

BREEN RESOURCES

NOISE AND VIBRATION IMPACT ASSESSMENT

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REVISION 0

APRIL 2021

PREPARED FOR

BREEN RESOURCES
330 CAPTAIN COOK DRIVE
KURNELL NSW 2231

DOCUMENT CONTROL

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APPENDIX A – Noise Monitoring Results

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.

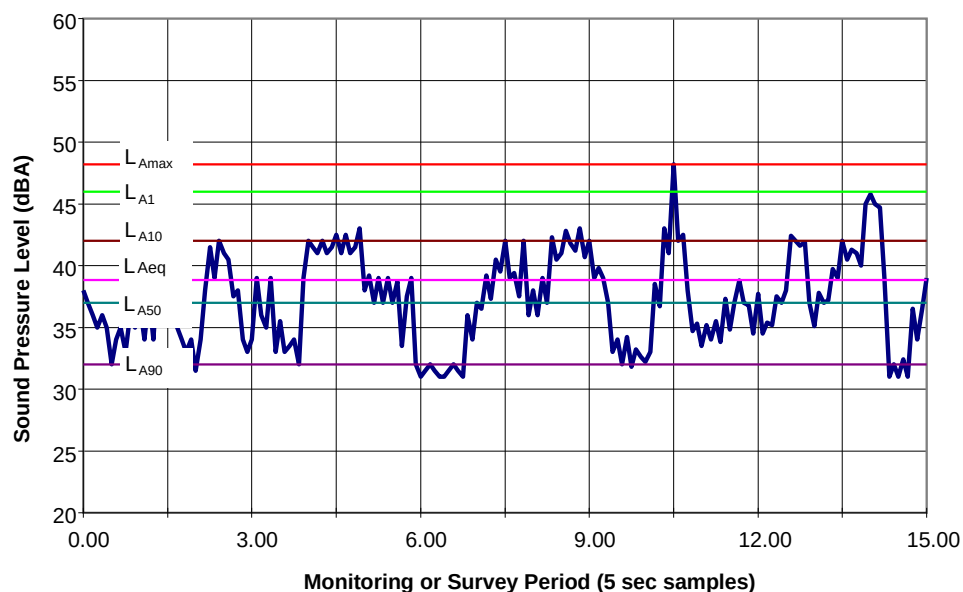
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

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

1.1 Background

The Proposal is comprised of the delivery of a new resource management facility, including the Embellished Marang Parklands, the continuation of landfilling on the residual parts of Lot 5 and the construction of the New Resource Recovery Facility.

Specifically, the Proposal involves the following key integrated components:

- Construction and operation of a resource management facility, comprising:
 - A New Resource Recovery Facility on the eastern part of the Proposal Site (Lot 5), including consolidation of existing waste management activities within this part of the Proposal Site; and
 - A waste disposal facility, being the continuation of current land restoration, landfilling and contouring operations at the Proposal Site by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5;
- Use of suitable material processed by the New Resource Recovery Facility to cap, contour and re-profile areas of the Proposal Site and to construct the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6;
- Re-profiling of parts of the Proposal Site within Lots 1122, 1123 and 6, with some existing waste materials from those lots;
- Delivery of an activated and integrated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6, to provide a superior parkland to that proposed under the VPA as detailed in Section 4.4.3 of the EIS (referred to as the Embellished Marang Parklands). This will include, among other things, integrated water usage and management and utilising personnel, plant, material and infrastructure across the whole of the Site.

To enable the above Proposal, the Existing Breen Resources Facility on Lots 1122, 1123 and 6 (this includes those parts of Lots 1122, 1123 and 6 that will comprise the Playing Fields) will be demolished and/or relocated (as required) to Lot 5.

The proposed Embellished Marang Parklands include the following improvements and benefits to the community over and above those contemplated by the 2010 VPA:

- A cleared 'Village Green' area in the middle of the parklands with amphitheatre, providing a place for the community to hold events and celebrations in a semi natural setting;
- Associated picnic areas for all members of the local and wider community to use and enjoy;
- A playground;
- A network of accessible paths, including key pedestrian and cycle links between Quibray Bay and Cronulla Beach, to allow visitors to easily access the parklands for pedestrians and cycling, reinforcing the Sydney Green Grid; and,
- An elevated landscape, including a panoramic look out in the western part of the parklands, that offers spectacular all-round regional views that will assist in a better understanding of the varied landscapes of this part of Sydney.

1.2 Purpose of this Report

Ethos Urban has been engaged by Breen to author an Environmental Impact Statement (EIS) to support a development application for approval of the Proposal under Part 4 of the New South Wales (NSW) Environmental Planning and Assessment Act 1979 (the EP&A Act). The EIS is being prepared in accordance with the provisions of the EP&A Act.

This report has been prepared by Wilkinson Murray to provide an assessment of potential noise and vibration impacts as an input to the EIS. This report addresses the Secretary of the NSW Department of Planning and Environment's Environmental Assessment Requirements (SSD-10412) dated 14 February 2020.

The Proposal is not likely to generate significant additional traffic movements, compared to traffic movements associated with historical operations of the Breen site, on the public road network. It is noted that the Proposal seeks to move the site entry point, however this would not affect road traffic noise levels near sensitive receivers. Accordingly, road traffic noise impacts have not been considered further in this assessment.

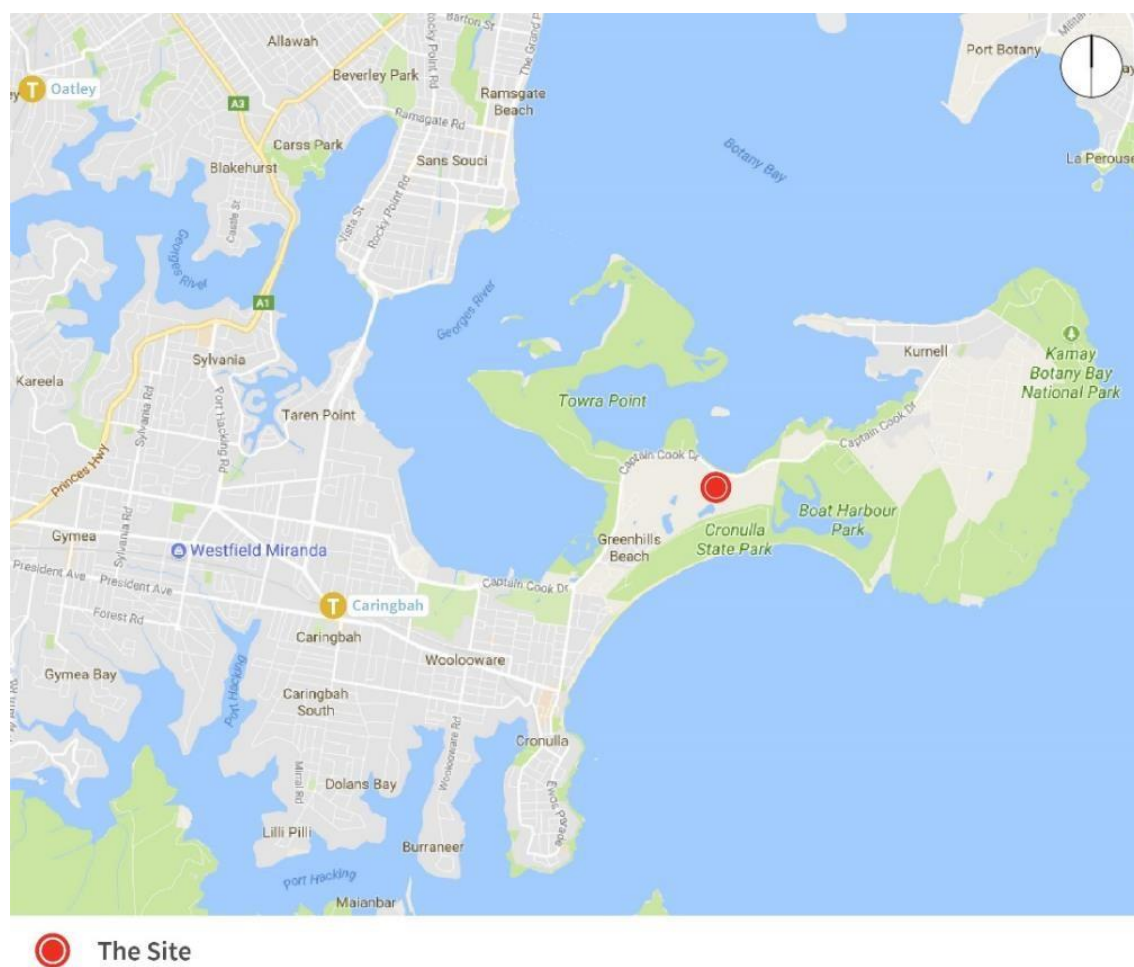
2 THE PROPOSAL SITE

2.1 Location

The Proposal site is located within the Sutherland Shire Local Government Area, approximately 12 kilometres south of the Sydney Kingsford Smith Airport. The Proposal site is situated on the Kurnell Peninsula, positioned between Quibray Bay (within Botany Bay) to the north and Bate Bay (being Cronulla and Wanda beaches) to the south. It is currently accessible from Captain Cook Drive and Lindum Road.

Figure 2-1 shows the location of the Proposal site.

Figure 2-1 Proposal site location



2.2 Site context

The Proposal site is generally bounded to the north by Captain Cook Drive, which provides access from North Cronulla through to the village of Kurnell, as well as the main access to the Existing Breen Resources Facility. Further to the north of Captain Cook Drive are the foreshores and waters of Botany Bay, including the Towra Point Nature Reserve.

Near the eastern end of the Proposal site, Sporting Field No. 1 and the Skate Park have recently been constructed on Lot 1 DP 1101922 and are now operational. This new recreational area represents the closest existing sensitive receptor to the eastern part of the Proposal site, where the New Resource Recovery Facility is proposed to be located.

An electricity transmission line easement runs along this boundary, between the Proposal site and the Sporting Field No. 1 and Skate Park recreational area. The easement contains Ausgrid 132kV overhead electricity transmission lines. Further to the west, Hockey Fields No. 2 and No. 3 have also already been constructed on Lot 111 DP777967 and part of Lot 1123, and are now operational.

To the south, the Proposal site adjoins the Heritage Sand Dune and Cronulla State Park, which leads to Wanda Beach, fronting onto Bate Bay.

To the east, the Proposal site is bounded by an unconstructed extension of Lindum Road, within which a pedestrian footpath has been constructed for beach and foreshore access. Beyond the Lindum Road road reserve is a sand mining site that is being progressively mined for construction sand and backfilled with virgin excavated natural materials.

To the west, the Proposal site adjoins Charlotte Breen Memorial Reserve and Sydney Water's Cronulla wastewater treatment plant. Beyond Charlotte Breen Memorial Reserve to the south west is the new residential suburb of Greenhills Beach, comprising low density residential housing.

2.3 Proposal overview

Key features of the Proposal include:

- Construction and operation of a resource management facility to process approximately 650,000 tonnes per year of construction and demolition (C&D) and commercial and industrial (C&I) wastes, comprising:
 - A New Resource Recovery Facility on the eastern part of the Proposal Site (Lot 5), including consolidation of existing waste management activities within this part of the Proposal Site; and
 - A waste disposal facility, being the continuation of current land restoration, landfilling and contouring operations at the Proposal Site by permanent application of some of the residual waste materials from the New Resource Recovery Facility to land on Lot 5;
- Use of suitable material processed by the New Resource Recovery Facility to cap, contour and re-profile areas of the Proposal Site and to construct the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6;
- Re-profiling of parts of the Proposal Site within Lots 1122, 1123 and 6, with some existing waste materials from those lots;
- Delivery of an activated and integrated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6, to provide a superior parkland to that proposed under the VPA as detailed in Section 4.4.3 of the EIS (referred to as the Embellished Marang Parklands).

