ACOUSTICS AND AIR

VISY RESOURCE RECOVERY FACILITY
112-120 EUSTON ROAD, ALEXANDRIA
NOISE & VIBRATION IMPACT ASSESSMENT

REPORT NO. 19258-N
VERSION B

OCTOBER 2019

PREPARED FOR

BUILD RUN REPAIR
LEVEL 11, 2 SOUTHBANK BOULEVARD
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WILKINSON MURRAY

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

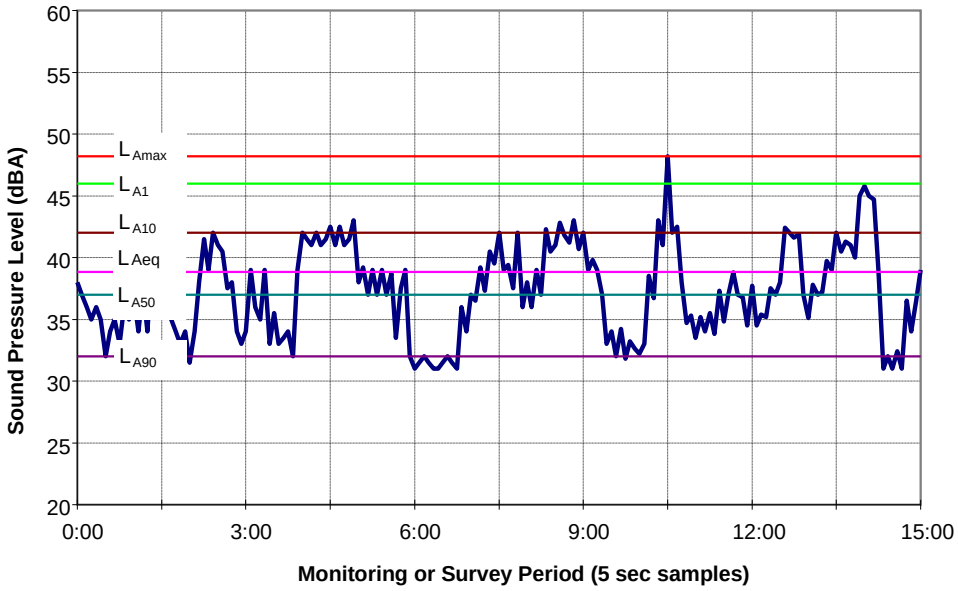
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray Pty Limited has been engaged by Visy to provide a noise and vibration assessment for the development of a Dry Recyclables Facility (DRF) – Stage 1 and Stage 2 at 112-120 Euston Road, Alexandria, (the site) which also fronts Burrows Road.

Stage 1 involves the relocation of an existing Visy facility from 6-10 Burrows Road, St Peters and includes a transfer station for kerbside dry recycling material and baling for commercial paper/recycling material. Stage 2 involves the addition of a Material Recovery Facility (MRF) to separate and recover recyclable materials. The existing site in Alexandria is to be refurbished as a Resource Recycling Facility (RRF).

The new Resource Recovery Facility in Alexandria is proposed to receive and process up to 155,000 tonnes per annum of commingled recyclable materials. Recyclable material will derive from kerbside collections and source-separated cardboard and paper from commercial collections. Truck entry and exit points of the new site are to be located on Burrows Road, on the east side of the site.

The primary objective of this study is to assess the potential noise impacts associated with the Project by addressing the Secretary's Environmental Assessment Requirements (SEARs) issued on 6 September 2019. Table 1-1 presents the outline of the SEARs and the sections addressing the SEARs.

Table 1-1 SEARs

SEARs	Assessment	Section
A quantitative assessment of potential construction, operational and transport noise and vibration impacts including on nearby sensitive receivers including the childcare at 95 Burrows Road, Alexandria	Nearby Sensitive Receivers	Section 2
	Operational Noise	Sections 5.6 & 5.7
	Transportation Noise	Section 6.3
	Construction Noise & Vibration	Sections 7.4 & 8.2
The assessment should be carried out in accordance with relevant Environment Protection Authority (EPA) guidelines and undertaken by a suitably qualified and experienced person(s)	Operational Noise Guidelines	Section 4
	Transportation Noise Guidelines	Section 6.1
	Construction Noise & Vibration Guidelines	Sections 7.1 & 8.1
Cumulative impacts of other developments	Cumulative Noise	Section 4.2
Details and justification of the proposed noise mitigation and monitoring measures	Proposed Noise Mitigation Measures	Section 5.5

2 SITE DESCRIPTION

The existing building at 112-120 Euston Road will be modified to enable operations to be enclosed. The construction and operation of the proposed Resource Recovery Facility is divided into two stages. The built development stages consist of the following:

- Stage 1 includes the construction of:
    - In/out weighbridges and road marking
    - Waste receival bays
    - Upgraded fire systems and new fire water storage tank
    - New building entrance and installing new doors and
    - Stormwater management structures
    - Mechanical Ventilation System

The operation of Stage 1 of the development will have the collection trucks and small commercial trucks enter the site via the southern Burrows Road door and across the inbound weighbridge, with capacity for queuing and staging of trucks if required, and onto the receival bay. Recyclable materials will be unloaded into the kerbside recyclable loose receival bay, which consists of surrounding concrete push up walls. The Front End loader will move recyclables within the receiving bay. The Front End loader will also load recyclable material into haul trucks as required for transport offsite.

The cardboard collection trucks will unload the material into the 3-sided receival bay. The forklift with grab attachment will push the loose cardboard/paper and feed the baler. All trucks will exit the site via the northern Burrows Road door of the building.

- Stage 2 includes the construction of:
    - Product bays for recovered recyclable material products
    - Structures to support materials sorting plant
    - Installation of processing plant and equipment

The Material Recovery Facility (MRF) comprises of approximately 10-12 pieces of equipment, interconnecting conveyors and metal transfer chutes. The Front End loader will be used to move recyclables onto the conveyor to feed the MRF. The material will be sorted and leave the sorting plant via chutes into collection bins. The material sorting plant will be situated on a first-floor mezzanine level.

The site is expected to involve operation activities 24 hours per day, 7 days per week. However, baling and MRF operations will typically be restricted to 6.00am and 10.00pm Monday to Friday with limited operation outside these times. Transfer station operation will generally occur during night-time and weekend hours. Waste delivery from kerbside recycling trucks will occur during daylight hours Monday to Friday with limited deliveries outside these times.

Figure 2-1 and Figure 2-2 present the proposed site layouts.

Figure 2-1 Proposed ground floor layout for Stage 1

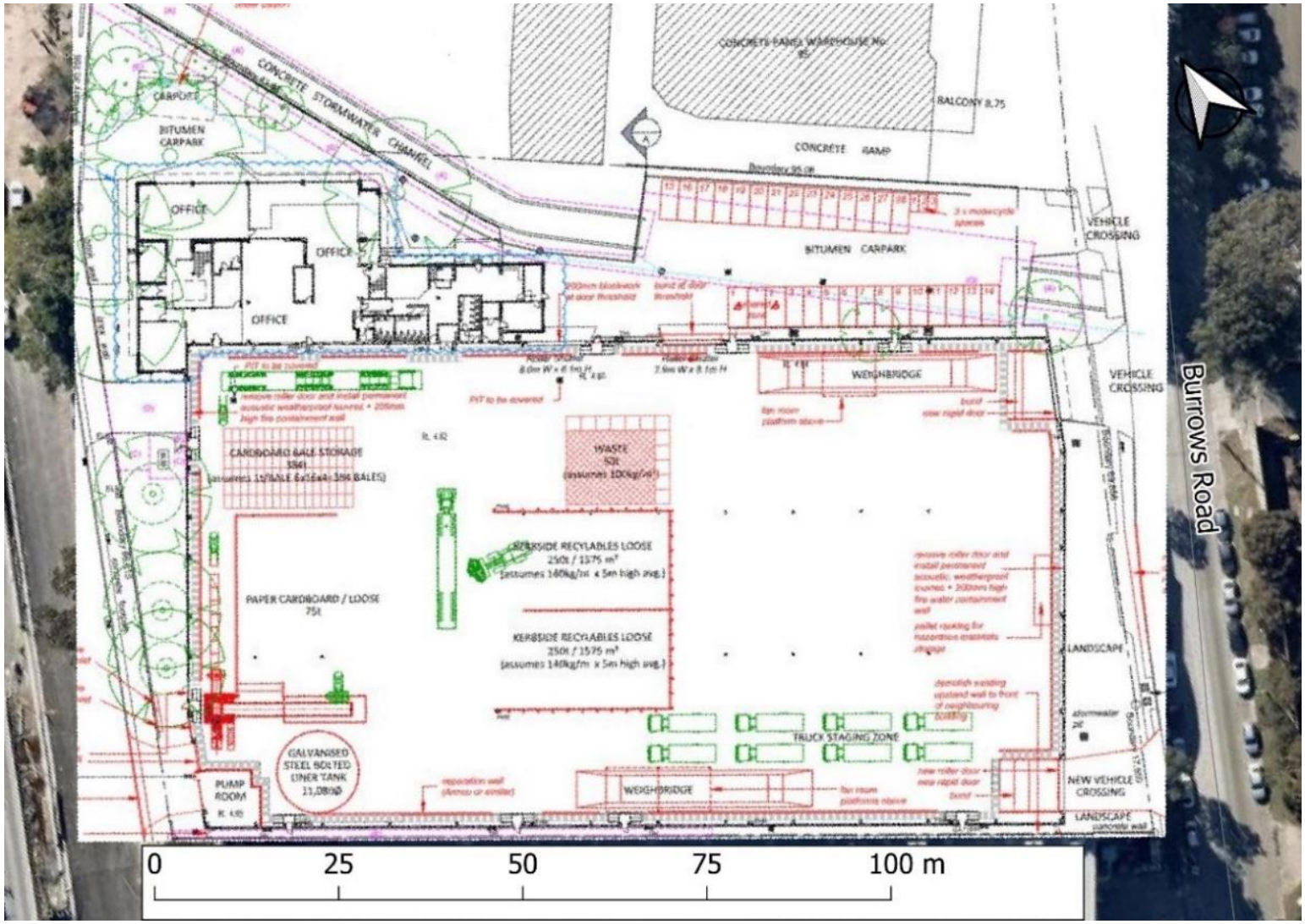
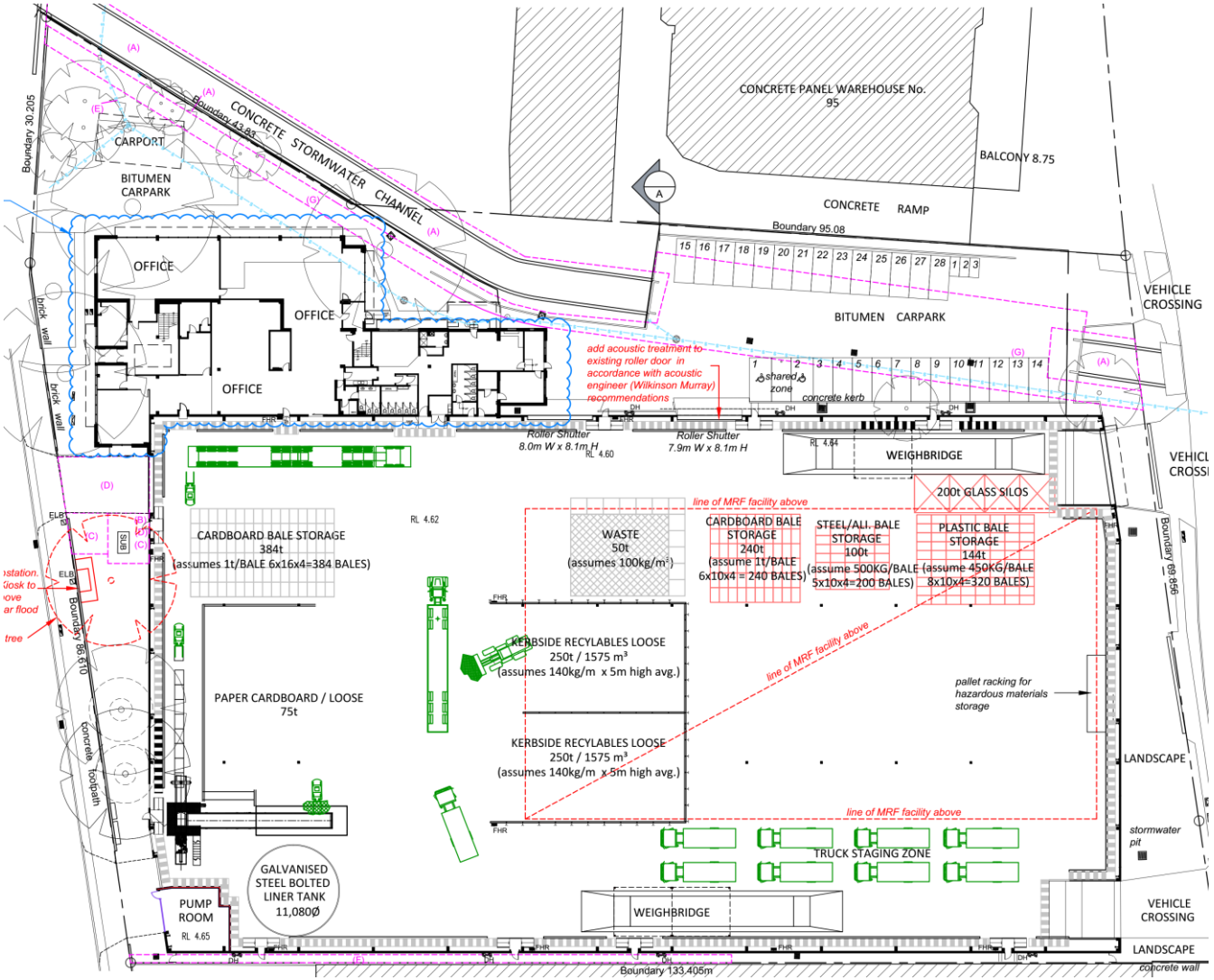


Figure 2-2 Proposed ground floor for Stage 2



According to the City of Sydney Council's Local Environmental Plan 2012, the proposed site and the nearby surrounding area are located within a general industrial zone (IN1). All immediate surrounding receivers are industrial receivers, with the exception of a childcare centre at 95 Burrow Roads.

