ACOUSTICS AND AIR

60 WALLGROVE ROAD

NOISE & VIBRATION ASSESSMENT

REPORT NO. 09064-M2
VERSION B

JULY 2015

PREPARED FOR

MIRVAC PROJECTS PTY LTD
LEVEL 26, 60 MARGARET STREET
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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Final	5 May 2015	Felipe Torres	Ben Lawrence
B	Final	3 July 2015	Felipe Torres	Ben Lawrence

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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.

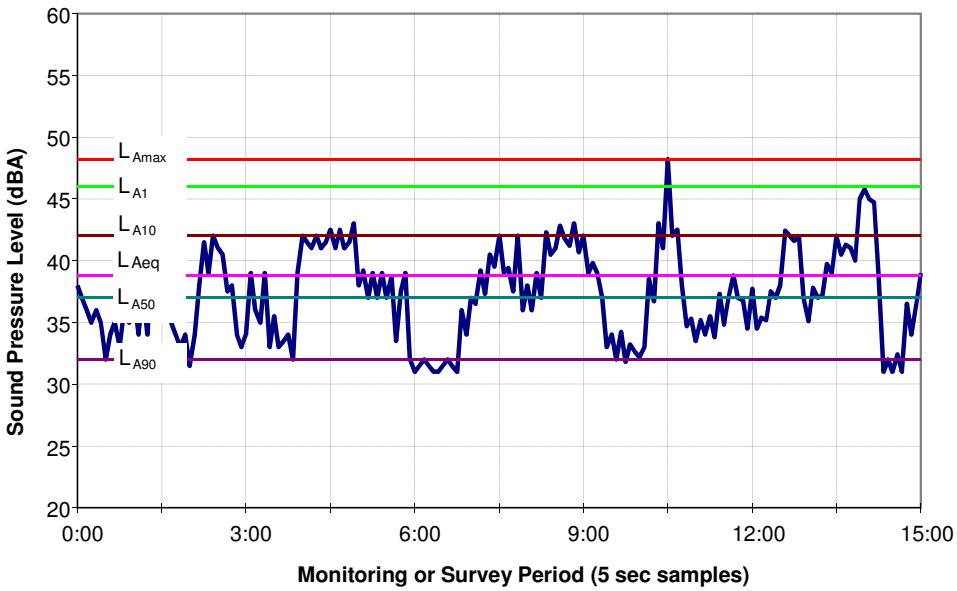
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

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 Mirvac to undertake a noise impact assessment for a proposed warehouse and distribution centre located at 60 Wallgrove Road, Eastern Creek. In particular, this report details the findings of construction and operational noise impacts from the proposed development.

Concept Plan Approval (CPA) MP 09_0099 was granted by a delegate of the (then) Minister for Planning on 29 June 2010. Since then, the CPA has been the subject of three (3) modifications.

The proposed development requires a modification of the approved Concept Plan to reflect the altered site layout. As such, Secretary's Environmental Assessment Requirements are also sought for the preparation of an environmental assessment to support a modification of the Concept Plan Approval under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).This report supports the aforementioned modification.

A previous "Revised Concept Acoustic Assessment" was carried out by Wilkinson Murray in September 2014 (ref 09064-M Version C). In addition, Mirvac commissioned JBA in March 2015 to carry out a "Preliminary Environmental Assessment Report" for the proposed modifications of the approved operations (JBA ref: 14046). Relevant information contained within Reports 09064-M Version C and 14046 have been utilised in the current noise survey.

As the distance of the closest receivers being 300 metres away from the subject site, vibration is not anticipated to be an issue and has not been considered in the assessment.

1.1 Scope of Works

This noise impact assessment has been limited to the following scope of works:

- Both long-term unattended and short-term attended noise monitoring at two surrounding residential locations surrounding the subject site;
- Establish construction noise management levels (NML's) in accordance with the *NSW Interim Construction Noise Guideline* (ICNG);
- Re-establish amenity and intrusive noise goals in accordance with the *NSW Industrial Noise Policy* (INP);
- Determination of all potential noise sources associated with the construction and operations at the subject site;
- Collection of required noise samples;
- Prediction of potential construction and operational noise impacts at the nearby noise sensitive receivers;
- Assessment of potential noise impacts against relevant legislation and guidelines;
- Prepare construction noise management recommendations where necessary;
- Investigate ameliorative measures/control solutions where necessary; and
- The compilation of this report containing concise statements of potential noise impact.

2 SITE DESCRIPTION & OPERATION

The site known as Calibre Industrial Estate, formally the Minchinbury Employment Park is located at 60 Wallgrove Road, Eastern Creek within the Blacktown City Council Local Government Area. The area is classified as "Light Industrial" in accordance with the NSW planning Viewer Land Zoning and is located in the Western Sydney Employment Area (WSEA) on approximately 22ha of land at the intersection of the M4 and M7 Motorways.

The Site is adjacent to:

- The Pinegrove Memorial Park Lawn Cemetery to the north and east, which adjoins low density residential development on Eskdale Street. The cemetery is approximately 270 metres from the northern boundary of the site;
- The M4 Motorway and Minchinbury Reservoir to the south; and
- Wallgrove Road and the M7 Motorway to the west. Rural residential dwellings on Pikes Lane are located west of the M7, approximately 310 metres to the west of the site.

Figure 2-1 shows the indicative site layout.

Figure 2-1 Development Site

The primary modifications of the approved development are:

- Demotion of all existing structures on the site;
- Clearance of all vegetation on the site;
- Bulk earthworks across the site;
- Construction of multiple warehouse structures and distribution related facilities across the site;
- Construction of reticulated site services and site infrastructure, including on-site storm water detention structures;
- Construction of the internal access road that will be capable of accommodating both heavy and light vehicles;
- Construction of lead-in services including electricity, sewer and potable water; and
- Construction of a new traffic signalised intersection at Wallgrove Road to provide entry into the site.

Existing Concept Plan Approval has been granted for the following construction hours:

Monday to Friday: 7am to 6pm

Saturday: 7am to 1pm

Sunday and Public Holidays: No work

Dominant noise sources located on site during the operational stage are expected to include:

- Fixed mechanical plant and equipment;
- Truck deliveries and movements; and
- Loading dock activities.

The site's main entry point will be from Wallgrove Road. The revised concept plan comprises five (5) large warehouses. It is envisaged that the site will be used by office, industrial and warehouse facilities, where operations will be predominately during the day; however, some facilities may continue to operate during the night. The Concept Plan Approval permits operating hours will be 24 hours 7 days per week.

Mechanical plant is likely to operate continuously throughout the daytime and some plant may also operate at night time.

3 SURROUNDING RECEIVERS

The potentially most affected receptor areas with respect to noise have been identified as:

- **R1**: Suburban residences to the north are located in Eskdale Street at distance of approximately 270 metres from the northern boundary of the development.
- **R2**: Suburban residences to the east across the Westlink M7 on Pikes Lane at a distance in the order of 310 metres from the eastern boundary of the site. It is understood that these residences are to be resumed in the future as part of the Western Sydney parkland, however these residences have been included for assessment purposes.
- **R3**: Passive recreation area directly adjacent to the site in the northern and western directions. The Pinegrove Memorial Park Lawn Cemetery is located in this area.
- **R4**: Industrial receptors located at approximately 270 metres from the southern boundary of the site. Given the close distance between these receptors and Westlink M7 and M4 Western Motorway, the potential for noise impacts is unlikely. However, the noise impacts were evaluated with due diligence.

These receptors were selected based on their proximity and directional bearing from the subject site. Figure 3-1 shows the location of the closest residential receptors relative to the site.

Figure 3-1 Surrounding Noise Sensitive Receptors

4 AMBIENT NOISE MONITORING

4.1 Noise Monitoring Locations

Unattended ambient noise level measurements were conducted at two residential locations between Tuesday, 5 and Thursday, 14 May 2015. Additional detailed attended short-term noise monitoring was undertaken at these locations during placement and retrieval of the noise loggers. The resultant data is considered representative of the background and equivalent sound pressure levels for the area, and is therefore suitable for use in this noise impact assessment. A brief description of the noise monitoring locations is described below whilst the location can be identified in Figure 4-1.

- **M1**: logger placed at front yard of residence located at 145 Eskadale Street, Eastern Creek; and
- **M2**: logger placed at front yard of residence located at 55 Pikes Lane, Eastern Creek.

Figure 4-1 Monitoring Locations

As specified in the *INP*, measured noise data obtained from the above monitored locations can be considered representative of the various potentially affected areas surrounding the subject site. The residential locations associated with the noise logger location are as follows:

- **M1**: associated with R1; and
- **M2**: associated with R2.

4.2 Equipment and Methodology

The noise monitoring equipment used consists of a Bruel & Kjaer 2236 Sound Level Meter (attended noise monitoring) and two (2) ARL EL-215 Environmental Noise Loggers (unattended noise monitoring). These were set to A-weighted, fast response, continuously monitoring over 15-minute sampling periods. The environmental noise loggers are 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.

The equipment has been calibrated at a NATA approved laboratory within the last two years in accordance with Australian standards and Wilkinson Murray's internal QS procedures. Current certificates for all devices have been issued.

Noise loggers determine a variety of descriptors such as L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. The L_{A90} level is normally taken as the background noise level during the relevant period and is most appropriate for this project as it is used to develop the Rating Background Levels (RBL's). Detailed results from noise monitoring are shown in graphical form in Appendix A. The graphs show measured values of L_{Aeq}, L_{A90}, L_{A10} and L_{A1} for each 15-minute monitoring period.

In assessing the background noise levels, any data affected by adverse weather conditions has been discarded according to the requirements of the *INP*. The weather data was sourced from the Bureau of Meteorology from the Automatic Weather Station (AWS) located at Penrith Lakes (ID 067113).

4.3 Unattended Noise Measurements

Table 4-1 summarises the L_{A90} and L_{Aeq} noise results, for daytime, evening and night time periods as defined in the *INP*. The summary values are:

- RBL – Rating Background Level is a measure of typical background noise levels which are used in determining noise criteria; and
- $L_{Aeq,period}$ – the overall L_{Aeq} noise level measured over the assessment period.

Table 4-1 Summary of Unattended Noise Measurements – dBA

Monitoring Location	RBL			$L_{Aeq,period}$		
	Daytime 7am-6pm	Evening 6-10pm	Night Time 10pm-7am	Daytime 7am-6pm	Evening 6-10pm	Night Time 10pm-7am
M1 – Eskdale Street	49	52	47	60	60	55
M2 – Pikes Lane	52	52	47	60	57	56

The RBL at location M1 was measured and found to be greater for the evening time period in comparison with the measured noise levels during the daytime period. Pursuant to the *INP*, which recommends that the intrusive noise level for the evening time period should not be greater

than the intrusive noise level for the day time period, the background noise levels measured during the evening have been set to equal the background noise levels measured during the day.

4.4 Attended Noise Measurements

Table 4-2 summarized the primary noise descriptors recorded during the attended noise monitoring.

Table 4-2 Summary of Attended Noise Measurements – dBA

Monitoring Location	Time	L_{A90}	L_{Aeq}	L_{A10}	Comments
M1	Day 10.20 to 10.35am	51	54	56	Background noise levels influenced by traffic.
M2	Day 11.10 to 11.25am	52	56	58	Background noise levels influenced by traffic.
M1	Night 00.05 to 00.20am	54	56	57	Traffic clearly audible, primary noise contributor
M2	Night 11.30 to 11.45pm	52	55	57	Traffic clearly audible, primary noise contributor

Traffic was found to be the primary noise contributor at both locations and no existing industrial noise was audible.

5 NOISE CRITERIA

5.1 *Interim Construction Noise Guideline* (ICNG)

The *NSW EPA Interim Construction Noise Guideline* (ICNG) presents the process to assess construction in NSW. 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 $L_{Aeq,15min}$ noise levels should not exceed the background noise by more that 10dBA. The standard hours are: Monday to Friday 7.00am-6.00pm and Saturday 8.00am-1.00pm. Table 5-1 details the *ICNG* noise goals.

Table 5-1 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 + 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 meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 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 relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

The *ICNG* presents the following noise management levels for non-residential premises:

- Active recreation areas (such as parks) external $L_{Aeq,15min}$ 65dBA
- Passive Recreation areas external $L_{Aeq,15min}$ 60dBA
- Industrial premises external $L_{Aeq,15min}$ 75dBA
- Offices, retail outlets external $L_{Aeq,15min}$ 70dBA

- Classrooms, hospitals, places of worships external $L_{Aeq,15min}$ 45dBA

5.2 Construction Site-Specific Noise Criteria

Table 5-2 presents the relevant construction noise criteria for this project during standard recommended hours.

