

MOOREBANK LOGISTIC PARK - PRECINCT EAST

ATS Building Products Warehouse Operational Compliance Measurements

1 December 2020

Qube Property Management Services Pty Ltd c/- Tactical Group

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Contents

1	Introduction	5
1.1	Warehouse operations description – ATS	6
1.1.1	Location	6
1.1.2	Operational activities and facilities and hours of operation	6
1.2	Nearby sensitive receivers	6
2	Summary of noise objectives	9
2.1	Compliance assessment noise requirements	9
2.2	Operational noise limits	10
2.3	Discussion of assessment noise limits	10
3	Measurement methodology and results	12
3.1	Compliance measurement methodology	12
3.2	Instrumentation	13
3.3	Receiver attended noise measurement results	13
3.3.1	Meteorological conditions	14
3.4	On-site attended operational activity noise measurement results	17
3.5	Unattended noise measurements	18
3.6	Modelled operational scenarios	20
3.6.1	Observed operations for modelling	20
3.6.1.1	Truck and despatching operations (ATS north)	21
3.6.1.2	Qube container handling operational area	21
3.6.2	Assessment noise source levels	22
3.6.3	Reasonable worst-case intrusiveness scenarios (15-minute period)	22
3.7	Modelling methodology	23
3.7.1	Overview of noise modelling	23
3.7.2	General modelling assumptions	24
3.7.3	Model validation	24
3.8	Noise compliance assessment	25
4	Conclusion	27
APPENDIX A	Glossary of terminology	29
APPENDIX B	Logger location 1 – ATS - North side	31
APPENDIX C	Logger location 2 – ATS – South side	32

List of tables

Table 1	Noise sensitive receivers and approximate distance from MPE warehouse (ATS)	7
Table 2	SSD 7628 CoC B80 noise limits, dB(A)	10
Table 3	Noise measurement equipment	13

Table 4	Receiver attended noise monitoring locations	14
Table 5	Summary of attended noise measurement results at the nearest sensitive residential receivers	16
Table 6	On-site attended measurement results	17
Table 7	Assessment noise source levels	22
Table 8	Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios	23
Table 9	Comparison between measured and modelled noise levels	25
Table 10	Predicted noise levels - Reasonable worst-case scenarios for warehouse (ATS)	26

List of figures

Figure 1	Warehouse location (ATS – WH4B), MPE precinct and the nearest residential receivers	8
Figure 2	Attended residential receiver noise monitoring locations	15
Figure 3	ATS South Unattended Noise Measurement Setup	19
Figure 4	ATS North Unattended Noise Measurement Setup	19
Figure 5	Unattended noise logger locations and main noise generation areas (imagery: Nearmap, 2020)	20

1 Introduction

Renzo Tonin & Associates was engaged by Tactical on behalf of Qube Property Management Services Pty Ltd (QUBE) to undertake an operational noise compliance assessment of the warehouse operations carried out by ATS Building Products (Warehouse 4B (WH4B)) within the Moorebank Precinct East (MPE), located within the Moorebank Logistics Park (MLP) at Moorebank, NSW.

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stages 1 and 2 of the MPE Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10_0193). Warehouse operations, including the site that is operated by ATS (WH4B), fall under the area and activities approved as part of SSD 7628.

This report has been prepared to address the operational noise monitoring requirements outlined in the MPE Operational Noise and Vibration Management Plan¹ (MPE ONVMP) required for the warehouse operations carried out by ATS. Specifically, this report has been prepared to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628, as detailed in Section 3.2.2 of the MPE ONVMP.

Appendix A contains a glossary of acoustic terms used in this report.

¹ Arcadis & Renzo Tonin & Associates, Operational Noise and Vibration Management Plan for Moorebank Logistics Park – East Precinct, Revision 012, dated 27/3/2020, available https://simta.com.au/wordpress/wp-content/uploads/2020/04/ONVMP_V12_redacted.pdf, accessed 8/10/2020

1.1 Warehouse operations description – ATS

1.1.1 Location

The MLP is located approximately 27 kilometres south-west of the Sydney Central Business District and approximately 26 kilometres west of Port Botany, within the Liverpool Local Government Area. The MLP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively, as shown in Figure 1.

1.1.2 Operational activities and facilities and hours of operation

ATS undertakes warehouse and distribution activities from the warehouse designated WH4B within the MPE. The day to day activities include:

- Receipt and despatch of goods from and to the IMEX terminal
- Packing and unpacking of containers
- Storage and distribution of building products
- Despatching and receiving truck movements in and out of the facility
- Forklift operations
- Cutting of timber products to size (Internal warehouse activity)
- De-termite timber treatment line (Internal warehouse activity)
- General office administrative and support functions.

ATS's warehouse and distribution activities can operate 24 hours, 7 days per week.

The despatch and receiving activities mostly occur from the north side of the ATS warehouse, typically between the hours of 5:00am and 10:00pm, with the busiest period around 5:30am to 6:30am. Additionally, there is a designated area on the southern side of the warehouse where containers from the IMEX terminal are transported to and stored for unloading within the warehouse. These two main areas are shown in Figure 5.

1.2 Nearby sensitive receivers

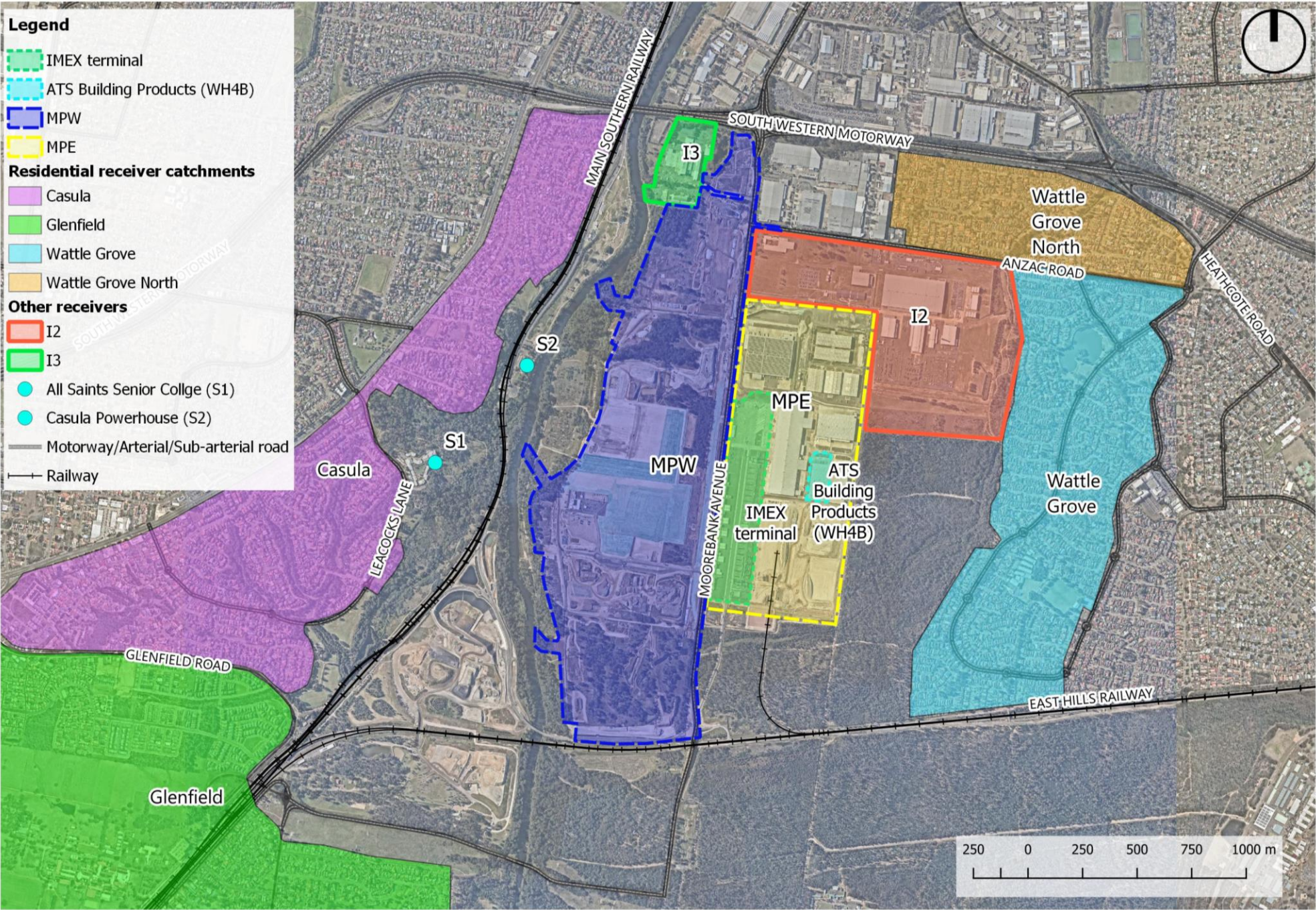
The potentially most affected residential receivers in the vicinity of the MPE (where loading / unloading at ATS north and south occur), are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. A summary of the approximate distance to the nearest residential receiver in the surround noise catchment areas (NCAs) is provided in Table 1. The locations of the NCAs or receivers, are shown in Figure 1.

Table 1 Noise sensitive receivers and approximate distance from MPE warehouse (ATS)

Sensitive receiver (Noise Catchment Area (NCA) or Receiver ID)	Receiver type	Approximate distance from MPE precinct warehouse (ATS), metres
Wattle Grove (NCA 1)	Residential	800
Wattle Grove North (NCA 2)		1,060
Casula (NCA 3)		1,530
Glenfield (NCA 4)		2,530
All Saints Senior College (S1)	Educational	1,720
Casula Powerhouse (S2)		1,380
Defence Joint Logistics Unit (DJLU) (I2)	Industrial	600
ABB (I3)		1,260

Notes: 1. Moorebank Precinct West (MPW) has not been assessed as the final receiver locations have not been confirmed or constructed.

Figure 1 Warehouse location (ATS – WH4B), MPE precinct and the nearest residential receivers



2 Summary of noise objectives

2.1 Compliance assessment noise requirements

The management of operational noise emission from warehouse activities within MPE Stage 2 is outlined in the MPE ONVMP. Specifically, this report has been prepared to address the monitoring requirements of CoC B85 in SSD 7628, as detailed in Section 4.1.1 of the MPE ONVMP.

This report includes noise monitoring performed to address the requirements in CoC B85, as detailed in Table 4-1 in Section 4.1.1 of the MPE ONVMP.

The requirements of CoC B85 state:

B85 The Applicant must carry out noise monitoring of mechanical plant and other noisy equipment for a minimum period of one week where valid data is collected following occupation of each warehouse. The monitoring program must be carried out by a suitably qualified and experienced person(s) and a Monitoring Report for Mechanical Plant must be submitted to the Secretary within two months of occupation or each tenancy to verify predicted mechanical plant and equipment noise levels.

CoC B85 requires that the monitored noise levels be compared against the predicted levels reviewed in accordance with CoC B84.

The noise impacts from warehouse operations were assessed as part of the environment impacts statement noise and vibration impact assessments (MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016 (MPE Stage 2 N&V assessment)). Individual warehouse operations were not assessed and further review of site noise emissions subsequently has not been undertaken. As such, there are no specific predicted noise levels for the warehouse activities at the nearby noise sensitive receivers that can then be used for verification under CoC B85.

As per Table 4-1 in Section 4.1.1 of the MPE ONVMP, Table 3-20 and Table 3-21 of the MPE ONVMP detail the predicted $L_{Aeq\ 15\ minute}$ intrusiveness and L_{Amax} sleep disturbance noise levels respectively for the overall MPE operations (not for an individual warehouses).

As such, for the purposes of addressing CoC B85, instead of comparing the facility noise emission against the noise level predicted in accordance with condition B84, this report aims to assess the noise levels from the mechanical plant and other noisy equipment that operate within the facility directly against the noise limits presented in Table 5 of condition B80.

2.2 Operational noise limits

The operational noise limits applicable for the warehouse operations within MPE are presented in Table 5 of SSD 7628 CoC B80 and are reproduced in Table 2. These noise limits are as per Table 3-5 of the MPE ONVMP. The noise limits are applicable not only to all operational noise sources approved under SSD 7628, but are inclusive of operations as part of MPE Stage 1, approval SSD 6766.

The $L_{Aeq(15 \text{ minute})}$ criteria are applicable during the day, evening and night-time periods and the $L_{A1(1 \text{ minute})}$ sleep disturbance noise limits at residential receivers are applicable during the night-time period.

The noise limits are applicable under prevailing meteorological conditions of wind speeds of up to 3 m/s at 10 metres above ground level or stability category 'F' temperature inversion conditions.

Table 2 SSD 7628 CoC B80 noise limits, dB(A)

Sensitive receiver	Day ¹	Evening ¹	Night ¹	Night ¹
	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{A1(1 \text{ min})}$
Wattle Grove (NCA 1)	35	35	35	52
Wattle Grove North (NCA 2)	35	35	35	52
Casula (NCA 3)	35	35	35	52
Glenfield (NCA 4)	35	35	35	52

Notes:

1. In accordance with the INP, day is the period from 7:00am to 6:00pm Monday to Saturday; or 8:00am to 6:00pm on Sundays and public holidays; evening is the period from 6:00pm to 10:00pm; and night is the remaining periods.
2. To determine compliance with the $L_{Aeq, 15 \text{ minute}}$ noise limits, noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 Noise Policy for Industry - NPfI). The modification factors in Section 4 of the INP must also be applied to the measured noise levels where applicable.
3. To determine compliance with the L_{A1} noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 of the NPfI).
4. The noise emission limits identified above apply under meteorological conditions of:
 - (i) wind speeds of up to 3 m/s at 10 metres above ground level; or
 - (ii) 'F' atmospheric stability class.

2.3 Discussion of assessment noise limits

As noted in Section 2.2, the noise limits detailed in SSD 7628 CoC B80 are applicable not only to all operational noise sources approved under SSD 7628, but are also inclusive of operations as part of the MPE Stage 1 approval for SSD 6766. Importantly, when assessing compliance with the noise limits, the most affected residential receiver for any individual operations will not necessarily be at the same location. Additionally, it is unlikely that the reasonable worst-case noise levels from any individual operations would also occur in the same 15-minute period.

As part of the recent modification application for SSD 7709 Moorebank Precinct West (MPW) – Stage 2, MOD 1 - Building height increase (July 2020), a review of the applicable operational noise requirements across Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) was undertaken (Renzo Tonin & Associates document reference TJ741-11F05 (r4), dated 30 June 2020). The review identified

that there are number of approval conditions that are applicable across both the MPW and MPE sites for operational noise, and that in the application of these approvals to the site activities it became apparent that the operational noise requirements were not consistent across the MPE and MPW sites.

Additionally, the review identified that the operational noise limits across MPE and MPW were set substantially below both the noise criteria and the predicted noise levels (even with feasible and reasonable mitigation measures) established during the environmental assessment stages and considering the cumulative operational noise levels from all MPE and MPW operations.

The review recommended that an overall approach for cumulative operational noise management of the Moorebank intermodal terminal precinct (for East and West precinct) for a “whole of complex” approach be adopted, and that consistent noise management objectives for the Moorebank intermodal terminal precinct’s operational noise be adopted to cover all operations within MPE and MPW. Appropriate and achievable noise management objectives consistent with EPA’s noise policies were also developed in the review.

Following the modification application for SSD 7709 (MOD 1), the submission received from the NSW Environment Protection Authority (NSW EPA) noted the following:

However, the current noise limits are set below the predicted noise levels and are not based on the Project Specific Noise Levels (PSNL) derived under the then-applicable Industrial Noise Policy 2000 (now superseded by the Noise Policy for Industry 2017).... The EPA considers that the resulting noise limits are not achievable for MPW, nor are they achievable for the cumulative MPW and MPE sites.

Also Liverpool City Council included in their submission:

Council considers that site regulation in regard to noise management may be assisted by adopting a precinct approach consistent with the NSW EPA’s Noise Policy for Industry (2017).... Whilst it is acknowledged that current criteria in the Approval may be impracticable, it will be necessary for the Department to consider applying suitable noise limits that are achievable and capable of protecting the amenity and wellbeing of sensitive receivers.

As such, this operational compliance assessment does not include further quantification of cumulative noise levels, and demonstrates that the ATS warehouse operations can achieve the noise limits set out in SSD 7628 CoC B80 in isolation during reasonable worst-case operations.

It is recommended that noise levels from this assessment achieve the required noise limits set out in Table 5 of SSD 7628 CoC B80, and that the site specific noise levels should be considered as part of the operational noise management applicable to the overall Moorebank intermodal terminal precinct.

3 Measurement methodology and results

3.1 Compliance measurement methodology

The Noise Policy for Industry (NPfI) provides guidance in Chapter 7 for monitoring the performance of a noise-generating industrial facility. In Section 7.1.1, the NPfI provides guidance as to how to review noise emissions of a site where the existing ambient noise levels are already high, resulting in the direct quantification of the noise under investigation not being possible via noise measurements at the receiver location. Additionally, it provides guidance about using noise modelling to review the performance of an industrial operation that is co-located with separate but noise-generating industrial sites impacting the same receiver.

Noise measurements undertaken as part of this compliance monitoring established that the existing ambient noise levels at the nearby receiver locations meant that the direct quantification or estimation of operational noise emissions from the warehouse operations was not possible.

As such, because of existing high ambient noise levels at the nearest receivers, in addition to a number of industrial noise-generating facilities being co-located, the noise emissions from the warehouse facility (ATS) have been evaluated using a combination of on-site attended and unattended noise monitoring, combined with noise modelling, in order to quantify the industrial noise emissions from ATS operations. To satisfy the requirements of CoC B85, the following noise monitoring and assessment steps have been undertaken:

1. Attended noise monitoring at nearby residential receivers to review existing noise levels and to determine if operational noise emissions are quantifiable (Section 3.3)
2. On-site attended monitoring of noise-generating activities to quantify noise emission levels of mechanical plant and other noise-generating activities as part of typical warehouse operations (Section 3.4)
3. Unattended noise monitoring within the ATS warehouse facility for a period of approximately two weeks, with concurrent video, to identify the reasonable worst-case operational scenarios for each major noise-generating area (Section 3.5).

Following the noise monitoring, the following steps were undertaken to assess the noise level contributions at the nearby sensitive receivers:

4. Review observations of warehouse operations, in addition to the noise monitoring results and associated video, to then determine the reasonable worst-case operational scenarios
5. Setup and calibrate the noise model for the reasonable worst-case operational scenarios
6. Calculate the operational noise levels from the warehouse operations to all nearby receivers and determine the noise level contribution at the property with the highest noise levels within each NCA.

3.2 Instrumentation

A range of noise monitoring equipment was used to undertake the compliance noise monitoring. A summary of measurement equipment and calibration dates is provided in Table 3.

All of the noise monitoring equipment are Class 1 instruments, with calibration certificates current at the time of the measurements. Before and after each series of attended measurements, the calibration of the sound level meters were verified using a reference calibration of 94 dB at 1 kHz. The difference between pre- and post-calibration levels was within 0.5 dB for all measurements.

Table 3 Noise measurement equipment

Monitoring location/ purpose	Equipment	Serial No	Last date calibrated
Receiver attended noise measurements	NTi XL2	A2A-13500-E0	17/01/2020
On-site attended noise measurements	NTi XL2	A2A-12698-E0	01/05/2019
Unattended on-site noise measurements (ATS North)	NTi XL2	A2A-08004-E0	01/11/2018
Unattended on-site noise measurements (ATS South)	NTi XL2	A2A-13529-E0	20/12/2019
Field calibration	B&K 4231	2677710	16/03/2020

3.3 Receiver attended noise measurement results

As detailed in Section 1.2, the nearest residential receivers to the ATS warehouse site are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North.

As the most intensive period of operational activities at WH4B (ATS) was during the morning period from 5:30am to 6:30am, attended noise measurements were performed at the nearest residential receiver locations between 5:30am and 8:00am on 7 September 2020. These measurements were undertaken concurrently with on-site unattended noise measurements to confirm that noise intensive activities were occurring on-site during the receiver noise measurements.

Attended noise measurements were undertaken at six potentially noise affected residential receivers in the surrounding residential noise catchment areas. These included nearby residential receiver locations and the locations of the permanent noise monitoring terminals that are established in the suburbs surrounding MLP.

A summary of the monitoring locations and the approximate distance to the warehouse (ATS) is provided in Table 4. The locations and noise catchment areas (NCAs) are presented in Figure 2.

The results of the attended measurements conducted on 7 September 2020 are presented in Table 5.

Table 4 Receiver attended noise monitoring locations

Monitoring location ID	Monitoring location (applicable NCA) (see Figure 2)	Approximate distance (metres) from warehouse (ATS)
M1	25 Yallum Court, Wattle Grove (Wattle Grove – NCA1)	1,100
M2	23 Gracemere Court, Wattle Grove (Wattle Grove – NCA1)	800
M3	31 Martindale Court, Wattle Grove (Wattle Grove – NCA1)	830
M4	39 Glenelg Court, Wattle Grove (Wattle Grove North – NCA2)	850
M5	St Andrews Park, Casula (Casula – NCA3)	1,420
M6	14 Dunmore Crescent, Casula (Casula – NCA3)	1,500
M7	26 Goodenough St, Glenfield (Glenfield – NCA4)	2,650

In all cases, the measured $L_{Aeq(15\text{minute})}$ noise levels at the residential receivers, noise from the direction of the ATS warehouse on-site activities was not audible and/or distinguishable. The noise measurements at each residential receiver location was dominated by noise from sources outside of the MPE operations, mainly dominated by traffic noise levels from nearby arterial roads.

Since the ATS noise emissions were not audible, it was not possible to estimate the industrial noise contribution from the facility at the nearest residential receivers from these measurements.

3.3.1 Meteorological conditions

Meteorological conditions during the period of the receiver attended noise measurements have been reviewed to determine the prevailing wind and temperature inversion conditions. Data from the meteorological data monitoring station adjacent to Moorebank Avenue, within the MPE site, established in accordance with CoC A54 SSD 7709 has been reviewed. It was determined from the review that the attended noise measurements were undertaken under periods with worst-case prevailing meteorological conditions in accordance with SSD 7628 B80.

The meteorological conditions experienced during receiver attended noise measurement on 7 September 2020 are summarised below:

- During the measurement period on 7 September, the temperature inversion conditions between 5:30am and 7:30am were generally Class F temperature inversion (> 95% of the measurement period), based upon calculations using the sigma-theta method referred to in Fact Sheet D of the NPfI;
- During the measurement period at the facility, the equivalent average wind speed was 0.5-1 m/s and generally from the SSW, varying from SE to W. The measurements were not impacted by excessive wind during any of the measurement periods;
- No rain occurred during any of the measurement periods; and
- The temperature during the measurement period ranged between 12°C and 16°C, and the cloud conditions were generally clear skies with a few scattered clouds.

Figure 2 Attended residential receiver noise monitoring locations

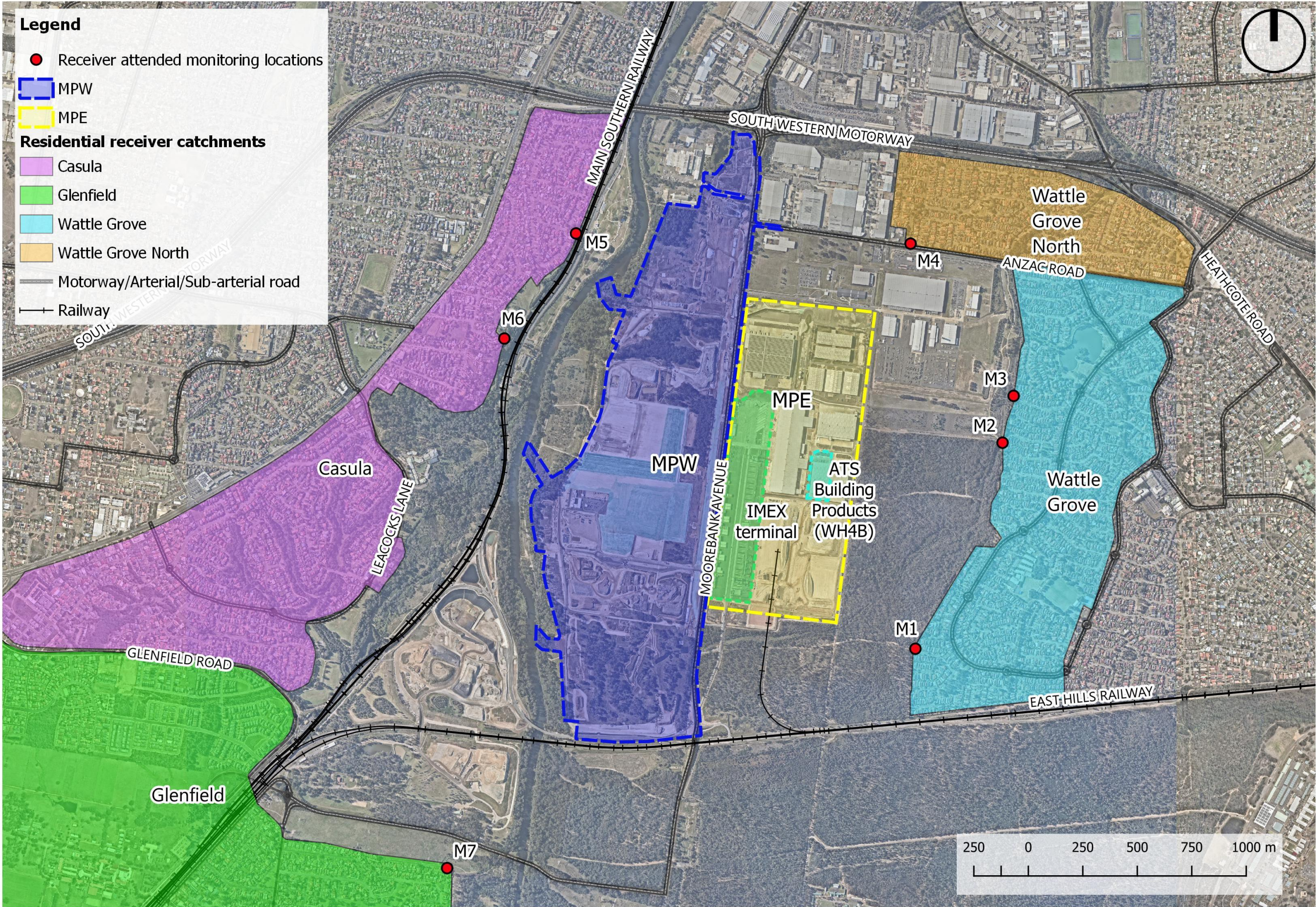


Table 5 Summary of attended noise measurement results at the nearest sensitive residential receivers

ID	Address	Noise limit, dB(A)		Measurement period	Measured noise level (15 minute), dB(A)				Estimated MPE operational noise contribution, dB(A)		Comments and measured noise levels from typical events	ATS noise audible?
		L _{A1} , 1 minute	L _{Aeq} , 15minute		L _{Amax}	L _{A1}	L _{Aeq}	L _{A90}	L _{A1} , 1 minute	L _{Aeq} , 15minute		
Wattle Grove												
M1	25 Yallum Ct, Wattle Grove	52	35	7/09/2020 7:23am to 7:38am	78	62	54	48	Note 1	Note 1	Ambient noise environment dominated by noise from road traffic at north west: Construction 54-57dB(A), bird 65-69dB(A), dog 50-56dB(A), rail traffic 49-52 dB(A).	No
M2	23 Gracemere Court, Wattle Grove	52	35	16/09/2020 6:08am to 6:23am	60	56	53	51	Note 1	Note 1	Ambient noise levels controlled by M5 traffic (54/55 dB(A)) from NW to NNE. Trucks were clearly distinguishable at times on the M5 (up to 60 dB(A)), also peaks are from motorbikes, but generally it is controlled by constant traffic noise. Occasional train movement faintly audible. Other noise sources contributed such as birds and frogs, and distant dogs to the south, and some activities in nearby residence. No noise audible from direction of warehouses.	No
M3	31 Martindale Court, Wattle Grove	52	35	7/09/2020 7:17am to 7:31am	69	61	54	52	Note 1	Note 1	Ambient noise environment dominated by noise from Road traffic from north west: Road traffic 54-55dB(A), Dog barking 64-69 dB(A)	No
Wattle Grove North												
M4	39 Glenelg Court, Wattle Grove North	52	35	7/09/2020 6:53am 7:08am	79	76	68	54	Note 1	Note 1	Ambient noise environment dominated by noise from Anzac Rd: Road traffic 79-80dB(A), Bird 60-62dB(A), Moorebank Ave traffic 54-55 dB(A)	No
Casula												
M5	St Andrews Park, Casula	52	35	7/09/2020 5:28am 05:45am	78	75	60	50	Note 1	Note 1	Ambient noise environment dominated by noise from M5 Motorway: Road traffic 50-51, Rail traffic 75-78dB(A), Bird 66-67 dB(A)	No
M6	14 Dunmore Crescent, Casula (NMT 04 permanent noise monitor)	52	35	7/09/2020 5:53am to 6:09am	69	56	51	49	Note 1	Note 1	Ambient noise environment dominated by noise from M5 Motorway: Road traffic 49-50dB(A), Rail traffic 53-54dB(A), Birds 68-69 dBA	No
Glenfield												
M7	26 Goodenough St, Glenfield	52	35	7/09/2020 6:23am to 6:38am	67	59	56	54	Note 1	Note 1	Ambient noise environment dominated by noise from Cambridge Ave: Road traffic 53-55dB(A), Bird 55-67dB(A), Dog barking 59-60 dB(A), Rail traffic 59-60 dB(A)	No

Notes: 1: Since noise levels from the MLP were not audible during the measurement period, it was not possible to estimate the MLP noise contribution

3.4 On-site attended operational activity noise measurement results

Attended noise measurements of individual operational items and typical operations were undertaken at ATS on 16 September 2020, in order to quantify the noise emissions from noise-generating operational activities. These noise levels have been used to assist in establishing the source noise levels in the noise model.

During all measurements, the specific noise source being measured was the dominant noise source. Observations were made of the on-site operations, which have then been reviewed in conjunction with the video data to model 'reasonable' worst-case operational scenarios over the assessment periods. Critical on-site attended measurement results are summarised in Table 6.

Table 6 On-site attended measurement results

Activity noise sources	Date	Time	Measurement duration (t), sec	Measurement distance, m	Measured noise levels, dB(A)	
					L _{Aeq(t)}	L _{AFmax}
Truck						
Truck pass-by	16/9/2020	5:55am	10	10	65	69
Truck Idling	16/9/2020	5:56am	20	5	67	67
Truck reversing beeper	16/9/2020	5:23am	16	38	55	59
Air brake release (container delivery truck)	7/9/2020	1:27pm	5	12	84	87
Combi-lift ¹						
Grabbing & dropping sound	7/9/2020	7:19am	2	44	67	71
Engine revving	7/9/2020	7:19am	10	23	75	76
Engine	7/9/2020	7:20am	20	38	60	61
Reversing beeper	7/9/2020	7:19am	12	23	71	74
Loading						
Loading & unloading activity	16/9/2020	6:06am	13	22	62	80
Forklift						
Forklift pass-by	16/9/2020	5:50am	10	8	66	70
Internal warehouse noise levels (noise breakout)						
Internal noise sources at loading dock door (radio, internal forklift operation)	16/9/2020	7:20am	900	At loading dock doorway	67	82
Mechanical plant						
Warehouse smoke exhaust fan ²	16/9/2020	7:51am	15	11	62	62
Air condenser unit	16/9/2020	5:23am	60	1	55	56

Notes:

1. Same Combi-lift is used for the container handling at the ATS warehouse as that used at the Target warehouse. Attended measurement of the Target container handling area on the 7 September 2020 have been used for determining sound power levels.
2. Internal noise levels within the ATS warehouse meant that fan noise levels were not audible or quantifiable from accessible locations, and so fan noise levels are based upon Internal noise measurement undertaken at ATS Building Products warehouse, 16 September 2020.

3.5 Unattended noise measurements

Unattended noise measurements were undertaken over the period between 2 September and 15 September 2020 at a location adjacent to the ATS north warehouse (refer to Figure 3) and the period between 7 September and 15 September 2020 at a location of container terminal adjacent to the ATS south warehouse (refer to Figure 4). Two main areas of noise-generating operations were identified across the warehouse site, one on the northern side of the warehouse and one the southern side. These are shown in Figure 5.

The location of the unattended noise loggers is shown in Figure 5. These were selected so that they would capture noise from the main noise-generating areas as part of the typical warehouse operations. Camera units were setup as shown in Figure 5 at the noise logger location at ATS north, and the eastern boundary fence at ATS south, to assist the engineers in gaining a comprehensive understanding of the site operations and truck movements.

The purpose of the noise logging at the selected locations was for the following:

- Determine the noise emissions from the facility at a fixed location close enough to quantify on-site sources;
- Determine the long-term background noise levels when operations were not taking place at the site;
- A source for analysis to determine duration and nature of the different on-site activities through correlation with the facility activity data;
- Source of validation for the noise model calibration process.

Detailed unattended noise monitoring results are provided in APPENDIX B for ATS North and APPENDIX C for ATS South. The noise model was validated using the unattended noise logger results, refer to Section 3.7 for noise model calibration.

Figure 3 ATS South Unattended Noise Measurement Setup

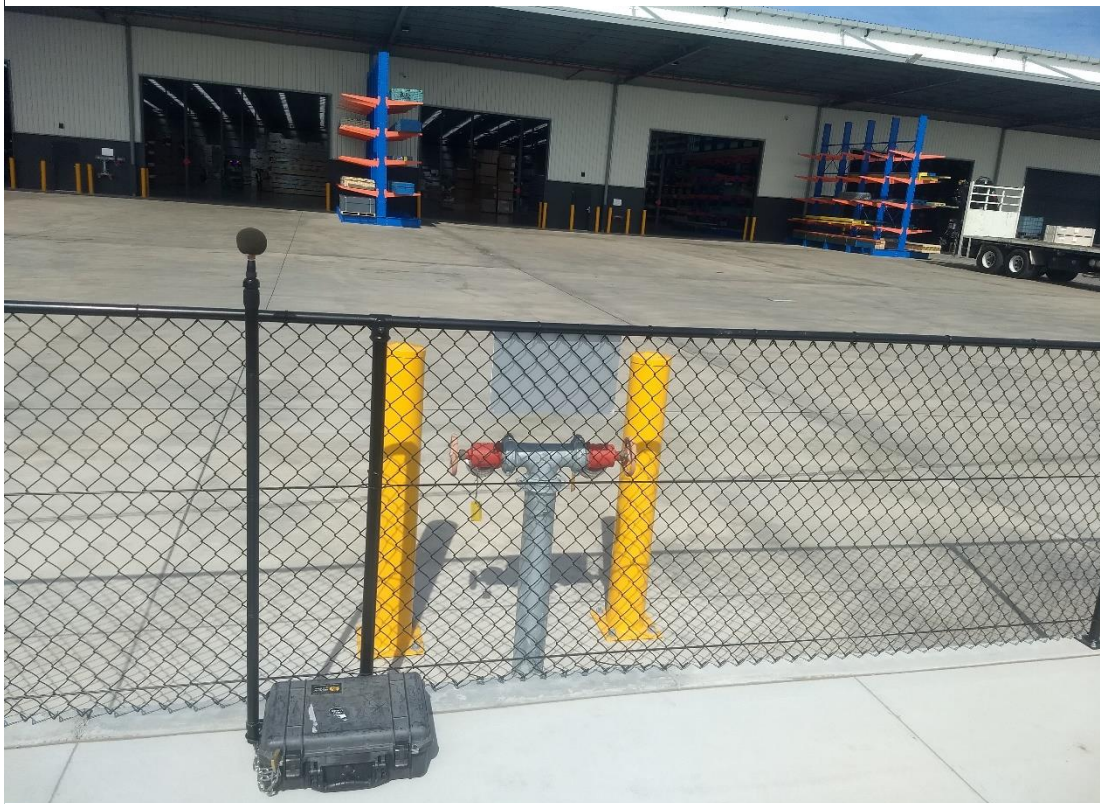
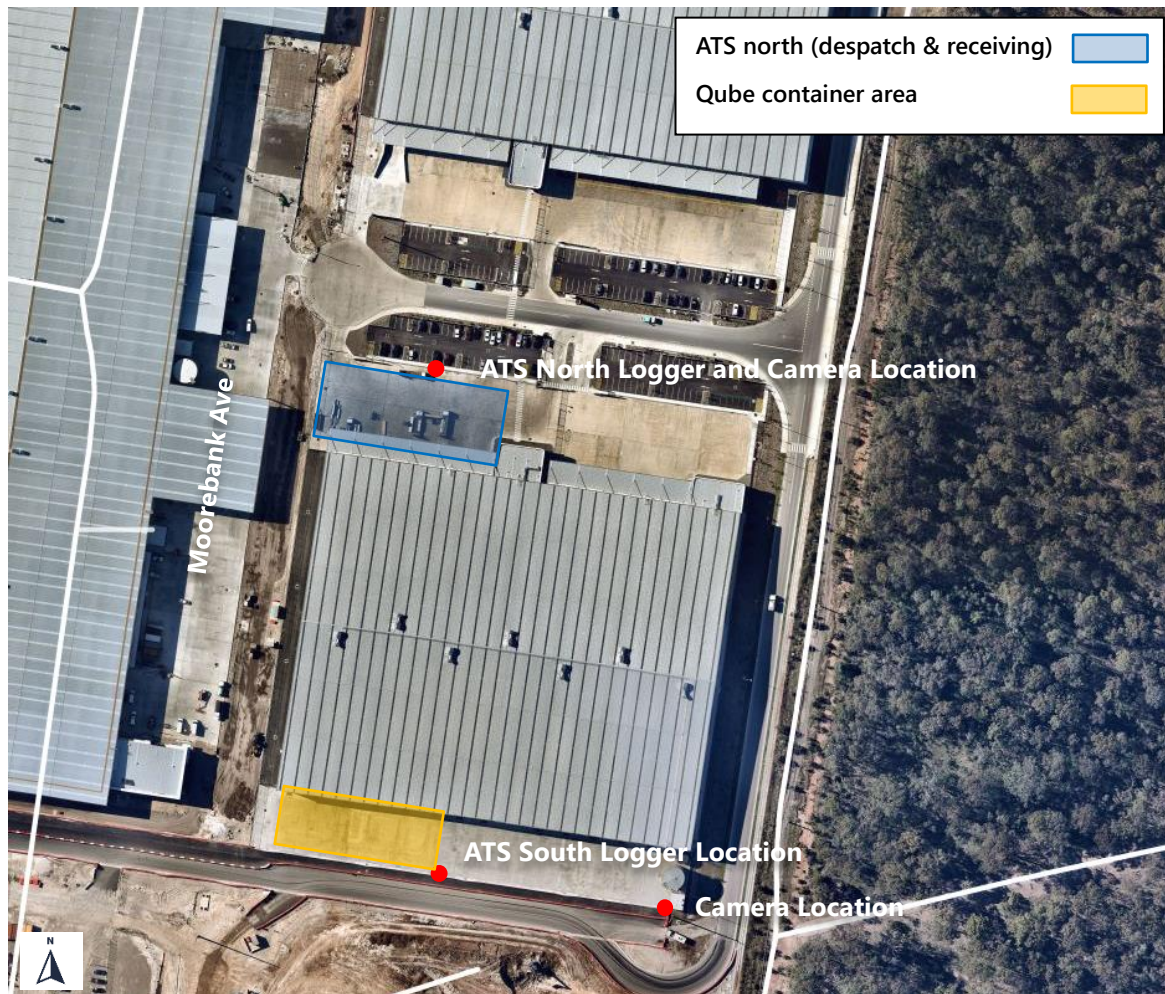


Figure 4 ATS North Unattended Noise Measurement Setup



Figure 5 Unattended noise logger locations and main noise generation areas (imagery: Nearmap, 2020)

MLP operates four continuous noise monitoring stations located in the surrounding residential noise catchment areas, as per Section 4.1.2 of the MPE ONVMP. However, following the attended noise measurements presented in Section 3.3, which found that the warehouse noise emissions were not audible at the nearby residential receivers locations, further analysis of the data from the continuous noise monitoring stations were not undertaken as it would not assist further in this compliance assessment.

3.6 Modelled operational scenarios

3.6.1 Observed operations for modelling

Based upon the on-site attended measurements presented in Section 3.4, the video recording for the facility undertaken for the duration of the unattended monitoring period presented in Section 3.5, and discussions with ATS personnel, 'reasonable' worst-case operational scenarios were established and modelled to satisfy the assessment periods under SSD 7628.

The following section details the key observations of each of the noise-generating activities that take place across the warehouse operations.

3.6.1.1 Truck and despatching operations (ATS north)

The following data on truck operations was obtained from the site observations during the attended noise measurements, and in addition to the unattended noise measurements/concurrent video recordings that were undertaken between 10 September and 12 September 2020.

- It was observed and confirmed by video data, that truck operations were typically crane trucks, and that a typical 'in-and-out' cycle time in the facility was on median 30 minutes, with each loading and unloading cycle taking approximately 30-45 minutes to be fully loaded with building materials.
- ATS trucks are parked inside the warehouse the night prior. The noise intensive period for truck loading activities was typically between 5:30am to 6:30am at ATS north, and then trucks leave the facility after being loaded with materials.
- The maximum number of trucks being loaded with forklift are two simultaneously within the ATS dispatching area, which was confirmed through analysis of the video data and on-site attended measurement. As such, the reasonable worst-case would be two loading events concurrently.

3.6.1.2 Qube container handling operational area

- It was observed that one combi-lift is in use to move containers "in and out" of the ATS terminal at the Qube container handling operational area. From the video data, it was observed that the combi-lift operate could operate continuously throughout a 15-minute period when handling containers.
- Impact noise events associated with grabbing and dropping would occur when the combi-lift gripper contact individual containers as part of handling operations. This sound power level is adopted in the modelling for the sleep disturbance calculations.
- Tonal reversing beepers is used when a combi-lift is undertaking container handling activities.
- Movements of containers within the Qube area can occur throughout the day and night-time period depending upon train arrivals. It was observed from the video data that eleven container movements were recorded within the daytime period over the period between 7 September and 16 September 2020
- Two container movements were observed during the night-time period between 7 September and 16 September 2020. This indicates that night-time container operations at ATS south are not a typical operational scenario, and so this is not incorporated into the 'reasonable' worst-case operational scenario.

3.6.2 Assessment noise source levels

Source levels for the key noise-generating activities on-site have been based on the attended noise measurements (Section 3.4) and unattended noise measurements (Section 3.5) during periods of typical operation. The sound power level inputs presented in Table 7 were used in the operational noise compliance modelling, and adjusted for the duration and frequency of operations (Section 3.6.3).

Table 7 Assessment noise source levels

Site items / operation	Individual activity sound power level (SWL) (L_{Aeq}), dB(A)
ATS North	
Trucks accelerating on site	101
Trucks idling on site/no engine load movement	72
Trucks reversing beeper	86
Truck (container delivery) airbrake event (L_{Amax})	117
Forklift operations	96
Forklift operations (L_{Amax})	111
Loading operations (L_{Amax})	115
ATS South	
Container combi-lift (moving container activity)	103
Container gripping & drop (L_{Amax})	114
Internal noise breakout	
Internal activities noise (breakout via warehouse doors)	67 L_{Aeq} internal sound pressure level
Mechanical Plant	
Warehouse air smoke exhaust fan ¹	90
Air condenser unit (warehouse façade north)	69

Notes:

1. Based upon internal noise measurement undertaken at ATS Building Products warehouse, 16 September 2020.

3.6.3 Reasonable worst-case intrusiveness scenarios (15-minute period)

As the noise limits in CoC B80 are set at 35 dB(A) L_{Aeq} 15 minute for the day, evening and night periods, specific separation of noise intensive periods for each of these time periods has not been undertaken. Instead, it is noted that there are three main areas of noise generation as part of typical warehouse operations, as presented in Figure 5.

In order to assess the operational noise emissions from the warehouse, the 'reasonable' worst-case operations for the three main areas of noise generation have been developed, along with the corresponding activities in the other noise-generating areas, in order to review a representative snapshot of activities from the warehouse operations. Each of the assessment scenarios have been developed from an analysis of the video movement data over during the one-week period, in addition to the information detailed in Section 3.6.1.

As activities at ATS North can occur prior to 6:00am, a representative scenario has been selected to assess a 'reasonable' worst-case scenario prior to 7:00am (night-time period). The most noise intensive activities for ATS north during the night period are the morning preparation and despatch activities which occur around the 6:00am period. The Qube container operational area at ATS is most active during daytime period after 7:00am. These two sets of activities represent the 'reasonable' worst-case operations for the two main areas of noise generation, and have been modelled to assess operational noise emissions. Table 8 provides the details of these two 'reasonable' worst-case scenarios (15-minute period).

All significant noise-generating equipment has been included the assessment modelling, in addition to the key noise-generating mechanical plant as required by CoC B85. The noise contribution from the mechanical plant items serving the warehouse and office area are included in the modelling, however, noise emissions from the site was generally controlled by other on-site activities such as truck departures, arrivals, loading and unloading activities.

Table 8 Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios

Activity	ATS North 15-minute assessment period	ATS South 15-minute assessment period (Qube container area)
ATS North 15-minute noise intensive period (Morning peak – typically 5:30am to 6:30am)		
Departure	Five crane truck departures from ATS north dispatching area	No activity
Arrival	Two crane trucks arrive and move into the warehouse via dock 1	No activity
Operation	Two crane trucks being loaded concurrently outside of the warehouse with two forklifts.	No activity
ATS South 15-minute noise intensive period (Daytime period with container handling taking place)		
Departure	No activity	One container truck departs
Arrival	No activity	One container truck and one combi-lift
Operation	External loading activities: a) Two trucks being loaded with two forklifts Noise breakout via open warehouse doors: b) Forklifts collecting goods are occurring inside the warehouse with warehouse doors open.	Container operations: a) Moving new containers into ATS warehouse site b) Removing container from ATS warehouse site onto container truck
Mechanical Plant		
	a) Roof top exhaust fan (4 fans) b) Warehouse Air condenser (8 units)	

3.7 Modelling methodology

3.7.1 Overview of noise modelling

Since noise levels from the warehouse operations were not audible at the nearest residential receivers, and it was not possible to directly measure or estimate the warehouse noise contribution directly,

computer noise modelling was used to calculate the operational noise levels from warehouse operations at the nearby noise sensitive receivers.

3.7.2 General modelling assumptions

Modelling and assessment of warehouse noise emissions was determined by modelling the noise sources, receiver locations, existing built structures and topographical features, using CadnaA (version 2020).

The modelling incorporated the worst-case prevailing meteorological conditions, as required by CoC B80, which are wind speeds of up to 3 m/s at 10 metres above ground level or stability category 'F' temperature inversion conditions.

The noise predictions are based on the CONCAWE noise prediction algorithms, noting that the nearby noise sensitive receivers are greater 100 metres from the site (except for MPW). The CONCAWE environmental noise prediction method is an appropriate method for predicting the noise propagation in these circumstances.

The noise prediction model considers:

- Location of noise sources on-site sensitive receiver locations
- Height of sources and receivers referenced to digital ground contours within the site and outside the site area
- Noise source levels of individual plant, equipment and internal building noise levels, modelled as either point, line or area noise sources. All noise sources associated with the ATS operations within the MPE boundary have been included in the noise modelling, including the truck movements outside of the WH4B ATS warehouse footprint, along internal MPE roads.
- Separation distances between sources and receivers
- Ground type between sources and receivers (mixed soft/ hard)
- Attenuation from buildings and built structures and topography (natural and purpose built)
- Atmospheric losses and assessment meteorological conditions.

The modelled activities and assumptions for the duration and frequency that the equipment operate as part of the 'reasonable' worst-case operational scenarios are described in Section 3.6.3.

3.7.3 Model validation

Following the development of each of the modelling scenarios, the noise model outputs were compared with the unattended noise measurement results for a period equivalent to the reasonable worst-case operational scenario. Validation of the reasonable worst-case on-site activities was

undertaken to check the final modelling inputs against a representative period, with the results of this process presented in Table 9.

Table 9 Comparison between measured and modelled noise levels

Time period	Logger	Measured noise levels L _{Aeq,15minute} (dB(A))	Predicted noise levels L _{Aeq,15minute} (dB(A))	Difference, dB(A)
5:55am to 6:10am 11 September 2020	ATS North	64	62	2
1:15pm to 1:30pm 7 September 2020	ATS South (Qube container handling area)	70	68	2

The differences between the modelled and the measured noise levels are the result of the following:

- For ATS North, the modelled levels for loading and unloading activities assumed that activities could be undertaken anywhere across the external hardstand. As such, the noise model has distributed this activity across this area. Actual operations would occur at specific loading docks with varying durations, which would change throughout the day. Modelled levels were based on worst-case average sound power levels of measured activities in this area. Differences between the specific locations and duration of activities during the comparison period is the likely reason for the differences between the measured and modelled levels. Similar minor differences resulted from assumed locations and durations of forklift operations.
- For ATS South, the modelled container handling and combi-lift levels assumed activities were assumed to generally occur in the middle of the container handling area, as any loading dock could be used as part of operations. During handling activities, containers could be placed at any loading dock or shifted between them. Differences between the specific locations and duration of activities (ie. truck movement close to logger) during the comparison period is the likely reason for the differences between the measured and modelled levels.

The results from the validation of the model demonstrates that it is suitable for determining the compliance noise levels for this assessment.

3.8 Noise compliance assessment

Predicted operational compliance noise levels are presented in Table 10 for each of the two compliance assessment scenarios. The noise levels have been predicted to each of the surrounding residential receiver noise catchments, and the highest residential receiver noise level in each catchment area is the reported level in Table 10. It should be noted that this is not necessarily the same receiver location for each assessment scenario.

These noise levels represent the reasonable worst-case intrusiveness operational scenarios (15-minute period) from typical operations of the warehouse. The results in Table 10 show that the predicted noise levels for both the L_{Aeq} (15-minute) and L_{A1} (1-minute) assessments comply with the overall operational noise limits presented in Table 2.

Table 10 Predicted noise levels - Reasonable worst-case scenarios for warehouse (ATS)

Noise catchment area/ receiver location	L _{Aeq} (15-minute)		Compliance	L _{A1} (1-minute)		Compliance
	Noise limits	Predicted noise levels		Noise limits	Predicted noise levels	
ATS North 15-minute noise intensive period (Morning peak – typically 5:30am to 6:30am)						
Wattle Grove (NCA 1)	35	27	Yes	52	38	Yes
Wattle Grove North (NCA 2)	35	21	Yes	52	29	Yes
Casula (NCA 3)	35	21	Yes	52	28	Yes
Glenfield (NCA 4)	35	< 20	Yes	52	<20	Yes
All Saints Senior College (S1)	45 ¹	< 20	Yes	-	N/A	N/A
Casula Powerhouse (S2)	45 ¹	23	Yes	-	N/A	N/A
Defence Joint Logistics Unit (DJLU) (I2)	70 ¹	33	Yes	-	N/A	N/A
ABB (I3)	70 ¹	21	Yes	-	N/A	N/A
ATS South 15-minute noise intensive period (Daytime period with container handling taking place)						
Wattle Grove (NCA 1)	35	30	Yes	52	38 ²	Yes
Wattle Grove North (NCA 2)	35	< 20	Yes	52	29 ²	Yes
Casula (NCA 3)	35	20	Yes	52	28 ²	Yes
Glenfield (NCA 4)	35	< 20	Yes	52	<20 ²	Yes
All Saints Senior College (S1)	45 ¹	21	Yes	-	N/A	N/A
Casula Powerhouse (S2)	45 ¹	21	Yes	-	N/A	N/A
Defence Joint Logistics Unit (DJLU) (I2)	70 ¹	31	Yes	-	N/A	N/A
ABB (I3)	70 ¹	20	Yes	-	N/A	N/A

Notes;

1. Noise limits for these receivers are only applicable when the receiver is in use
2. Activities do not typically occur during the night period, but levels have been included for completeness.

4 Conclusion

The noise assessment has been undertaken to address the operational noise requirements for the ATS warehouse (WH4B) within the Moorebank Precinct East in accordance with the *Operational Noise and Vibration Management Plan, Moorebank Logistics Park – East Precinct* (dated 27 March 2019, Revision 12) (MPE ONVMP), more specifically to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628.

As part of the compliance noise assessment, a series of noise measurements were undertaken over a two week period. Unattended noise monitoring was undertaken at two locations near the ATS warehouse in September 2020. Attended noise measurements were also performed at the nearest residential receivers and in close proximity to the ATS warehouse site. The aim of the attended measurements was to quantify operational noise levels at the nearby residential receivers and to confirm operational noise sources levels on site.

Attended noise measurements were undertaken on 7 September 2020 to determine if noise levels from warehouse operations were audible and quantifiable at nearby receivers. These measurements identified that the existing ambient noise levels were too high for direct quantification or estimation of operational noise emissions from the warehouse operations. For this reason, guidance from the NSW EPA Noise Policy for Industry (NPfI) Chapter 7 has been followed in order to compare the site noise emissions with the noise limits.

Noise emissions from the warehouse facility operations have been evaluated using a combination of the on-site attended and unattended noise monitoring, combined with noise modelling.

Two 'reasonable' worst-case assessment scenarios were established based upon on site unattended noise monitoring and video recording over the monitoring period, in addition to discussions with ATS personnel and observations made during on-site attended noise measurements. These were developed to capture the 'reasonable' worst-case operations for the two main areas of noise generation on the site. On the north side, this occurred prior to 7:00am as part of the morning preparation and despatch activities, while on the south side this was container handling activities that typically occurred during the daytime period after 7:00am.

All significant noise-generating equipment was included the assessment noise modelling, in addition to the key noise-generating mechanical plant as required by CoC B85. The noise contribution from the mechanical plant items serving the warehouse and office area are included in the modelling, however, noise emissions from the site was generally controlled by other on-site activities such as truck departures, arrivals, loading and unloading activities.

Using the calibrated noise model, noise levels were predicted to all nearby noise sensitive receiver locations, including the residential receivers in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. Noise levels were assessed assuming the worst-case prevailing meteorological conditions were present, as required by CoC B80.

