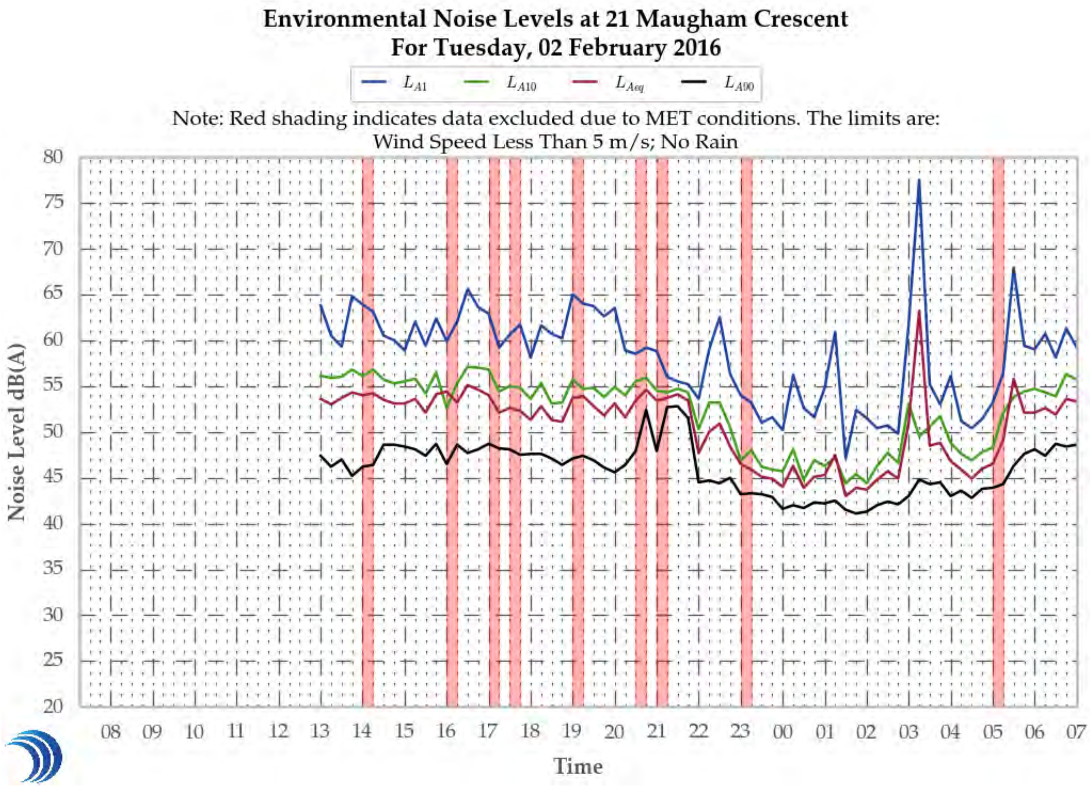
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time

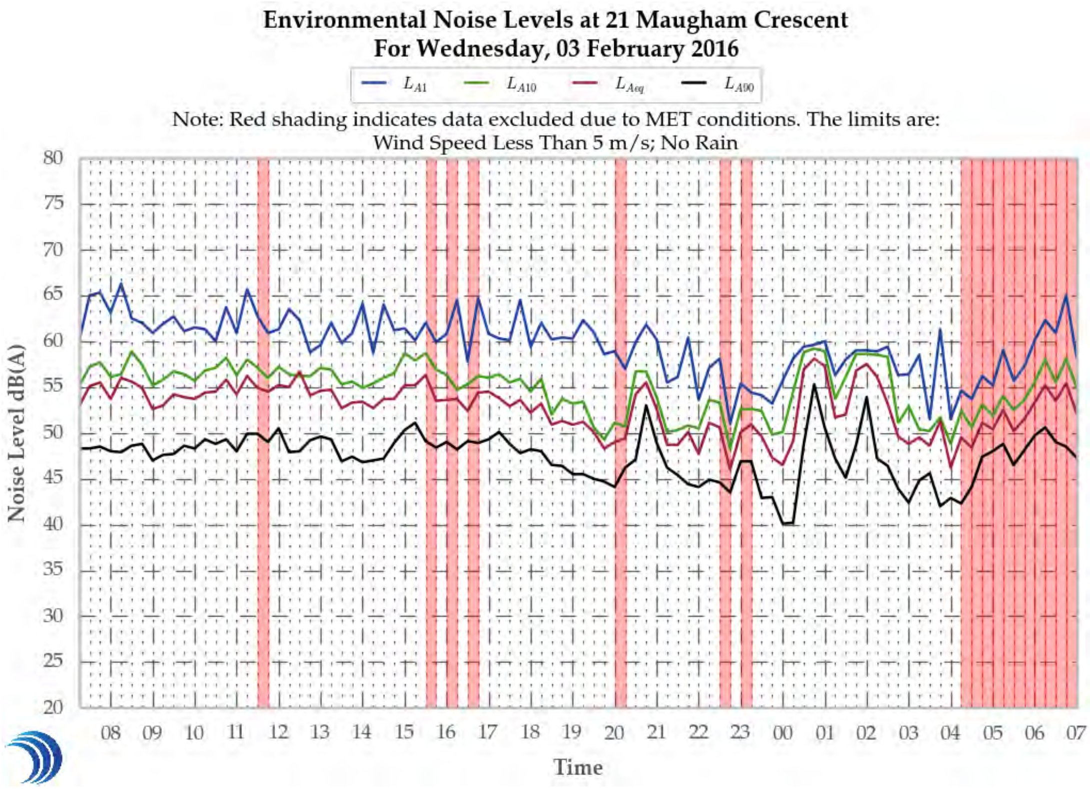
Environmental Noise Levels at 24 Davis Road
For Wednesday, 10 February 2016

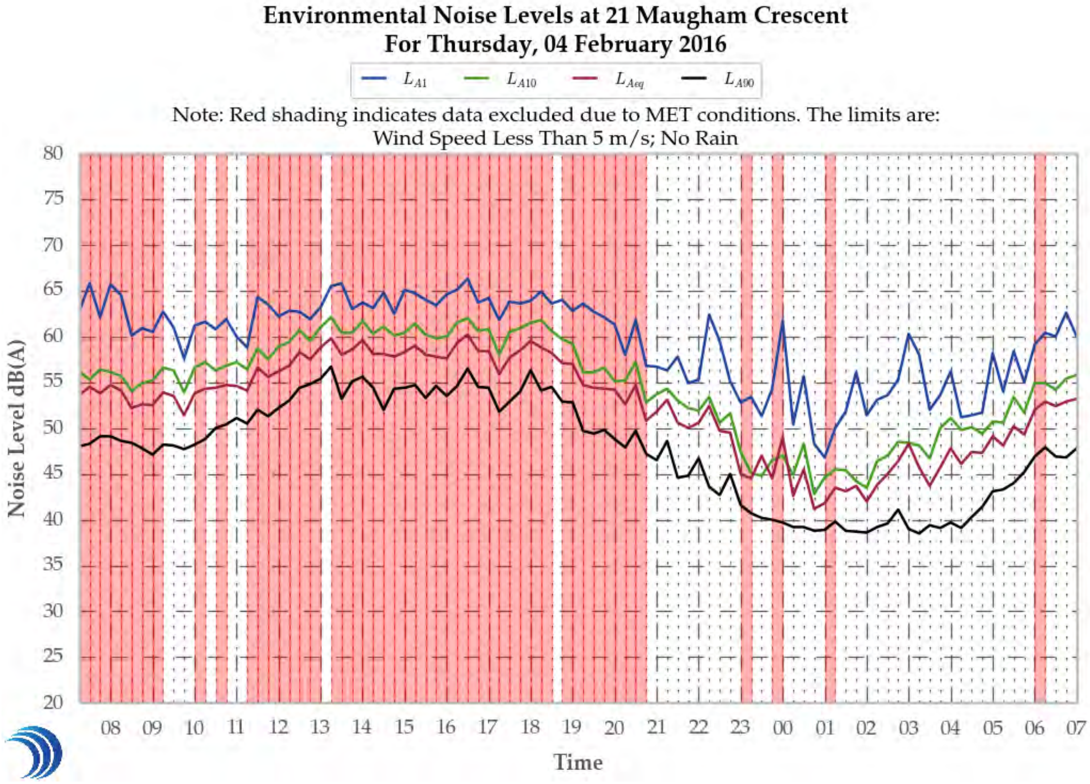


Environmental Noise Levels at 24 Davis Road
For Thursday, 11 February 2016




Environmental Noise Levels at 21 Maugham Crescent