The nearest existing residential receivers to the proposed site are situated approximately 300m north-west of the site. It should be noted, the residential development at 18 Huntley Street is still in construction. However, this receiver is considered in this assessment.

Table 2-1 presents the nearby surrounding receivers from the site. Figure 2-3 and Figure 2-4 present the location of the proposed Resource Recovery Facility (outlined blue) and the surrounding receivers. The yellow cross on Figure 2-4 represents the noise monitoring location at 177-219 Mitchell Road, Erskineville.

Table 2-1 Surrounding receivers

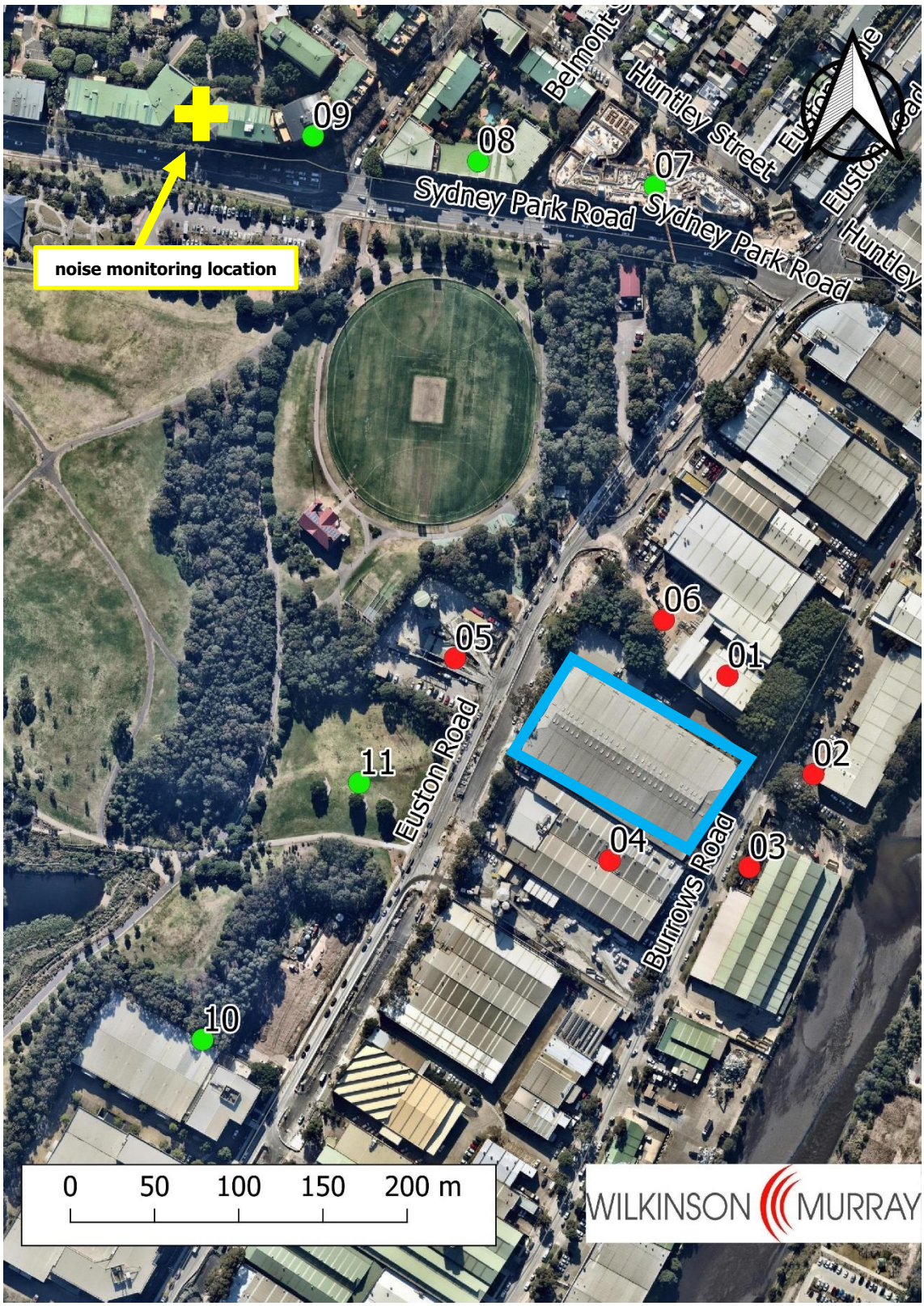
Receiver ID	Address	Receiver Type	Orientation from site
01A	95 Burrows Road	Childcare Centre Ground Floor	North
01B	95 Burrows Road	Childcare Centre First Floor	North
01C	95 Burrows Road	Commercial First Floor	North
02	84-88 Burrows Road	Industrial	North-East
03	76-82 Burrows Road	Industrial	East
04	122-130 Euston Road	Industrial	South
05	171A Euston Road	Industrial	West
06	106-110 Euston Road	Industrial	North
07	18 Huntley Street	Residential	North
08	362 Mitchell Road	Residential	North-West
09	177-219 Mitchell Road	Residential	North-West
10	205-225 Euston Road	Future Residential & Commercial	South-West
11	Sydney Park – 416 Sydney Park Road	Active Recreation Area	West

The City of Sydney Council's DA database indicates the existing commercial building at 205-225 Euston Road is to be refurbished into a mixed-use development. At this stage this development is approved with conditions. The proposed DA at this location will consist of eight buildings with underground parking, retail stores and residential apartments. This receiver is considered as residential receiver in this assessment to assess the worst-case scenario.

According to Renzo Tonin & Associate's WestConnex New M5 Operational Noise and Vibration Review report (ref: TH014-05F07 ONVR Revision 5), the traffic noise from Euston Road is going to significantly increase due to the WestConnex St Peters interchange located approximately 400m south from this development. The WestConnex New M5 is proposed to be complete in 2020. Details of the background noise measurement in this location is outlined in Section 3.1.3.

Figure 2-3 Proposed site and nearest industrial/commercial receivers

Figure 2-4 Proposed site and all nearby receivers



3 BACKGROUND/AMBIENT NOISE MEASUREMENTS

3.1 Background Noise Measurement

3.1.1 Unattended Background Noise Measurement

To establish the existing ambient noise environment of the nearest residential area from the site, unattended environmental noise monitoring was conducted. The monitoring equipment was installed on the south boundary of the Sydney Park Village apartment block at 177-219 Mitchell Road, Erskineville between 20 September and 1 October 2019 as shown in Figure 2-4.

The instrumentation used for the survey consisted of an Acoustic Research Laboratories (ARL) Environmental Noise Logger Type EL-316 fitted with microphone windshield. Calibration of the logger was checked prior to and after the measurement. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The measured data was processed according to the NSW EPA's *Noise Policy for Industry* (NPfI) assessment time periods.

Table 3-1 details the RBL (background) and L_{Aeq} noise levels recorded during the daytime, evening and night time periods. Data affected by adverse meteorological conditions was removed from the data prior to processing.

Table 3-1 Unattended ambient noise measurement

Logger Location	Noise Level – dBA							
	Daytime 7am – 6pm		Evening 6pm – 10pm		Night Time 10pm – 7am		Morning Shoulder Period 5am – 7am	
	RBL	L_{Aeq}	RBL	L_{Aeq}	RBL	L_{Aeq}	RBL	L_{Aeq}
Sydney Park Village at 177-219 Mitchell Road, Erskineville	59	69	51	68	40	65	46	67

3.1.2 Attended Background Noise Measurement

Daytime short-term background noise measurements at the existing childcare centre adjacent to the proposed site (95 Burrows Road, Alexandria) was undertaken on 20 September and 1 October 2019. As per City of Sydney Council's requirement, the purpose of this attended measurement is to compare existing background noise level of the predicted noise impact from the proposed site. This is to ensure the amenity of the childcare centre is not adversely impacted.

Additional attended noise measurement was conducted 205-225 Euston Road, Alexandria. The short-term attended noise measurement (15-minutes) are presented Table 3-2.

Table 3-2 Attended ambient noise measurements

Location	Date	Time	Noise Level dBA		Notes
			RBL	L_{Aeq}	
95 Burrows Road, Alexandria	20/09/19	8.15am – 8.30am	58	69	32 heavy vehicles passing by. Intermittent truck idling and beeping at industrial site across the road. Intermittent light vehicles passing by (60-70dBA) and aircraft noise passing by (approx. 73dBA)
	20/09/19	8.30am – 8.45am	59	69	35 heavy vehicles passing by. Intermittent beeping from industrial site across the road. Intermittent light vehicles passing by and aircraft noise passing by.
	01/10/19	12:00pm – 12.15pm	61	71	56 heavy vehicles passing by. Intermittent truck idling at industrial site across the road. Intermittent light vehicles passing by
	01/10/19	12:15pm – 12.30pm	60	72	57 heavy vehicles passing by. Intermittent light vehicles passing by
205-225 Euston Road	20/09/19	9.00am – 9.30am	57	62	7 heavy vehicles passing by. Intermittent beeping and humming noise from industrial site across the road.

3.1.3 Background Noise Measurement for 205-225 Euston Road Proposed Development

As noted earlier, the receiver at 205-225 is currently a commercial receiver and is proposed to be redeveloped into an apartment block with commercial developments. To ensure noise amenity is maintained for the future residential receivers, the site is considered as residential receiver for this assessment.

A detailed account of the environmental noise survey of 205-225 Euston Road was provided within the acoustic assessment report prepared by Wood & Grieve Engineers (Report No. 29279), dated June 2018. The noise measurement was taken for Stage 2 of the Development Application. The noise measurement was conducted between 12 and 20 September 2016 north-west of the development at 205-225 Euston Road. This measurement will be used to establish the noise criteria for receiver R10.

Table 3-3 presents the noise measurement results of 205-225 Euston Road as presented in Wood & Grieve Engineers acoustic report (Report No. 29279).

Table 3-3 Unattended ambient noise measurement of 205-225 Euston Road

Logger Location	Noise Level – dBA					
	Daytime 7am – 6pm		Evening 6pm – 10pm		Night Time 10pm – 7am	
	RBL	L_{Aeq}	RBL	L_{Aeq}	RBL	L_{Aeq}
L2 – north-west of 205-225 Euston Road	49	57	46	55	44	50

4 OPERATIONAL CRITERIA

4.1 Intrusive Noise Level

The Noise Policy for Industry (*NPfI)* provides a framework and process for deriving noise criteria for consents and licences that enable the EPA and others to regulate premises that are scheduled under the Protection of the Environment Operations Act 1997. The document provides details of determining noise trigger levels, assessing/measuring intrusive noise, guidelines for feasible and reasonable noise mitigation measures and preparing environmental noise reports.

The project noise trigger level represents the level that, if exceeded, may indicate a potential noise impact upon a community. It is a benchmark or objective and is not intended for use as a mandatory requirement.

For assessing intrusiveness, the background noise level (L_{A90}) is measured and the Rating Background Level (RBL) is determined. The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous noise level (L_{Aeq}) of the source (measured over a 15-minute period) does not exceed the background noise level (RBL) by more than 5dBA.

4.1.1 Shoulder Period

The site is proposed to have collection and cardboard trucks come in from 6.00am to 10.00pm to unload the waste. Considering the commencement of trucks coming to site is 1 hour before the day-time category, as per the *NPfI*'s requirement, a noise criterion for the shoulder period is considered.