The outcome of the compliance noise monitoring and modelling demonstrated that the mechanical plant and other noisy equipment that operate as part of the ATS warehouse operations achieve the noise limits presented SSD 7628 CoC B80, which is consistent with the noise emission review undertaken prior to construction to satisfy CoC B84.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).																																								
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.																																								
Assessment period	The period in a day over which assessments are made.																																								
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.																																								
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).																																								
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment: <table><tr><td rowspan="2">threshold of hearing</td><td>0 dB</td><td>The faintest sound we can hear</td></tr><tr><td>10 dB</td><td>Human breathing</td></tr><tr><td rowspan="2">almost silent</td><td>20 dB</td><td></td></tr><tr><td>30 dB</td><td>Quiet bedroom or in a quiet national park location</td></tr><tr><td rowspan="2">generally quiet</td><td>40 dB</td><td>Library</td></tr><tr><td>50 dB</td><td>Typical office space or ambience in the city at night</td></tr><tr><td rowspan="2">moderately loud</td><td>60 dB</td><td>CBD mall at lunch time</td></tr><tr><td>70 dB</td><td>The sound of a car passing on the street</td></tr><tr><td rowspan="2">loud</td><td>80 dB</td><td>Loud music played at home</td></tr><tr><td>90 dB</td><td>The sound of a truck passing on the street</td></tr><tr><td rowspan="2">very loud</td><td>100 dB</td><td>Indoor rock band concert</td></tr><tr><td>110 dB</td><td>Operating a chainsaw or jackhammer</td></tr><tr><td rowspan="2">extremely loud</td><td>120 dB</td><td>Jet plane take-off at 100m away</td></tr><tr><td>130 dB</td><td></td></tr><tr><td>threshold of pain</td><td>140 dB</td><td>Military jet take-off at 25m away</td></tr></table>			threshold of hearing	0 dB	The faintest sound we can hear	10 dB	Human breathing	almost silent	20 dB		30 dB	Quiet bedroom or in a quiet national park location	generally quiet	40 dB	Library	50 dB	Typical office space or ambience in the city at night	moderately loud	60 dB	CBD mall at lunch time	70 dB	The sound of a car passing on the street	loud	80 dB	Loud music played at home	90 dB	The sound of a truck passing on the street	very loud	100 dB	Indoor rock band concert	110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away	130 dB		threshold of pain	140 dB	Military jet take-off at 25m away
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dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.																																								
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.																																								

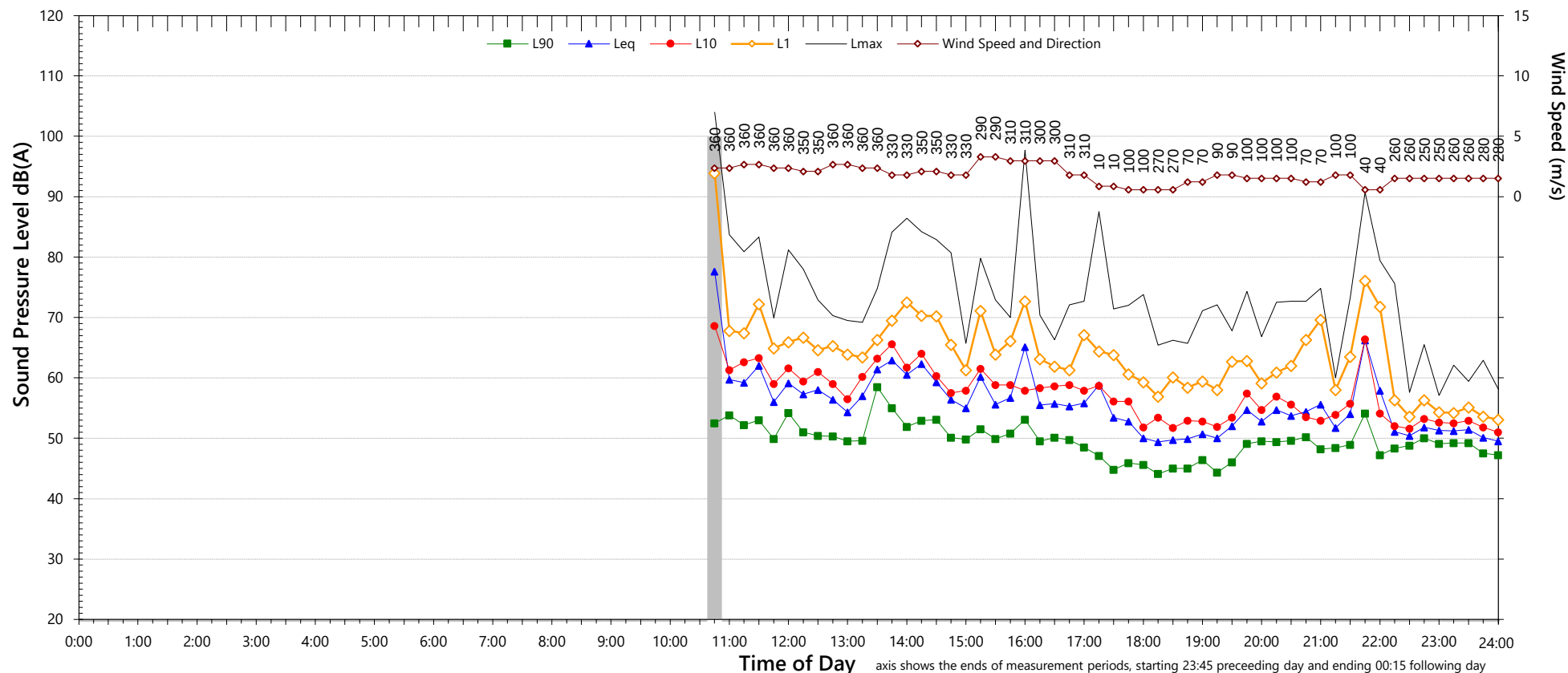
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L _{eq} sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B **Logger location 1 – ATS - North side**

Unattended Noise Monitoring Results

ATS North

Wednesday, 2 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	45	45
LA _{eq}	-	57	56

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	66	to	84
L _{Max} - L _{eq} (Range)	15	to	24

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	61	58
L _{eq} 1hr upper 10 percentile	64	64
L _{eq} 1hr lower 10 percentile	55	51

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

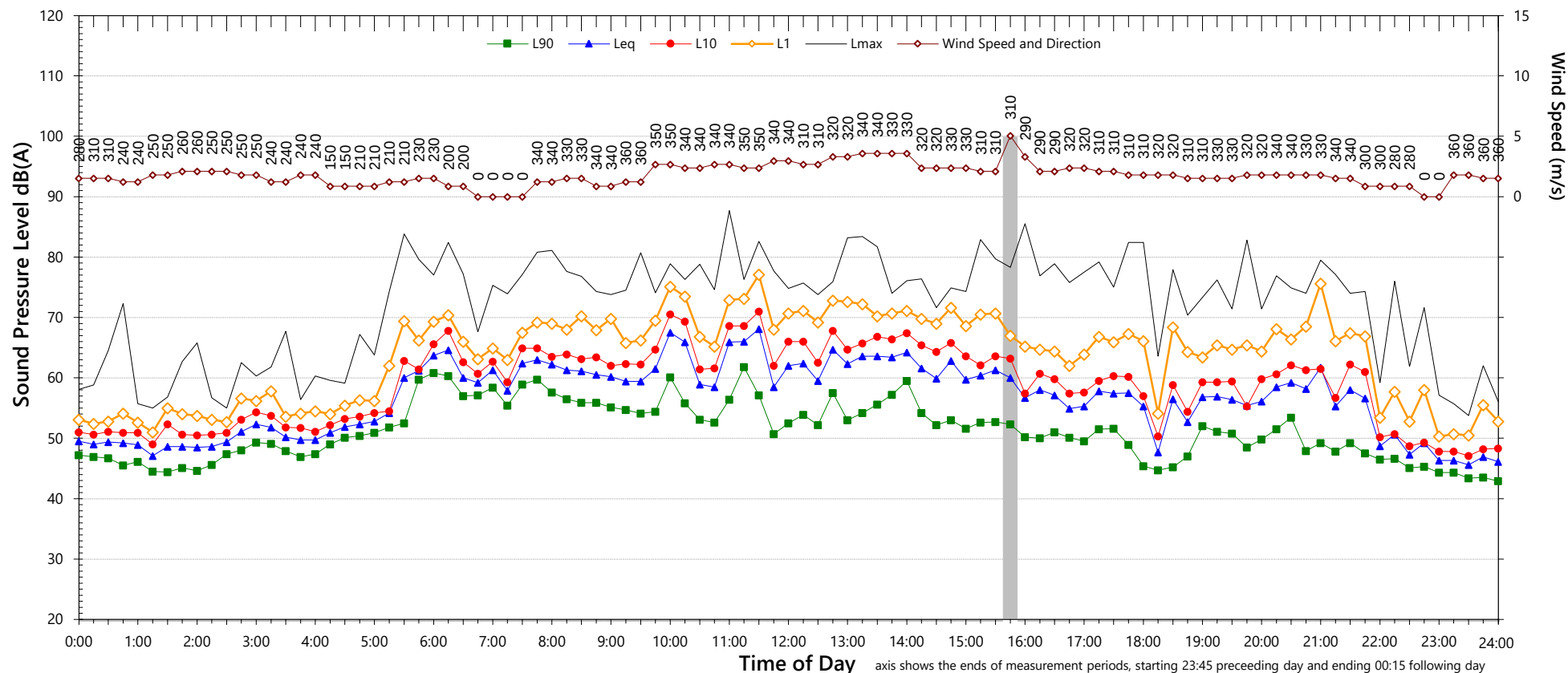
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Thursday, 3 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	50	46	43
L _{Aeq}	62	57	55

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	67	to	92
L _{Max} - L _{eq} (Range)	15	to	32

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	64	57
L _{eq} 1hr upper 10 percentile	66	62
L _{eq} 1hr lower 10 percentile	58	49

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

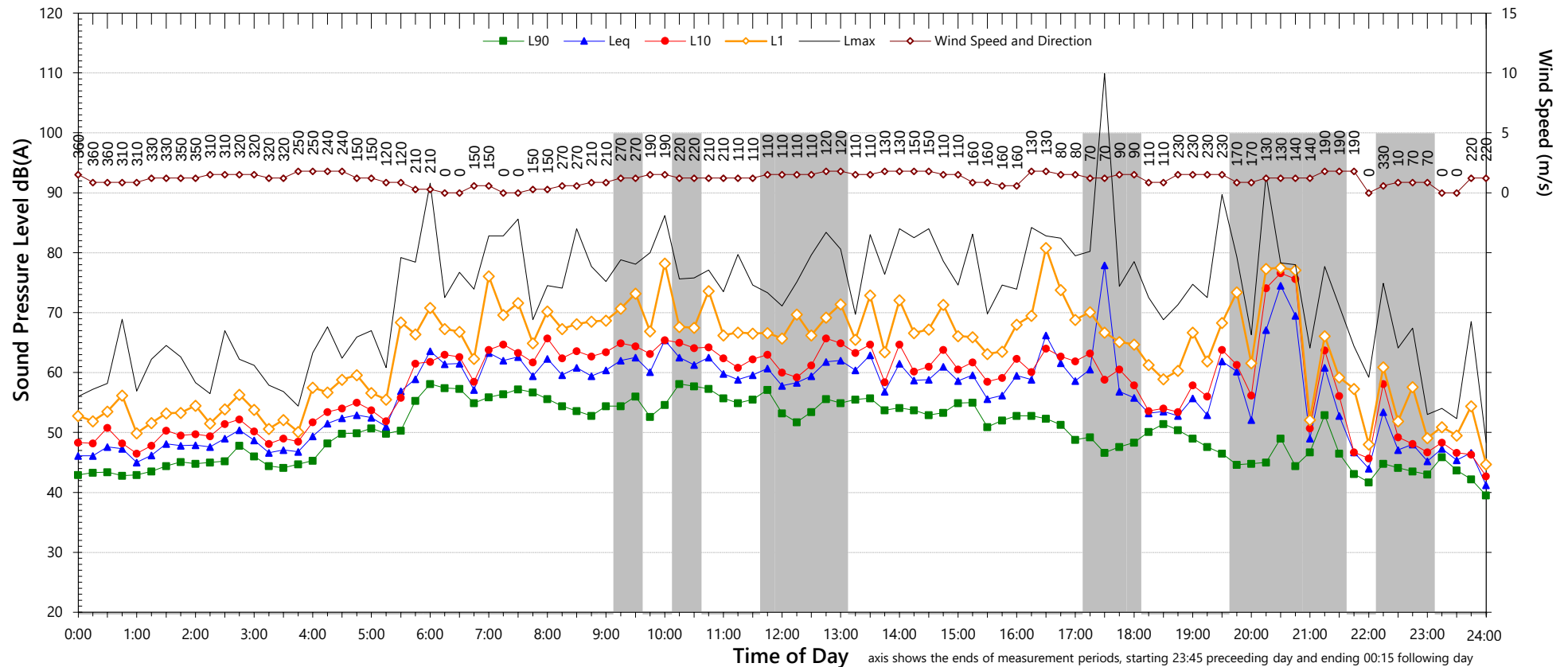
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Friday, 4 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	-	35
LA _{eq}	-	-	50

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	66	to	88
L _{Max} - L _{eq} (Range)	17	to	30

Notes:

- Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
- "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
- "Evening" is the period from 6pm till 10pm
- "Night" relates to the remaining periods
- "Night" relates to period from 10pm on this graph to morning on the following graph.
- Graphed data measured in free-field; tabulated results facade corrected
- Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)
- Meteorological data has been sourced from the nearest Bureau of Meteorology station (Horsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

Logger Graphs ATS North (r0)

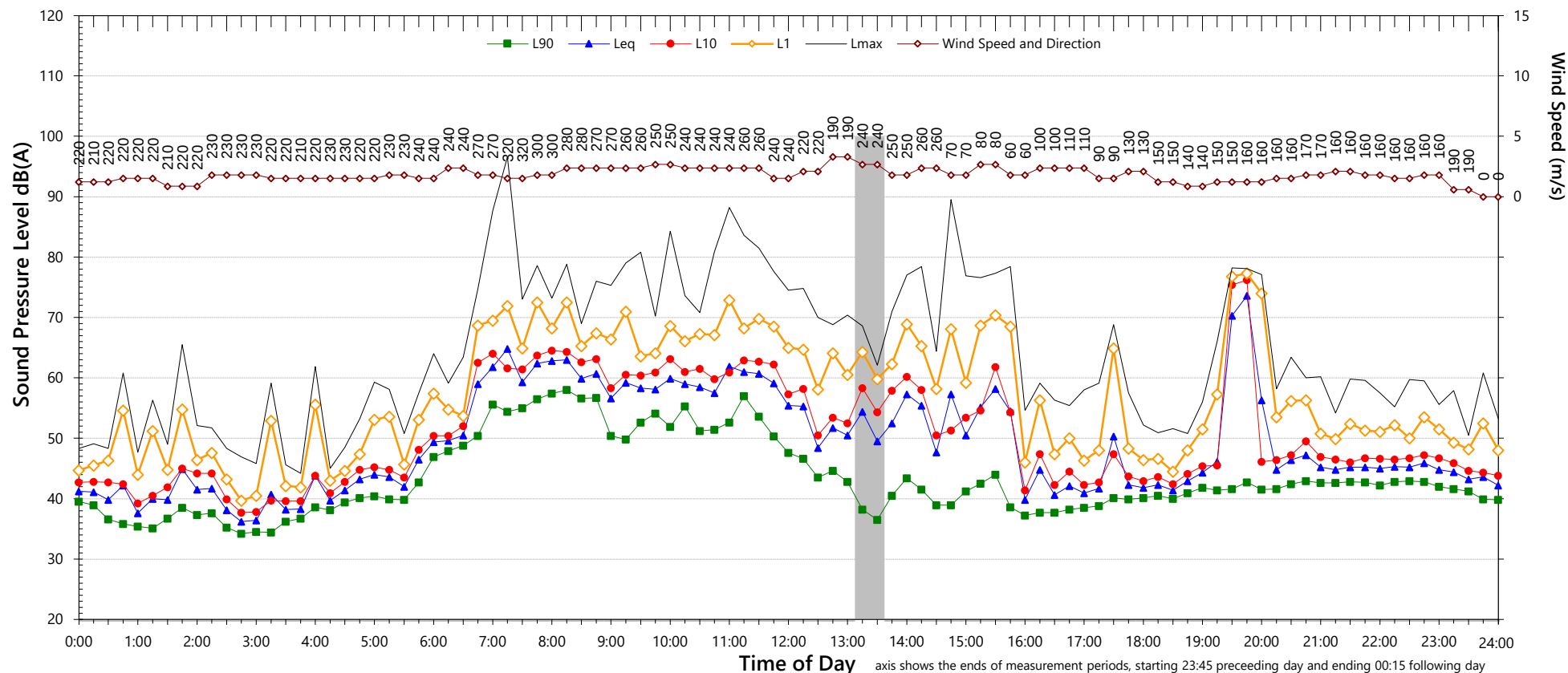
NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	63	52
L _{eq} 1hr upper 10 percentile	65	52
L _{eq} 1hr lower 10 percentile	57	42

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Saturday, 5 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	39	41	38
LA _{eq}	58	63	44

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	66	to	67
L _{Max} - L _{eq} (Range)	16	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	63	46
L _{eq} 1hr upper 10 percentile	64	48
L _{eq} 1hr lower 10 percentile	46	44

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

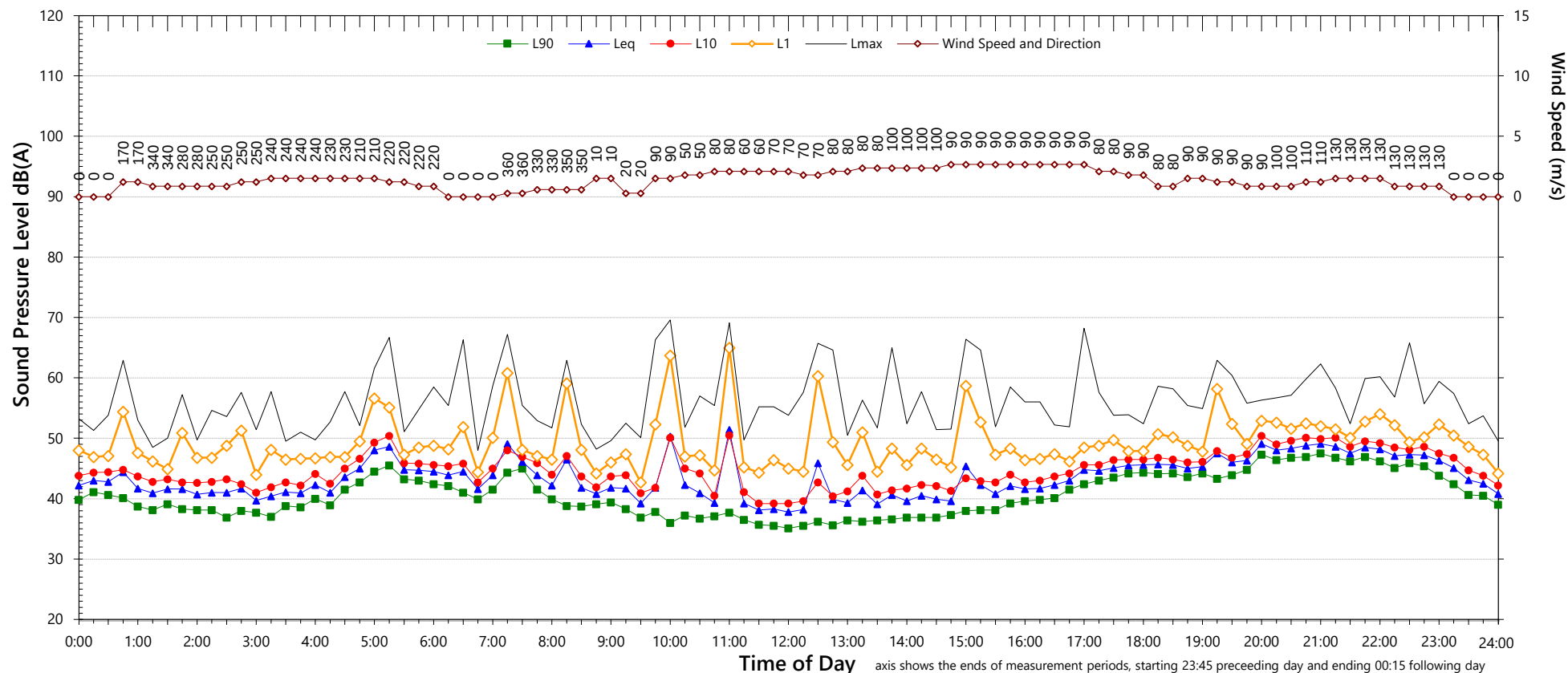
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Sunday, 6 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	36	44	38
L _{Aeq}	43	48	53

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	66	to	79
L _{Max} - L _{eq} (Range)	16	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	48	55
L _{eq} 1hr upper 10 percentile	50	61
L _{eq} 1hr lower 10 percentile	43	43

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

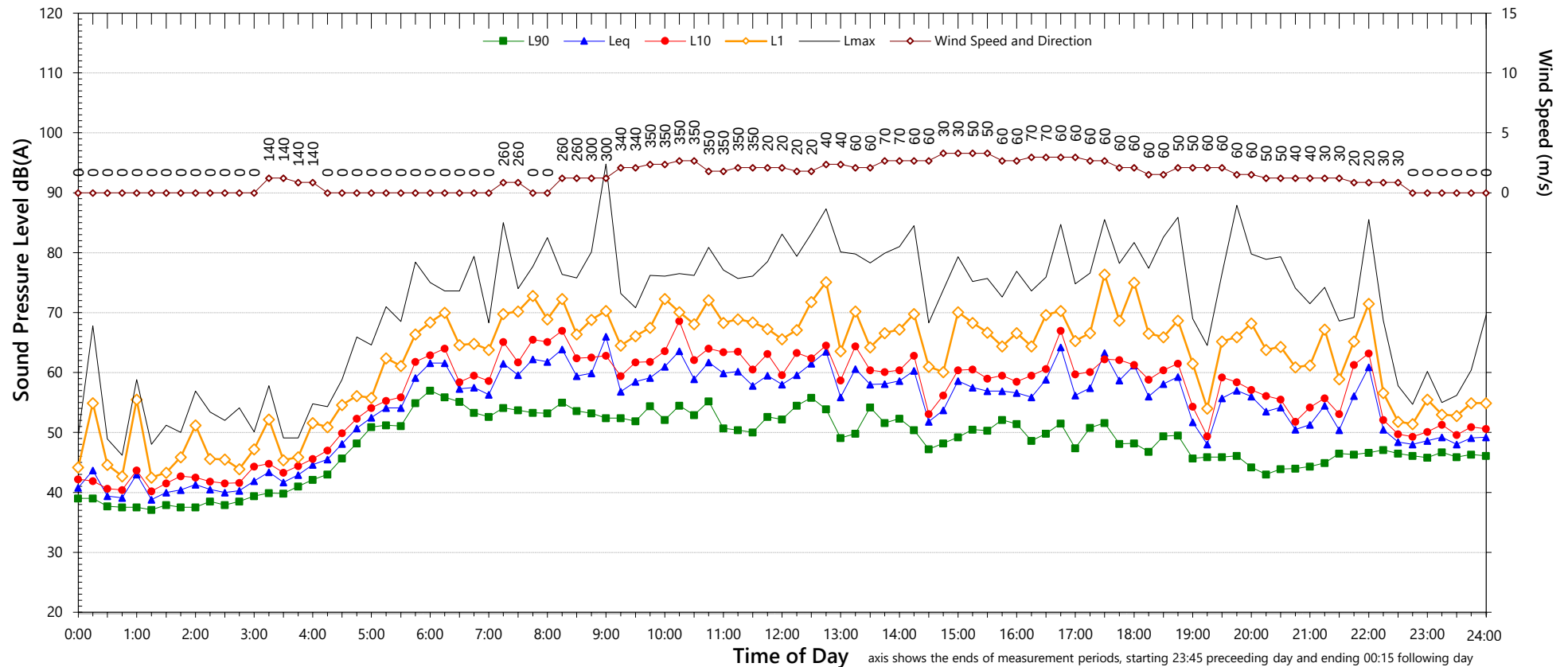
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Monday, 7 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	48	44	44
LA _{eq}	60	56	55

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	65	to	89
L _{Max} - L _{eq} (Range)	16	to	28

Notes:

- Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
- "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
- "Evening" is the period from 6pm till 10pm
- "Night" relates to the remaining periods
- "Night" relates to period from 10pm on this graph to morning on the following graph.
- Graphed data measured in free-field; tabulated results facade corrected
- Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)
- Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

Logger Graphs ATS North (r0)

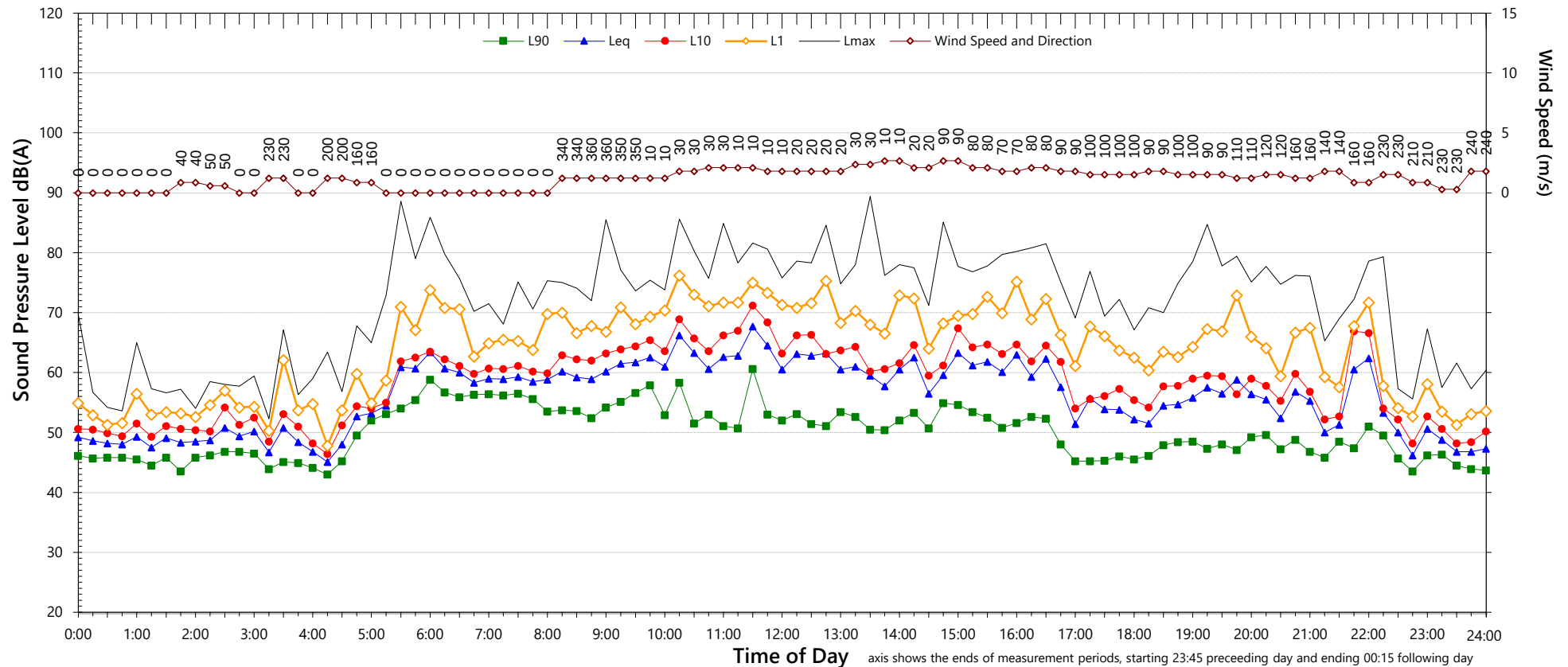
NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	62	57
L _{eq} 1hr upper 10 percentile	64	62
L _{eq} 1hr lower 10 percentile	58	51

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Tuesday, 8 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	47	46	37
LA _{eq}	61	57	54

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	66	to	81
L _{Max} - L _{eq} (Range)	18	to	29

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	63	57
L _{eq} 1hr upper 10 percentile	66	62
L _{eq} 1hr lower 10 percentile	57	44

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

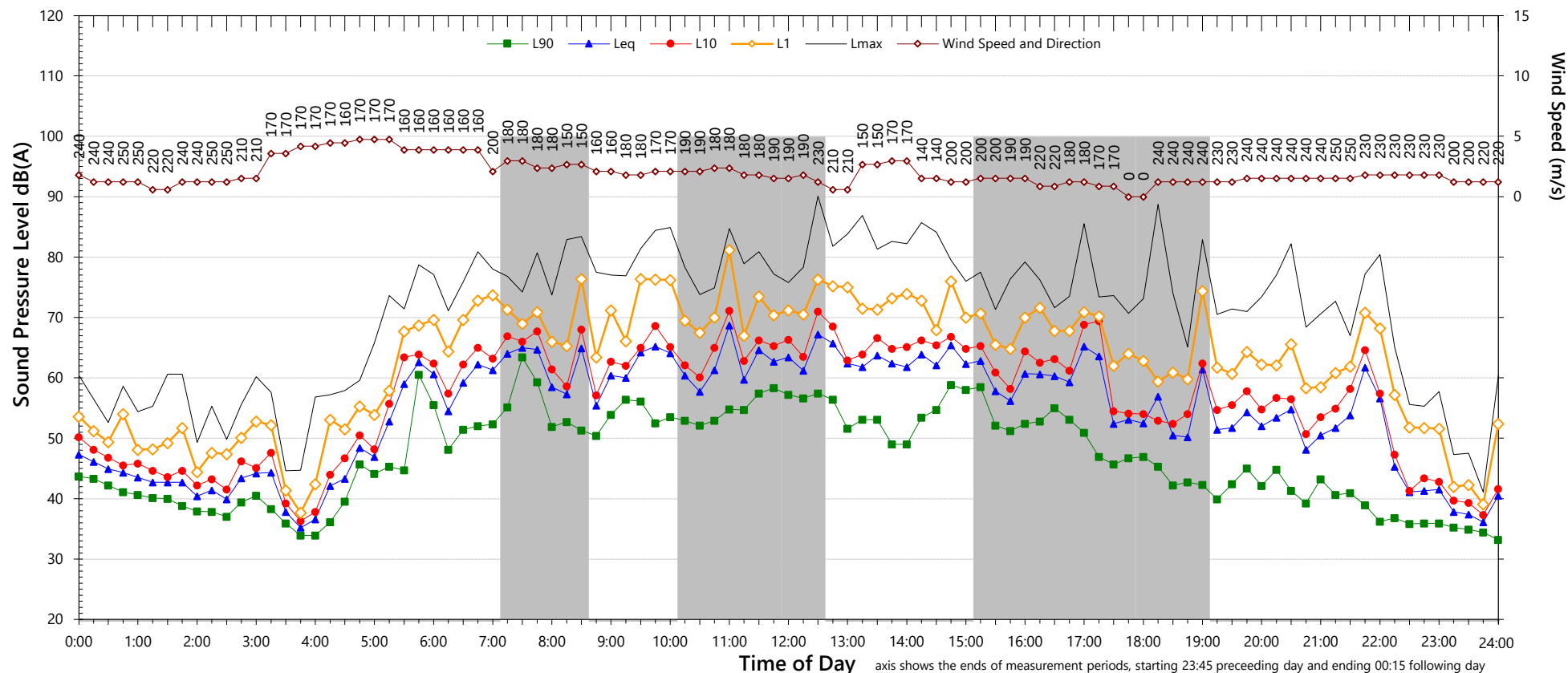
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Wednesday, 9 September 2020



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	-	33
LA _{eq}	-	-	64

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	65	to	110
L _{Max} - L _{eq} (Range)	15	to	37

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)

Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	64	66
L _{eq} 1hr upper 10 percentile	66	66
L _{eq} 1hr lower 10 percentile	55	40

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

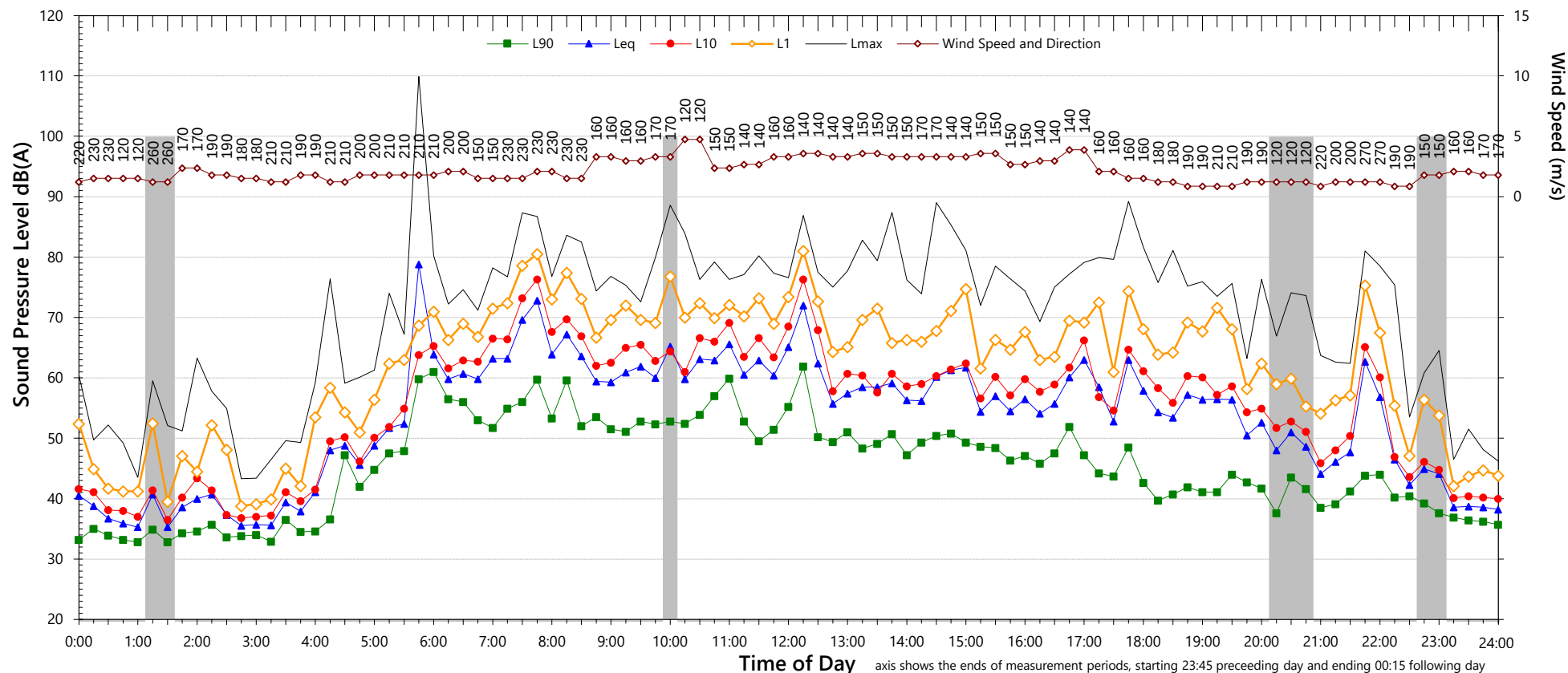
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Thursday, 10 September 2020



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	46	-	36
L _{Aeq}	63	-	57

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	67	to	82
L _{Max} - L _{eq} (Range)	18	to	31

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade)

(see note 6)

Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	65	59
L _{eq} 1hr upper 10 percentile	68	64
L _{eq} 1hr lower 10 percentile	58	42

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

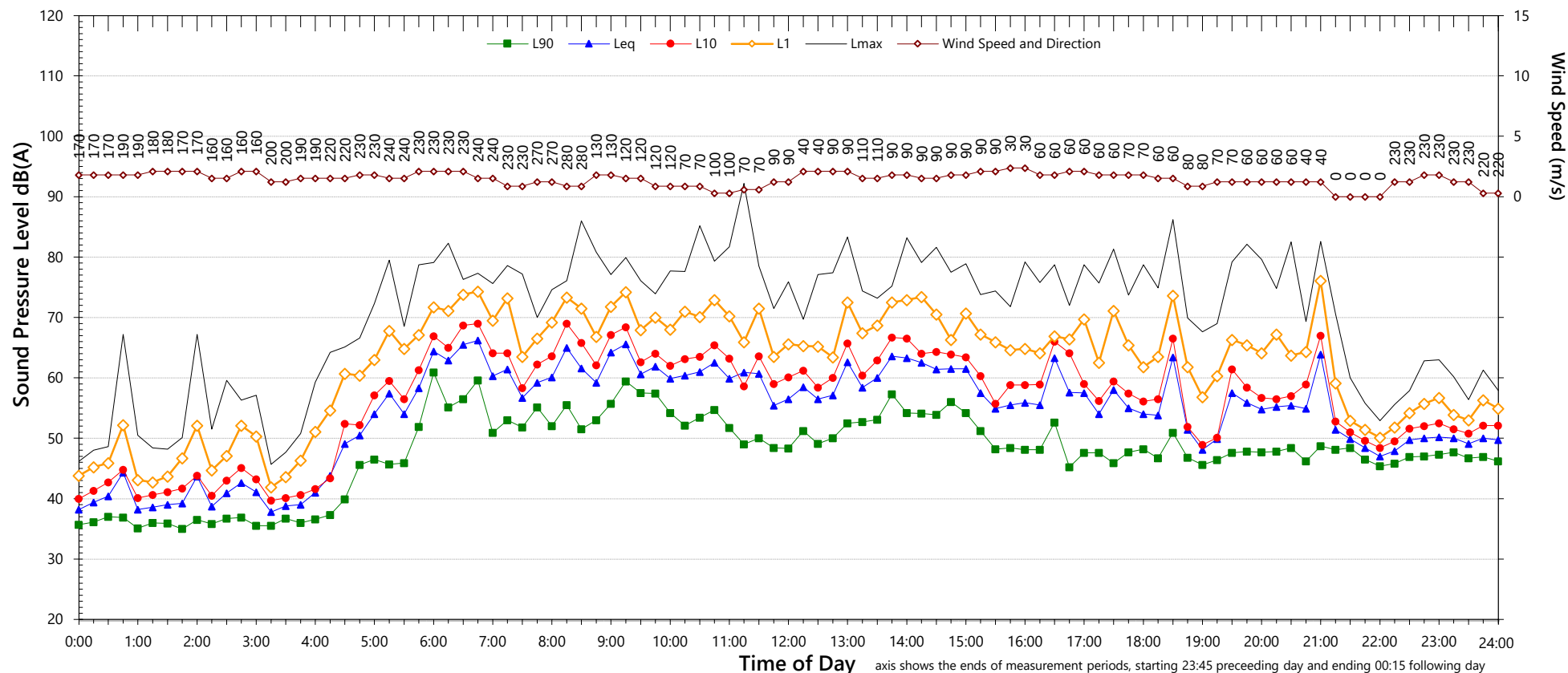
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Friday, 11 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	48	46	43
LA _{eq}	61	57	51

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	66	to	82
L _{Max} - L _{eq} (Range)	15	to	25

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	62	53
L _{eq} 1hr upper 10 percentile	65	54
L _{eq} 1hr lower 10 percentile	58	50

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

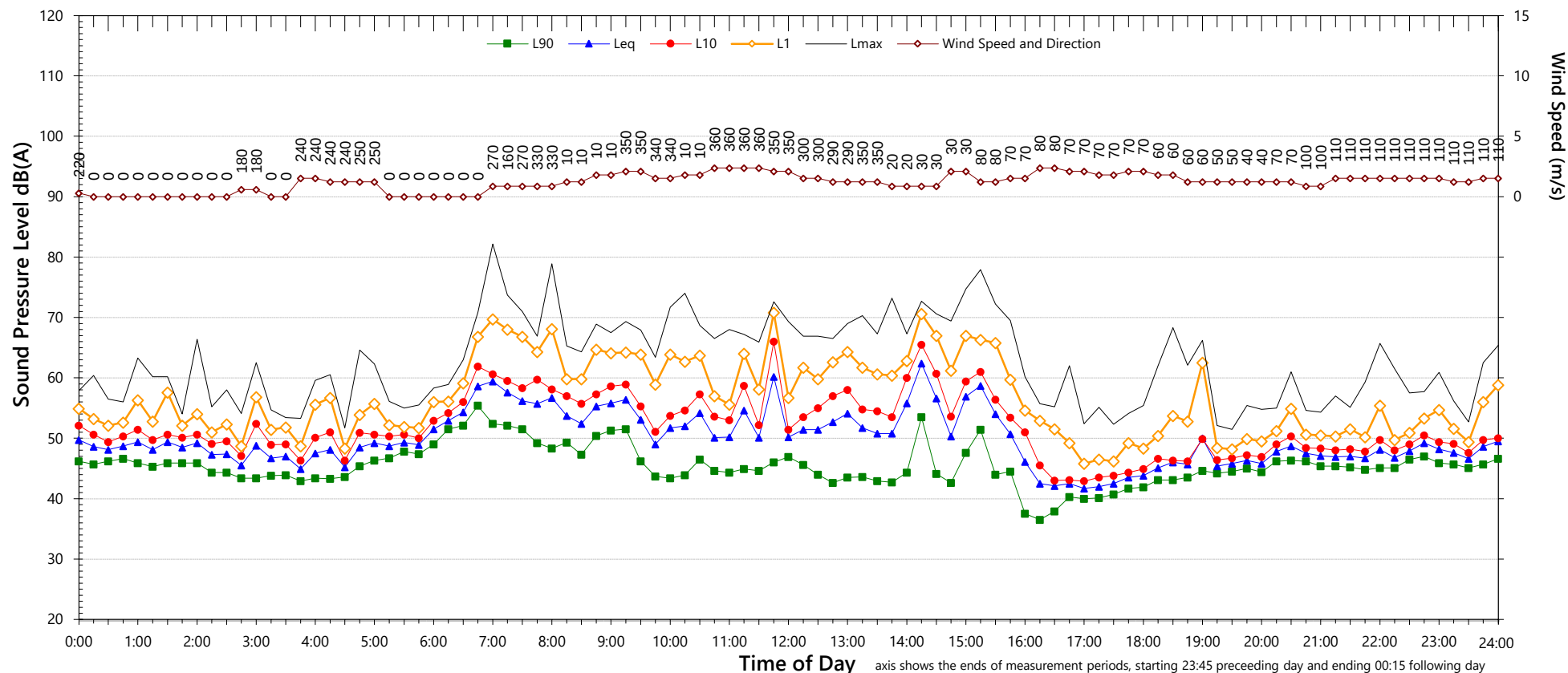
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Saturday, 12 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	40	43	37
LA _{eq}	54	47	48

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	65	to	69
L _{Max} - L _{eq} (Range)	15	to	25

Notes:

- Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
- "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days
- "Evening" is the period from 6pm till 10pm
- "Night" relates to the remaining periods
- "Night" relates to period from 10pm on this graph to morning on the following graph.
- Graphed data measured in free-field; tabulated results facade corrected
- Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)
- Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

Logger Graphs ATS North (r0)

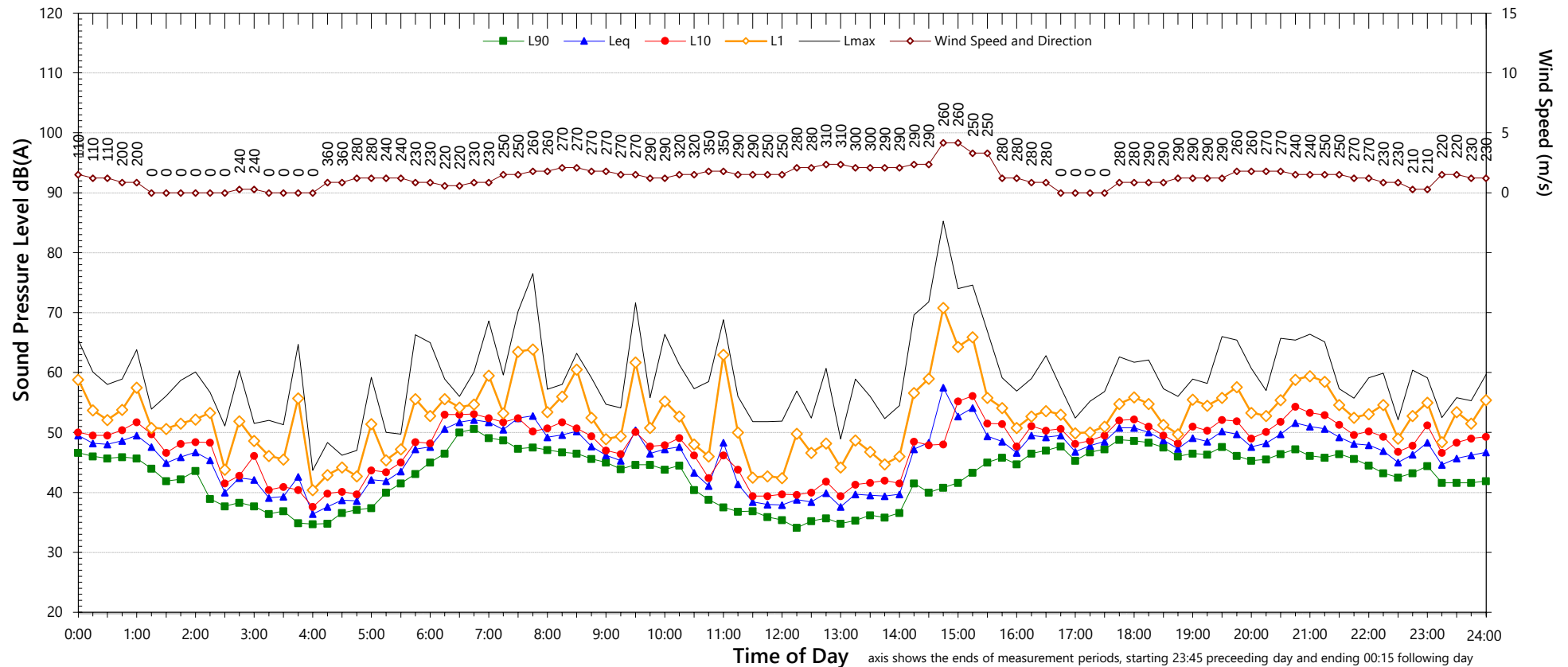
NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	56	50
L _{eq} 1hr upper 10 percentile	59	52
L _{eq} 1hr lower 10 percentile	47	42

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Sunday, 13 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	35	45	41
LA _{eq}	48	49	56

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	72	to	86
L _{Max} - L _{eq} (Range)	23	to	35

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Horsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	51	59
L _{eq} 1hr upper 10 percentile	54	62
L _{eq} 1hr lower 10 percentile	42	49

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

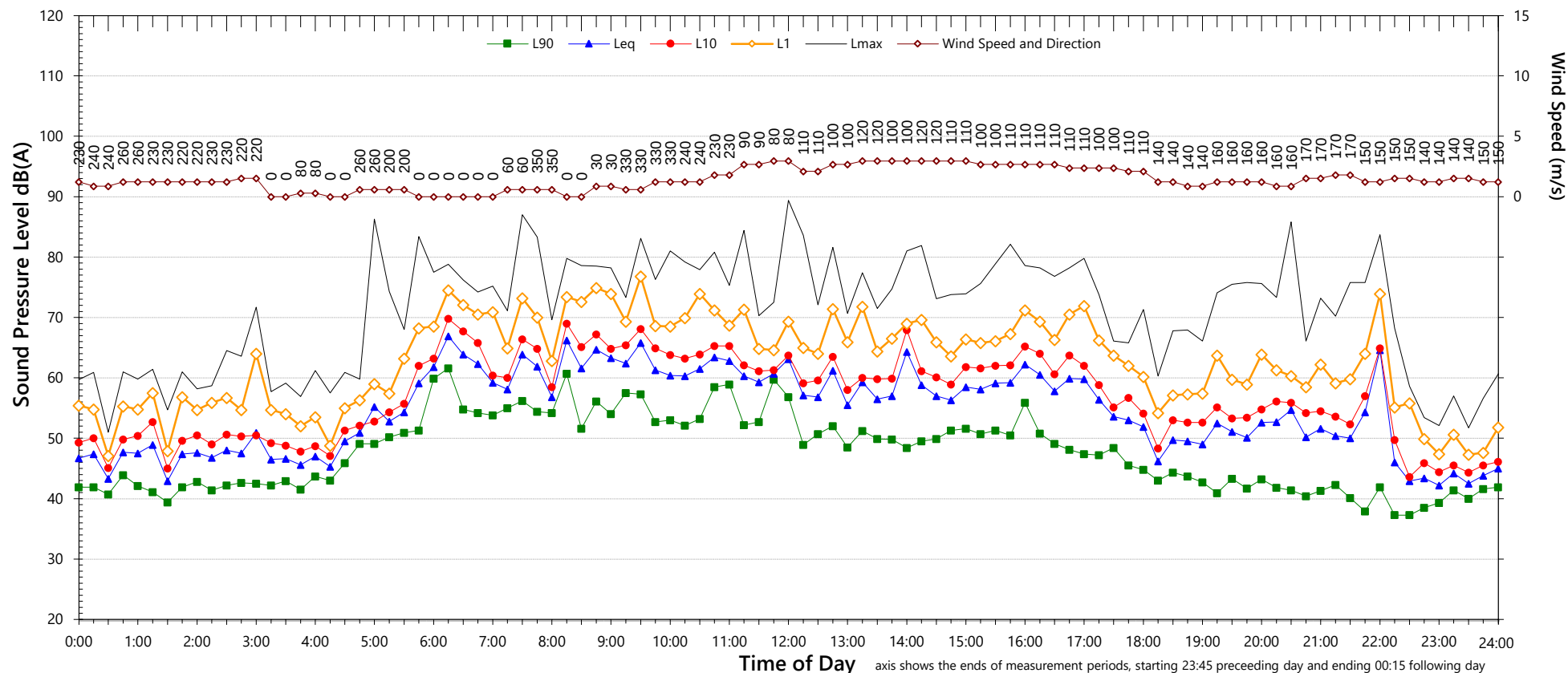
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Monday, 14 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	48	40	35
L _{Aeq}	61	55	54

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	67	to	87
L _{Max} - L _{eq} (Range)	17	to	33

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	62	56
L _{eq} 1hr upper 10 percentile	65	61
L _{eq} 1hr lower 10 percentile	55	44

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

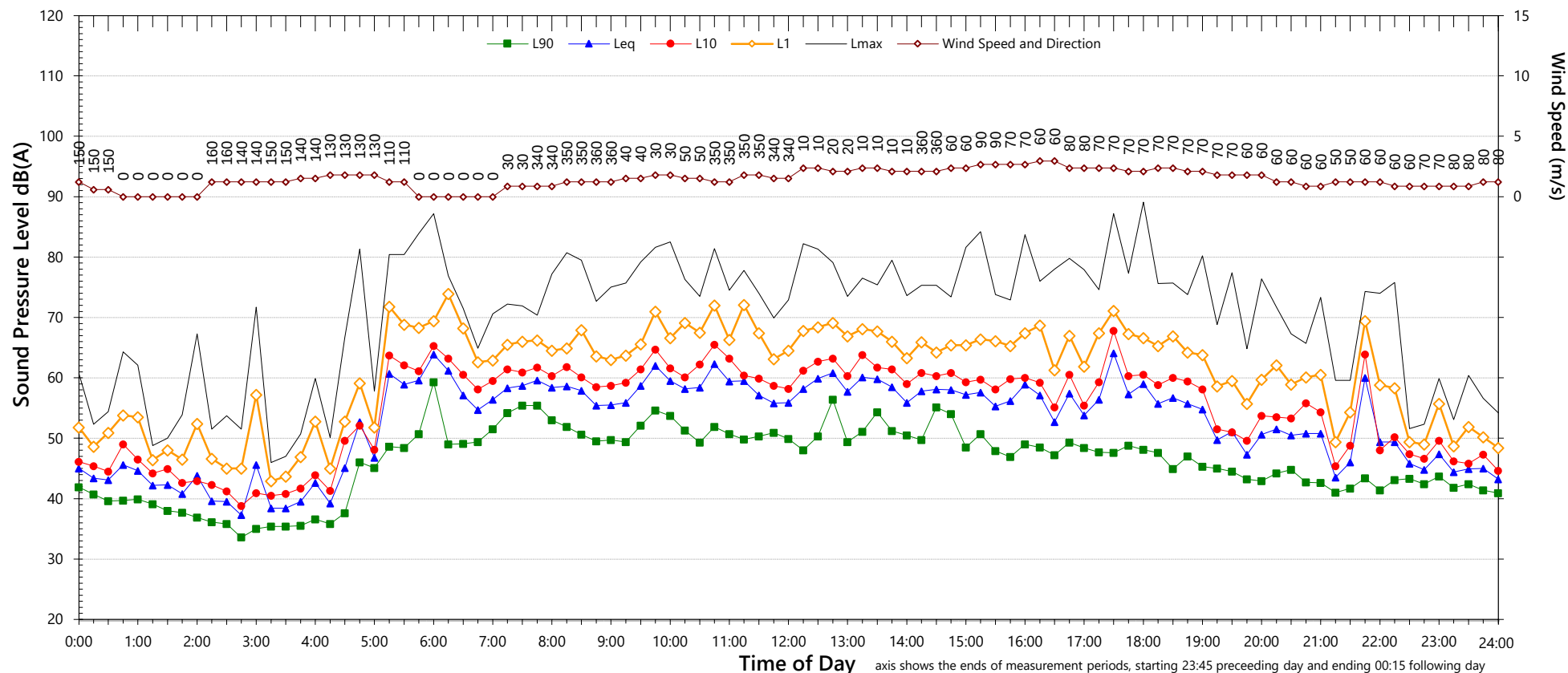
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Tuesday, 15 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	48	42	41
L _{Aeq}	59	53	55

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	76	to	81
L _{Max} - L _{eq} (Range)	16	to	29

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	60	57
L _{eq} 1hr upper 10 percentile	62	61
L _{eq} 1hr lower 10 percentile	55	47

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

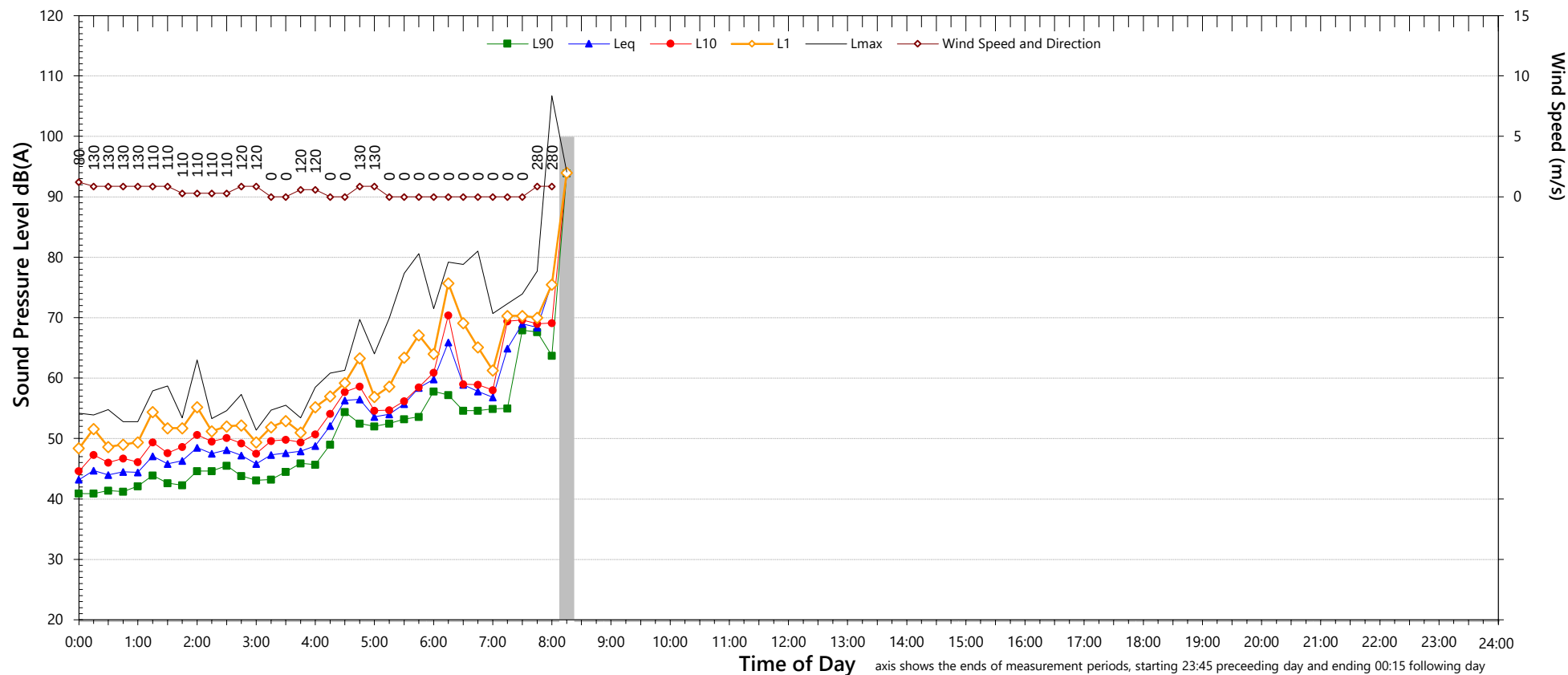
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS North

Wednesday, 16 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	-	-
L _{Aeq}	-	-	-

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	-	to	-
L _{Max} - L _{eq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-02_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Logger Graphs ATS North (r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	74	-
L _{eq} 1hr upper 10 percentile	74	-
L _{eq} 1hr lower 10 percentile	74	-

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

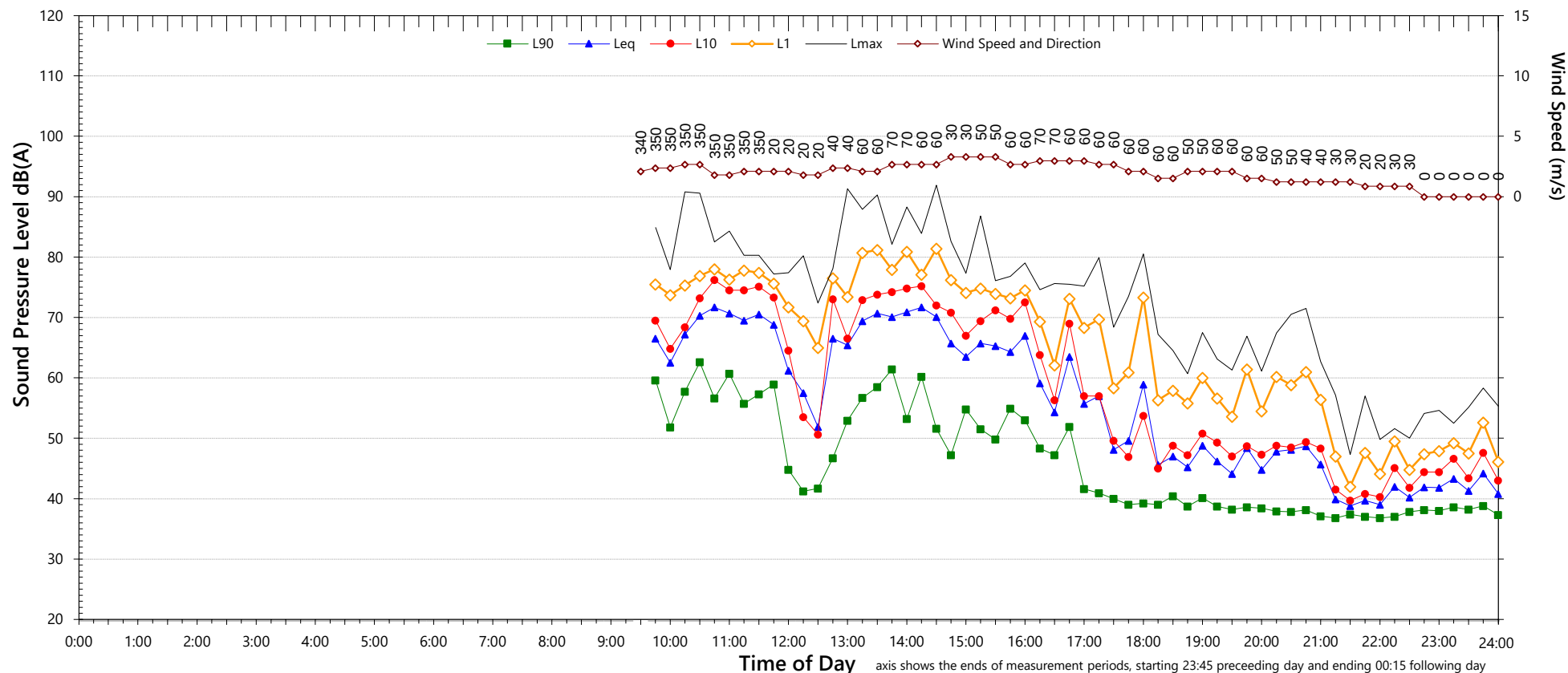
QTE-26 Logger Graphs Program (r34)

APPENDIX C **Logger location 2 – ATS – South side**

Unattended Noise Monitoring Results

ATS South

Monday, 7 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	37	38
L _{Aeq}	-	46	50

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	76	to	81
L _{Max} - L _{eq} (Range)	16	to	25

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

ATS south(r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	68	53
L _{eq} 1hr upper 10 percentile	72	55
L _{eq} 1hr lower 10 percentile	49	44

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

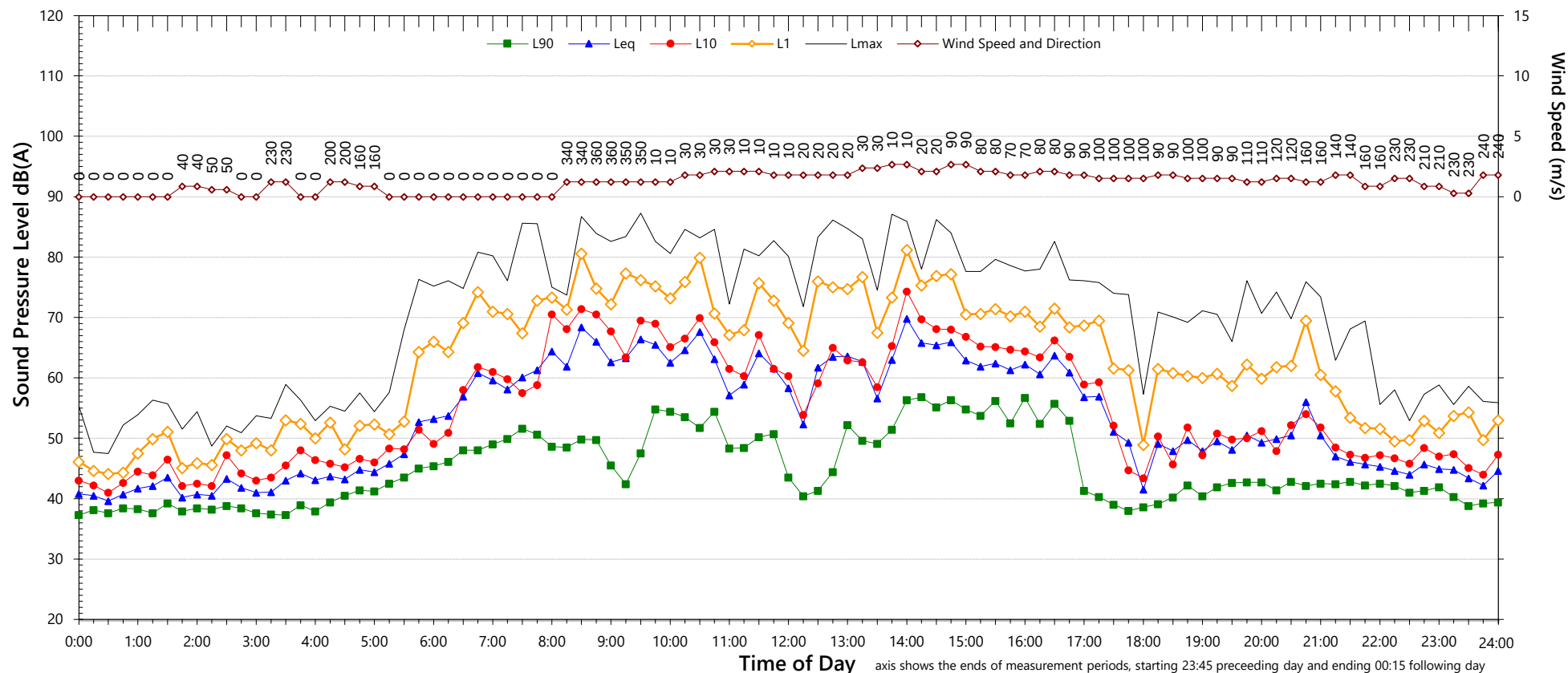
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS South