For Tuesday, 02 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80 75 70 65 60 55 50 45 40 35 30 25 20
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time


Environmental Noise Levels at 21 Maugham Crescent
For Wednesday, 03 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80 75 70 65 60 55 50 45 40 35 30 25 20
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time


Environmental Noise Levels at 21 Maugham Crescent
For Thursday, 04 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
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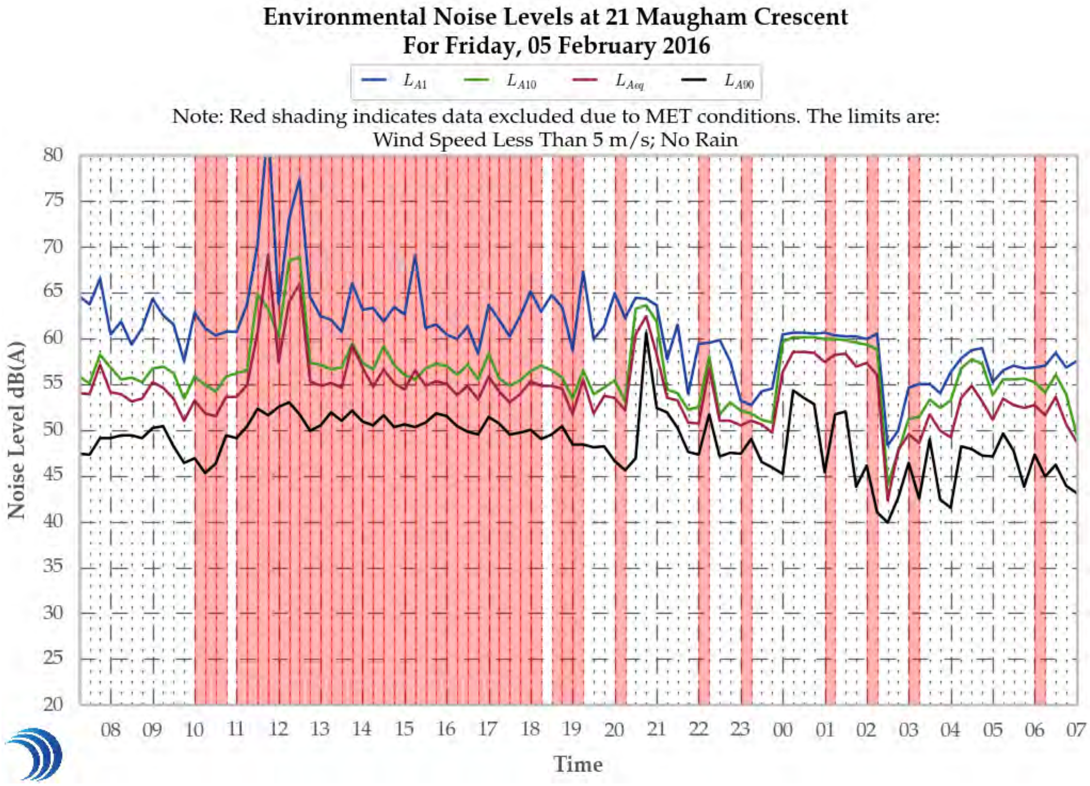
Time


Environmental Noise Levels at 21 Maugham Crescent
For Friday, 05 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
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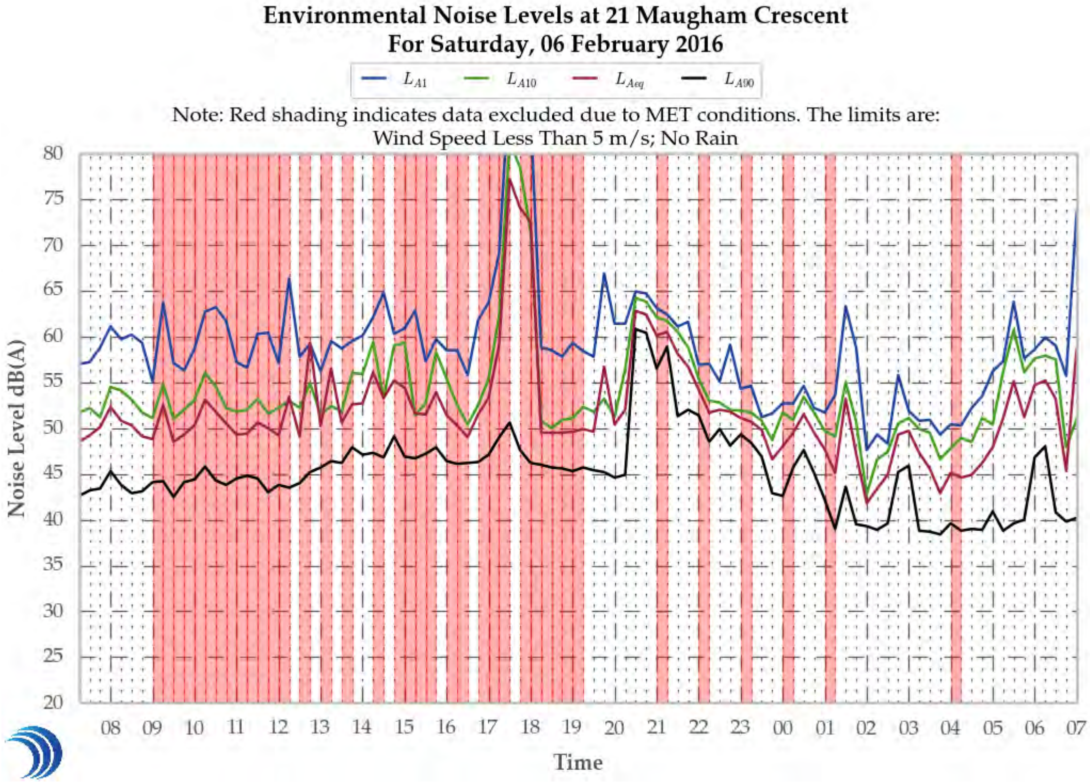