The *NPfI* states where early mornings (5.00am-7.00am) operations are proposed, it may be unreasonable to expect such operations to be assessed against the night-time project noise trigger levels. As a rule of thumb and for the purpose of deriving the intrusiveness noise level only, it may be appropriate to assign a shoulder period rating background noise level based on:

- The lowest 10th percentile of $L_{AF90,15min}$ dB measurements for the equivalent of one weeks' worth of valid data taken over the shoulder period (that is, all days included in a single data set of should period); or,
- The $L_{AF90(shoulder\ period)}$ dB value (that is, the lowest 10th percentile value of aggregate data for the equivalent of one week's worth of valid data taken over the shoulder period).

The objective of this methodology is to achieve environmental amenity in a feasible and reasonable manner. Therefore, intrusive noise criterion should only be considered to address noise within a shoulder period.

4.1.2 Summary of Residential Intrusive Noise Criteria

The intrusiveness criteria for the residential receiver area are presented in Table 4- 1. This was calculated by adding 5dB to the RBL of the long-term monitoring location.

Table 4-1 Intrusive noise criteria – $L_{Aeq,15min}$ dBA

Receiver ID	Address	Time of Day[1]	Intrusiveness Criteria $L_{Aeq,15min}$ dBA
07-09	18 Huntley Street 362 Mitchell Road 177-219 Mitchell Road	5am – 7am	51
		Day	64
		Evening	56
		Night	45
10	205-225 Euston Road	5am – 7am	51
		Day	54
		Evening	51
		Night	49

Note 1: Daytime 7.00am–6.00pm, Evening 6.00pm-10.00pm, Night: 10:00pm-7.00am.

4.2 Amenity Noise Level

The amenity assessment is based on noise criteria specific to land use and associated activities. The amenity noise level aims to limit continuing increases in noise levels which may occur if the intrusiveness level alone is applied to successive development within an area.

4.2.1 Childcare Centre at 95 Burrows Road (Receiver 1A & 1B)

The ambient noise at the childcare centre is affected by road traffic noise, particularly heavy vehicles, and surrounding industrial noise. Ambient noise was measured to be between 69-72dBA.

The amenity noise criterion for the active recreation area for the childcare centre are well below the measured ambient noise measurement, 16-19dB below. Section 2.4.1 of the *NPfI* states:

The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the L_{Aeq} noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the $L_{Aeq,period(traffic)}$ minus 15 dB(A).

A review of the summarised acoustic assessment report for the childcare centre at 95 Burrows Road, prepared by NG Child & Associates (dated 16 September 2013), was undertaken. Attended morning and peak hour traffic noise measurements were undertaken and L_{Aeq} noise measurement ranged from 54-55dBA. Since 2013, the ambient noise level in the area have increased and is unlikely to reduce over time.

Based on the measurement and *NPfI* amenity requirement, the Project Trigger Noise Level of the childcare centre is set as 15dB below the measured ambient noise level, 54dBA. It should be noted, any noise found to be less than 10dB than the existing ambient noise would not contribute to the ambient noise level and is considered barely audible.

4.2.2 Summary of Noise Amenity Levels

To prevent increases in industrial noise due to the cumulative effect of several developments, the project amenity noise level for each new source of industrial noise is set at 5dBA below the recommended amenity noise level. This methodology is in accordance with the SEAR's requirement regarding 'cumulative impacts of other developments.'

It should be noted, the noise emissions from this site may vary at times due to the number of trucks entering/exiting the site and the operation of the Front End Loader and Forklift. The amenity noise criteria, as prescribed by *NPfI*, derive from an average noise level of the whole time period and is more suitable for constant noise sources.

The *NPfI*, project trigger noise levels and limits are assessed on a 15-minute assessment period. The *NPfI* provides the following guidance on adjusting the $L_{Aeq,period}$ level to a representative $L_{Aeq,15minute}$ level in order to standardise the time periods.

$$L_{Aeq,15minute} = L_{Aeq,period} + 3dBA$$

The nearby residents (Receivers 7 – 10) are considered 'Urban residents' as they meet the Urban receiver noise category guideline as outlined in Table 2.3 of the *NPfI*. Receivers 7 – 9 are dominated by urban hum and are near Sydney Park Road which has continuous traffic flow during peak periods. Receiver 10 is across the road from an industrial area and when the WestConnex is complete, Euston Road will consist of heavy traffic flow during peak hour.

A summary of the $L_{Aeq,15min}$ amenity noise level for the surrounding receivers is presented in Table 4-2.

Table 4-2 Amenity noise levels

Noise Amenity Area	Time of Day	Recommended Amenity Noise Level L_{Aeq} (dBA)
Childcare Centre	Day	**54**
Residential – Urban	Day	**58** (60 – 5 +3)
	Evening	**48** (50 – 5 +3)
	Night	**43** (45 – 5 +3)
Industrial	All	**68** (70 – 5+3)
Active recreation area (Sydney Park)	All	**53** (55 – 5+3)
Commercial Premises	All	**63** (65 – 5+3)

4.3 Sleep Disturbance

Noise sources of short duration and high level that may cause disturbance to sleep if occurring during the night time need to be considered.

The approach recommended by the *NPfI* is to apply the following initial screening noise levels:

- $L_{Aeq,15min}$ 40dBA or the prevailing RBL + 5dB, whichever is the greater; and/or
- L_{AFmax} 52dBA or the prevailing RBL + 15dB, whichever is the greater.

The sleep disturbance screening noise levels apply outside bedroom windows during the night time period. It should be noted, the sleep disturbance criteria do not apply to receivers within an industrial zone.

4.4 Project Noise Trigger Level

The amenity and intrusiveness noise levels and resulting Project Noise Trigger Level (PNTL) applicable to sources of continuous operational noise are shown in Table 4-3.

Table 4-3 Operational Project Noise Trigger Level – $L_{Aeq,15min}$ (dBA)

Rec. ID	Address	Receiver Type	Receiver Type	Time of Day	PNTL $L_{Aeq,15min}$ (dBA)
01A	95 Burrows Road	Childcare Centre Grd Floor	Active recreation area	All	54
01B	95 Burrows Road	Childcare Centre First Floor			
01C	95 Burrows Road	Commercial First Floor	Commercial	All	63
02	84-88 Burrows Road	Industrial	Industrial	All	68
03	76-82 Burrows Road	Industrial			
04	122-130 Euston Road	Industrial			
05	171A Euston Road	Industrial			
06	106-110 Euston Road	Industrial			
07	18 Huntley Street	Residential	Residential – Urban	6am – 7am	51
08	362 Mitchell Road	Residential		Day	58
09	177-219 Mitchell Road	Residential		Evening	48
				Night	43
10	205-225 Euston Road	Future Residential & Commercial	Residential – Urban	Day	53
				Evening	48
				Night	43
11	Sydney Park – 416 Sydney Park Rd	Active Recreation Area	Active recreation area (e.g. school playground	All	53

The PNTL for the surrounding receivers are based on the established amenity criterion as out lined in Section 4.2, with exception of day-time criterion for Receiver 10. The amenity criteria takes into consideration the cumulative noise impacts of other industrial sites.

Table 4-4 presents the sleep disturbance noise criteria (night time period only) for continuous and maximum noise level events.

Table 4-4 Sleep disturbance – L_{Amax} (dBA)

Receiver ID	Address	Sleep Disturbance L_{Amax} (dBA)
07	18 Huntley Street	60
08	362 Mitchell Road	
09	177-219 Mitchell Road	
0	205-225 Euston Road	59

5 OPERATIONAL NOISE ASSESSMENT

5.1 Noise Modelling

Site related noise emissions were modelled using the SoundPLAN 8 noise prediction software. To complete this, a representative 3-D model within the software was constructed of the site and surrounding receivers.

Factors that are addressed in the modelling are:

- Equipment sound level emissions and locations;
- Screening effects from buildings;
- Receiver locations;
- Ground topography;
- Noise attenuation due to geometric spreading; and
- Ground and atmospheric absorption.

5.2 Noise Sources

Attended noise measurements of the existing operations of the Visy baling operation and transfer station at 6-10 Burrows Road, St Peters was undertaken on 4 September 2019. The purpose of this measurement was to collect the Sound Power Level of the noise sources on site and use the measurement data in the noise prediction model. Sound Power Level of Recovery Facility plant and glass falling into a silo were obtained from a previous Material Recycling Facility noise assessment.

At this stage, the selection of the specific condenser unit and the rooftop smoke exhaust fans have not been finalised. Therefore, the sound power level for these units have been assumed and selection of these units should not exceed the selected Sound Power Level.

Table 5-1 details the summarised L_{Aeq} sound power levels of each noise source adjusted for each 15-minute period. This accounts for the duration of each activity within a worst case 15-minute period.

Table 5-1 Plant and equipment noise levels

Noise Source	Sound Power Level, $L_{Aeq,15min}$ (dBA)	Scenario
Front End Loader moving/loading waste	106	1 & 2
Unloading from Waste Truck	105	1 & 2
Haul Trucks & Waste Trucks	105	1 & 2
Unloading of Cardboard Box	97	1 & 2
Waste Truck idling	101	1 & 2
Baler & Conveyor	100	1 & 2
Forklift	95	1 & 2

Noise Source	Sound Power Level, $L_{Aeq,15min}$ (dBA)	Scenario
Condenser Unit	75*	1 & 2
3x Plant & Vehicle Emission Exhaust Fans	89	1 & 2
Recovery Facility Plant	114	2
Glass falling into silo	108	2

*Assumed Sound Power Level

Moving of glass and other recyclable waste with the Front End Loader had the highest L_{Amax} noise measurement. This is used in the sleep disturbance noise assessment.

Table 5-2 details the summarised L_{Aeq} sound power levels of each noise source adjusted for the sleep disturbance noise assessment.

Table 5-2 L_{Amax} sound power level for sleep disturbance noise assessment

Noise Source	Sound Power Level, dBA	Scenario
Front End Loader moving glass and waste	121	1 & 2

5.3 Meteorological Conditions

A review of the wind measurements (between Oct 2018 – Oct 2019) at the Sydney Airport from the Bureau of Meteorology database was undertaken. The purpose of this was to determine whether wind conditions would affect noise propagation from the site. It was noted wind conditions likely to enhance noise propagation occurs less than 30% of the time. An analysis of the wind data is presented in Appendix B of the report.

It is very unlikely noise would be affected by temperature inversions as the development and nearby surrounding area is situated relatively near the coast and is within a metropolitan/industrial area. Therefore, noise affected by adverse conditions is not required in this assessment, as per the *NPfI*.

However, weather enhancing conditions have be assessed for reference purposes only. Two meteorological scenarios are assessed, one is under neutral conditions where temperature inversion and wind have minimal effect on the noise. The second is a worst-case scenario, where temperature inversion and wind affect the noise emissions.

The standardised neutral and worst-case weather conditions outlined in Section D of the NSW *NPfI* are used in the noise prediction model. A summary of the meteorological conditions is outlined in Table 5-3.

Table 5-3 Meteorological conditions adopted for the noise modelling

Meteorological Condition	Air Temperature	Relative Humidity	Wind Speed	Wind Direction	Stability Category
Neutral	10°C	70	0.5	Worst-case	D Class
Worst-case	10°C	70	3 m/s	Worst-case	D Class

5.4 Operational Assumptions

The other assumptions in the noise prediction include the following:

- It is proposed that the kerbside pick-up trucks and commercial recyclable trucks will access the site generally from 6.00am to 6.00pm. Haul trucks are proposed to access the development site on a 24-hour basis. Haul trucks generally come in when kerbside pick-up trucks and commercial trucks do not occupy the building. Therefore, noise impact prediction for a shoulder period (5.00am to 7.00am), day and evening is assessed and a separate noise prediction for night time operation is prepared. Each of the noise prediction modelling assumes the following:
    - Shoulder/Day/Evening time operation assumes five trucks entering and five trucks departing from the site. Five trucks entering and five truck departing the site within a 15-minute period. Trucks will enter and exit through eastern side of the building on Burrows Road. In addition to this, eight trucks idling inside the building on the south side is also assumed.
    - Trucks may still enter the site during the night. However, the number of trucks is significantly reduced. Night time operation assumes three trucks entering and three trucks departing from the site within a 15-minute period. In addition to this, three trucks idling inside the building on the south side is also assumed.
- An airborne noise assessment of the existing roller door to determine the acoustic performance, i.e. Transmission Loss (TL), was conducted on site. The roller doors on the north side of the proposed site are proposed to remain permanently closed. The TL of the roller door was used in the noise prediction model for the two northern roller doors. Roller doors are considered one of the weakest points of the development to transmit noise.
- The inbound and outbound roller doors on the north-eastern side to Burrows Road will each have a rapid door installed, while the roller doors will remain open. The inbound door is to be newly constructed on the on the south-eastern side of the site, facing Burrows Road. An existing roller door on Burrows Road will not be used and will be replaced with weatherproof acoustic louvres. The rapid doors will allow the site to operate in an enclosed space and open quickly for trucks to enter and exit. It is assumed the doors will open for 5 minutes within a 15-minute assessment period during day and evening period. During the night, it is assumed the door will be open for three minutes within a 15-minute period.
- The two existing roller doors on the western side of the building to Euston Road are to be replaced with weatherproof acoustic louvres and the southern door will also be partially sealed (to about 3m height) with a newly installed fire pump house.
- Operation of all equipment and vehicles.