Tuesday, 8 September 2020



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	41	40	36
LA _{eq}	63	50	53

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	66	to	97
L _{Max} - L _{eq} (Range)	15	to	35

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

ATS south(r0)

NSW Road Noise Policy (1m from facade) (see note 6)

Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	65	56
L _{eq} 1hr upper 10 percentile	68	60
L _{eq} 1hr lower 10 percentile	52	44

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

4. "Night" relates to the remaining periods

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

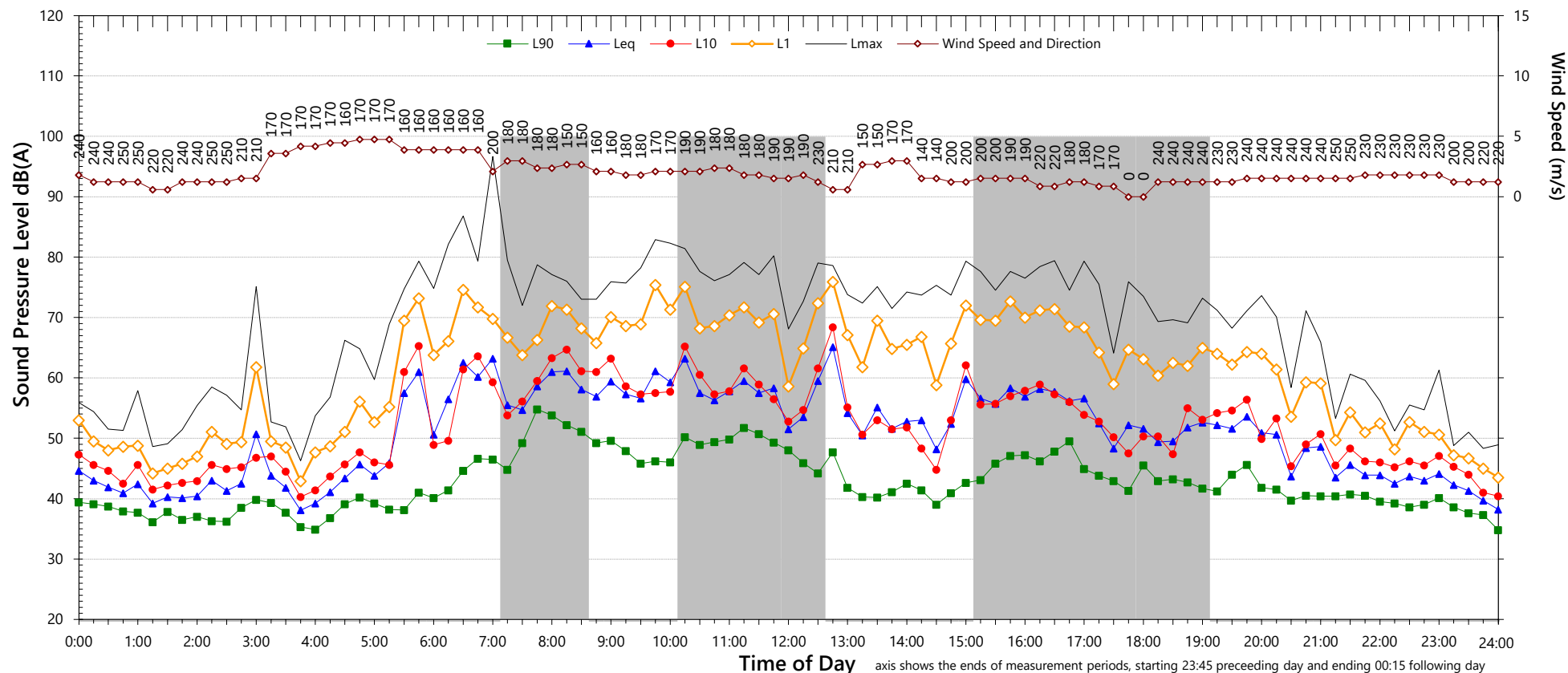
7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS South

Wednesday, 9 September 2020



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	-	34
LA _{eq}	-	-	50

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	69	to	81
L _{Max} - L _{eq} (Range)	16	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

ATS south(r0)

NSW Road Noise Policy (1m from facade) (see note 6)

Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	59	52
L _{eq} 1hr upper 10 percentile	62	52
L _{eq} 1hr lower 10 percentile	50	40

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

4. "Night" relates to the remaining periods

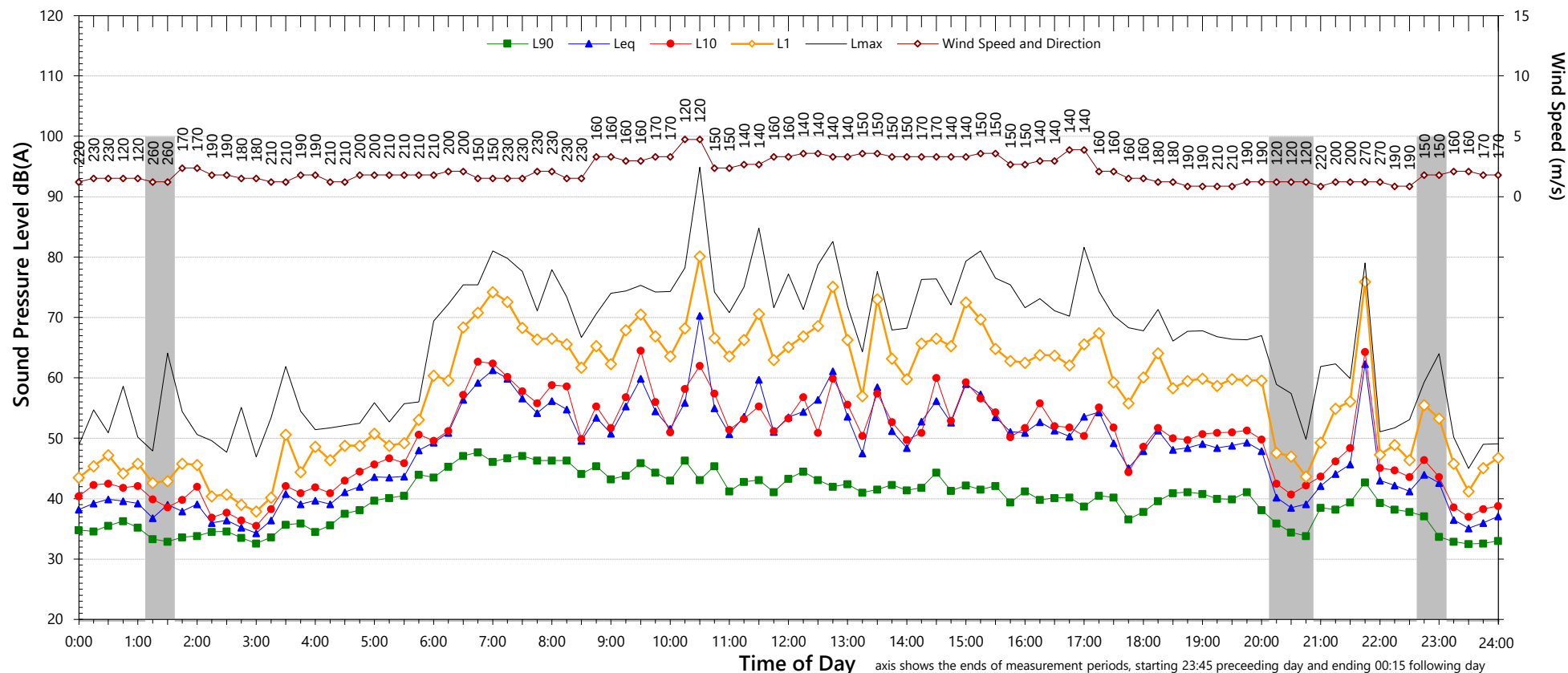
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

Unattended Noise Monitoring Results

ATS South

Thursday, 10 September 2020



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	40	-	32
L _{Aeq}	57	-	51

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	69	to	84
L _{Max} - L _{eq} (Range)	16	to	30

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

ATS south(r0)

NSW Road Noise Policy (1m from facade) (see note 6)

Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	59	54
L _{eq} 1hr upper 10 percentile	60	58
L _{eq} 1hr lower 10 percentile	51	39

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

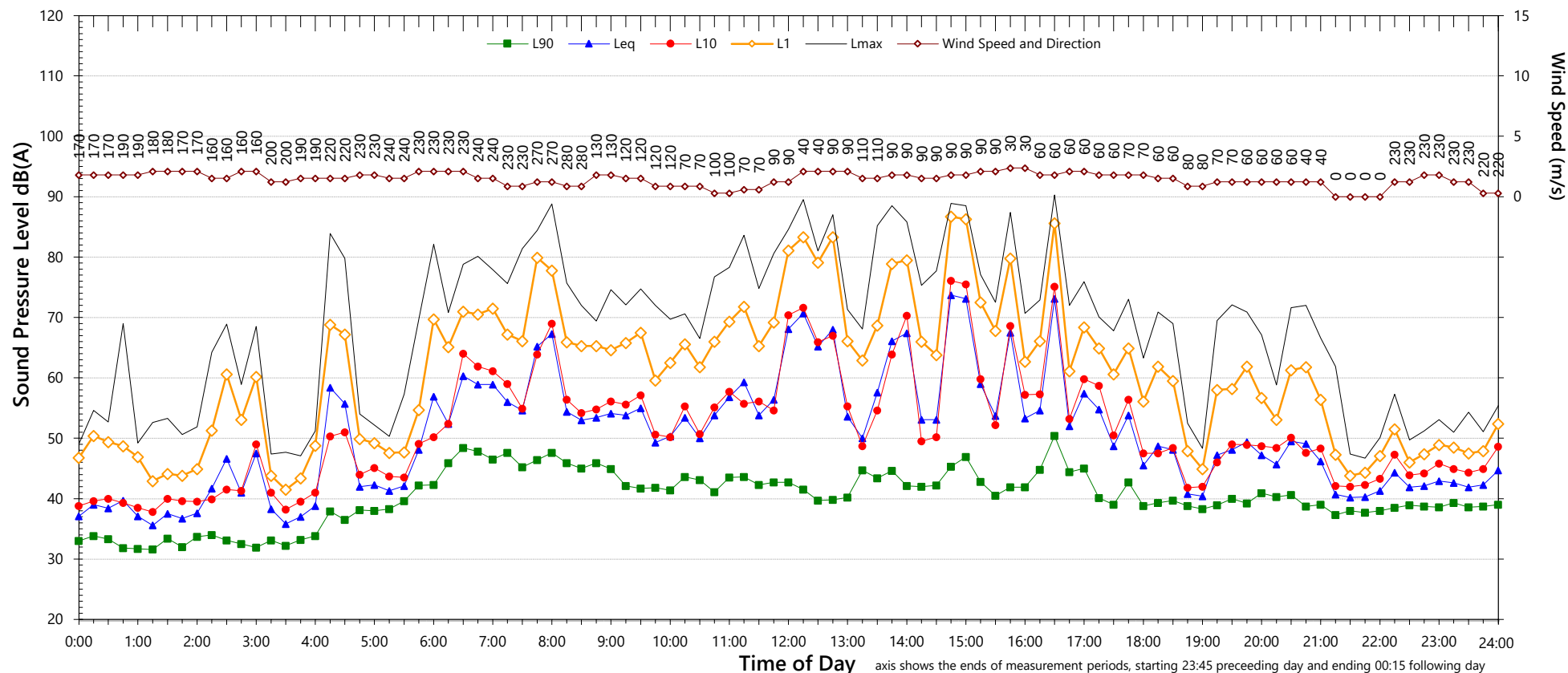
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Unattended Noise Monitoring Results

ATS South

Friday, 11 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	40	38	36
LA _{eq}	65	46	47

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	75	to	79
L _{Max} - L _{eq} (Range)	16	to	27

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

ATS south(r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	66	50
L _{eq} 1hr upper 10 percentile	70	52
L _{eq} 1hr lower 10 percentile	49	43

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

4. "Night" relates to the remaining periods

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

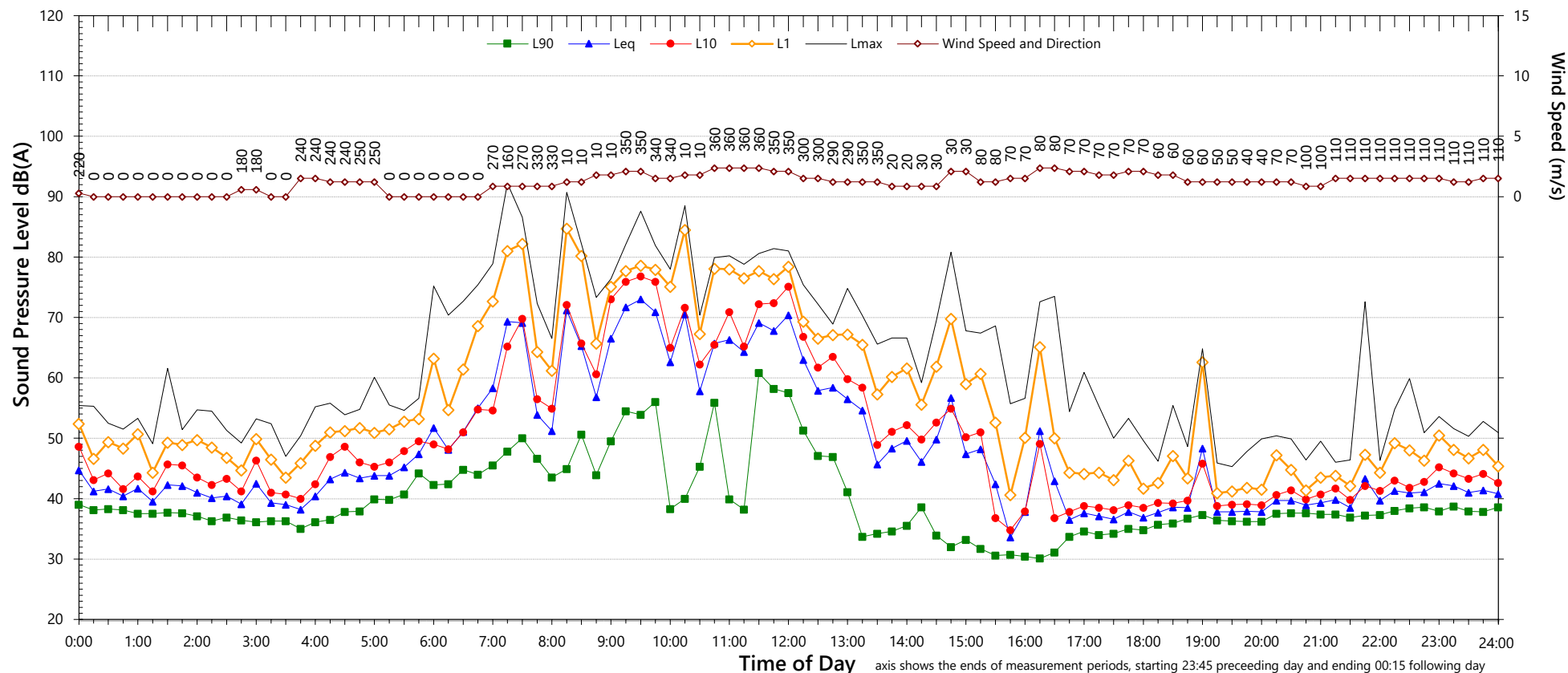
7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS South

Saturday, 12 September 2020



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	31	36	34
L _{Aeq}	65	41	43

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	76	to	77
L _{Max} - L _{eq} (Range)	17	to	33

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

ATS south(r0)

NSW Road Noise Policy (1m from facade)

(see note 6)

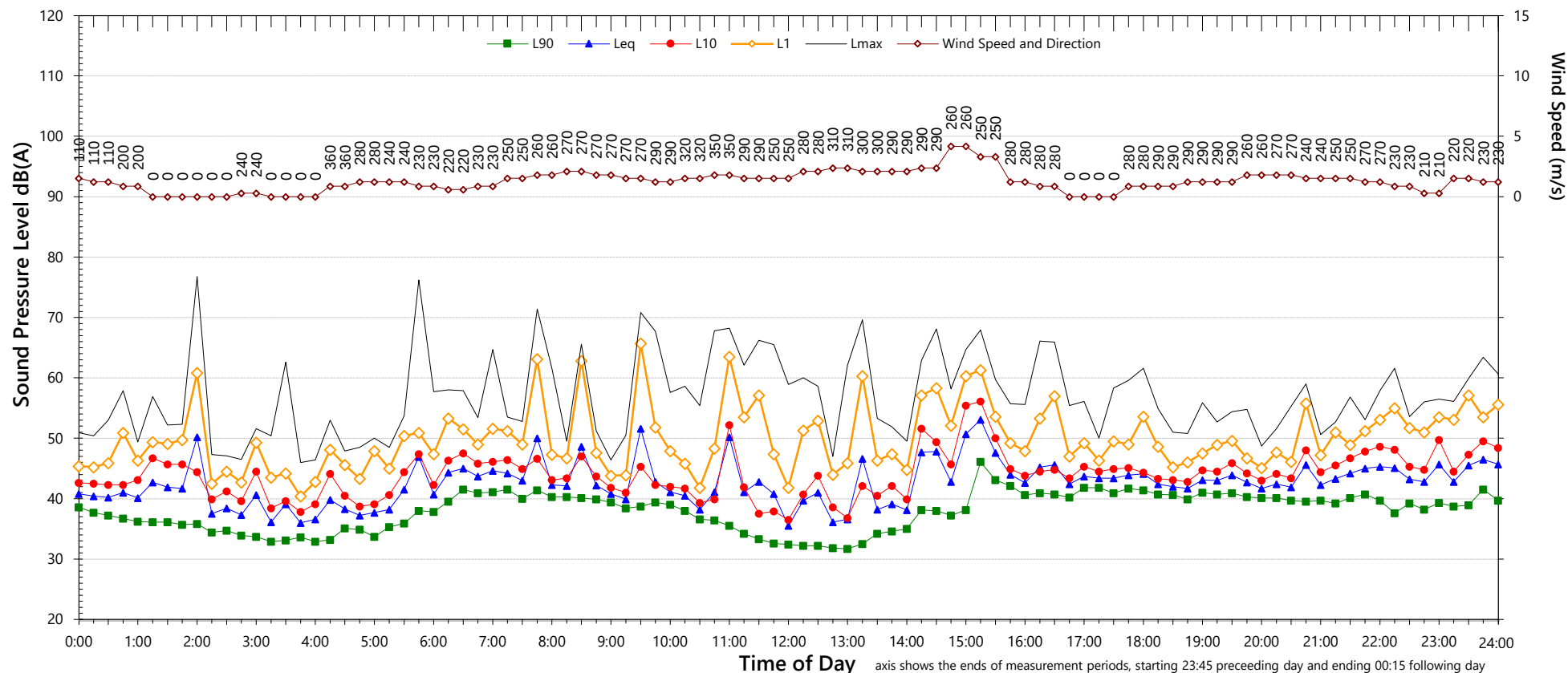
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	66	45
L _{eq} 1hr upper 10 percentile	70	47
L _{eq} 1hr lower 10 percentile	41	41

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS South

Sunday, 13 September 2020



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	32	40	37
L _{Aeq}	45	43	49

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	68	to	79
L _{Max} - L _{eq} (Range)	15	to	28

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

ATS south(r0)

NSW Road Noise Policy (1m from facade)

(see note 6)

Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	47	52
L _{eq} 1hr upper 10 percentile	50	53
L _{eq} 1hr lower 10 percentile	44	45

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

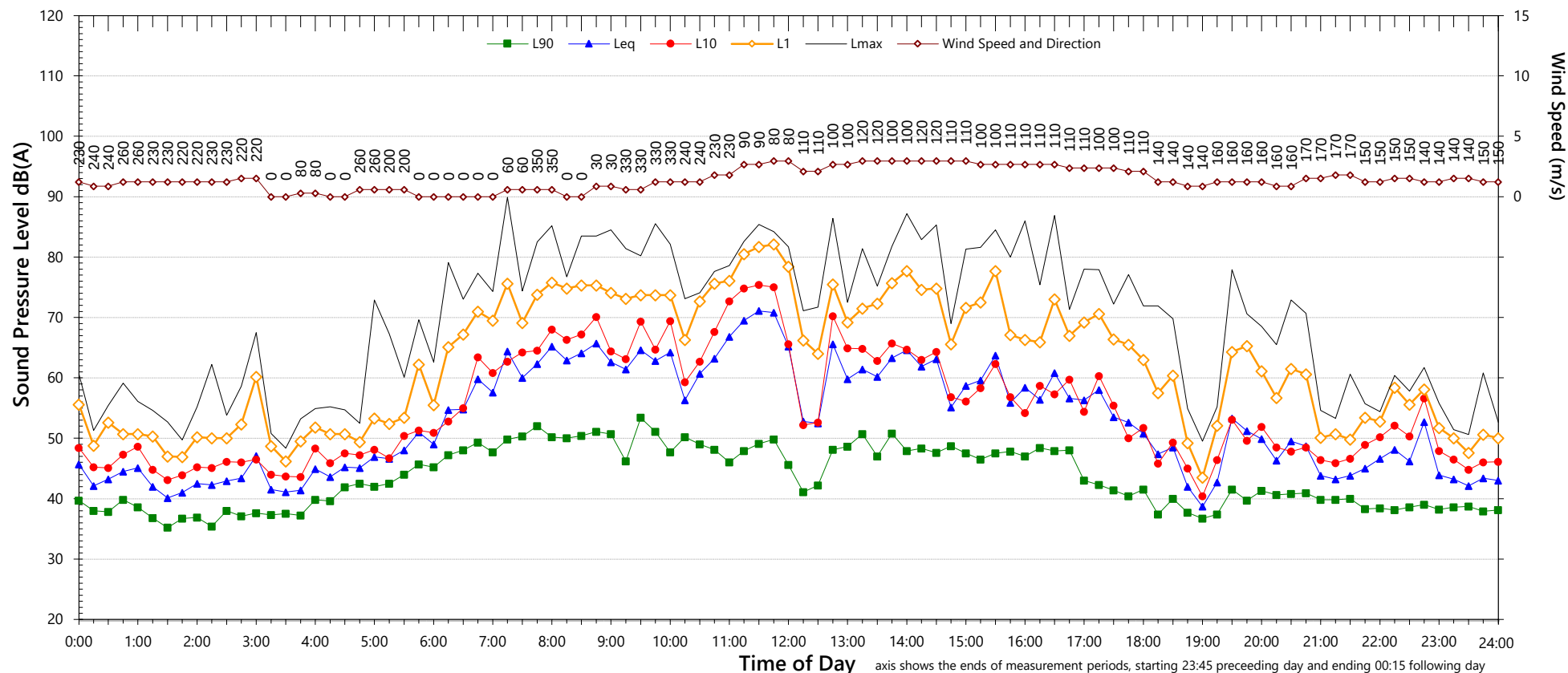
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS South

Monday, 14 September 2020



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	42	37	35
L _{Aeq}	63	48	51

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	79	to	82
L _{Max} - L _{eq} (Range)	18	to	27

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

ATS south(r0)

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade)

(see note 6)

Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	65	54
L _{eq} 1hr upper 10 percentile	66	56
L _{eq} 1hr lower 10 percentile	49	44

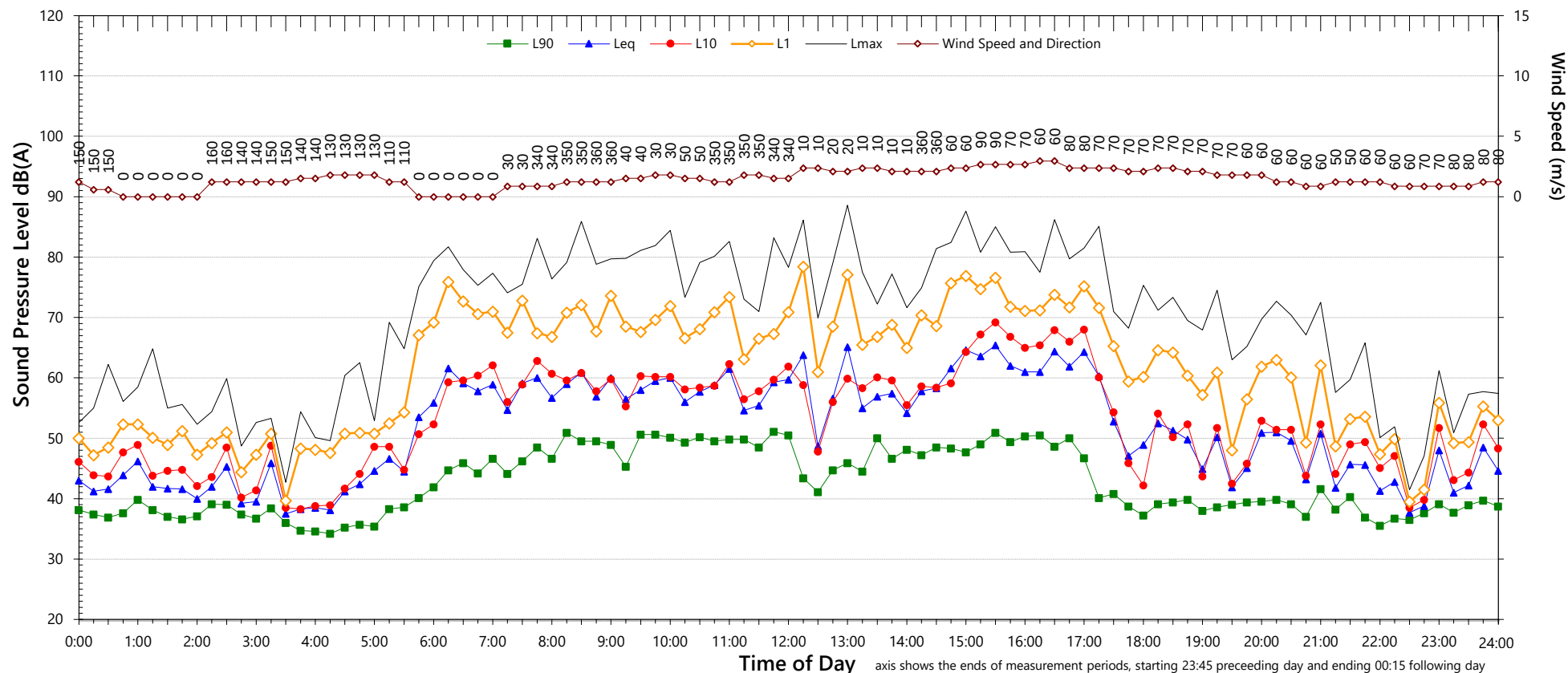
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Unattended Noise Monitoring Results

ATS South

Tuesday, 15 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	42	37	37
LA _{eq}	60	49	51

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	70	to	81
L _{Max} - L _{eq} (Range)	17	to	24

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

ATS south(r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	61	53
L _{eq} 1hr upper 10 percentile	65	56
L _{eq} 1hr lower 10 percentile	51	46

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

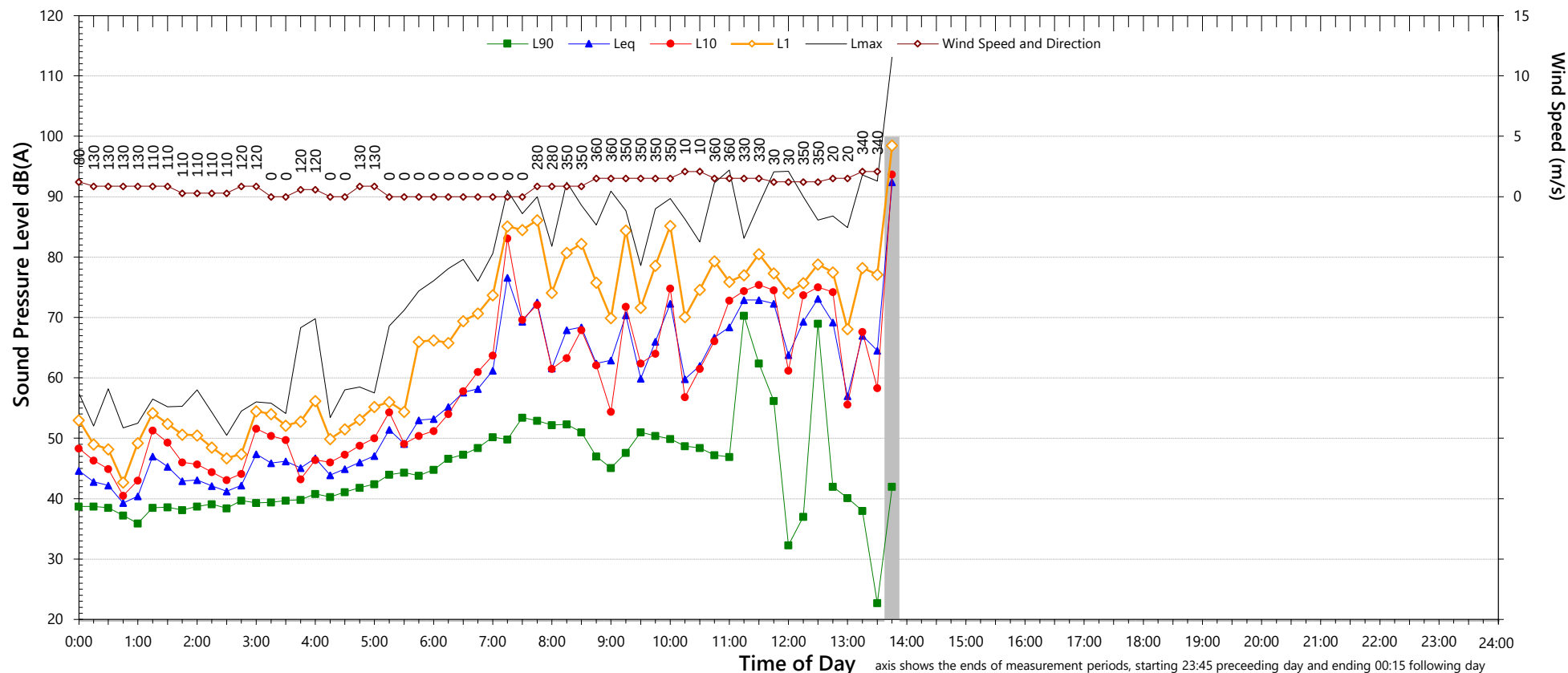
5. "Night" relates to period from 10pm on this graph to morning on the following graph.

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

ATS South

Wednesday, 16 September 2020



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	-	-
LA _{eq}	-	-	-

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	-	to	-
L _{Max} - L _{eq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

8. Meteorological data has been sourced from the nearest Bureau of Meteorology station (Holsworthy Aerodrome AWS)

Data File: 2020-09-07_SLM_000_123_Rpt_Report.txt

ATS south(r0)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	72	-
L _{eq} 1hr upper 10 percentile	75	-
L _{eq} 1hr lower 10 percentile	68	-

2. "Day" is the period from 8am till 6pm on Sundays and 7am til 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

QTE-26 Logger Graphs Program (r34)

B.9 Warehouse 3B Noise Monitoring Report

Renzo Tonin & Associates Report TL116-09F01 Warehouse 3B Ops (r2)

MOOREBANK LOGISTIC PARK - PRECINCT EAST

Warehouse 3B Operational Compliance Measurements

6 April 2021

Qube Property Management Services Pty Ltd c/- Tactical Group

TL116-09F01 Warehouse 3B Ops (r2)

Document details

Detail	Reference
Doc reference:	TL116-09F01 Warehouse 3B Ops (r2)
Prepared for:	Qube Property Management Services Pty Ltd c/- Tactical Group
Attention:	

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
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06.04.2021	Final	-	2			
File Path: R:\AssocSydProjects\TL101-TL150\TL116 cw Moorebank IMT Temporary Noise Monitoring\Task 9 - cw Warehouse Compliance Monitoring\1 Docs\WH3B\TL116-09F01 Warehouse 3B Ops (r2).docx						

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This document is issued subject to review and authorisation by the suitably qualified and experienced person named in the last column above. If no name appears, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

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We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

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Contents

1	Introduction	5
1.1	Warehouse operations description – WH3B	6
1.1.1	Location	6
1.1.2	Operational activities and facilities and hours of operation	6
1.2	Nearby sensitive receivers	6
2	Summary of noise objectives	9
2.1	Compliance assessment noise requirements	9
2.2	Operational noise limits	9
2.3	Discussion of assessment noise limits	10
3	Measurement methodology and results	12
3.1	Compliance measurement methodology	12
3.2	Instrumentation	13
3.3	Receiver unattended noise measurement results	13
3.3.1	Meteorological conditions	17
3.4	On-site attended operational activity noise measurement results	17
3.5	Unattended noise measurements	18
3.6	Modelled operational scenarios	19
3.6.1	Observed operations for modelling	19
3.6.1.1	Loading and Unloading operations (WH3B south)	20
3.6.1.2	Qube container handling operational area (WH3B north)	20
3.6.2	Assessment noise source levels	21
3.6.3	Reasonable worst-case intrusiveness scenarios (15-minute period)	21
3.7	Modelling methodology	23
3.7.1	Overview of noise modelling	23
3.7.2	General modelling assumptions	23
3.7.3	Model validation	24
3.8	Noise compliance assessment	25
4	Conclusion	27
APPENDIX A	Glossary of terminology	28
APPENDIX B	Logger location 1 – WH3B - North side	30
APPENDIX C	Logger location 2 – WH3B – South side	31

List of tables

Table 1	Noise sensitive receivers and approximate distance from MPE WH3B	7
Table 2	SSD 7628 CoC B80 noise limits, dB(A)	10
Table 3	Noise measurement equipment	13

Table 4	Permanent noise monitoring stations	13
Table 5	Receiver permanent noise monitoring locations	14
Table 6	Summary of permanent noise monitoring results at the nearest sensitive residential receivers	16
Table 7	On-site attended noise measurement results	18
Table 8	Assessment noise source levels	21
Table 9	Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios	23
Table 10	Comparison between measured and modelled noise levels	24
Table 11	Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH3B north	26
Table 12	Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH3B south	26

List of figures

Figure 1	Warehouse location WH3B, MPE precinct and the nearest residential receiver catchments	8
Figure 2	Residential receiver noise monitoring locations NMT01 to NMT04	15
Figure 3	Unattended noise logger locations and main noise generation areas (imagery: Nearmap, 2021)	19

1 Introduction

Renzo Tonin & Associates was engaged by Tactical on behalf of Qube Property Management Services Pty Ltd (QUBE) to undertake an operational noise compliance assessment of the warehouse operations carried out by Warehouse 3B (WH3B) within the Moorebank Precinct East (MPE), located within the Moorebank Logistics Park (MLP) at Moorebank, NSW.

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stages 1 and 2 of the MPE Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10_0193). Warehouse operations, including the site that is operated by WH3B fall under the area and activities approved as part of SSD 7628.

This report has been prepared to address the operational noise monitoring requirements outlined in the MPE Operational Noise and Vibration Management Plan¹ (MPE ONVMP) required for the warehouse operations carried out by WH3B. Specifically, this report has been prepared to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628, as detailed in Section 3.2.2 of the MPE ONVMP.

Appendix A contains a glossary of acoustic terms used in this report.

¹ Arcadis & Renzo Tonin & Associates, Operational Noise and Vibration Management Plan for Moorebank Logistics Park – East Precinct, Revision 012, dated 27/3/2020, available https://simta.com.au/wordpress/wp-content/uploads/2020/04/ONVMP_V12_redacted.pdf, accessed 25/3/2021

1.1 Warehouse operations description – WH3B

1.1.1 Location

The MLP is located approximately 27 kilometres south-west of the Sydney Central Business District and approximately 26 kilometres west of Port Botany, within the Liverpool Local Government Area. The MLP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively, as shown in Figure 1.

1.1.2 Operational activities and facilities and hours of operation

Operational activities at WH3B include storage and distribution activities at the position shown in Figure 1. The day to day activities include:

- Receipt and despatch of containers from and to the IMEX terminal
- Loading and unloading of containers
- Storage of products
- Despatching and receiving product to commercial customers using internal equipment such as forklifts
- Internal product moving and loading activities, including use of forklifts
- General office administrative and support functions.

The despatch activities mostly occur from the south side of the WH3B, typically between the hours of 7:00am and 6:00pm, however the busiest period of noise generating activities typically occurs around 9:00am to 1:00pm. There are no activities that typically occur during the night period (10:00pm to 7:00am) within the site. The noise generating vehicle movements associated with the general deliveries and commercial customer activities mostly occur from the southern side of the warehouse. The northern side of the warehouse is the designated area where containers from the IMEX terminal or other sources are transported to and stored for unloading to within the warehouse. These two main areas are shown in Figure 3.

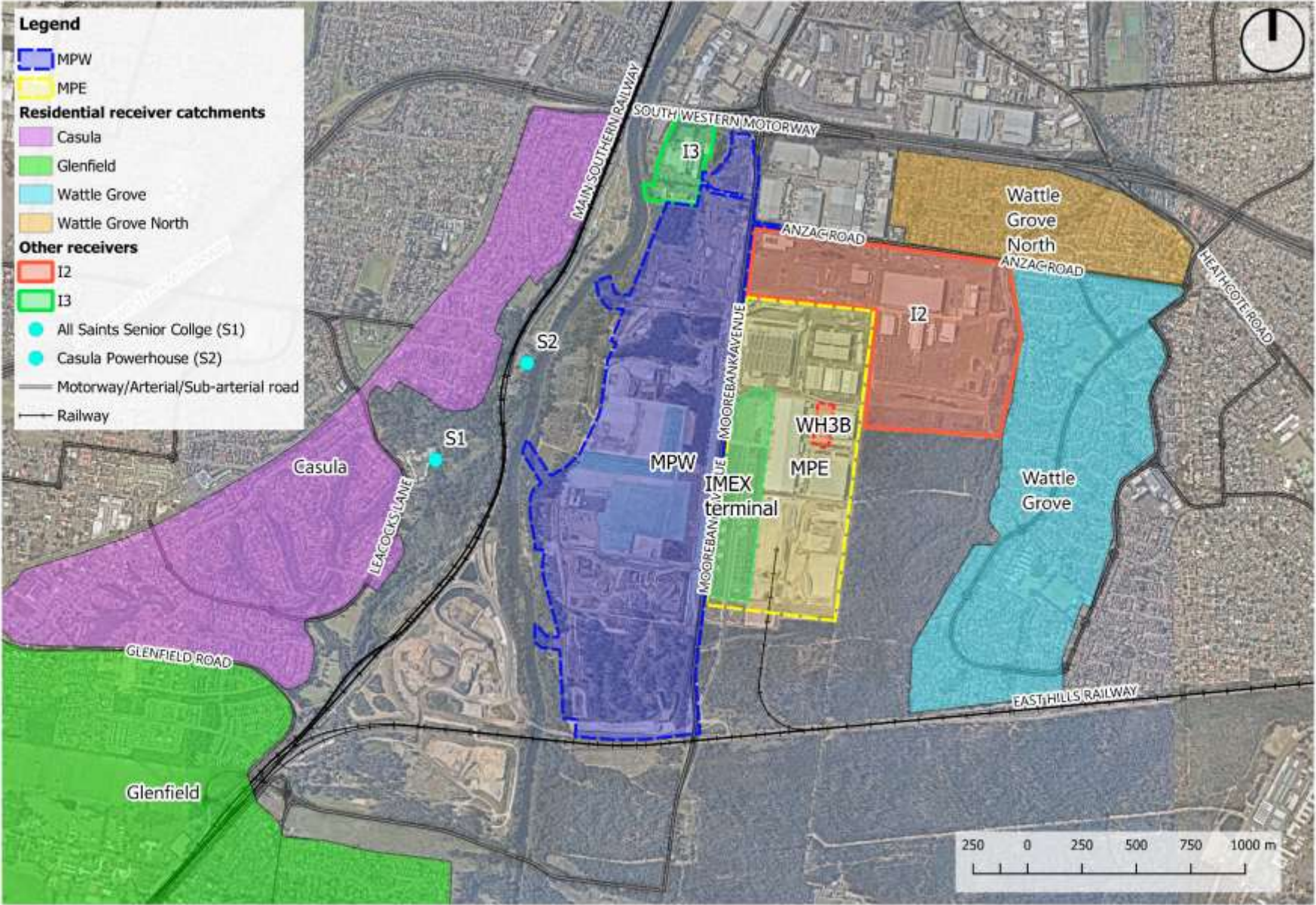
1.2 Nearby sensitive receivers

The potentially most affected residential receivers in the vicinity of the MPE, when noise intensive activities at the WH3B are occurring, are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. A summary of the approximate distance to the nearest residential receiver in the surround noise catchment areas (NCAs) is provided in Table 1. The locations of the NCAs or receivers, are shown in Figure 1.

Table 1 Noise sensitive receivers and approximate distance from MPE WH3B

Sensitive receiver (Noise Catchment Area (NCA) or Receiver ID)	Receiver type	Approximate distance from MPE precinct WH3B, metres
Wattle Grove (NCA 1)	Residential	800
Wattle Grove North (NCA 2)		820
Casula (NCA 3)		1,400
Glenfield (NCA 4)		2,700
All Saints Senior College (S1)	Educational	1,800
Casula Powerhouse (S2)		1,400
Defence Joint Logistics Unit (DJLU) (I2)	Industrial	230
ABB (I3)		1,120

Figure 1 Warehouse location WH3B, MPE precinct and the nearest residential receiver catchments



2 Summary of noise objectives

2.1 Compliance assessment noise requirements

The management of operational noise emission from warehouse activities within MPE Stage 2 is outlined in the MPE ONVMP. Specifically, this report has been prepared to address the requirements of CoC B85 in SSD 7628, as detailed in Section 4.1.1 of the MPE ONVMP.

This report includes noise monitoring performed to address the requirements in CoC B85, as detailed in Table 4-1 in Section 4.1.1 of the MPE ONVMP.

The requirements of CoC B85 state:

B85 The Applicant must carry out noise monitoring of mechanical plant and other noisy equipment for a minimum period of one week where valid data is collected following occupation of each warehouse. The monitoring program must be carried out by a suitably qualified and experienced person(s) and a Monitoring Report for Mechanical Plant must be submitted to the Secretary within two months of occupation or each tenancy to verify predicted mechanical plant and equipment noise levels.

CoC B85 requires that the monitored noise levels be compared against the predicted levels reviewed in accordance with CoC B84.

The noise impacts from warehouse operations were assessed as part of the EIS noise and vibration impact assessment (MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016 (MPE Stage 2 N&V assessment)). The individual noise impacts of warehouse operations were not quantified as part of the EIS. As such, noise level predictions for the warehouse activities are not available for verification with CoC B85.

As per Table 4-1 in Section 4.1.1 of the MPE ONVMP, Table 3-20 and Table 3-21 of the MPE ONVMP detail the predicted $L_{Aeq\ 15\ minute}$ intrusiveness and L_{Amax} sleep disturbance noise limit levels respectively for the overall MPE operations (not for individual warehouses).

As such, for the purposes of addressing CoC B85, instead of comparing the facility noise emission against the noise level predicted in accordance with CoC B84, this report aims to assess the noise levels from the mechanical plant and other noisy equipment that operate within the facility directly against the noise limits presented in Table 5 of condition B80.

2.2 Operational noise limits

The operational noise limits applicable for the warehouse operations within MPE are presented in Table 5 of SSD 7628 CoC B80 and are reproduced in Table 2. These noise limits are as per Table 3-5 of

the MPE ONVMP. The noise limits are applicable not only to all operational noise sources approved under SSD 7628, but are inclusive of operations as part of MPE Stage 1, approval SSD 6766.

The $L_{Aeq(15 \text{ minute})}$ criteria are applicable during the day, evening and night-time periods and the $L_{A1(1 \text{ minute})}$ sleep disturbance noise limits at residential receivers are applicable during the night-time period.

The noise limits are applicable under prevailing meteorological conditions of wind speeds of up to 3 m/s at 10 metres above ground level or stability category 'F' temperature inversion conditions.

Table 2 SSD 7628 CoC B80 noise limits, dB(A)

Sensitive receiver	Day ¹	Evening ¹	Night ¹	Night ¹
	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{A1(1 \text{ min})}$
Wattle Grove (NCA 1)	35	35	35	52
Wattle Grove North (NCA 2)	35	35	35	52
Casula (NCA 3)	35	35	35	52
Glenfield (NCA 4)	35	35	35	52

Notes:

1. In accordance with the INP, day is the period from 7:00 am to 6:00 pm Monday to Saturday; or 8:00 am to 6:00 pm on Sundays and public holidays; evening is the period from 6:00 pm to 10:00 pm; and night is the remaining periods.
2. To determine compliance with the $L_{Aeq, 15 \text{ minute}}$ noise limits, noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 Noise Policy for Industry - NPfI). The modification factors in Section 4 of the INP must also be applied to the measured noise levels where applicable.
3. To determine compliance with the L_{A1} noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 of the NPfI).
4. The noise emission limits identified above apply under meteorological conditions of:
 - (i) wind speeds of up to 3 m/s at 10 metres above ground level; or
 - (ii) 'F' atmospheric stability class.

2.3 Discussion of assessment noise limits

As noted in Section 2.2, the noise limits detailed in SSD 7628 CoC B80 are applicable not only to all operational noise sources approved under SSD 7628, but are also inclusive of operations as part of the MPE Stage 1 approval for SSD 6766. Importantly, when assessing compliance with the noise limits, the most affected residential receiver for any individual operations will not necessarily be at the same location. Additionally, it is unlikely that the reasonable worst-case noise levels from any individual operations would also occur in the same 15-minute period.

As part of the recent modification application for SSD 7709 Moorebank Precinct West (MPW) – Stage 2, MOD 1 - Building height increase, which was approved 24 December 2020, a review of the applicable operational noise requirements across Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) was undertaken (Renzo Tonin & Associates document reference TJ741-11F05 (r4), dated 30 June 2020). The review identified that there are number of approval conditions that are applicable across both the MPW and MPE sites for operational noise, and that in the application of these approvals to the site activities, it became apparent that the operational noise requirements were not consistent across the MPE and MPW sites.

Additionally, the review identified that the operational noise limits across MPE and MPW were set substantially below both the noise criteria and the predicted noise levels (even with feasible and reasonable mitigation measures) established during the environmental assessment stages and considering the cumulative operational noise levels from all MPE and MPW operations.

The review recommended that an overall approach for cumulative operational noise management of the Moorebank intermodal terminal precinct (for East and West precinct) for a “whole of complex” approach be adopted, and that consistent noise management objectives for the Moorebank intermodal terminal precinct’s operational noise be adopted to cover all operations within MPE and MPW. Appropriate and achievable noise management objectives consistent with EPA’s noise policies were also developed in the review.

Following the modification application for SSD 7709 (MOD 1), the submission received from the NSW Environment Protection Authority (NSW EPA) noted the following:

However, the current noise limits are set below the predicted noise levels and are not based on the Project Specific Noise Levels (PSNL) derived under the then-applicable Industrial Noise Policy 2000 (now superseded by the Noise Policy for Industry 2017).... The EPA considers that the resulting noise limits are not achievable for MPW, nor are they achievable for the cumulative MPW and MPE sites.

Also Liverpool City Council included in their submission:

Council considers that site regulation in regard to noise management may be assisted by adopting a precinct approach consistent with the NSW EPA’s Noise Policy for Industry (2017).... Whilst it is acknowledged that current criteria in the Approval may be impracticable, it will be necessary for the Department to consider applying suitable noise limits that are achievable and capable of protecting the amenity and wellbeing of sensitive receivers.

As such, this operational compliance assessment does not include further quantification of cumulative noise levels, and demonstrates that WH3B operations can achieve the noise limits set out in SSD 7628 CoC B80 in isolation during reasonable worst-case operations.

It is recommended that noise levels from this assessment achieve the required noise limits set out in Table 5 of SSD 7628 CoC B80, and that the site specific noise levels should be considered as part of the operational noise management applicable to the overall Moorebank intermodal terminal precinct.

3 Measurement methodology and results

3.1 Compliance measurement methodology

The Noise Policy for Industry (NPfI) provides guidance in Chapter 7 for monitoring the performance of a noise-generating industrial facility. In Section 7.1.1, the NPfI provides guidance as to how to review noise emissions of a site where the existing ambient noise levels are already high, resulting in the direct quantification of the noise under investigation not being possible via noise measurements at the receiver location. Additionally, the NPfI provides guidance about using noise modelling to review the performance of an industrial operation that is co-located with separate but noise-generating industrial sites impacting the same receiver. To satisfy the requirements of CoC B85, the following noise monitoring and assessment steps have been undertaken:

1. Review of permanent noise monitoring at nearby residential receivers during periods when noise intensive activities were taking place within the WH3B facility to determine if noise levels would allow for quantification of operational noise emissions, by checking if operational noise emissions are audible, distinguishable and quantifiable at the receiver locations during periods of noise intensive on-site activities (Section 3.3).
2. On-site attended monitoring of noise-generating activities to quantify noise emission levels of mechanical plant and other noise-generating activities as part of typical warehouse operations (Section 3.4).
3. Unattended noise monitoring at the WH3B facility for a period of one week, with concurrent video, to identify the reasonable worst-case operational scenarios and periods for each major noise-generating area (Section 3.5).

The review of unattended noise monitoring data measurements in Section 3.3 established that the existing ambient noise levels at the nearest receivers were high and controlled by noise sources outside of MPW, in addition to a number of industrial noise-generating facilities being co-located. As such, direct quantification or estimation of operational noise emissions from the warehouse operations at the sensitive receiver locations was not possible. Noise emissions from the WH3B have been evaluated using a combination of on-site attended and unattended noise monitoring, combined with noise modelling, in order to quantify the industrial noise emissions from WH3B operations.

The following steps were undertaken to assess the noise level contributions at the nearby sensitive receivers:

1. Review observations of warehouse operations, in addition to the noise monitoring results and associated video, to then determine the reasonable worst-case operational scenarios.
2. Setup and calibrate the noise model for the reasonable worst-case operational scenarios.
3. Calculate the operational noise levels from the warehouse operations to all nearby receivers and determine the noise level contribution at the property with the highest noise levels within each NCA.

3.2 Instrumentation

A range of noise monitoring equipment was used to undertake the compliance noise monitoring. A summary of measurement equipment and calibration dates is provided in Table 3.

All of the noise monitoring equipment are Class 1 instruments, with calibration certificates current at the time of the measurements. Before and after each series of attended measurements, the calibration of the sound level meters were verified using a reference calibration of 94 dB at 1 kHz. The difference between pre- and post-calibration levels was within 0.5 dB for all measurements.

Table 3 Noise measurement equipment

Monitoring location/ purpose	Equipment	Serial No	Last date calibrated
On-site attended noise measurements	NTi XL2	A2A-16217-E0	05/07/2019
Unattended on-site noise measurements (WH3B North)	NTi XL2	A2A-09356-E0	01/05/2019
Unattended on-site noise measurements (WH3B South)	NTi XL2	A2A-08004-E0	16/12/2020
Field calibration	B&K 4231	3016756	27/11/2020

Four Envirosuite permanent noise monitors are set up at nearest representative residential locations in the community and are labelled NMT01 to NMT04 in Figure 2.

Table 4 Permanent noise monitoring stations

Monitoring location	Description	Equipment	Serial No	Last Date Calibrated
NMT01	Permanent noise monitor	B&K 2250	3025394	12/03/2019
NMT02	Permanent noise monitor	B&K 2250	3025271	12/03/2019
NMT03	Permanent noise monitor	B&K 2250	3025351	12/03/2019
NMT04	Permanent noise monitor	B&K 2250	3025317	12/03/2019

3.3 Receiver unattended noise measurement results

As detailed in Section 1.2, the residential receivers nearby to the WH3B are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North.

As the most intensive period of operational activities at WH3B typically occurs during the daytime period from 12:00 pm and there are no night period activities (10:00pm to 7:00am), noise monitoring data from the permanent noise monitoring stations have been reviewed for the period between 11:00 am and 1:00 pm on 4 March 2021, during which onsite noise intensive activities were confirmed to be taking place. The permanent noise monitoring stations were configured to record audio and undertaken short-term statistical noise measurements. During this measurement period, concurrent unattended noise measurements were undertaken on-site of noise generating activities (see Section 3.4). This assisted to confirm that noise intensive activities were occurring on-site during the reviewed period of permanent noise monitoring data and noise recordings.

A summary of the monitoring locations and the approximate distance to the WH3B is provided in Table 5. These locations along with the noise catchment areas (NCAs) are presented in Figure 2.

Table 5 Receiver permanent noise monitoring locations

Monitoring location ID	Monitoring location (applicable NCA) (see Figure 2)	Approximate distance (m) from WH3B
NMT01	22 Glenelg Court, Wattle Grove (Wattle Grove North – NCA2)	810
NMT02	26 Goodenough Street, Glenfield (Glenfield – NCA4)	2,700
NMT03	31 Martindale Court, Wattle Grove (Wattle Grove – NCA1)	700
NMT04	14 Dunmore Crescent, Casula (Casula – NCA3)	1,600

The results of the permanent noise monitoring results on 4 March 2021 are presented in Table 6.

The ambient noise levels during the reviewed monitoring period were greater than 48 dB(A) $L_{Aeq\ 15\ minute}$ at all monitoring locations, with corresponding background noise levels no less than 47 dB(A) $L_{A90\ 15\ minute}$ at all monitoring locations. Sample reviewed audio could not clearly distinguish noise levels corresponding to concurrent onsite activities. As such, given that noise levels are expected to be below the overall noise limit of 35 dB(A) $L_{Aeq\ 15\ minute}$, were not audible and/or distinguishable at nearby receivers because of high ambient noise levels, direct quantification or estimation of operational noise emissions from the warehouse operations at the sensitive receiver locations would not be possible via direct measurement in the presence of the ambient noise level environment. As such, it appropriate to use the alternative methodology of modelling to determine compliance as detailed in Section 7.1.1 of the NPfl.

Figure 2 Residential receiver noise monitoring locations NMT01 to NMT04

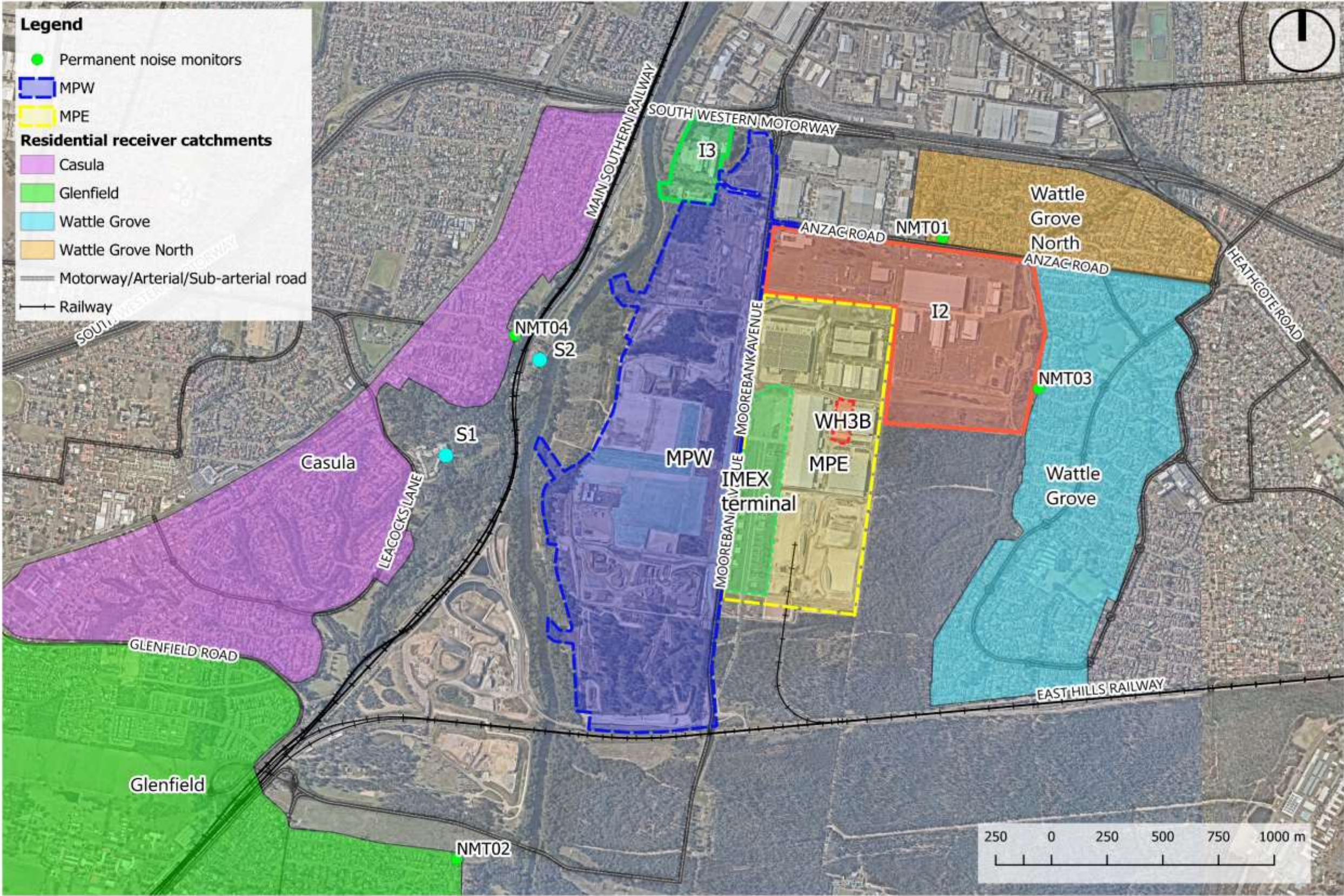


Table 6 Summary of permanent noise monitoring results at the nearest sensitive residential receivers

Measurement period	Measured noise level (15 minute), dB(A)			
	L _{Amax}	L _{A1}	L _{Aeq}	L ₉₀
NMT01 (22 Glenelg Court, Wattle Grove)				
4 March 2021 11:00 to 11:15	66	60	54	48
4 March 2021 11:15 to 11:30	67	60	54	50
4 March 2021 11:30 to 11:45	66	61	53	47
4 March 2021 11:45 to 12:00	65	60	55	51
4 March 2021 12:00 to 12:15	74	60	55	50
4 March 2021 12:15 to 12:30	74	62	55	50
4 March 2021 12:30 to 12:45	74	61	55	49
4 March 2021 12:45 to 13:00	66	60	53	47
NMT02 (26 Goodenough Street, Glenfield)				
4 March 2021 11:00 to 13:00	Not available due to maintenance activity			
NMT03 (31 Martindale Court, Wattle Grove)				
4 March 2021 11:00 to 11:15	65	56	49	45
4 March 2021 11:15 to 11:30	76	59	51	45
4 March 2021 11:30 to 11:45	74	56	48	44
4 March 2021 11:45 to 12:00	85	62	57	46
4 March 2021 12:00 to 12:15	63	55	48	45
4 March 2021 12:15 to 12:30	63	56	49	46
4 March 2021 12:30 to 12:45	62	53	48	45
4 March 2021 12:45 to 13:00	64	56	48	45
NMT04 (14 Dunmore Crescent, Casula)				
4 March 2021 11:00 to 11:15	67	63	52	47
4 March 2021 11:15 to 11:30	69	66	55	48
4 March 2021 11:30 to 11:45	68	64	53	50
4 March 2021 11:45 to 12:00	66	63	54	50
4 March 2021 12:00 to 12:15	82	68	57	50
4 March 2021 12:15 to 12:30	75	71	59	50
4 March 2021 12:30 to 12:45	74	63	55	51
4 March 2021 12:45 to 13:00	66	64	54	47

3.3.1 Meteorological conditions

Meteorological conditions for the review period of the permanent noise monitoring station data has been reviewed to ensure they were acceptable in accordance with the NPfl. Data from the MLP meteorological data monitoring station adjacent to Moorebank Avenue, within the MPE site, established in accordance with CoC A54 SSD 7709 has been reviewed. The meteorological conditions experienced during receiver permanent noise monitoring on 4 March 2021 are summarised below:

- During the measurement period at the facility, the equivalent average wind speed was 2 m/s and generally from the NNE. All other measurements were not impacted by excessive wind during any of the measurement periods.
- No rain occurred during any of the measurement periods.
- The temperature during the measurement period ranged between 30°C and 31°C, and the cloud conditions were generally clear skies with a few scattered clouds.