Table 5-2 Summary of Construction Noise Criteria – dBA

Receptor	Management Level $L_{eq,15minute}$
R1	59
R2	62
R3	60
R4	75

5.3 *Industrial Noise Policy* (INP)

The *NSW Industrial Noise Policy* (INP) recommends two noise criteria, "Intrusiveness" and "Amenity", both of which are relevant for the assessment of noise at residences. In most situations for continuous noise, one of these is more stringent than the other and is the controlling noise criteria for assessment purposes. The noise criteria are based on the L_{Aeq} descriptor, which is explained in the Glossary of Acoustic Terms.

5.3.1 Intrusiveness Noise Criteria

Intrusiveness criteria applies for residential receivers only.

The intrusiveness criterion requires that the L_{Aeq} noise level from the source being assessed, when measured over 15 minutes, should not exceed the Rating Background Noise Level (RBL) by more than 5dBA. The RBL represents the 'background' noise in the area, and is determined from measurement of L_{A90} noise levels, in the absence of noise from the source. The definition of L_{A90} and the procedure for calculating the RBL is given in Glossary of Acoustic Terms.

5.3.2 Amenity Noise Criteria

The amenity criteria sets a limit on the total noise level from *all industrial noise sources* affecting a receiver. Different criteria apply for different types of receiver (eg. residence, school classroom); different areas (eg. rural, suburban); and different time periods, namely daytime (7.00am-6.00pm), evening (6.00pm-10.00pm) and night time (10.00pm-7.00am).

The noise level to be compared with this criterion is the L_{Aeq} noise level, measured over the time period in question, due to all industrial noise sources, but excluding non-industrial sources, such as transportation.

Where a new noise source is proposed in an area with negligible existing industrial noise, the amenity criterion for that source may be taken as being equal to the overall amenity criterion.

However, if there is significant existing industrial noise, the criterion for any new source must be set at a lower value. If existing industrial noise already exceeds the relevant amenity criterion, noise from any new source must be set well below the overall criterion to ensure that any increase in noise levels is negligible. Methods for determining a source-specific amenity criterion where there is existing industrial noise are set out in the *INP.*

5.3.3 Sleep Disturbance Noise Criterion

Intermittent noises due to activities such as trucks starting and loading dock activities during the night-time period are not directly addressed by the *INP*.

There is no universally accepted criterion governing the likelihood of sleep disturbance. In other words, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance (for all or even a majority of people). The EPA recommends that, in order to minimise the risk of sleep disturbance from the operations during night-time operation:

- *Sleep disturbance is assessed as the emergence of the $L_{A1(1\ minute)}$ level above the $L_{A90(15\ minute)}$ level at the time. Appropriate screening criteria for sleep disturbance are determined to be an $L_{A1(1\ minute)}$ level 15 dBA above the Rating Background Level (RBL) for the night-time period*.

5.4 Operational Site-Specific Noise Criteria

In accordance with Schedule 3 of the Concept Plan Approval (CPA) MP 09_0099 granted on 29 June 2010, the site must be incompliance with approved noise criteria for the day and night time periods based on unattended long-term noise monitoring undertaken in April 2009. As the current noise environment at surrounding residences is likely to have changed over the last 6 years, the intrusiveness and amenity criteria have been re-established based on noise monitoring carried out in May 2015. The calculated intrusiveness and amenity noise criteria are shown in Table 5-3.

Table 5-3 Intrusiveness and Amenity Noise Criteria – dBA

Receptor	Area	Time Period	Intrusiveness Criterion $L_{eq,15min}$	Amenity Criterion $L_{eq,period}$
R1	Urban	Day	54	60
		Evening	54	50
		Night	52	45
R2	Urban	Day	57	60
		Evening	57	50
		Night	52	46*
R3	Passive Recreation	when in use	n/a	50
R4	Industrial	when in use	n/a	70

Note: * Based on areas with high traffic noise levels whereby amenity criteria become existing L_{Aeq} minus 10dB.

The proposed Project Specific Noise Levels (PSNL) applicable to site operations has been based on the most stringent value between the intrusiveness and amenity criteria shown in Table 5-3. The PSNL are shown in Table 5-4 and reflect the current noise environment in the surrounding areas.

Table 5-4 Project Specific Noise Levels – dBA

Receptor	Time Period	PSNL $L_{eq,15min}$	Sleep Disturbance L_{max}
R1	Day	54	n/a
	Evening	50	n/a
	Night	45	62
R2	Day	57	n/a
	Evening	50	n/a
	Night	46	62
R3	when in use	50	n/a
R4	when in use	70	n/a

It should be noted that different time periods apply for the PSNL as the intrusiveness criterion considers a 15 minute assessment period while the amenity criterion requires assessment over the total length of time that a site is operational within each day, evening or night period. In order to ensure compliance under all circumstances, a 15-minute period assessment has been considered for all receivers.

6 PREDICTED CONSTRUCTION NOISE LEVELS & ASSESSMENT

6.1 Noise Model

Noise predictions associated with the likely construction of the proposed facility have been conducted. The noise modelling was used to assess the potential for noise impact at the nearby surrounding receivers.

Site related noise emissions were modeled using the ISO 9613 algorithm implemented in the "Cadna A" acoustic noise prediction software. Factors that are addressed in the noise modeling are:

- Equipment sound level emissions and location;
- Receiver locations;
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

6.2 Noise Sources

Approximate A-weighted octave band centre frequency sound power levels have been in the calculations. Table 6-1 presents a summary of the sound power levels (SWLs) utilised in the noise prediction model for the various items of equipment.

Table 6-1 Summary of SWLs used for Construction Stages – dBA

Equipment	Specifications	Quantity	Sound Power Level *	Sound Pressure Level at 7m *
Demotion of all existing structures on the Site				
Breaker	7.4 t 59kW Mounted on Wheeled Backhoe	1	120	96
Tracked Excavator	44 t 228kW (Breaking and spreading rubble)	2	110	86
Tracked Excavator	44 t 228kW (Loading Dump Truck)	2	113	89
Wheeled Loader	23 t 184kW	2	104	79
Clearing & Stripping				
Scraper	Wheel Tractor Cat 637 336kW	2	119	95
Tracked Excavator	71 t 301kW	4	105	81
Wheeled Loader	23 t 184kW	2	104	79
Tree Mulcher	-	2	115	91
Ground Excavation				
Tracked Excavator	40 t 226kW	3	107	83
Wheeled Loader	23 t 184kW	3	104	79
Dozer	41 t 239kW	3	108	84
Bulk Fill Operations				
Tracked Excavator	40 t 226kW	3	107	83
Grader	Cat 240G	2	111	86
Dozer	20 t 142kW	2	109	84
Hydraulic Vibratory Compactor	225 kg / 193 bar / 17,500 N (Tracked Excavator)	4	106	81
Water Cart	-	2	105	80
Construction of the internal access road (Concrete Works)				
Agitator truck	-	2	108	83
Vibrator	Poker Vibrator	2	107	82
Compaction equipment	60 kg 3kW Vibratory Compacter (Asphalt)	1	111	86
Concrete saw	300mm diameter / 9.2 kg 3kW Hand-held Circular Saw (Petrol)	1	115	90
Compressor	1 t 45kW Compressor for Mini Piling	1	103	79
Generator	-	1	102	77

Note: * represent the SWL of 1 item only

6.3 Noise Model Scenarios

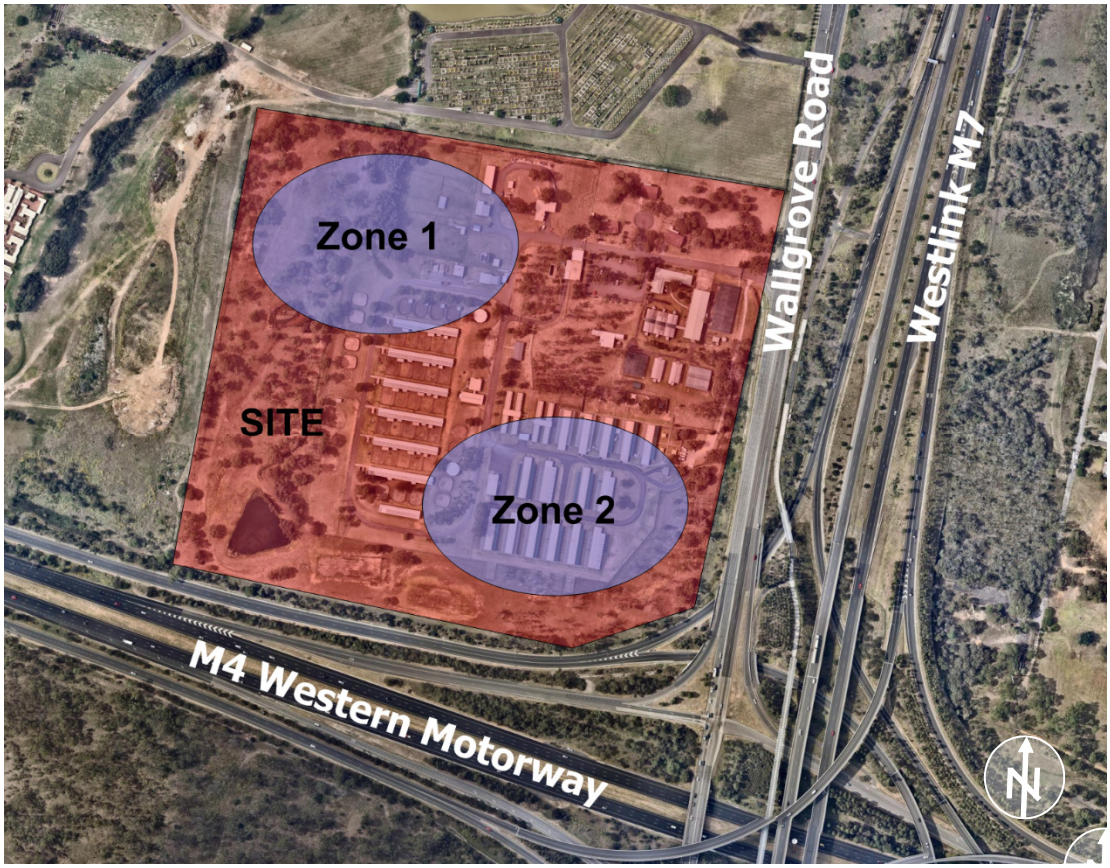
This primary modifications of the approved development consist of 7 stages. These stages have been grouped and classified in 5 construction scenarios as follows:

- Demotion of all existing structures on the site;
- Clearing & Stripping;
- Ground Excavation;
- Bulk Fill Operations; and
- Construction of the internal access road (concrete works).

Due to the large extension of the site, operation could be undertaken at several locations within the site resulting in significant variations of the noise impact generated at the receptors. For this reason, the site has been divided in two main work zones as follows (refer to Figure 6-1):

- Zone 1: north western area of the site; and
- Zone 2: south eastern area of the site.

Figure 6-1 Primary Construction Zones



6.4 Predicted Noise Levels

The modelling assumes a "typical worst-case" scenario whereby all the equipment 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. Table 6-2 presents the predicted noise levels at adjacent residences, cemetery grounds and industrial receptor for all modelled scenarios.

Table 6-2 Predicted Construction Noise Levels - dBA

Receptor	Predicted L_{Aeq} Zone 1	Predicted L_{Aeq} Zone 2	Management Level L_{eq}	Complies? (Zone 1 / Zone 2)
Demotion of all existing structures on the Site				
R1	55	47	59	Yes/Yes
R2	47	51	62	Yes/Yes
R3: East of Oak Side Drive	60	50	60	Yes/Yes
R3: Melville Road	60	52	60	Yes/Yes
R4	48	50	75	Yes/Yes
Clearing & Stripping				
R1	51	44	59	Yes/Yes
R2	43	48	62	Yes/Yes
R3: East of Oak Side Drive	60	47	60	Yes/Yes
R3: Melville Road	57	48	60	Yes/Yes
R4	46	51	75	Yes/Yes
Ground Excavation				
R1	48	42	59	Yes/Yes
R2	40	44	62	Yes/Yes
R3: East of Oak Side Drive	57	45	60	Yes/Yes
R3: Melville Road	54	46	60	Yes/Yes
R4	42	45	75	Yes/Yes
Bulk Fill Operations				
R1	51	44	59	Yes/Yes
R2	43	46	62	Yes/Yes
R3: East of Oak Side Drive	59	48	60	Yes/Yes
R3: Melville Road	58	48	60	Yes/Yes
R4	44	48	75	Yes/Yes
Construction of the internal access road (Concrete Works)				
R1	48	42	59	Yes/Yes
R2	40	44	62	Yes/Yes
R3: East of Oak Side Drive	57	46	60	Yes/Yes
R3: Melville Road	54	47	60	Yes/Yes
R4	42	45	75	Yes/Yes

Predicted construction noise levels at all residential locations surrounding the subject site will readily comply with the noise management levels for the entire proposed construction period. The noise generated at the industrial sites located on the south of the subject site is likely to be inaudible under all scenarios. In addition, the noise generated during construction works will comply at the cemetery under all scenarios

7 PREDICTED OPERATIONAL NOISE LEVELS & ASSESSMENT

7.1 Noise Model

Noise predictions associated with the likely operation of the proposed facility have been conducted. The noise modelling was used to assess the potential for noise impact at the nearby surrounding receivers.