Figure 2-2 shows the key components of the Proposal. Figure 2-3 shows the proposed layout of the New Resource Recovery Facility.

Figure 2-2 Proposal – key components



LEGEND

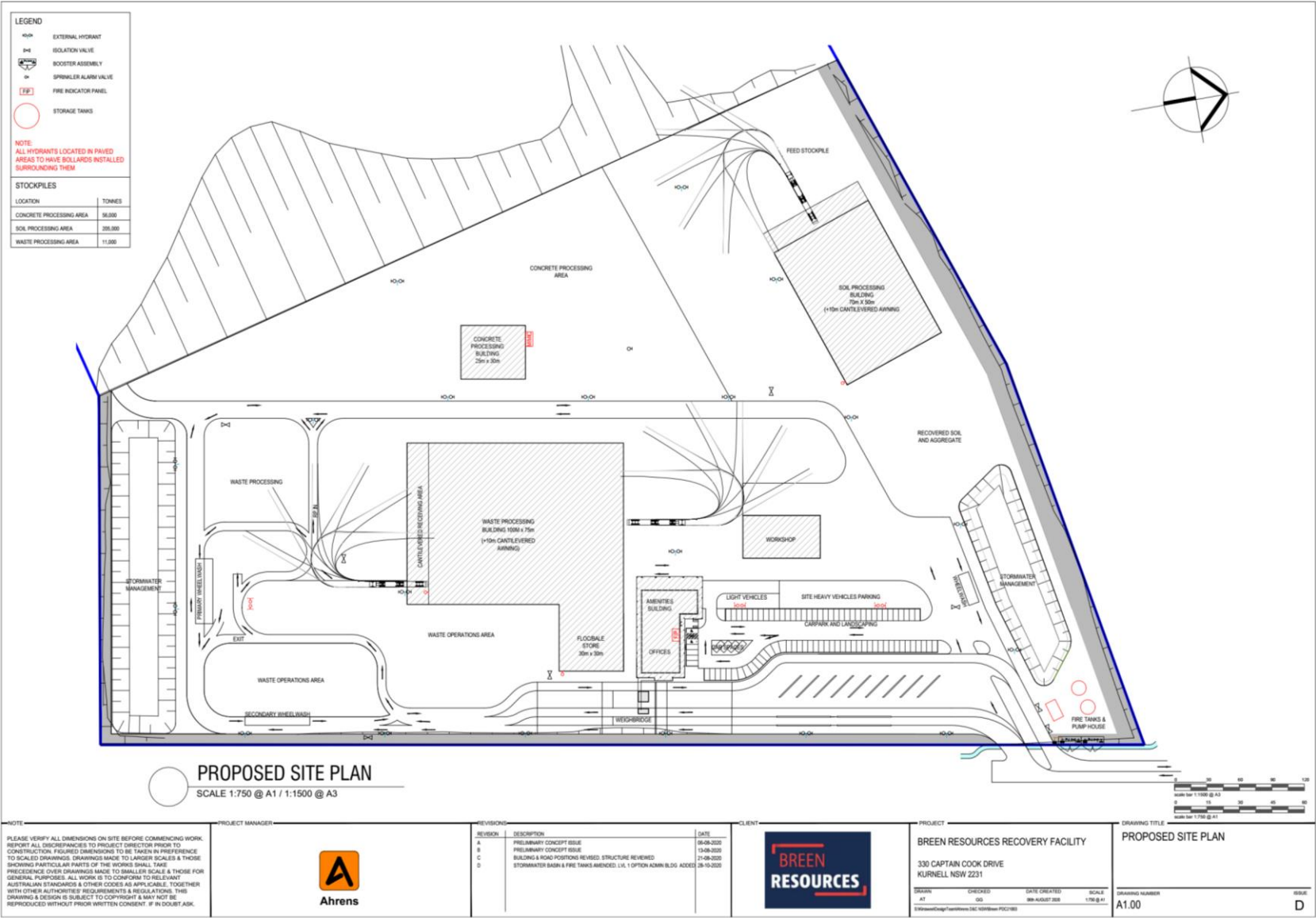
- Project Boundary
- Landscape Boundary
- Landform contours
- Shared pathways
- Recycled sculptures/ Interpretative trail
- Kurnell Dune Forest
- Coastal Dune Heath
- Modified Kurnell Dune Heath (Low Heath)

- Informal native grass (Indicative Area)
- Managed native grass (Indicative Area)
- Trees
- Picnic shelters (x3)
- Picnic tables (x11)

KEY

- 1. Amphitheatre
- 2. Potential Installation Art
- 3. Village green
- 4. Drop off, turn around area & coach parking
- 5. Disabled parking
- 6. Pedestrian entry zone
- 7. Main plaza
- 8. Panoramic lookout
- 9. Stabilised embankment
- 10. Slide
- 11. Lookout/ peak
- 12. General carparking
- 13. Open grassed picnic area
- 14. Nature play/trail connection
- 15. Playground
- 16. Vehicular access point
- 17. Pedestrian access points
- 18. Picnic facilities
- 19. Future amenities block
- 20. Existing amenities block
- 21. Infiltration area

Figure 2-3 Proposed Site Plan – New Resource Recovery Facility



3 EXISTING ENVIRONMENT

3.1 Sensitive receivers

The nearest and most potentially affected residential receivers near the Proposal Site are located in Greenhills Beach, approximately 1.5 km south west of the Proposal Site and Kurnell, approximately 2 km north east of the Proposal Site. Additionally, a number of recreational facilities, hockey fields and a soccer field, are located immediately north of the site and several commercial land uses are located approximately 750 metres north east of the Proposal Site. These receivers are shown on Figure 3-1.

3.2 Ambient Noise Monitoring

Long term unattended noise monitoring was conducted at 3 Whitehaven Street, Greenhills Beach (L1) between 2 May 2018 and 13 May 2018 to establish the existing ambient noise levels at the most potentially affected residential receivers near the Proposal. The monitoring location is shown in Figure 3-1 and is considered representative of typical background noise levels at residences in Greenhills Beach. For the purposes of assessment, it is assumed that the existing ambient background noise levels in Kurnell are similar to those in Greenhills Beach.

3.2.1 Ambient Noise Monitoring Results

The noise monitoring equipment used for these measurements consisted of an environmental noise logger set to A-weighted, fast response. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

From the background noise levels (L_{A90}) the Rating Background Levels (RBLs) were determined using the methodology recommended in the NPfI.

The existing ambient noise levels are presented in Table 3-1 below. The NPfI specifies minimum RBLs of 35 dBA in the daytime and 30 dBA in the evening and night time. The RBL presented in Table 3-1 have been corrected for the minimum values where appropriate. Daily plots of the noise logger data are presented in Appendix A.

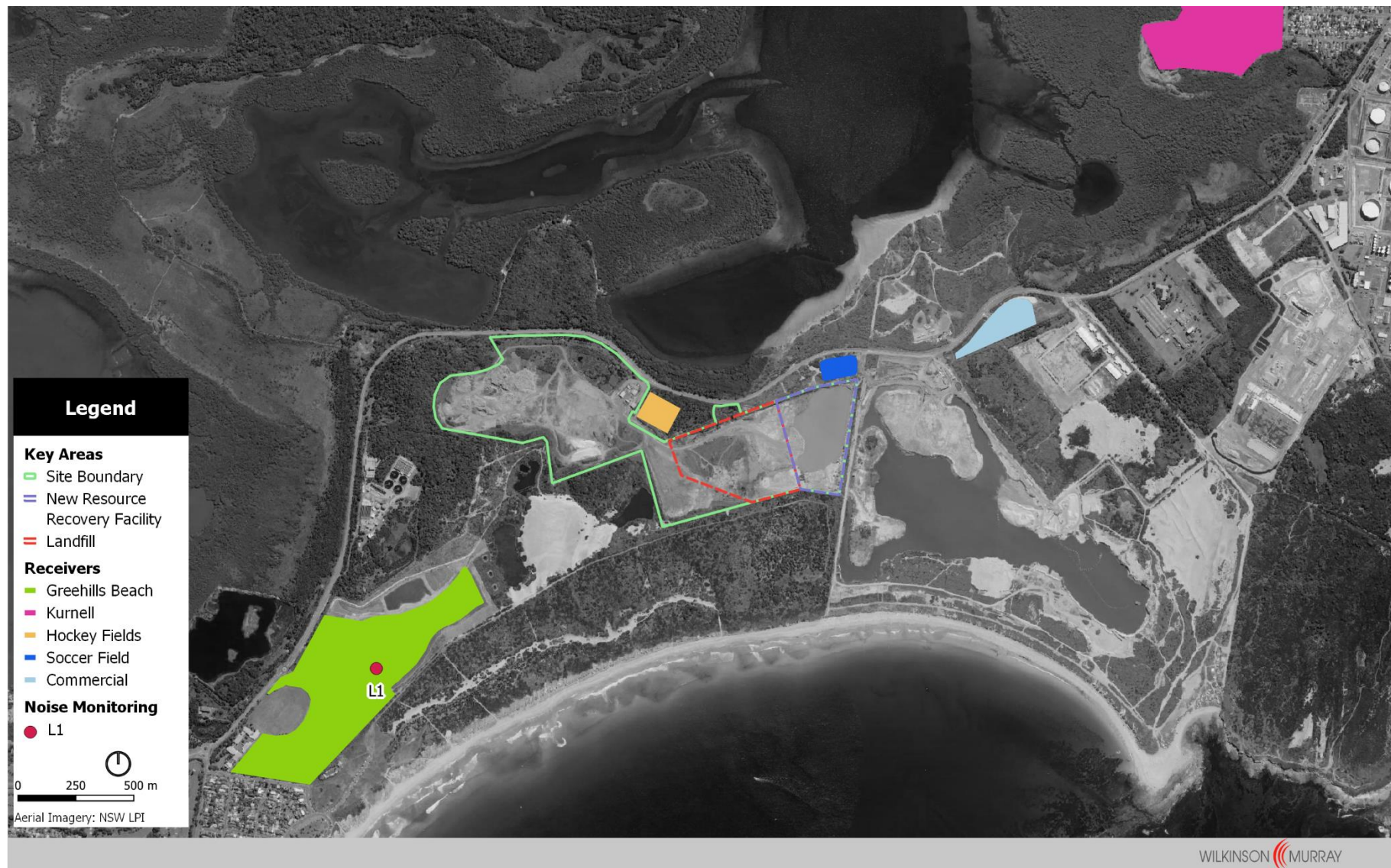
Table 3-1 Existing Ambient Noise Levels

Monitoring location	Represented Receivers	Time of Day ^a	Noise Levels (dBA)	
			RBL ^b	L_{Aeq}
L1	All Residential	Day	35 (33)	50
		Evening	38	51
		Night	32	44

a. Day = 7.00am – 6.00pm, evening = 6.00pm – 10.00pm, night = 10.00pm – 7.00am

b. Corrected to NPfI minimum value. Unadjusted value in brackets.

Figure 3-1 Sensitive Receivers and Noise Monitoring Location



4 OPERATIONAL NOISE ASSESSMENT

The following section presents an assessment of potential noise impacts associated with the operation of the landfill and the New Resource Recovery Facility.

4.1 Operational Noise Trigger Levels

The *NSW Noise Policy for Industry* (the NPfI) provides a framework for assessing environmental noise impacts from industrial premises and industrial development proposals in New South Wales.