5.5 Noise Control Plan

Noise control measures are also assumed in the noise prediction models. The 'in principle' noise control recommendations are outlined below.

5.5.1 Acoustic Louvres

The standard weatherproof louvre on the east and west side of the development should be upgraded to acoustic weatherproof louvres. Table 5-4 presents the required acoustic performance (transmission loss) of the proposed louvres.

Table 5-4 Transmission loss of acoustic louvres

Facade	Transmission Loss					
	125Hz	250Hz	500Hz	1KHz	2Khz	4KHz
All louvres on the east and west side of the development	9	10	13	17	20	20

At the design stage of the project, the selected louvre specifications should be sent to Wilkinson Murray for review, to ensure acoustic properties meet the noise requirement.

5.5.2 In-Fill Opening at Roller Door 6 (Stage 2)

An additional wall at roller door 6 (northern side of the development, nearest to Burrows Road) achieving an R_W of 30 should be constructed. An example of this construction is a wall comprising of 90mm timber stud in front of the roller door, with 50mm insulation in the cavity and 13mm plasterboard mounted on the stud. The wall construction should be completely sealed against the existing wall. This wall should be added before the commencement of Stage 2.

5.5.3 Mechanical Plant Noise

The ducting for all plant and vehicle emissions exhaust fans should be fitted with at least 3 metres of 25mm internal insulation.

5.5.4 Rapid Door

Table 5-5 presents the required acoustic performance (transmission loss) of the proposed rapid doors.

Table 5-5 Transmission loss of proposed rapid doors

Facade	Transmission Loss					
	125Hz	250Hz	500Hz	1KHz	2Khz	4KHz
Rapid Door	9	16	25	22	30	27

At the design stage of the project, the selected Rapid Door specifications should be sent to Wilkinson Murray for review, to ensure acoustic properties meet the noise requirement.

5.5.5 Glass Silo

Prior to the commencement of Stage 2, the location of the glass silo for Stage 2 should be reviewed to ensure noise emissions satisfy relevant noise standards.

5.6 Predicted Noise Levels

Continuous cumulative operational noise levels have been predicted at the nearest receivers surrounding the site, using SoundPlan 8 noise modelling software implementing the CONCAWE predication algorithm.

Table 5-6 and Table 5-8 presents predicted noise levels for Stage 1 and 2, respectively, at surrounding receivers with all equipment and vehicles operating. The residential receivers for which night-time noise criteria are used are identified. The neutral and worst-case conditions refer to the meteorological conditions as outlined in Table 5-3. As noted earlier, the worst-case conditions for this assessment is not required and should only be used as a reference.

The evening noise criterion is the most stringent noise criterion during operations between 6.00am to 10.00pm and is presented as the noise criterion in this period in the tables below.

The noise impact at the Sydney Park has a noise impact range. The range is based on the noise receiver on the east boundary nearest to the site and another receiver location approximately 50 metres from the east boundary, adjacent to the south boundary of Metro mix. The nearest receiver point in the park to the proposed site is adjacent to the existing Metro mix concrete batching plant and is likely affected by existing noise from Metro mix and traffic along Euston Road.

Table 5-6 Stage 1 operational noise prediction day and evening – $L_{Aeq,15min}$ dBA (6am – 10pm)

ID	Address	Predicted Operational Noise Level		Evening Noise Criteria	Compliance
		Neutral	Worst-Case		
01A	95 Burrows Road – Ground Floor Childcare Centre	50	51	54	Complies
01B	95 Burrows Road – First Floor Childcare Centre	46	46	54	Complies
01C	95 Burrows Road – Commercial First Floor	47	48	63	Complies
02	84-88 Burrows Road	59	60	68	Complies
03	76-82 Burrows Road	61	62	68	Complies
04	122-130 Euston Road	59	59	68	Complies
05	171A Euston Road	46	47	68	Complies
06	106-110 Euston Road	50	51	68	Complies
07	18 Huntley Street	36	37	48	Complies
08	362 Mitchell Road	37	37	48	Complies
09	177-219 Mitchell Road	35	35	48	Complies
10	205-215 Euston Rodd	37	38	48	Complies
11	Sydney Park	42-47	42-47	53	Complies

Table 5-7 Stage 1 operational noise prediction night – $L_{Aeq,15min}$ dBA (10pm – 6am)

ID	Address	Predicted Operational Noise Level		Noise Criteria	Compliance
		Neutral	Worst-Case		
01A	95 Burrows Road – Ground Floor Childcare Centre	49	50	54	Complies
01B	95 Burrows Road – First Floor Childcare Centre	45	45	54	Complies
01C	95 Burrows Road – Commercial First Floor	45	46	63	Complies
02	84-88 Burrows Road	57	58	68	Complies
03	76-82 Burrows Road	59	59	68	Complies
04	122-130 Euston Road	56	57	68	Complies
05	171A Euston Road	47	47	68	Complies
06	106-110 Euston Road	49	50	68	Complies
07	18 Huntley Street	36	37	43	Complies
08	362 Mitchell Road	37	37	43	Complies
09	177-219 Mitchell Road	35	35	43	Complies
10	205-215 Euston Road	37	38	43	Complies
11	Sydney Park	42-47	42-48	53	Complies

Table 5-8 Stage 2 operational noise prediction day and evening – $L_{Aeq,15min}$ dBA (6am – 10pm)

ID	Address	Predicted Operational Noise Level		Noise Criteria	Compliance
		Neutral	Worst-Case		
01A	95 Burrows Road – Ground Floor Childcare Centre	53	54	54	Complies
01B	95 Burrows Road – First Floor Childcare Centre	50	51	54	Complies
01C	95 Burrows Road – Commercial First Floor	50	51	63	Complies
02	84-88 Burrows Road	64	64	68	Complies
03	76-82 Burrows Road	66	66	68	Complies
04	122-130 Euston Road	63	63	68	Complies
05	171A Euston Road	52	53	68	Complies
06	106-110 Euston Road	51	52	68	Complies
07	18 Huntley Street	38	40	48	Complies
08	362 Mitchell Road	38	39	48	Complies
09	177-219 Mitchell Road	37	38	48	Complies
10	205-215 Euston Road	41	42	48	Complies
11	Sydney Park	46-54	47-54	53	Complies*

*Highest noise impact is at the park boundary nearest to the site. Noise impact is 53dBA seven metres from the eastern boundary. It should also be noted, 1dB exceedance is considered barely perceptible and is negligible. Therefore, this is deemed to comply.

Table 5-9 Stage 2 operational noise prediction night – $L_{Aeq,15min}$ dBA (10pm – 6am)

ID	Address	Predicted Operational Noise Level		Noise Criteria	Compliance
		Neutral	Worst-Case		
01A	95 Burrows Road – Ground Floor Childcare Centre	52	53	54	Complies
01B	95 Burrows Road – First Floor Childcare Centre	50	50	54	Complies
01C	95 Burrows Road – Commercial First Floor	48	49	63	Complies
02	84-88 Burrows Road	62	62	68	Complies
03	76-82 Burrows Road	64	64	68	Complies
04	122-130 Euston Road	60	61	68	Complies
05	171A Euston Road	52	52	68	Complies
06	106-110 Euston Road	51	51	68	Complies
07	18 Huntley Street	39	40	43	Complies
08	362 Mitchell Road	39	40	43	Complies
09	177-219 Mitchell Road	38	39	43	Complies
10	205-215 Euston Road	41	42	43	Complies
11	Sydney Park	46-54	47-54	53	Complies*

*Highest noise impact is at the park boundary nearest to the site. Noise impact is 53dBA seven metres from the eastern boundary. It should also be noted, 1dB exceedance is considered barely perceptible and is negligible. Therefore, this is deemed to comply.

5.7 Sleep Disturbance Assessment

In the case of sleep disturbance, the maximum noise levels (L_{Amax}) associated with the operation of the movement of glass and waste using the Front End Loader. Table 5-10 presents the predicted maximum noise levels at the nearest residential receiver (R7 to R10).

Table 5-10 Predicted maximum noise levels at residences – L_{Amax} dBA

Receiver ID	Receiver Location	Noise Level		Screening Criteria
		Neutral	Worst-Case	
07	18 Huntley Street	41	42	60
08	362 Mitchell Road	42	42	60
09	177-219 Mitchell Road	41	41	60
10	205-215 Euston Road	43	44	59

Noise is predicted to comply with the sleep disturbance screening criteria at the nearest residential receivers during night time operations.

6 ROAD TRAFFIC NOISE

6.1 Road Traffic Noise Criteria

Road traffic movements generated by the proposed site need to be assessed to determine whether the increased traffic associated with the site will impact residential receivers along Sydney Park Road, Campbell Road and Euston Road north of Sydney Park Road. The assessment is be based on the road traffic noise assessment criteria for residential land uses contained within Table 3 of the NSW EPA *Road Noise Policy* (RNP).

The applicable *RNP* criteria during the day and night (when vehicular movements associated with the proposed centre will occur) is presented in Table 6-1.

Table 6-1 Road noise criteria

Road Category	Type of Project / Land Use	Assessment Criteria – dB(A)	
		Day (7am–10pm)	Night (10pm–7am)
Freeway/Arterial/ Sub-arterial roads	Existing residences affected by additional traffic on existing sub-arterial roads generated by land use developments	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)

Note 1: These criteria are for assessment against façade-corrected noise levels when measured in front of a building façade.

When existing traffic noise levels are above the noise criteria (as outlined above), the noise objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria. An increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person.

6.2 Road Traffic Data

Existing traffic volume data of Sydney Park Road, Campbell Road and Euston Road north of Sydney Park Road was provided by Traffix. Table 6-2 presents the Annual Average Daily Traffic (AADT) data, including the heavy vehicle percentage. In addition to this, the AADT has been divided into day (7.00am-10.00pm) and night (10.00pm-7.00am) periods. The traffic count for the day and night period is a prediction based on the historical traffic data on Sydney Park Road in 2009.

Table 6-2 Annual average daily traffic data

Road	AADT	Heavy Vehicle %	AADT Day	AADT Night
Sydney Park Road	38,000	9%	32,680	5,320
Campbell Road	39,000	13%	33,540	5,460
Euston Road north of Sydney Park Road	32,000	7%	27,520	4,480

An indication of the traffic generation of the site was predicted by Traffix. It should be noted, the traffic movement is for the entry and exit point of the site on Burrows Road. The traffic generation prediction are as follows:

- Maximum of 275 truck movements between 7.00am and 10.00pm
- Maximum of 95 truck movements between 10.00pm and 7.00am
- 52 car movements between 7.00am and 10.00pm would occur assuming that 100% of employees would complete a shift (i.e. 26 in, 26 out).
- 4 car movements between 10.00pm and 7.00am would occur assuming 2 employees would be on shift (i.e. 2 in, 2 out).

Traffix has predicted the following heavy vehicle (i.e. trucks) route pre-WestConnex conditions on Sydney Park and Campbell Road:

- Sydney Park Road – Entering (eastbound): 50%
- Sydney Park Road – Exiting (westbound): 50%
- Campbell Road – Entering (eastbound): 20%
- Campbell Road – Exiting (westbound): 20%
- Euston Road north of Sydney Park Road – Exiting (northbound): 10%
- Euston Road north of Sydney Park Road – Entering (southbound): 10%

Figure 6-1 presents the site map with the AADT volume and the heavy vehicle increase in relation to the proposed Resource Recovery Facility. It should be noted that the AADT increase is for vehicle movements which accounts for trucks traveling to and from the proposed facility.

The remaining trucks are likely to enter on to Huntley Street and Bourke Street. The receivers on these streets are industrial/commercial developments and considered less sensitive to road traffic noise compared to residential receivers.

Figure 6-1 Road AADT Volume Map

6.3 Predicted Road Traffic Noise Generation

The *Calculation of Road Traffic Noise* (CoRTN) algorithm was used to predict the existing and new traffic noise generated from the proposed development. The road traffic impact is based on the road traffic volume data and traffic increase predictions provided by Traffix Pty as outlined in the previous section.

The road traffic noise measurement at the receiver location along Sydney Park Road exceed the day and night sub-arterial road criteria set in the *RNP*. The average day time road traffic noise was measured at 68.8dBA and the average night road traffic noise level as 64.4dBA. It should also be noted, the traffic volume along Campbell Road and Euston Road have a relatively similar traffic volume and heavy vehicle percentage compared to Sydney Park Road.

A road traffic noise prediction of existing traffic volume for 34 Campbell Road and 105-155 Euston Road was undertaken and road traffic noise exceed the *RNP* day and night criteria. Therefore, the relative increase of 2dBA noise assessment applies to both Sydney Park Road, Campbell Road and Euston Road residential receivers.