Site related noise emissions were modeled using the ISO 9613 algorithm implemented in the "Cadna A" acoustic noise prediction software. Factors that are addressed in the noise modeling are:

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

Refer to section 6.1.

7.2 Noise Sources

Approximate A-weighted octave band centre frequency sound power levels have been in the calculations. Table 7-1 presents a summary of the sound power levels (SWLs) utilised in the noise prediction model for the various items of plant and mobile equipment.

Table 7-1 Summary of SWLs used for Operational Activities – dBA

Item	Operating Condition	Sound Power Level
Petrol Forklift	Lifting/moving	96
Exhaust Fan	Operating	87
Semi-trailer	Loading/unloading at dock	95
	Driving through yard	104

For the modelling purposes it has been assumed that activities within each lot will be contained within the structure of each building. Typically, such buildings will consist of tilt up slab walls and a metal roof. Therefore, the roof fans and yard activities are likely to be the most acoustically significant sources on site.

7.3 Noise Model Scenarios

Operational site noise will be primarily associated with truck movements and dock activities along with exhaust fans. These may occur on a 24-hour basis. Accordingly assessments of typical operating scenarios have been conducted. The assessment is based on previous assessments of similar facilities.

Noise emanating from the facilities and roof fans was modelled based on site plan drawing no. DA002 dated 14 April 15. The modelled noise levels are considered representative of a busy period which would typically occur during the day, evening and night-time periods.

At night, a reduced number of facilities are likely to operate. The operational scenarios remain unchanged from the approved Concept Plan. Table 7-2 presents the operational scenarios used in the noise modelling.

Table 7-2 Operational Scenarios (15-minute period)

Time Period	Plant / Equipment Type	No. of Items	Description of Modelled Industrial Operations
Daytime 7am-6pm & Evening 6pm-10pm	Semi-trailer at dock	10	Loading / unloading (each truck operating for a period of 15-min)
	Forklift	7	Operating for the entire 15-min period
	Semi-trailer	10	Trucks entering and leaving the site (2-min duration for each truck)
	Fan	37	Located on roofs of buildings
Night Time 10pm-7am	Semi-trailer at dock	6	Loading / unloading (each truck operating for a period of 15-min)
	Forklift	4	Operating for the entire 15-min period
	Semi-trailer	6	Trucks entering and leaving the site (2-min duration for each truck)
	Fan	20	Located on roofs of buildings

7.4 Predicted Noise Levels

7.4.1 Daytime & Evening Operations

Table 7-3 presents the predicted noise levels at adjacent residences, cemetery grounds and industrial receivers for all modelled scenarios. Adverse wind effects of 3m/s (source-to receiver component) have been considered in the calculations.

Table 7-3 Predicted Operational Noise Levels for Daytime and Evening - dBA

Receptor	Predicted L_{Aeq} Neutral Weather Condition	Predicted L_{Aeq} Wind Effects	PSNL Day $L_{eq,15minute}$	PSNL Evening $L_{eq,15minute}$	Complies? (Daytime / Evening)
R1	37	41	54	50	Yes/Yes
R2	38	42	57	50	Yes/Yes
R3: East of Oak Side Drive	44	46	50	50	Yes/Yes
R3: Melville Road	40	43	50	50	Yes/Yes
R4	38	42	70	70	Yes/Yes

A review of the predicted noise levels indicated that resultant noise levels are likely to be below the PSNL at all residences, adjacent cemetery and industrial sites. Similar noise levels were predicted at the residential receivers compared to the predictions carried out in the previous noise assessment ref 09064-M Version C. The predicted noise levels at the cemetery differ to the previous noise levels shown in report ref 09064-M Version C primarily due to the new configuration of the building within the site. However, compliance is readily achieved at all receivers.

Figure 7-1 and Figure 7-2 illustrate the noise propagation for the daytime / evening operations.

7.4.2 Night Time Operations

Table 7-4 presents the predicted noise levels at adjacent residences, cemetery grounds and industrial receiver for all modelled scenarios. In addition, temperature inversion conditions that are likely to occur on winter nights have been modelled.

Table 7-4 Predicted Operational Noise Levels for Night Time - dBA

Receptor	Predicted L_{Aeq} Neutral Weather Condition	Predicted L_{Aeq} Temperature Inversion	PSNL Night $L_{eq,15minute}$	Complies? (Neutral/Adverse)
R1	34	38	45	Yes/Yes
R2	36	40	46	Yes/Yes
R3: East of Oak Side Drive	n/a	n/a	n/a	n/a
R3: Melville Road	n/a	n/a	n/a	n/a
R4	36	41	70	Yes/Yes

A review of the predicted night noise levels indicates that resultant noise levels are likely to be below established PSNL the identified residences and industrial sites. Differences up to 3 dB were predicted at residential receivers when comparing current and previous (ref 09064-M Version C) noise predictions. This has been attributed to the new configuration of the buildings.

Figure 7-3 and Figure 7-3 illustrate the noise propagation for the night operations.