3.4 On-site attended operational activity noise measurement results

In order to quantify the noise emissions from on-site activities for the purposes of determining compliance noise levels, attended noise measurements of individual operational items and typical operations were undertaken at WH3B on 2 March, 9 March and 16 March 2021. These noise levels have been used to assist in establishing the source noise levels in the noise model.

During all measurements, the specific noise source being measured was the dominant source. Observations were made of the on-site operations, which have then been reviewed to model 'reasonable' worst-case operational scenarios over the assessment periods. Critical on-site attended measurement results are summarised in Table 7.

The main noise generating activities observed were being undertaken within the warehouse, including forklift operations and noise generated from temporary interior fitout activities. It was understood that the WH3B has not been fully furnished. There are ongoing internal fitout activities which will take place over the next few month during the commencement of operations. However, the type of operations including loading and unloading of products with external and internal forklift operations are not expected to change. As such, the assessed operational scenario is considered conservative.

Table 7 On-site attended noise measurement results

Activity noise sources	Date	Time	Measurement duration (t), sec	Measurement distance (m)	Measured noise levels, dB(A)	
					L _{Aeq(t)}	L _{AFmax}
Internal warehouse noise levels (noise breakout)						
Internal noise level at loading dock door (internal sources include electric forklifts, internal fitout activities)	16/3/2021	1:00pm	900	At external roller doors	64	80
Electric Forklift						
Electric forklift 1.5-2 Tonnes, passby ²	16/3/2021	1:10pm ²	10	5	58	63
Curtain side trailer truck ¹						
Truck pass-by	3/3/2021	6:00am	10	6	74	78
Truck Idling	3/3/2021	7:00am	60	20	65	67
Mechanical plant						
Office air condenser unit ³	9/3/2021	12:12pm	40	1	58	58

Note:

1. Attended measurement results for Curtain side trailer trucks were obtained at WH5, as the same type of truck was operated as part of the WH3B activities.
2. Data extracted from the 15-minute internal noise measurement
3. 6 out of 12 condenser units were operating at time of measurement.

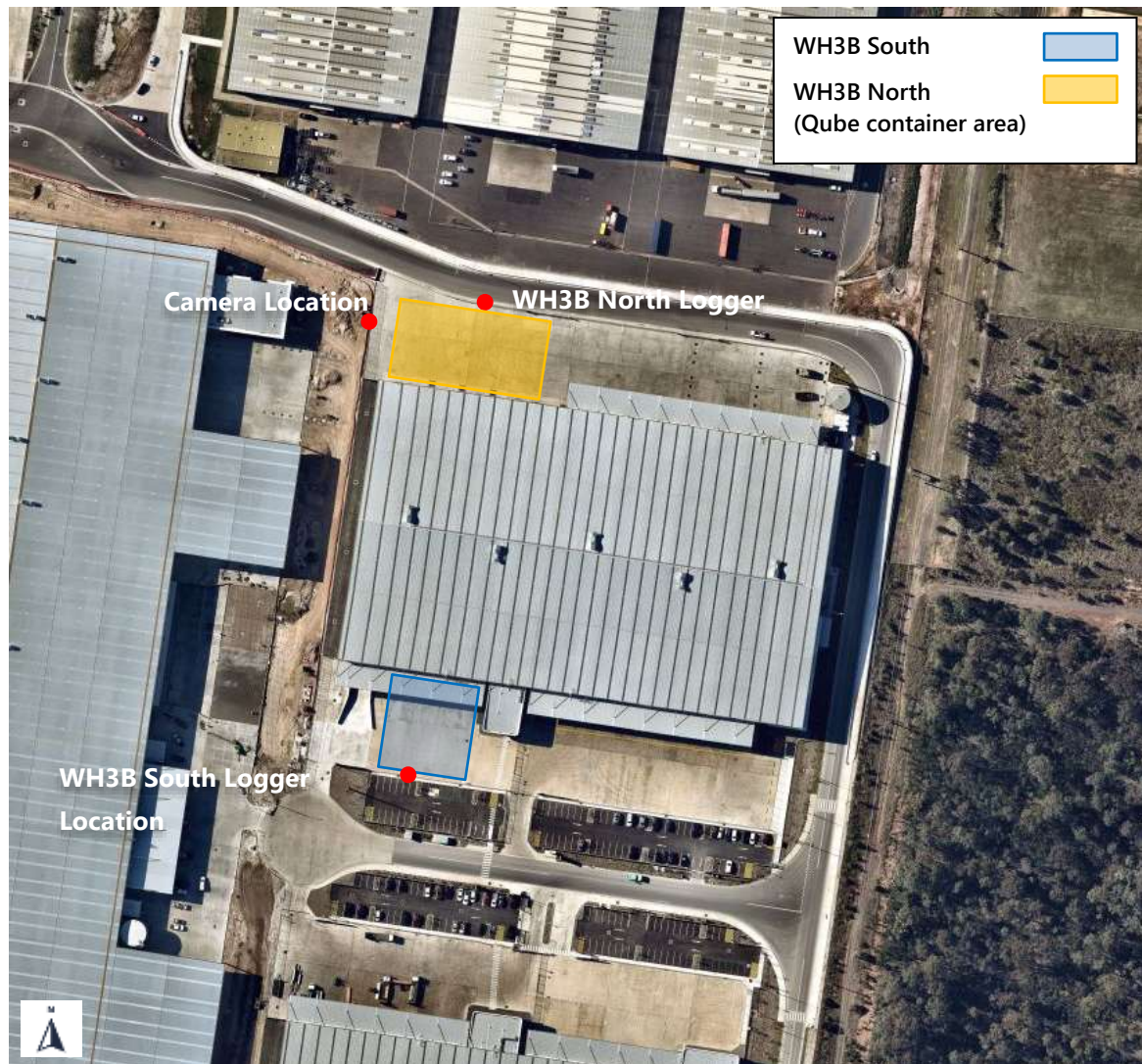
3.5 Unattended noise measurements

Unattended noise measurements were undertaken over the period between 2 March and 9 March 2021 at locations adjacent to WH3B on both side of the warehouse. Two main areas of noise-generating operations were identified across the warehouse site, one on the northern side of the warehouse and one on the southern side. The location of the unattended noise loggers is shown in Figure 3. These were selected so that they would capture noise from the main noise-generating areas as part of the typical warehouse operations. A camera unit was setup on the western side boundary fence at WH3B north to assist in gaining a comprehensive understanding of the site operations and vehicle movements.

The purpose of the noise logging at the selected locations was for the following:

- Determine the noise emissions from the facility at a fixed location close enough to quantify on-site sources.
- Determine the long-term background noise levels when operations were not taking place at the site.
- A source for analysis to determine the duration and nature of the different on-site activities through correlation with the Facility activity data.
- Source of validation for the noise model calibration process.

Detailed unattended noise monitoring results are provided in APPENDIX B for 3B North and APPENDIX C for 3B South. The noise model was validated using the unattended noise logger results through comparison against reference activity periods, refer to Section 3.7.3 for noise model calibration.

Figure 3 Unattended noise logger locations and main noise generation areas (imagery: Nearmap, 2021)

3.6 Modelled operational scenarios

3.6.1 Observed operations for modelling

Based upon the on-site attended measurements presented in Section 3.4, the video recording for the facility over the unattended monitoring period presented in Section 3.5, and discussions with WH3B personnel, 'reasonable' worst-case operational assessment scenarios were established and modelled to satisfy the assessment periods under SSD 7628.

The following section details the key observations of each of the noise-generating activities that take place across the warehouse operations.

3.6.1.1 Loading and Unloading operations (WH3B south)

The following data on delivery truck operations was based upon site observations during the attended measurements on 9 March and 16 March 2020, in addition the unattended noise level and audio data during periods when internal truck movement on the hardstand and forklift operations were clearly distinguishable over the period between 2 March and 9 March.

- It was observed on during attended measurements and verified with unattended measurement data, that internal truck movement on the hardstand were typically Curtain Side Trailer Trucks, and that a typical 'in-and-out' cycle time in the facility was on median 20 minutes, with each loading cycle taking approximately 10-15 minutes.
- It was observed during attended noise measurements that the internal truck movements on the hardstand in the WH3B south despatching area move at a relative low speed of approximately 5 km/h.
- No loading and unloading of containers occurred outside of the warehouse on the southside of WH3B.
- Unloading of products from delivery trucks typically would occur within the warehouse with the warehouse doors open. However, due to the current storage capacity of the warehouse prior to the fitout completion, it was observed that a truck would be loaded or unloaded in the external despatch area using an electric forklift.

3.6.1.2 Qube container handling operational area (WH3B north)

- It was observed that one container crane truck would be used to move containers to and from the northern hardstand of the WH3B site boundary, to and from, the MLP terminal area. Using the unattended measurements and concurrent camera during the monitoring it was observed that the container crane truck loading/unloading operations could occur for longer than 15 minutes, and it would operate continuously throughout a 15-minute period when handling containers.
- Impact noise events associated with grabbing and dropping of containers would occur when the container crane truck gripper contacted individual containers as part of handling operations.
- Movements of containers within the WH3B north area can occur at any time throughout the daytime period. It was observed movements typically started from approximately 7:00am. Only three container movements during the monitoring week were observed from the video data, and only one container movement would occur during any one day.

3.6.2 Assessment noise source levels

Source levels for the key noise-generating activities on-site have been established based upon the attended noise measurements (Section 3.4) and unattended noise measurements (Section 3.5) during periods of typical operation. The sound power level inputs presented in Table 8 were used in the operational noise compliance modelling, and adjusted for the duration and frequency of operations (Section 3.6.3).

Table 8 Assessment noise source levels

Site items / operation	Individual activity sound power level (SWL) (L_{Aeq} , dB(A))
WH3B North	
Container Crane Trucks (slow speed manoeuvring within the site boundary)	99
Container movement noise events (L_{AFmax})	107
Container movement noise events (L_{Aeq}) ⁴	79 $L_{Aeq,15min}$
WH3B South	
Curtain Side Trailer Truck moving with speed less than 20km/h	102
Air brake release (L_{AFmax})	117
Air brake release (L_{Aeq}) ⁴	78 $L_{Aeq,15min}$
Internal noise breakout	
Internal activities noise ¹	62 $L_{Aeq,15min}$ internal sound pressure level
External roller doors	64 $L_{Aeq,15min}$ internal sound pressure level ³
Mechanical Plant	
Air condenser unit ²	70
Other noise sources	
Curtain Side Trailer Truck moving on internal roads within MLP, outside of the WH3B site (typical speed on internal roads of 20 km/h)	102

Notes:

1. Attended measurement shows breakout via WH3B South loading dock door during loading and unloading operations Internal noise levels included internal noise intensive periods when Electric forklifts and general tools were in use.
2. Air condenser units are located on the east façades of the warehouse.
3. Internal noise levels controlled by forklift and internal fitout operations within the warehouse
4. Based upon a 2 second measurement

3.6.3 Reasonable worst-case intrusiveness scenarios (15-minute period)

As the noise limits in CoC B80 are set at 35 dB(A) $L_{Aeq, 15 \text{ minute}}$ for the day, evening and night periods, specific separation of noise intensive periods for each of these time periods has not been undertaken. Instead, it is noted that there are two main areas of noise generation as part of typical warehouse operations, as presented in Figure 3.

In order to assess the operational noise emissions from the warehouse, the 'reasonable' worst-case operations for each of the two main areas of noise generation have been developed, along with the corresponding activities in the other noise-generating areas, in order to review a representative

snapshot of activities from the warehouse operations. Each of the assessment scenarios have been developed from an analysis of the video movement data or attended on-site observations over during the one-week period, in addition to the information detailed in Section 3.6.1. It is noted that the peak periods of noise generating activities for each of the two main areas (northern side of the warehouse and southern side of the warehouse) did not occur concurrently.

A representative scenario has been established to assess a 'reasonable' worst-case scenario for the northern side of the warehouse, which is the WH3B north. A total of three container movements were observed on the video data to occur over the period of one week. The duration of each container delivery operation was approximately 15 minutes or less. During the periods when containers were being moved within WH3B north (Qube container operation area), warehouse roller doors remained closed on the north side of WH3B.

The WH3B south activities were observed to commence from 7:00am, with a peak period of noise intensive activities around the 9:00am to 1:00pm.

Periods representing the 'reasonable' worst-case operations, for each the northern side of the warehouse and southern side of the warehouse, based upon these peak periods of noise intensive activities have been used to assess operational noise emissions. Table 9 details the two 'reasonable' worst-case scenarios (15-minute period), covering the noise intensive periods for the two main areas of noise generation across the site.

As required by CoC B85, all significant noise-generating equipment has been included the assessment modelling, including the key noise-generating mechanical plant. It is noted that the noise contribution from the mechanical plant items serving the office area are included in the modelling, however, they generate minimal contribution to the overall noise levels from site operations, which are controlled by other on-site activities such as truck departures, arrivals and warehouse internal loading and unloading activities. The roof mounted smoke ventilation fans were observed not to be in operation during typically activities onsite.

No onsite noise generating activities were observed during the night period (10:00pm to 7:00am). As such, sources of potential sleep disturbance have not been modelled.

Table 9 Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios

Activity	WH3B North 15-minute assessment period (Qube container area)	WH3B South 15-minute assessment period
WH3B North 15-minute noise intensive period (with container handling taking place)		
Departure	One container crane truck departure from Qube area loaded with 1 container.	No activity
Arrival	One container crane truck arrival at WH3B north (Qube container operational area) loaded with 1 container.	No activity
On-site operations	Container operations: a) Placing one container down b) Removing one empty container from dock 1 on to the container crane truck. All loading activity are occurring inside the warehouse with warehouse doors closed.	<i>Noise breakout via open warehouse doors.</i> All loading activity are occurring inside the warehouse with warehouse doors open, two noise generating activities occurring concurrently. a) Forklift movements b) Internal fit out
WH3B South 15-minute noise intensive period		
Departure	No activity	No activity
Arrival	No activity	One Curtain Side Trailer Truck arrives, moves through hardstand area, then turns engine off after parking.
On-site operations	No activity	<i>Noise breakout via open warehouse doors.</i> All loading activity is occurring inside the warehouse with warehouse doors open, one noise generating activity occurring at the time. a) Forklift movements
Mechanical plant (All scenarios)		
Warehouse office air conditioning condenser (6 out of 12 units operating)		

3.7 Modelling methodology

3.7.1 Overview of noise modelling

Since ambient noise levels were well above the project noise limit at the nearest residential receivers, and it was not possible to directly measure or estimate the warehouse noise contribution directly, computer noise modelling was used to calculate the operational noise levels from warehouse operations at the nearby noise sensitive receivers.

3.7.2 General modelling assumptions

Modelling and assessment of warehouse noise emissions were determined by modelling the noise sources, receiver locations, existing built structures and topographical features, using CadnaA (version 2020).

The modelling incorporated the worst-case prevailing meteorological conditions, as required by CoC B80, which are wind speeds of up to 3 m/s at 10 metres above ground level for the assessed activities for daytime activities.

The noise predictions are based on the CONCAWE noise prediction algorithms, noting that the nearby noise sensitive receivers are greater 100 metres from the subject site. The CONCAWE environmental noise prediction method is an appropriate method for predicting noise propagation in these circumstances.

The noise prediction model considers:

- Location of noise sources on-site sensitive receiver locations
- Height of noise sources and receivers referenced to digital ground contours within the site and outside the site area
- Noise source levels of individual plant, equipment and internal building noise levels, modelled as either point, line or area noise sources. All noise sources associated with the WH3B operations within the MPE boundary have been included in the noise modelling, including the truck movements outside of the WH3B footprint, along internal MPE roads.
- Separation distances between sources and receivers
- Ground type between sources and receivers (mixed soft/ hard)
- Attenuation from buildings and built structures and topography (natural and purpose built)
- Atmospheric losses and assessment meteorological conditions.

The modelled activities and assumptions for the to the equipment operating and the duration and frequency of operation as part of the 'reasonable' worst-case operational scenarios are described in Section 3.6.3.

3.7.3 Model validation

Following the development of each of the representative modelling scenarios, the noise model outputs were compared against a reference time period of the onsite unattended noise measurement results for the period during which similar activities to the reasonable' worst-case operational scenario were taking place. Validation of the reasonable worst-case on-site activities was undertaken to check the final representative modelling inputs against a period of measured activities. The results of this process are presented in Table 10.

Table 10 Comparison between measured and modelled noise levels

Time period	Logger	Measured noise levels LAeq,15minute (dBA)	Predicted noise levels LAeq,15minute (dBA)	Difference, dB
8:50 am to 9:05 am 4 March 2021 ¹	WH3B North	71	69	2
12:00 am to 12:15 am 4 March 2021 ²	WH3B South	59	60	1

- Notes:
1. Noise generating activities within the facility were as per Table 9 "3B North 15-minute noise intensive period (With container handling taking place)"
 2. Noise generating activities within the facility were as per Table 9 "3B South 15-minute noise intensive period"

The differences between the modelled and the measured noise levels are the result of the following:

- Noise levels at the logger location are dependent upon the specific location of loading activities and which internal loading dock is being used by Curtain Side Trailer Trucks at WH3B South.
- Differences in modelled levels compared with measured noise levels from the noise breakout from internal warehouse activities will depend upon the specific duration and operating times of noise intensive plant/equipment associated with internal loading activities.
- For WH3B south, noise contribution from vehicle movements, which varied in duration, speed and location compared to the logger location throughout the activity, which would result in minor differences in measured noise levels.

The results from the validation of the model demonstrate that it is suitable for determining the compliance noise levels at the nearby receivers for this assessment.

3.8 Noise compliance assessment

Predicted operational compliance noise levels are presented in Table 11 for each of the two compliance assessment scenarios. The noise levels have been predicted to each of the surrounding residential receiver noise catchments, and the highest residential receiver noise level in each catchment area is the reported level in Table 11. It should be noted that this is not necessarily the same receiver location for each assessment scenario.

These noise levels represent the reasonable worst-case intrusiveness operational scenarios (15-minute period) from typical operations of the warehouse. The results in Table 11 and Table 12 show that the predicted noise levels for the $L_{Aeq(15\text{-minute})}$ assessments comply with the overall operational noise limits presented in Table 2.

As the noise levels from the site operations are not audible at the nearby noise sensitive receivers, the noise levels would not be perceived as particularly annoying at the nearby receiver locations as per the NPfI (ie. if the resulting noise level at a receiver location is tonal, low frequency or is intermittent at night). As such, no adjustments in accordance with Fact Sheet C of the NPfI are required.

As no activities typically take place during the night period (10:00pm to 7:00am) when the $L_{A1(1\text{-minute})}$ noise limits presented in Table 2 are applicable. As such no direct assessment has been undertaken as the warehouse operations then satisfy this noise limit.

Table 11 Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH3B north

Noise catchment area/ receiver location	L _{Aeq} (15-minute)		Compliance
	Noise limits	Predicted noise levels	
Wattle Grove (NCA 1)	35	28	Yes
Wattle Grove North (NCA 2)	35	<20	Yes
Casula (NCA 3)	35	23	Yes
Glenfield (NCA 4)	35	<20	Yes
All Saints Senior College (S1)	45 ¹	<20	Yes
Casula Powerhouse (S2)	45 ¹	<20	Yes
Defence Joint Logistics Unit (DJLU) (I2)	70 ¹	27	Yes
ABB (I3)	70 ¹	<20	Yes

Notes: 1. Noise limits for these receivers are only applicable when the receiver is in use

Table 12 Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH3B south

Noise catchment area/ receiver location	L _{Aeq} (15-minute)		Compliance
	Noise limits	Predicted noise levels	
Wattle Grove (NCA 1)	35	21	Yes
Wattle Grove North (NCA 2)	35	<20	Yes
Casula (NCA 3)	35	<20	Yes
Glenfield (NCA 4)	35	<20	Yes
All Saints Senior College (S1)	45 ¹	<20	Yes
Casula Powerhouse (S2)	45 ¹	<20	Yes
Defence Joint Logistics Unit (DJLU) (I2)	70 ¹	25	Yes
ABB (I3)	70 ¹	<20	Yes

Notes: 1. Noise limits for these receivers are only applicable when the receiver is in use

The highest modelled noise levels at nearby residential receivers for the WH3B South 15-minute noise intensive period is predicted to be 21 dB(A) L_{Aeq,15minute} at Wattle Grove. For WH3B north, the highest modelled noise level at nearby residential receivers from container unloading activities is predicted to be 28 dB(A) L_{Aeq,15minute} at Wattle Grove (NCA 1).

The noise levels from the two noise generation areas have not been directly combined as part of the assessment, as they did not occur concurrently. The video data showed that container deliveries to WH3B north only occurred three times within the monitoring period, each of 15 minutes or less. As such, this would not be considered a typical operation. As such, the modelled noise levels for the 'reasonable' worst case WH3B North 15-minute noise assessment period will only occur occasionally. It is expected from current operations that peak activities at WH3B north and WH3B south is unlikely to occur, however, in the case that this were to occur the resulting noise levels at Wattle Grove (NCA 1) would only increase by 1 dB(A) to be 29 dB(A) L_{Aeq,15minute}.

4 Conclusion

The noise assessment has been undertaken to address the operational noise requirements for the WH3B within the Moorebank Precinct East in accordance with the *Operational Noise and Vibration Management Plan, Moorebank Logistics Park – East Precinct* (dated 27 March 2019, Revision 12) (MPE ONVMP), more specifically to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628.

A review of noise measurements at the nearest residential receivers during period of peak onsite activities determined that site activities were not audible and distinguishable at nearby receivers because of high ambient noise levels from road traffic, rail traffic and construction noise. For this reason, guidance from the NSW EPA Noise Policy for Industry (NPfI) Chapter 7 has been followed in order to use an alternative approach to determine compliance, and compare the site noise emissions with the noise limits.

A combination of on-site and off-site measurements were performed, between 2 March and 9 March 2021. The aim of the measurements was to quantify on-site operational noise levels from the WH3B facility, in order to then predict back to the nearby receivers. Using this approach, noise emissions from the warehouse facility operations have been evaluated using a combination of on-site attended and unattended noise monitoring, combined with noise modelling, to predict the operational noise levels at the nearest sensitive receivers.

Two 'reasonable' worst-case assessment scenarios were established based upon on site unattended noise monitoring and video recordings, in addition to discussions with WH3B personnel and observations made during on-site attended noise measurements. These were used to develop the current 'reasonable' worst case noise intensive periods that occur onsite. These were separated into two main areas of activities, one on the northern side of the warehouse and one on the southern side.

As required by CoC B85, all significant noise-generating equipment was included the assessment modelling, including the key noise-generating mechanical plant. The noise contribution from the mechanical plant items serving the warehouse and office area generate minimal contribution to the overall noise levels from site operations, which are generally controlled by other on-site activities such as truck departures, arrivals and internal warehouse loading and unloading activities.

The model was developed, and validated against the on-site unattended noise monitoring data, during periods with similar operational activities. Using the calibrated noise model, noise levels were predicted to all nearby noise sensitive receiver locations, including the residential receivers in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. Noise levels were assessed assuming the worst-case prevailing meteorological conditions were present, as required by CoC B80.

The outcome of the compliance noise monitoring and modelling demonstrated that the mechanical plant and other noisy equipment that operate as part of the WH3B operations achieve the noise limits presented SSD 7628 CoC B80.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).																																								
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.																																								
Assessment period	The period in a day over which assessments are made.																																								
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.																																								
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).																																								
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment: <table><tr><td rowspan="2">threshold of hearing</td><td>0 dB</td><td>The faintest sound we can hear</td></tr><tr><td>10 dB</td><td>Human breathing</td></tr><tr><td rowspan="2">almost silent</td><td>20 dB</td><td></td></tr><tr><td>30 dB</td><td>Quiet bedroom or in a quiet national park location</td></tr><tr><td rowspan="2">generally quiet</td><td>40 dB</td><td>Library</td></tr><tr><td>50 dB</td><td>Typical office space or ambience in the city at night</td></tr><tr><td rowspan="2">moderately loud</td><td>60 dB</td><td>CBD mall at lunch time</td></tr><tr><td>70 dB</td><td>The sound of a car passing on the street</td></tr><tr><td rowspan="2">loud</td><td>80 dB</td><td>Loud music played at home</td></tr><tr><td>90 dB</td><td>The sound of a truck passing on the street</td></tr><tr><td rowspan="2">very loud</td><td>100 dB</td><td>Indoor rock band concert</td></tr><tr><td>110 dB</td><td>Operating a chainsaw or jackhammer</td></tr><tr><td rowspan="2">extremely loud</td><td>120 dB</td><td>Jet plane take-off at 100m away</td></tr><tr><td>130 dB</td><td></td></tr><tr><td>threshold of pain</td><td>140 dB</td><td>Military jet take-off at 25m away</td></tr></table>			threshold of hearing	0 dB	The faintest sound we can hear	10 dB	Human breathing	almost silent	20 dB		30 dB	Quiet bedroom or in a quiet national park location	generally quiet	40 dB	Library	50 dB	Typical office space or ambience in the city at night	moderately loud	60 dB	CBD mall at lunch time	70 dB	The sound of a car passing on the street	loud	80 dB	Loud music played at home	90 dB	The sound of a truck passing on the street	very loud	100 dB	Indoor rock band concert	110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away	130 dB		threshold of pain	140 dB	Military jet take-off at 25m away
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	130 dB																																								
threshold of pain	140 dB	Military jet take-off at 25m away																																							
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.																																								
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.																																								

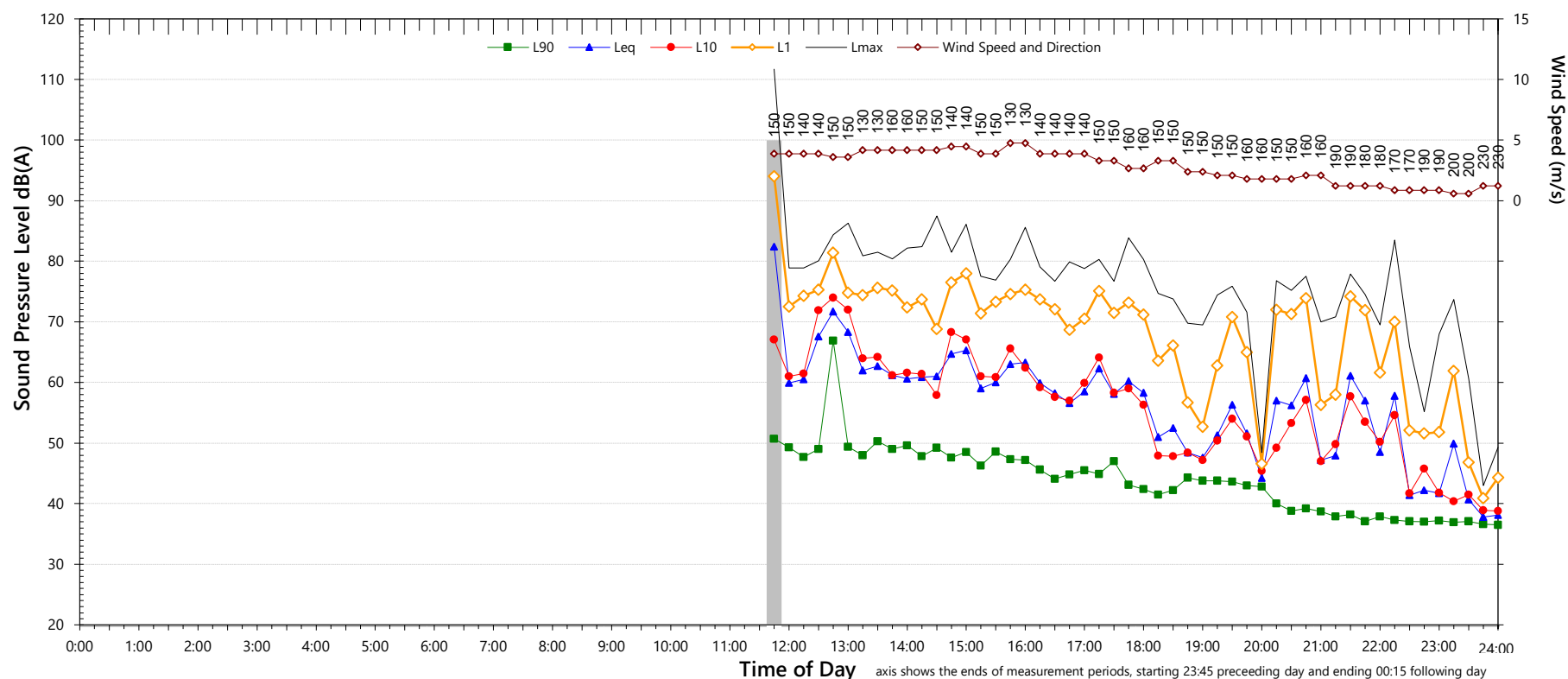
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L _{eq} sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B **Logger location 1 – WH3B - North side**

Unattended Noise Monitoring Results

WH3B - North

Tuesday, 2 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	38	32
L _{Aeq}	-	55	53

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	69	to	84
L _{Max} - L _{eq} (Range)	21	to	31

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	64	55
L _{eq} 1hr upper 10 percentile	66	58
L _{eq} 1hr lower 10 percentile	55	46

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

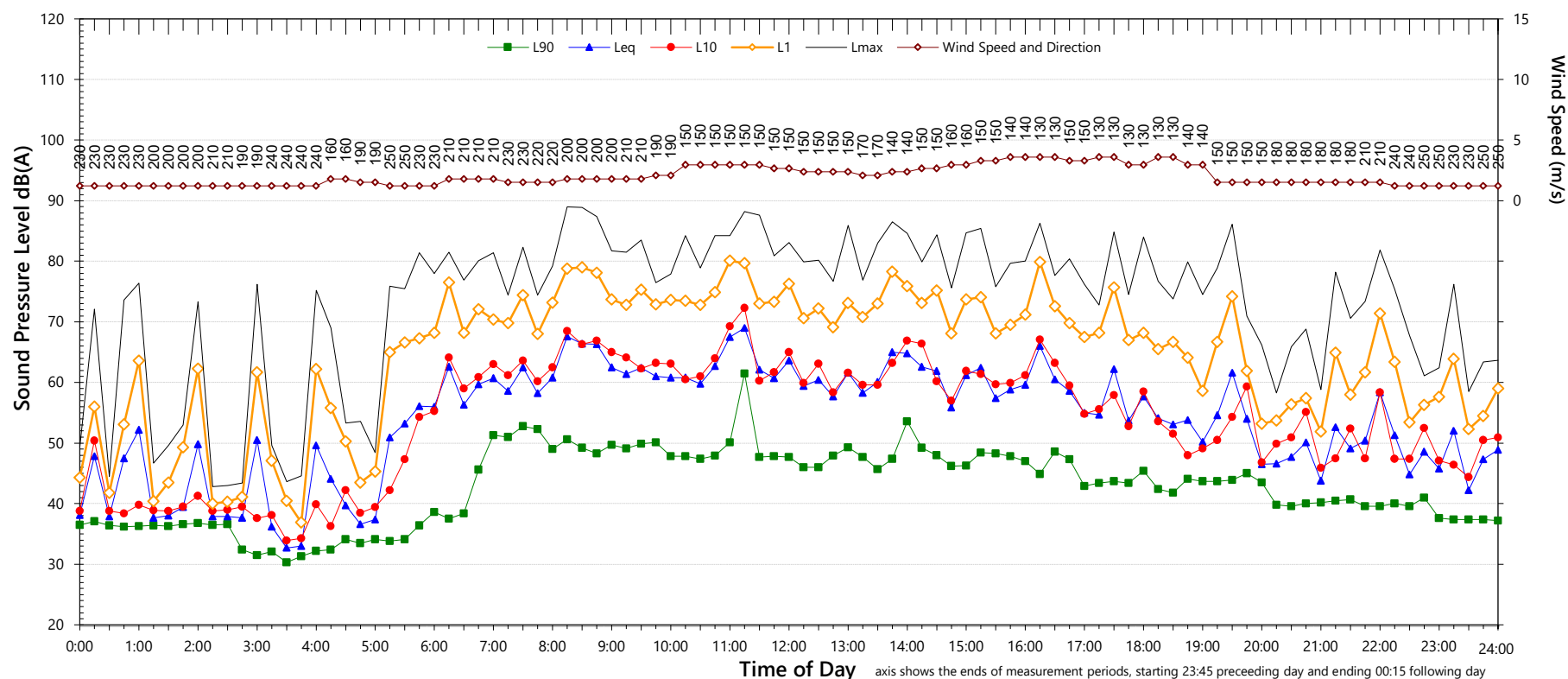
WH3B

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - North

Wednesday, 3 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	45	40	35
L _{Aeq}	63	54	58

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	74	to	89
L _{Max} - L _{eq} (Range)	15	to	30

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	64	60
L _{eq} 1hr upper 10 percentile	67	65
L _{eq} 1hr lower 10 percentile	56	47

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

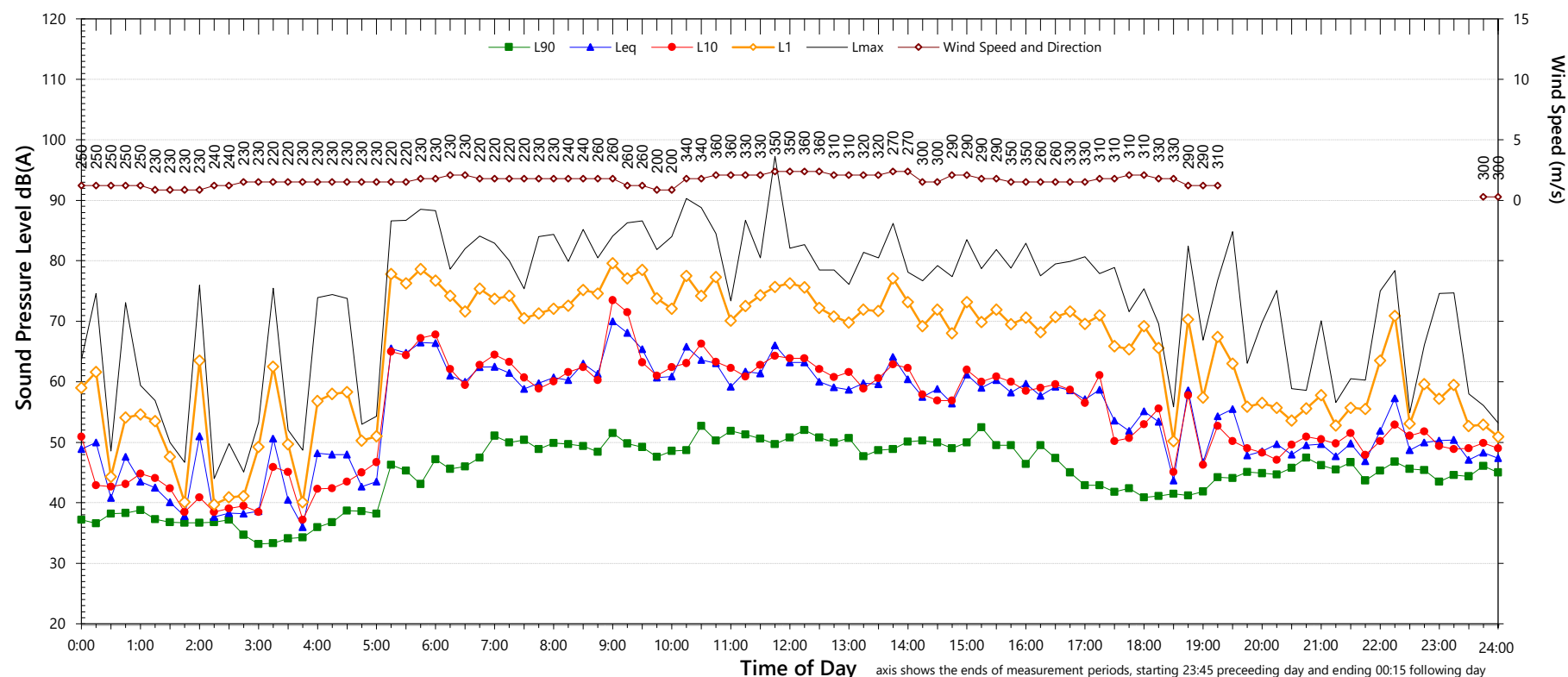
WH3B

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - North

Thursday, 4 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	44	41	40
L _{Aeq}	62	52	54

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	71	to	81
L _{Max} - L _{eq} (Range)	21	to	28

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	63	56
L _{eq} 1hr upper 10 percentile	67	60
L _{eq} 1hr lower 10 percentile	53	49

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

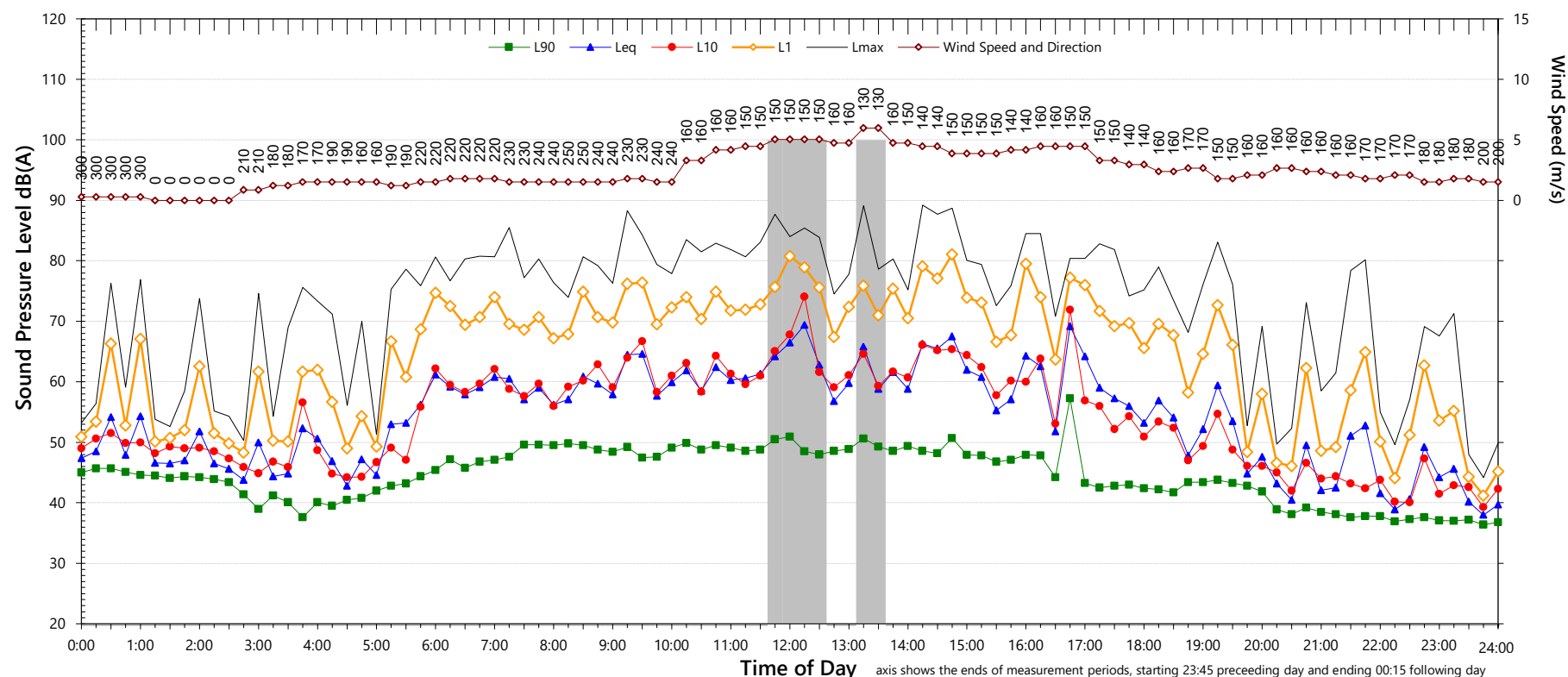
WH3B

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - North

Friday, 5 March 2021



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	43	38	29
L _{Aeq}	62	52	54

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	67	to	92
L _{Max} - L _{eq} (Range)	24	to	32

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade)

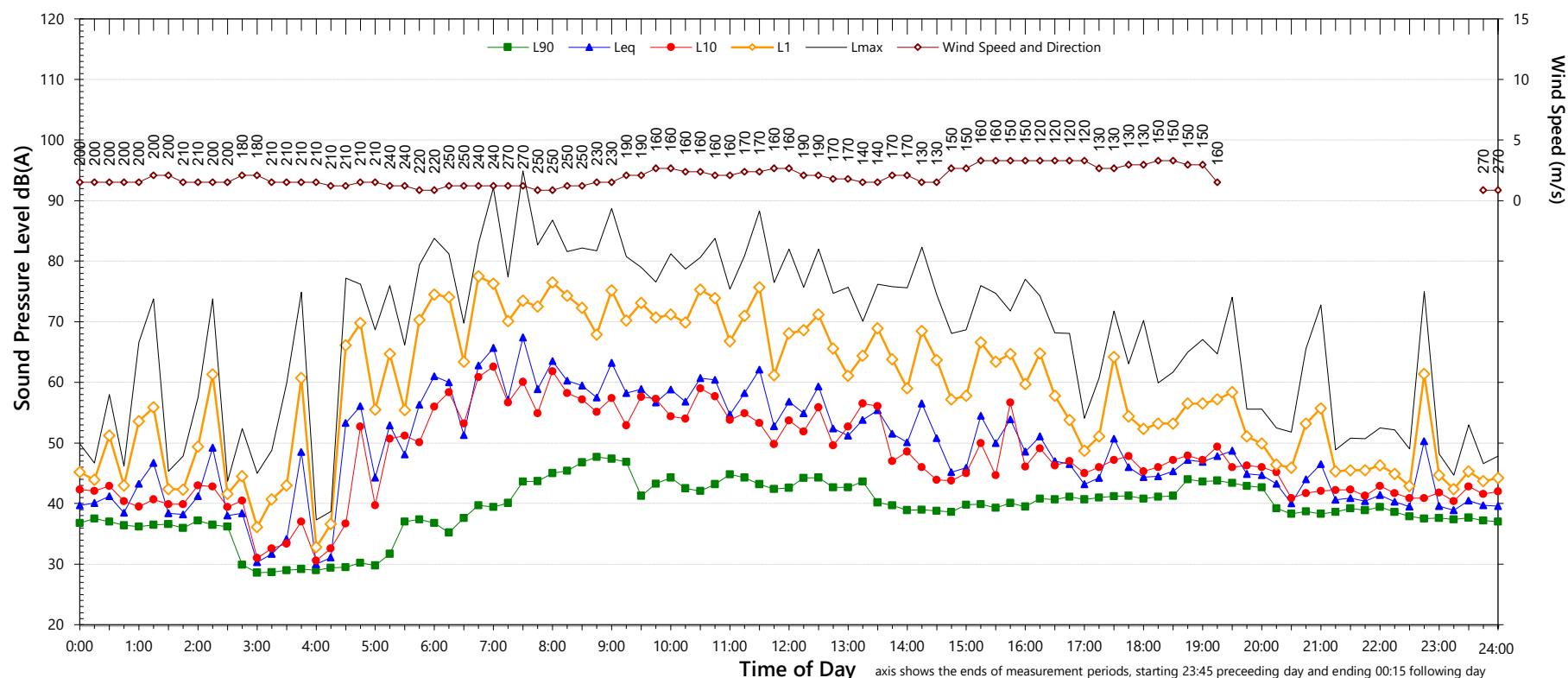
(see note 6)

Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	63	57
L _{eq} 1hr upper 10 percentile	67	60
L _{eq} 1hr lower 10 percentile	54	44

Unattended Noise Monitoring Results

WH3B - North

Saturday, 6 March 2021



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	39	38	32
L _{Aeq}	58	45	45

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	68	to	84
L _{Max} - L _{eq} (Range)	16	to	33

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade)

(see note 6)

Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	59	48
L _{eq} 1hr upper 10 percentile	62	51
L _{eq} 1hr lower 10 percentile	47	42

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

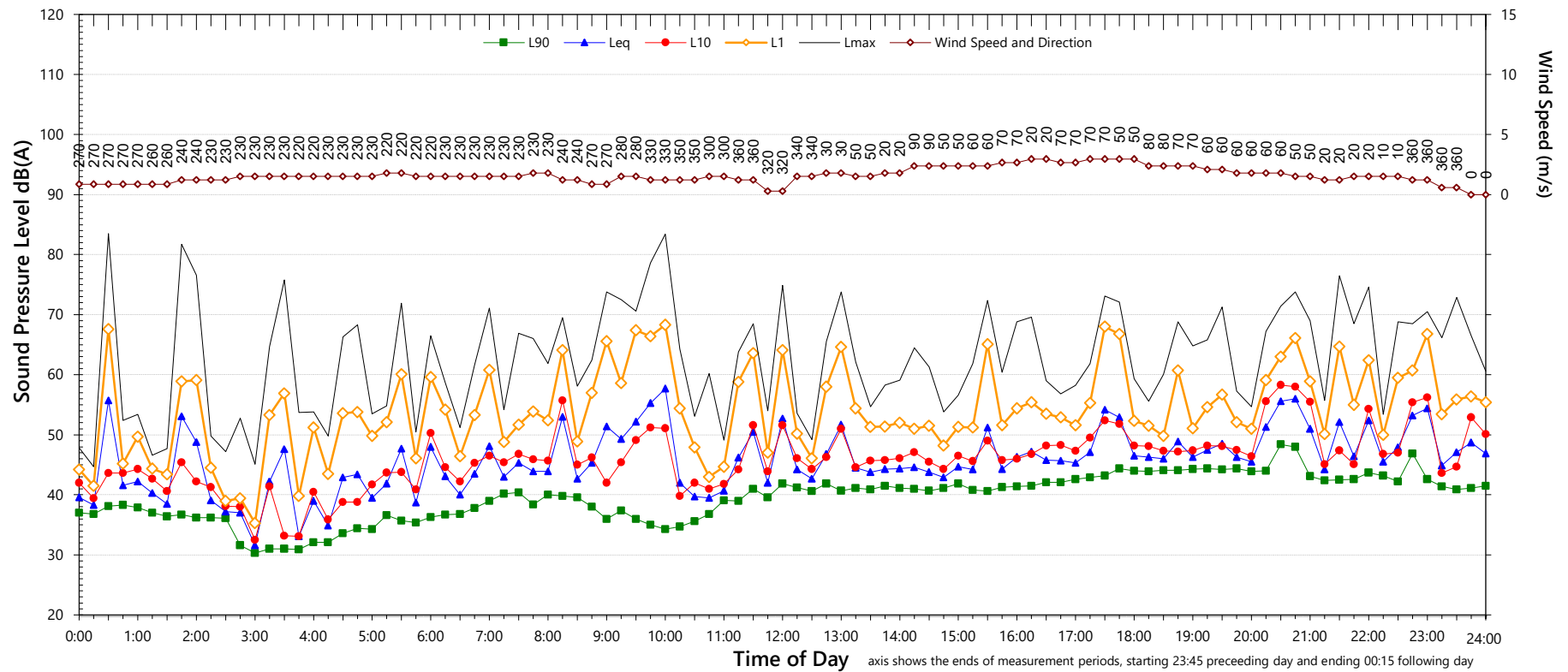
WH3B

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - North

Sunday, 7 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4 5}
L ₉₀	36	43	40
L _{Aeq}	49	51	53

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	71	to	84
L _{Max} - L _{eq} (Range)	19	to	30

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	52	56
L _{eq} 1hr upper 10 percentile	56	59
L _{eq} 1hr lower 10 percentile	47	47

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

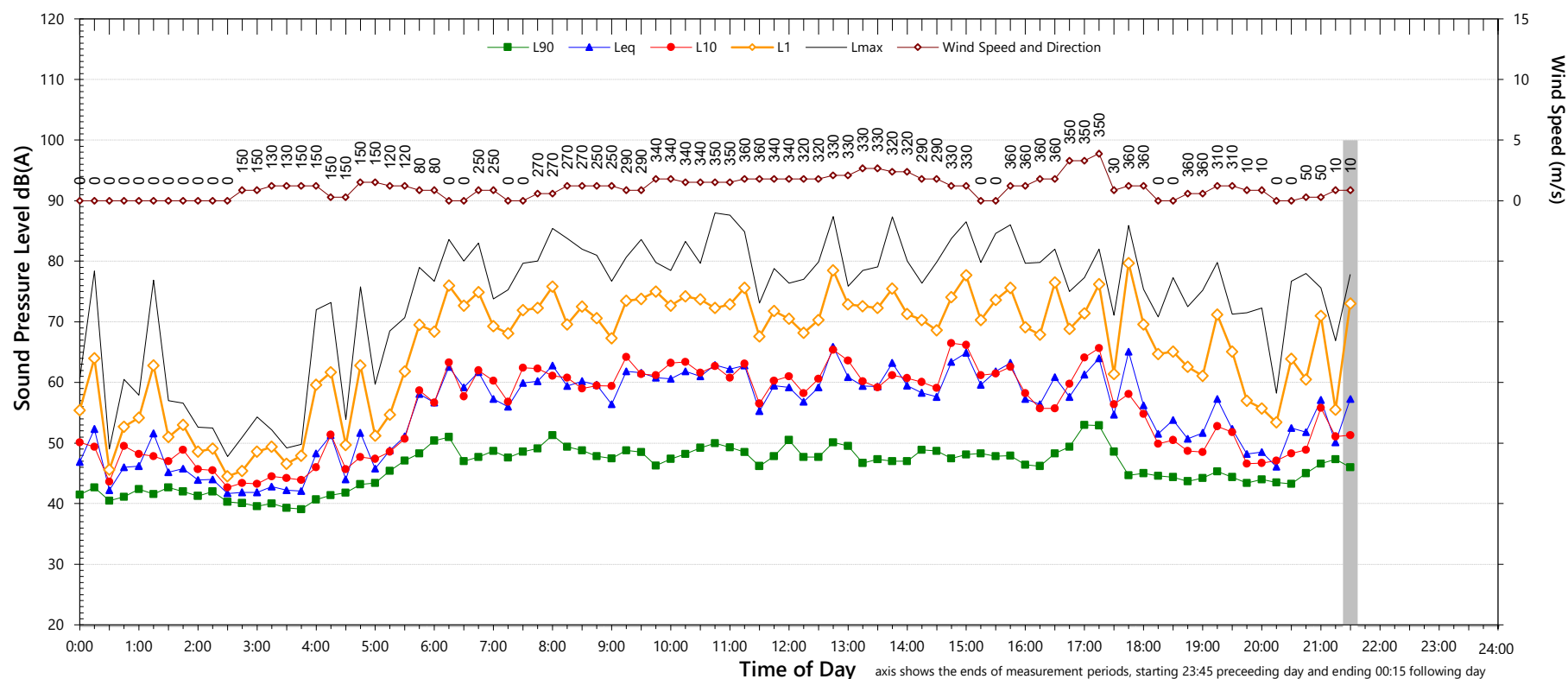
WH3B

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - North

Monday, 8 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	46	-	-
L _{Aeq}	61	-	-

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	-	to	-
L _{Max} - L _{eq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	63	-
L _{eq} 1hr upper 10 percentile	65	-
L _{eq} 1hr lower 10 percentile	55	-

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

WH3B

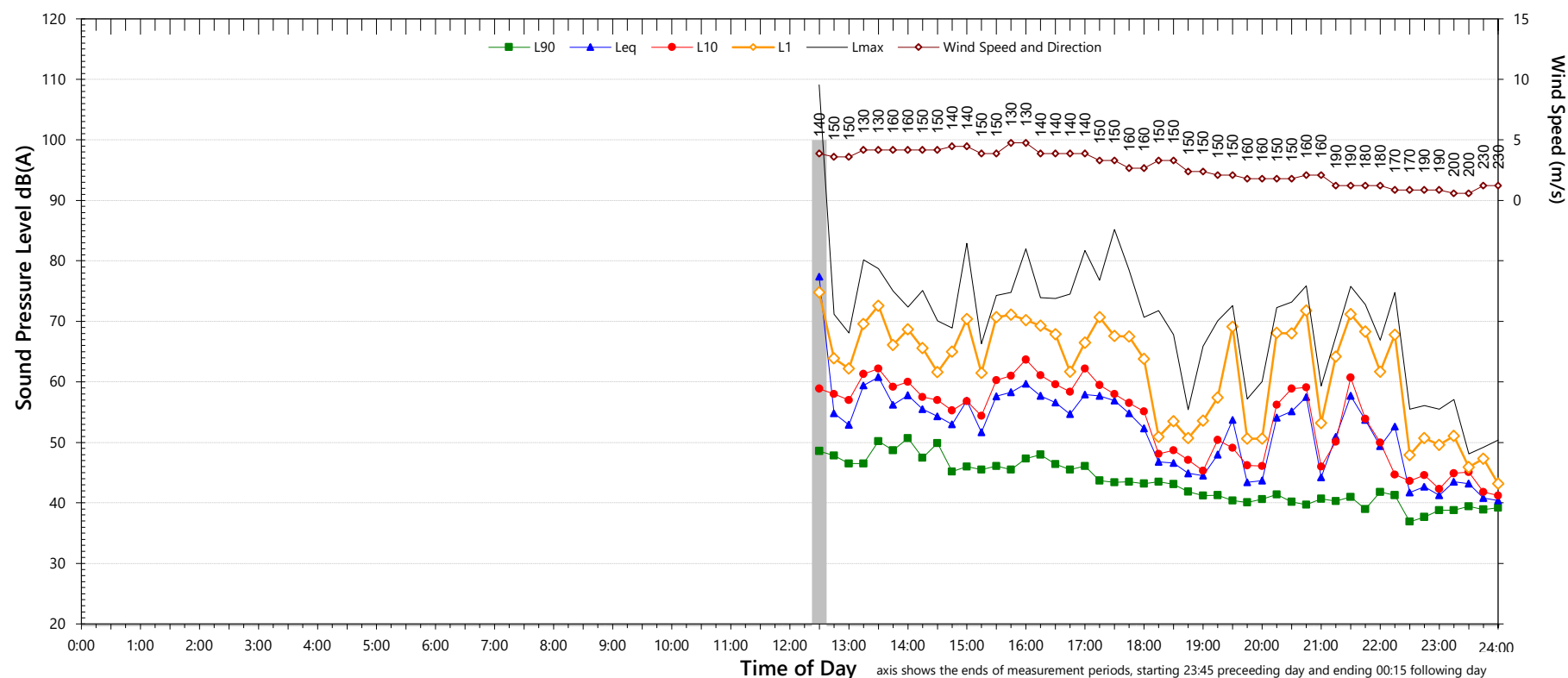
QTE-26 Logger Graphs Program (r34)

APPENDIX C **Logger location 2 – WH3B – South side**

Unattended Noise Monitoring Results

WH3B - South

Tuesday, 2 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	40	32
L _{Aeq}	-	52	48

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	73	to	75
L _{Max} - L _{eq} (Range)	20	to	27

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	58	50
L _{eq} 1hr upper 10 percentile	60	55
L _{eq} 1hr lower 10 percentile	51	39