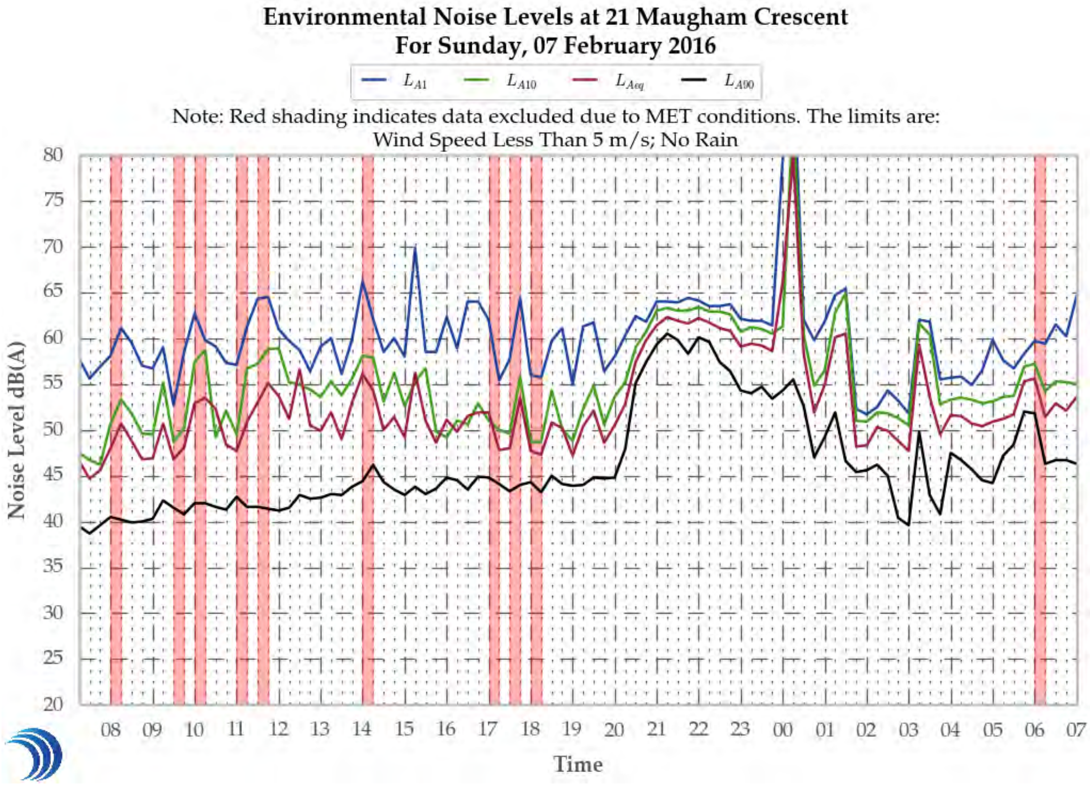
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time


Environmental Noise Levels at 21 Maugham Crescent
For Saturday, 06 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80 75 70 65 60 55 50 45 40 35 30 25 20
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time


Environmental Noise Levels at 21 Maugham Crescent