Figure 7-1 Daytime & Evening Noise Levels under Neutral Weather Conditions

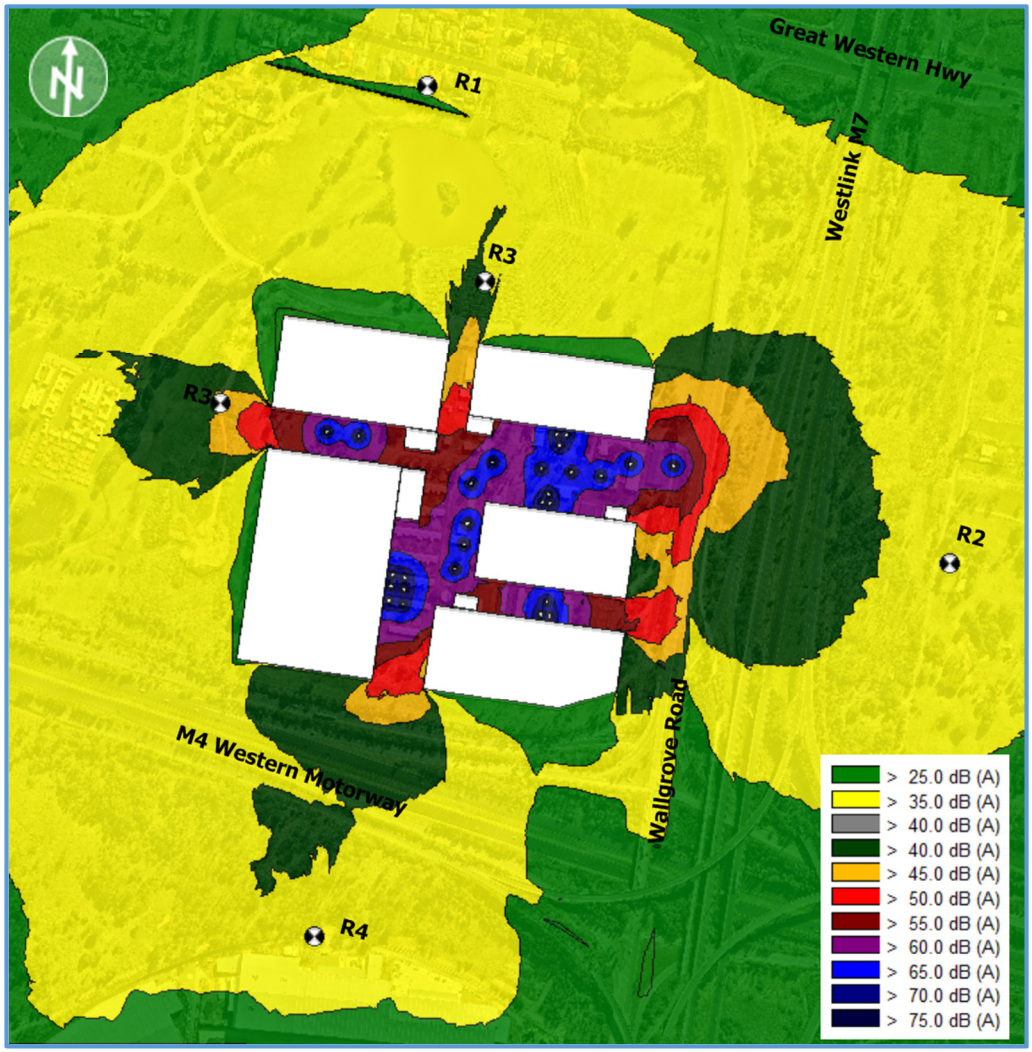


Figure 7-2 Daytime & Evening Noise Levels under Wind Effects

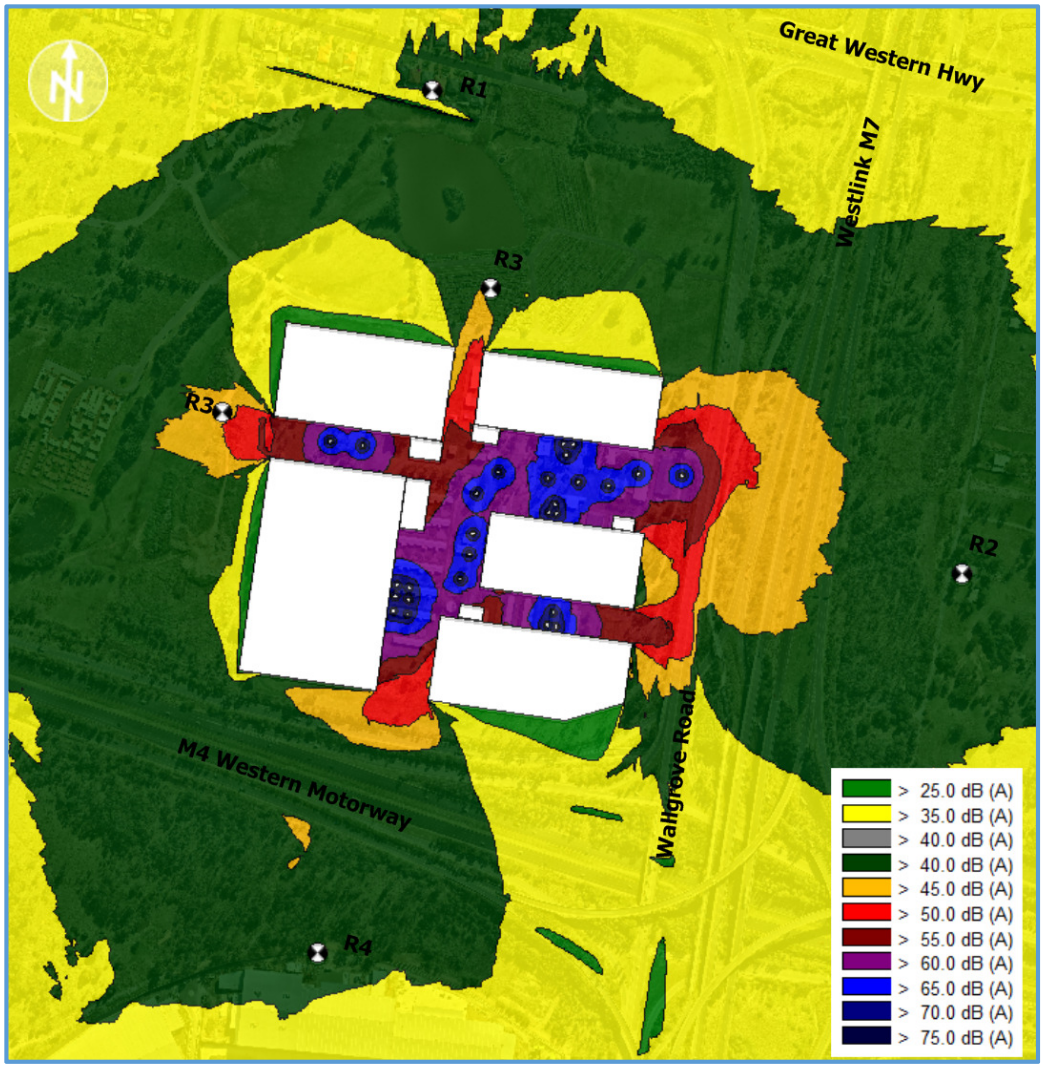


Figure 7-3 Night Time Noise Levels under Neutral Weather Conditions

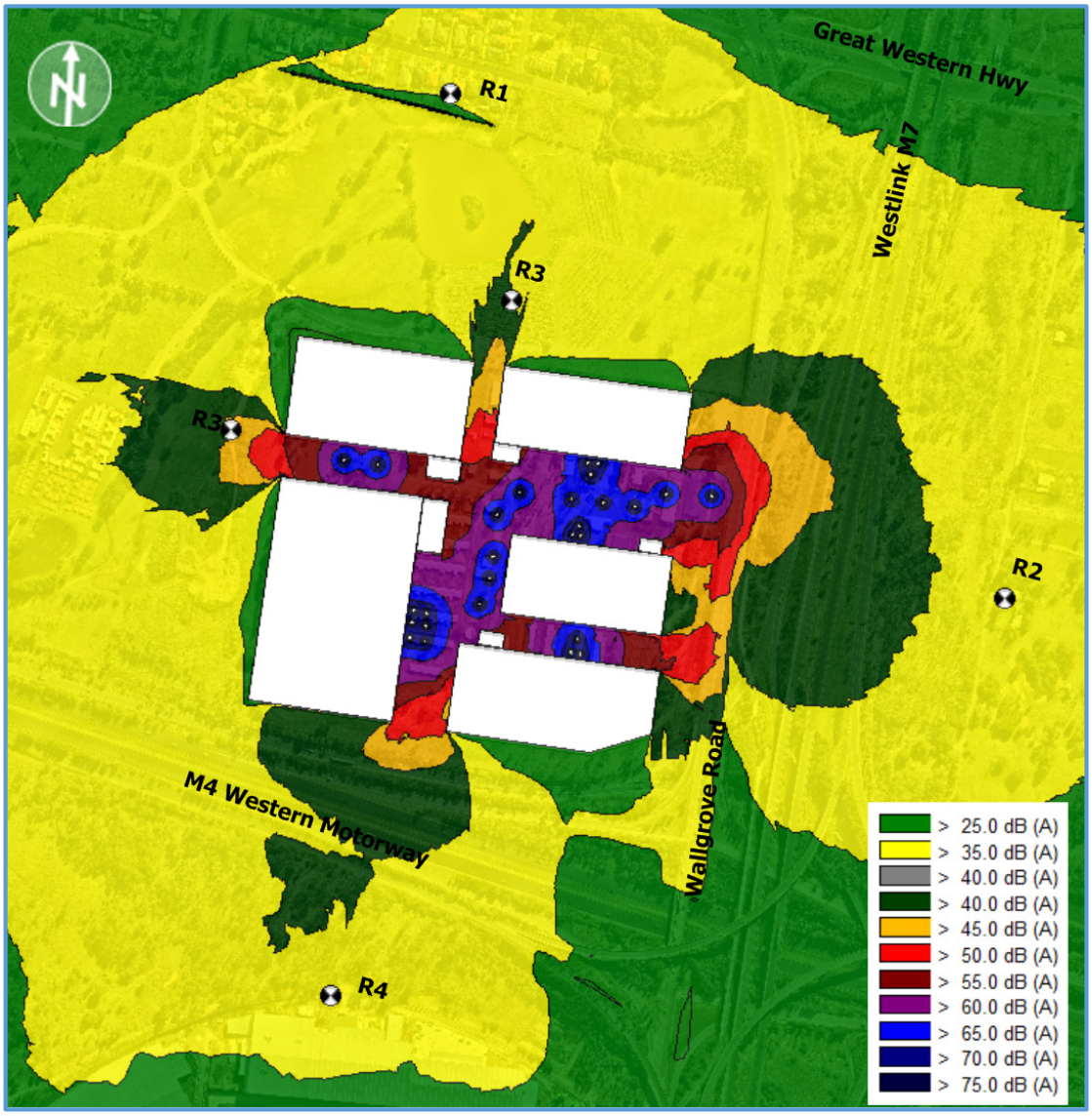
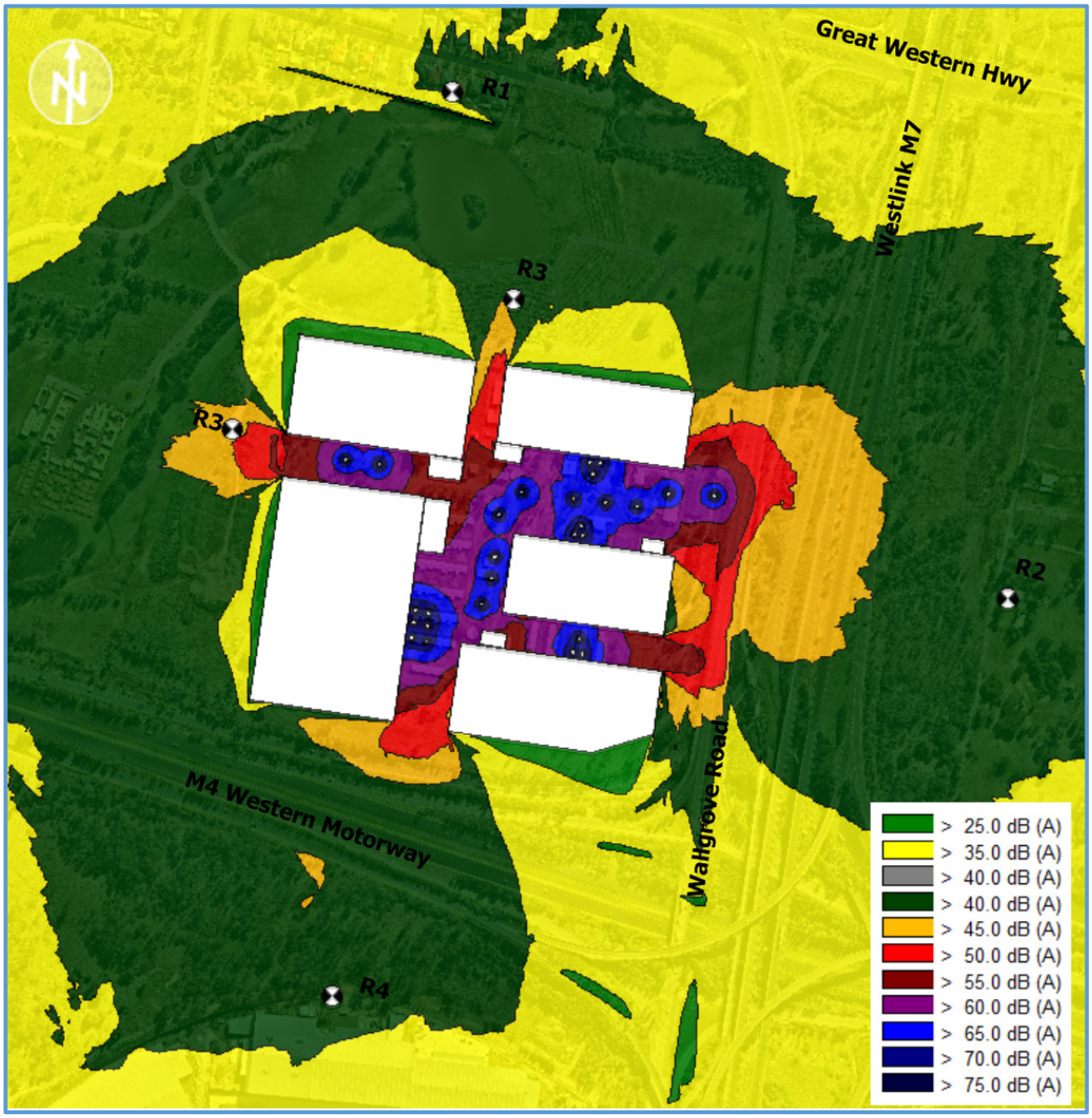


Figure 7-4 Night Time Noise Levels under Temperature Inversions



7.4.3 Sleep Disturbance Assessment

Based on previous experience of loading dock activities, trucks, trolleys and roller doors tend to produce the highest noise levels. The rumbling and impact noise occur for periods of approximately ten seconds at a time.

Reversing alarm and engine noise occur at the beginning and end of loading dock activities and the entire loading/unloading procedure usually lasts less than half an hour.

Table 7-5 details the loading dock sources that have been considered along with the typical maximum noise levels associated with these activities.

Table 7-5 Typical Loading Dock Activities & Maximum SWL – dBA

Noise Source	Maximum Sound Power Level
Truck engine	100
Truck along access road	104
Reversing alarm	100-110
Roller door	94
Trolley	93

Resultant noise levels at residences have been predicted based on noise associated with reversing alarms positioned at the northernmost and easternmost points within the site loading areas.

Table 7-4 presents resultant noise levels.

Table 7-6 Predicted Operational Noise Levels for Night Time – dBA

Receptor	Predicted L_{A1} Neutral Weather Condition	Predicted L_{A1} Temperature Inversion	Sleep Disturbance L_{max}	Complies? (Neutral / Adverse)
R1	42	47	62	Yes/Yes
R2	43	48	62	Yes/Yes
R3: East of Oak Side Drive	n/a	n/a	n/a	n/a
R3: Melville Road	n/a	n/a	n/a	n/a
R4	n/a	n/a	n/a	n/a

A review of predicted noise levels indicates that predicted maximum L_{A1} noise levels at residences are significantly below the established sleep disturbance noise criteria of 62dBA. Therefore, no noise control measures will be required. Furthermore, these levels represent the worst case scenario as much of the noise from trucks and loading activities will be shielded by the structures on site. Lower noise levels were predicted at residential receivers when comparing current and previous (ref 09064-M Version C) noise predictions. This has been attributed to the new configuration of the buildings.

8 DISCUSSION OF GENERAL MITIGATION MEASURES

8.1 Construction Noise Emissions

The following noise mitigation measures are considered best practice and are recommended to be adopted on site:

- Inform affected residents/owners of the works program and contact details for the site representative;
- Diesel powered machines such as trucks and excavators should be switched off if not required for more than a few minutes, rather than left idling unnecessarily;
- Machines used on site should be maintained in good condition, particularly considering the exhaust system on diesel powered machines, to minimise noise emissions. Excessively loud machines should be repaired, modified or removed from the site. Sound pressure level measurements should be conducted on all plant prior to works beginning on-site;
- A representative from the construction contractor should be available to respond to questions and complaints from the community in a professional, considerate and timely manner;
- Reversing alarms should be controlled to the minimum sound level consistent with safety by replacing, shielding or relocating the alarm unit on noisy machines; and.
- A representative should be nominated by site management to monitor, manage and respond to complaints.

8.2 Operational Noise Emissions

8.2.1 Mechanical Services Noise

Mechanical plant associated with the proposed industrial development can have the potential to impact on future nearby receptors if not addressed at the planning stage. At this stage of the project, the selection of the type and location of mechanical plant associated with the proposed development is not known.

At the detailed design stage of the project the selected plant noise levels must be assessed with respect to established noise criteria. Should an exceedance be indicated, it is envisaged that standard noise control measures will be adopted to ensure that the acoustic amenity of nearby receivers is maintained.

Indicative engineering treatment methods that can be adopted are:

- Judicious selection of plant and equipment behind built elements to provide shielding to residences;
- Noise attenuators; and
- Acoustically lined ductwork.

8.2.2 Noise from Industrial Operations

The proposed facilities may also contain light industry type operations. Based upon previous experience of light to medium warehouse facilities, an indicative internal reverberant noise level is typically around 70dBA.

As the buildings will typically be constructed of tilt up slab walls and a metal roof, these constructions will adequately control noise emissions from the buildings on site.

Should activities generate higher noise levels than those indicated in this assessment, then the additional noise control measures may be required. Indicatively these can consist of measures such as:

- Acoustic louvres on openings facing residences;
- Ceilings in factory areas;
- Acoustic lining of walls; and
- Judicious location of plant and openings.