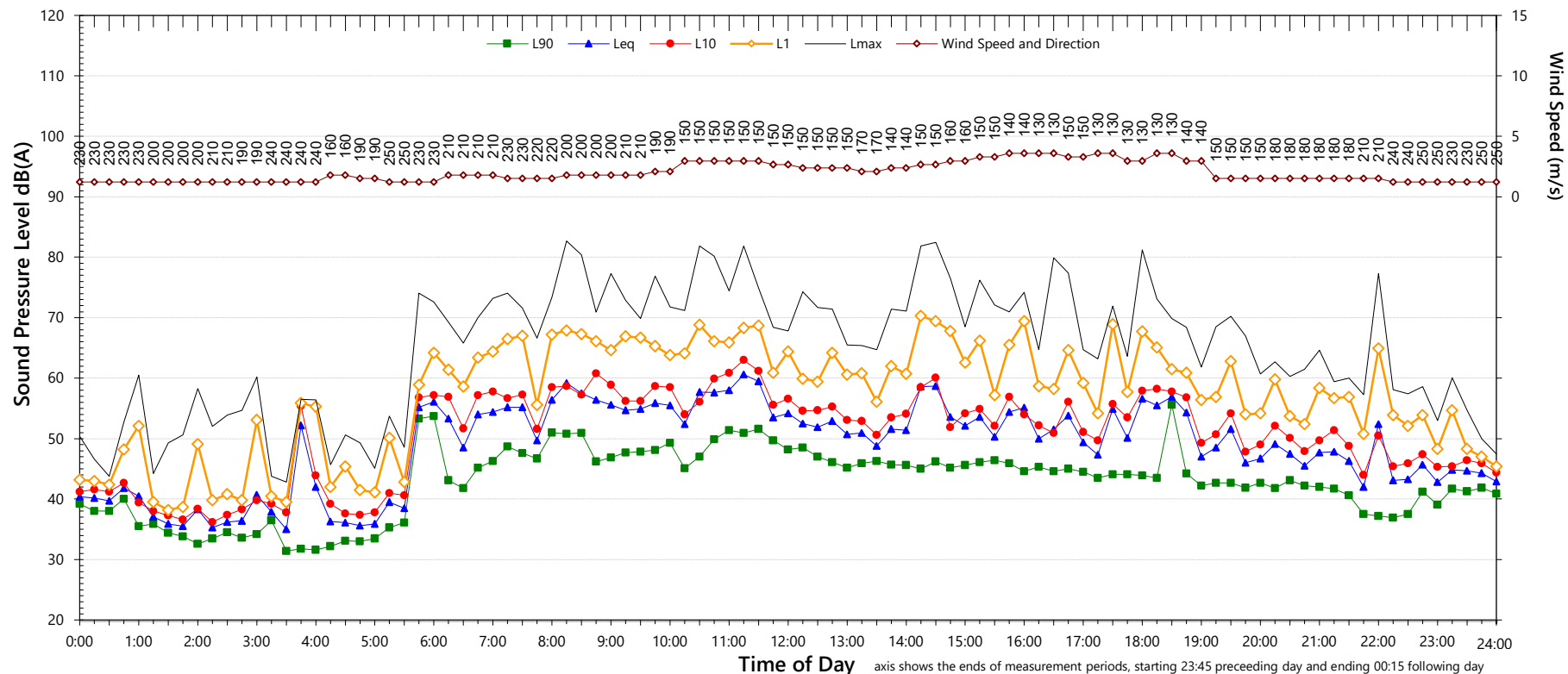
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Unattended Noise Monitoring Results

WH3B - South

Wednesday, 3 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	45	39	35
L _{Aeq}	55	51	50

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	75	to	86
L _{Max} - L _{eq} (Range)	16	to	29

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	57	52
L _{eq} 1hr upper 10 percentile	60	56
L _{eq} 1hr lower 10 percentile	51	42

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

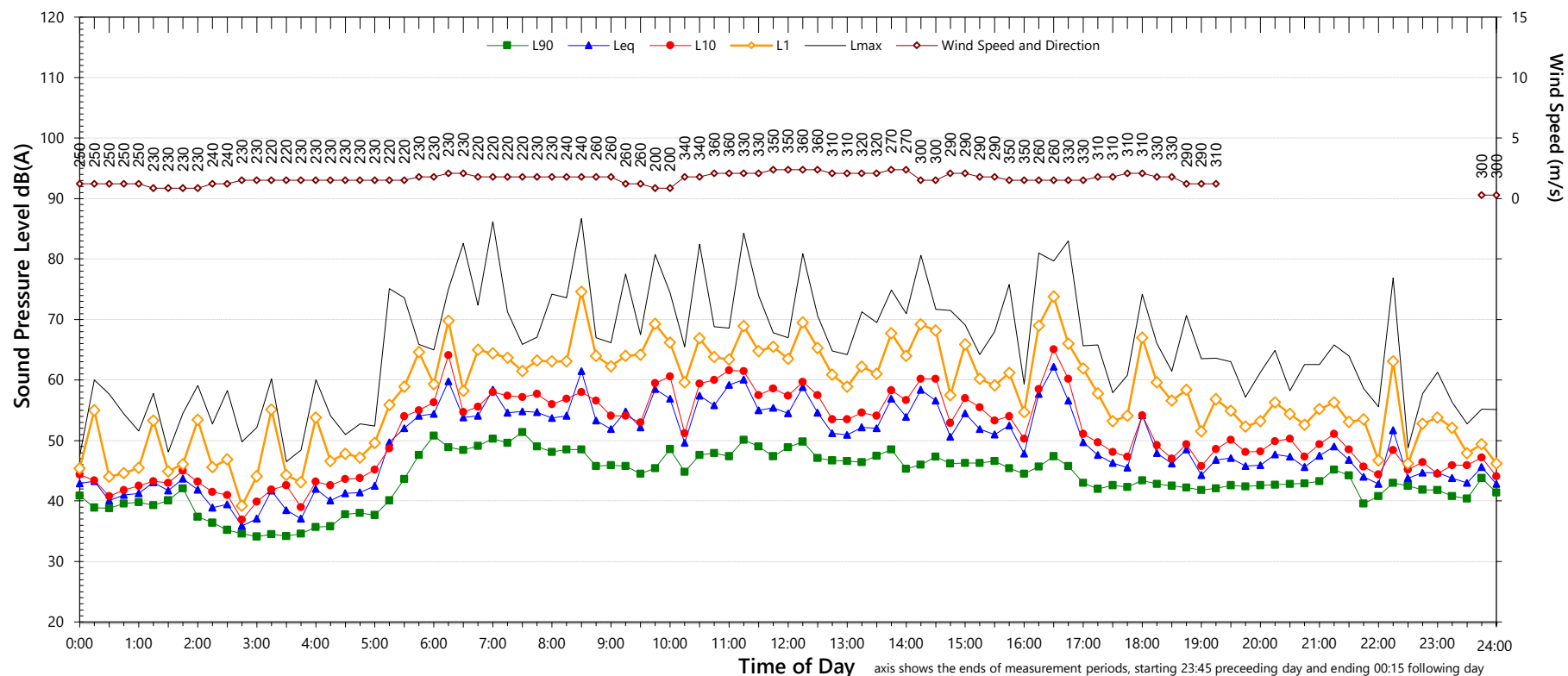
WH3B_Front(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - South

Thursday, 4 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	44	41	39
L _{Aeq}	56	47	48

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	72	to	77
L _{Max} - L _{eq} (Range)	16	to	29

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	57	51
L _{eq} 1hr upper 10 percentile	60	55
L _{eq} 1hr lower 10 percentile	49	44

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

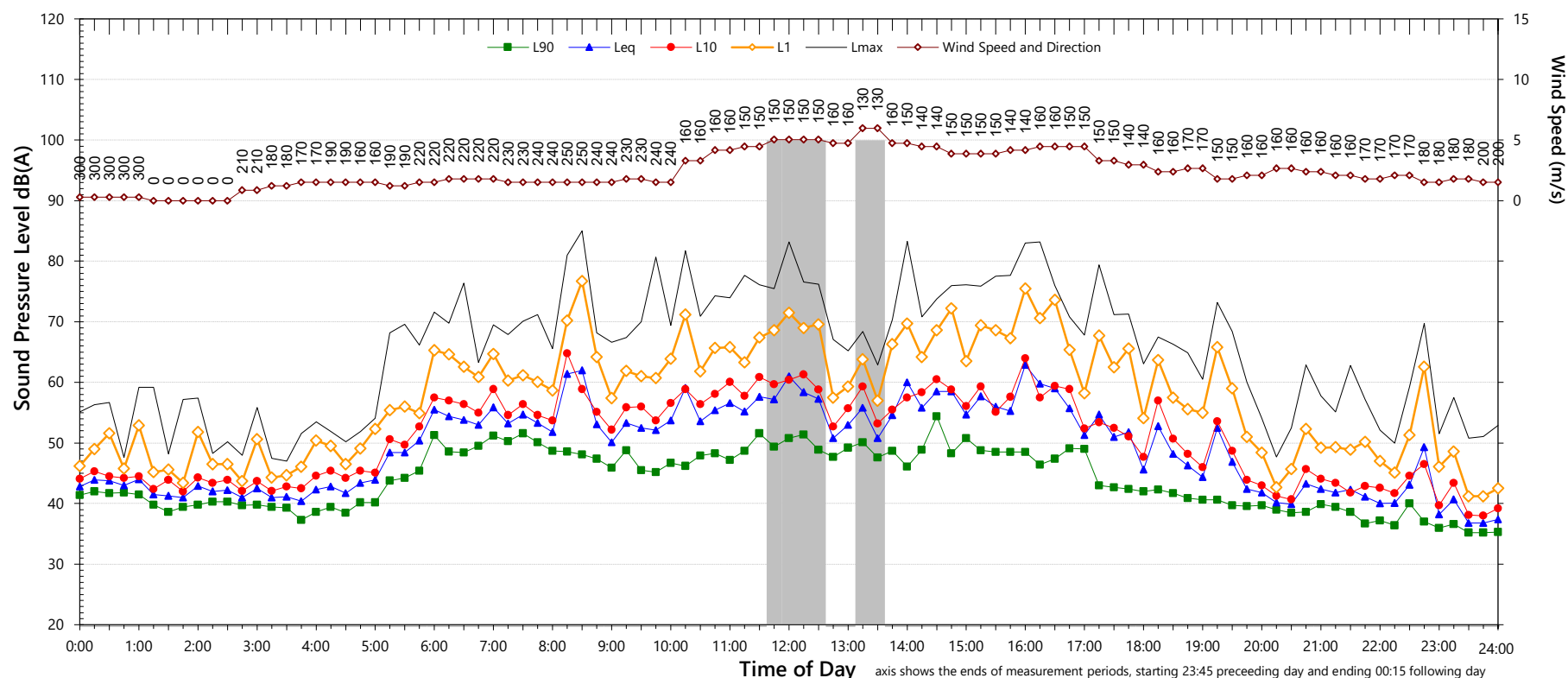
WH3B_Front(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - South

Friday, 5 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	45	38	32
L _{Aeq}	57	46	50

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	68	to	84
L _{Max} - L _{eq} (Range)	16	to	27

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	58	52
L _{eq} 1hr upper 10 percentile	61	56
L _{eq} 1hr lower 10 percentile	47	41

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

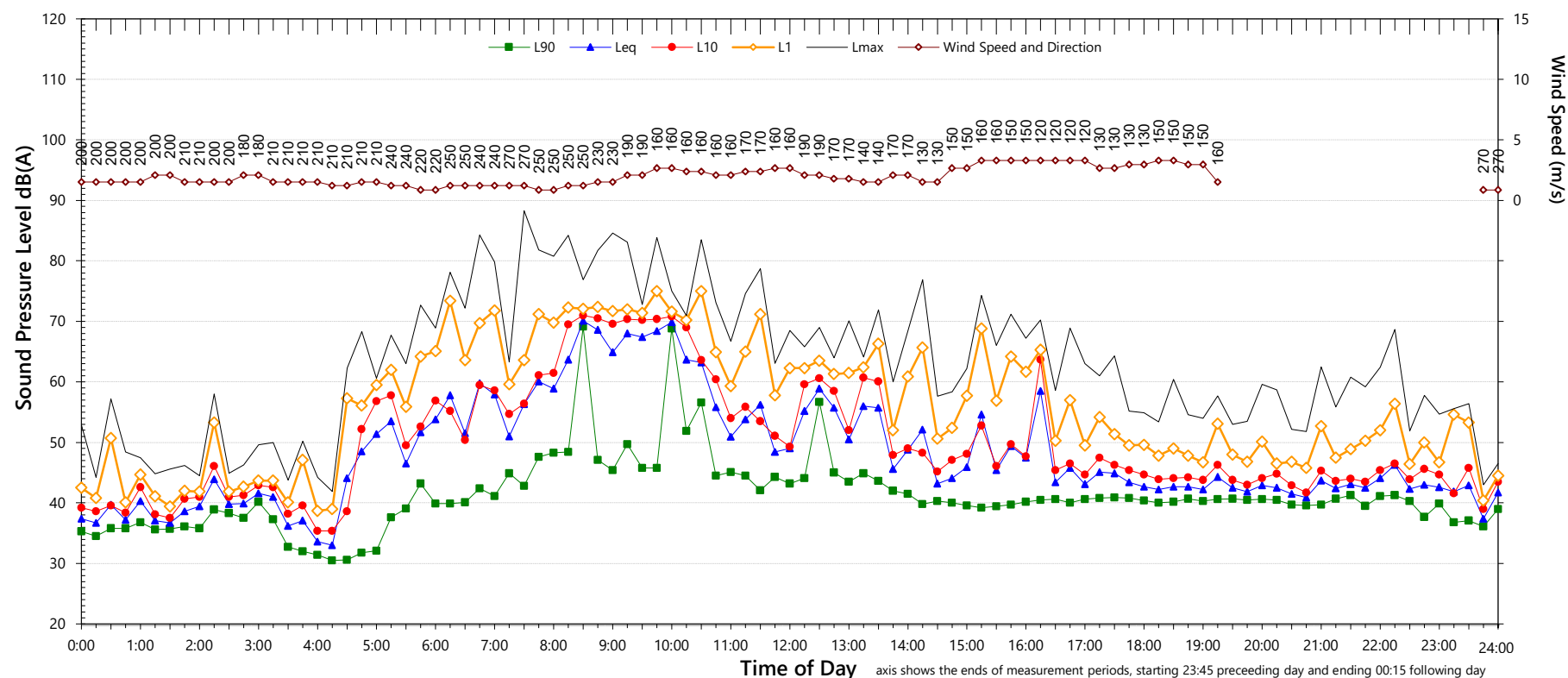
WH3B_Front(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - South

Saturday, 6 March 2021



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	40	40	33
L _{Aeq}	62	43	42

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	69	to	70
L _{Max} - L _{eq} (Range)	17	to	29

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade)

(see note 6)

Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	63	44
L _{eq} 1hr upper 10 percentile	67	47
L _{eq} 1hr lower 10 percentile	45	39

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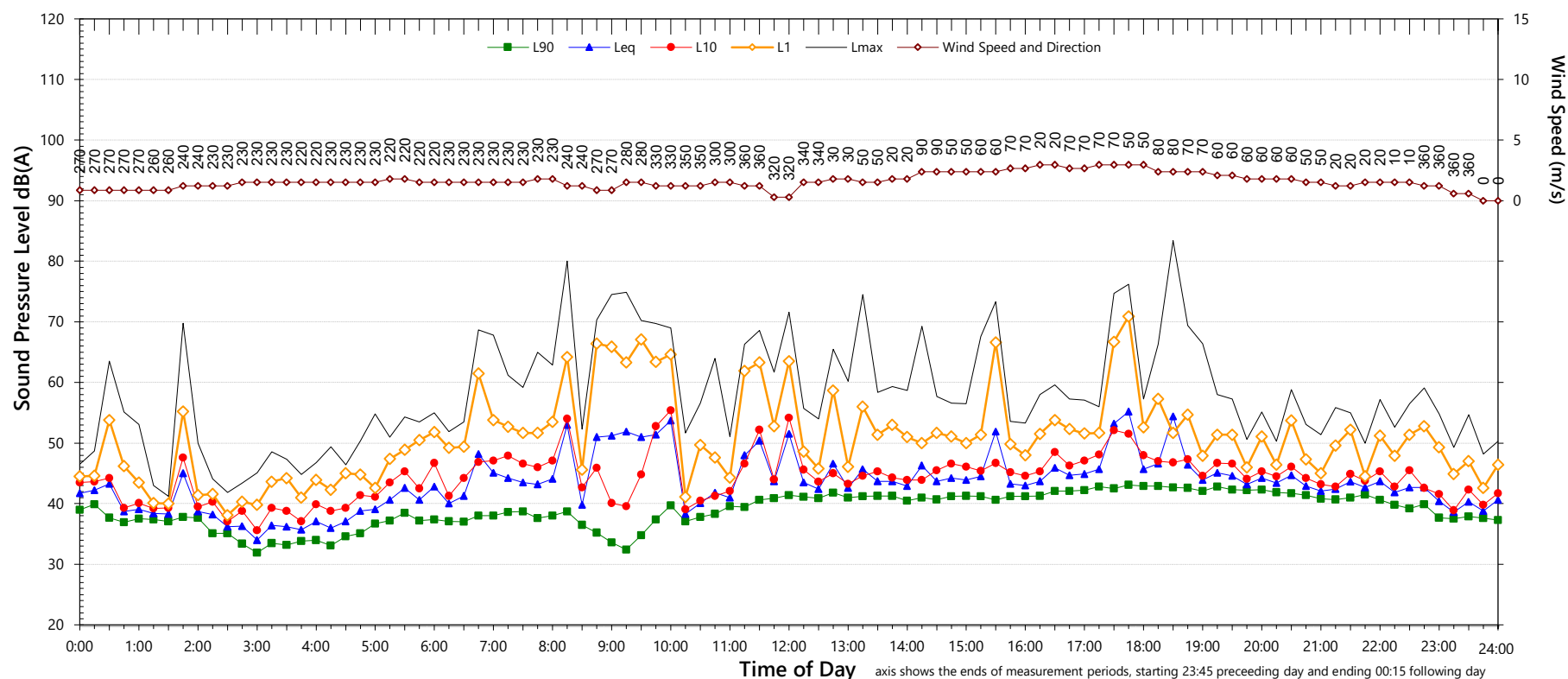
WH3B_Front(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - South

Sunday, 7 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	36	41	37
L _{Aeq}	48	46	45

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	67	to	73
L _{Max} - L _{eq} (Range)	15	to	25

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	50	47
L _{eq} 1hr upper 10 percentile	54	51
L _{eq} 1hr lower 10 percentile	46	41

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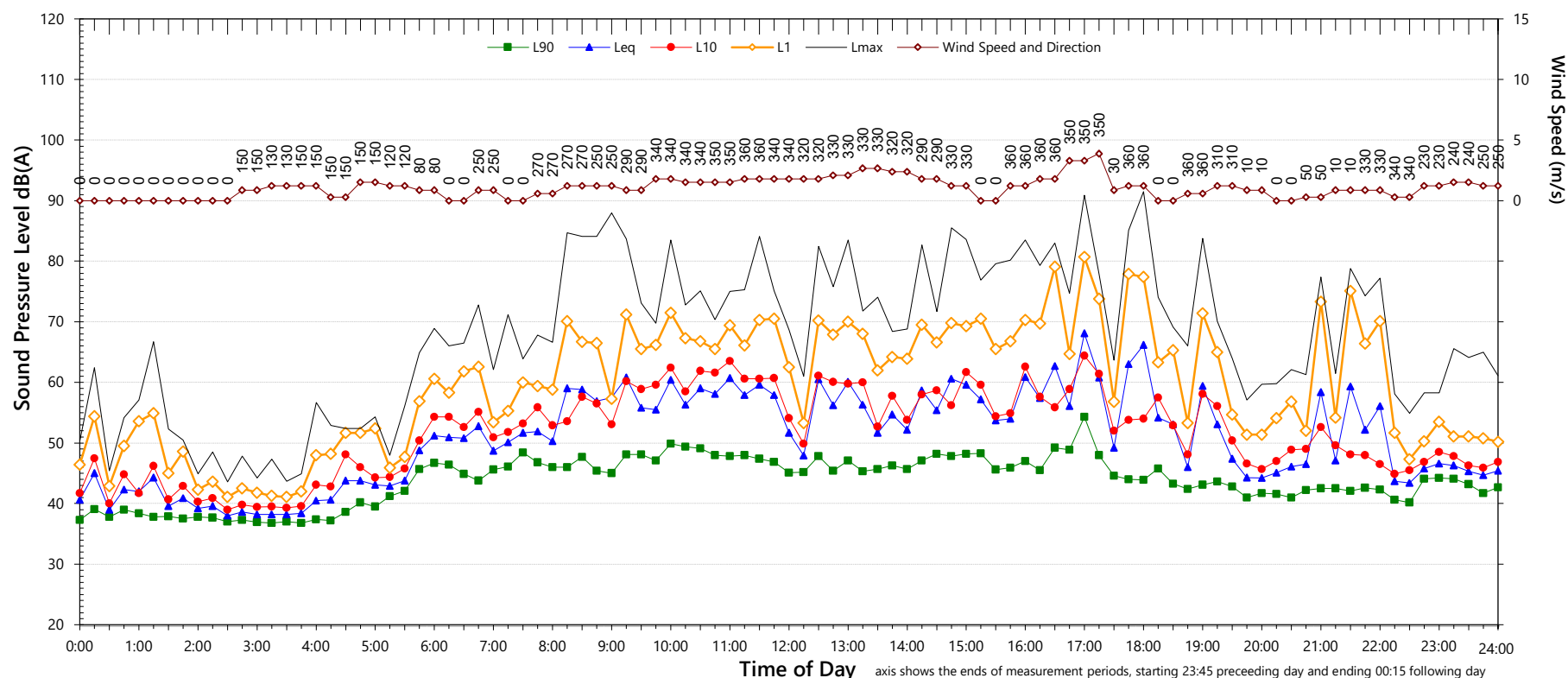
WH3B_Front(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - South

Monday, 8 March 2021



NSW Noise Policy for Industry (Free Field)

Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	45	41	39
L _{Aeq}	59	54	49

Night Time Maximum Noise Levels

(see note 7)

L _{Max} (Range)	66	to	74
L _{Max} - L _{eq} (Range)	16	to	27

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade)

(see note 6)

Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	61	51
L _{eq} 1hr upper 10 percentile	64	55
L _{eq} 1hr lower 10 percentile	54	45

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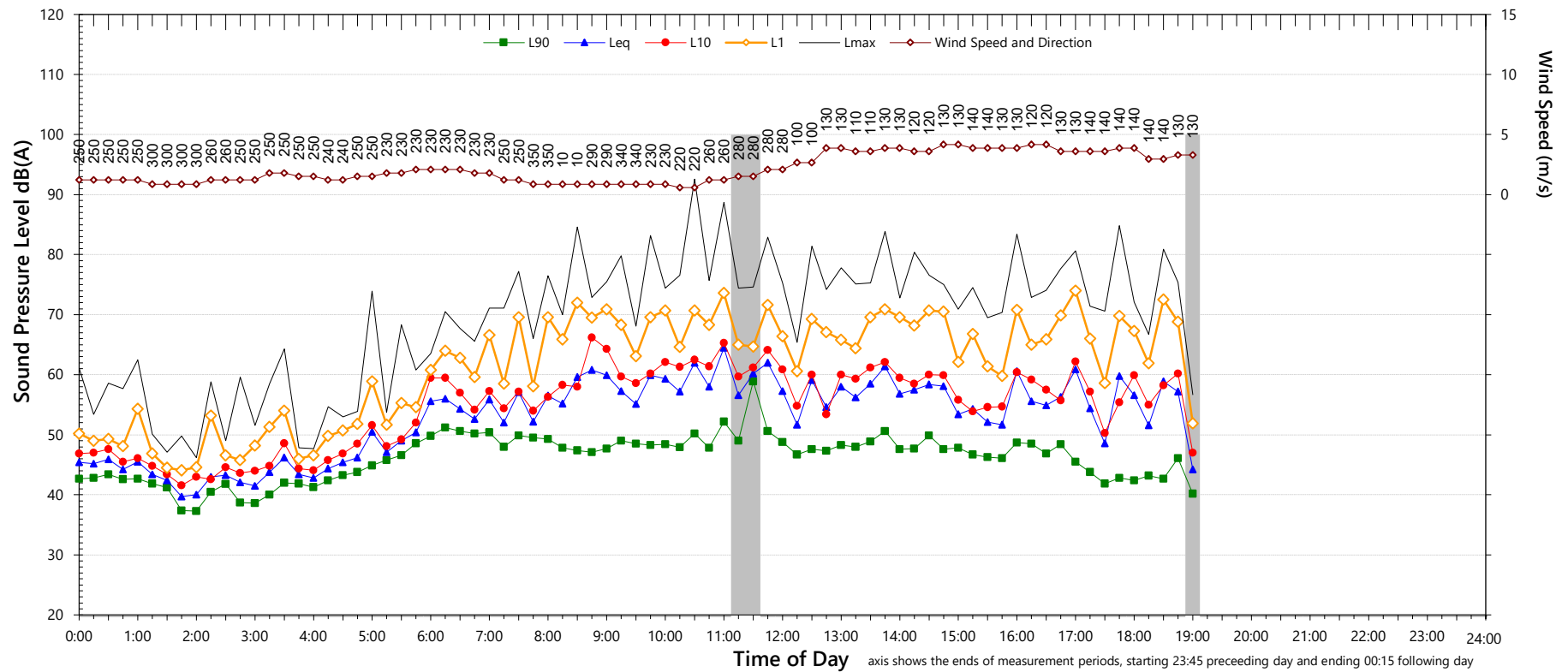
WH3B_Front(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH3B - South

Tuesday, 9 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	46	-	-
L _{Aeq}	58	-	-

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	-	to	-
L _{Max} - L _{eq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	61	-
L _{eq} 1hr upper 10 percentile	63	-
L _{eq} 1hr lower 10 percentile	59	-

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

WH3B_Front(r0)

QTE-26 Logger Graphs Program (r34)

B.10 Warehouse 4A Noise Monitoring Report

Renzo Tonin & Associates Report TL116-09F02 Warehouse 4A Ops (r1)

MOOREBANK LOGISTIC PARK - PRECINCT EAST

Warehouse 4A Operational Compliance Measurements

6 April 2021

Qube Property Management Services Pty Ltd c/- Tactical Group

TL116-09F02 Warehouse 4A Ops (r1)

Document details

Detail	Reference
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Attention:	

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
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We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

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Contents

1	Introduction	5
1.1	Warehouse operations description – WH4A	6
1.1.1	Location	6
1.1.2	Operational activities and facilities and hours of operation	6
1.2	Nearby sensitive receivers	6
2	Summary of noise objectives	9
2.1	Compliance assessment noise requirements	9
2.2	Operational noise limits	9
2.3	Discussion of assessment noise limits	10
3	Measurement methodology and results	12
3.1	Compliance measurement methodology	12
3.2	Instrumentation	13
3.3	Receiver unattended noise measurement results	13
3.3.1	Meteorological conditions	17
3.4	On-site attended operational activity noise measurement results	17
3.5	Unattended noise measurements	18
3.6	Modelled operational scenarios	19
3.6.1	Observed operations for modelling	19
3.6.1.1	Loading and Unloading operations (WH4A north)	19
3.6.1.2	Qube container handling operational area (WH4A south)	20
3.6.2	Assessment noise source levels	20
3.6.3	Reasonable worst-case intrusiveness scenarios (15-minute period)	21
3.7	Modelling methodology	23
3.7.1	Overview of noise modelling	23
3.7.2	General modelling assumptions	23
3.7.3	Model validation	24
3.8	Noise compliance assessment	25
4	Conclusion	27
APPENDIX A	Glossary of terminology	28
APPENDIX B	Logger location 1 – WH4A - North side	30
APPENDIX C	Logger location 2 – WH4A – South side	31

List of tables

Table 1	Noise sensitive receivers and approximate distance from MPE WH4A	7
Table 2	SSD 7628 CoC B80 noise limits, dB(A)	10
Table 3	Noise measurement equipment	13

Table 4	Permanent noise monitoring stations	13
Table 5	Receiver permanent noise monitoring locations	14
Table 6	Summary of permanent noise monitoring results at the nearest sensitive residential receivers	16
Table 7	On-site attended noise measurement results	18
Table 8	Assessment noise source levels	21
Table 9	Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios	23
Table 10	Comparison between measured and modelled noise levels	24
Table 11	Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH4A north	25
Table 12	Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH4A south	26

List of figures

Figure 1	Warehouse location WH4A, MPE precinct and the nearest residential receiver catchments	8
Figure 2	Residential receiver noise monitoring locations NMT01 to NMT04	15
Figure 3	Unattended noise logger locations and main noise generation areas (imagery: Nearmap, 2021)	19

1 Introduction

Renzo Tonin & Associates was engaged by Tactical on behalf of Qube Property Management Services Pty Ltd (QUBE) to undertake an operational noise compliance assessment of the warehouse operations carried out by Warehouse 4A (WH4A) within the Moorebank Precinct East (MPE), located within the Moorebank Logistics Park (MLP) at Moorebank, NSW.

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stages 1 and 2 of the MPE Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10_0193). Warehouse operations, including the site that is operated by WH4A fall under the area and activities approved as part of SSD 7628.

This report has been prepared to address the operational noise monitoring requirements outlined in the MPE Operational Noise and Vibration Management Plan¹ (MPE ONVMP) required for the warehouse operations carried out by WH4A. Specifically, this report has been prepared to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628, as detailed in Section 3.2.2 of the MPE ONVMP.

Appendix A contains a glossary of acoustic terms used in this report.

¹ Arcadis & Renzo Tonin & Associates, Operational Noise and Vibration Management Plan for Moorebank Logistics Park – East Precinct, Revision 012, dated 27/3/2020, available https://simta.com.au/wordpress/wp-content/uploads/2020/04/ONVMP_V12_redacted.pdf, accessed 25/3/2021

1.1 Warehouse operations description – WH4A

1.1.1 Location

The MLP is located approximately 27 kilometres south-west of the Sydney Central Business District and approximately 26 kilometres west of Port Botany, within the Liverpool Local Government Area. The MLP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively, as shown in Figure 1.

1.1.2 Operational activities and facilities and hours of operation

Operational activities at WH4A include storage and distribution activities at the position shown in Figure 1. The day to day activities include:

- Receipt and despatch of containers from and to the IMEX terminal
- Loading and unloading of containers
- Storage of products
- Despatching and receiving product to commercial customers using internal equipment such as forklifts
- Internal product moving and loading activities, including use of forklifts
- General office administrative and support functions.

The despatch activities mostly occur from the south side of WH4A, typically between the hours of 9:00am and 6:00pm, however the busiest period of noise-generating activities typically occurs around 9:00am to 11:00am. There are no activities that typically occur during the night period (10:00pm to 7:00am) within the site. The noise-generating vehicle movements associated with the general deliveries and commercial customer activities mostly occur from the northern side of the warehouse. The southern side of the warehouse is the designated area where containers from the IMEX terminal or other sources are transported to and stored for unloading to within the warehouse. These two main areas are shown in Figure 3.

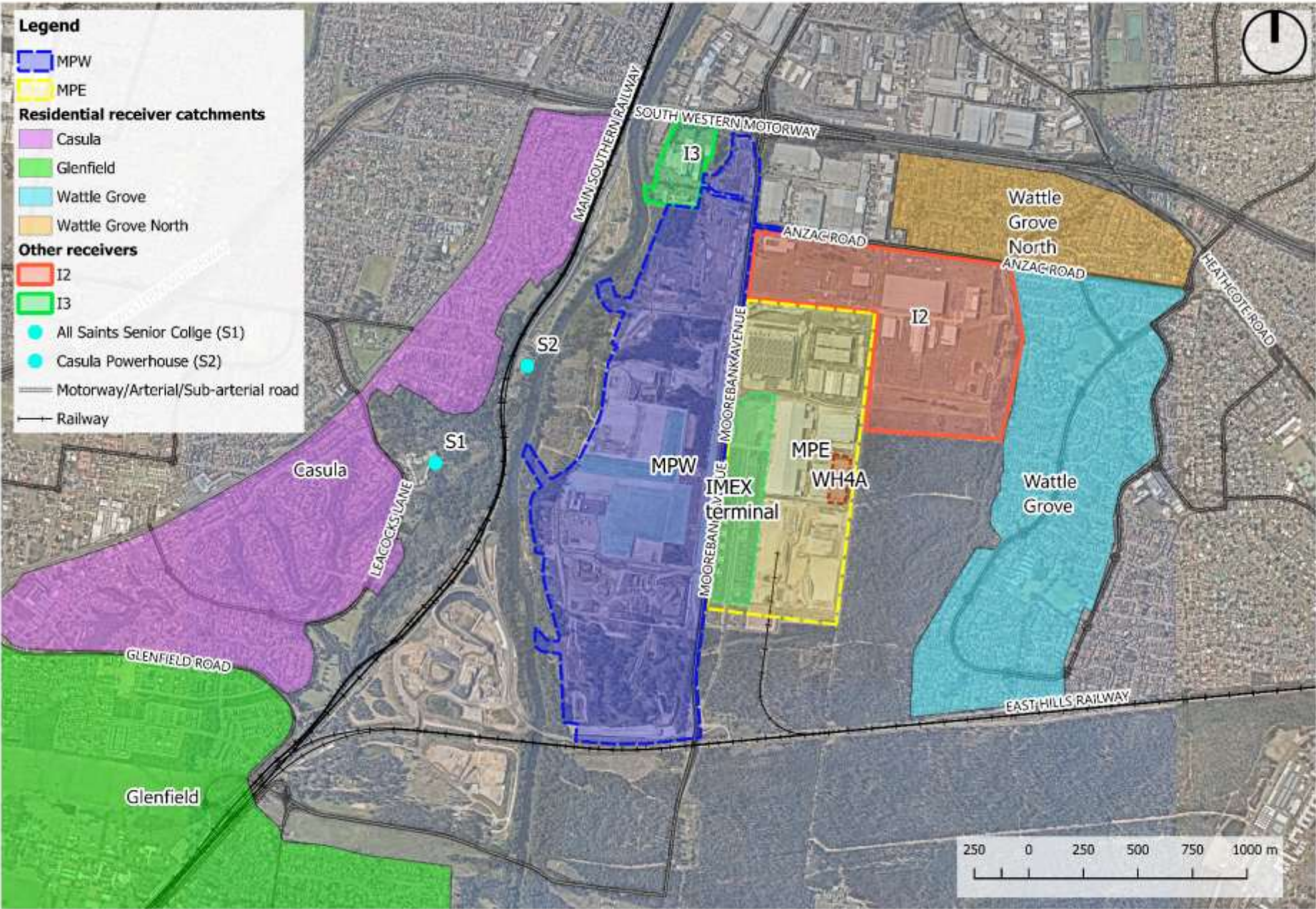
1.2 Nearby sensitive receivers

The potentially most affected residential receivers in the vicinity of the MPE, when noise intensive activities at the WH4A are occurring, are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. A summary of the approximate distance to the nearest residential receiver in the surround noise catchment areas (NCAs) is provided in Table 1. The locations of the NCAs or receivers, are shown in Figure 1.

Table 1 Noise sensitive receivers and approximate distance from MPE WH4A

Sensitive receiver (Noise Catchment Area (NCA) or Receiver ID)	Receiver type	Approximate distance from MPE precinct WH4A, metres
Wattle Grove (NCA 1)	Residential	800
Wattle Grove North (NCA 2)		1,060
Casula (NCA 3)		1,530
Glenfield (NCA 4)		2,530
All Saints Senior College (S1)	Educational	1,720
Casula Powerhouse (S2)		1,380
Defence Joint Logistics Unit (DJLU) (I2)	Industrial	600
ABB (I3)		1,260

Figure 1 Warehouse location WH4A, MPE precinct and the nearest residential receiver catchments



2 Summary of noise objectives

2.1 Compliance assessment noise requirements

The management of operational noise emission from warehouse activities within MPE Stage 2 is outlined in the MPE ONVMP. Specifically, this report has been prepared to address the requirements of CoC B85 in SSD 7628, as detailed in Section 4.1.1 of the MPE ONVMP.

This report includes noise monitoring performed to address the requirements in CoC B85, as detailed in Table 4-1 in Section 4.1.1 of the MPE ONVMP.

The requirements of CoC B85 state:

B85 The Applicant must carry out noise monitoring of mechanical plant and other noisy equipment for a minimum period of one week where valid data is collected following occupation of each warehouse. The monitoring program must be carried out by a suitably qualified and experienced person(s) and a Monitoring Report for Mechanical Plant must be submitted to the Secretary within two months of occupation or each tenancy to verify predicted mechanical plant and equipment noise levels.

CoC B85 requires that the monitored noise levels be compared against the predicted levels reviewed in accordance with CoC B84.

The noise impacts from warehouse operations were assessed as part of the EIS noise and vibration impact assessment (MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016 (MPE Stage 2 N&V assessment)). The individual noise impacts of warehouse operations were not quantified as part of the EIS. As such, noise level predictions for the warehouse activities are not available for verification with CoC B85.

As per Table 4-1 in Section 4.1.1 of the MPE ONVMP, Table 3-20 and Table 3-21 of the MPE ONVMP detail the predicted $L_{Aeq\ 15\ minute}$ intrusiveness and L_{Amax} sleep disturbance noise limit levels respectively for the overall MPE operations (not for individual warehouses).

As such, for the purposes of addressing CoC B85, instead of comparing the facility noise emission against the noise level predicted in accordance with CoC B84, this report aims to assess the noise levels from the mechanical plant and other noisy equipment that operate within the facility directly against the noise limits presented in Table 5 of condition B80.

2.2 Operational noise limits

The operational noise limits applicable for the warehouse operations within MPE are presented in Table 5 of SSD 7628 CoC B80 and are reproduced in Table 2. These noise limits are as per Table 3-5 of

the MPE ONVMP. The noise limits are applicable not only to all operational noise sources approved under SSD 7628, but are inclusive of operations as part of MPE Stage 1, approval SSD 6766.

The $L_{Aeq(15 \text{ minute})}$ criteria are applicable during the day, evening and night-time periods and the $L_{A1(1 \text{ minute})}$ sleep disturbance noise limits at residential receivers are applicable during the night-time period.

The noise limits are applicable under prevailing meteorological conditions of wind speeds of up to 3 m/s at 10 metres above ground level or stability category 'F' temperature inversion conditions.

Table 2 SSD 7628 CoC B80 noise limits, dB(A)

Sensitive receiver	Day ¹	Evening ¹	Night ¹	Night ¹
	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{A1(1 \text{ min})}$
Wattle Grove (NCA 1)	35	35	35	52
Wattle Grove North (NCA 2)	35	35	35	52
Casula (NCA 3)	35	35	35	52
Glenfield (NCA 4)	35	35	35	52

Notes:

1. In accordance with the INP, day is the period from 7:00 am to 6:00 pm Monday to Saturday; or 8:00 am to 6:00 pm on Sundays and public holidays; evening is the period from 6:00 pm to 10:00 pm; and night is the remaining periods.
2. To determine compliance with the $L_{Aeq, 15 \text{ minute}}$ noise limits, noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 Noise Policy for Industry - NPfI). The modification factors in Section 4 of the INP must also be applied to the measured noise levels where applicable.
3. To determine compliance with the L_{A1} noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 of the NPfI).
4. The noise emission limits identified above apply under meteorological conditions of:
 - (i) wind speeds of up to 3 m/s at 10 metres above ground level; or
 - (ii) 'F' atmospheric stability class.

2.3 Discussion of assessment noise limits

As noted in Section 2.2, the noise limits detailed in SSD 7628 CoC B80 are applicable not only to all operational noise sources approved under SSD 7628, but are also inclusive of operations as part of the MPE Stage 1 approval for SSD 6766. Importantly, when assessing compliance with the noise limits, the most affected residential receiver for any individual operations will not necessarily be at the same location. Additionally, it is unlikely that the reasonable worst-case noise levels from any individual operations would also occur in the same 15-minute period.

As part of the recent modification application for SSD 7709 Moorebank Precinct West (MPW) – Stage 2, MOD 1 - Building height increase, which was approved 24 December 2020, a review of the applicable operational noise requirements across Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) was undertaken (Renzo Tonin & Associates document reference TJ741-11F05 (r4), dated 30 June 2020). The review identified that there are number of approval conditions that are applicable across both the MPW and MPE sites for operational noise, and that in the application of these approvals to the site activities, it became apparent that the operational noise requirements were not consistent across the MPE and MPW sites.

Additionally, the review identified that the operational noise limits across MPE and MPW were set substantially below both the noise criteria and the predicted noise levels (even with feasible and reasonable mitigation measures) established during the environmental assessment stages and considering the cumulative operational noise levels from all MPE and MPW operations.

The review recommended that an overall approach for cumulative operational noise management of the Moorebank intermodal terminal precinct (for East and West precinct) for a “whole of complex” approach be adopted, and that consistent noise management objectives for the Moorebank intermodal terminal precinct’s operational noise be adopted to cover all operations within MPE and MPW. Appropriate and achievable noise management objectives consistent with EPA’s noise policies were also developed in the review.

Following the modification application for SSD 7709 (MOD 1), the submission received from the NSW Environment Protection Authority (NSW EPA) noted the following:

However, the current noise limits are set below the predicted noise levels and are not based on the Project Specific Noise Levels (PSNL) derived under the then-applicable Industrial Noise Policy 2000 (now superseded by the Noise Policy for Industry 2017).... The EPA considers that the resulting noise limits are not achievable for MPW, nor are they achievable for the cumulative MPW and MPE sites.

Also Liverpool City Council included in their submission:

Council considers that site regulation in regard to noise management may be assisted by adopting a precinct approach consistent with the NSW EPA’s Noise Policy for Industry (2017).... Whilst it is acknowledged that current criteria in the Approval may be impracticable, it will be necessary for the Department to consider applying suitable noise limits that are achievable and capable of protecting the amenity and wellbeing of sensitive receivers.

As such, this operational compliance assessment does not include further quantification of cumulative noise levels, and demonstrates that WH4A operations can achieve the noise limits set out in SSD 7628 CoC B80 in isolation during reasonable worst-case operations.

It is recommended that noise levels from this assessment achieve the required noise limits set out in Table 5 of SSD 7628 CoC B80, and that the site specific noise levels should be considered as part of the operational noise management applicable to the overall Moorebank intermodal terminal precinct.

3 Measurement methodology and results

3.1 Compliance measurement methodology

The Noise Policy for Industry (NPfI) provides guidance in Chapter 7 for monitoring the performance of a noise-generating industrial facility. In Section 7.1.1, the NPfI provides guidance as to how to review noise emissions of a site where the existing ambient noise levels are already high, resulting in the direct quantification of the noise under investigation not being possible via noise measurements at the receiver location. Additionally, the NPfI provides guidance about using noise modelling to review the performance of an industrial operation that is co-located with separate but noise-generating industrial sites impacting the same receiver. To satisfy the requirements of CoC B85, the following noise monitoring and assessment steps have been undertaken:

1. Review of permanent noise monitoring at nearby residential receivers during periods when noise intensive activities were taking place within the WH4A facility to determine if noise levels would allow for quantification of operational noise emissions, by checking if operational noise emissions are audible, distinguishable and quantifiable at the receiver locations during periods of noise intensive on-site activities (Section 3.3).
2. On-site attended monitoring of noise-generating activities to quantify noise emission levels of mechanical plant and other noise-generating activities as part of typical warehouse operations (Section 3.4).
3. Unattended noise monitoring at the WH4A facility for a period of one week, with concurrent video, to identify the reasonable worst-case operational scenarios and periods for each major noise-generating area (Section 3.5).

The review of unattended noise monitoring data measurements in Section 3.3 established that the existing ambient noise levels at the nearest receivers were high and controlled by noise sources outside of MPE in addition to a number of industrial noise-generating facilities being co-located. As such, direct quantification or estimation of operational noise emissions from the warehouse operations at the sensitive receiver locations was not possible. Noise emissions from the WH4A have been evaluated using a combination of on-site attended and unattended noise monitoring, combined with noise modelling, in order to quantify the industrial noise emissions from WH4A operations.

The following steps were undertaken to assess the noise level contributions at the nearby sensitive receivers:

1. Review observations of warehouse operations, in addition to the noise monitoring results and associated video, to then determine the reasonable worst-case operational scenarios.
2. Setup and calibrate the noise model for the reasonable worst-case operational scenarios.
3. Calculate the operational noise levels from the warehouse operations to all nearby receivers and determine the noise level contribution at the property with the highest noise levels within each NCA.

3.2 Instrumentation

A range of noise monitoring equipment was used to undertake the compliance noise monitoring. A summary of measurement equipment and calibration dates is provided in Table 3.

All of the noise monitoring equipment are Class 1 instruments, with calibration certificates current at the time of the measurements. Before and after each series of attended measurements, the calibration of the sound level meters were verified using a reference calibration of 94 dB at 1 kHz. The difference between pre- and post-calibration levels was within 0.5 dB for all measurements.

Table 3 Noise measurement equipment

Monitoring location/ purpose	Equipment	Serial No	Last date calibrated
On-site attended noise measurements	NTi XL2	A2A-16217-E0	05/07/2019
Unattended on-site noise measurements (WH4A North)	NTi XL2	A2A-08520-E0	14/03/2019
Unattended on-site noise measurements (WH4A South)	NTi XL2	A2A-07815-E0	23/12/2020
Field calibration	B&K 4231	3016756	27/11/2020

Four Envirosuite permanent noise monitors are set up at nearest representative residential locations in the community and are labelled NMT01 to NMT04 in Figure 2.

Table 4 Permanent noise monitoring stations

Monitoring location	Description	Equipment	Serial No	Last Date Calibrated
NMT01	Permanent noise monitor	B&K 2250	3025394	12/03/2019
NMT02	Permanent noise monitor	B&K 2250	3025271	12/03/2019
NMT03	Permanent noise monitor	B&K 2250	3025351	12/03/2019
NMT04	Permanent noise monitor	B&K 2250	3025317	12/03/2019

3.3 Receiver unattended noise measurement results

As detailed in Section 1.2, the residential receivers nearest to WH4A are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North.

As the most intensive period of operational activities at WH4A typically occurs during the daytime period from 9:00 am, noise monitoring data from the permanent noise monitoring stations have been reviewed for the period between 9:00 am and 11:00 am on 3 March 2021, during which onsite noise intensive activities were confirmed to be taking place. The permanent noise monitoring stations were configured to record audio and undertaken short-term statistical noise measurements. During this measurement period, concurrent unattended noise measurements were undertaken on-site of noise generating activities (see Section 3.4). This assisted to confirm that noise intensive activities were occurring on-site during the reviewed period of permanent noise monitoring data and noise recordings.

A summary of the monitoring locations and the approximate distance to the WH4A is provided in Table 5. These locations along with the noise catchment areas (NCAs) are presented in Figure 2.

Table 5 Receiver permanent noise monitoring locations

Monitoring location ID	Monitoring location (applicable NCA) (see Figure 2)	Approximate distance (m) from WH4A
NMT01	22 Glenelg Court, Wattle Grove (Wattle Grove North – NCA2)	1000
NMT02	26 Goodenough Street, Glenfield (Glenfield – NCA4)	2,400
NMT03	31 Martindale Court, Wattle Grove (Wattle Grove – NCA1)	815
NMT04	14 Dunmore Crescent, Casula (Casula – NCA3)	1,600

The results of the permanent noise monitoring results on 3 March 2021 are presented in Table 6.

The ambient noise levels during the reviewed monitoring period were greater than 48 dB(A) $L_{Aeq\ 15\ minute}$ at all monitoring locations, with corresponding background noise levels no less than 37 dB(A) $L_{A90\ 15\ minute}$ at all monitoring locations. Sample reviewed audio could not clearly distinguish noise levels corresponding to concurrent onsite activities. As such, given that noise levels are expected to be below the overall noise limit of 35 dB(A) $L_{Aeq\ 15\ minute}$, were not audible and/or distinguishable at nearby receivers because of high ambient noise levels, direct quantification or estimation of operational noise emissions from the warehouse operations at the sensitive receiver locations would not be possible via direct measurement in the presence of the ambient noise level environment. As such, it is appropriate to use the alternative methodology of modelling to determine compliance as detailed in Section 7.1.1 of the NPfI.

Figure 2 Residential receiver noise monitoring locations NMT01 to NMT04

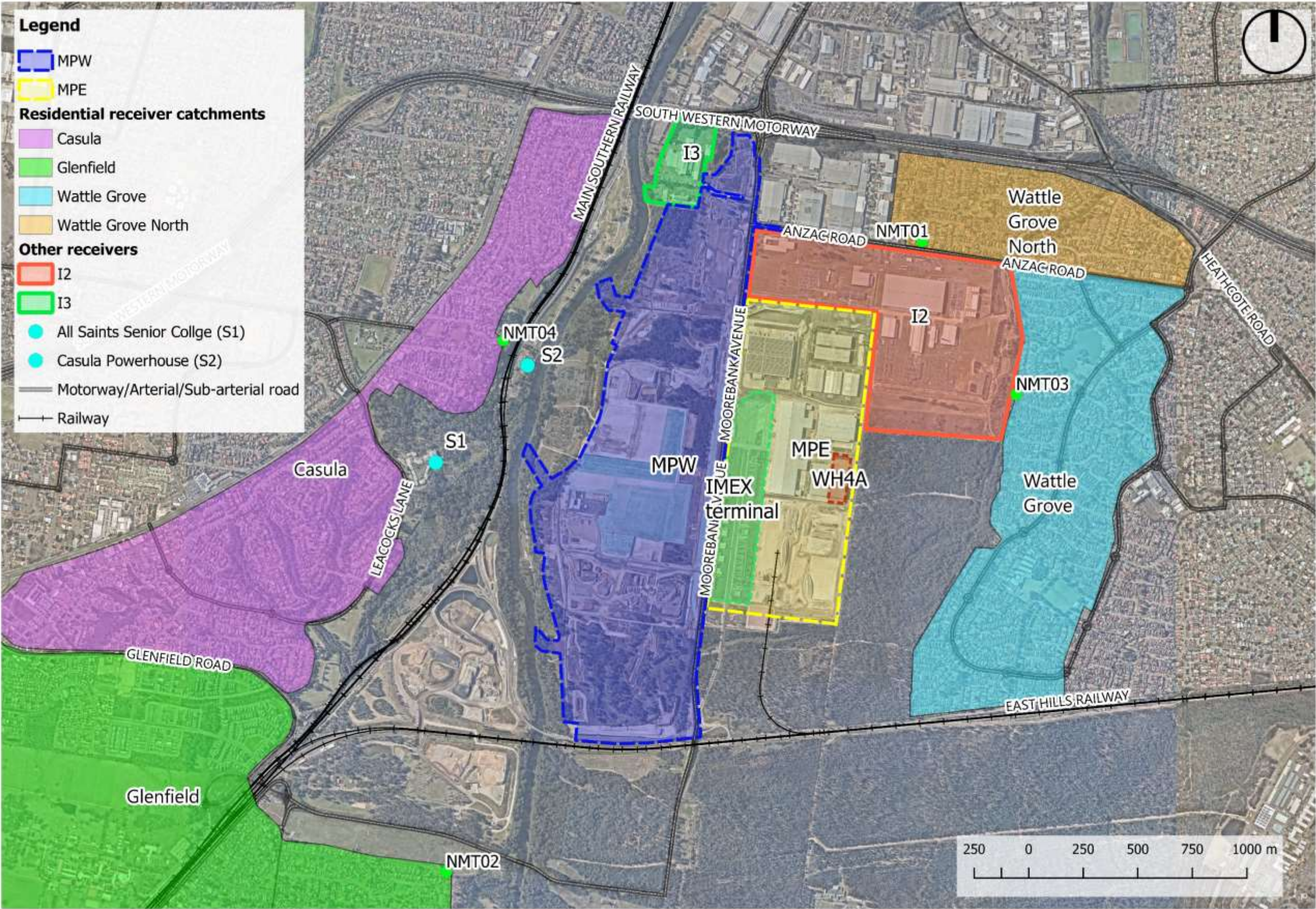


Table 6 Summary of permanent noise monitoring results at the nearest sensitive residential receivers

Measurement period	Measured noise level (15 minute), dB(A)			
	L _{Amax}	L _{A1}	L _{Aeq}	L ₉₀
NMT01 (22 Glenelg Court, Wattle Grove)				
03/Mar/21 09:00:00 09:15:00	75	67	55	44
03/Mar/21 09:15:00 09:30:00	64	60	53	43
03/Mar/21 09:30:00 09:45:00	80	61	53	41
03/Mar/21 09:45:00 10:00:00	69	61	53	43
03/Mar/21 10:00:00 10:15:00	64	60	52	44
03/Mar/21 10:15:00 10:30:00	68	60	52	46
03/Mar/21 10:30:00 10:45:00	65	60	52	47
03/Mar/21 10:45:00 11:00:00	74	60	53	47
NMT02 (26 Goodenough Street, Glenfield)				
3 March 2021 9:00 to 11:00	Not available due to maintenance and calibration.			
NMT03 (31 Martindale Court, Wattle Grove)				
03/Mar/21 09:00:00 09:15:00	84	68	56	37
03/Mar/21 09:15:00 09:30:00	87	72	61	39
03/Mar/21 09:30:00 09:45:00	82	65	56	43
03/Mar/21 09:45:00 10:00:00	73	63	54	43
03/Mar/21 10:00:00 10:15:00	68	57	50	43
03/Mar/21 10:15:00 10:30:00	73	63	51	43
03/Mar/21 10:30:00 10:45:00	85	55	52	44
03/Mar/21 10:45:00 11:00:00	63	54	48	44
NMT04 (14 Dunmore Crescent, Casula)				
03/Mar/21 09:00:00 09:15:00	73	65	54	48
03/Mar/21 09:15:00 09:30:00	77	64	55	49
03/Mar/21 09:30:00 09:45:00	68	64	53	49
03/Mar/21 09:45:00 10:00:00	66	63	53	46
03/Mar/21 10:00:00 10:15:00	71	67	55	46
03/Mar/21 10:15:00 10:30:00	74	64	53	45
03/Mar/21 10:30:00 10:45:00	70	66	55	47
03/Mar/21 10:45:00 11:00:00	77	73	60	48

3.3.1 Meteorological conditions

Meteorological conditions for the review period of the permanent noise monitoring station data has been reviewed to ensure they were acceptable in accordance with the NPfl. Data from the MLP meteorological data monitoring station adjacent to Moorebank Avenue, within the MPE site, established in accordance with CoC A54 SSD 7709 has been reviewed. The meteorological conditions experienced during receiver permanent noise monitoring on 3 March 2021 are summarised below:

- During the measurement period at the facility, the equivalent average wind speed was 1.6 m/s and generally from the SSW. All other measurements were not impacted by excessive wind during any of the measurement periods.
- No rain occurred during any of the measurement periods.
- The temperature during the measurement period ranged between 32°C and 35°C, and the cloud conditions were generally clear skies with a few scattered clouds.

3.4 On-site attended operational activity noise measurement results

In order to quantify the noise emissions from on-site activities for the purposes of determining compliance noise levels, attended noise measurements of individual operational items and typical operations were undertaken at WH4A on 2 March, 9 March and 16 March 2021. These noise levels have been used to assist in establishing the source noise levels in the noise model.

During all measurements, the specific noise source being measured was the dominant source. Observations were made of the on-site operations, which have then been reviewed to model 'reasonable' worst-case operational scenarios over the assessment periods. Critical on-site attended measurement results are summarised in Table 7.

The main noise generating activities observed were being undertaken within the warehouse, including forklift operations and noise generated from warehouse internal activities.

Table 7 On-site attended noise measurement results

Activity noise sources	Date	Time	Measurement duration (t), sec	Measurement distance (m)	Measured noise levels, dB(A)	
					L _{Aeq(t)}	L _{AFmax}
Internal warehouse noise levels (noise breakout)						
Internal noise level at loading dock door (internal sources include forklifts)	2/3/2021	2:30pm	300	At external roller doors	62	80
Forklift						
Forklift 1.5-2 Tonnes, passby	2/3/2021	1:40pm	10	10	62	65
Curtain side trailer truck ¹						
Truck pass-by	3/3/2021	6:00am	10	6	74	78
Truck Idling	3/3/2021	7:00am	60	20	65	67
Mechanical plant						
Office air condenser unit ²	2/3/2021	1:00pm	300	1	50	51

Note:

1. Attended measurement results for Curtain side trailer trucks were obtained at WH5, as the same type of truck was operated as part of the WH4A activities.
2. 1 out of 12 condenser units were operating at time of measurement.

3.5 Unattended noise measurements

Unattended noise measurements were undertaken over the period between 2 March and 8 March 2021 at locations adjacent to WH4A on both side of the warehouse. Two main areas of noise-generating operations were identified across the warehouse site, one on the northern side of the warehouse and one on the southern side. The location of the unattended noise loggers is shown in Figure 3. These were selected so that they would capture noise from the main noise-generating areas as part of the typical warehouse operations. A camera unit was setup on the northern side boundary fence at WH4A north to assist in gaining a comprehensive understanding of the site operations and vehicle movements.

The purpose of the noise logging at the selected locations was for the following:

- Determine the noise emissions from the facility at a fixed location close enough to quantify on-site sources.
- Determine the long-term background noise levels when operations were not taking place at the site.
- A source for analysis to determine the duration and nature of the different on-site activities through correlation with the Facility activity data.
- Source of validation for the noise model calibration process.

Detailed unattended noise monitoring results are provided in APPENDIX B for WH4A North and APPENDIX C for WH4A South. The noise model was validated using the unattended noise logger results through comparison against reference activity periods, refer to Section 3.7.3 for noise model calibration.

Figure 3 Unattended noise logger locations and main noise generation areas (imagery: Nearthmap, 2021)

3.6 Modelled operational scenarios

3.6.1 Observed operations for modelling

Based upon the on-site attended measurements presented in Section 3.4, the video recording for the facility over the unattended monitoring period presented in Section 3.5, and discussions with WH4A personnel, 'reasonable' worst-case operational assessment scenarios were established and modelled to satisfy the assessment periods under SSD 7628.

The following section details the key observations of each of the noise-generating activities that take place across the warehouse operations.

3.6.1.1 Loading and Unloading operations (WH4A north)

The following data related to delivery truck operations was based upon site observations during the attended measurements on 9 March and 16 March 2020, in addition the unattended noise level and audio data recordings during periods when internal truck movements on the hardstand and forklift operations were clearly distinguishable between 2 March and 8 March.

- It was observed during the attended measurements and verified with unattended measurement data, that internal truck movements on the hardstand were typically Curtain Side Trailer Trucks, and that a typical 'in-and-out' cycle time in the facility was on median 20 minutes, with each loading cycle taking approximately 10-15 minutes.
- It was observed during the attended noise measurements that the internal truck movements on the hardstand in the WH4A north despatching area move at a relative low speed of approximately 10 km/h.
- Loading and unloading of containers from Container Crane Trucks occurred outside of the warehouse on the WH4A north. Based on a review of the video and unattended noise data, these operations occurred once per week and are therefore not considered as a typical operation for north WH4A.
- Unloading of products from delivery trucks typically occur within the warehouse, with the warehouse doors open. It was observed that a truck would be loaded or unloaded in the external despatch area using a forklift.

3.6.1.2 Qube container handling operational area (WH4A south)

- It was observed that one combi-lift would be used to move containers to and from the southern hardstand of the WH4A site boundary, to and from, the MLP terminal area. Using the unattended measurements and concurrent video recordings during the monitoring, it was observed that the duration of the combi-lift loading/unloading operations was less than 10 minutes, and operate continuously when handling containers.
- Impact noise events associated with grabbing and dropping of containers would occur when the combi-lift gripper contacted individual containers. Air brake events associated with combi-lift operation would occur during handling operations. This sound power level is adopted in the modelling of potential sleep disturbance events.
- Movements of containers within the WH4A south area can occur at any time throughout the daytime period. It was observed that movements typically started from approximately 7:00am. Only three container movements during the monitoring week were observed in the video recordings, and only one container movement would occur during any one day.

3.6.2 Assessment noise source levels

Source levels for the key noise-generating activities on-site have been established based upon the attended noise measurements (Section 3.4) and unattended noise measurements (Section 3.5) during periods of typical operation. The sound power level inputs presented in Table 8 were used in the operational noise compliance modelling, and adjusted for the duration and frequency of operations (Section 3.6.3).