For Sunday, 07 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80 75 70 65 60 55 50 45 40 35 30 25 20
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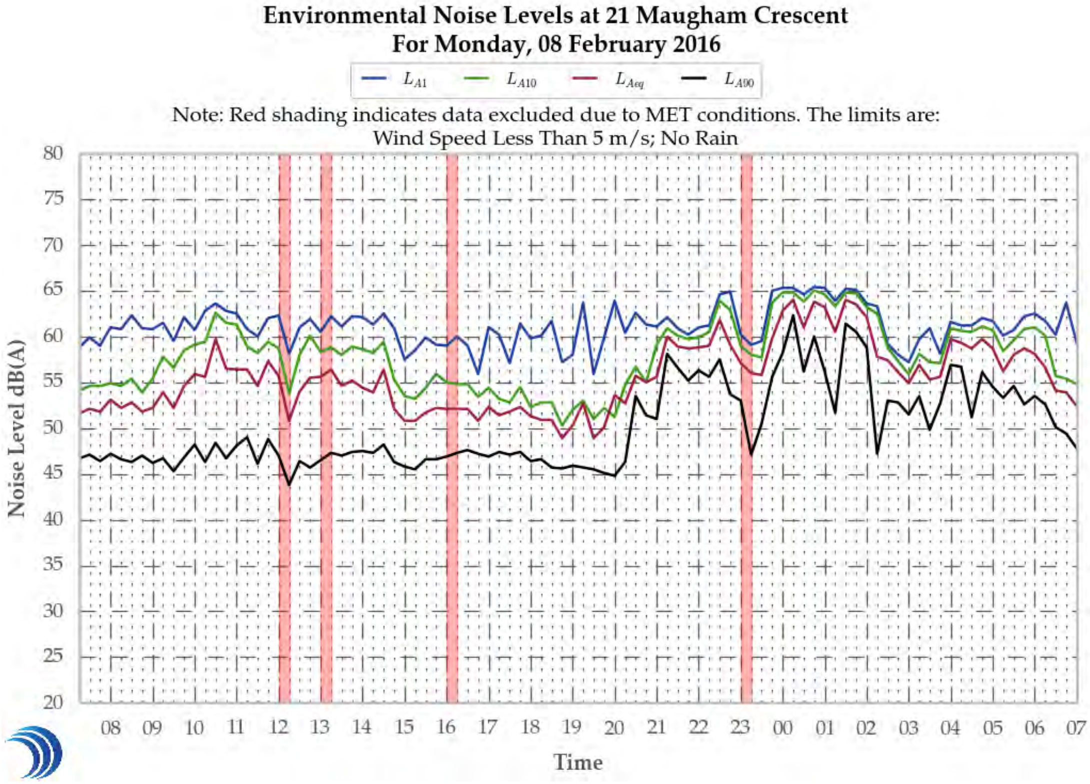
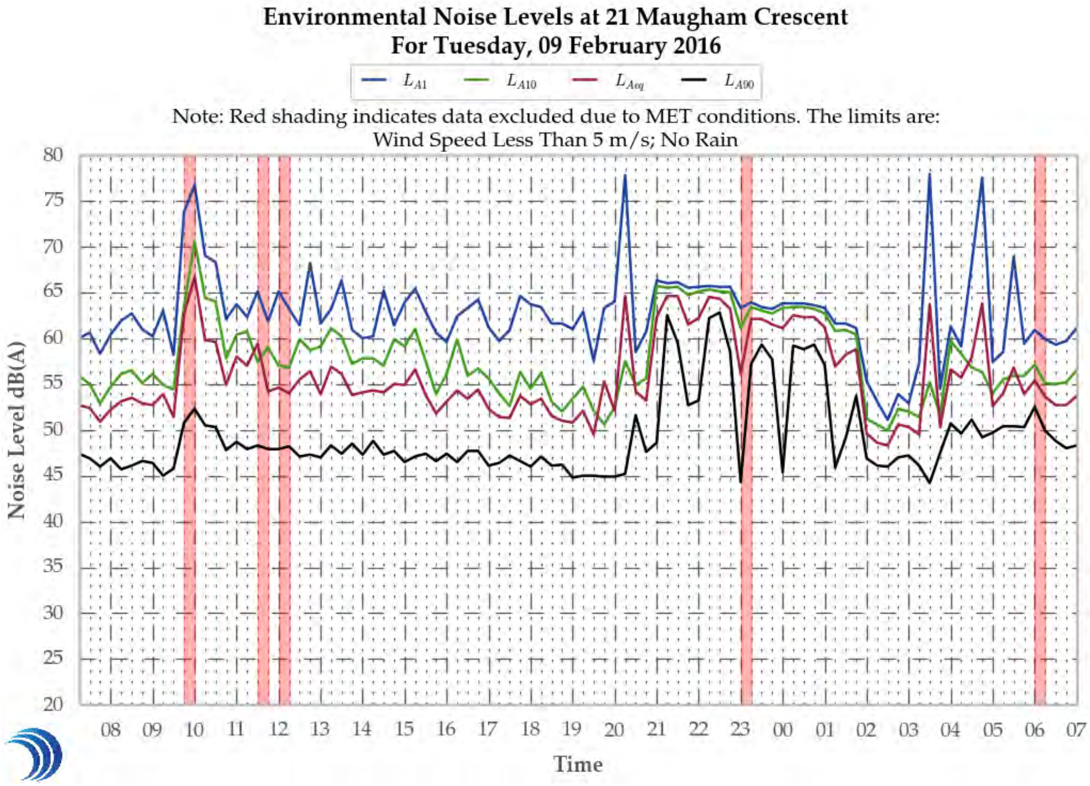
Time


Environmental Noise Levels at 21 Maugham Crescent
For Monday, 08 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80
75
70
65
60