These issues can be adequately addressed during the design stage of individual facilities.

9 CONCLUSION

Wilkinson Murray Pty Limited has conducted an acoustic assessment associated with construction and operational activities at the proposed warehouse and distribution centre located at 60 Wallgrove Road, Eastern Creek.

The noise assessment was carried out in accordance with both *NSW EPA Interim Construction Noise Guideline* (ICNG) and *NSW EPA Industrial Noise Policy* (INP).

Impacts at relevant noise sensitive receptors have been quantified and where required, mitigation measures have been proposed to minimise the potential impact.

The assessment can be summarized as follows:

Construction Noise

Construction noise levels were determined to comply with the noise management levels at all residential, cemetery grounds and industrial receivers surrounding the subject site. Noise levels at the cemetery located adjacent to the site are likely to be audible primarily during construction works in the northern and western areas of the site. However, compliance with the noise management levels is expected under all stages. General noise mitigation measures have been recommended to be adopted on site.

Mechanical Noise Emissions

Specific plant selections have not been made at this stage of the project. This issue will be reviewed at the detailed design stage of the project to ensure noise compliance is achieved at surrounding receivers. Where a reduction in plant noise is necessary, standard engineering noise controls will be adopted.

It is concluded that with standard engineering treatments to the mechanical plant, the proposed development will not adversely impact on acoustic amenity of surrounding receivers.

Loading Dock Activities & Outside Activities

Noise from the external areas has been modelled for indicative "worst-case" day, evening and night periods. Compliance with the project specific noise levels was achieved even under adverse weather conditions. The protection of the amenity of surrounding receivers is facilitated by the layout of the development whereby buildings on the site will shield the residences from any noise generated on the site.

In the case of the amenity at the cemetery, resultant noise levels are predicted to be below recommended noise levels for passive recreation areas.

Sleep Disturbance

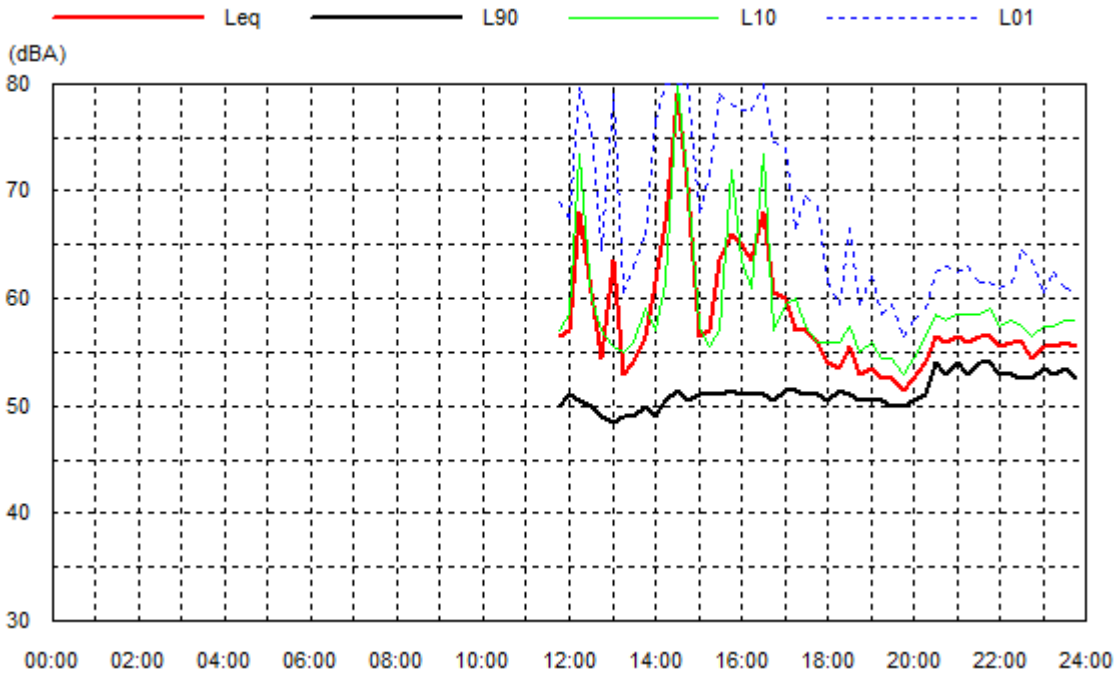
No sleep disturbance due to night operations is expected.

APPENDIX A

NOISE MEASUREMENT RESULTS

Location: 145 Eskdale St

Tue 05 May 15



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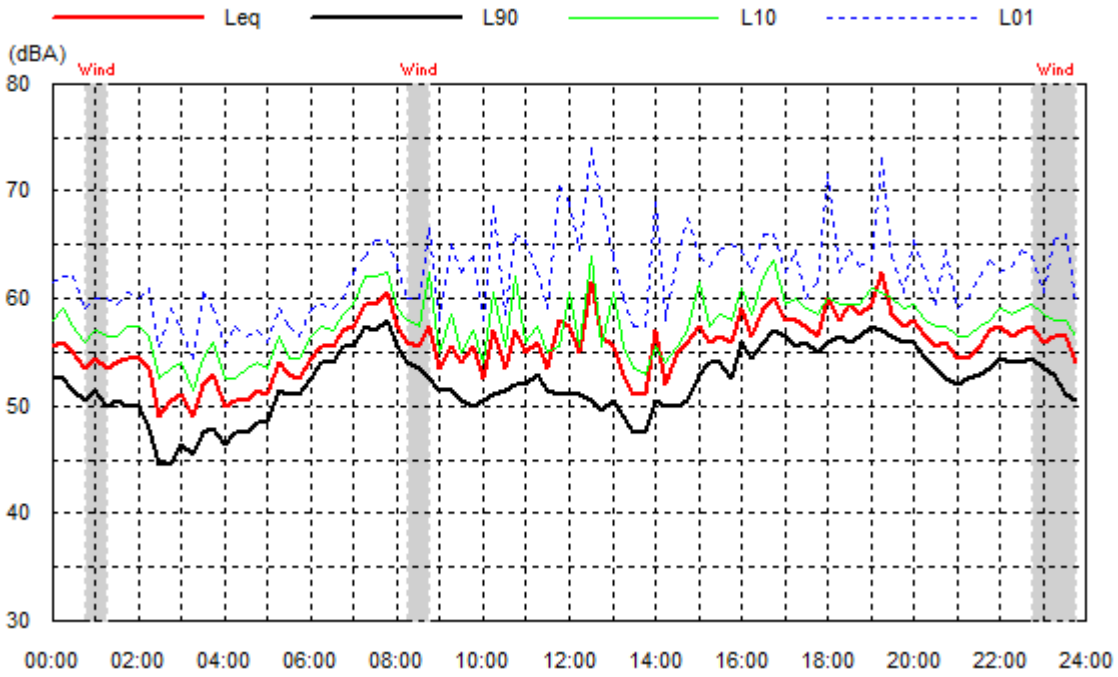

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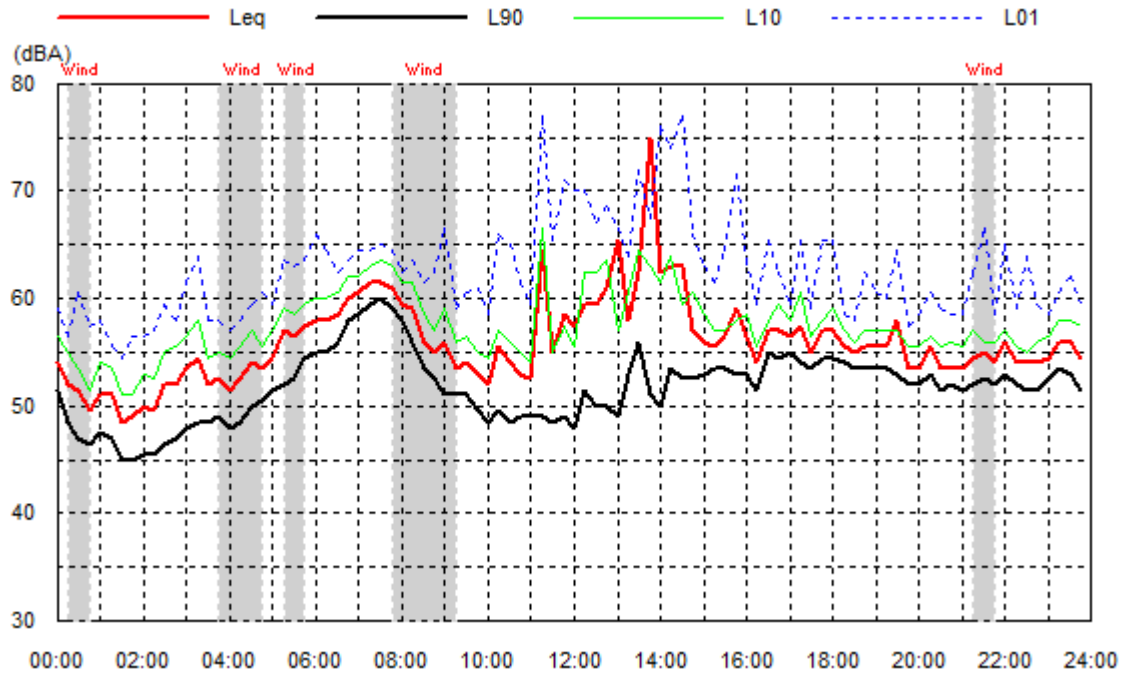

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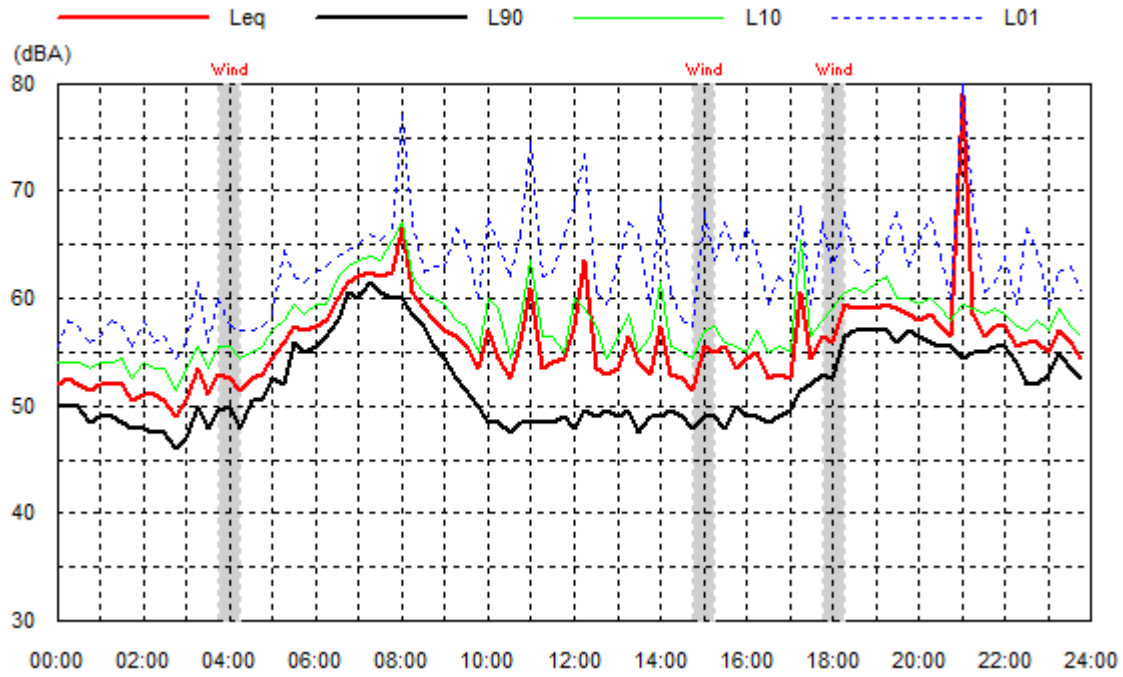