Table 8 Assessment noise source levels

Site items / operation	Individual activity sound power level (SWL) (L_{Aeq} , dB(A))
WH4A North	
Container Crane Trucks (slow speed manoeuvring within the site boundary)	99
Container movement noise events (L_{AFmax})	107
Container movement noise events (L_{Aeq}) ⁴	79 $L_{Aeq, 15min}$
Curtain Side Trailer Truck moving with speed less than 20km/h	102
Air brake release (L_{AFmax})	117
WH4A South	
Container combi-lift (moving container activity)	103
Container gripping & drop (L_{Amax})	108
Container gripping & drop (L_{Aeq}) ⁴	81 $L_{Aeq, 15min}$
Internal noise breakout	
Internal noise breakout via roof ¹	74
External roller doors ⁵	76
Mechanical Plant	
Air condenser unit ²	70
Other noise sources	
Curtain Side Trailer Truck moving on internal roads within MLP, outside of the WH4A site (typical speed on internal roads of 20 km/h)	102

Notes:

1. Attended measurement shows breakout via WH4A warehouse roof during loading and unloading operations Internal noise levels included internal noise intensive periods when forklifts were in use.
2. Air condenser units are located on the east façades of the warehouse.
3. Internal noise levels controlled by forklift operations within the warehouse.
4. One event assumed in the 15-minute interval.
5. Sound power level for each roller door.

3.6.3 Reasonable worst-case intrusiveness scenarios (15-minute period)

As the noise limits in CoC B80 are set at 35 dB(A) $L_{Aeq, 15 \text{ minute}}$ for the day, evening and night periods, specific separation of noise intensive periods for each of these time periods has not been undertaken. Instead, it is noted that there are two main areas of noise generation as part of typical warehouse operations, as presented in Figure 3.

In order to assess the operational noise emissions from the warehouse, the 'reasonable' worst-case operations for each of the two main areas of noise generation have been developed, along with the corresponding activities in the other noise-generating areas, in order to review a representative snapshot of activities from the warehouse operations. Each of the assessment scenarios have been developed from an analysis of the video movement data or attended on-site observations over during the one-week period, in addition to the information detailed in Section 3.6.1. It is noted that the peak

periods of noise generating activities for each of the two main areas (northern side of the warehouse and southern side of the warehouse) did not occur concurrently.

A representative scenario has been established to assess a 'reasonable' worst-case scenario for the northern side of the warehouse, which is the WH4A north. A total of three container movements were observed on the video data to occur over the period of one week. The duration of each container delivery operation was approximately 10 minutes or less. During the periods when containers were being moved within WH4A south (Qube container operation area), warehouse roller doors remained closed on the south side of WH4A.

The WH4A north activities were observed to commence from 9:00am, with a peak period of noise intensive activities around the 9:00am to 11:00am.

Periods representing the 'reasonable' worst-case operations, for each the northern side of the warehouse and southern side of the warehouse, based upon these peak periods of noise intensive activities have been used to assess operational noise emissions. Table 9 details the two 'reasonable' worst-case scenarios (15-minute period), covering the noise intensive periods for the two main areas of noise generation across the site.

As required by CoC B85, all significant noise-generating equipment has been included in the assessment modelling, including the key noise-generating mechanical plant. It is noted that the noise contribution from the mechanical plant items serving the office area are included in the modelling, however, they generate minimal contribution to the overall noise levels from site operations, which are controlled by other on-site activities such as truck departures, arrivals and warehouse internal loading and unloading activities. The roof mounted smoke ventilation fans were not operating during typically activities on-site.

Table 9 Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios

Activity	WH4A South 15-minute assessment period (Qube container area)	WH4A South 15-minute assessment period
WH4A South 15-minute noise intensive period (with container handling taking place)		
Departure	One Combi-lift departure from WH4A south (Qube container operational area) loaded with 1 container.	No activity
Arrival	One Combi-lift arrival at WH4A south (Qube container operational area) loaded with 1 container.	No activity
On-site operations	Container operations: a) Placing one container down	<i>Noise breakout via open warehouse doors.</i> All loading activity are occurring inside the warehouse with warehouse doors open, one noise generating activities occurring concurrently. a) Forklift movements
WH4A North 15-minute noise intensive period		
Departure	No activity	One Curtain Side Truck departure from WH4A north.
Arrival	No activity	Two Curtain Side Truck arrive at WH4A north, engine off after parking.
On-site operations	No activity	<i>Noise breakout via open warehouse doors.</i> Loading and unloading activities are occurring outside the warehouse with warehouse doors open, one noise generating activity occurring at the time. a) Forklift movements
Mechanical plant (All scenarios)		
Warehouse office air conditioning condenser (12 out of 12 units operating)		

3.7 Modelling methodology

3.7.1 Overview of noise modelling

Since ambient noise levels were well above the project noise limit at the nearest residential receivers, and it was not possible to directly measure or estimate the warehouse noise contribution directly, computer noise modelling was used to calculate the operational noise levels from warehouse operations at the nearby noise sensitive receivers.

3.7.2 General modelling assumptions

Modelling and assessment of warehouse noise emissions were determined by modelling the noise sources, receiver locations, existing built structures and topographical features, using CadnaA (version 2020).

The modelling incorporated the worst-case prevailing meteorological conditions, as required by CoC B80, which are wind speeds of up to 3 m/s at 10 metres above ground level for the assessed activities for daytime activities.

The noise predictions are based on the CONCAWE noise prediction algorithms, noting that the nearby noise sensitive receivers are greater 100 metres from the subject site. The CONCAWE environmental noise prediction method is an appropriate method for predicting noise propagation in these circumstances.

The noise prediction model considers:

- Location of noise sources on-site sensitive receiver locations
- Height of noise sources and receivers referenced to digital ground contours within the site and outside the site area
- Noise source levels of individual plant, equipment and internal building noise levels, modelled as either point, line or area noise sources. All noise sources associated with the WH4A operations within the MPE boundary have been included in the noise modelling, including the truck movements outside of the WH4A footprint, along internal MPE roads.
- Separation distances between sources and receivers
- Ground type between sources and receivers (mixed soft/ hard)
- Attenuation from buildings and built structures and topography (natural and purpose built)
- Atmospheric losses and assessment meteorological conditions.

The modelled activities and assumptions for the to the equipment operating and the duration and frequency of operation as part of the 'reasonable' worst-case operational scenarios are described in Section 3.6.3.

3.7.3 Model validation

Following the development of each of the representative modelling scenarios, the noise model outputs were compared against a reference time period of the onsite unattended noise measurement results for the period during which similar activities to the reasonable' worst-case operational scenario were taking place. Validation of the reasonable worst-case on-site activities was undertaken to check the final representative modelling inputs against a period of measured activities. The results of this process are presented in Table 10.

Table 10 Comparison between measured and modelled noise levels

Time period	Logger	Measured noise levels LAeq,15minute (dBA)	Predicted noise levels LAeq,15minute (dBA)	Difference, dB(A)
10:45 am to 11:00 am 3 March 2021 ¹	WH4A North	62	62	< 1
2:50 pm to 3:05 pm 3 March 2021 ²	WH4A South	65	64	1

Notes: 1. Noise generating activities within the facility were as per Table 9 "4A North 15-minute noise intensive period"
2. Noise generating activities within the facility were as per Table 9 "4A South 15-minute noise intensive period (With container handling taking place)"

The predicted noise levels are within the modelling tolerance of 1 dB(A). The results from the validation of the model demonstrate that it is suitable for determining the compliance noise levels at the nearby receivers for this assessment.

3.8 Noise compliance assessment

Predicted operational compliance noise levels are presented in Table 11 and Table 12 for the two reasonable worst-case operational assessment scenarios. The noise levels have been predicted to each of the surrounding residential receiver noise catchments. The highest residential receiver noise level in each catchment area are reported. This is not necessarily the same receiver location for each assessment scenario.

The results in Table 11 and Table 12 show that the predicted noise levels for the L_{Aeq} (15-minute) assessments comply with the overall operational noise limits presented in Table 2.

As the noise levels from the site operations were not audible at the nearby noise sensitive receivers, the noise levels would not be perceived as particularly annoying at the nearby receiver locations as per the NPfI (i.e. if the resulting noise level at a receiver location is tonal, low frequency or is intermittent at night). As such, no adjustments in accordance with Fact Sheet C of the NPfI are required.

During the 7 days monitoring period, only one combi-lift activity at WH4A south was observed during the night period (10:00pm to 7:00am). As such, this is not considered a typical operation for the south WH4A. L_{A1} (1-minute) noise predictions have been performed for this scenario to assess the potential for sleep disturbance impacts (see Table 2 for the relevant assessment criteria). The results in Table 11 and Table 12 show that the predicted L_{A1} (1-minute) noise levels comply with the sleep disturbance noise limits.

Table 11 Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH4A north

Noise catchment area/ receiver location	L_{Aeq} (15-minute)		Compliance	L_{A1} (1-minute)		Compliance
	Noise limits	Predicted noise levels		Noise limits	Predicted noise levels	
Wattle Grove (NCA 1)	35	27	Yes	52	34	Yes
Wattle Grove North (NCA 2)	35	< 20	Yes	52	< 20	Yes
Casula (NCA 3)	35	20	Yes	52	< 20	Yes
Glenfield (NCA 4)	35	< 20	Yes	58	< 20	Yes
All Saints Senior College (S1)	45 ¹	< 20	Yes	-	N/A	N/A
Casula Powerhouse (S2)	45 ¹	21	Yes	-	N/A	N/A
Defence Joint Logistics Unit (DJLU) (I2)	70 ¹	31	Yes	-	N/A	N/A
ABB (I3)	70 ¹	< 20	Yes	-	N/A	N/A

Note: 1. Noise limits for these receivers are only applicable when the receiver is in use

Table 12 Predicted noise levels - Reasonable 15-minute worst-case scenarios for WH4A south

Noise catchment area/ receiver location	L _{Aeq} (15-minute)		Compliance	L _{A1} (1-minute)		Compliance
	Noise limits	Predicted noise levels		Noise limits	Predicted noise levels	
Wattle Grove (NCA 1)	35	28	Yes	52	40	Yes
Wattle Grove North (NCA 2)	35	< 20	Yes	52	< 20	Yes
Casula (NCA 3)	35	< 20	Yes	52	29	Yes
Glenfield (NCA 4)	35	< 20	Yes	58	26	Yes
All Saints Senior College (S1)	45 ¹	< 20	Yes	-	N/A	N/A
Casula Powerhouse (S2)	45 ¹	< 20	Yes	-	N/A	N/A
Defence Joint Logistics Unit (DJLU) (I2)	70 ¹	20	Yes	-	N/A	N/A
ABB (I3)	70 ¹	< 20	Yes	-	N/A	N/A

Note: 1. Noise limits for these receivers are only applicable when the receiver is in use

The highest modelled noise levels at nearby residential receivers for the WH4A North 15-minute noise intensive period is predicted to be 27 dB(A) L_{Aeq,15minute} at Wattle Grove. For WH4A north, the highest modelled noise level at nearby residential receivers from container unloading activities is predicted to be 28 dB(A) L_{Aeq,15minute} at Wattle Grove (NCA 1).

The noise levels from the two noise generation areas have not been directly combined as part of the assessment, as they did not occur concurrently. The video data showed that container deliveries to WH4A south only occurred three times within the one-week period, each of 10 minutes or less. As such, this would not be considered a typical operation. As such, the modelled noise levels for the 'reasonable' worst case WH4A North 15-minute noise assessment period will only occur occasionally. It is not expected that peak activities at WH4A north and WH4A south will occur concurrently. In the very unlikely event that peak activities at WH4A north and WH4A south occur concurrently, the resulting noise levels at Wattle Grove (NCA 1) would be 30 dB(A) L_{Aeq,15minute}.

4 Conclusion

The noise assessment has been undertaken to address the operational noise requirements for the WH4A within the Moorebank Precinct East in accordance with the *Operational Noise and Vibration Management Plan, Moorebank Logistics Park – East Precinct* (dated 27 March 2019, Revision 12) (MPE ONVMP), more specifically to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628.

A review of noise measurements at the nearest residential receivers during period of peak onsite activities determined that site activities were not audible and distinguishable at nearby receivers because of high ambient noise levels from road traffic, rail traffic and construction noise. For this reason, guidance from the NSW EPA Noise Policy for Industry (NPfI) Chapter 7 has been followed in order to use an alternative approach to determine compliance, and compare the site noise emissions with the noise limits.

A combination of on-site and off-site measurements were performed, between 2 March and 16 March 2021. The aim of the measurements was to quantify on-site operational noise levels from the WH4A facility, in order to then predict back to the nearby receivers. Using this approach, noise emissions from the warehouse facility operations have been evaluated using a combination of on-site attended and unattended noise monitoring, combined with noise modelling, to predict the operational noise levels at the nearest sensitive receivers.

Two 'reasonable' worst-case assessment scenarios were established based upon on site unattended noise monitoring and video recordings, in addition to discussions with WH4A personnel and observations made during on-site attended noise measurements. These were used to develop the current 'reasonable' worst case noise intensive periods that occur onsite. These were separated into two main areas of activities, one on the northern side of the warehouse and one on the southern side.

As required by CoC B85, all significant noise-generating equipment was included the assessment modelling, including the key noise-generating mechanical plant. The noise contribution from the mechanical plant items serving the warehouse and office area generate minimal contribution to the overall noise levels from site operations, which are generally controlled by other on-site activities such as truck departures, arrivals and internal warehouse loading and unloading activities.

The model was developed, and validated against the on-site unattended noise monitoring data, during periods with similar operational activities. Using the calibrated noise model, noise levels were predicted to all nearby noise sensitive receiver locations, including the residential receivers in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove North. Noise levels were assessed assuming the worst-case prevailing meteorological conditions were present, as required by CoC B80.

The outcome of the compliance noise monitoring and modelling demonstrated that the mechanical plant and other noisy equipment that operate as part of the WH4A operations achieve the noise limits presented SSD 7628 CoC B80.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).																																								
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.																																								
Assessment period	The period in a day over which assessments are made.																																								
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.																																								
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).																																								
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment: <table><tr><td rowspan="2">threshold of hearing</td><td>0 dB</td><td>The faintest sound we can hear</td></tr><tr><td>10 dB</td><td>Human breathing</td></tr><tr><td rowspan="2">almost silent</td><td>20 dB</td><td></td></tr><tr><td>30 dB</td><td>Quiet bedroom or in a quiet national park location</td></tr><tr><td rowspan="2">generally quiet</td><td>40 dB</td><td>Library</td></tr><tr><td>50 dB</td><td>Typical office space or ambience in the city at night</td></tr><tr><td rowspan="2">moderately loud</td><td>60 dB</td><td>CBD mall at lunch time</td></tr><tr><td>70 dB</td><td>The sound of a car passing on the street</td></tr><tr><td rowspan="2">loud</td><td>80 dB</td><td>Loud music played at home</td></tr><tr><td>90 dB</td><td>The sound of a truck passing on the street</td></tr><tr><td rowspan="2">very loud</td><td>100 dB</td><td>Indoor rock band concert</td></tr><tr><td>110 dB</td><td>Operating a chainsaw or jackhammer</td></tr><tr><td rowspan="2">extremely loud</td><td>120 dB</td><td>Jet plane take-off at 100m away</td></tr><tr><td>130 dB</td><td></td></tr><tr><td>threshold of pain</td><td>140 dB</td><td>Military jet take-off at 25m away</td></tr></table>			threshold of hearing	0 dB	The faintest sound we can hear	10 dB	Human breathing	almost silent	20 dB		30 dB	Quiet bedroom or in a quiet national park location	generally quiet	40 dB	Library	50 dB	Typical office space or ambience in the city at night	moderately loud	60 dB	CBD mall at lunch time	70 dB	The sound of a car passing on the street	loud	80 dB	Loud music played at home	90 dB	The sound of a truck passing on the street	very loud	100 dB	Indoor rock band concert	110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away	130 dB		threshold of pain	140 dB	Military jet take-off at 25m away
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	130 dB																																								
threshold of pain	140 dB	Military jet take-off at 25m away																																							
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.																																								
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.																																								

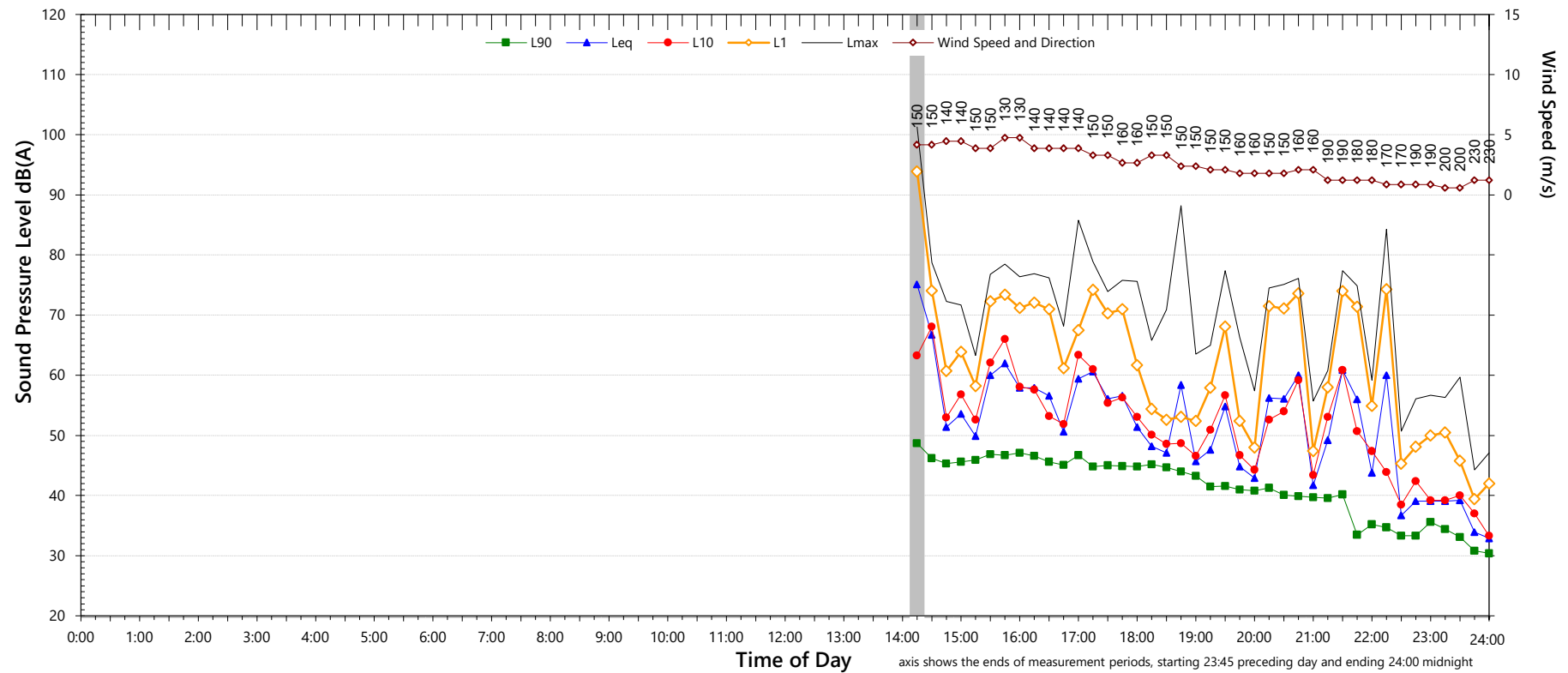
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L _{eq} sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B **Logger location 1 – WH4A - North side**

Unattended Noise Monitoring Results

WH4A - North

Tuesday, 2 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	-	37	30
L _{Aeq}	-	55	47

Night Time Maximum Noise Levels		(see note 7)	
L _{AFMax} (Range)	78	to	84
L _{AFMax} - L _{Aeq} (Range)	15	to	30

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	-	50
L _{Aeq} 1hr upper 10 percentile	-	55
L _{Aeq} 1hr lower 10 percentile	-	37

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

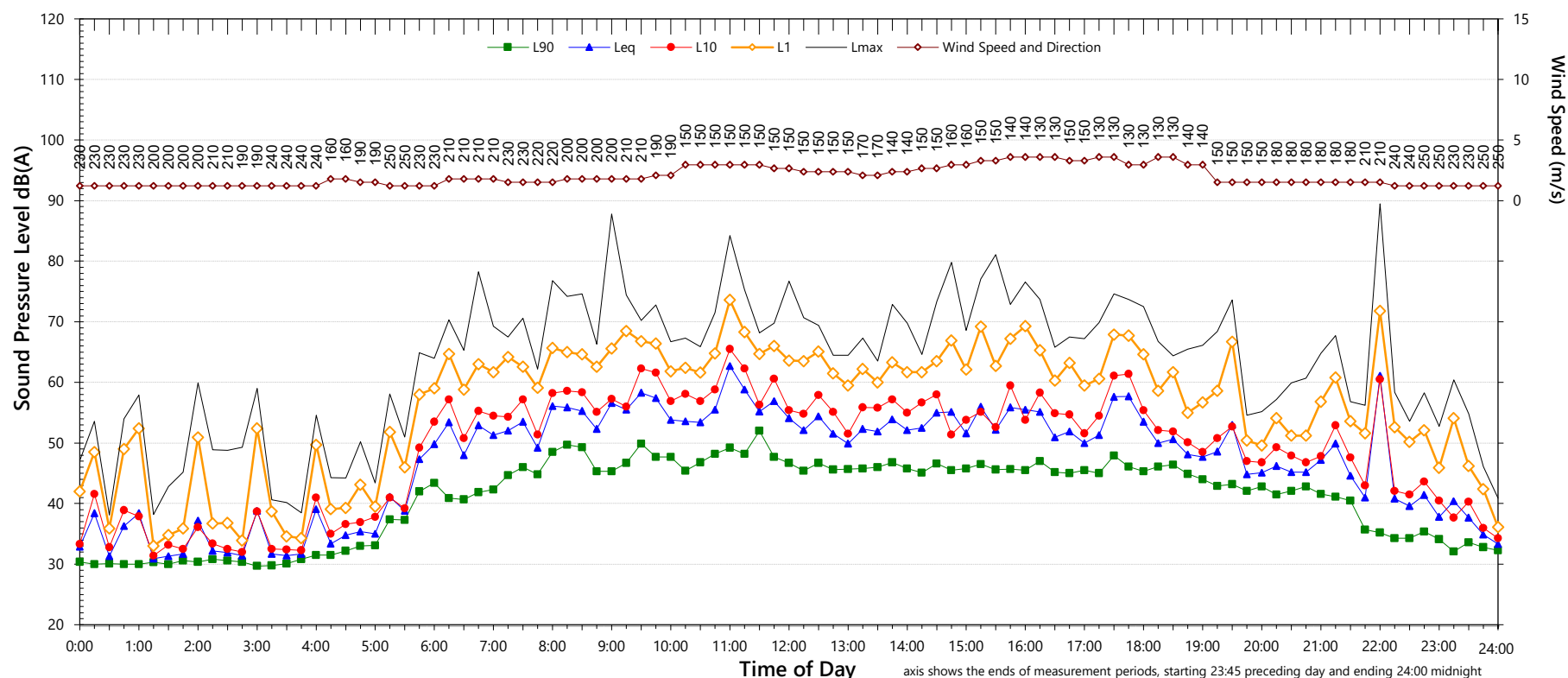
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

WH4A - North

Wednesday, 3 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	45	38	33
L _{Aeq}	55	52	47

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	73	to	76
L _{AFMax} - L _{Aeq} (Range)	17	to	25

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	57	50
L _{Aeq} 1hr upper 10 percentile	59	56
L _{Aeq} 1hr lower 10 percentile	52	40

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

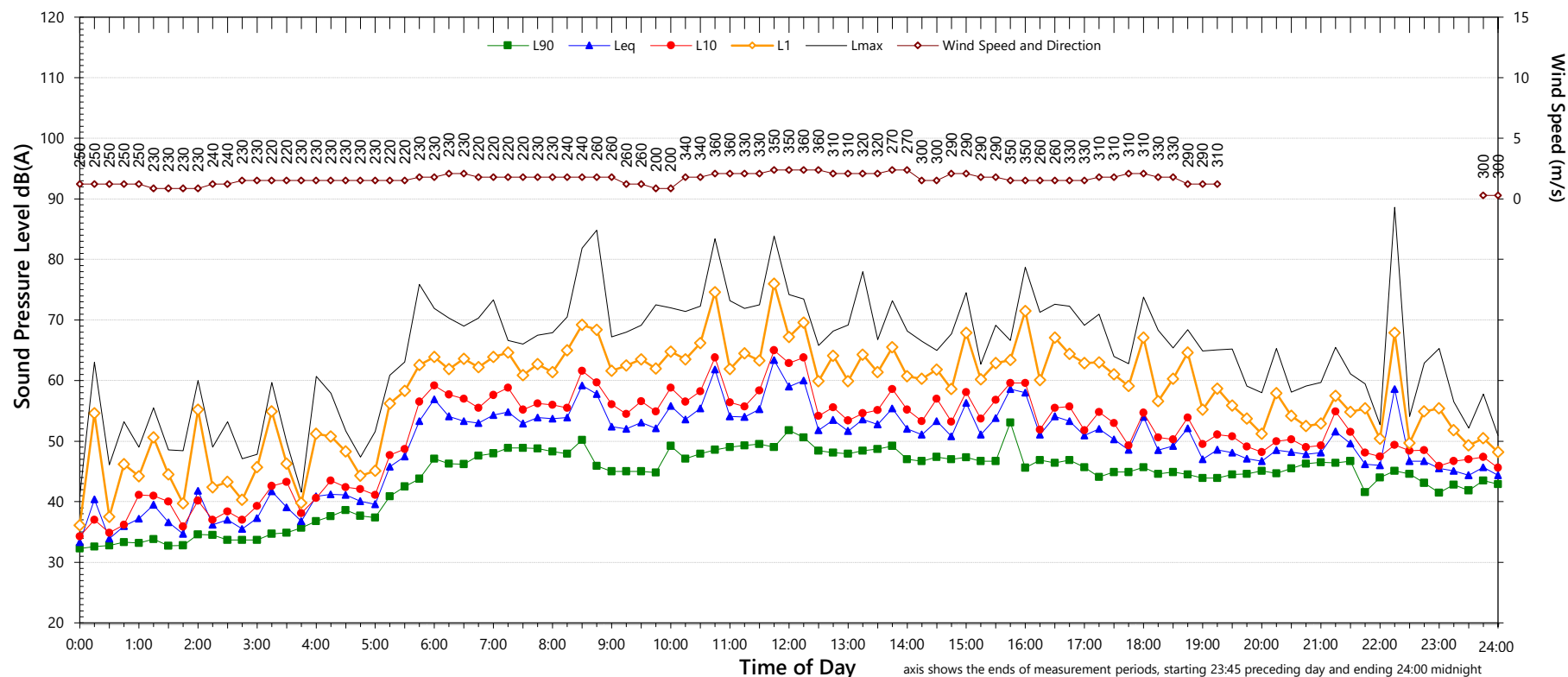
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

WH4A - North

Thursday, 4 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	45	44	39
L _{Aeq}	56	49	49

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	65	to	89
L _{AFMax} - L _{Aeq} (Range)	15	to	35

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	57	51
L _{Aeq} 1hr upper 10 percentile	60	56
L _{Aeq} 1hr lower 10 percentile	51	45

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

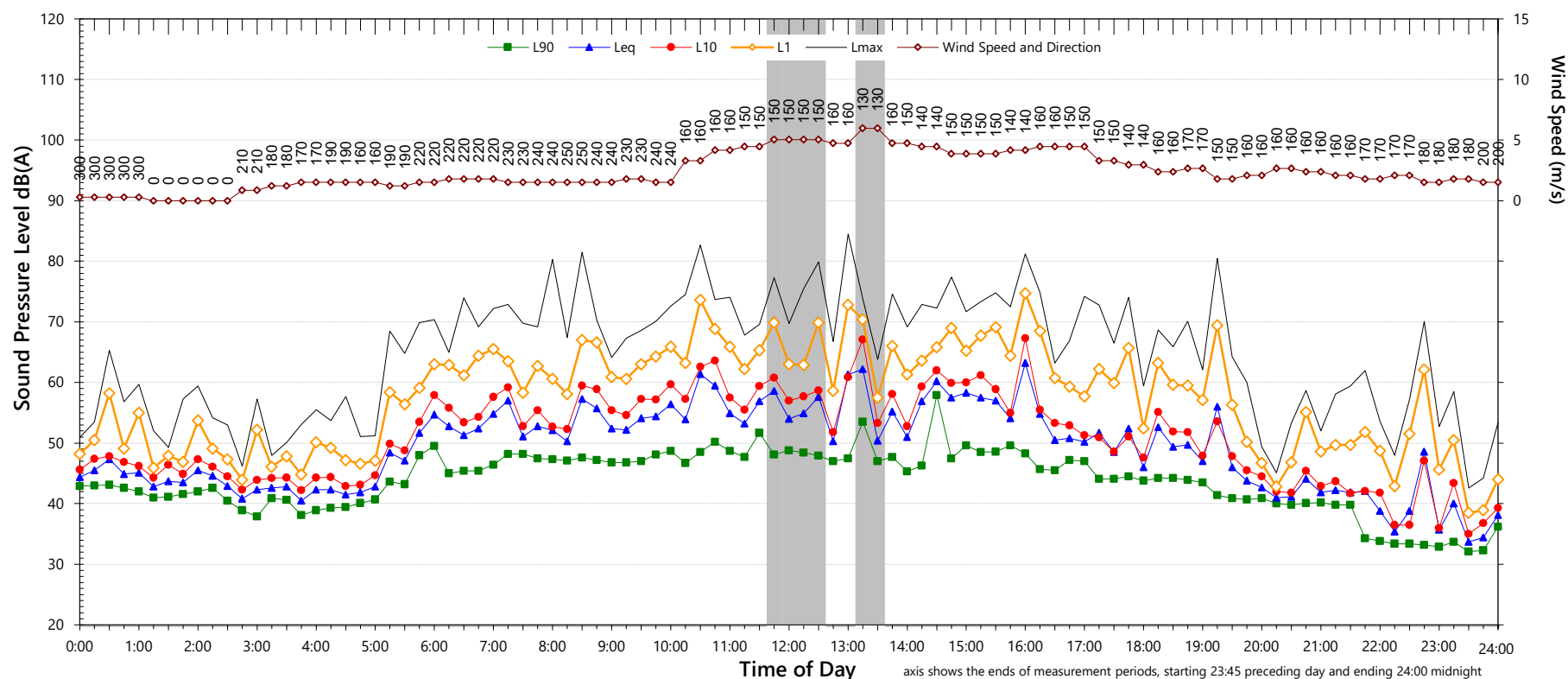
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

WH4A - North

Friday, 5 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	45	37	31
L _{Aeq}	56	48	49

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	68	to	88
L _{AFMax} - L _{Aeq} (Range)	18	to	31

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	57	51
L _{Aeq} 1hr upper 10 percentile	61	52
L _{Aeq} 1hr lower 10 percentile	48	38

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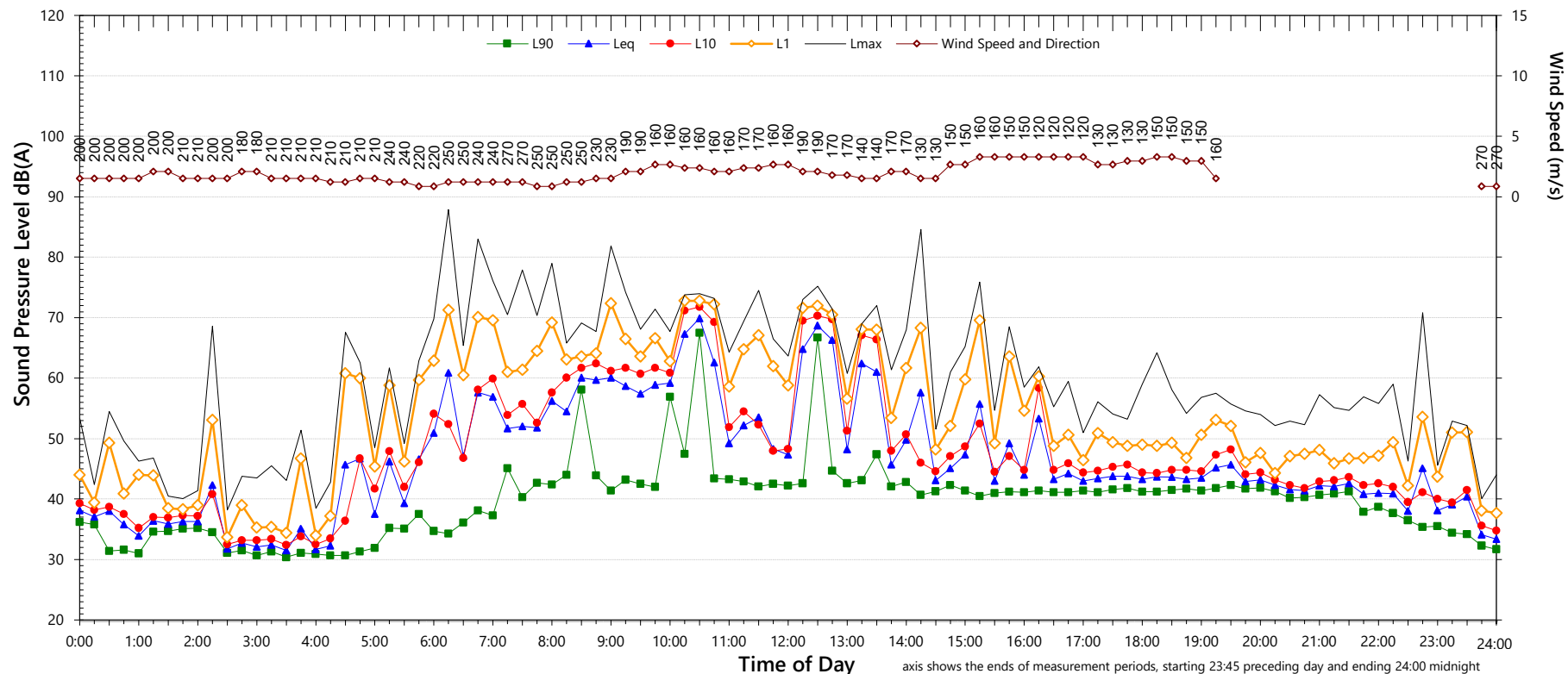
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

WH4A - North

Saturday, 6 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	41	39	31
L _{Aeq}	60	43	41

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	66	to	77
L _{AFMax} - L _{Aeq} (Range)	15	to	34

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	61	43
L _{Aeq} 1hr upper 10 percentile	66	46
L _{Aeq} 1hr lower 10 percentile	45	37

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

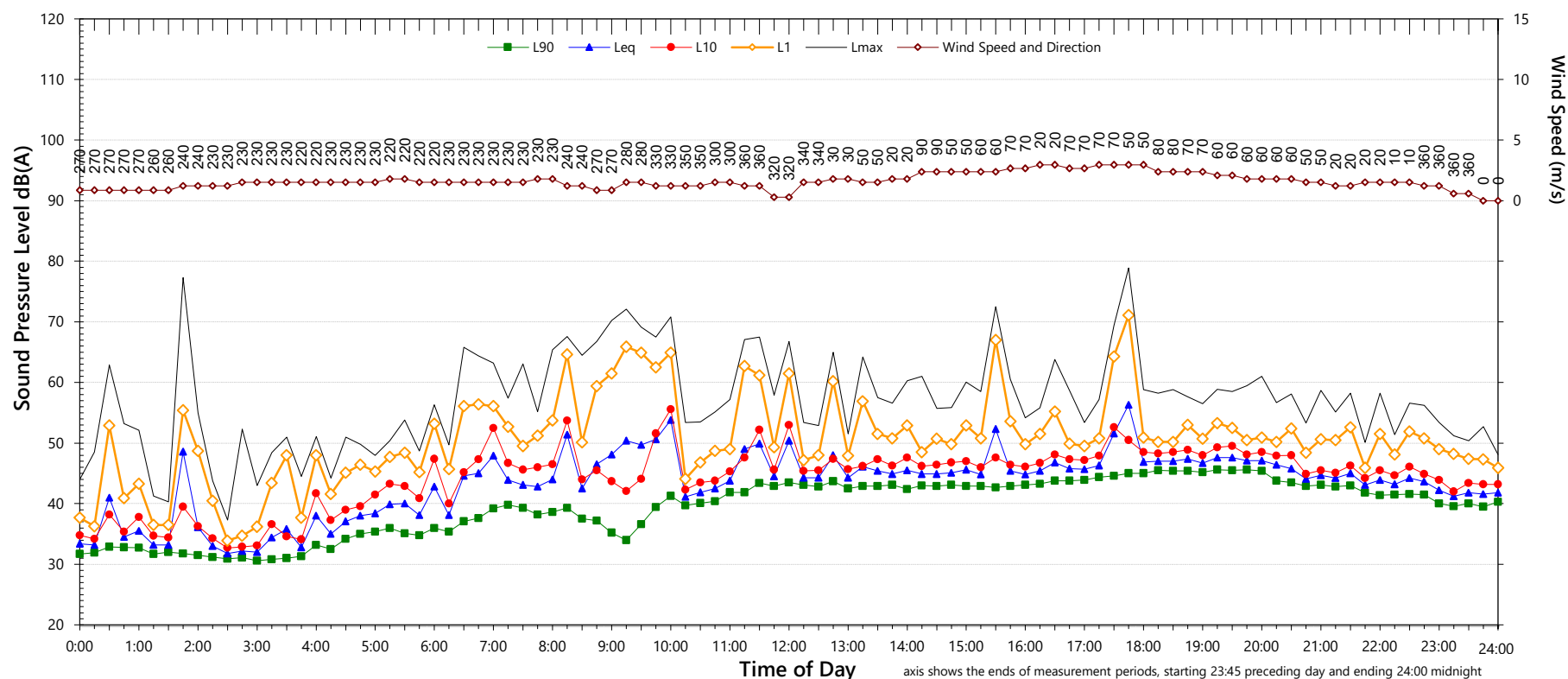
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

WH4A - North

Sunday, 7 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4 5}
L _{A90} ABL	37	42	39
L _{Aeq}	48	46	48

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	67	to	71
L _{AFMax} - L _{Aeq} (Range)	17	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	50	51
L _{Aeq} 1hr upper 10 percentile	53	55
L _{Aeq} 1hr lower 10 percentile	46	44

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

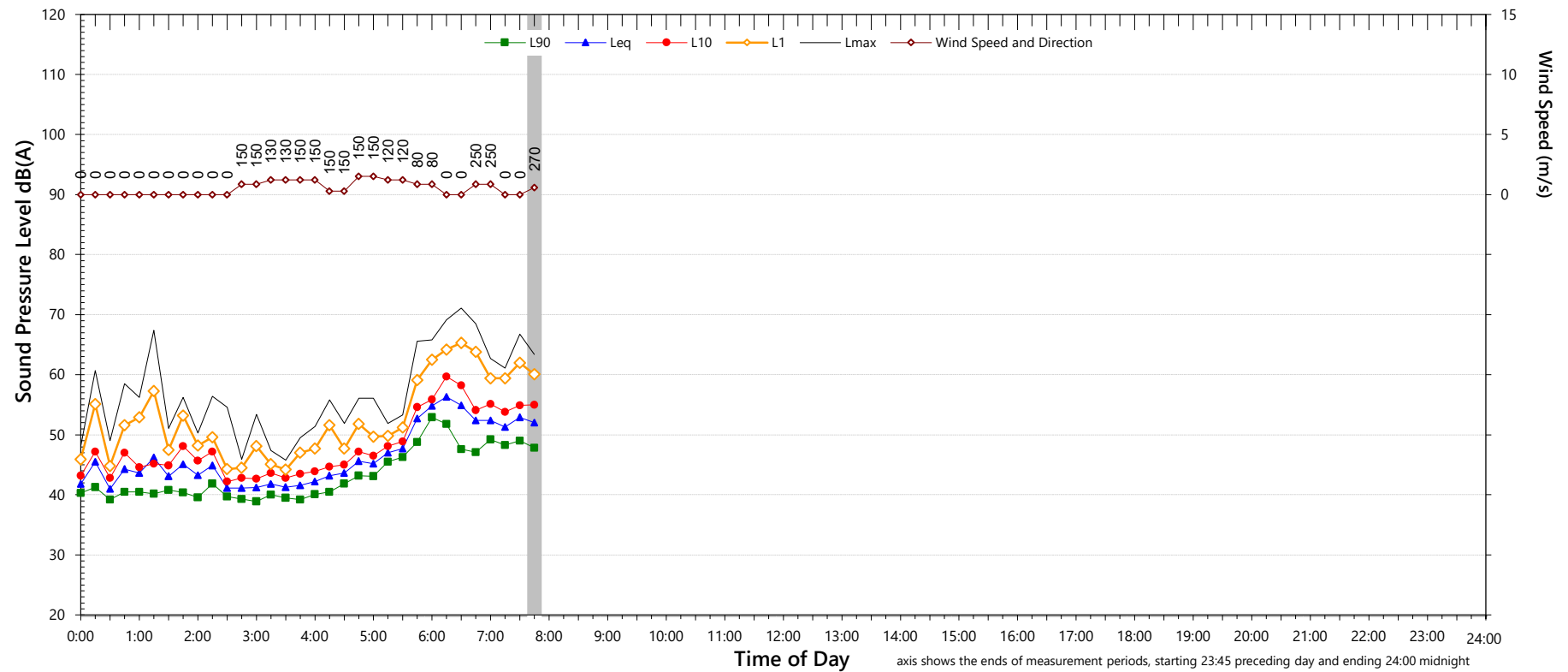
WH4A - North (r0)

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

WH4A - North

Monday, 8 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4 5}
L _{A90} ABL	-	-	-
L _{Aeq}	-	-	-
Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	-	to	-
L _{AFMax} - L _{Aeq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	-	-
L _{Aeq} 1hr upper 10 percentile	-	-
L _{Aeq} 1hr lower 10 percentile	-	-

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

WH4A - North (r0)

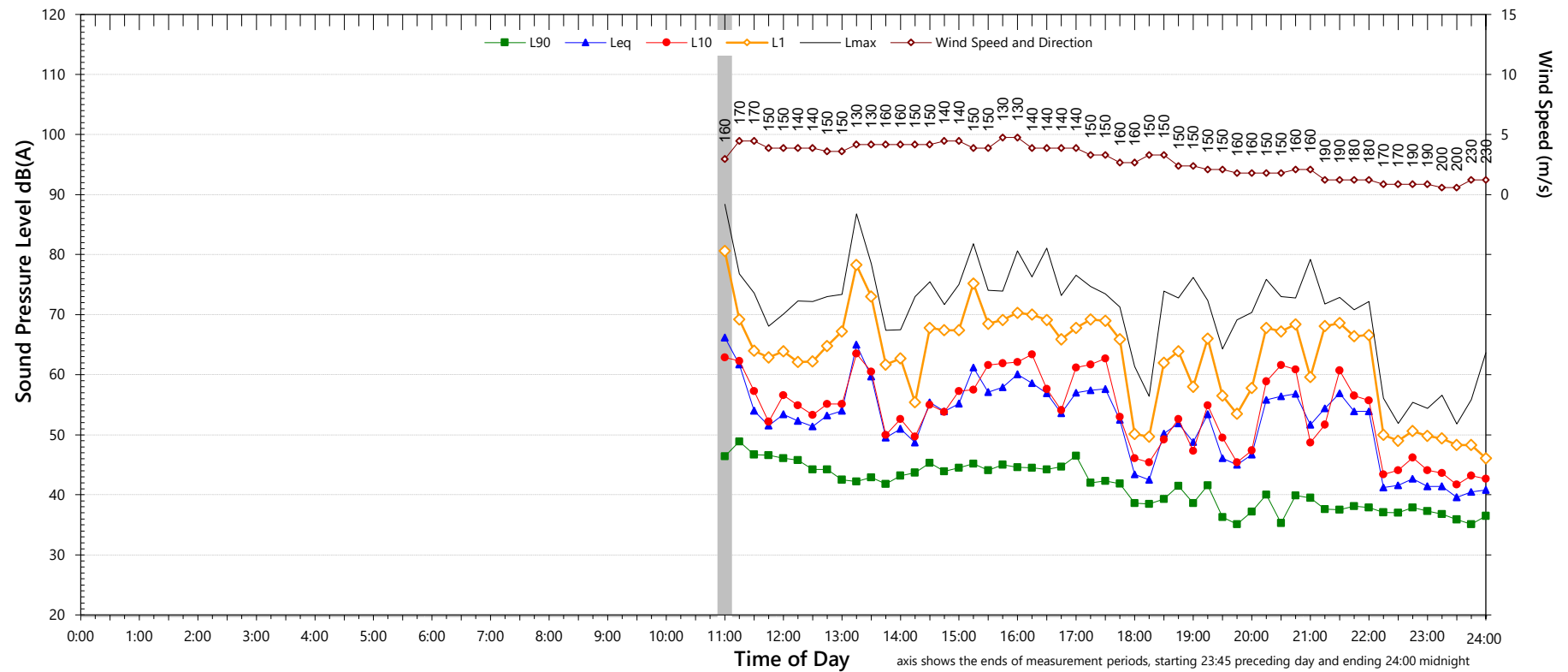
QTE-26 Logger Graphs Program (r36)

APPENDIX C **Logger location 2 – WH4A – South side**

Unattended Noise Monitoring Results

WH4A - South

Tuesday, 2 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	-	36	32
L _{Aeq}	-	53	47

Night Time Maximum Noise Levels		(see note 7)	
L _{AFMax} (Range)	81	to	81
L _{AFMax} - L _{Aeq} (Range)	15	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	-	49
L _{Aeq} 1hr upper 10 percentile	-	50
L _{Aeq} 1hr lower 10 percentile	-	40

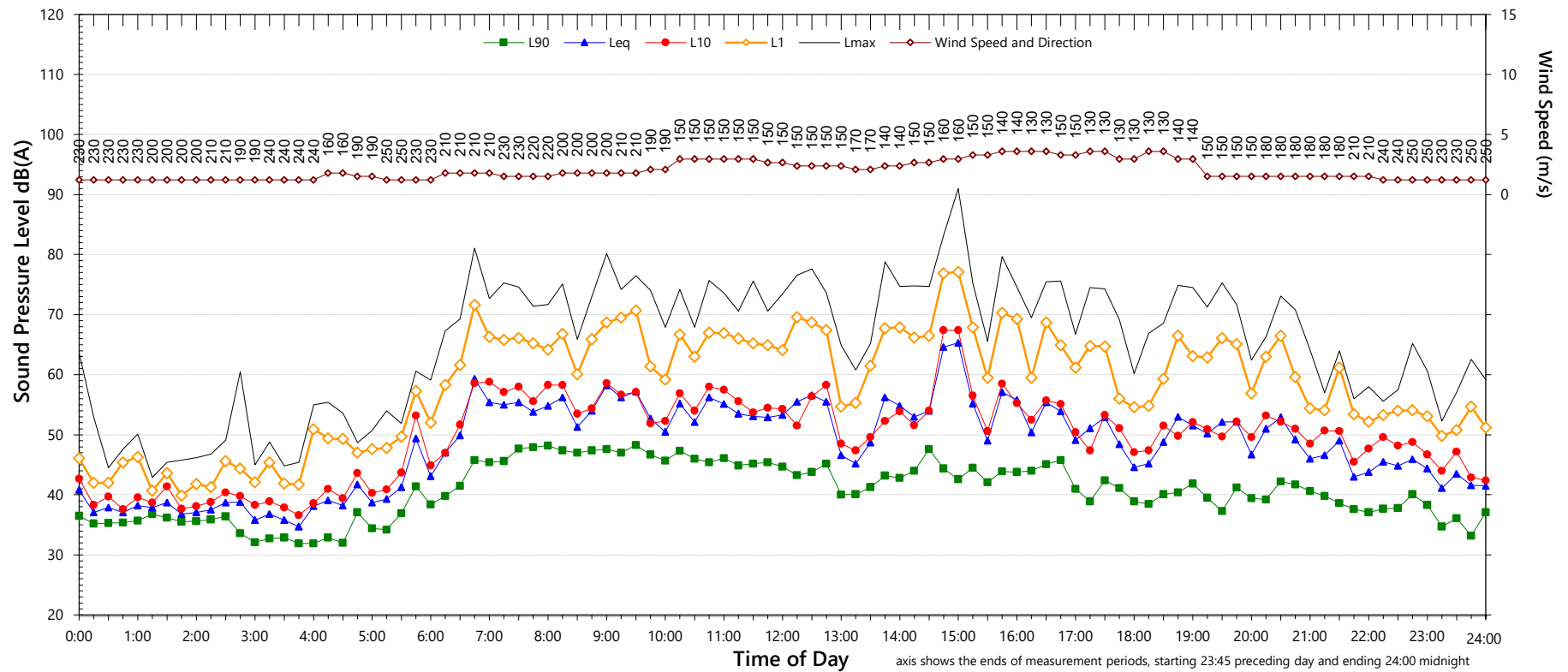
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Unattended Noise Monitoring Results

WH4A - South

Wednesday, 3 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	41	37	35
L _{Aeq}	56	50	49

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	65	to	79
L _{AFMax} - L _{Aeq} (Range)	20	to	25

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

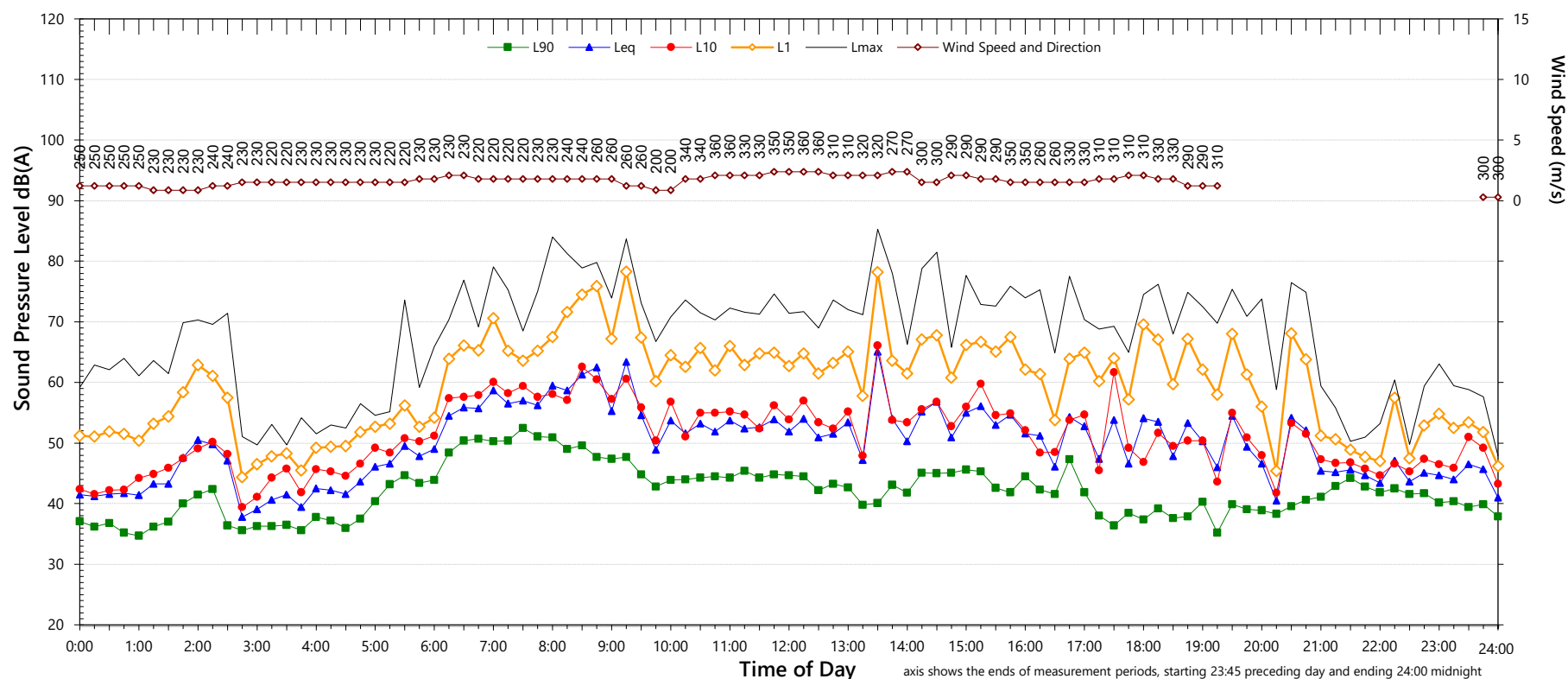
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	57	51
L _{Aeq} 1hr upper 10 percentile	58	52
L _{Aeq} 1hr lower 10 percentile	53	44

Unattended Noise Monitoring Results

WH4A - South

Thursday, 4 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	40	38	37
L _{Aeq}	56	50	53

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	70	to	83
L _{AFMax} - L _{Aeq} (Range)	16	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	58	55
L _{Aeq} 1hr upper 10 percentile	62	54
L _{Aeq} 1hr lower 10 percentile	53	43

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

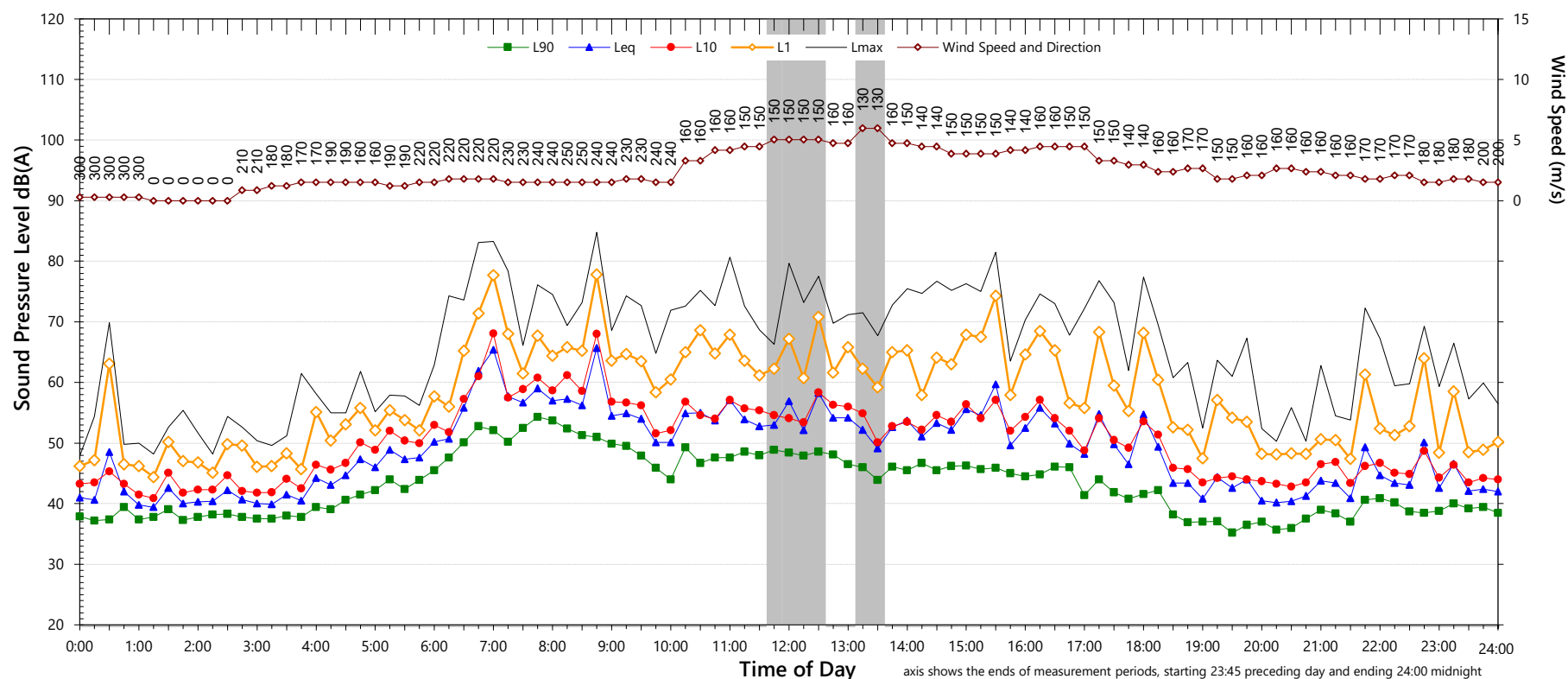
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QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

WH4A - South

Friday, 5 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	43	36	36
L _{Aeq}	56	44	44

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	67	to	74
L _{AFMax} - L _{Aeq} (Range)	17	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

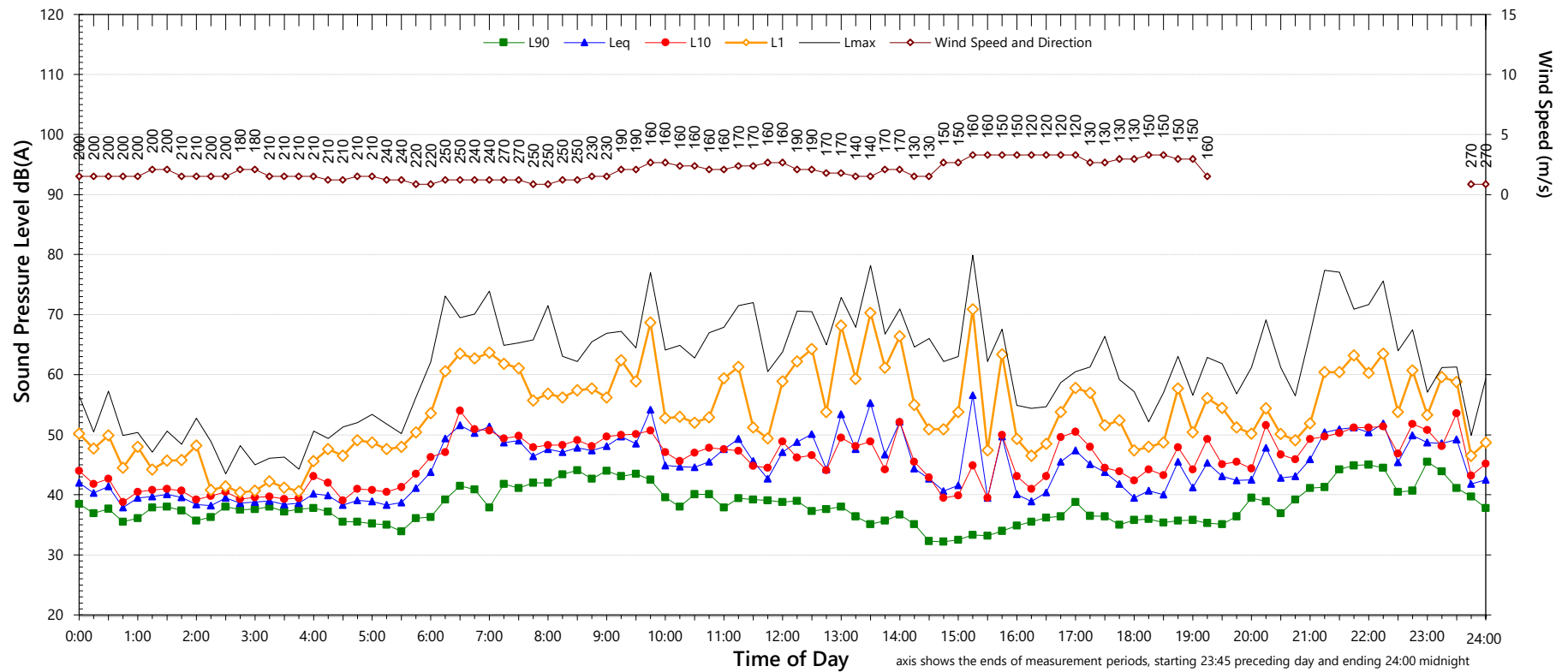
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	57	47
L _{Aeq} 1hr upper 10 percentile	59	50
L _{Aeq} 1hr lower 10 percentile	47	42