The NPfI recommends the development of project noise trigger levels, which provide a benchmark for assessing a proposal or site. The project noise trigger levels should not be interpreted as mandatory noise criteria but, rather, as noise levels that, if exceeded, would indicate a potential noise impact on the community.

The project noise trigger level is the lower value of the project intrusiveness noise level and the project amenity noise level. The project intrusiveness noise level assesses the likelihood of noise being intrusive above the ambient noise level and is applied to residential receivers only. The project amenity noise level ensures the total industrial noise from all sources in the area does not rise above a maximum acceptable level.

The NPfI stipulates that project noise trigger levels are determined for the daytime (7.00am – 6.00pm), evening (6.00pm – 10.00pm) and night time (10.00pm – 7.00am) periods, as relevant. The determined trigger levels typically apply at the most affected point on or within the receiver property boundary.

4.1.1 Project Intrusiveness Noise Levels

The intrusiveness noise level is the noise level 5 dBA above the background noise level for each time period (daytime, evening or night time) of interest at a residential receiver. The background noise level is derived from the measured L_{A90} noise levels.

The NPfI stipulates that project intrusiveness noise levels should not be set below 40 dBA during the daytime and 35 dBA in the evening and night time. Additionally, the NPfI recommends that the project intrusiveness noise level for evening is set at no greater than that for the daytime, and that the project intrusiveness level for night time is set at no greater than that for the evening and daytime.

Intrusiveness noise levels for the project are calculated from the RBLs in Section 3.2.1 of this report, in accordance with the NPfI, and are presented in Table 4-1 below.

Table 4-1 Project Intrusiveness Noise Levels

Receiver	Time of Day ¹	RBL	Project Intrusiveness Noise Level ($L_{Aeq,15min}$ dBA)
All Residences	Day	35	40
	Evening	38	40
	Night	32	37

1. Day = 7.00am – 6.00pm, evening = 6.00pm – 10.00pm, night = 10.00pm – 7.00am

4.1.2 Project Amenity Noise Levels

Project amenity noise levels aim to set a limit on continuing increases in noise levels from all industrial noise sources affecting a variety of receiver types; that is, the ambient noise level in an area from all industrial noise sources remains below recommended amenity noise levels.

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include transportation noise (when on public transport corridors), noise from motor sport, construction noise, community noise, blasting, shooting ranges, occupational workplace noise, wind farms, amplified music/patron noise.

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.

The recommended amenity noise level represents the objective for total industrial noise at a receiver location. The project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

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.

The following exceptions apply to determining the project amenity noise level:

- For high-traffic areas the amenity criterion for industrial noise becomes the $L_{Aeq,period(traffic)}$ minus 15dBA.
- In proposed developments in major industrial clusters.
- If the resulting project amenity noise level is 10dB or more lower than the existing industrial noise level, the project amenity noise level can be set at 10dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.
- Where cumulative industrial noise is not a consideration because no other industries are present in, or likely to be introduced into the area, the relevant amenity noise level is assigned as the project amenity noise level for the development.

Amenity noise levels are not used directly as regulatory limits. They are used in combination with the project intrusiveness noise level to assess the potential impact of noise, assess mitigation options and determine achievable noise requirements.

The project amenity noise levels are calculated from the recommended amenity noise levels presented in Table 4-2.

Table 4-2 Recommended Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day ¹	Recommended Amenity Noise Level (dBA L _{Aeq,period})
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day.
School classroom-internal	All	Noisiest 1-hour period when in use	35
Hospital ward internal external	All	Noisiest 1-hour	35
	All	Noisiest 1-hour	50
Place of worship-internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	65
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5dB(A) to recommended noise amenity area

1. Day = 7.00am – 6.00pm, evening = 6.00pm – 10.00pm, night = 10.00pm – 7.00am

Recommended amenity noise levels presented in Table 4-2 represent the objective for total industrial noise at a receiver location. In the case of a single new noise source being proposed, the project amenity noise level represents the objective for noise from a single industrial development at the receiver location. This is typically calculated as the recommended amenity noise level minus 5dBA.

The Proposal is considered to be the dominant potential source of industrial noise at the nearby hockey and soccer field. Therefore, cumulative noise impacts are considered unlikely at these locations and the project amenity noise level is set at the recommended amenity noise level.

Due to different averaging periods for the $L_{Aeq,15min}$ and $L_{Aeq,period}$ noise descriptors, the values of project intrusiveness and amenity noise levels cannot be compared directly when identifying noise trigger levels i.e. the most stringent values of each category. In order to make a comparison between descriptors, the NPFI assumes that the $L_{Aeq,15min}$ equivalent of an $L_{Aeq,period}$ noise level is equal to the $L_{Aeq,15min}$ level plus 3dB.

Residential receivers in Greenhills Beach and Kurnell are considered as being in a "suburban" noise amenity area.

The project amenity noise levels for the Proposal are presented in Table 4-3.

Table 4-3 Project Amenity Noise Levels

Receiver	Time of Day ¹	Recommended Amenity Noise Level ($L_{Aeq,period}$)	Project Amenity Noise Level ($L_{Aeq,15min}$ dBA)
All residences	Day	55	53
	Evening	45	43
	Night	40	38
Soccer & Hockey Fields	When in use	55	58
Commercial	When in use	65	63

1. Day = 7.00am – 6.00pm, evening = 6.00pm – 10.00pm, night = 10.00pm – 7.00am

4.1.3 Project Noise Trigger Levels

Table 4-4 below shows the project noise levels for sensitive receivers, with the project noise trigger levels shown in bold.

Table 4-4 Project Noise Trigger Levels

Receiver	Time of Day ¹	Project Intrusiveness Noise Levels ($L_{Aeq,15min}$ dBA)	Project Amenity Noise Levels ($L_{Aeq,15min}$ dBA)
All residences	Day	40	53
	Evening	40	43
	Night	37	38
Soccer & Hockey Fields	When in use	n/a	58
Commercial	When in use	n/a	63

1. Day = 7.00am – 6.00pm, evening = 6.00pm – 10.00pm, night = 10.00pm – 7.00am

4.1.4 Maximum Noise Trigger Levels

Noise sources at night occurring over a short duration have the potential to cause sleep disturbance despite complying with project noise trigger levels. Approval is sought for the New Resource Recovery Facility to operate on a 24-hour basis as required. Therefore, maximum noise level events need to be considered for potential sleep disturbance.

The NPfI recommends that, where the night time L_{Amax} receiver noise levels from a development exceeds 52 dBA or the RBL plus 15 dBA, whichever is the greater, then a more detailed assessment of potential sleep disturbance impacts is warranted. Table 4-5 presents the maximum noise trigger levels for the receivers identified in this assessment. These noise levels are typically addressed at the façade of potentially affected dwellings and should consider multiple storey dwellings.

Table 4-5 Maximum Noise Trigger Levels

Receiver	RBL (dBA)	RBL + 15 dBA	Maximum Noise Trigger Level (dBA)
All residences	32	47	52

Additionally, in instances where night time $L_{Aeq,15min}$ noise levels exceed 40 dBA or the prevailing RBL plus 5 dBA, whichever is the greater, then a detailed assessment of potential sleep disturbance impacts is warranted. Since the night time project noise trigger level is less than 40 dBA for all nearby residential receivers, compliance with these noise trigger levels will ensure that no further assessment of night time $L_{Aeq,15min}$ noise levels, with regard to sleep disturbance, would be required.

4.2 Operational Noise Modelling Methodology

4.2.1 Computer Noise Model

Operational and noise emissions associated with the Proposal were modelled using the CadnaA acoustic noise prediction software and the CONCAWE noise prediction algorithm. The CONCAWE noise propagation model is used around the world and is widely accepted as an appropriate model for predicting noise over significant distances. Factors that were addressed in the noise modelling are:

- Equipment noise level emissions and locations;
- Shielding from ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and,
- Atmospheric absorption.

4.2.2 Noise and Visual Bund

A earthen bund is proposed to be established along the northern boundary of part of Lot 5 to provide noise and visual screening between part of Lot 5 and the sporting fields to the north. This bund would be approximately 4 metres high and is included in the noise model.

4.2.3 Meteorological Effects

At relatively large distances from a source, the resultant noise levels at receivers can be influenced by meteorological conditions, particularly temperature inversions and gradient winds. Where these factors are a feature of an area, their effect on resultant noise levels should be taken into account.

Noise enhancing meteorology adopted in this assessment, denoted as "NE" in results tables, are described below.

Temperature Inversions

Temperature inversions are considered likely to be a feature of the area, particularly during winter nights. Therefore, the following default temperature inversion parameters recommended in the NPfI have been included in the assessment:

- Stability category F with 2 m/s source-to-receiver drainage winds.

These parameters have been applied during night time assessment period.

The CadnaA noise modelling software includes a feature that allows the model to be run with the "worst-case wind direction". This option produces the highest noise level for each receiver due to noise-enhancing winds and has been used in the modelling.

Gradient Winds

Gradient (i.e. prevailing) winds have been identified in general accordance with "Fact Sheet D" of the NPfI, based on hourly wind speed and direction observations taken during 2019 at the Kurnell Automatic Weather Station (AWS) operated by the Bureau of Meteorology.

Table 4-6 presents the percentage of time where light winds up to 3.0 m/s are blowing from a particular direction, plus or minus 45 degrees, during the day, evening and night time in each season. Where the percentage is 30% or more, denoted in bold text, the winds are considered a feature of the area, and should be included in the assessment.

Table 4-6 indicates that gradient winds, as defined by the NPfI, are not a feature of the area and do not need to be considered further in the assessment.

Table 4-6 Identification of Gradient Winds

Direction	Percentage of Time											
	Summer			Autumn			Winter			Night		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
N	3	1	6	4	4	7	4	5	2	3	3	9
NNE	3	1	7	2	5	4	2	4	1	2	4	7
NE	3	1	6	2	6	1	2	5	0	2	4	6
ENE	2	3	6	2	6	1	2	4	0	2	7	6
E	2	3	5	2	6	1	2	5	0	1	8	6
ESE	2	4	4	3	6	1	3	6	0	1	7	5
SE	1	5	5	2	7	2	3	6	0	1	7	5
SSE	1	5	6	2	9	3	3	7	1	0	6	4
S	1	4	6	2	8	4	2	8	1	1	4	4
SSW	1	3	6	1	7	7	2	9	3	0	4	4
SW	1	2	5	1	5	10	2	12	5	0	3	6
WSW	1	1	5	2	4	13	3	11	8	1	2	6
W	2	1	5	5	5	15	5	9	9	2	1	7
WNW	3	0	5	7	5	15	7	7	8	4	1	9
NW	3	0	5	7	5	13	7	4	7	4	1	9
NNW	3	0	5	7	4	9	6	5	4	4	1	9

4.3 Operational Activities and Plant

The most significant sources of operational noise from the Proposal are the fixed and mobile plant associated with the various waste management activities and heavy customer vehicles (i.e. trucks) accessing the site. The client has advised the type and quantity of plant items expected to be used under the Proposal. These plant items are summarised in Table 4-7. Table 4-7 also presents the sound power levels (SWL) of these plant items. The locations of the waste processing building, concrete recycling and soil recycling are shown on Figure 2-3.