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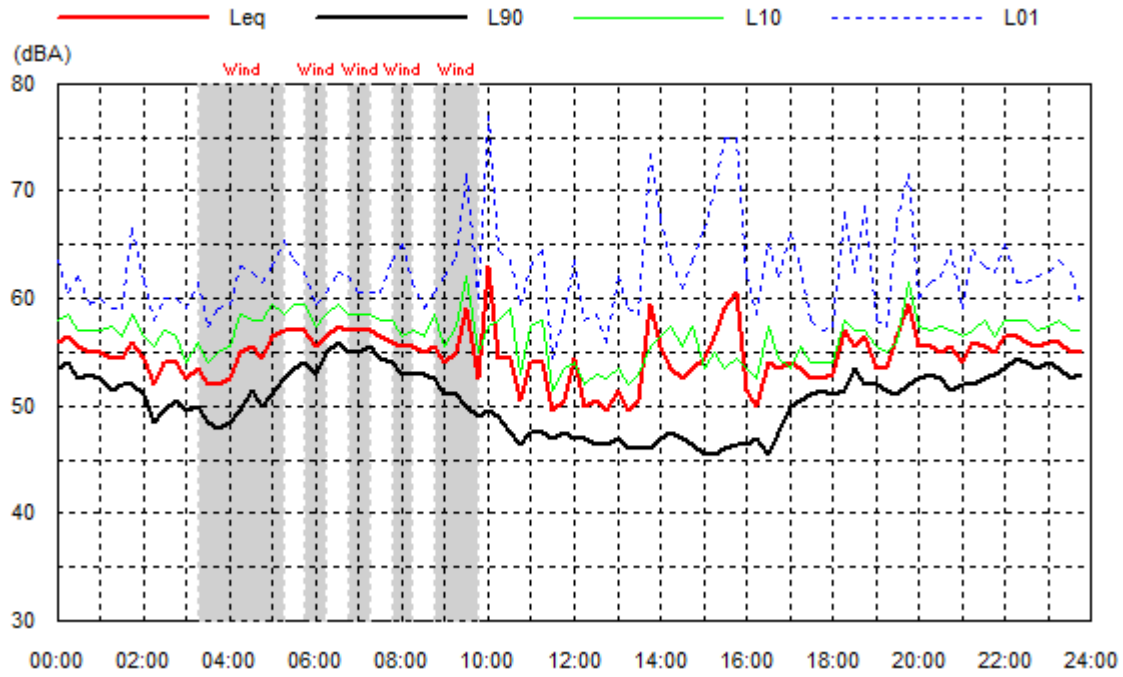

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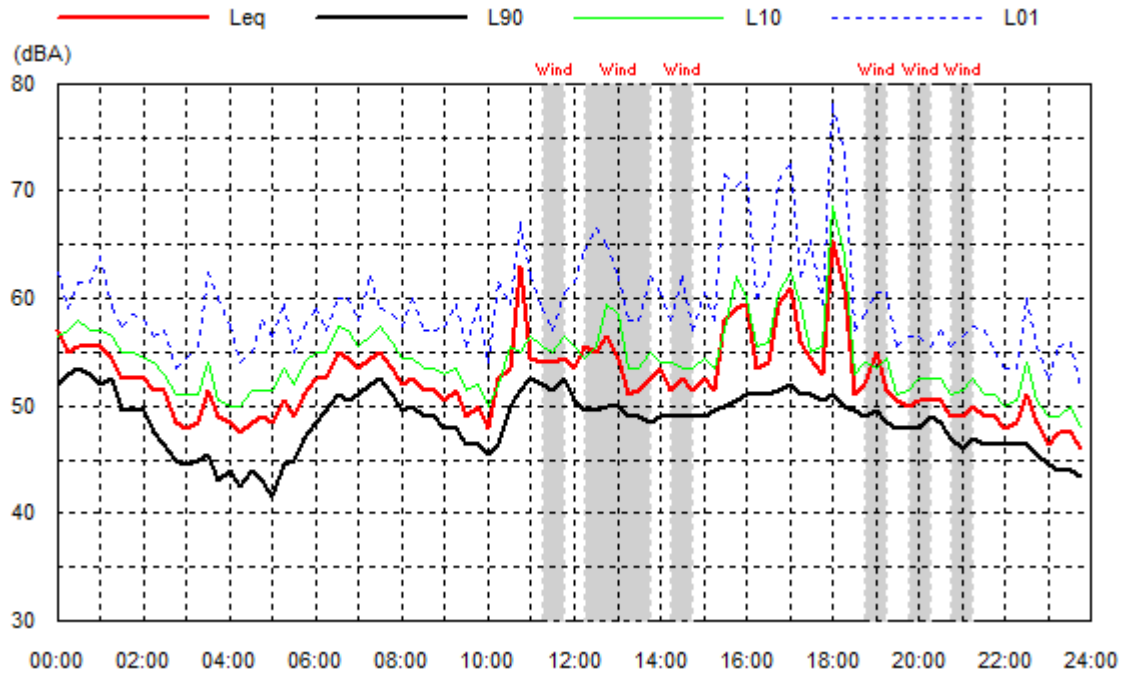

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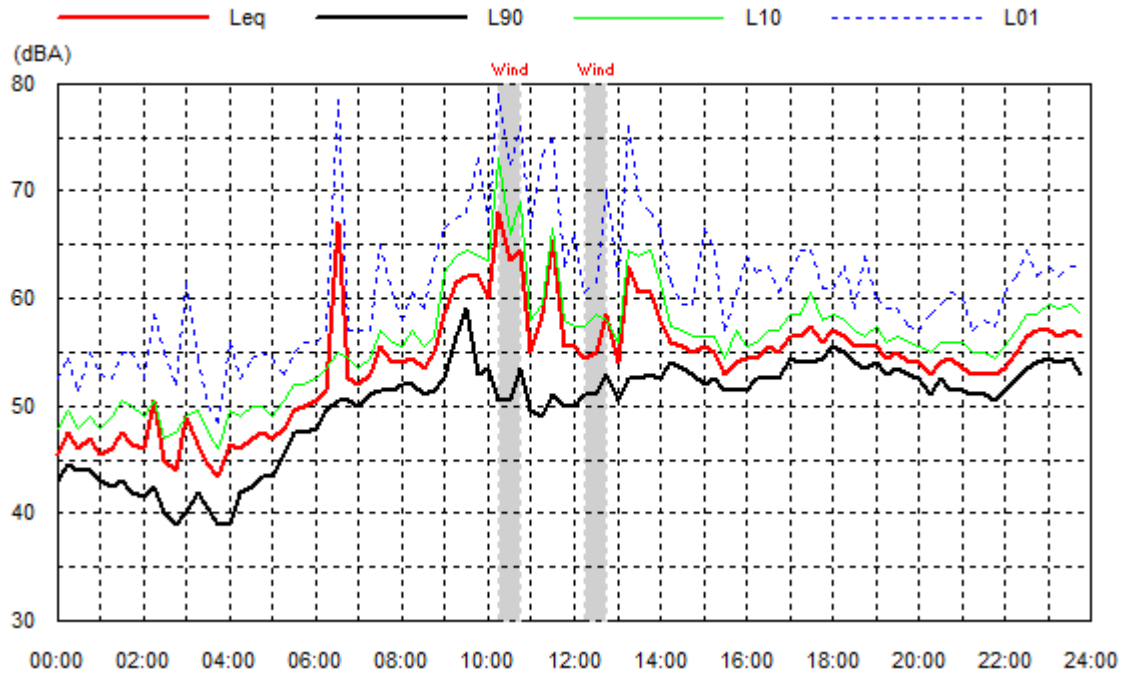

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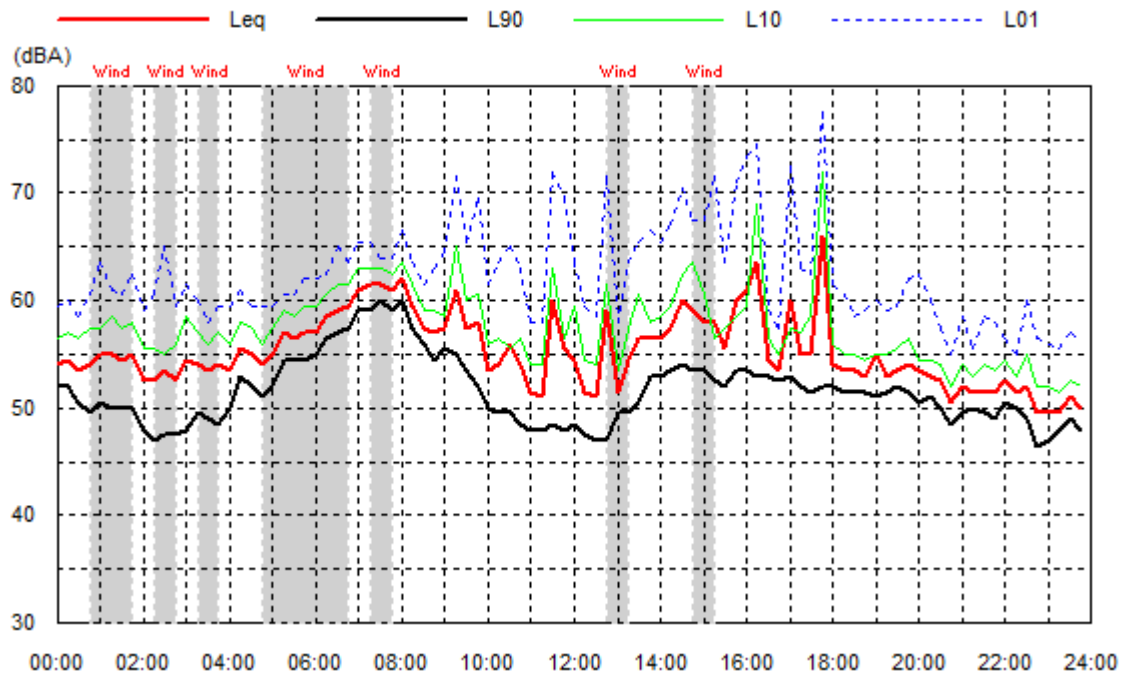

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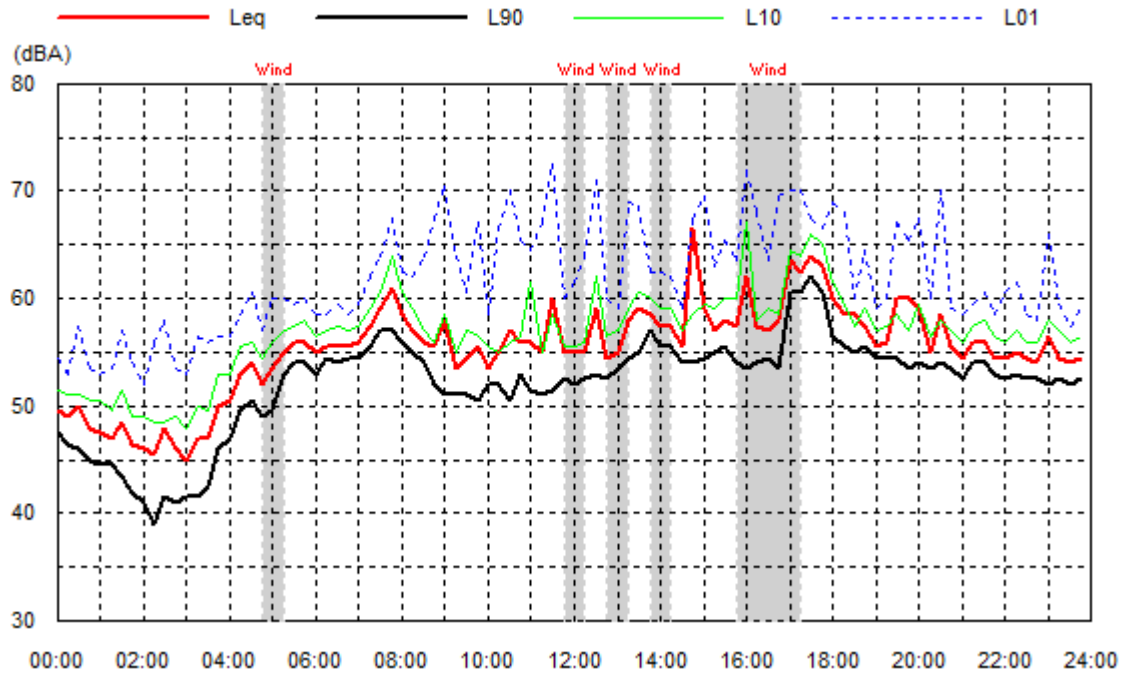