Traffic noise calculations were completed for 177-219 Mitchell Road, 34 Campbell Road and 105-155 Euston Road which would be the worst affected receivers regarding traffic noise. The following additional heavy vehicle movement has been assumed for each road to assess the worst-case scenario:

- Additional 185 heavy vehicle movements on Sydney Park Road passing residential receiver 177-219 Mitchell Road.
- Additional 74 heavy vehicle movements on Campbell Road passing residential receiver at 34 Campbell Road.
- Additional 37 heavy vehicle movements on Euston Road north of Sydney Park Road passing residential receiver at 105-155 Euston Road.

The following road traffic noise prediction are as follows:

- A 0.3dB increase in road traffic noise is predicted at 177-219 Mitchel Road during the day and 0.5dB increase at night.
- A 0.3dB increase at 34 Campbell Street during the day and 0.4dB increase during the night.
- A 0.3dB increase at 105-155 Euston Road during the day and 0.4dB during the night.

The additional traffic noise is predicted to have an negligible impact on the surrounding receivers and therefore complies with the *RNP*.

7 CONSTRUCTION NOISE ASSESSMENT

7.1 Construction Noise Criteria

The EPA released the *"Interim Construction Noise Guideline" (ICNG)* in July 2009. The guideline provides noise goals that assist in assessing the impact of construction noise.

For residences, the basic daytime construction noise goal is that the noise should not exceed the noise affected RBL by more than 10 dBA. This is for construction during standard hours: Monday to Friday 7.00am-6.00pm, and Saturday 8.00am-1.00pm. Outside the standard hours, the criterion would be RBL + 5 dBA.

Table 7-1 Construction noise goals at residences using quantitative assessment

Time of Day	Management Level $L_{Aeq(15min)}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10 dBA	• The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq(15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. • 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 75 dBA	• 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 proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. • If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5dB	• A strong justification would typically be required for works outside the recommended standard. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2 of the *Interim Construction Noise Guideline.*

In addition to the above noise guideline, the following construction noise management levels $L_{Aeq,15min}$ is recommended for other receivers and areas as follows:

- Industrial premises: External $L_{Aeq,15min}$ 75dBA;
- Offices, retail outlets: External $L_{Aeq,15min}$ 70dBA;
- Active recreation areas: External 65dBA.

Based on the above,

Table 7-2 and Table 7-3 presents the applicable Noise Management Level (NML) for construction activities. All construction works will take place during the daytime only.

Table 7-2 Residential Construction NML

Receiver ID	Receivers	NML L_{Aeq} (dBA)			Highly Affected Construction Noise Level, L_{Aeq} (dBA)
		Day	Saturday 8am-1pm	Saturday 1pm–6pm & Sunday 8am – 6pm	
07	18 Huntley Street	69	63	58	75
08	362 Mitchell Road				
09	177-219 Mitchell Road				
10	205-215 Euston Road	59	59	54	75

Table 7-3 Construction NML for non-residential receivers

	Receivers	NML L_{Aeq} (dBA)
01A	95 Burrows Road – Ground Floor Childcare Centre	65
01B	95 Burrows Road – First Floor Childcare Centre	65
01C	95 Burrows Road – Commercial First Floor	70
02	84-88 Burrows Road	75
03	76-82 Burrows Road	75
04	122-130 Euston Road	75
05	171A Euston Road	75
06	106-110 Euston Road	75
11	Sydney Park	65

7.2 Construction Noise Scenarios

The construction project is divided into 3 separate work stages and a summary of the construction works within each stage are outlined below:

Stage 1A Construction

- Installation of Weighbridges and conveyor pit – the concrete floor area to be removed and may then be broken into manageable pieces for removal with an excavator with a hydraulic hammer attachment;
- Removing Internal columns; and
- Installation of FCM receival bay push wall support.

Stage 1B Construction

- Install new truck entry driveway and refurbishing existing driveway to Burrows Road. The works will consist of Driveway civil works, concreting and kerbing;
- Install baler;
- Install supporting trusses and replace roof section. Demolish three existing internal fire walls;
- Install mechanical plant, fire service hydrant system and fire service sprinklers; and
- Install louvres and rapid doors.

The hydraulic hammer in Stage 1A is only likely to be used for up to 2 days. All works in Stage 1A will be undertaken inside the development. Stage 1B is undertake inside and outside of the site. All rollers are assumed to be open, excluding the doors on the western side of the development for Stages 1A and 1B.

Stage 2 Construction

- Installation mezzanine level including support piles;
- Install new MRF, including additional supporting structures, on mezzanine floor and multilevel platforms; and
- Installation of equipment on ground level for compacting recovered recyclable materials (i.e. steel bales) and glass silos.

Stage 2 Construction scenario includes the noise control measures outlined in Section 5.5. Stage 2 works will also coincide with the operations of Stage 1 of the site.

7.3 Construction Equipment Noise Source Levels

A detailed list of equipment likely to be used during construction was not provided. Therefore, typical equipment expected to be used is assumed in each construction stage and is presented in Table 7-4. The table also includes the Sound Power Levels of each piece of equipment.

Sound Power Level is the noise level at the source and is independent of measurement position. The level presented below assumes the operation of the piece of equipment to be continuous within a 15-minute assessment period.

Table 7-4 Estimated plant & activities

Scenario	Estimated Plant	Quantity	Sound Power Level
1A	**Stage 1A Works**		
	Concrete Saw	1	110
	Excavator with attached Hydraulic hammer	1	118
	Power Hand tools	2	102
	Delivery Truck	1	106
	Scissor Lift	1	94
	Forklift	1	90
1B	**Stage 1B Works**		
	Crane	1	104
	Delivery Truck	1	106
	Concrete Pump	1	103
	Concrete Truck	1	108
	Power Hand tools	4	102
	Scissor Lift	1	94
	Forklift	1	90
2	**Stage 2 Works**		
	Crane	1	104
	Delivery Truck	1	106
	Power Hand tools	4	102
	Scissor Lift	1	94
	Forklift	1	90

7.4 Construction Noise Impact Prediction

The *ICNG* requires predicted noise levels at receivers to be based on 15-minute periods. The modelling assumes a "typical worst-case" scenario whereby all the plant is running continuously.

As such, the modelling represents likely noise levels that would occur during intensive periods of construction. Therefore, the presented noise levels can be considered in the upper range of noise levels that can be expected at surrounding receivers when the various construction scenarios occur.

Based on the above, resultant noise levels at receivers have been predicted, as shown in Table 7-5.

Table 7-5 Predicted L_{Aeq} daytime construction noise dBA for each scenario

Receiver ID	Receivers	Scenario 1A Predicted Level	Scenario 1B Predicted Level	Scenario 2 Predicted Level	Noise Management Level		
					Weekday 7am-6pm	Saturday 8am-1pm	Saturday 1pm– 6pm & Sunday 8am – 6pm
01A	95 Burrows Road – Ground Floor Child Care Centre	59	63	48	**65**	**65**	**65**
01B	95 Burrows Road – First Floor Childcare Centre	60	59	45	**65**	**65**	**65**
01C	95 Burrows Road – Commercial First Floor	49	54	39	**70**	**70**	**70**
02	84-88 Burrows Road	67	71	53	**75**	**75**	**75**
03	76-82 Burrows Road	68	73	49	**75**	**75**	**75**
04	122-130 Euston Road	66	71	48	**75**	**75**	**75**
05	171A Euston Road	47	46	45	**75**	**75**	**75**
06	106-110 Euston Road	60	54	48	**75**	**75**	**75**
07	18 Huntley Street	39	37	30	**69**	**63**	**58**
08	362 Mitchell Road	47	37	31	**69**	**63**	**58**
09	177-219 Mitchell Road	43	37	30	**69**	**63**	**58**
10	205-215 Euston Road	42	38	32	**59**	**59**	**54**
11	Sydney Park	50	47	47	**65**	**65**	**65**

All construction scenarios comply with the relevant NML. This is likely due to the majority of the works undertaken inside the development which provides noise shielding to the receiver. However, noise management should be implemented to ensure noise amenity at the nearest surrounding locations is maintained.

7.5 Noise Management Control

7.5.1 Noise Management

The following project specific mitigation measures are recommended:

- Construction should be limited to 7am to 6pm Monday to Friday and 8am to 5pm Saturday and Sunday and no work on public holidays;
- Rollers doors should be shut during intensive construction works (i.e. using the hydraulic hammer);
- Consultation with neighbours to inform of construction activities and timeframes and scheduling to minimise impact as practicable;
- Site contact details displayed, and complaints register, and protocol established.

The adoption of the above measures is aimed to maintain noise amenity at surrounding receivers.

8 VIBRATION ASSESSMENT

8.1 Construction Vibration Criteria

8.1.1 Human Annoyance Criteria

Vibration criteria for assessment of the effects of vibration on human comfort are set out in British Standard 6472-1992. Methods and criteria in that Standard are used to set "preferred" and "maximum" vibration levels in the document "*Assessing Vibration: A Technical Guideline*" (2006) produced by the NSW DECCW.

Acceptable values of human exposure to continuous vibration are dependent on the time of day and the activity taking place in the occupied space (e.g. workshop, office, residence or a vibration-critical area). Guidance on preferred values for continuous vibration is set out in Table 8-1.

Table 8-1 Criteria for exposure to continuous & impulsive vibration

Place	Time	Peak velocity (mm/s)	
		Preferred	Maximum
Residences	Daytime	0.28	0.56
	Night time	0.20	0.40
Offices	Day or Night time	0.56	1.1
Workshops	Day or Night time	1.1	2.2

8.1.2 Building Damage Criteria

In terms of the most recent relevant vibration damage objectives, Australian Standard AS 2187 : Part 2-2006 *"Explosives – Storage and Use – Part 2: Use of Explosives"* recommends the frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 *"Evaluation and measurement for vibration in buildings Part 2"* as they "are applicable to Australian Conditions" BS 7385.

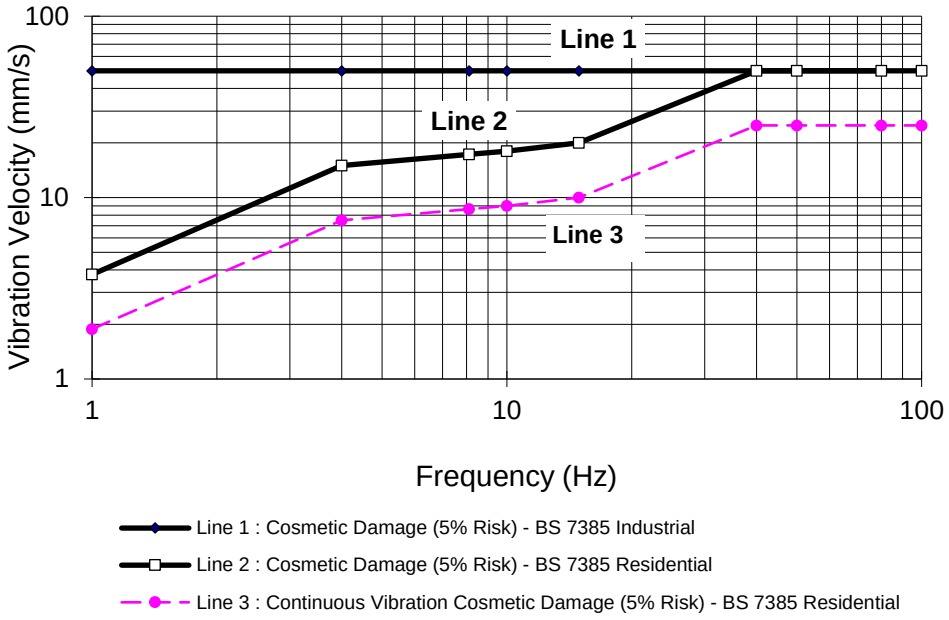
The recommended limits (guide values) from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 8-2.

Table 8-2 Transient vibration guide values – minimal risk of cosmetic damage

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4 Hz and above	N/A
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s at 4 Hz increasing to 20mm/s at 15 Hz	20mm/s at 15 Hz increasing to 50mm/s at 40 Hz and above

The British Standard to states that "*Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity*". In addition, a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.

Figure 8-1 Graph of transient vibration guide values for cosmetic damage



8.2 Vibration Emissions

Operation of a hydraulic hammer may have the potential to transmit vibration likely to cause annoyance to nearby receivers. Structural damage vibration criteria are much higher than human comfort criteria, particularly for industrial and commercial buildings. Table 8-3 sets out the typical ground vibration levels at various distances for safe working distances (Extracted from the TfNSW *Construction Noise Strategy*).

Table 8-3 Recommended safe working distances for vibration intensive plant

Item	Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Small Hydraulic Hammer	(300 kg – 5-12t excavator)	2m	7m
Medium Hydraulic Hammer	(900 kg – 12-18t excavator)	7m	23m
Large Hydraulic Hammer	(1600 kg – 18-34t excavator)	22m	73m
Bored Piling	≤ 800mm	2m (nominal)	N/A

Based on the recommended safe working distance, hydraulic hammer is unlikely to cause structural damage to the surrounding receiver buildings. Depending on the size of the hydraulic hammer, the vibration works may cause annoyance. According to the proposed construction works, however, the hydraulic hammer is likely only to be used for approximately 2 days. Therefore, the vibration impact on the nearest receiver would cause minor annoyance.