Table 4-7 Plant Items and Sound Power Levels

Area	Plant Item	Quantity	Unit SWL (dBA)
Waste processing building	Loader	1	105 ^a
	Excavator	4	105 ^a
	Processing plant	1	114 ^a
Concrete processing building	Loader	1	105 ^a
	Excavator	1	105 ^a
	Cone crusher	1	115 ^a
	Jaw crusher	1	108 ^b
	Screen	1	110 ^b
Soil processing building	Loader	1	105 ^a

Area	Plant Item	Quantity	Unit SWL (dBA)
Landfill	Excavator	1	105 ^a
	Impact crusher	1	107 ^b
	Screen	1	104 ^a
	Compactor	1	114 ^a
	Dump truck	4	107 ^a

a. Based on measurements at the existing Breen site

b. Adopted from data presented in *Noise Impact Assessment, Concrush Pty Ltd*, Prepared by RCA Australia, November 2018.

In addition to the plant items listed in Table 4-7, the client advises that approximately 53 trucks would be expected to enter the site in the busiest one-hour period. Road trucks are assumed to have a sound power level of 103 dBA and would typically travel throughout the site at a speed of approximately 10 km/h.

4.4 Assessment Scenarios

A single assessment scenario has been developed to present potential noise impacts associated with typical worst-case operations under the Proposal. This scenario involves peak truck movements throughout the site, and the plant items identified in Table 4-7 operating simultaneously.

4.5 Predicted $L_{Aeq,15min}$ Operational Noise Levels at Sensitive Receivers

Based on the typical worst-case operating scenario, as identified above, the predicted operational noise levels at sensitive receivers are presented in Table 4-8.

Table 4-8 Predicted $L_{Aeq,15min}$ Operational Noise Levels at Sensitive Receivers

Receiver	Predicted $L_{Aeq,15min}$ Noise Level (dBA)		Project Noise Trigger Level (dBA)			Complies?
	Calm ²	NE ³	Day ¹	Evening ¹	Night ¹	
Greenhills Beach	<20	24	40	40	37	Yes
Kurnell	26	31	40	40	37	Yes
Soccer Field	54	56		58		Yes
Hockey Fields	46	51		58		Yes
Commercial	44	49		63		Yes

1. Daytime = 7.00am–6.00pm; Evening = 6.00pm – 10.00pm; Night = 10.00pm–7.00am.

2. CONCAWE Category 4.

3. CONCAWE Category 6.

Review of Table 4-8 indicates that the predicted $L_{Aeq,15min}$ noise levels, due to the operation of the Proposal, comply with the project noise trigger levels at all sensitive receivers.

Contour plots of the predicted $L_{Aeq,15min}$ operational noise levels during calm and noise enhancing meteorological conditions are shown in Figure 4-1 and Figure 4-2, respectively.

Figure 4-1 Operational Noise Contour Plot, Calm Meteorology

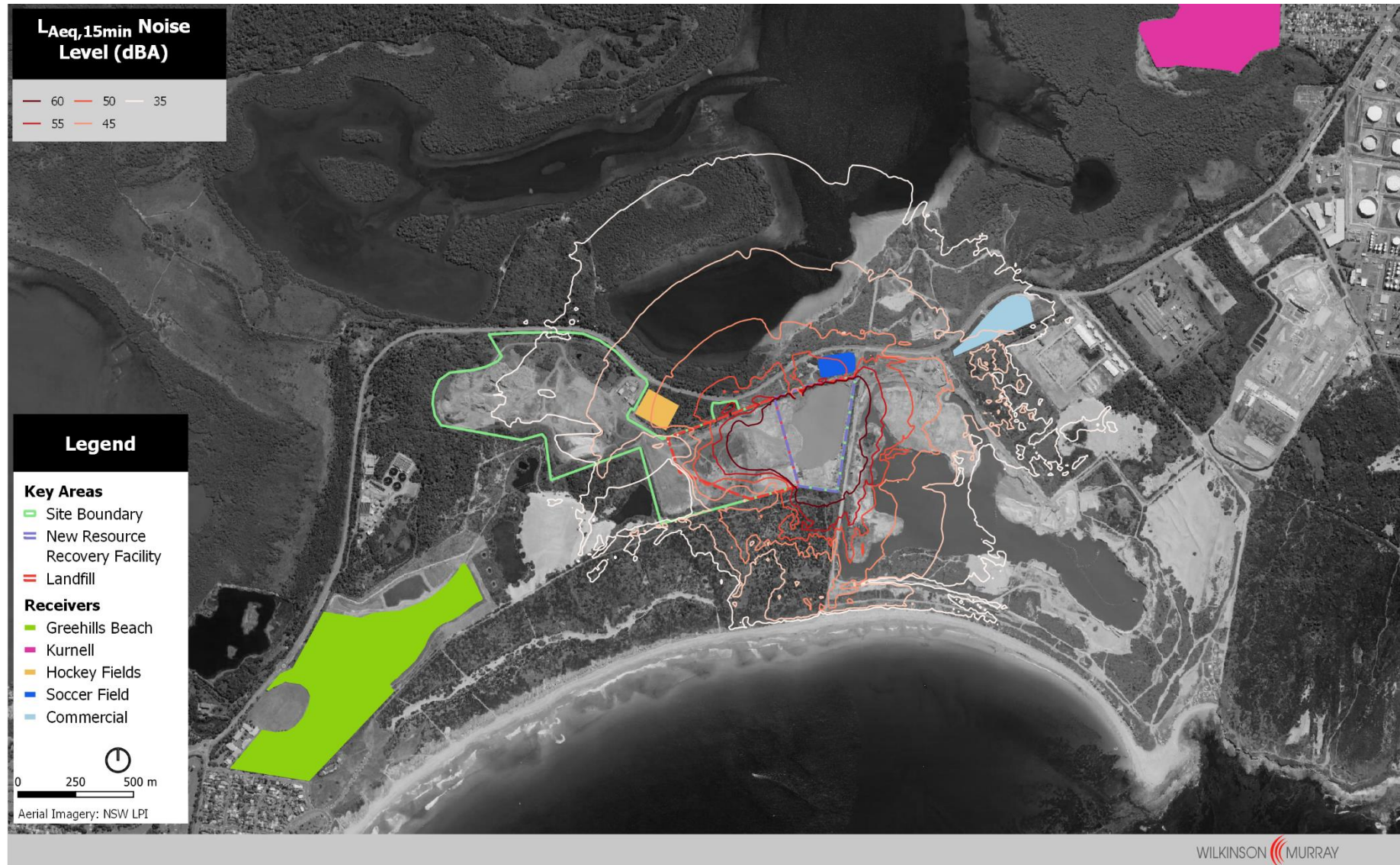
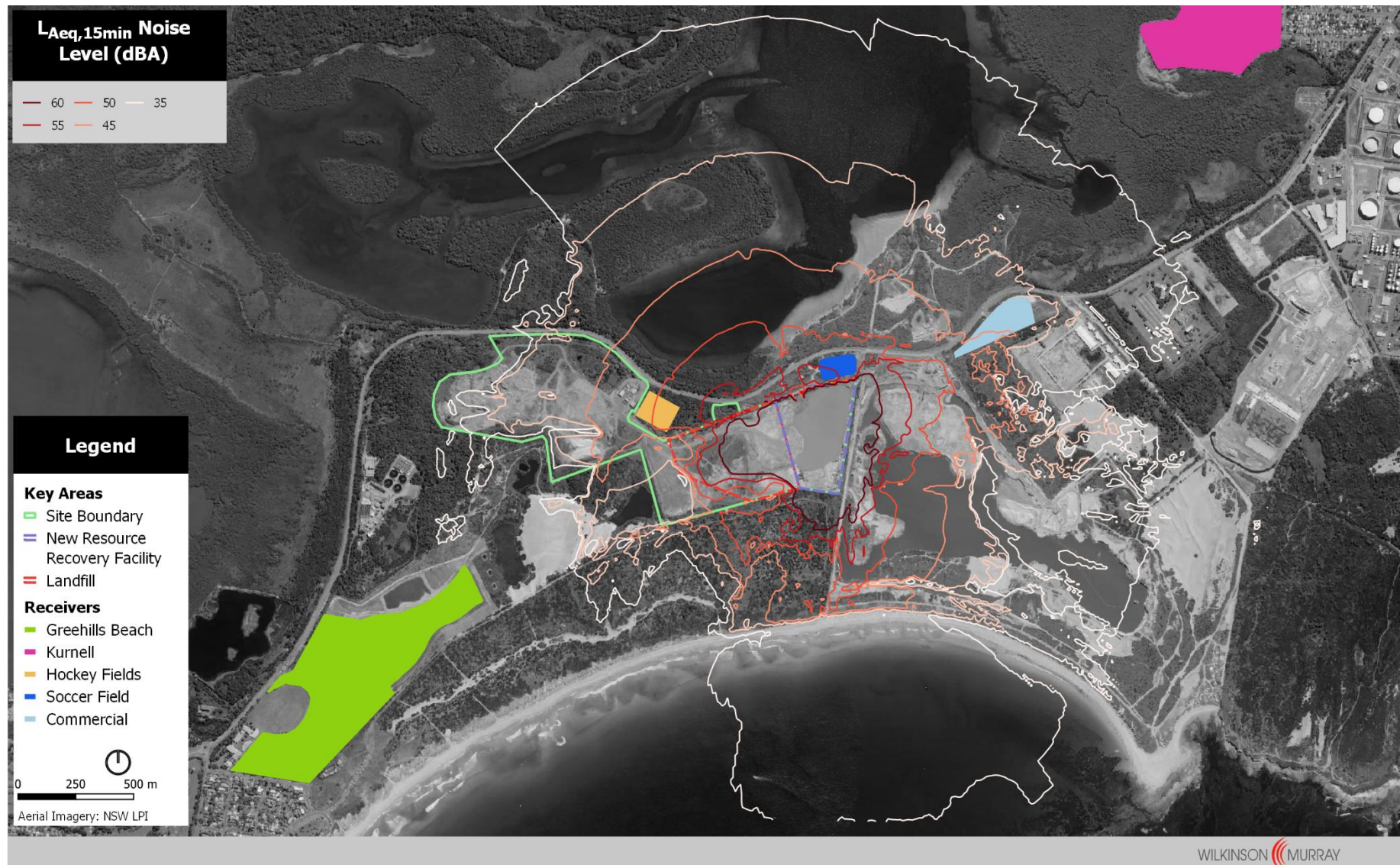


Figure 4-2 Operational Noise Contour Plot, Noise Enhancing Meteorology



4.6 Predicted L_{Amax} Operational Noise Levels

Pneumatic parking brakes on trucks are considered the most likely potential source of maximum noise levels during night time operations. Based on measurements previously conducted by Wilkinson Murray, the L_{Amax} sound power level of pneumatic parking brakes is typically up to 122 dBA.

The predicted L_{Amax} noise levels at residential receivers due to the operation of truck parking brakes on the site are presented in Table 4-9.

Table 4-9 Predicted L_{Amax} Noise Levels

Receiver	Predicted Level		Maximum Noise Trigger Level	Complies?
	Calm ^a	NE ^b		
Greenhills Beach	20	25	52	Yes
Kurnell	<20	<20	52	Yes

a. D-class stability, no wind

b. F-class stability and 2 m/s source to receiver wind.

Table 4-9 indicates that the predicted L_{Amax} operational noise levels comply with the maximum noise trigger level at all receivers. Therefore, no further assessment of potential sleep disturbance impacts is warranted.

4.7 Summary of Operational Noise Impacts

The predicted $L_{Aeq,15min}$ and L_{Amax} noise levels at sensitive receivers associated with the operation of the landfill and New Resource Recovery Facility comply with the established trigger levels. Therefore, in accordance with the NPfI, the operational noise impacts of the Proposal are considered to be acceptable.