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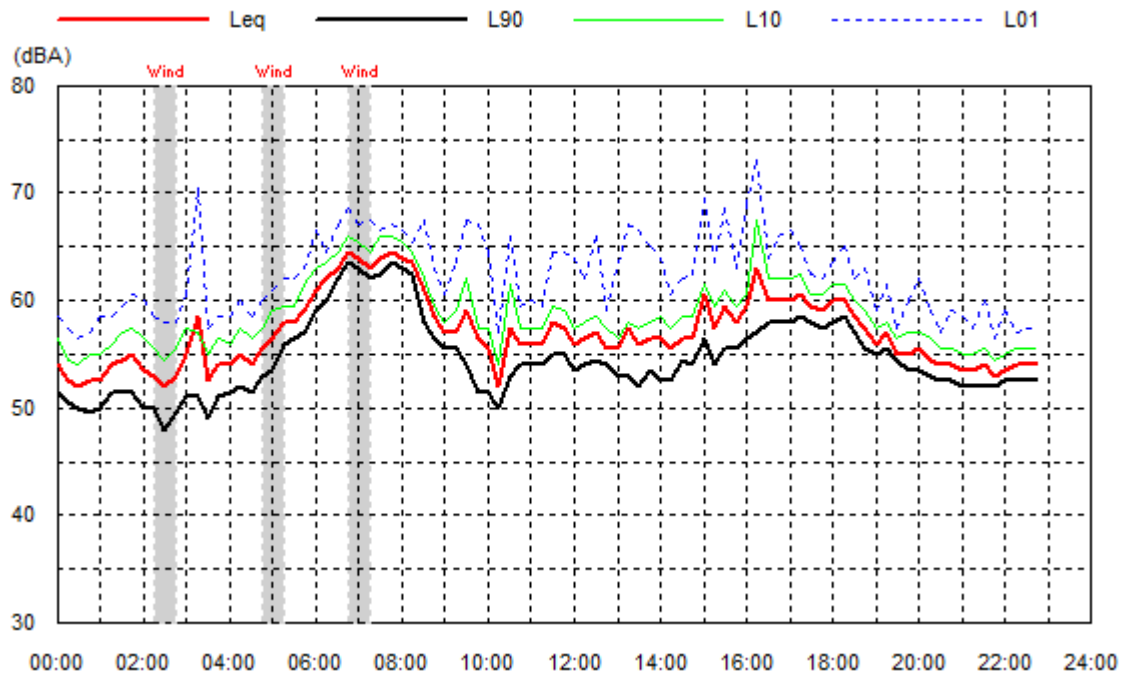

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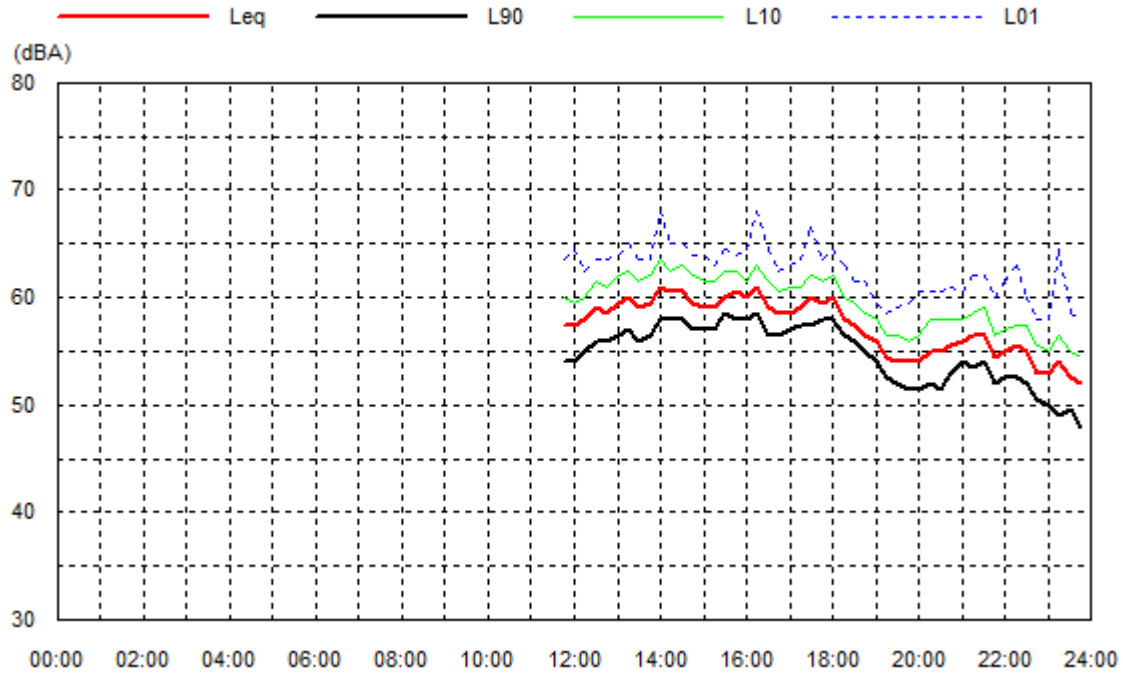

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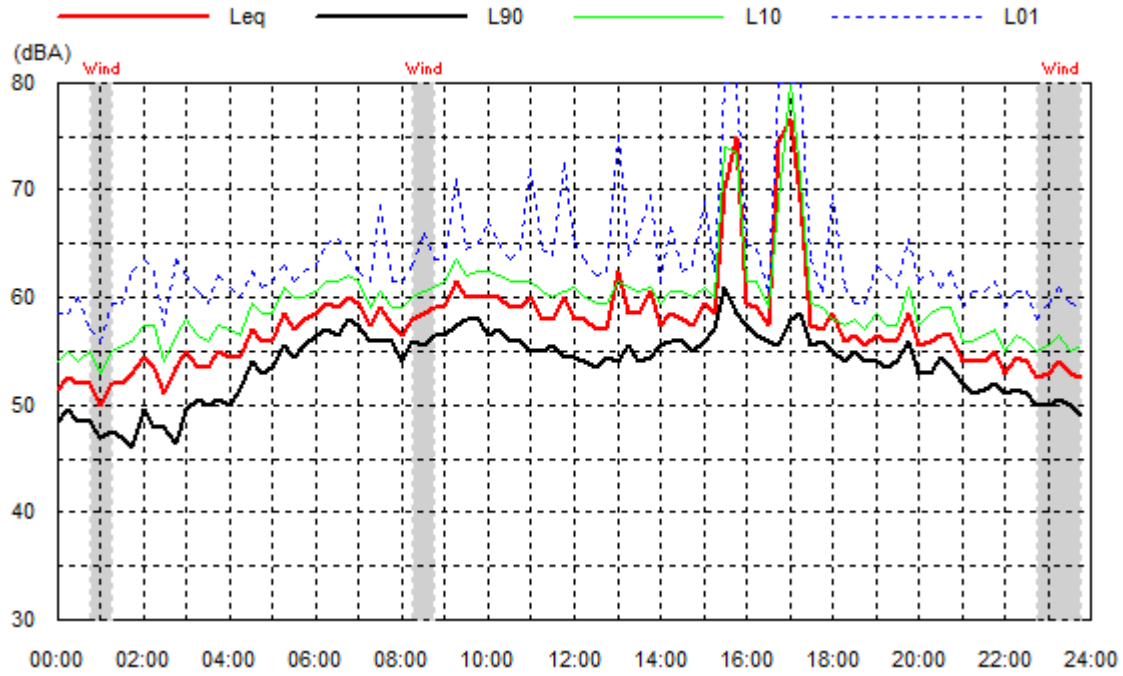

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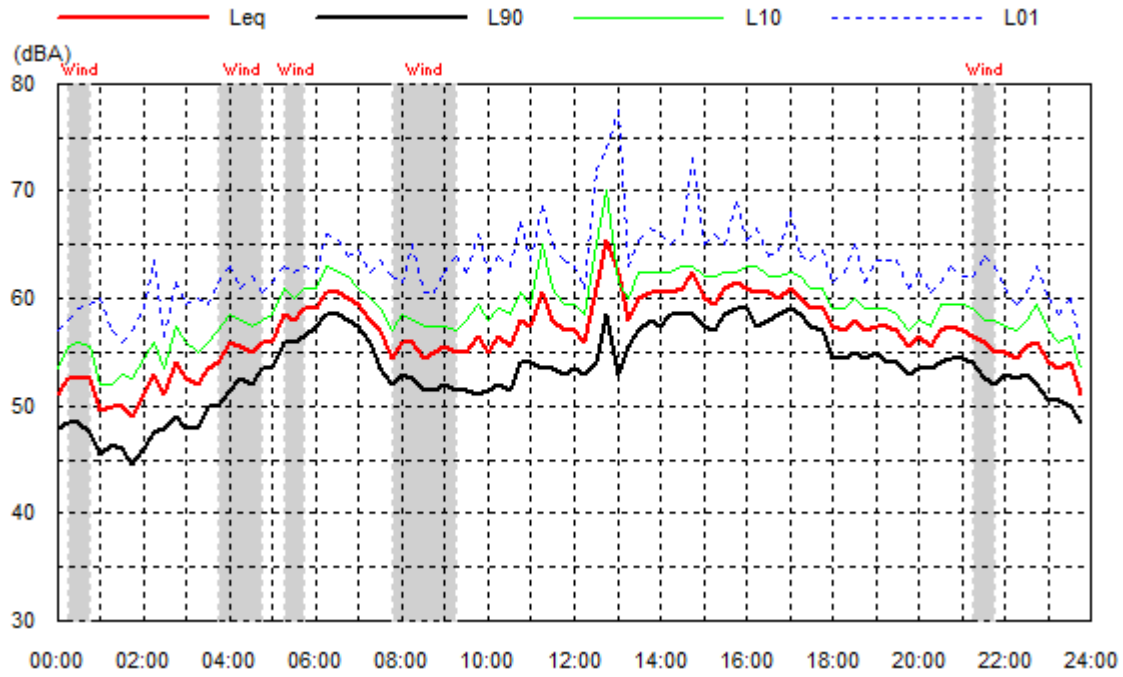

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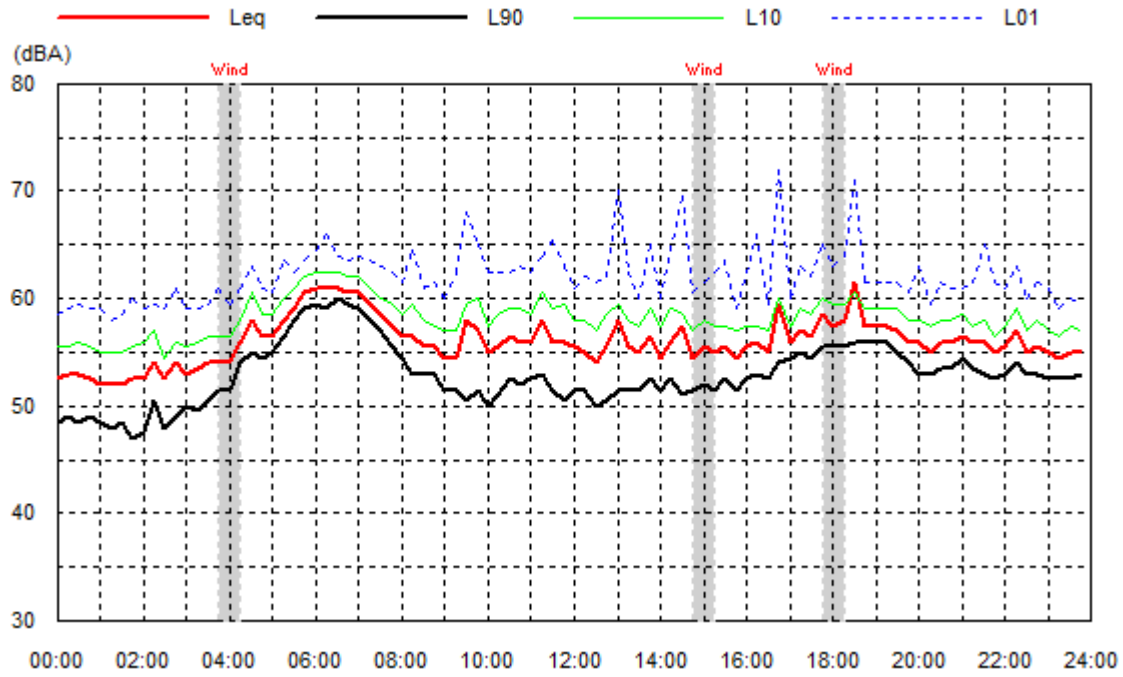