9 CONCLUSION

An acoustic assessment was undertaken to determine the noise impact from the proposed Resource Recovery Facility (RRF) in Alexandria on the surrounding receivers. In addition to this, the road traffic noise associated with the project (Section 6), and construction noise and vibration (Sections 7 and 8) was also addressed.

The worst-case operational scenarios have been considered in the noise predictions. The noise predictions include operation assumption outlined in Section 5.4 and noise control measures. The proposed Resource Recovery Facility operational noise complies with the noise criteria at all receiver locations, provided the noise control plan in Section 5.5 are implemented.

The noise control includes ensuring the northern roller doors are shut at all times, install entry and exit rapid doors, install acoustic louvres, provide internal duct lining for the. Prior to the commencement of Stage 2, a wall achieving a R_W of 30 should be constructed to attenuate noise emitting from northern roller door.

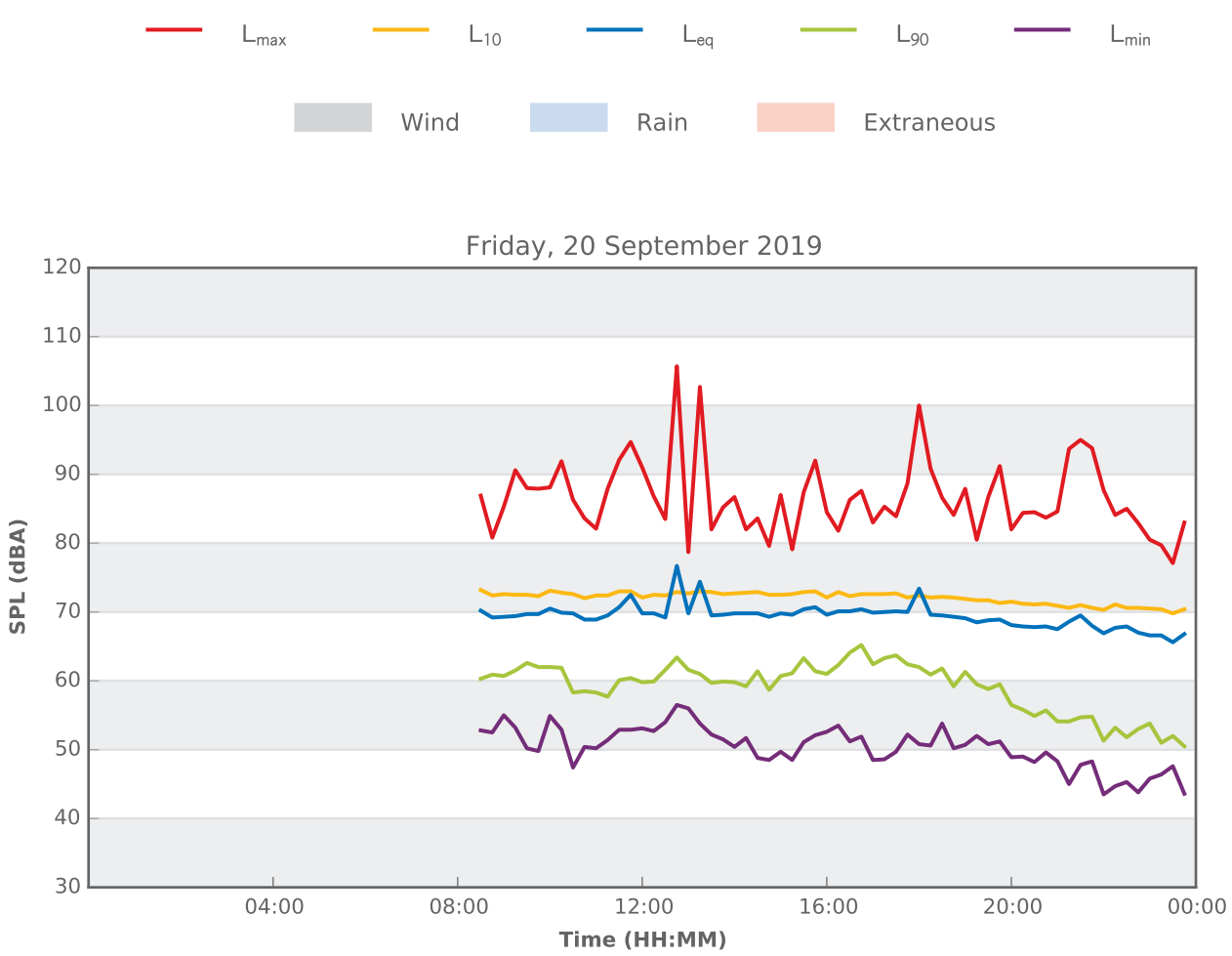
Existing road traffic noise exceed the Road Noise Policy noise criteria and therefore a 2dB relative increase criterion is applied. Road traffic noise generation associated with the operation of the Resource Recycling Facility is predicted to have an insignificant impact on nearby residential receivers.

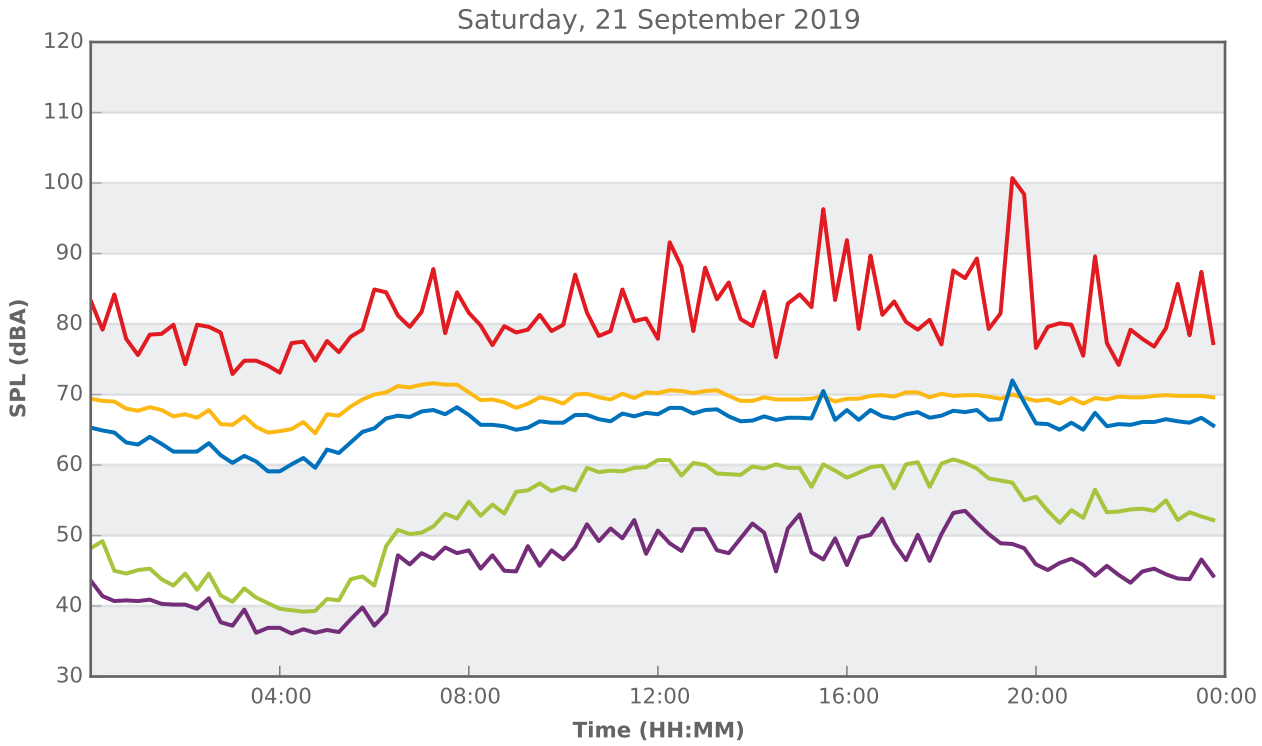
All construction scenarios comply with the relevant NML. This is likely due to the majority of the works undertaken inside the development which provides noise shielding to the receiver. However, noise management should be implemented to ensure noise amenity at the nearest surrounding locations is maintained. Construction noise control plan is provided in Sections 7.5. Based on the vibration works, the vibration emission is planned to be undertaken for a short period of time and would therefore have a minor impact on the nearest receivers.

APPENDIX A

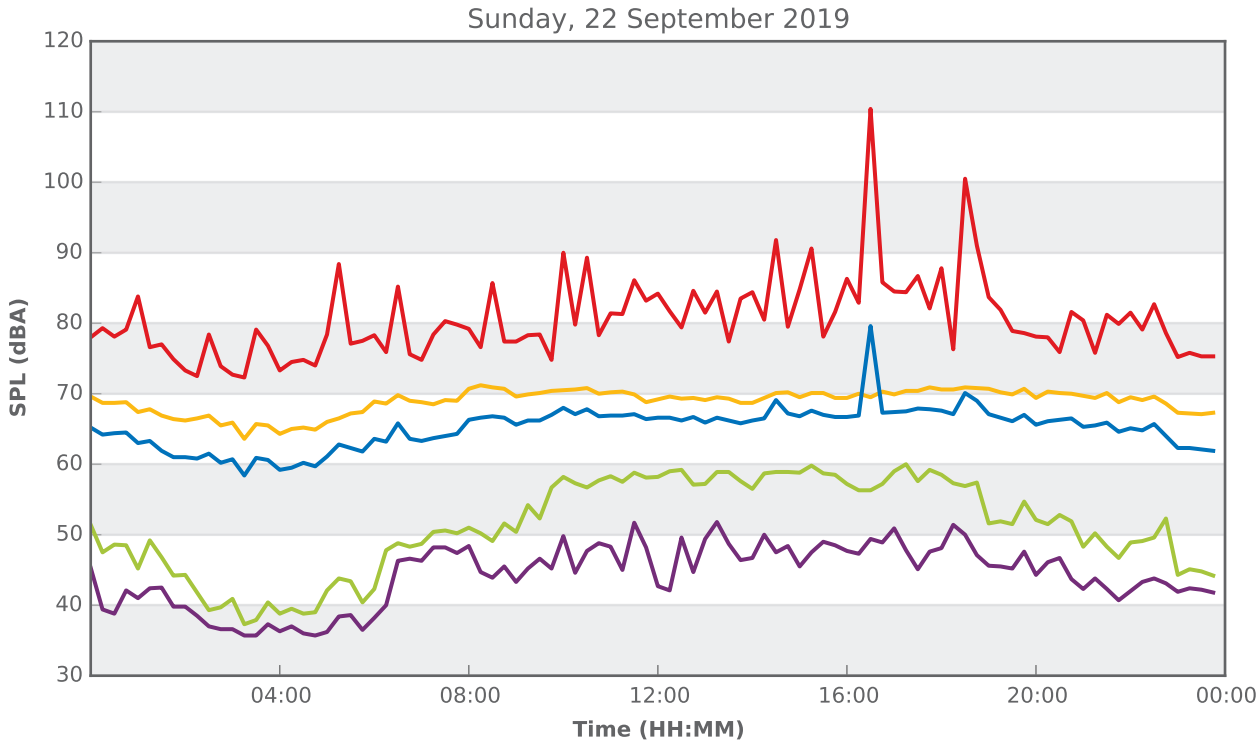
NOISE MEASUREMENT RESULTS

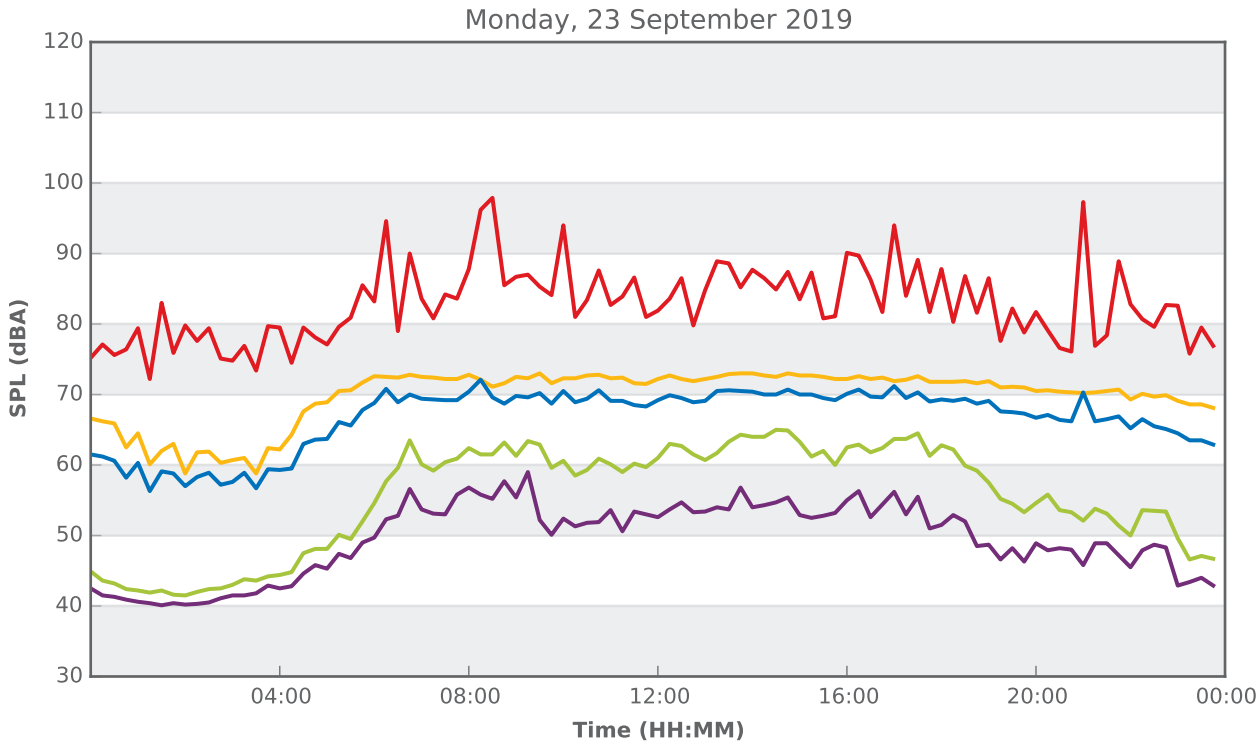
177-219 Mitchell Rd, Erskineville Nsw 2043