5 CONSTRUCTION NOISE ASSESSMENT

The following section presents an assessment of potential noise impacts associated with the construction of the Proposal. Cumulative noise levels associated with the combined operation of the Proposal and the construction of the Embellished Marang Parklands are also presented.

5.1 Construction Noise Management Levels

The *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) recommends noise management levels (NML) to reduce the likelihood of noise impacts arising from construction activities. The ICNG NML for residential receivers are shown in Table 5-1.

Table 5-1 Construction NMLs at Residences

Time of Day	Management Level $L_{Aeq,15min}$ (dBA)	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 + 10dBA	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 75dBA	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 + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. 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 5dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2.

Subject to approval, the construction hours are expected to be in accordance with the ICNG, with construction between 7.00am to 6.00pm on weekdays and 8.00am to 1.00pm on Saturdays and no work on Sundays or public holidays.

Based on the established RBLs, construction noise management levels for receivers near the Proposal site are presented in Table 5-2.

Table 5-2 Project-specific construction NML

Receiver	Acceptable $L_{Aeq,15min}$ Noise Level (Standard daytime construction hours)	Highly Affected Noise Level (dBA)
All residences	45	75
Sporting fields	65	75
Commercial	70	75

5.2 Construction Noise Modelling Methodology

Site-related noise emissions were modelled with the "CadnaA" noise prediction software using the CONCAWE noise prediction algorithms. Factors that are addressed in the noise model are:

- Equipment noise level emissions and locations;
- Shielding from ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and,
- Atmospheric absorption.

Noise predictions have been made based on the likely worst-case impacts taking into consideration the anticipated construction scenarios. This has been made based on Wilkinson Murray's previous experience with similar scale construction projects. As a worst-case scenario, this assumes that most of the relevant plant would be operating during most of the 15-minute assessment period.

5.3 Assessment of Construction of New Resource Recovery Facility

5.3.1 Construction Plant, Activities and Sound Power Levels – New Resource Recovery Facility

The main activities and noisiest plant items to be used for construction of the New Resource Recovery Facility are listed in Table 5-3. The table also provides typical sound power levels of the equipment, based on measurements previously conducted by Wilkinson Murray, and the resultant total sound power for each construction activity.

Table 5-3 Sound Power Levels for Construction Plant – New Resource Recovery Facility

Construction Activity	Plant	Individual Sound Power Level (dBA)	Activity Sound Power Level (dBA)
Clearing and Earthworks	Dozer	116	118
	Roller	109	
	Backhoe	105	
	Excavator	110	
	Generator	95	
	Trucks	105	
	Water cart	105	
Construction of Buildings	Compressor	100	119
	Generator	95	
	Concrete pump	103	
	Agitators	105	
	Concrete saw	118	
	Mobile crane	110	
	Forklift	100	
	Trucks	105	
	Welder	90	

The activity sound power is considered to represent the typical worst-case level in a given 15-minute period. It is important to note that this sound power level is unlikely to be sustained at such a level for the duration of the activity. As a result, many 15-minute periods will be at lower levels.

5.3.2 Predicted Construction Noise Levels – New Resource Recovery Facility

The predicted $L_{Aeq,15min}$ noise levels at sensitive receivers associated with the construction of the New Resource Recovery Facility are presented in Table 5-4.

Table 5-4 Predicted $L_{Aeq,15min}$ Construction Noise Levels – New Resource Recovery Facility

Receiver	Predicted noise level		NML	Highly affected level	Exceedance
	Earthworks	Buildings			
Greenhills Beach	<20	<20	45	75	-
Kurnell	24	25	45		-
Soccer Field	61	62	65		-
Hockey Fields	30	31	65		-
Commercial	42	43	70		-

The results in Table 5-4 indicate that predicted noise levels associated with the construction of the New Resource Recovery Facility comply with the NML at residential receivers. No exceedances of the highly affected level are predicted at any receivers.

5.4 Assessment of Construction of Parklands

The noisiest plant items to be used for construction of the Embellished Marang Parklands are listed in Table 5-5. The table also provides typical sound power levels of the equipment, based on measurements previously conducted by Wilkinson Murray, and the resultant total sound power for each construction activity.

Table 5-5 Sound Power Levels for Construction Plant – Embellished Marang Parklands

Plant	Qty	Individual Sound Power Level (dBA)	Activity Sound Power Level (dBA)
20t excavator	2	108	121
35t excavator	2	110	
Dump truck	4	107	
Compactor	2	106	
Dozer	1	116	
Roller	1	109	
Water cart	2	107	

The activity sound power is considered to represent the typical worst-case level in a given 15-minute period. It is important to note that this sound power level is unlikely to be sustained at such a level for the duration of the activity. As a result, many 15-minute periods will be at lower levels.

The construction of the Embellished Marang Parklands will utilise machinery from elsewhere on the site and would not result in a significant increase in the total number of plant items on the entire site. This will assist in reducing noise impacts.

5.4.1 Predicted Construction Noise Levels – Embellished Marang Parklands

The predicted $L_{Aeq,15min}$ noise levels at sensitive receivers associated with the construction of the Embellished Marang Parklands are presented in Table 5-6.

Table 5-6 Predicted $L_{Aeq,15min}$ Construction Noise Levels – Embellished Marang Parklands

Receiver	Predicted noise level	NML	Highly affected level	Exceedance
Greenhills Beach	39	45	75	-
Kurnell	23	45		-
Soccer Field	47	n/a		-
Hockey Fields	60	n/a		-
Commercial	30	n/a		-

The results in Table 5-6 indicate that predicted noise levels associated with the construction of the Embellished Marang Parklands comply with the NML at residential receivers. No exceedances of the highly affected level are predicted at any receivers.

5.5 Cumulative Noise Levels

The predicted cumulative $L_{Aeq,15min}$ noise levels associated with concurrent operation of the New Resource Recovery Facility and the landfill and the construction of the Embellished Marang Parklands are presented in Table 5-7.

Table 5-7 Predicted Cumulative $L_{Aeq,15min}$ Noise Levels

Receiver	Predicted noise level
Greenhills Beach	39
Kurnell	28
Soccer Field	55
Hockey Fields	60
Commercial	44

5.6 Summary of Construction Noise Impacts

The predicted $L_{Aeq,15min}$ noise levels at sensitive receivers associated with the construction of the Proposal (including both the New Resource Recovery Facility and the Embellished Marang Parklands) comply with the established noise management levels. Therefore, in accordance with the ICNG, the construction noise impacts of the Proposal are considered to be acceptable.

6 VIBRATION ASSESSMENT

The following section presents an assessment of potential vibration impacts associated with the Proposal. Vibratory rollers, which may be used during the construction of the Proposal would be the most likely potential source of potential vibration impacts associated with the Proposal.

6.1 Vibration Criteria

When assessing vibration there are two components that require consideration:

- Human exposure to vibration; and
- The potential for building damage from vibration.

Construction work is generally considered an intermittent source of vibration.

6.1.1 Human Exposure to Vibration

The DECCW's *Assessing Vibration: A Technical Guideline* provides guidance for assessing human exposure to vibration. The publication is based on British Standard BS6472:1992. Intermittent vibration is best assessed by the Vibration Dose Value (VDV) which is based on the *weighted* root mean quartic (rmq) acceleration. However, for simplicity of assessment and monitoring, a peak particle velocity (PPV) goal is preferred.

Table 6-1 sets out PPV values for continuous and impulsive vibration as specified by *Assessing Vibration: A Technical Guideline*. The impulsive vibration goals are shown in brackets.

Table 6-1 Human Comfort Vibration Goals – PPV (mm/s)

Place	Day (7.00am-10.00pm)	
	Preferred	Maximum
Residences	0.28 (8.6)	0.56 (17.0)
Offices	0.56 (18.0)	1.1 (36.0)
Workshops	1.1 (18.0)	2.2 (36.0)

Note: Impulsive goals are shown in brackets – These are most relevant to activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.

6.1.2 Building Damage from Vibration

There are currently no Australian Standards or guidelines to provide guidance on assessing the potential for building damage from vibration. It is common practice to derive goal levels from international standards such as British Standard BS7385:1993

The recommended limits (guide values from BS7385) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented in Table 6-2.

Table 6-2 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	15mm/s at 4 Hz increasing to	20mm/s at 15 Hz increasing to
Residential or light commercial type buildings	20mm/s at 15 Hz	50mm/s at 40 Hz and above

For general construction vibration, the dominant frequency of vibration is typically in the range 31.5 – 100 Hz. Because the dominant frequency of vibration cannot be determined with certainty, conservative goals of 20 mm/s for residential buildings and 50 mm/s for commercial and industrial buildings have been adopted.

6.2 Safe Working Distances

The recommended safe working distances for vibration intensive plant suggested in the Transport Construction Authority's *Construction Noise Strategy* have been adopted in this assessment to evaluate the potential for vibration impacts from the proposed works. Table 6-3 sets out the recommended safe working distances for various vibration intensive plant relevant to the proposed works.

Table 6-3 Recommended Safe Working Distances for Vibration Intensive Plant

Item	Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Vibratory Roller	<50 kN (typically 1-2 tonnes)	5 m	15 m to 20 m
	<100 kN (typically 2-4 tonnes)	6 m	20 m
	<200 kN (typically 4-6 tonnes)	12 m	40 m
	<300 kN (typically 7-13 tonnes)	15 m	100 m
	>300 kN (typically 13-18 tonnes)	20 m	100 m
	>300 kN (>18 tonnes)	25 m	100 m

Source: Construction Noise Strategy, 2012, Transportation Construction Authority

Review of the information in Table 6-3 indicates that the safe working distances for building damage and human comfort applicable to the largest foreseeable vibratory roller are 25 metres and 100 metres, respectively. During the construction of the New Resource Recovery Facility and the Embellished Marang Parklands, vibratory rollers are unlikely to be operated within 25 meters of off-site buildings or within 100 metres of residential receivers. Therefore, vibration impacts during construction are considered unlikely.

7 CONCLUSION

The Proposal involves:

- Construction and operation of a resource management facility;
- Use of suitable material processed by the New Resource Recovery Facility to cap, contour and re-profile areas of the Proposal Site and to construct the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6;
- Re-profiling of parts of the Proposal Site within Lots 1122, 1123 and 6, with some existing waste materials from those lots;
- Delivery of an activated and integrated community space in the form of the Embellished Marang Parklands on Lots 1122, 1123 and Lot 6, to provide a superior parkland to that proposed under the VPA as detailed in Section 4.4.3 of the EIS (referred to as the Embellished Marang Parklands).

Wilkinson Murray has undertaken a noise and vibration impact assessment (NVIA) for the Proposal. The NVIA has been conducted in general accordance with the *Noise Policy for Industry* (NPfI) and the *Interim Construction Noise Guideline* (ICNG).

Unattended noise monitoring was conducted to establish the existing ambient noise levels at the most potentially affected residential receivers. Project noise trigger levels for all nearby potentially affected receivers were established in accordance with the NPfI.

A computer noise model was developed to predict noise levels at the most potentially affected nearby receivers associated with the construction and operation of the Proposal.

The predicted $L_{Aeq,15min}$ and L_{Amax} noise levels at sensitive receivers associated with the operation of the landfill and New Resource Recovery Facility comply with the established trigger levels. Therefore, in accordance with the NPfI, the operational noise impacts of the Proposal are considered to be acceptable.