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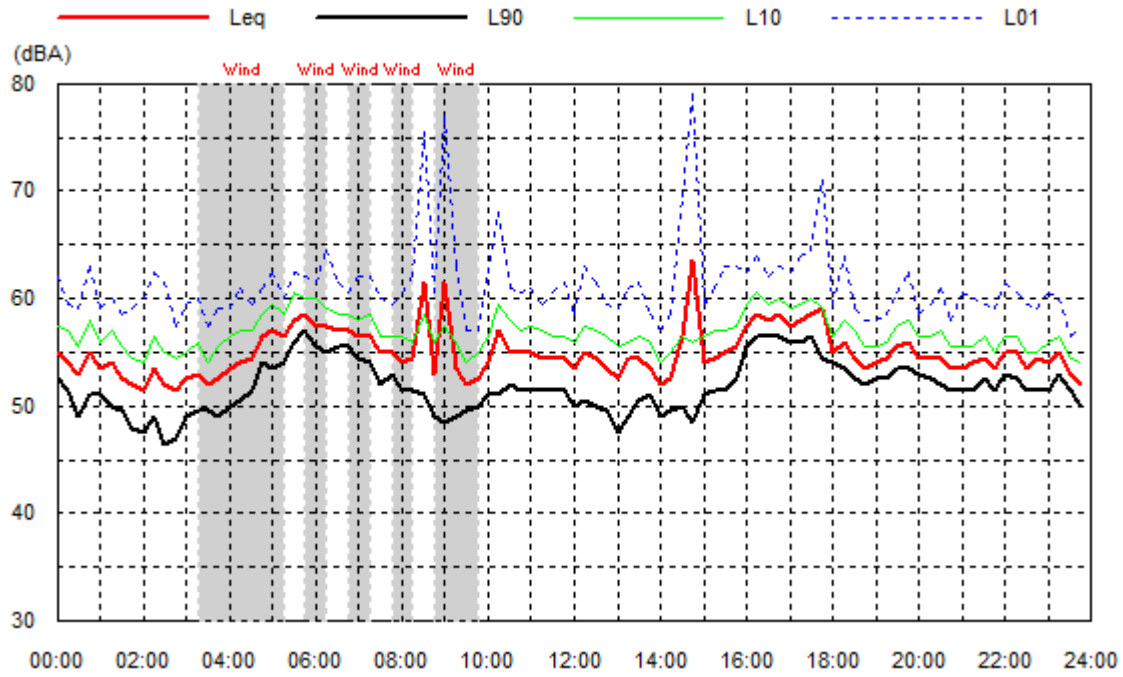

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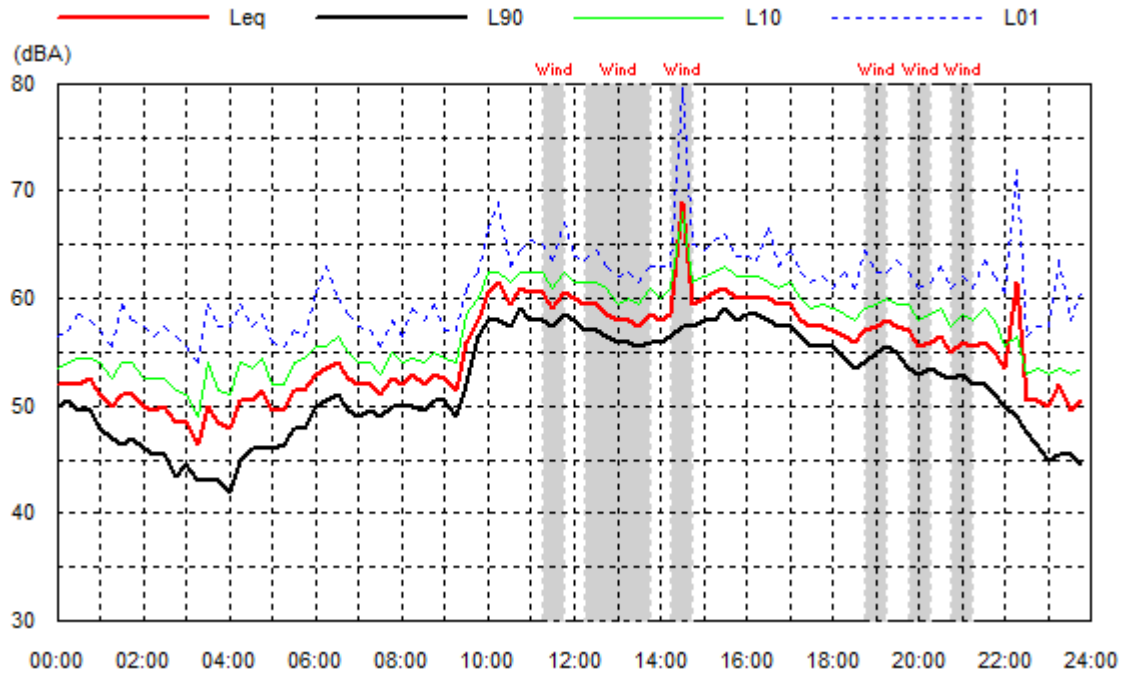

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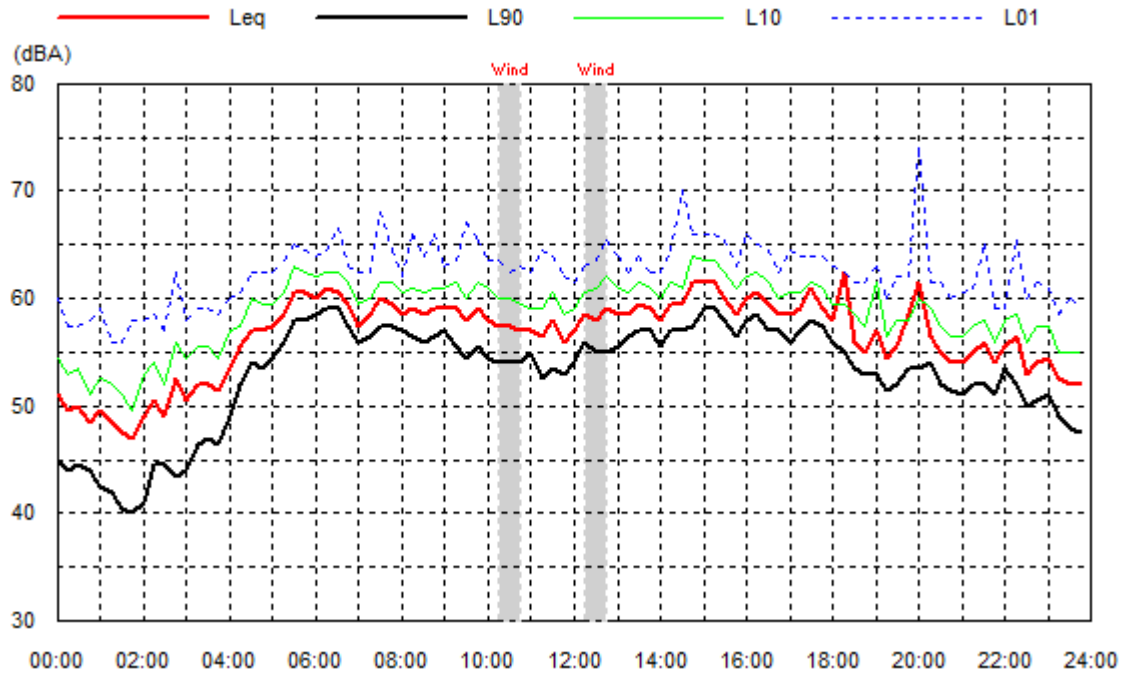

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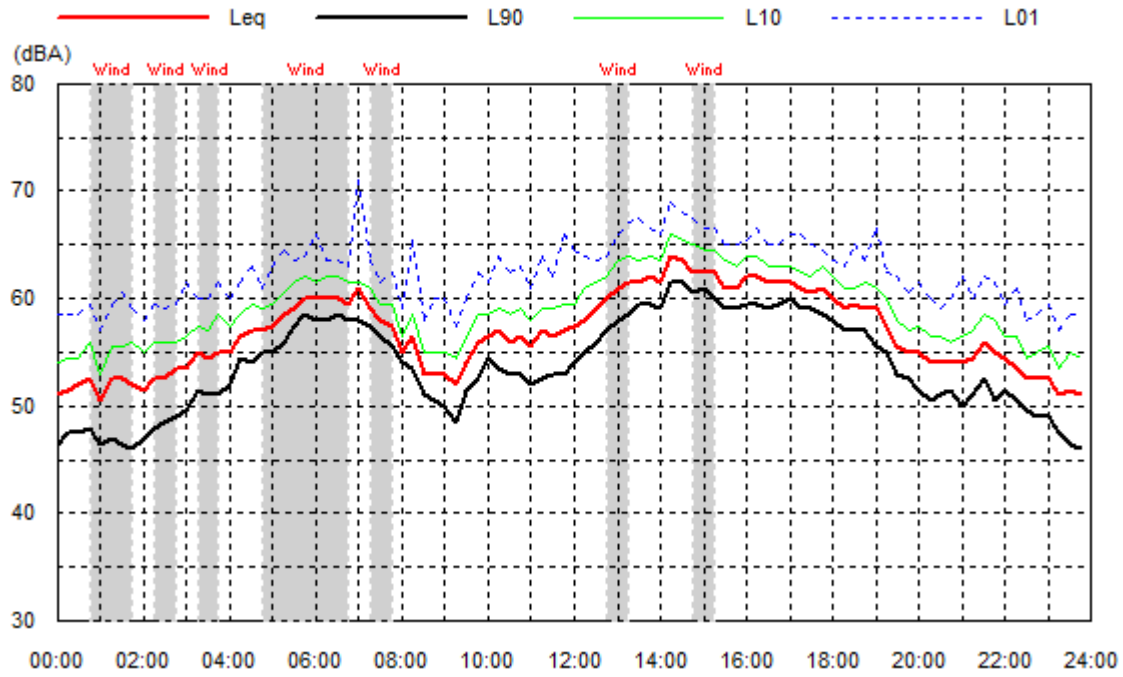

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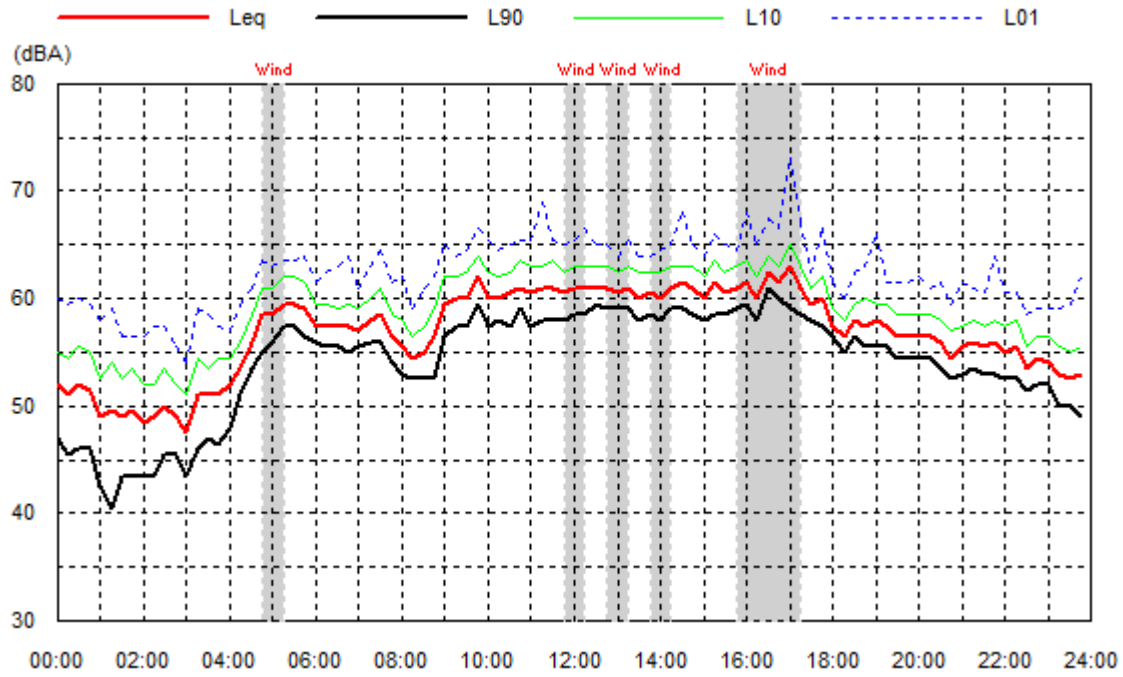

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