177-219 Mitchell Rd, Erskineville Nsw 2043





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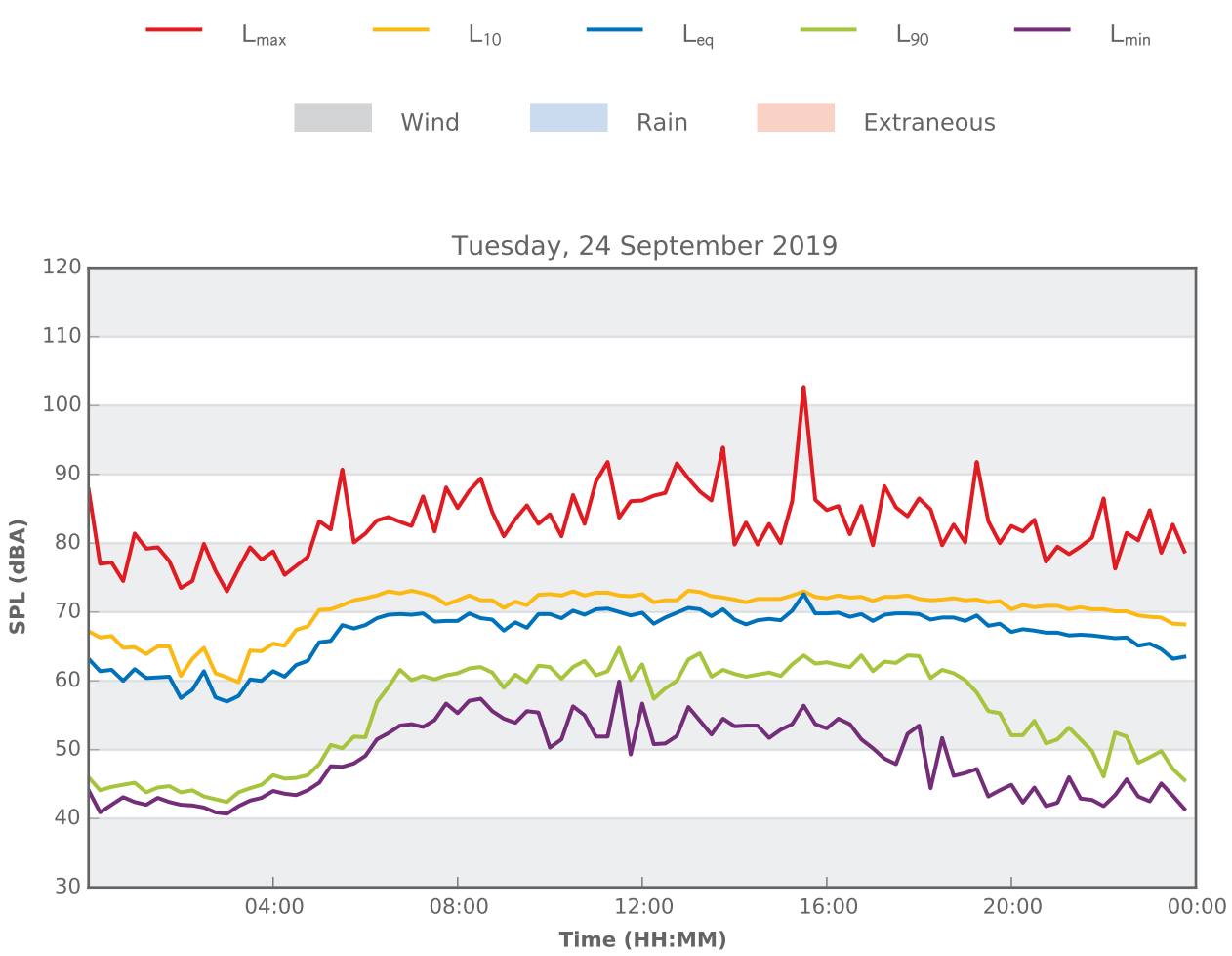

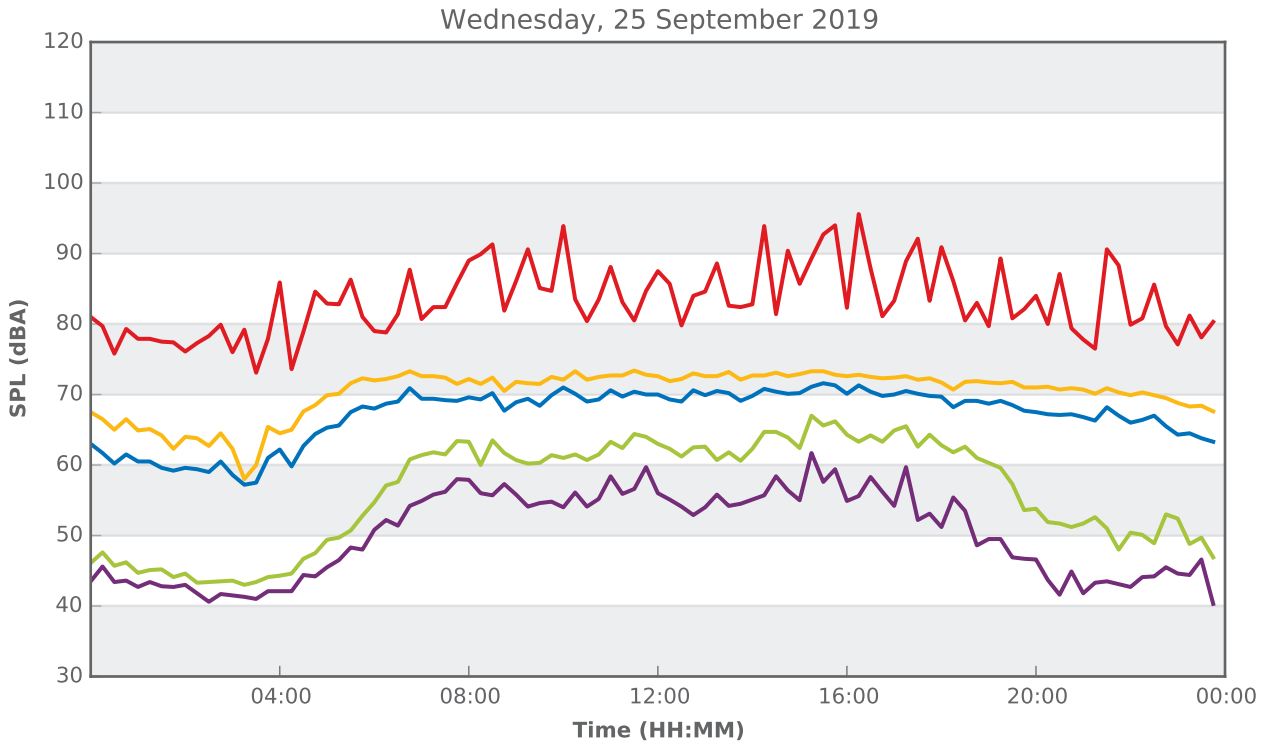

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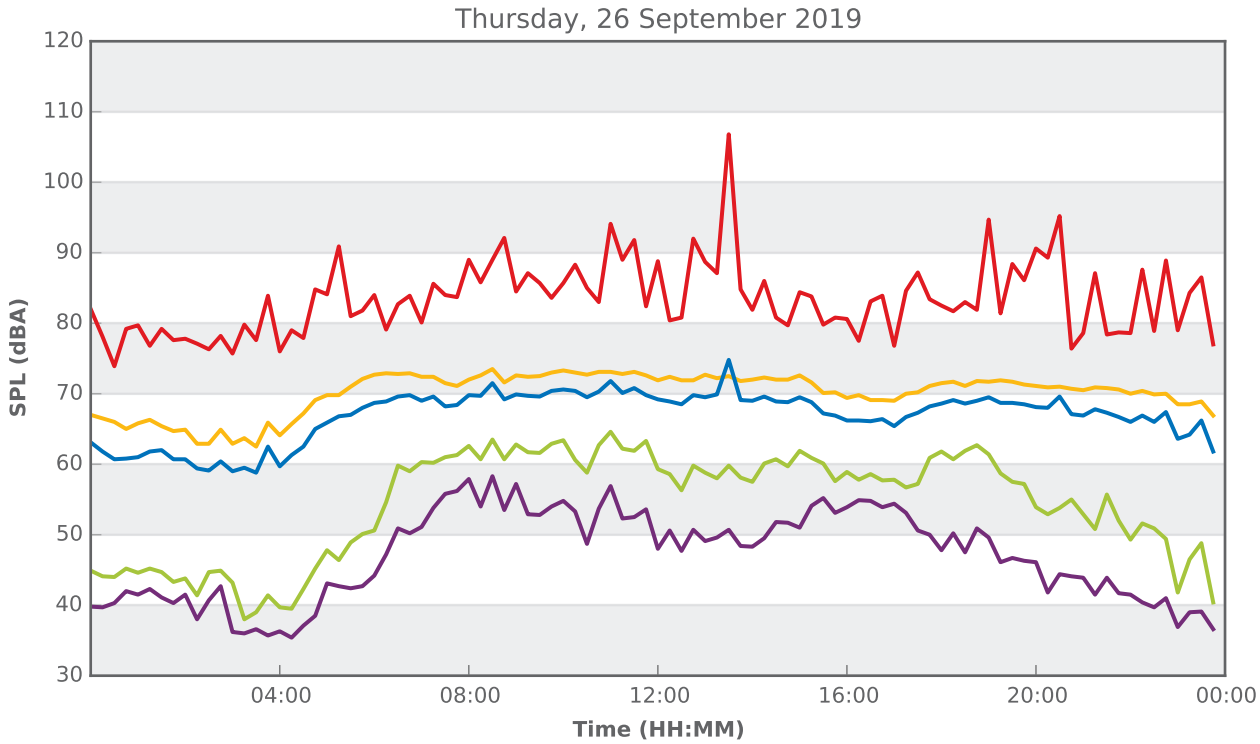