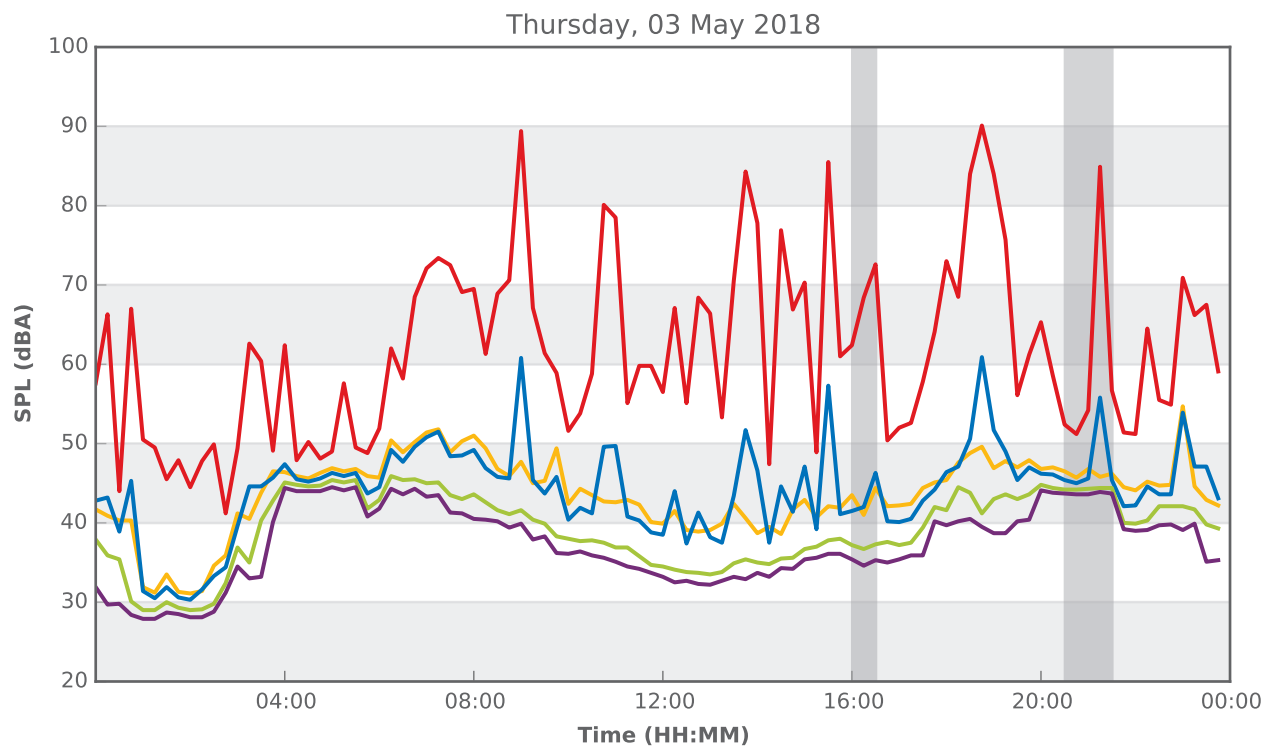
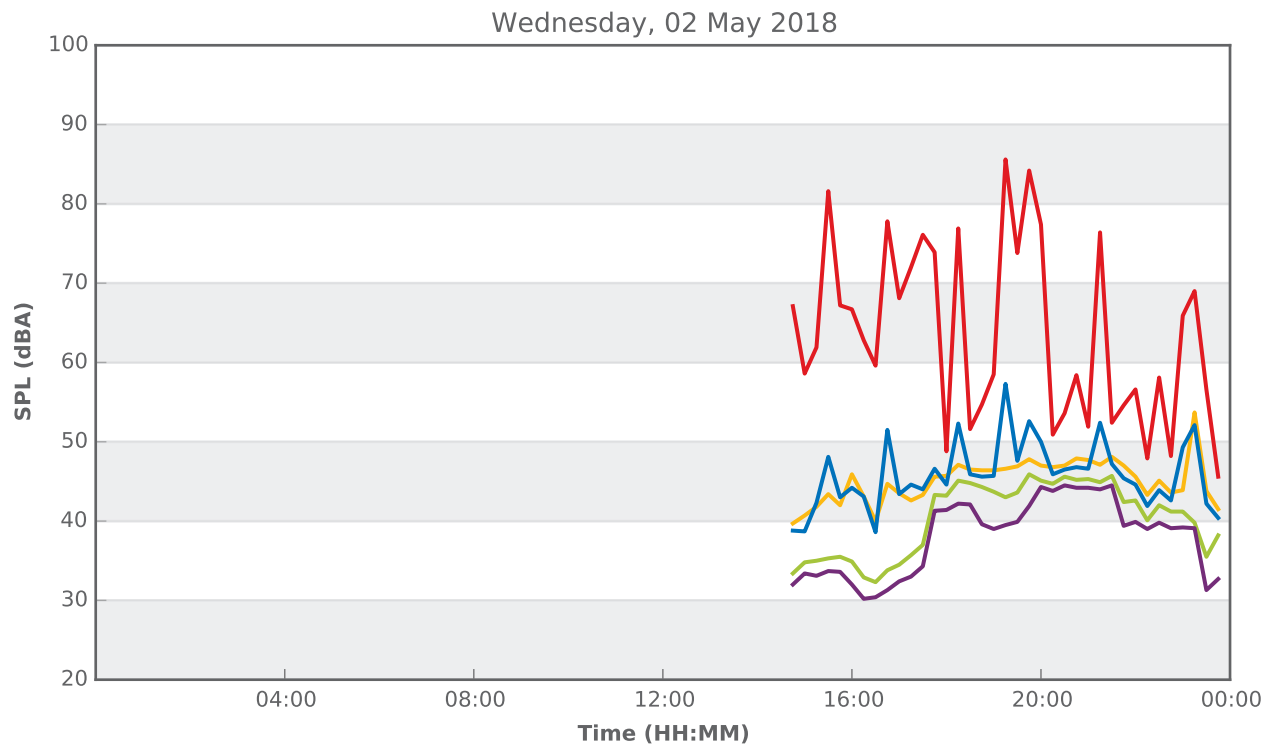
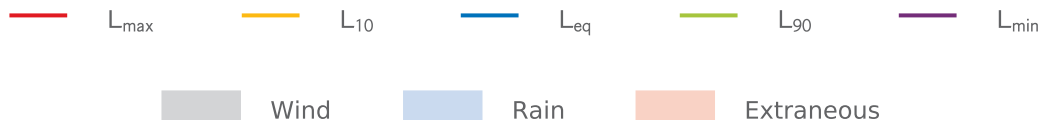
The predicted $L_{Aeq,15min}$ noise levels at sensitive receivers associated with the construction of both the New Resource Recovery Facility and the Embellished Marang Parklands comply with the established noise management levels. Therefore, in accordance with the ICNG, the construction noise impacts of the Proposal are considered to be acceptable.

Vibratory rollers, which could be used during the construction of the New Resource Recovery Facility and/or the Embellished Marang Parklands are the most significant potential source of vibration associated with the Proposal. It is considered unlikely that vibratory rollers would be used within safe working distances of sensitive structures and/or receivers. Therefore, vibration impacts are considered unlikely.

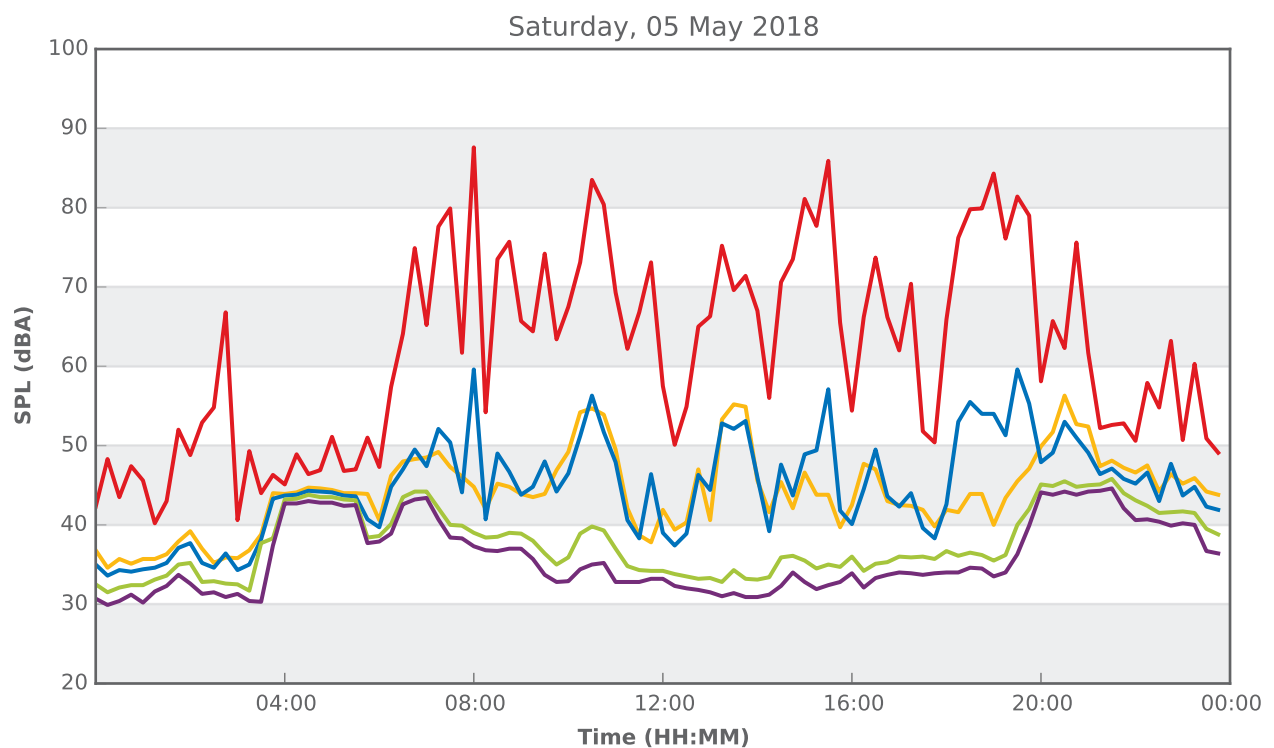
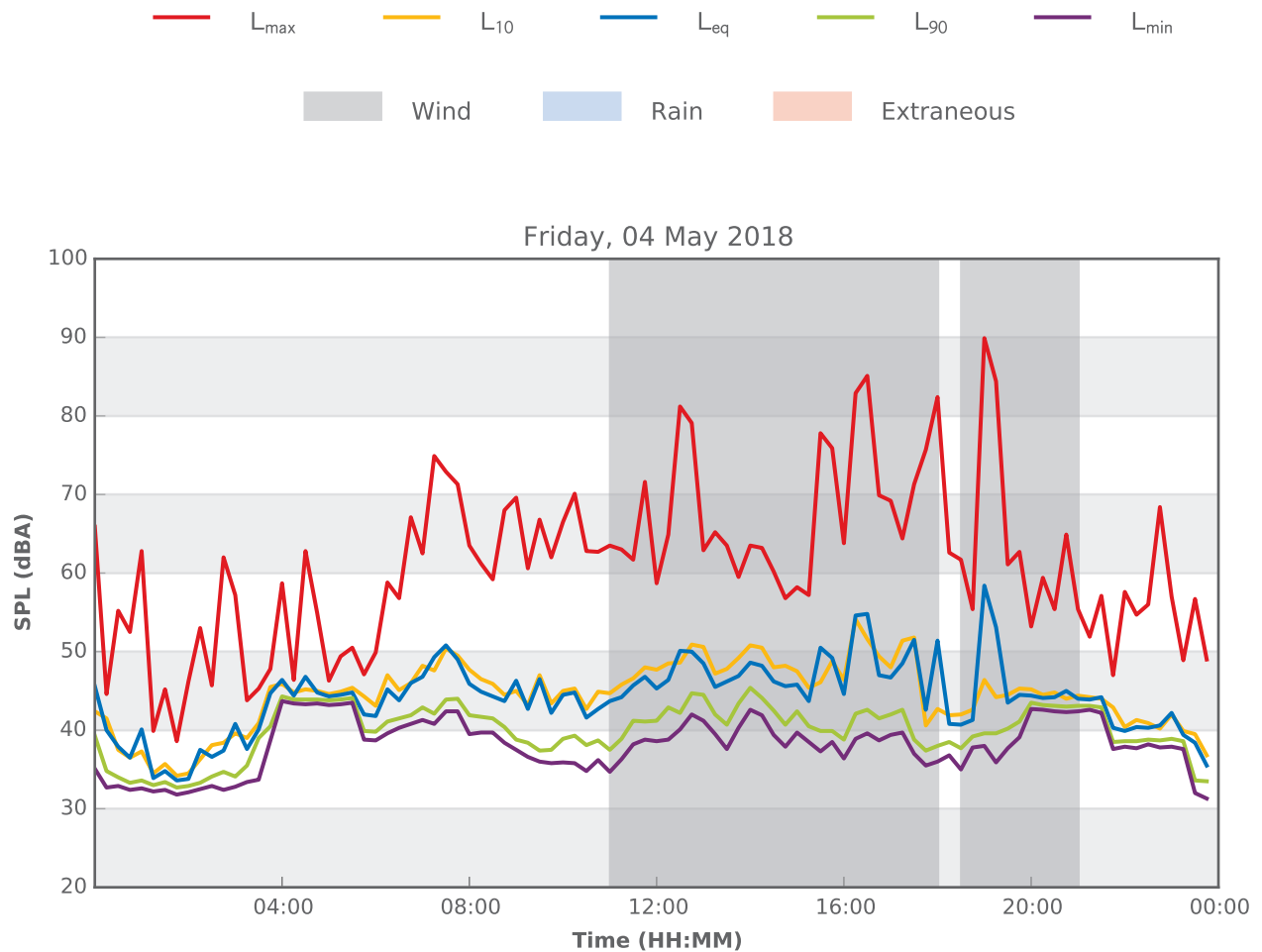
APPENDIX A