55
50
45
40
35
30
25
20
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time


Environmental Noise Levels at 21 Maugham Crescent
For Tuesday, 09 February 2016
L_{A1} L_{A10} L_{Aeq} L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80
75
70
65
60
55
50
45
40
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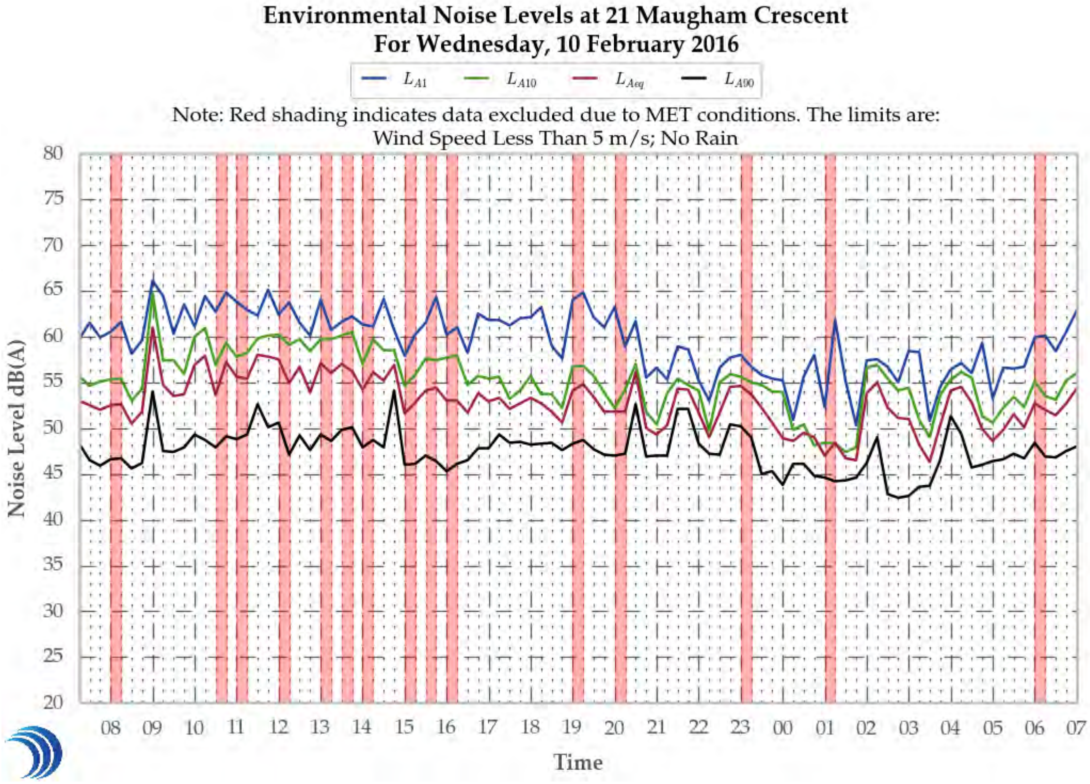
30
25
20
08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 00 01 02 03 04 05 06 07
Time


Environmental Noise Levels at 21 Maugham Crescent
For Wednesday, 10 February 2016
L_{A1}
L_{A10}
L_{Aeq}
L_{A90}
Note: Red shading indicates data excluded due to MET conditions. The limits are:
Wind Speed Less Than 5 m/s; No Rain
Noise Level dB(A)
80
75
70
65
60
55
50
45
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Time