Unattended Noise Monitoring Results

WH4A - South

Saturday, 6 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	34	35	34
L _{Aeq}	49	47	45

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	65	to	76
L _{AFMax} - L _{Aeq} (Range)	18	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

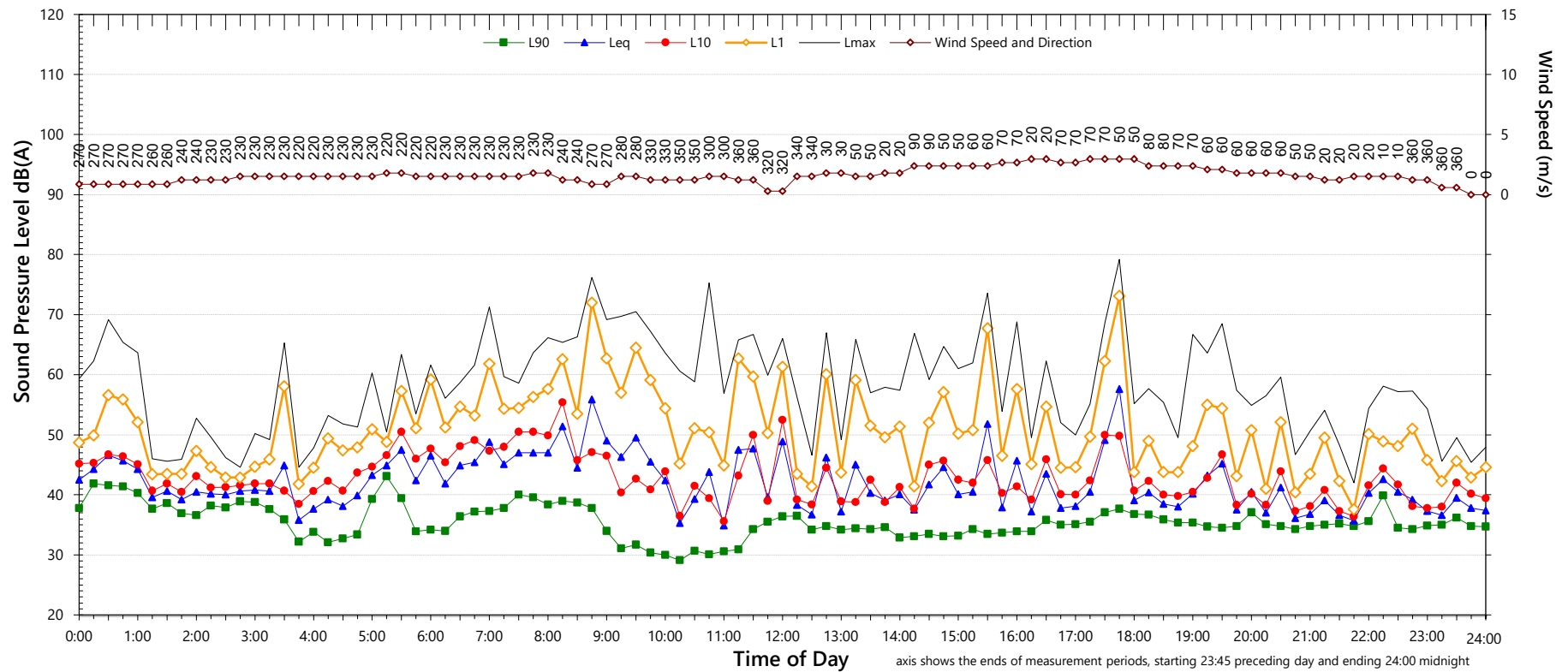
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	51	48
L _{Aeq} 1hr upper 10 percentile	54	50
L _{Aeq} 1hr lower 10 percentile	45	43

Unattended Noise Monitoring Results

WH4A - South

Sunday, 7 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	31	35	34
L _{Aeq}	47	40	46

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	76	to	77
L _{AFMax} - L _{Aeq} (Range)	16	to	30

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

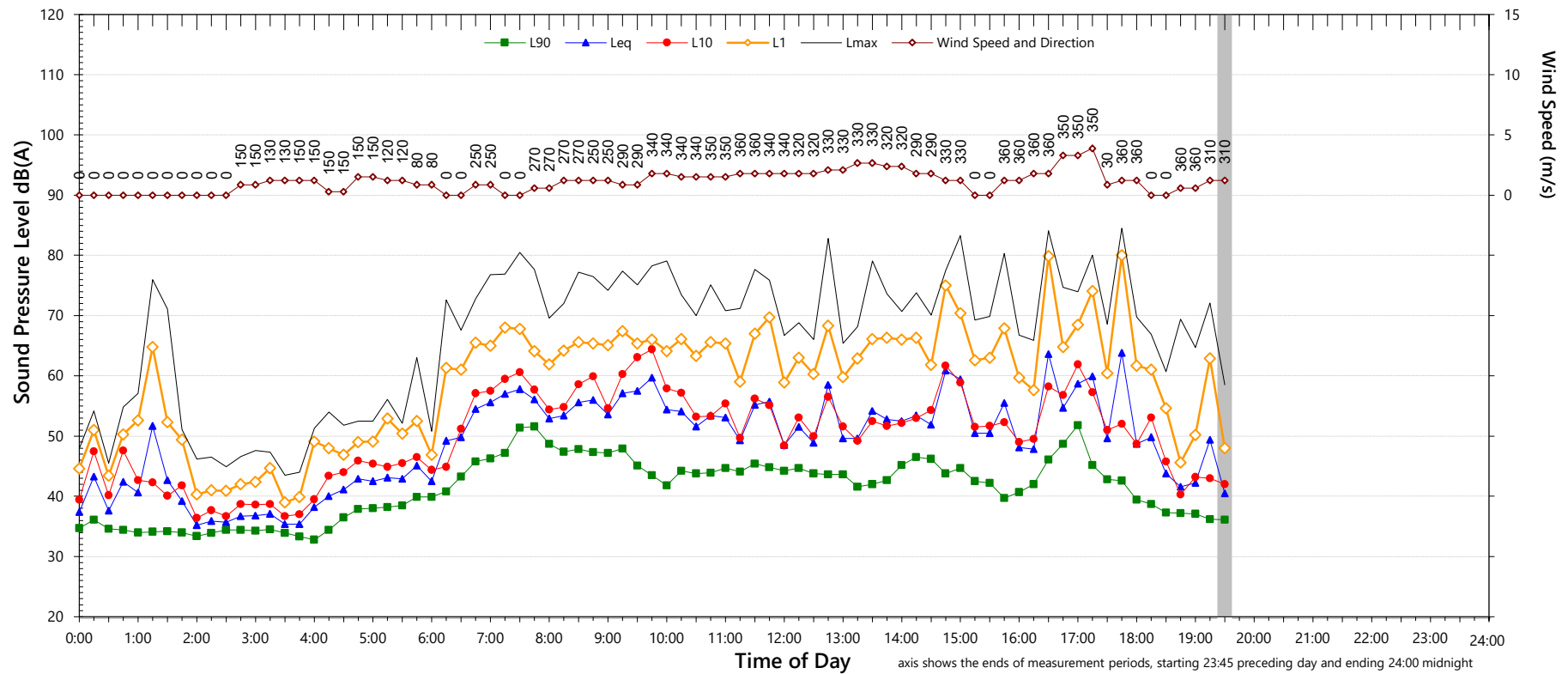
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	49	48
L _{Aeq} 1hr upper 10 percentile	53	50
L _{Aeq} 1hr lower 10 percentile	41	39

Unattended Noise Monitoring Results

WH4A - South

Monday, 8 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	42	-	-
L _{Aeq}	56	-	-

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	-	to	-
L _{AFMax} - L _{Aeq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	-	-
L _{Aeq} 1hr upper 10 percentile	-	-
L _{Aeq} 1hr lower 10 percentile	-	-

2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

B.11 Warehouse 5 Noise Monitoring Report

Renzo Tonin & Associates Report TL116-09F03 Warehouse 5 Ops (r1)

MOOREBANK LOGISTIC PARK - PRECINCT EAST

Warehouse 5 Operational Compliance Measurements

9 April 2021

Qube Property Management Services Pty Ltd c/- Tactical Group

TL116-09F03 Warehouse 5 Ops (r1)

Document details

Detail	Reference
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Prepared for:	Qube Property Management Services Pty Ltd c/- Tactical Group
Address:	Level 15, 124 Walker Street North Sydney, NSW, 2060
Attention:	

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Reviewed / Authorised
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File Path: R:\AssocSydProjects\TL101-TL150\TL116 cw Moorebank IMT Temporary Noise Monitoring\Task 9 - cw Warehouse Compliance Monitoring\1 Docs\WH5\TL116-09F03 Warehouse 5 Ops (r1).docx

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Contents

1	Introduction	5
1.1	Warehouse operations description – WH5	6
1.1.1	Location	6
1.1.2	Operational activities and facilities and hours of operation	6
1.2	Nearby sensitive receivers	6
2	Summary of noise objectives	9
2.1	Compliance assessment noise requirements	9
2.2	Operational noise limits	9
2.3	Discussion of assessment noise limits	10
3	Measurement methodology and results	12
3.1	Compliance measurement methodology	12
3.2	Instrumentation	13
3.3	Receiver unattended noise measurement results	13
3.3.1	Meteorological conditions	xvii
3.4	On-site attended operational activity noise measurement results	xvii
3.5	Unattended noise measurements	xviii
3.6	Modelled operational scenarios	xix
3.6.1	Observed operations for modelling	xix
3.6.1.1	Loading and Unloading operations (WH5 east)	xx
3.6.1.2	Qube container handling operational area (WH5 west)	xx
3.6.2	Assessment noise source levels	xxi
3.6.3	Reasonable worst-case intrusiveness scenarios (15-minute period)	xxii
3.7	Modelling methodology	xxiii
3.7.1	Overview of noise modelling	xxiii
3.7.2	General modelling assumptions	xxiii
3.7.3	Model validation	xxiv
3.8	Noise compliance assessment	xxv
4	Conclusion	xxvii
APPENDIX A	Glossary of terminology	xxviii
APPENDIX B	Logger location 1 – WH5 - West side	xxx
APPENDIX C	Logger location 2 – WH5 – East side (L1)	xxxi
APPENDIX D	Logger location 3 – WH5 – East side (L2)	xxxii

List of tables

Table 1	Noise sensitive receivers and approximate distance from MPE WH5	7
Table 2	SSD 7628 CoC B80 noise limits, dB(A)	10

Table 3	Noise measurement equipment	13
Table 4	Permanent noise monitoring stations	13
Table 5	Receiver permanent noise monitoring locations	14
Table 6	Summary of permanent noise monitoring results at the nearest sensitive residential receivers	xvi
Table 7	On-site attended noise measurement results	xviii
Table 8	Assessment noise source levels	xxi
Table 9	Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios	xxiii
Table 10	Comparison between measured and modelled noise levels	xxv
Table 11	Predicted noise levels - Reasonable 15-minute worst-case scenario for WH5 west	xxvi
Table 12	Predicted noise levels - Reasonable 15-minute worst-case scenario for WH5 east	xxvi

List of figures

Figure 1	Warehouse location WH5, MPE precinct and the nearest residential receiver catchments	8
Figure 2	Residential receiver noise monitoring locations NMT01 to NMT04	15
Figure 3	Unattended noise logger locations and main noise generation areas for WH5 (imagery: Nearmap, 2021)	xix

1 Introduction

Renzo Tonin & Associates was engaged by Tactical on behalf of Qube Property Management Services Pty Ltd (QUBE) to undertake an operational noise compliance assessment of the warehouse operations being carried out at Warehouse 5 (WH5) within the Moorebank Precinct East (MPE), located within the Moorebank Logistics Park (MLP) at Moorebank, NSW.

The Sydney Intermodal Terminal Alliance (SIMTA) received approval for the construction and operation of Stages 1 and 2 of the MPE Project (SSD 6766 and SSD 7628 respectively), which together comprise the two stages of development under the MPE Concept Approval (MP10_0193). Warehouse operations, including the site that is operated by WH5 fall under the area and activities approved as part of SSD 7628.

This report has been prepared to address the operational noise monitoring requirements outlined in the MPE Operational Noise and Vibration Management Plan¹ (MPE ONVMP) required for the warehouse operations carried out by WH5. Specifically, this report has been prepared to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628, as detailed in Section 3.2.2 of the MPE ONVMP.

Appendix A contains a glossary of acoustic terms used in this report.

1. 1 Arcadis & Renzo Tonin & Associates, Operational Noise and Vibration Management Plan for Moorebank Logistics Park – East Precinct, Revision 012, dated 27/3/2020, available https://simta.com.au/wordpress/wp-content/uploads/2020/04/ONVMP_V12_redacted.pdf, accessed 25/3/2021

1.1 Warehouse operations description – WH5

1.1.1 Location

The MLP is located approximately 27 kilometres east-west of the Sydney Central Business District and approximately 26 kilometres west of Port Botany, within the Liverpool Local Government Area. The MLP is divided into an East Precinct and a West Precinct, located east and west of Moorebank Avenue respectively, as shown in Figure 1.

1.1.2 Operational activities and facilities and hours of operation

Operational activities at WH5 include storage and distribution activities at the position shown in Figure 1. The day to day activities include:

- Receipt and despatch of containers from and to the IMEX terminal
- Loading and unloading of containers
- Storage of products
- Despatching and receiving commercial products. Deliveries are via trucks, with loading and unloading activities via forklift
- Internal product transferring and moving activities using forklifts
- General office administrative and support functions.

The despatch activities, general deliveries and commercial customer activities mostly occur from the east side of WH5. The western side of the warehouse is the designated area where containers from the IMEX terminal or other sources are transported to and stored for unloading to within the warehouse. These two main areas are shown in Figure 3.

Noise-generating activities typically occur between 6:00am and 6:00pm, however the busiest period is typically between 6:00am and 11:00am. Since the 6:00am to 7:00am period is within the 10:00pm to 7:00am night-time period, the potential for sleep disturbance impacts at nearby residential receivers has been undertaken as part of this report. Activities typically do not occur during the remaining 10:00pm to 6:00am night-time period.

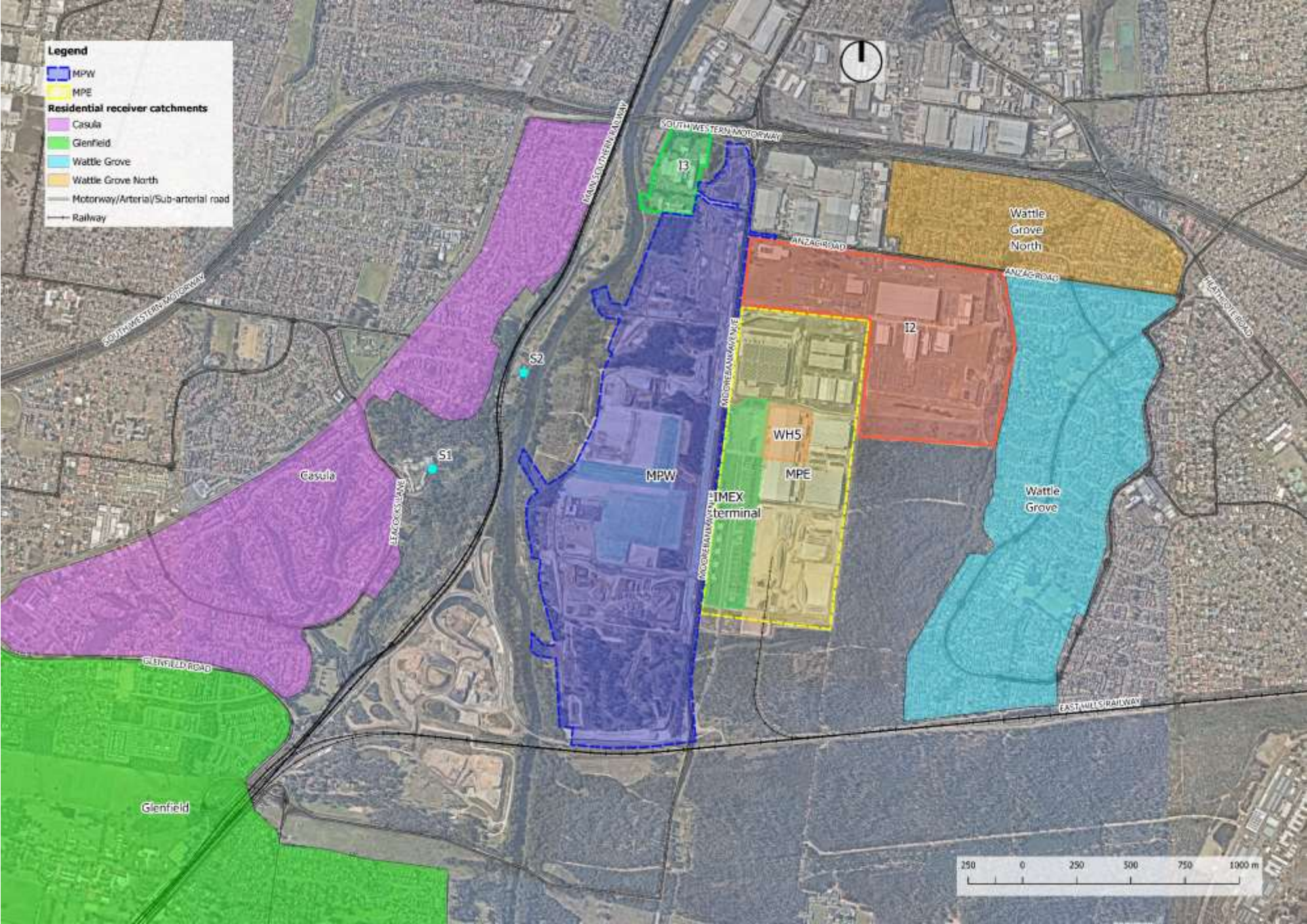
1.2 Nearby sensitive receivers

The potentially most affected residential receivers in the vicinity of the MPE for the WH5 operations, are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove West. A summary of the approximate distance to the nearest residential receiver in the surround noise catchment areas (NCAs) in addition to nearby other noise receivers is provided in Table 1. The locations of the NCAs or receivers, are shown in Figure 1.

Table 1 Noise sensitive receivers and approximate distance from MPE WH5

Sensitive receiver (Noise Catchment Area (NCA) or Receiver ID)	Receiver type	Approximate distance from MPE precinct WH5, metres
Wattle Grove (NCA 1)	Residential	860
Wattle Grove West (NCA 2)		850
Casula (NCA 3)		1160
Glenfield (NCA 4)		2,430
All Saints Senior College (S1)	Educational	1,530
Casula Powerhouse (S2)		1,145
Defence Joint Logistics Unit (DJLU) (I2)	Industrial	230
ABB (I3)		955

Figure 1 Warehouse location WH5, MPE precinct and the nearest residential receiver catchments



2 Summary of noise objectives

2.1 Compliance assessment noise requirements

The management of operational noise emission from warehouse activities within MPE Stage 2 is outlined in the MPE ONVMP. Specifically, this report has been prepared to address the requirements of CoC B85 in SSD 7628, as detailed in Section 4.1.1 of the MPE ONVMP.

This report includes noise monitoring performed to address the requirements in CoC B85, as detailed in Table 4-1 in Section 4.1.1 of the MPE ONVMP.

The requirements of CoC B85 state:

B85 The Applicant must carry out noise monitoring of mechanical plant and other noisy equipment for a minimum period of two weeks where valid data is collected following occupation of each warehouse. The monitoring program must be carried out by a suitably qualified and experienced person(s) and a Monitoring Report for Mechanical Plant must be submitted to the Secretary within two months of occupation or each tenancy to verify predicted mechanical plant and equipment noise levels.

CoC B85 requires that the monitored noise levels be compared against the predicted levels reviewed in accordance with CoC B84.

The noise impacts from warehouse operations were assessed as part of the EIS noise and vibration impact assessment (MPE Stage 2 Noise and Vibration Impact Assessment, Wilkinson Murray, Report No. 12186-S2, Version C, 29 November 2016 (MPE Stage 2 N&V assessment)). The individual noise impacts of warehouse operations were not quantified as part of the EIS. As such, noise level predictions for the warehouse activities are not available for verification with CoC B85.

As per Table 4-1 in Section 4.1.1 of the MPE ONVMP, Table 3-20 and Table 3-21 of the MPE ONVMP detail the predicted $L_{Aeq\ 15\ \text{minute}}$ intrusiveness and $L_{A1\ (1\ \text{minute})} \setminus L_{Amax}$ sleep disturbance noise limit levels respectively for the overall MPE operations (not for individual warehouses).

As such, for the purposes of addressing CoC B85, instead of comparing the facility noise emission against the noise level predicted in accordance with CoC B84, this report aims to assess the noise levels from the mechanical plant and other noisy equipment that operate within the facility directly against the noise limits presented in Table 5 of condition B80.

2.2 Operational noise limits

The operational noise limits applicable for the warehouse operations within MPE are presented in Table 5 of SSD 7628 CoC B80 and are reproduced in Table 2. These noise limits are as per Table 3-5 of

the MPE ONVMP. The noise limits are applicable not only to all operational noise sources approved under SSD 7628, but are inclusive of operations as part of MPE Stage 1, approval SSD 6766.

The $L_{Aeq(15 \text{ minute})}$ criteria are applicable during the day, evening and night-time periods and the $L_{A1(1 \text{ minute})}$ sleep disturbance noise limits at residential receivers are applicable during the night-time period.

The noise limits are applicable under prevailing meteorological conditions of wind speeds of up to 3 m/s at 10 metres above ground level or stability category 'F' temperature inversion conditions.

Table 2 SSD 7628 CoC B80 noise limits, dB(A)

Sensitive receiver	Day ¹	Evening ¹	Night ¹	Night ¹
	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{Aeq, 15 \text{ minute}}$	$L_{A1(1 \text{ minute})}$
Wattle Grove (NCA 1)	35	35	35	52
Wattle Grove West (NCA 2)	35	35	35	52
Casula (NCA 3)	35	35	35	52
Glenfield (NCA 4)	35	35	35	52

Notes:

1. In accordance with the INP, day is the period from 7:00 am to 6:00 pm Monday to Saturday; or 8:00 am to 6:00 pm on Sundays and public holidays; evening is the period from 6:00 pm to 10:00 pm; and night is the remaining periods.
2. To determine compliance with the $L_{Aeq, 15 \text{ minute}}$ noise limits, noise from the development is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of a dwelling where the dwelling is more than 30 metres from the boundary. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 Noise Policy for Industry - NPfI). The modification factors in Section 4 of the INP must also be applied to the measured noise levels where applicable.
3. To determine compliance with the L_{A1} noise limits, noise from the project is to be measured at 1 metre from the dwelling façade. Where it can be demonstrated that direct measurement of noise from the project is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 of the NPfI).
4. The noise emission limits identified above apply under meteorological conditions of:
 - (i) wind speeds of up to 3 m/s at 10 metres above ground level; or
 - (ii) 'F' atmospheric stability class.

2.3 Discussion of assessment noise limits

As noted in Section 2.2, the noise limits detailed in SSD 7628 CoC B80 are applicable not only to all operational noise sources approved under SSD 7628, but are also inclusive of operations as part of the MPE Stage 1 approval for SSD 6766. Importantly, when assessing compliance with the noise limits, the most affected residential receiver for any individual operations will not necessarily be at the same location. Additionally, it is unlikely that the reasonable worst-case noise levels from any individual operations would also occur in the same 15-minute period.

As part of the recent modification application for SSD 7709 Moorebank Precinct West (MPW) – Stage 2, MOD 1 - Building height increase, which was approved 24 December 2020, a review of the applicable operational noise requirements across Moorebank Precinct West (MPW) and Moorebank Precinct East (MPE) was undertaken (Renzo Tonin & Associates document reference TJ741-11F05 (r4), dated 30 June 2020). The review identified that there are number of approval conditions that are applicable across both the MPW and MPE sites for operational noise, and that in the application of these approvals to the site activities, it became apparent that the operational noise requirements were not consistent across the MPE and MPW sites.

Additionally, the review identified that the operational noise limits across MPE and MPW were set substantially below both the noise criteria and the predicted noise levels (even with feasible and reasonable mitigation measures) established during the environmental assessment stages and considering the cumulative operational noise levels from all MPE and MPW operations.

The review recommended that an overall approach for cumulative operational noise management of the Moorebank intermodal terminal precinct (for East and West precinct) for a “whole of complex” approach be adopted, and that consistent noise management objectives for the Moorebank intermodal terminal precinct’s operational noise be adopted to cover all operations within MPE and MPW. Appropriate and achievable noise management objectives consistent with EPA’s noise policies were also developed in the review.

Following the modification application for SSD 7709 (MOD 1), the submission received from the NSW Environment Protection Authority (NSW EPA) noted the following:

However, the current noise limits are set below the predicted noise levels and are not based on the Project Specific Noise Levels (PSNL) derived under the then-applicable Industrial Noise Policy 2000 (now superseded by the Noise Policy for Industry 2017).... The EPA considers that the resulting noise limits are not achievable for MPW, nor are they achievable for the cumulative MPW and MPE sites.

Also Liverpool City Council included in their submission:

Council considers that site regulation in regard to noise management may be assisted by adopting a precinct approach consistent with the NSW EPA’s Noise Policy for Industry (2017).... Whilst it is acknowledged that current criteria in the Approval may be impracticable, it will be necessary for the Department to consider applying suitable noise limits that are achievable and capable of protecting the amenity and wellbeing of sensitive receivers.

As such, this operational compliance assessment does not include further quantification of cumulative noise levels, and demonstrates that WH5 operations can achieve the noise limits set out in SSD 7628 CoC B80 in isolation during reasonable worst-case operations.

It is recommended that noise levels from this assessment achieve the required noise limits set out in Table 5 of SSD 7628 CoC B80, and that the site specific noise levels should be considered as part of the operational noise management applicable to the overall Moorebank intermodal terminal precinct.

3 Measurement methodology and results

3.1 Compliance measurement methodology

The Noise Policy for Industry (NPfI) provides guidance in Chapter 7 for monitoring the performance of a noise-generating industrial facility. In Section 7.1.1, the NPfI provides guidance as to how to review noise emissions of a site where the existing ambient noise levels are already high, resulting in the direct quantification of the noise under investigation not being possible via noise measurements at the receiver location. Additionally, the NPfI provides guidance about using noise modelling to review the performance of an industrial operation that is co-located with separate but noise-generating industrial sites impacting the same receiver. To satisfy the requirements of CoC B85, the following noise monitoring and assessment steps have been undertaken:

1. Review of permanent noise monitoring at nearby residential receivers during periods when noise intensive activities were taking place within the WH5 facility to determine if noise levels would allow for quantification of operational noise emissions, by checking if operational noise emissions are audible, distinguishable and quantifiable at the receiver locations during periods of noise intensive on-site activities (Section 3.3).
2. On-site attended monitoring of noise-generating activities to quantify noise emission levels of mechanical plant and other noise-generating activities as part of typical warehouse operations (Section 3.3.1).
3. Unattended noise monitoring at the WH5 facility for a period of two weeks, with concurrent video, to identify the reasonable worst-case operational scenarios and periods for each major noise-generating area (Section 3.5).

The review of unattended noise monitoring data measurements in Section 3.3 established that the existing ambient noise levels at the nearest receivers were high and controlled by noise sources outside of MPE. Additionally, a number of industrial noise-generating facilities are co-located within MPE, which makes it difficult to separate the noise contribution from individual MPE warehouse operations. As such, direct quantification or estimation of operational noise emissions from the warehouse operations at the sensitive receiver locations was not possible. Noise emissions from the WH5 have been evaluated using a combination of on-site attended and unattended noise monitoring, combined with noise modelling, in order to quantify the industrial noise emissions from WH5 operations.

The following steps were undertaken to assess the noise level contributions at the nearby sensitive receivers:

1. Review observations of warehouse operations, in addition to the noise monitoring results and associated video, to then determine the reasonable worst-case operational scenarios.
2. Setup and calibrate the noise model for the reasonable worst-case operational scenarios.

- Calculate the operational noise levels from the warehouse operations to all nearby receivers and determine the noise level contribution at the property with the highest noise levels within each NCA.

3.2 Instrumentation

A range of noise monitoring equipment was used to undertake the compliance noise monitoring. A summary of measurement equipment and calibration dates is provided in Table 3.

All of the noise monitoring equipment are Class 1 instruments, with calibration certificates current at the time of the measurements. Before and after each series of attended measurements, the calibration of the sound level meters were verified using a reference calibration of 94 dB at 1 kHz. The difference between pre- and post-calibration levels was within 0.5 dB for all measurements.

Table 3 Noise measurement equipment

Monitoring location/ purpose	Equipment	Serial No	Last date calibrated
On-site attended noise measurements	NTi XL2	A2A-16217-E0	05/07/2019
Unattended on-site noise measurements (WH5 West)	NTi XL2	A2A-07073-E0	19/12/2018
Unattended on-site noise measurements (WH5 East – L1)	NTi XL2	A2A-08038-E0	19/01/2021
Unattended on-site noise measurements (WH5 East – L2)	NTi XL2	A2A-16117-E0	5/07/2019
Field calibration	B&K 4231	3016756	27/11/2020

Four Envirosuite permanent noise monitors are set up at nearest representative residential locations in the community and are labelled NMT01 to NMT04 in Figure 2.

Table 4 Permanent noise monitoring stations

Monitoring location	Description	Equipment	Serial No	Last Date Calibrated
NMT01	Permanent noise monitor	B&K 2250	3025394	12/03/2019
NMT02	Permanent noise monitor	B&K 2250	3025271	12/03/2019
NMT03	Permanent noise monitor	B&K 2250	3025351	12/03/2019
NMT04	Permanent noise monitor	B&K 2250	3025317	12/03/2019

3.3 Receiver unattended noise measurement results

As detailed in Section 1.2, the residential receivers nearest to WH5 are located in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove West.

The most intensive period of operational activities at WH5 typically occurs during the night-time period from 6:00am to 7:00am and daytime period from 7:00am to 11:00am. As such, noise monitoring data from the permanent noise monitoring stations have been reviewed for the period between 6:00am and 8:00am on 4 March 2021, during which onsite noise intensive activities were confirmed via video and noise monitoring data to be taking place.

The permanent noise monitoring stations were configured to record audio and undertake statistical noise measurements. During the reviewed measurement period, concurrent unattended noise measurements were undertaken on-site (see Section 3.3.1). This assisted to confirm that noise intensive activities were occurring on-site during the reviewed period.

A summary of the monitoring locations and the approximate distance to the WH5 is provided in Table 5. These locations along with the noise catchment areas (NCAs) are presented in Figure 2.

Table 5 Receiver permanent noise monitoring locations

Monitoring location ID	Monitoring location (applicable NCA) (see Figure 2)	Approximate distance (m) from WH5
NMT01	22 Glenelg Court, Wattle Grove (Wattle Grove West – NCA2)	900
NMT02	26 Goodenough Street, Glenfield (Glenfield – NCA4)	2430
NMT03	31 Martindale Court, Wattle Grove (Wattle Grove – NCA1)	920
NMT04	14 Dunmore Crescent, Casula (Casula – NCA3)	1280

The results of the permanent noise monitoring results for the review period of 6:00am and 8:00am on 4 March 2021 are presented in Table 6.

The ambient noise levels during the reviewed monitoring period were greater than 48 dB(A) $L_{Aeq\ 15\ minute}$ at all monitoring locations, with background noise levels over this same period being no less than 42 dB(A) $L_{A90\ 15\ minute}$. Sample reviewed audio of the receiver located permanent monitoring stations could not clearly distinguish noise corresponding to concurrent onsite activities. Noise from concurrent site activities was confirmed through audio from the on-site unattended noise monitor combined with video. As such, given that noise levels are expected to be below the overall noise limit of 35 dB(A) $L_{Aeq\ 15\ minute}$, and were not audible and/or distinguishable at nearby receivers because of high ambient noise levels, direct quantification or estimation of operational noise emissions from the warehouse operations at the sensitive receiver locations was not be possible via direct measurement in the presence of the ambient noise level environment. As such, it is appropriate to use the alternative methodology of modelling to determine compliance as detailed in Section 7.1.1 of the NPfI.

Figure 2 Residential receiver noise monitoring locations NMT01 to NMT04

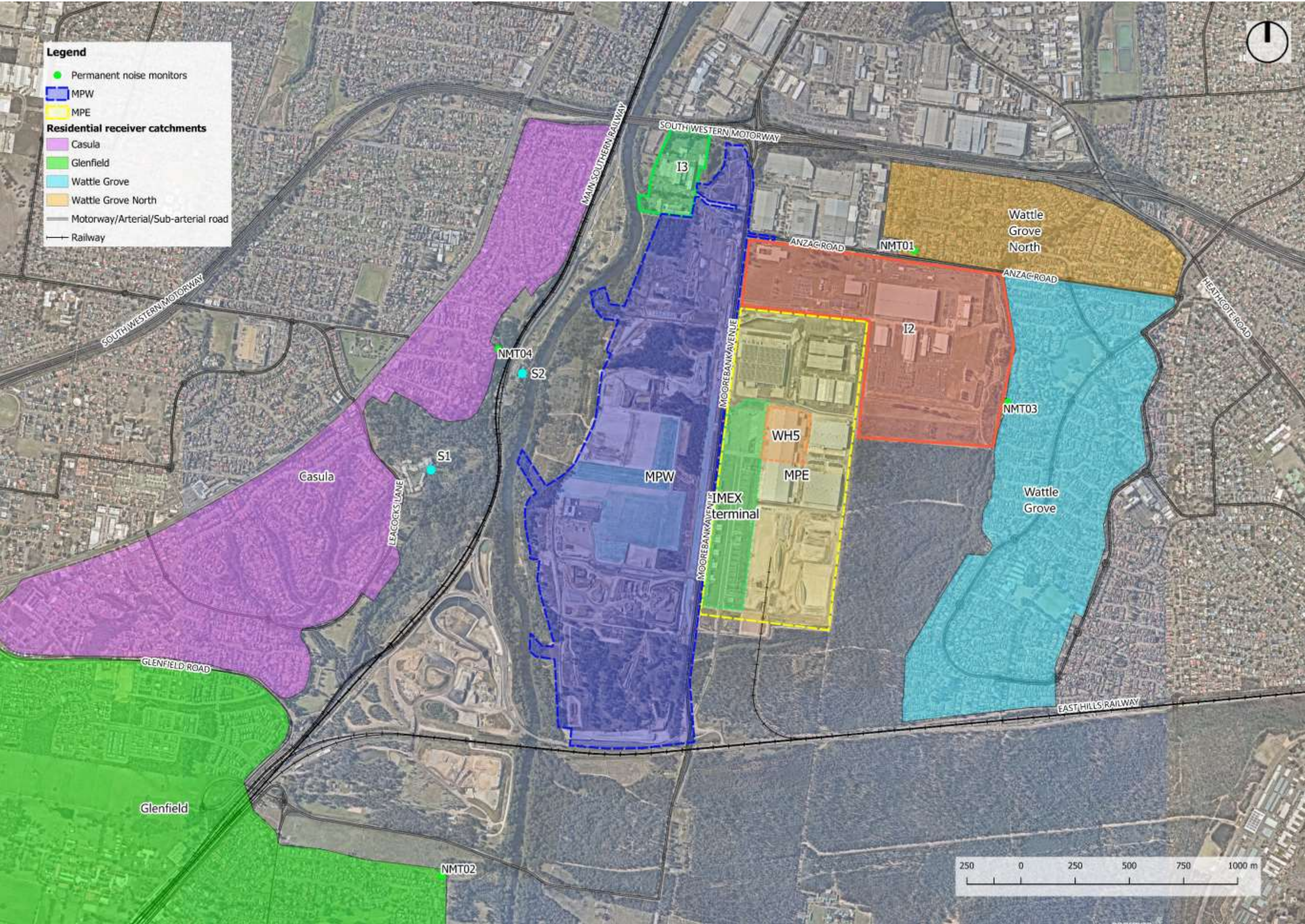


Table 6 Summary of permanent noise monitoring results at the nearest sensitive residential receivers

Measurement period	Measured noise level (15 minute), dB(A)			
	L _{Amax}	L _{A1}	L _{Aeq}	L ₉₀
NMT01 (22 Glenelg Court, Wattle Grove)				
04/Mar/21 06:00 - 06:15	66	61	54	48
04/Mar/21 06:15 - 06:30	66	62	55	49
04/Mar/21 06:30 - 06:45	67	63	57	52
04/Mar/21 06:45 - 07:00	78	64	57	50
04/Mar/21 07:00 - 07:15	67	61	55	48
04/Mar/21 07:15 - 07:30	77	62	56	50
04/Mar/21 07:30 - 07:45	69	62	56	48
04/Mar/21 07:45 - 08:00	76	63	57	50
NMT02 (26 Goodenough Street, Glenfield)				
04/Mar/21 6:00 - 8:00	Not available due to maintenance and calibration.			
NMT03 (31 Martindale Court, Wattle Grove)				
04/Mar/21 06:00 - 06:15	56	53	48	45
04/Mar/21 06:15 - 06:30	58	52	48	46
04/Mar/21 06:30 - 06:45	76	61	52	47
04/Mar/21 06:45 - 07:00	81	67	55	48
04/Mar/21 07:00 - 07:15	76	69	57	48
04/Mar/21 07:15 - 07:30	89	77	65	49
04/Mar/21 07:30 - 07:45	92	82	68	47
04/Mar/21 07:45 - 08:00	89	69	63	46
NMT04 (14 Dunmore Crescent, Casula)				
04/Mar/21 06:00 - 06:15	67	63	50	42
04/Mar/21 06:15 - 06:30	73	68	56	43
04/Mar/21 06:30 - 06:45	66	63	51	43
04/Mar/21 06:45 - 07:00	68	65	54	45
04/Mar/21 07:00 - 07:15	68	65	54	47
04/Mar/21 07:15 - 07:30	81	65	57	52
04/Mar/21 07:30 - 07:45	73	70	59	52
04/Mar/21 07:45 - 08:00	80	67	58	51

3.3.1 Meteorological conditions

Meteorological conditions for the review period of the permanent noise monitoring station data has been reviewed to ensure they were acceptable in accordance with the NPfl. Data from the MLP meteorological data monitoring station adjacent to Moorebank Avenue, within the MPE site, established in accordance with CoC A54 SSD 7709 has been reviewed. The meteorological conditions experienced during receiver permanent noise monitoring on 4 March 2021 are summarised below:

- During the measurement period at the facility, the equivalent average wind speed was less than 0.5 m/s and generally from the WNW. All other measurements were not impacted by excessive wind during any of the measurement periods.
- No rain occurred during any of the measurement periods.

The temperature during the measurement period ranged between 17°C and 25°C, and the cloud conditions were generally clear skies with a few scattered clouds.

3.4 On-site attended operational activity noise measurement results

In order to quantify the noise emissions from on-site activities for the purposes of determining compliance noise levels, attended noise measurements of individual operational items and typical operations were undertaken at WH5 on 2 March and 9 March 2021. These noise levels have been used to assist in establishing the source levels in the noise model. During all measurements, the specific noise source being measured was the dominant source.

Observations were made of the on-site operations to assist with determining the 'reasonable' worst-case operational scenarios over the assessment periods. Critical on-site attended measurement results are summarised in Table 7.

The main noise generating activities observed were being undertaken externally on the hardstand areas (see Figure 3), which included forklift operations. There was also contribution to noise emissions from internal warehouse activities.

Table 7 On-site attended noise measurement results

Activity noise sources	Date	Time	Measurement duration (t), sec	Measurement distance (m)	Measured noise levels, dB(A)	
					L _{Aeq(t)}	L _{Afmax}
Internal warehouse noise levels (noise breakout)						
Internal noise level at loading dock door (internal sources include forklifts) ¹	2/3/2021	2:30pm to 2:45pm	120	At external roller doors	50	60
Forklift						
Forklift 1.5-2 Tonnes	2/3/2021	1:20pm	10	15	62	67
Curtain side trailer truck						
Truck pass-by	2/3/2021	1:30pm	10	20	72	76
Truck idling	2/3/2021	1:30pm	60	20	65	66
Mechanical plant						
Office air condenser unit ²	9/3/2021	1:00pm	46	1	70	71

Note:

1. Internal noise sources included forklift operations, but were lower than expected due to increased distance. More conservative (higher) noise levels are assumed in the modelling, based on past measurement for WH4A.
2. 3 out of 5 condenser units were operating at time of measurement.

3.5 Unattended noise measurements

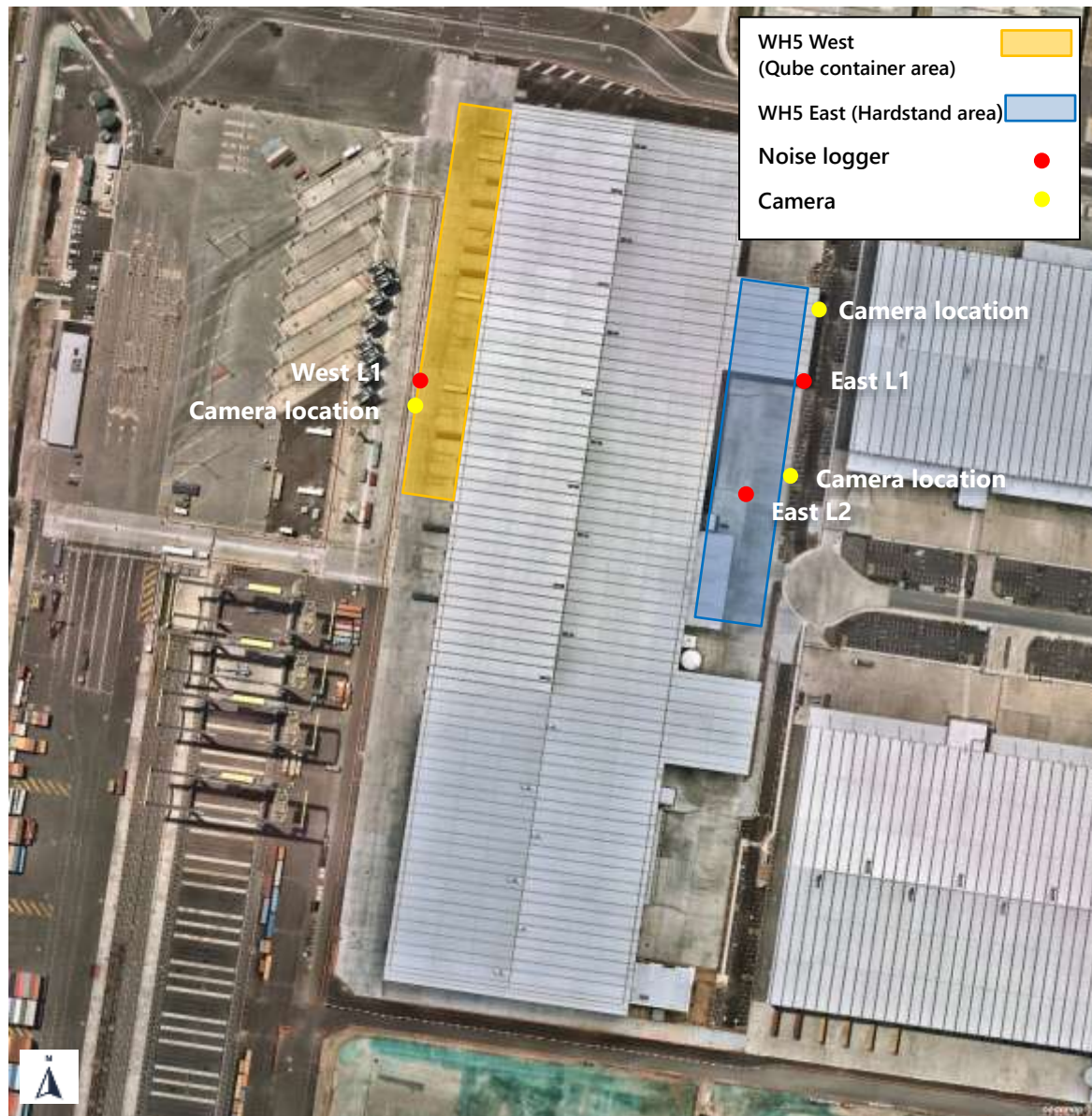
Unattended noise measurements were undertaken over the period between 2 to 16 March 2021 at locations adjacent to WH5 on both side of the warehouse. Two main areas of noise-generating operations were identified across the warehouse site, one on the western side of the warehouse and one on the eastern side. The locations of the unattended noise loggers are shown in Figure 3. These were selected so that they would capture noise from the main noise-generating areas as part of the typical warehouse operations. Camera units were set up on the western and eastern side boundary fences at WH5 to assist in gaining a comprehensive understanding of the site operations and vehicle movements.

The purpose of the noise logging at the selected locations was for the following:

- Determine the noise emissions from the facility at a fixed location close enough to quantify on-site sources.
- Determine the long-term background noise levels when operations were not taking place at the site.
- A source for analysis to determine the duration and nature of the different on-site activities through correlation with the Facility activity data.
- Source of validation for the noise model calibration process.

Detailed unattended noise monitoring results are provided in APPENDIX B for WH5 west and APPENDIX C for WH5 East. The noise model was validated using the unattended noise logger results through comparison against reference activity periods, refer to Section 3.7.3 for noise model calibration.

Figure 3 Unattended noise logger locations and main noise generation areas for WH5 (imagery: Nearmap, 2021)



3.6 Modelled operational scenarios

3.6.1 Observed operations for modelling

Based upon the on-site attended measurements presented in Section 3.4, the video recording for the facility over the unattended monitoring period presented in Section 3.5, and discussions with WH5 personnel, 'reasonable' worst-case operational assessment scenarios were established and modelled to determine site noise emission levels to determine compliance with the requirements of SSD 7628.

The following section details the key observations of each of the noise-generating activities that take place across the warehouse operations.

3.6.1.1 Loading and Unloading operations (WH5 east)

WH5 east was predominately used for loading and unloading of Curtain Side Trailer Trucks via forklift. The following data related to delivery truck operations was based upon site observations during the attended measurements on 2 March and 9 March 2021, in addition to the unattended noise level and audio data recordings during periods between 2 March and 9 March 2021 when truck movements within the warehouse site boundary on the hardstand area and forklift operations were clearly distinguishable.

- It was observed during the attended measurements and video data, that internal truck movements at WH5 East on the hardstand were typically Curtain Side Trailer Trucks, and that a typical 'in-and-out' cycle time in the facility was on median 30 minutes, with each loading cycle taking approximately 15-20 minutes.
- It was observed during the attended noise measurements and video data that the internal truck movements on the hardstand in the WH5 east despatching area move at a relative low speed of approximately 10 km/h.
- The noise intensive period for Curtain Side Trailer truck loading and unloading activities was typically between 6:00am and 11:00am on weekdays at WH5 east, and then the Curtain Side Trailer trucks would leave the facility after being loaded with products.
- Unloading of products from delivery trucks typically occur within the warehouse, with the warehouse doors open. It was observed that a truck would be loaded or unloaded in the external despatch area using a forklift.
- The maximum number of trucks being loaded simultaneously by forklifts was four within the WH5 despatching area. This was confirmed through analysis of the video data and unattended noise data. As such, the 'reasonable' worst-case would be four loading events occurring concurrently. Air brake noise associated with Curtain Side Trailer truck operations could occur during arrival and departure operations. This forms part of the noise modelling of potential sleep disturbance events.

3.6.1.2 Qube container handling operational area (WH5 west)

WH5 west was predominately used for container delivery operations via combi-lift, which occurred infrequently.

- Movements of containers within the WH5 west area can occur at any time throughout the daytime period. It was observed that movements typically started from approximately 7:00am. Four container movements were observed during the two-week monitoring period, with a maximum of two container movements during any one day.
- It was observed that one combi-lift would be used to move containers to and from the western hardstand of the WH5 site boundary, to and from, the MLP terminal area. Using the unattended

measurements and concurrent video recordings during the monitoring, it was observed that the duration of the combi-lift loading/unloading operations would take less than 5 minutes, but during this period the combi-lift would operate continuously generating noise as part of the container handling operation.

- Impact noise events associated with grabbing and dropping of containers would occur when the combi-lift gripper contacted individual containers. The tonal reversing beeper associated with combi-lift operations would occur during container handling operations.

3.6.2 Assessment noise source levels

Source levels for the key noise-generating activities on-site have been established based upon the attended noise measurements (Section 3.4) and unattended noise measurements (Section 3.5) during periods of typical operation. The sound power level inputs presented in Table 8 were used in the operational noise compliance modelling, and adjusted for the duration and frequency of operations (Section 3.6.3).

Table 8 Assessment noise source levels

Site items / operation	Individual activity sound power level (SWL) (L_{Aeq} , dB(A))
WH5 West	
Curtain Side Trailer Truck moving with speed less than 20km/h	102
Air brake release (L_{AFmax})	117
Trucks idling on site	98
Forklift operations	96
Forklift operations (L_{AFmax})	111
Loading operations (L_{AFmax})	115
WH5 East	
Container combi-lift (moving container activity)	103
Container gripping & drop (L_{Amax})	108
Container gripping & drop (L_{Aeq}) ⁴	81 $L_{Aeq, 15min}$
Container combi-lift reversing with tonal reversing alarm	105
Internal noise breakout	
Internal noise breakout via roof ¹	74
Internal noise breakout via external roller doors ⁵	76
Mechanical Plant	
Air condenser unit ²	80 ²
Other noise sources	
Curtain Side Trailer Truck moving on internal roads within MLP, outside of the WH5 site (typical speed on internal roads of 20 km/h)	102

Site items / operation	Individual activity sound power level (SWL) (L_{Aeq}), dB(A)
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Notes:

1. Attended measurement shows breakout via WH5 warehouse roof during loading and unloading operations. Internal noise levels are based on intensive periods when forklifts were in use.
2. Air condenser units are located on the east façades of the warehouse. 5 units are installed onsite. The modelling conservatively assumes that all 5 units are operational..
3. Internal noise levels controlled by forklift operations within the warehouse.
4. One event assumed in the 15-minute interval.
5. Sound power level for the breakout via each roller door

3.6.3 Reasonable worst-case intrusiveness scenarios (15-minute period)

As the noise limits in CoC B80 are set at 35 dB(A) L_{Aeq} 15 minute for the day, evening and night periods, specific separation of noise intensive periods for each of these time periods has not been undertaken. Instead, it is noted that there are two main areas of noise generation as part of typical warehouse operations, as presented in Figure 3.

In order to assess the operational noise emissions from the warehouse, the 'reasonable' worst-case operations for each of the two main areas of noise generation have been developed, along with the corresponding activities in the other noise-generating areas, in order to review a representative snapshot of activities from the warehouse operations. Each of the assessment scenarios have been developed from an analysis of the video movement data or attended on-site observations over during the two week period, in addition to the information detailed in Section 3.6.1. It is noted that the peak periods of noise generating activities for each of the two main areas (western side of the warehouse and eastern side of the warehouse) did not occur concurrently.

For the 'reasonable' worst-case scenario developed for the western side of the warehouse (WH5 west), a total of four container movements were observed on the video data to occur over the period of two weeks. The duration of each container delivery operation was 5 minutes or less. During the periods when containers were being moved within WH5 west (Qube container operation area), warehouse roller doors remained closed on the east side of WH5. As such, even though these activities have been assessed as the 'reasonable' worst-case scenario, it is noted that they occur very infrequently.

Periods representing the 'reasonable' worst-case operations, for each the western side of the warehouse and eastern side of the warehouse, based upon these peak periods of noise intensive activities have been used to assess operational noise emissions. Table 9 details the two 'reasonable' worst-case scenarios (15-minute period), covering the noise intensive periods for the two main areas of noise generation across the site.

As required by CoC B85, all significant noise-generating equipment has been included the assessment modelling, including the key noise-generating mechanical plant. It is noted that the noise contribution from the mechanical plant items serving the office area are included in the modelling, however, they generate minimal contribution to the overall noise levels from site operations, which are controlled by other on-site activities such as truck departures, arrivals and warehouse internal loading and unloading

activities. The roof mounted smoke ventilation fans were observed to not operate as part of typical warehouse activities.

Table 9 Representative 'reasonable' worst-case 15-minute intrusive assessment scenarios

Activity	WH5 West 15-minute assessment period (Qube container area)	WH5 East 15-minute assessment period
WH5 West 15-minute noise intensive period (with container handling taking place)		
Departure	One Combi-lift departure from WH5 west (Qube container operational area) loaded with 1 container.	No activity
Arrival	One Combi-lift arrival at WH5 west (Qube container operational area) ready to remove 1 container.	No activity
On-site operations	Container operations: a) Placing one container down	<i>Noise breakout via open warehouse doors.</i> All loading activity are occurring inside the warehouse with warehouse doors open, one noise generating activity occurred at the time. a) Forklift movements
WH5 East 15-minute noise intensive period		
Arrival/departure	No activity	Four Curtain Side Truck arriving or departing WH5 east, engine off after parking.
On-site operations	No activity	<i>Noise breakout via open warehouse doors.</i> Loading and unloading activities are occurring outside the warehouse with warehouse doors open, one noise generating activity occurring at the time. a) Forklift movements
Mechanical plant (All scenarios)		
Warehouse office air conditioning condenser units (assumed that 5 out of 5 units could be operating at full capacity)		

3.7 Modelling methodology

3.7.1 Overview of noise modelling

Since ambient noise levels were well above the project noise limit at the nearest residential receivers, and it was not possible to directly measure or estimate the warehouse noise contribution directly, computer noise modelling was used to calculate the operational noise levels from warehouse operations at the nearby noise sensitive receivers.

3.7.2 General modelling assumptions

Modelling and assessment of warehouse noise emissions were determined by modelling the noise sources, receiver locations, existing built structures and topographical features, using CadnaA (version 2020).

The modelling incorporated the worst-case prevailing meteorological conditions, as required by CoC B80, which are wind speeds of up to 3 m/s at 10 metres above ground level for the assessed activities for daytime activities.

The noise predictions have adopted the CONCAWE noise prediction algorithm, noting that the nearby noise sensitive receivers are greater 100 metres from the subject site. The CONCAWE environmental noise prediction method is an appropriate method for predicting noise propagation in these circumstances.

The noise model predictions consider the following:

- Location of noise sources on-site and nearby sensitive receiver locations
- Height of noise sources and receivers referenced to digital ground contours within the site and outside the site area
- Noise source levels of individual plant, equipment and internal building noise levels, modelled as either point, line or area noise sources. All noise sources associated with the WH5 operations within the MPE boundary have been included in the noise modelling, including the truck movements outside of the WH5 footprint, along internal MPE roads.
- Separation distances between sources and receivers
- Ground type between sources and receivers (mixed soft/ hard)
- Attenuation from buildings and built structures and topography (natural and purpose built)
- Atmospheric losses and assessment meteorological conditions.

The modelled activities and assumptions for the to the equipment operating and the duration and frequency of operation as part of the 'reasonable' worst-case operational scenarios are described in Section 3.6.3.

3.7.3 Model validation

Following the development of each of the representative modelling scenarios, the noise model outputs were compared against a reference time period of the onsite unattended noise measurement results for the period during which similar activities to the 'reasonable' worst-case operational scenario were taking place. Validation of the reasonable worst-case on-site activities was undertaken to check the final representative modelling inputs against a period of measured activities. The results of this process are presented in Table 10.

Table 10 Comparison between measured and modelled noise levels

Time period	Logger	Measured noise levels LAeq,15minute (dBA)	Predicted noise levels LAeq,15minute (dBA)	Difference, dB(A)
3:00 pm to 3:15 pm 5 March 2021 ¹	WH5 West	52	51	1
6:10 am to 6:25 am 4 March 2021 ²	WH5 East	70	69	1

Notes: 1. Noise generating activities within the facility were as per Table 9 "WH5 East 15-minute noise intensive period"
 2. Noise generating activities within the facility were as per Table 9 "WH5 West 15-minute noise intensive period (With container handling taking place)"

The predicted noise levels are within the modelling tolerance of 1 dB(A). The results from the validation of the model demonstrate that it is suitable for determining the compliance noise levels at the nearby receivers for this assessment.

3.8 Noise compliance assessment

Predicted operational compliance noise levels are presented in Table 11 and Table 12 for the two reasonable worst-case operational assessment scenarios. The noise levels have been predicted to each of the surrounding residential receiver noise catchments. The highest residential receiver noise level in each catchment area is reported. This is not necessarily the same receiver location for each assessment scenario.

The results in Table 11 and Table 12 show that the predicted noise levels for the L_{Aeq} (15-minute) and L_{A1} (1-minute) assessments comply with the overall operational noise limits presented in Table 2.

As the noise levels from the site operations were not clearly audible and distinguishable at the nearby noise sensitive receivers, the noise levels would not be perceived as particularly annoying at the nearby receiver locations as per the NPfI (i.e. if the resulting noise level at a receiver location is tonal, low frequency or is intermittent at night). As such, no adjustments in accordance with Fact Sheet C of the NPfI are required.

Table 11 Predicted noise levels - Reasonable 15-minute worst-case scenario for WH5 west

Noise catchment area/ receiver location	L _{Aeq} (15-minute)		Compliance	L _{A1} (1-minute)		Compliance
	Noise limits	Predicted noise levels		Noise limits	Predicted noise levels	
Wattle Grove (NCA 1)	35	< 20	Yes	52	N/A ²	Yes
Wattle Grove West (NCA 2)	35	< 20	Yes	52	N/A ²	Yes
Casula (NCA 3)	35	25	Yes	52	N/A ²	Yes
Glenfield (NCA 4)	35	< 20	Yes	58	N/A ²	Yes
All Saints Senior College (S1)	45 ¹	24	Yes	-	N/A	N/A
Casula Powerhouse (S2)	45 ¹	25	Yes	-	N/A	N/A
Defence Joint Logistics Unit (DJLU) (I2)	70 ¹	20	Yes	-	N/A	N/A
ABB (I3)	70 ¹	< 20	Yes	-	N/A	N/A

Note: 1. Noise limits for these receivers are only applicable when the receiver is in use
 2. During the 14-day monitoring period, no combi-lift activity at WH5 west was observed during the night-time period (10:00pm to 7:00am). As such, the potential for sleep disturbance impacts from this activity has not been assessed.