NOISE MEASUREMENT RESULTS

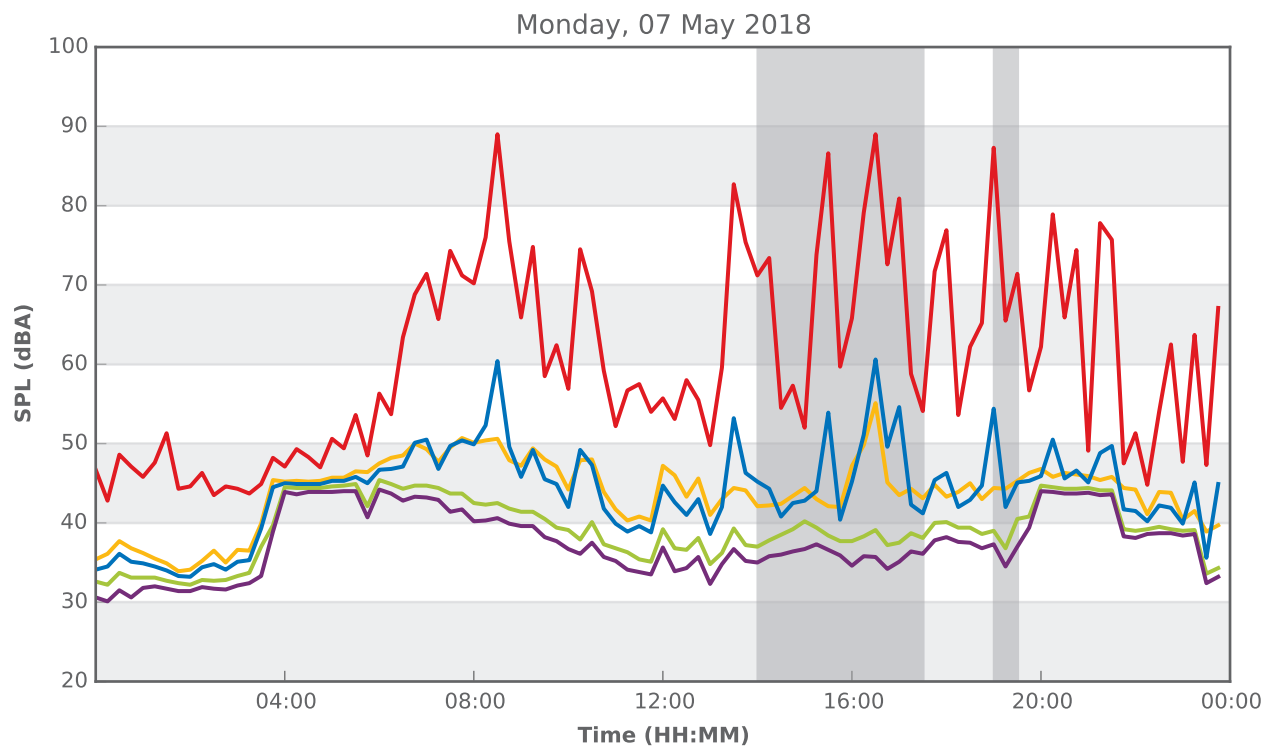
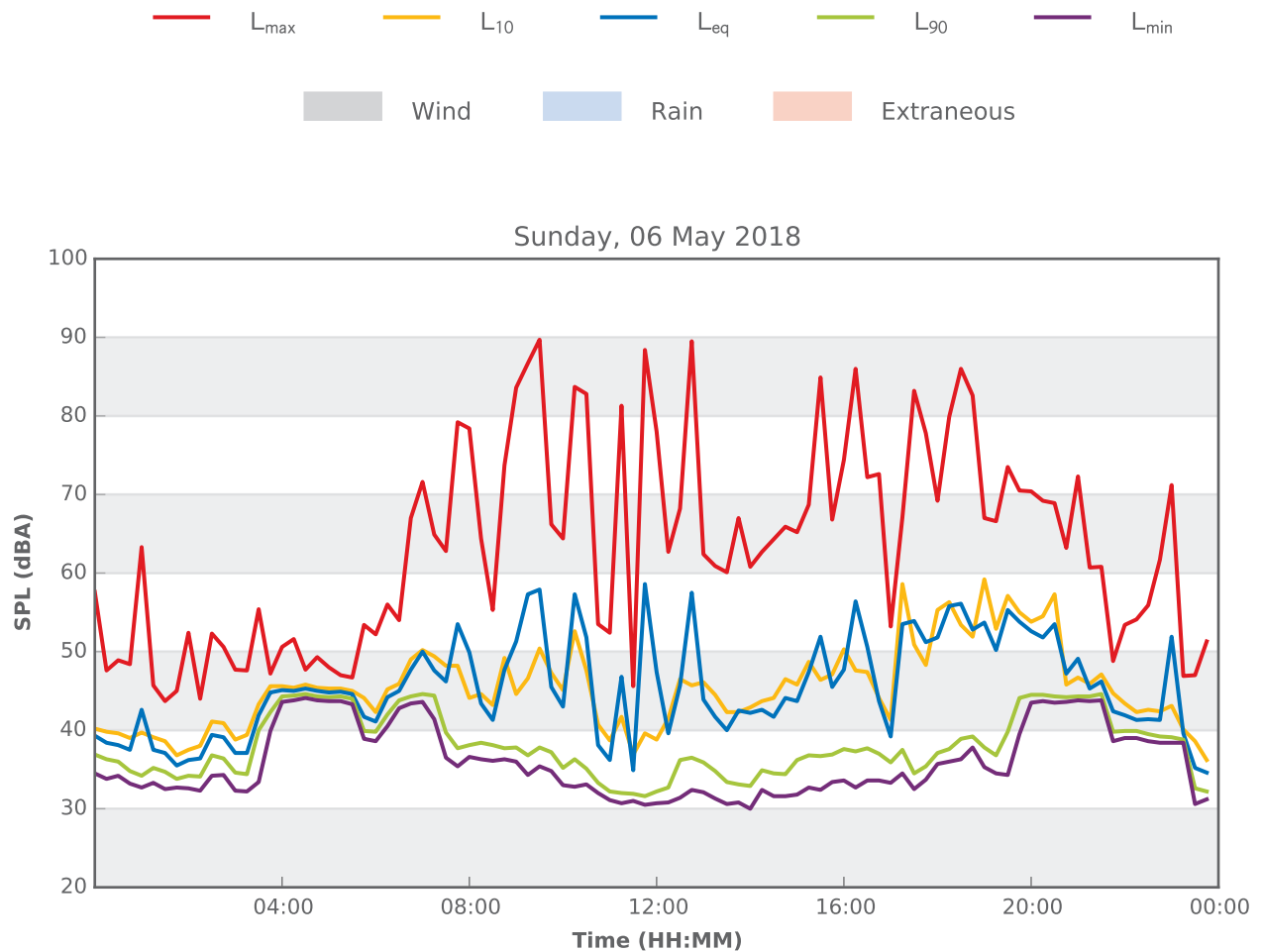
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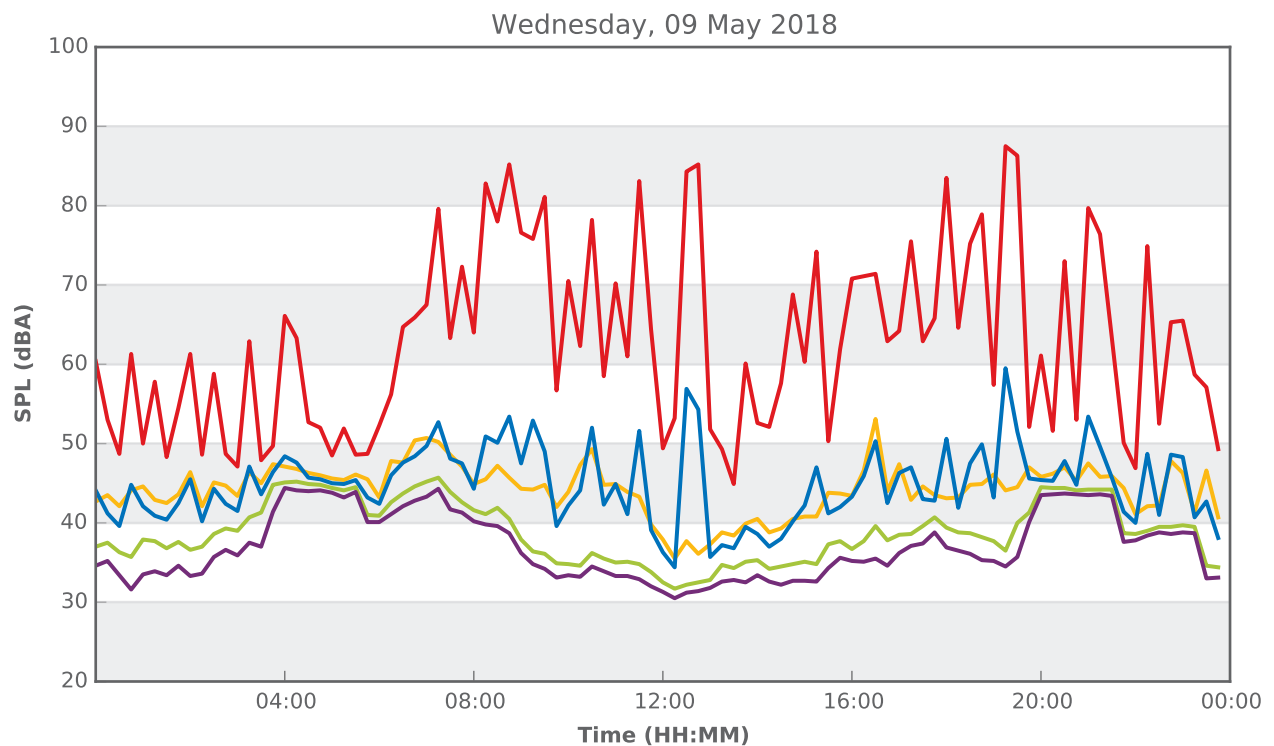