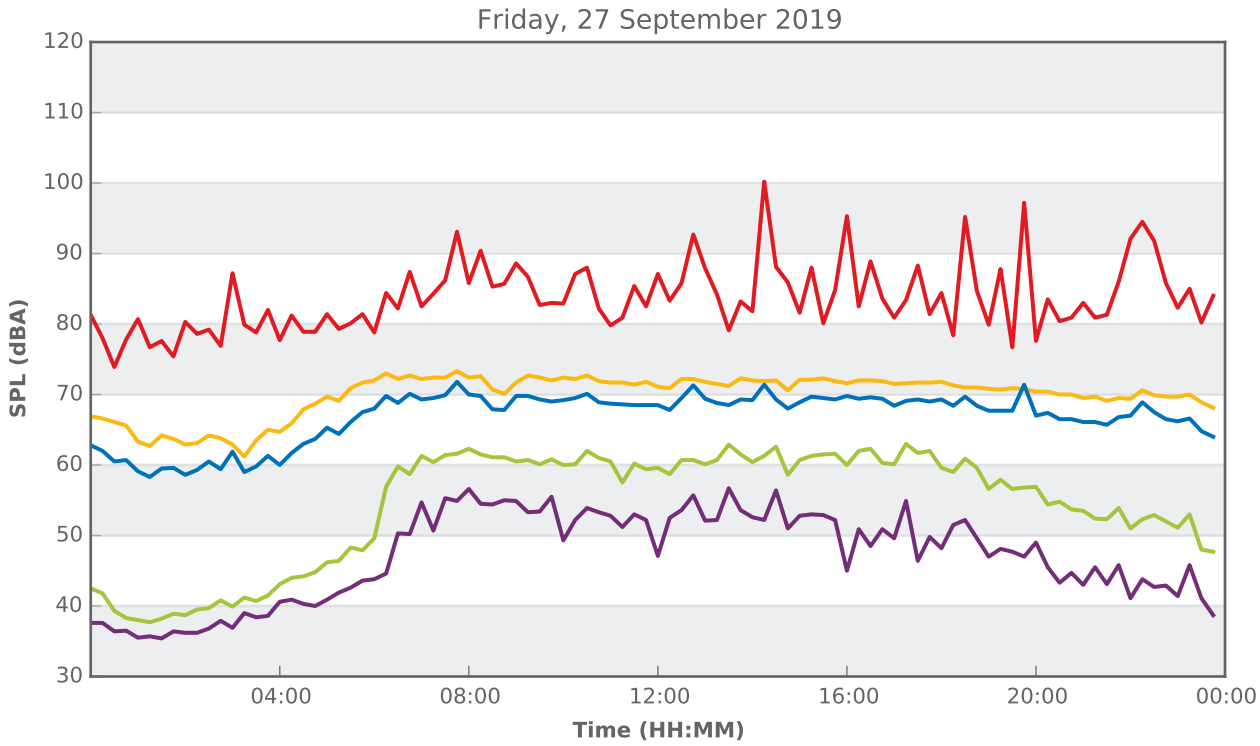

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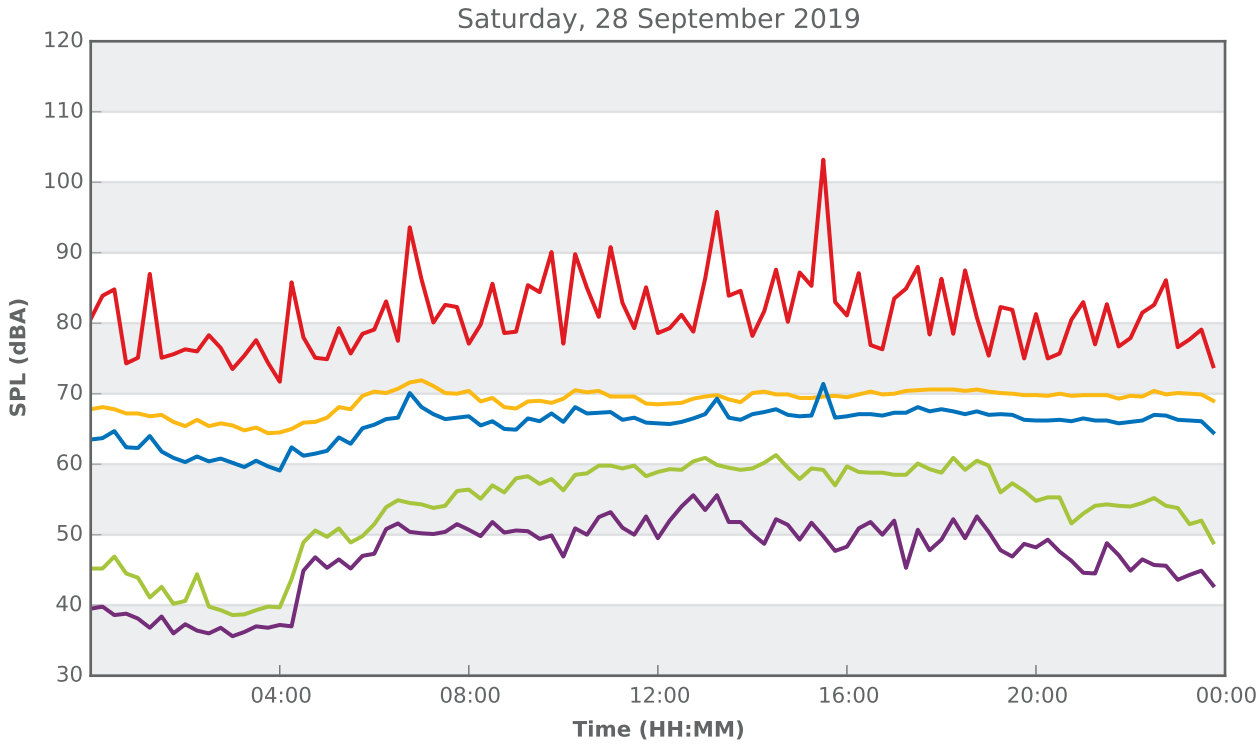

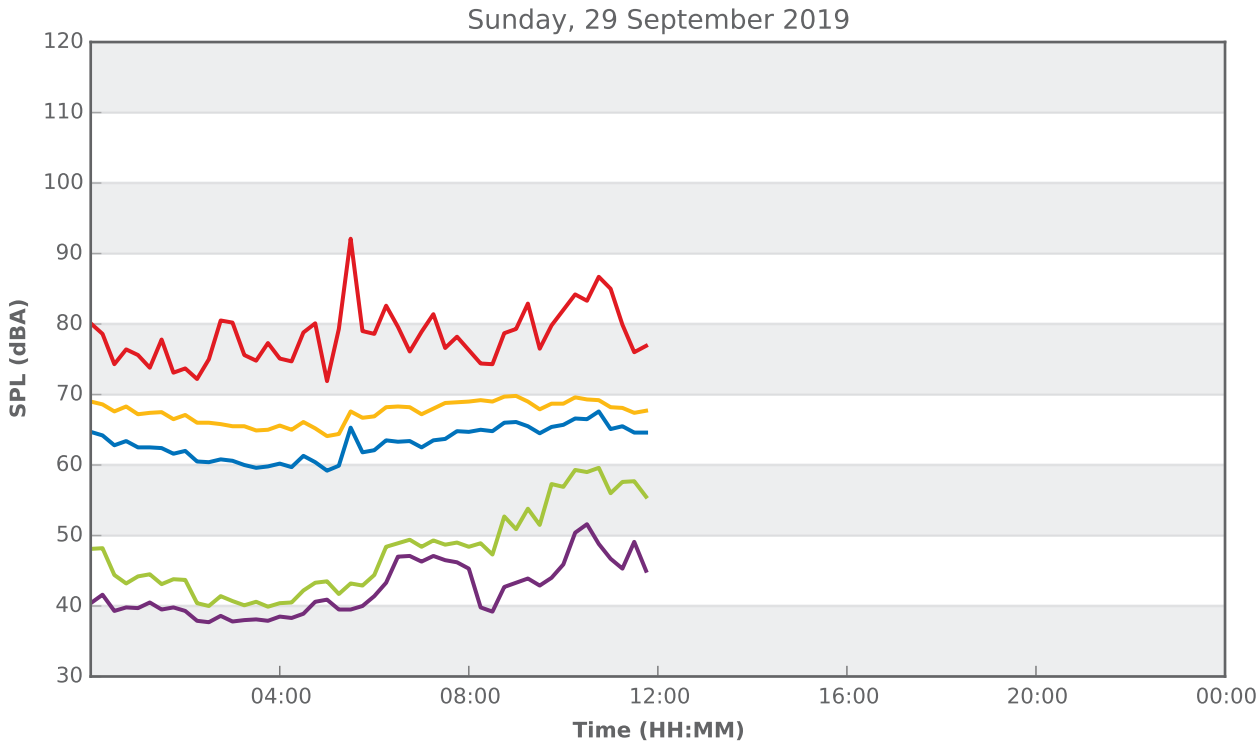

APPENDIX B

METEOROLOGICAL ANALYSIS

Wind-Related Noise-Enhancing Analysis

Appendix B sets out the process followed to determine the significance of the noise-enhancing meteorological conditions. As described in Fact Sheet D of the *NPfI*, the significance of noise-enhancing conditions is based on a threshold of occurrence of 30 percent.

For each season and assessment period (i.e. day, evening, night), the following process was followed:

1. Group all wind directions into a 16-direction wind compass (22.5 degree-arc per direction), with North ranging from 348.75 degrees – 11.25 degrees.
2. For each of the above 16 directions, add the four closest directions (2 x 22.5 degree-arcs on either side) to generate 16 totals (112.5 degree-arc per direction).
3. Divide the number of entries in each of the 16 totals over base data.
4. Assess percentage of occurrence against threshold of occurrence of 30% determined in accordance with the provisions in *NPfI*. If percentage of occurrence is 30% or more (rounded to 1 decimal place), light winds in the direction in question are considered significant.

Tables B-1, B-2 and B-3 summarise the frequencies of occurrence for all seasons for the day, evening and night periods, respectively.

Table B-1 Wind-Related Noise-Enhancing Conditions - Percentages of Occurrence – Day

Direction	Spring	Summer	Autumn	Winter
N	3.3%	4.0%	3.9%	3.5%
NNE	2.2%	3.0%	2.6%	2.3%
NE	2.0%	2.5%	1.8%	1.7%
ENE	1.8%	2.3%	1.5%	1.5%
E	2.0%	1.8%	1.1%	1.6%
ESE	1.8%	1.2%	0.9%	1.9%
SE	1.6%	1.4%	0.9%	2.2%
SSE	1.3%	1.6%	0.9%	2.4%
S	1.3%	1.6%	1.0%	2.7%
SSW	1.4%	1.8%	1.5%	3.3%
SW	2.0%	1.9%	2.6%	3.6%
WSW	3.8%	2.2%	4.0%	5.2%
W	5.0%	3.0%	5.4%	6.2%
WNW	5.4%	3.5%	6.1%	6.3%
NW	5.3%	3.5%	5.9%	5.9%
NNW	4.7%	3.7%	5.2%	5.3%

Table B-2 Wind-Related Noise-Enhancing Conditions - Percentages of Occurrence – Evening

Direction	Spring	Summer	Autumn	Winter
N	4.1%	0.1%	9.8%	6.6%
NNE	4.6%	0.2%	10.6%	5.3%
NE	4.6%	0.5%	10.2%	5.1%
ENE	4.5%	0.7%	8.3%	4.7%
E	3.8%	1.3%	7.0%	3.8%
ESE	2.4%	2.3%	4.8%	3.6%
SE	1.8%	2.4%	3.9%	3.5%
SSE	1.8%	2.2%	3.8%	3.6%
S	1.5%	1.9%	3.5%	3.8%
SSW	1.3%	1.2%	3.5%	5.2%
SW	1.4%	0.2%	3.6%	6.6%
WSW	1.8%	0.0%	3.9%	7.7%
W	1.8%	0.0%	4.1%	8.9%
WNW	1.9%	0.0%	4.8%	8.7%
NW	2.3%	0.0%	6.7%	7.8%
NNW	2.6%	0.1%	7.9%	7.4%

Table B-3 Wind-Related Noise-Enhancing Conditions - Percentages of Occurrence – Night

Direction	Spring	Summer	Autumn	Winter
N	13.7%	11.0%	17.3%	10.5%
NNE	11.1%	9.9%	10.8%	6.0%
NE	8.5%	9.1%	5.2%	2.3%
ENE	5.6%	8.0%	2.5%	0.3%
E	4.2%	6.5%	1.4%	0.1%
ESE	3.3%	5.9%	0.5%	0.1%
SE	2.9%	5.6%	0.6%	0.2%
SSE	2.6%	5.8%	1.0%	0.6%
S	3.5%	5.2%	1.7%	1.2%
SSW	4.3%	5.0%	3.2%	1.6%
SW	4.9%	4.0%	5.3%	3.0%
WSW	7.0%	4.4%	9.1%	4.8%
W	9.8%	5.8%	15.3%	8.9%
WNW	11.6%	7.2%	20.3%	12.0%
NW	13.5%	7.8%	21.6%	13.6%
NNW	14.3%	10.1%	20.6%	12.3%

Table B-4 summarises all percentages of occurrence for the worst-case seasons for day, evening and night at the northern receivers.

Table B-4 Wind-Related Noise-Enhancing Conditions - Percentages of Occurrence – Worst-Case Season

Wind Direction	Max Season		
	Light Winds (up to 3m/s)		
	Day	Evening	Night
N	4.0%	9.8%	17.3%
NNE	3.0%	10.6%	11.1%
NE	2.5%	10.2%	9.1%
ENE	2.3%	8.3%	8.0%
E	2.0%	7.0%	6.5%
ESE	1.9%	4.8%	5.9%
SE	2.2%	3.9%	5.6%
SSE	2.4%	3.8%	5.8%
S	2.7%	3.8%	5.2%
SSW	3.3%	5.2%	5.0%
SW	3.6%	6.6%	5.3%
WSW	5.2%	7.7%	9.1%
W	6.2%	8.9%	15.3%
WNW	6.3%	8.7%	20.3%
NW	5.9%	7.8%	21.6%
NNW	5.3%	7.9%	20.6%

Based on the percentages of occurrence summarised in Table B-4, wind conditions likely to enhance noise propagation only occur a small proportion of the time and less than 30% in any season.