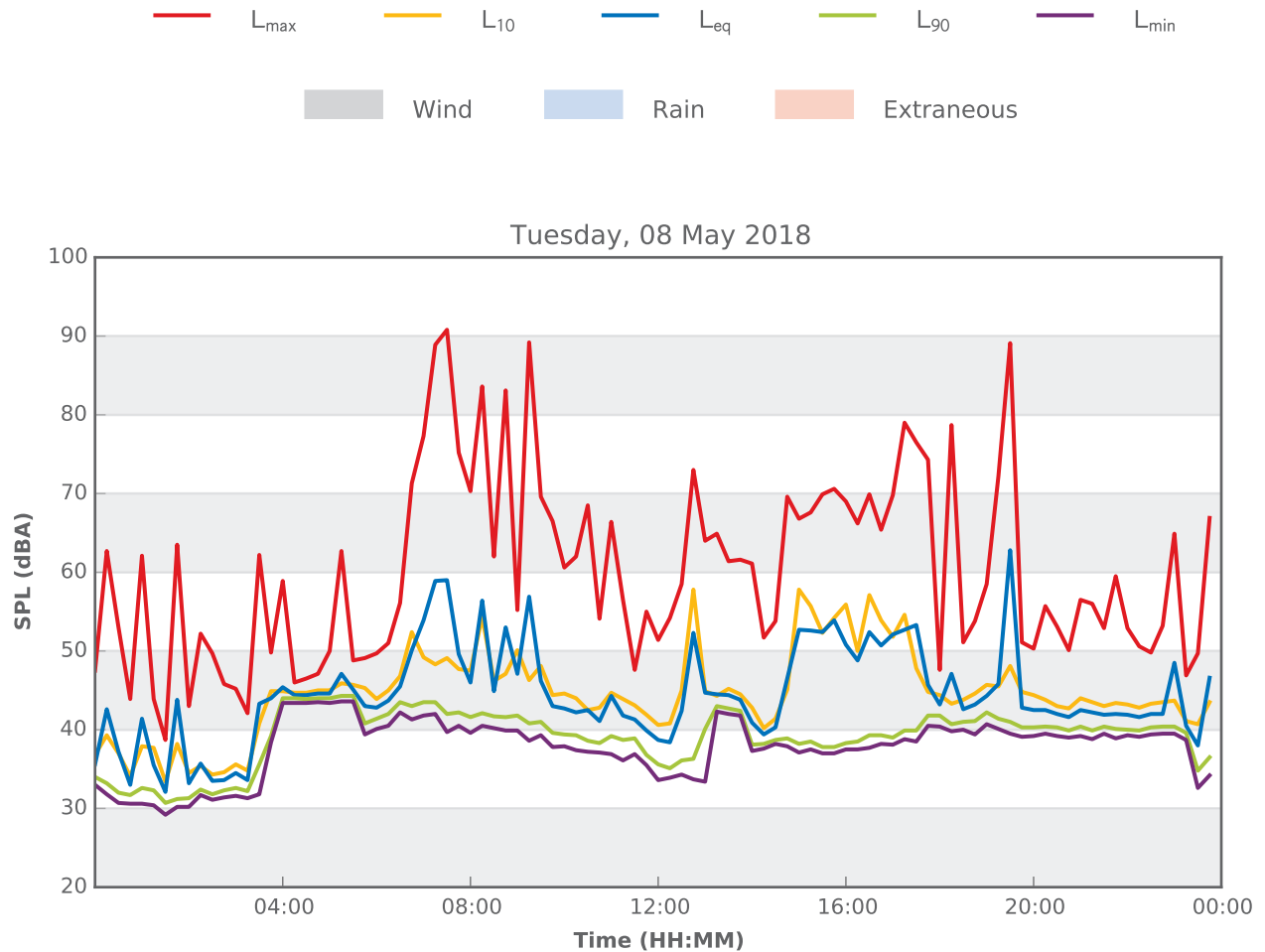
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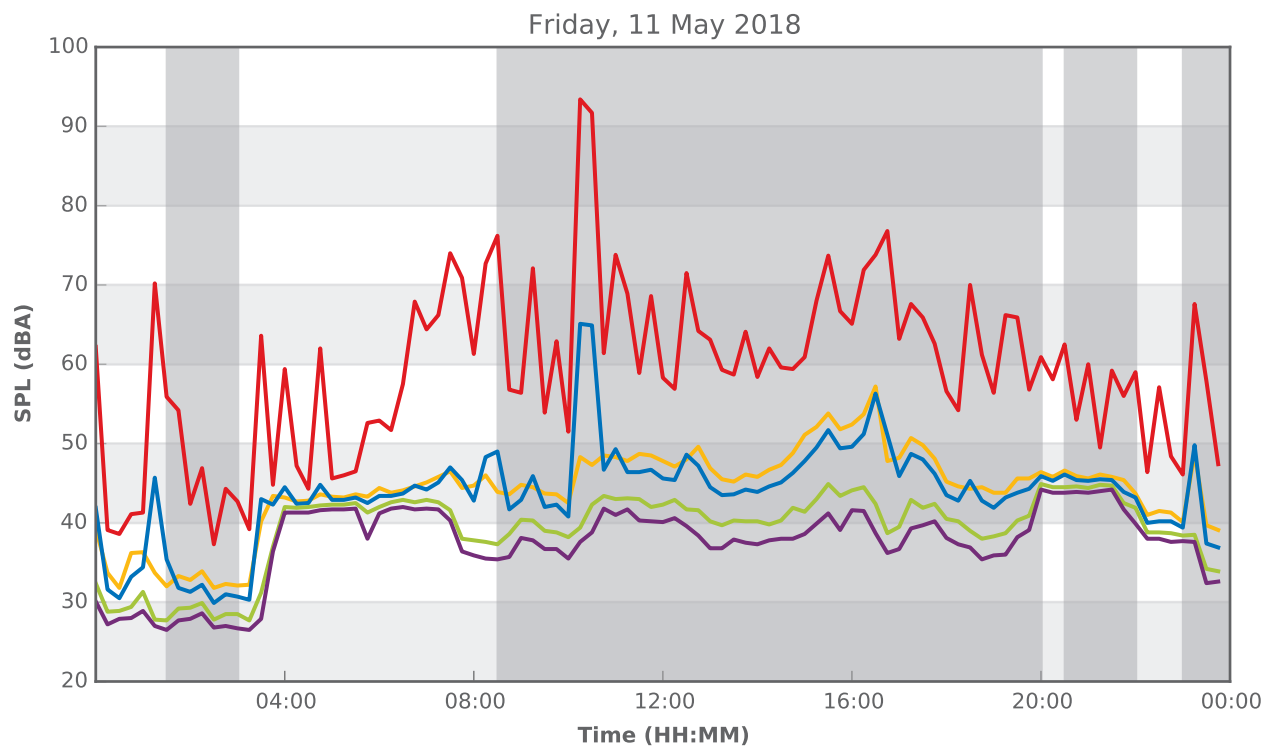
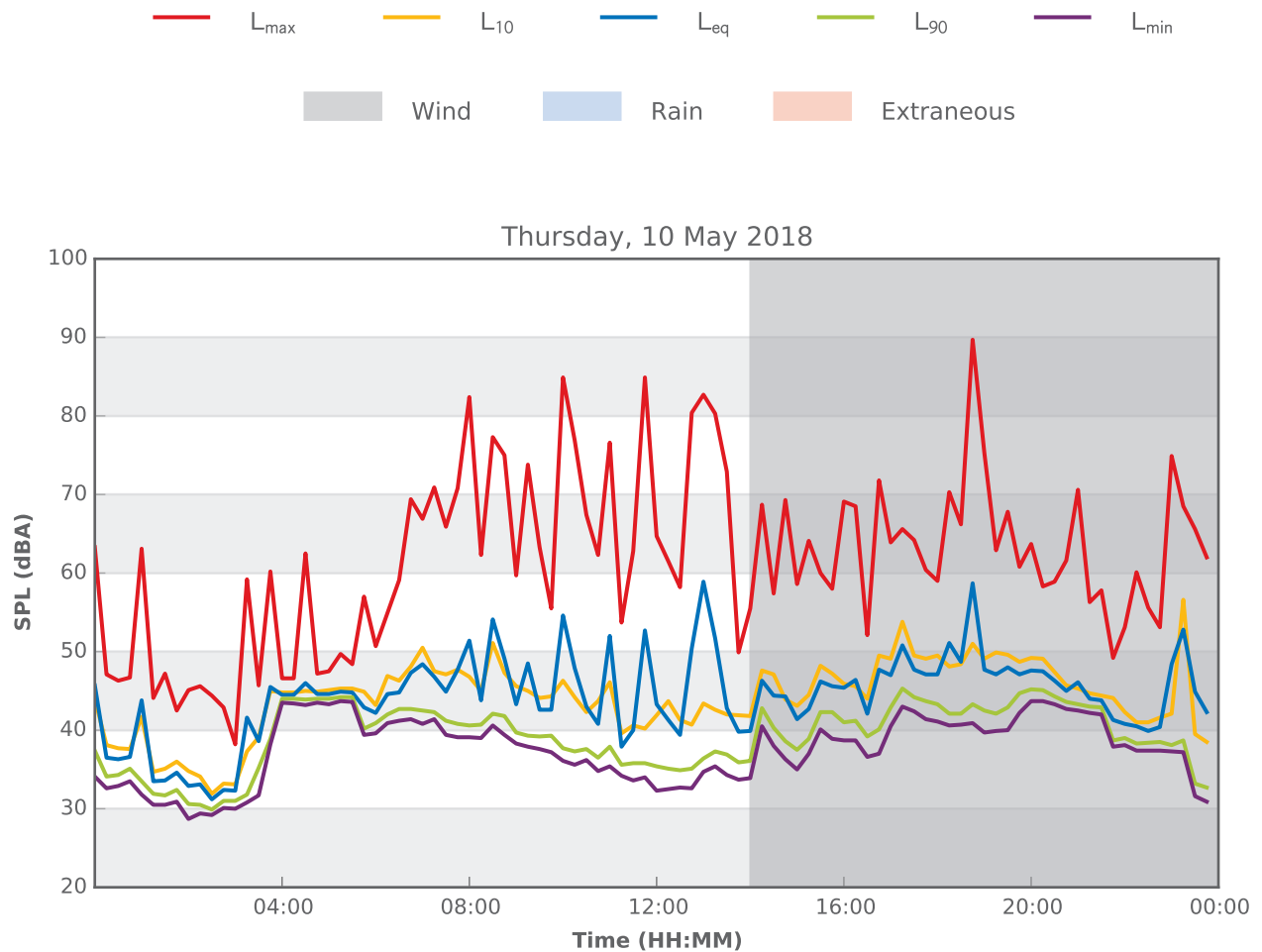
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