Table 12 Predicted noise levels - Reasonable 15-minute worst-case scenario for WH5 east

Noise catchment area/ receiver location	L _{Aeq} (15-minute)		Compliance	L _{A1} (1-minute)		Compliance
	Noise limits	Predicted noise levels		Noise limits	Predicted noise levels	
Wattle Grove (NCA 1)	35	25	Yes	52	26	Yes
Wattle Grove West (NCA 2)	35	20	Yes	52	< 20	Yes
Casula (NCA 3)	35	20	Yes	52	< 20	Yes
Glenfield (NCA 4)	35	< 20	Yes	58	< 20	Yes
All Saints Senior College (S1)	45 ¹	< 20	Yes	-	N/A	N/A
Casula Powerhouse (S2)	45 ¹	21	Yes	-	N/A	N/A
Defence Joint Logistics Unit (DJLU) (I2)	70 ¹	28	Yes	-	N/A	N/A
ABB (I3)	70 ¹	< 20	Yes	-	N/A	N/A

Note: 1. Noise limits for these receivers are only applicable when the receiver is in use

The highest modelled noise levels at nearby residential receivers for the WH5 west 15-minute noise intensive period is predicted to be 25 dB(A) L_{Aeq,15minute} at Casula (NCA 2). For WH5 east, the highest modelled noise level at nearby residential receivers from loading and unloading activities from forklift is predicted to be 25 dB(A) L_{Aeq,15minute} at Wattle Grove (NCA 1).

The noise levels from the two noise generation areas have not been directly combined as part of the assessment, as they did not occur concurrently. It is not expected that peak activities at WH5 west and WH5 east will occur concurrently. The video data showed that container deliveries to WH5 east only occurred four times within the two week period, each of 5 minute duration or less. As such, this would not be considered a typical operation, as it would occur infrequently... In the very unlikely event that peak activities at WH5 west and WH5 east occur concurrently, the resulting noise levels at Wattle Grove (NCA 1) would be 28 dB(A) L_{Aeq,15minute}.

4 Conclusion

The noise assessment has been undertaken to address the operational noise requirements for the WH5 within the Moorebank Precinct East in accordance with the *Operational Noise and Vibration Management Plan, Moorebank Logistics Park – East Precinct* (dated 27 March 2019, Revision 12) (MPE ONVMP), more specifically to address the requirements of Condition of Consent (CoC) B85 in State Significant Development (SSD) 7628.

A review of noise measurements at the nearest residential receivers during period of peak onsite activities determined that site activities were not audible and distinguishable at nearby receivers because of high ambient noise levels from road traffic, rail traffic and construction noise. For this reason, guidance from the NSW EPA Noise Policy for Industry (NPfI) Chapter 7 has been followed in order to use an alternative approach to determine compliance, and compare the site noise emissions with the noise limits.

A combination of on-site and off-site measurements were performed, between 2 to 16 March 2021. The aim of the measurements was to quantify on-site operational noise levels from the WH5 facility, in order to then predict back to the nearby receivers. Using this approach, noise emissions from the warehouse facility operations have been evaluated using a combination of on-site attended and unattended noise monitoring, combined with noise modelling, to predict the operational noise levels at the nearest sensitive receivers.

Two 'reasonable' worst-case assessment scenarios were established based upon on site unattended noise monitoring and video recordings, in addition to discussions with WH5 personnel and observations made during on-site attended noise measurements. These were used to develop the current 'reasonable' worst case noise intensive periods that occur onsite. These were separated into two main areas of activities, one on the western side of the warehouse and one on the eastern side.

As required by CoC B85, all significant noise-generating equipment was included the assessment modelling, including the key noise-generating mechanical plant. The noise contribution from the mechanical plant items serving the warehouse and office area generate minimal contribution to the overall noise levels from site operations, which are generally controlled by other on-site activities such as truck departures, arrivals and internal warehouse loading and unloading activities.

The model was developed, and validated against the on-site unattended noise monitoring data, during periods with similar operational activities. Using the calibrated noise model, noise levels were predicted to all nearby noise sensitive receiver locations, including the residential receivers in the suburbs of Casula, Glenfield, Wattle Grove and Wattle Grove West. Noise levels were assessed assuming the worst-case prevailing meteorological conditions were present, as required by CoC B80.

The outcome of the compliance noise monitoring and modelling demonstrated that the mechanical plant and other noisy equipment that operate as part of the WH5 operations achieve the noise limits presented SSD 7628 CoC B80.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).																																								
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.																																								
Assessment period	The period in a day over which assessments are made.																																								
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.																																								
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).																																								
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment: <table><tr><td rowspan="2">threshold of hearing</td><td>0 dB</td><td>The faintest sound we can hear</td></tr><tr><td>10 dB</td><td>Human breathing</td></tr><tr><td rowspan="2">almost silent</td><td>20 dB</td><td></td></tr><tr><td>30 dB</td><td>Quiet bedroom or in a quiet national park location</td></tr><tr><td rowspan="2">generally quiet</td><td>40 dB</td><td>Library</td></tr><tr><td>50 dB</td><td>Typical office space or ambience in the city at night</td></tr><tr><td rowspan="2">moderately loud</td><td>60 dB</td><td>CBD mall at lunch time</td></tr><tr><td>70 dB</td><td>The sound of a car passing on the street</td></tr><tr><td rowspan="2">loud</td><td>80 dB</td><td>Loud music played at home</td></tr><tr><td>90 dB</td><td>The sound of a truck passing on the street</td></tr><tr><td rowspan="2">very loud</td><td>100 dB</td><td>Indoor rock band concert</td></tr><tr><td>110 dB</td><td>Operating a chainsaw or jackhammer</td></tr><tr><td rowspan="2">extremely loud</td><td>120 dB</td><td>Jet plane take-off at 100m away</td></tr><tr><td>130 dB</td><td></td></tr><tr><td>threshold of pain</td><td>140 dB</td><td>Military jet take-off at 25m away</td></tr></table>			threshold of hearing	0 dB	The faintest sound we can hear	10 dB	Human breathing	almost silent	20 dB		30 dB	Quiet bedroom or in a quiet national park location	generally quiet	40 dB	Library	50 dB	Typical office space or ambience in the city at night	moderately loud	60 dB	CBD mall at lunch time	70 dB	The sound of a car passing on the street	loud	80 dB	Loud music played at home	90 dB	The sound of a truck passing on the street	very loud	100 dB	Indoor rock band concert	110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away	130 dB		threshold of pain	140 dB	Military jet take-off at 25m away
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dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the “A” filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.																																								
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.																																								

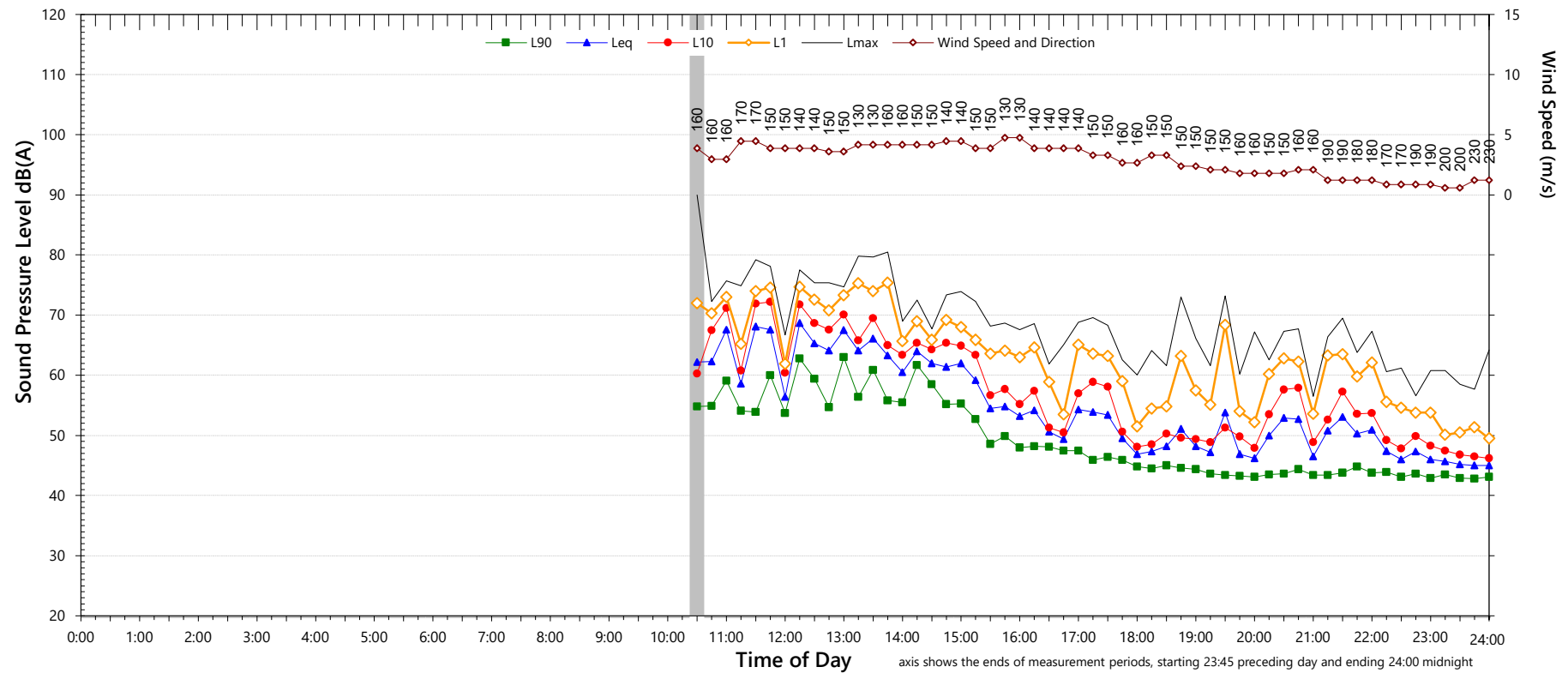
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L _{eq} sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B **Logger location 1 – WH5 - West side**

Unattended Noise Monitoring Results

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Tuesday, 2 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	-	43	42
L _{Aeq}	-	50	48

Night Time Maximum Noise Levels		(see note 7)	
L _{AFMax} (Range)	70	to	76
L _{AFMax} - L _{Aeq} (Range)	18	to	22

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	-	50
L _{Aeq} 1hr upper 10 percentile	-	53
L _{Aeq} 1hr lower 10 percentile	-	46

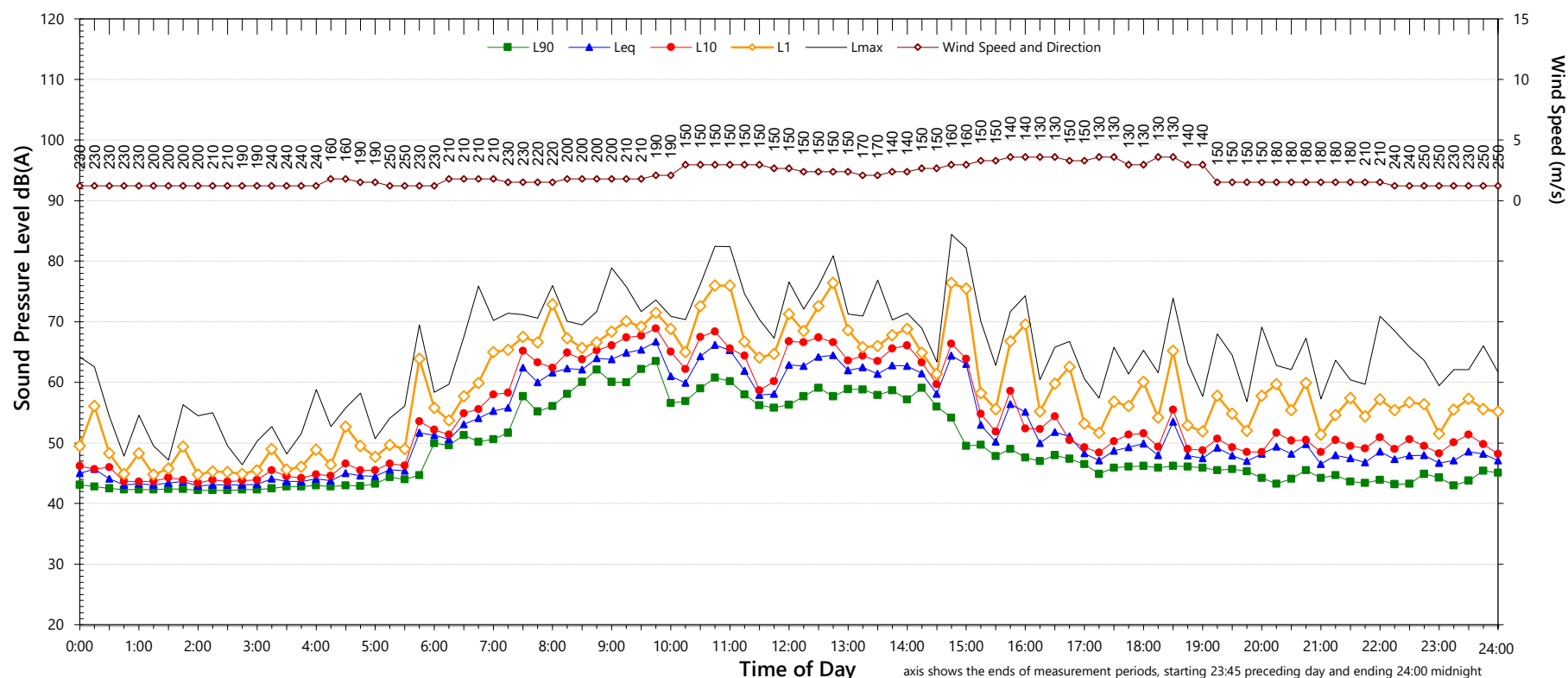
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Unattended Noise Monitoring Results

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Wednesday, 3 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	47	44	44
L _{Aeq}	62	49	51

Night Time Maximum Noise Levels		(see note 7)	
L _{AFMax} (Range)	66	to	81
L _{AFMax} - L _{Aeq} (Range)	17	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	63	54
L _{Aeq} 1hr upper 10 percentile	67	55
L _{Aeq} 1hr lower 10 percentile	51	50

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

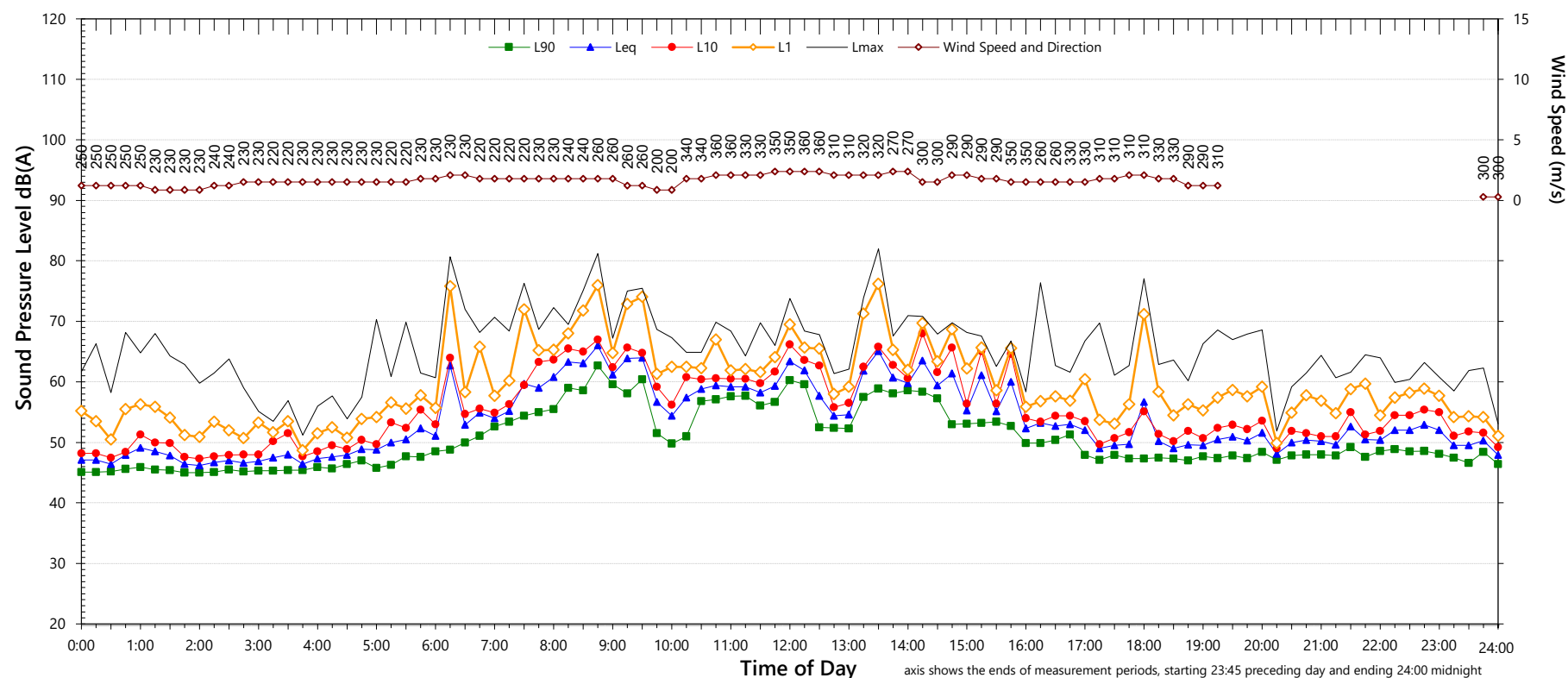
QTE-26 Logger Graphs Program (r36)1

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

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Thursday, 4 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	48	47	45
L _{Aeq}	60	50	52

Night Time Maximum Noise Levels		(see note 7)	
L _{AFMax} (Range)	72	to	83
L _{AFMax} - L _{Aeq} (Range)	15	to	24

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	61	55
L _{Aeq} 1hr upper 10 percentile	65	56
L _{Aeq} 1hr lower 10 percentile	53	50

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

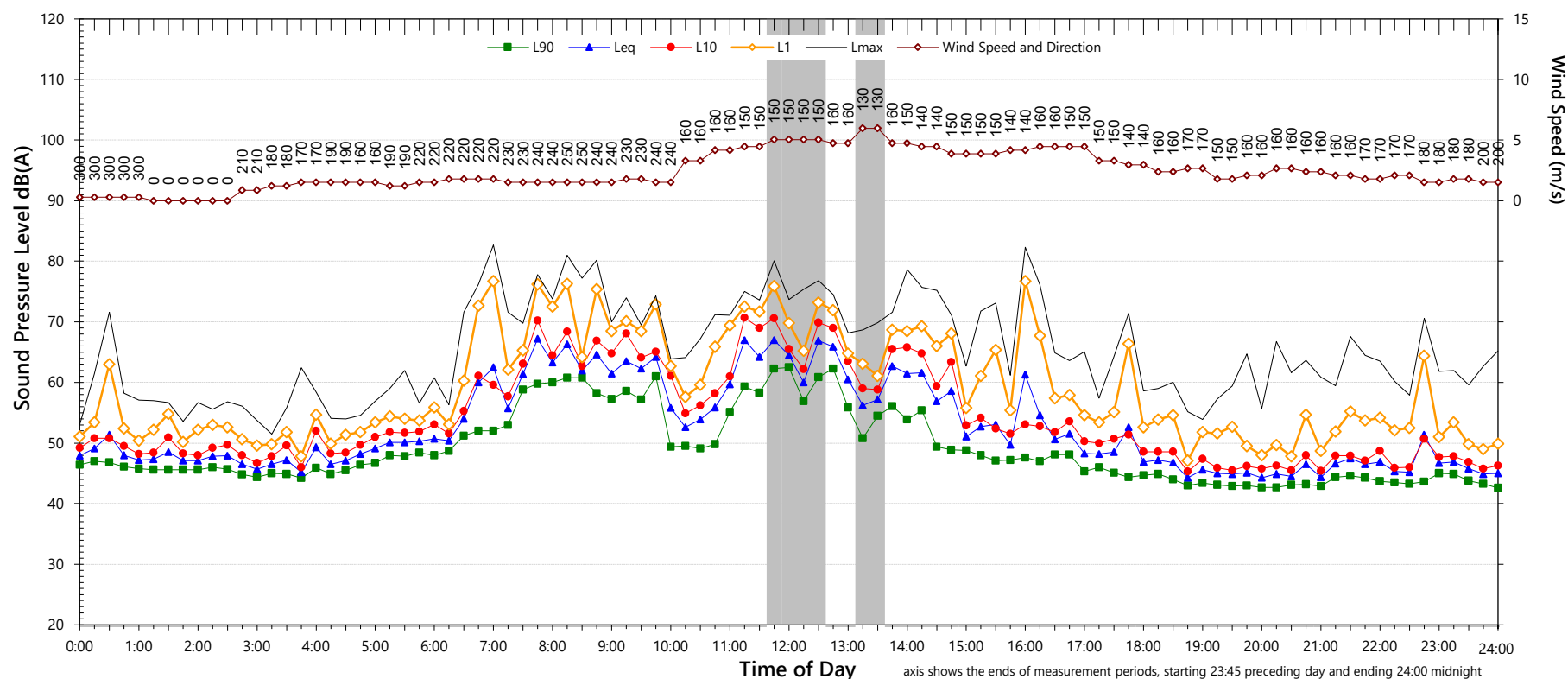
QTE-26 Logger Graphs Program (r36)1

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

0

Friday, 5 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	46	43	42
L _{Aeq}	61	46	45

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	65	to	71
L _{AFMax} - L _{Aeq} (Range)	18	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	62	48
L _{Aeq} 1hr upper 10 percentile	67	51
L _{Aeq} 1hr lower 10 percentile	48	46

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

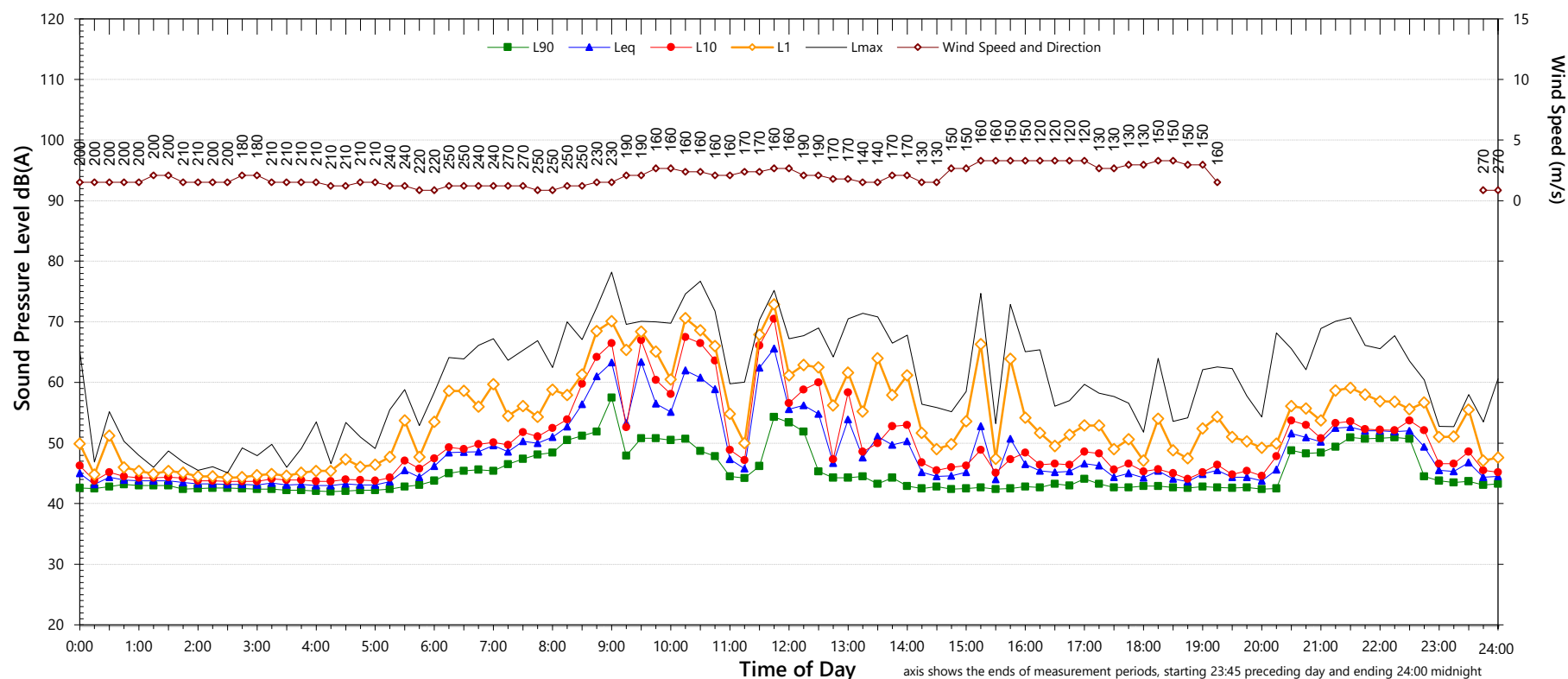
QTE-26 Logger Graphs Program (r36)1

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

0

Saturday, 6 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	43	43	44
L _{Aeq}	56	49	48

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	65	to	71
L _{AFMax} - L _{Aeq} (Range)	15	to	23

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	58	50
L _{Aeq} 1hr upper 10 percentile	62	52
L _{Aeq} 1hr lower 10 percentile	47	48

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

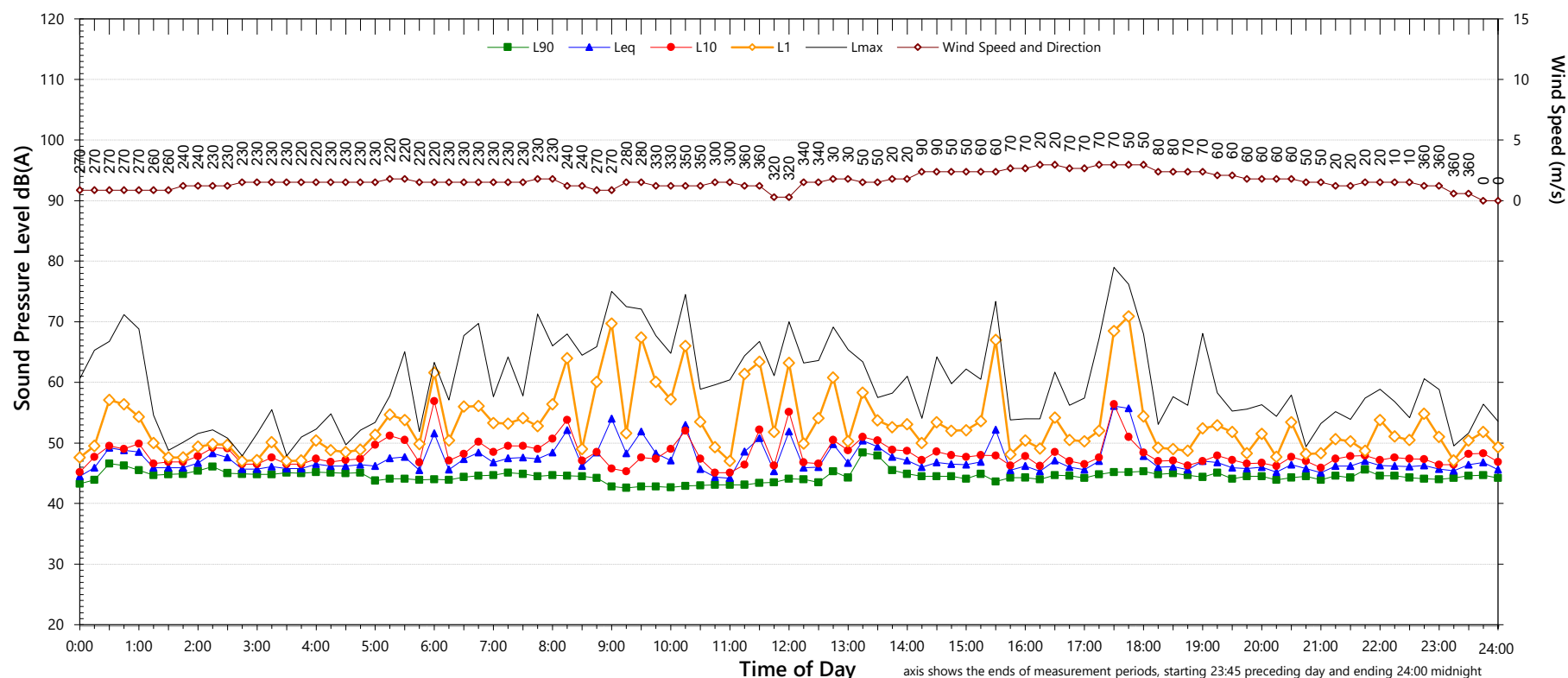
QTE-26 Logger Graphs Program (r36)1

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

0

Sunday, 7 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4 5}
L _{A90} ABL	43	44	44
L _{Aeq}	50	46	48

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	67	to	67
L _{AFMax} - L _{Aeq} (Range)	19	to	19

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	51	50
L _{Aeq} 1hr upper 10 percentile	53	52
L _{Aeq} 1hr lower 10 percentile	49	48

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

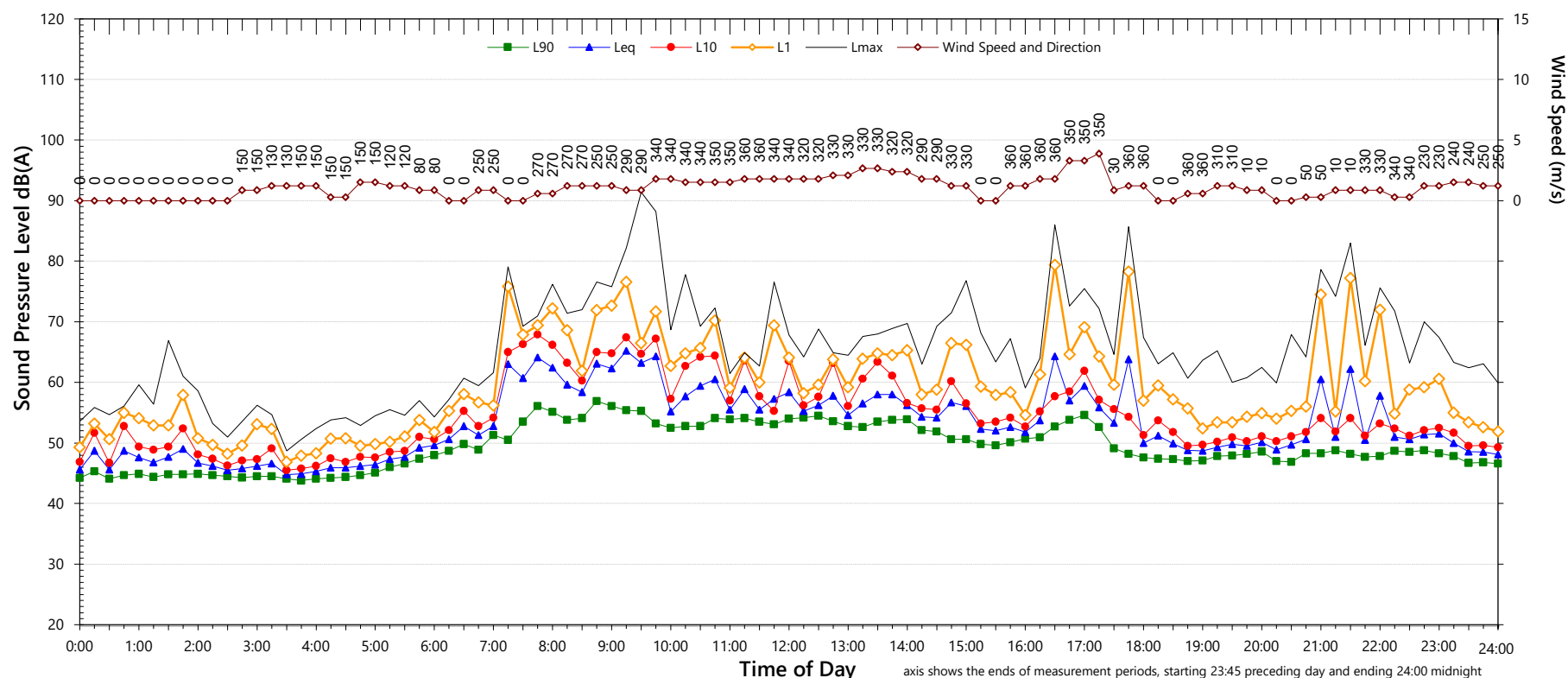
QTE-26 Logger Graphs Program (r36)1

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

0

Monday, 8 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4 5}
L _{A90} ABL	50	47	46
L _{Aeq}	60	55	53

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	65	to	80
L _{AFMax} - L _{Aeq} (Range)	15	to	22

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	61	55
L _{Aeq} 1hr upper 10 percentile	65	59
L _{Aeq} 1hr lower 10 percentile	53	51

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

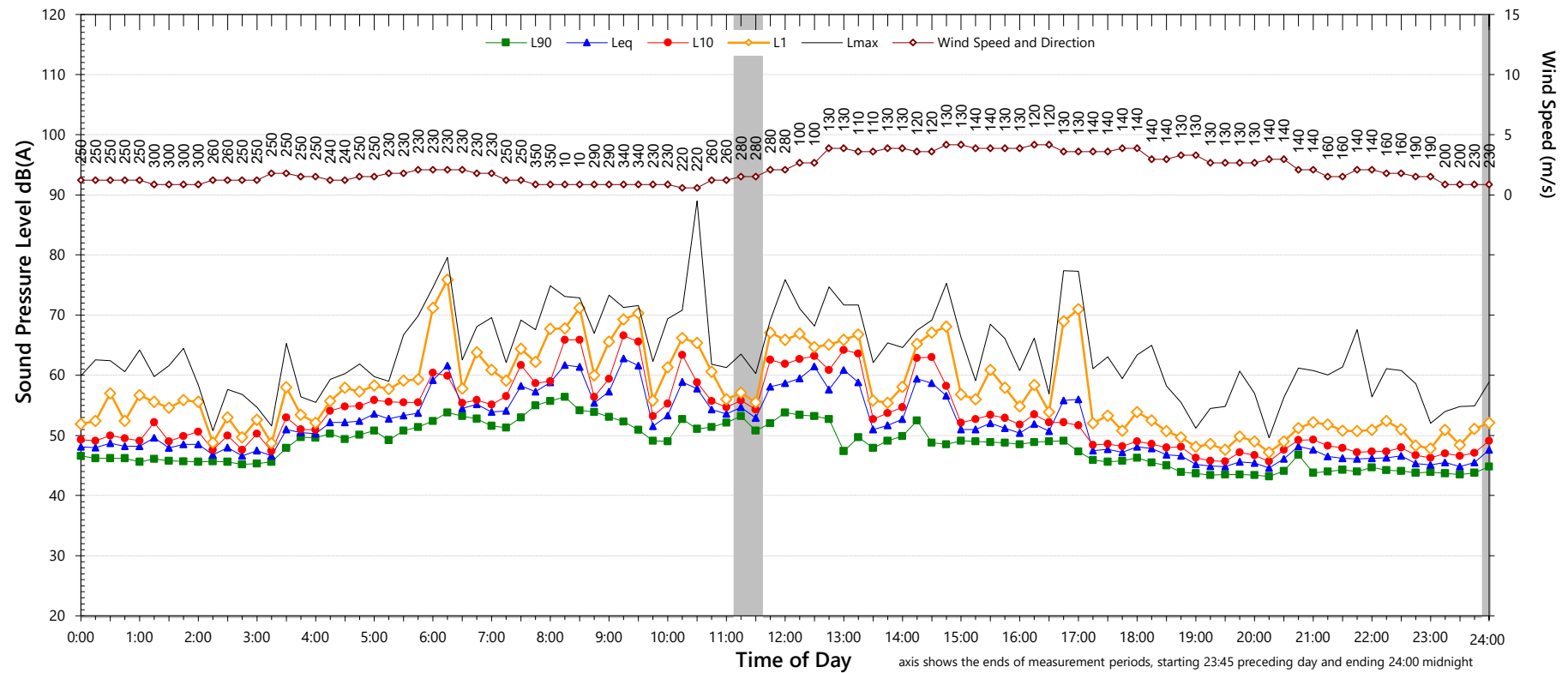
QTE-26 Logger Graphs Program (r36)1

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

0

Tuesday, 9 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	47	43	-
L _{Aeq}	57	46	-

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	-	to	-
L _{AFMax} - L _{Aeq} (Range)	15	to	15

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	58	-
L _{Aeq} 1hr upper 10 percentile	62	-
L _{Aeq} 1hr lower 10 percentile	49	-

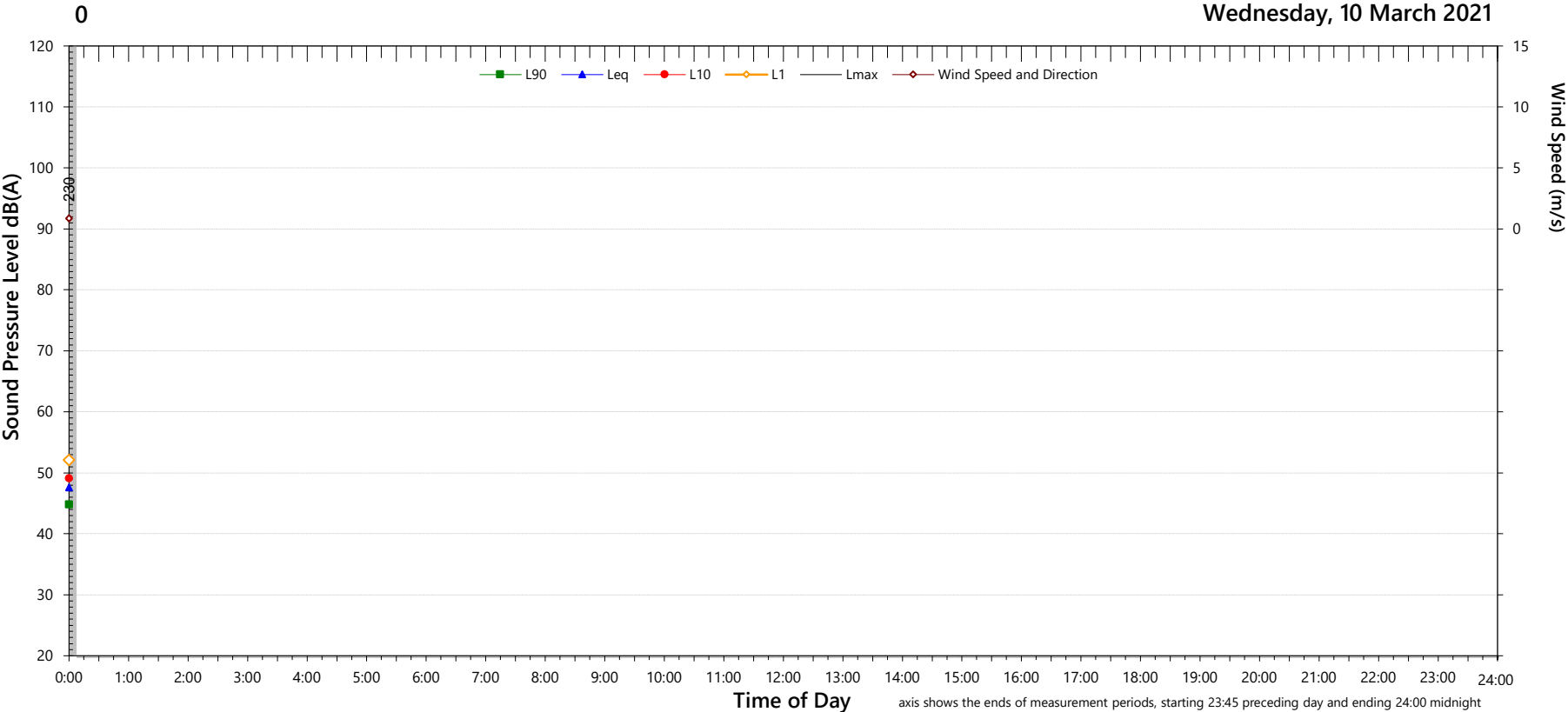
Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

QTE-26 Logger Graphs Program (r36)1

QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

Wednesday, 10 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4 5}
L _{A90} ABL	-	-	-
L _{Aeq}	-	-	-

Night Time Maximum Noise Levels		(see note 7)	
L _{AFMax} (Range)	-	to	-
L _{AFMax} - L _{Aeq} (Range)	-	to	-

Notes:

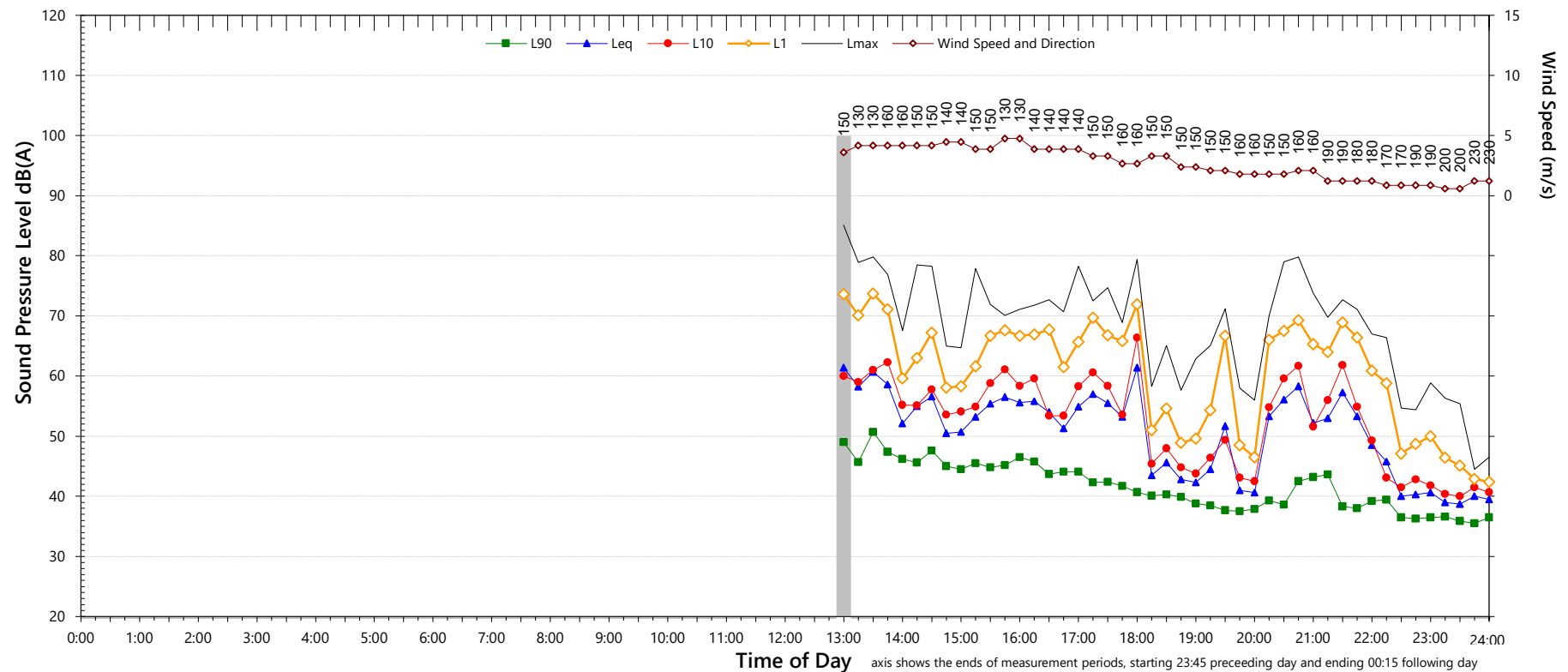
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days
3. "Evening" is the period from 6pm till 10pm
4. "Night" relates to the remaining periods
5. "Night" relates to period from 10pm on this graph to morning on the following graph.
6. Graphed data measured in free-field; tabulated results facade corrected
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

APPENDIX C **Logger location 2 – WH5 – East side (L1)**

Unattended Noise Monitoring Results

WH5 East L1

Tuesday, 2 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	-	38	34
L _{Aeq}	-	52	53

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	66	to	95
L _{Max} - L _{eq} (Range)	15	to	34

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	58	56
L _{eq} 1hr upper 10 percentile	60	52
L _{eq} 1hr lower 10 percentile	49	40

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

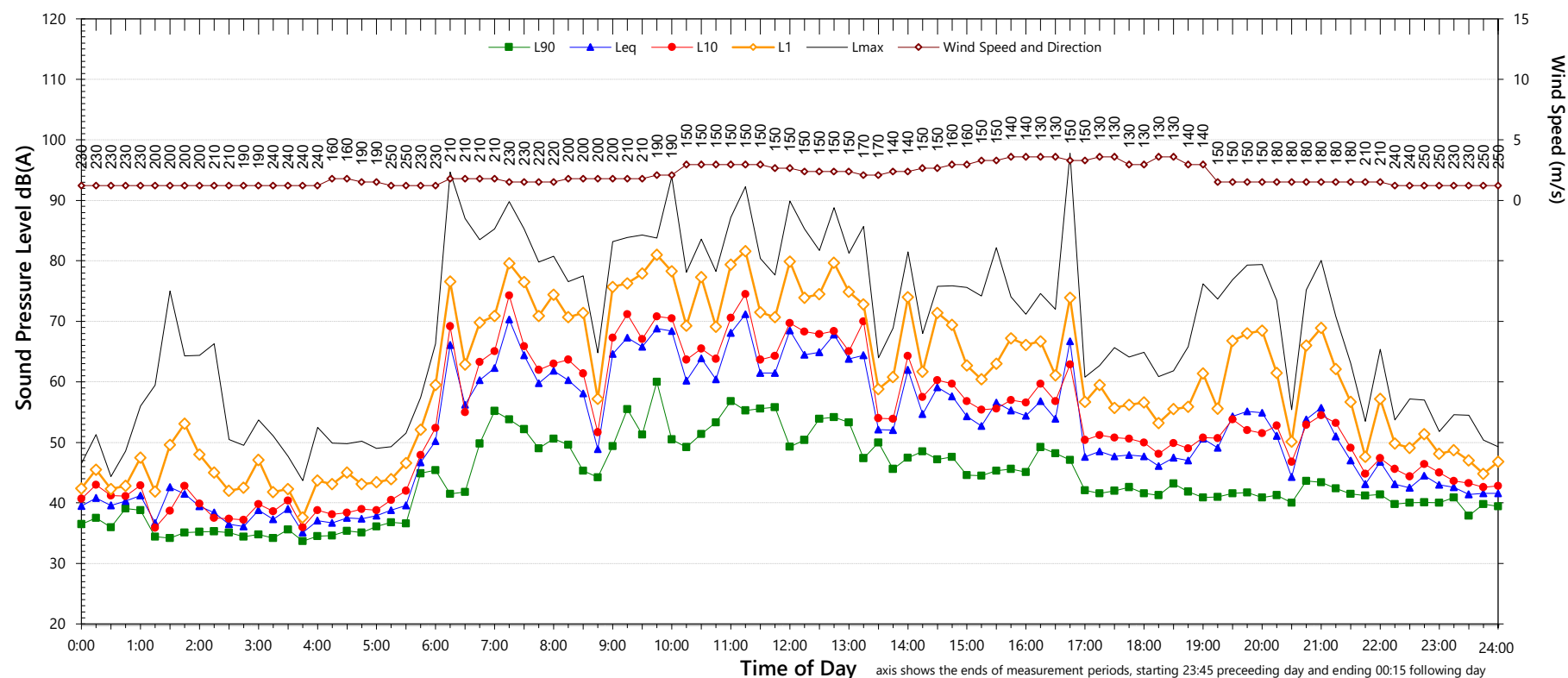
WH5 East L1(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH5 East L1

Wednesday, 3 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	43	41	34
L _{Aeq}	64	51	60

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	66	to	92
L _{Max} - L _{eq} (Range)	16	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	65	63
L _{eq} 1hr upper 10 percentile	69	56
L _{eq} 1hr lower 10 percentile	51	41

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

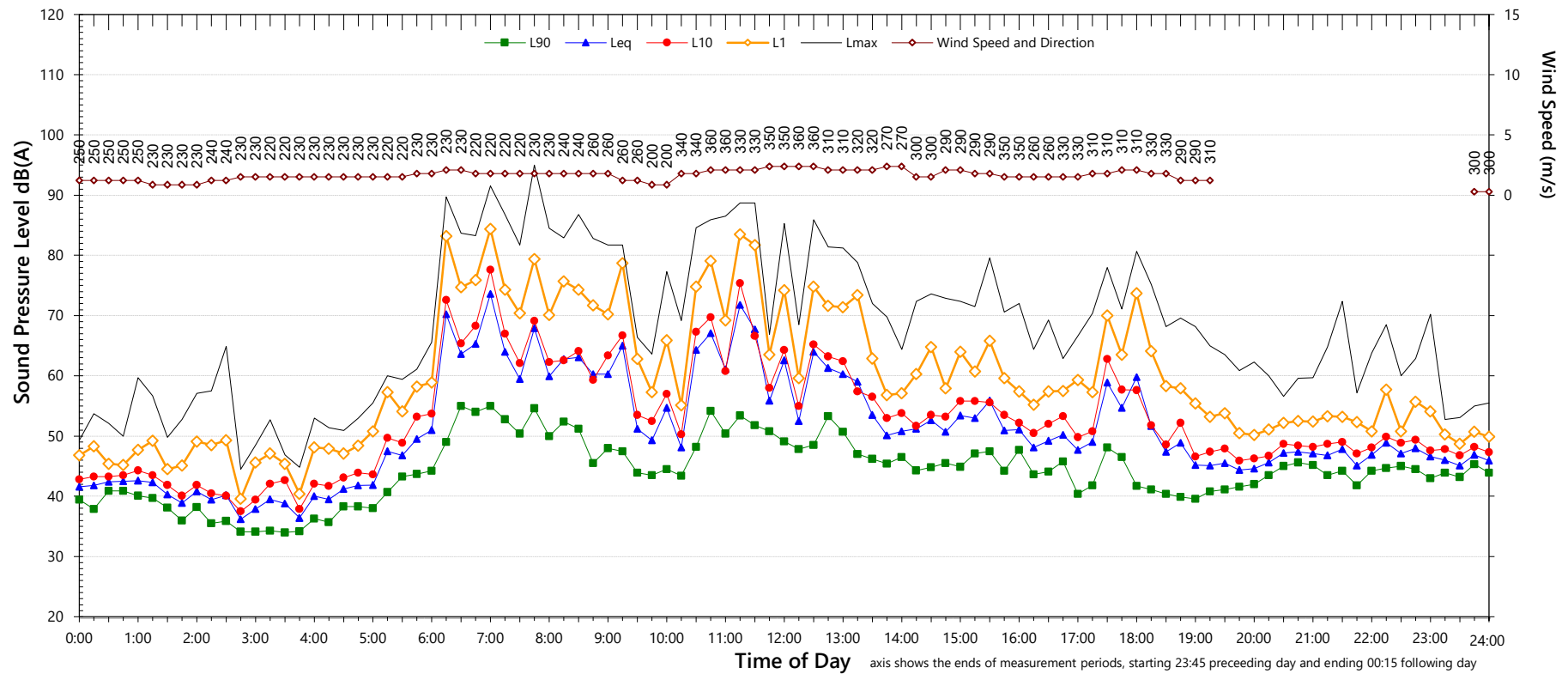
WH5 East L1(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH5 East L1

Thursday, 4 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	44	40	39
L _{Aeq}	62	47	58

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	70	to	90
L _{Max} - L _{eq} (Range)	16	to	24

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	63	60
L _{eq} 1hr upper 10 percentile	66	55
L _{eq} 1hr lower 10 percentile	49	46

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

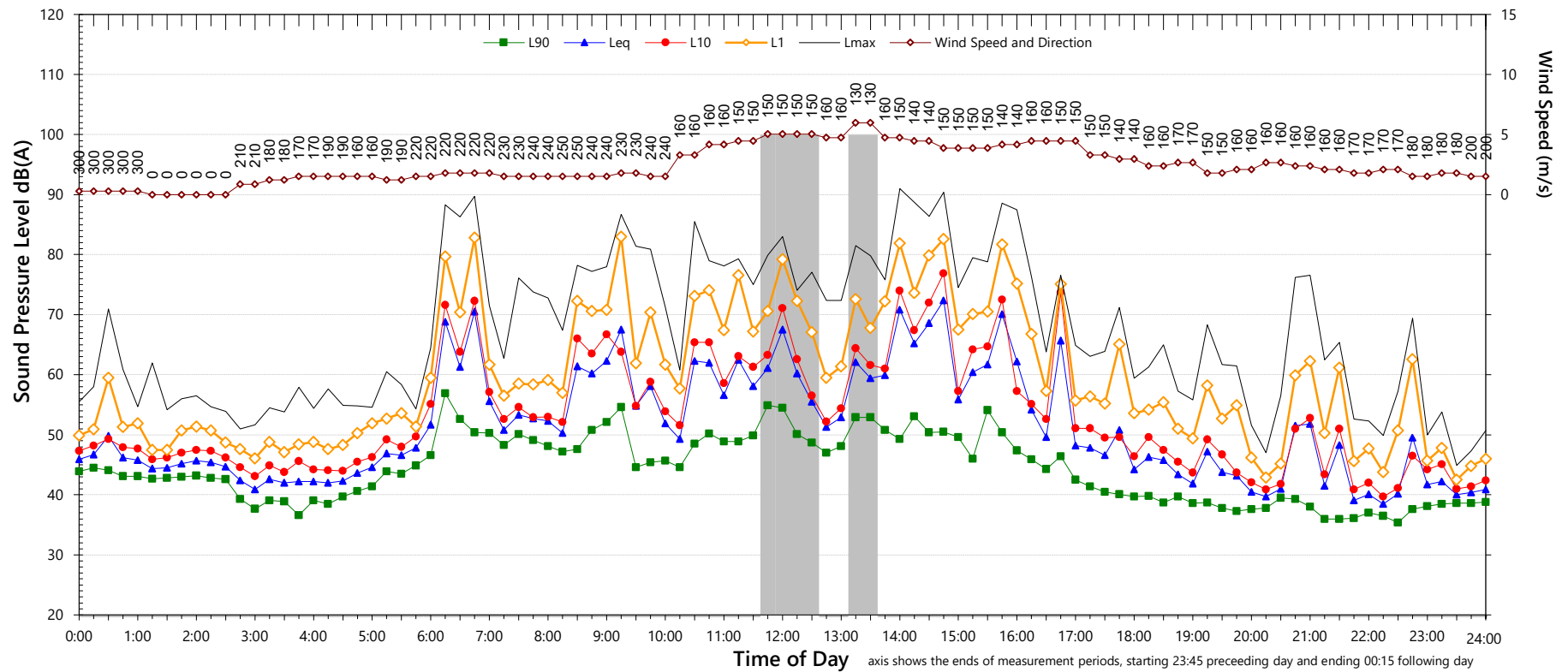
WH5 East L1(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH5 East L1

Friday, 5 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	42	36	35
L _{Aeq}	63	46	59

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	69	to	95
L _{Max} - L _{eq} (Range)	20	to	28

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	64	62
L _{eq} 1hr upper 10 percentile	70	67
L _{eq} 1hr lower 10 percentile	47	40

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

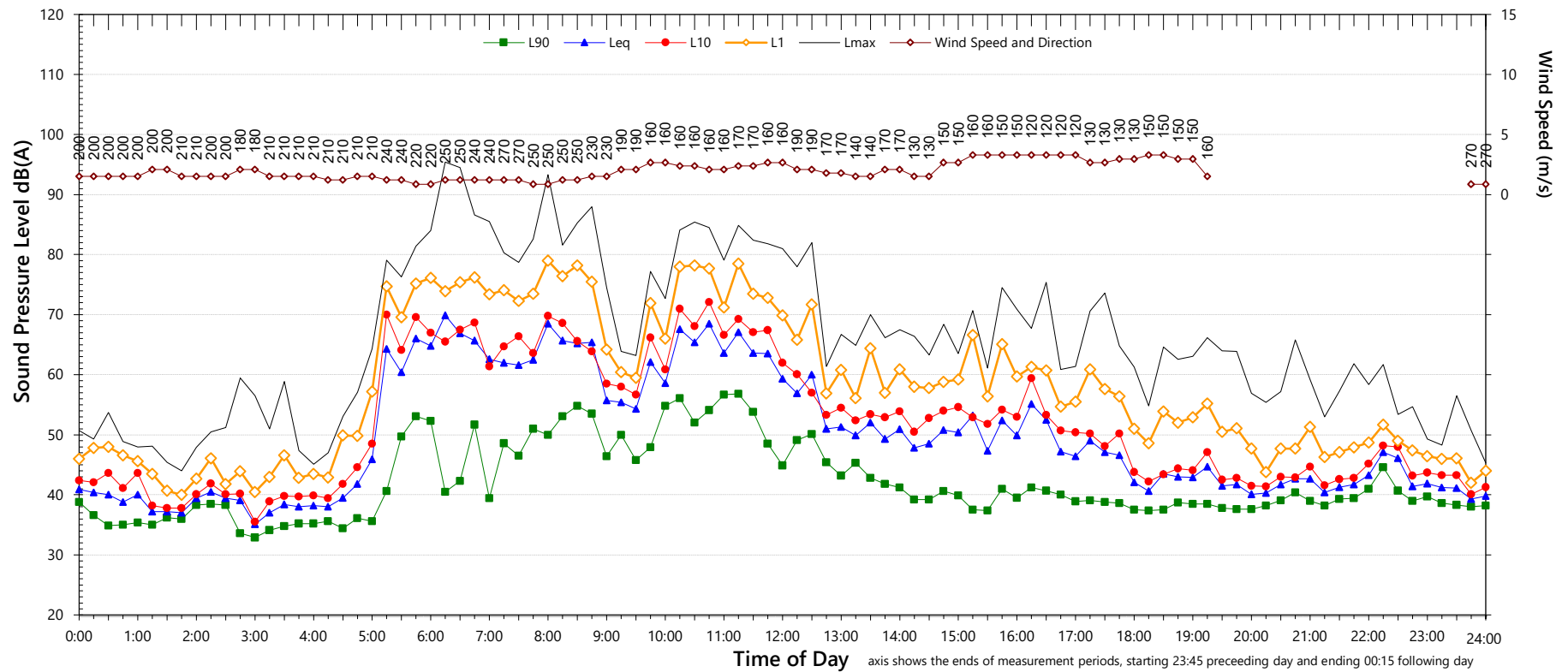
WH5 East L1(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH5 East L1

Saturday, 6 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	39	38	36
L _{Aeq}	61	42	42

Night Time Maximum Noise Levels		(see note 7)	
L _{Max} (Range)	67	to	70
L _{Max} - L _{eq} (Range)	16	to	27

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	62	44
L _{eq} 1hr upper 10 percentile	67	47
L _{eq} 1hr lower 10 percentile	45	43

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

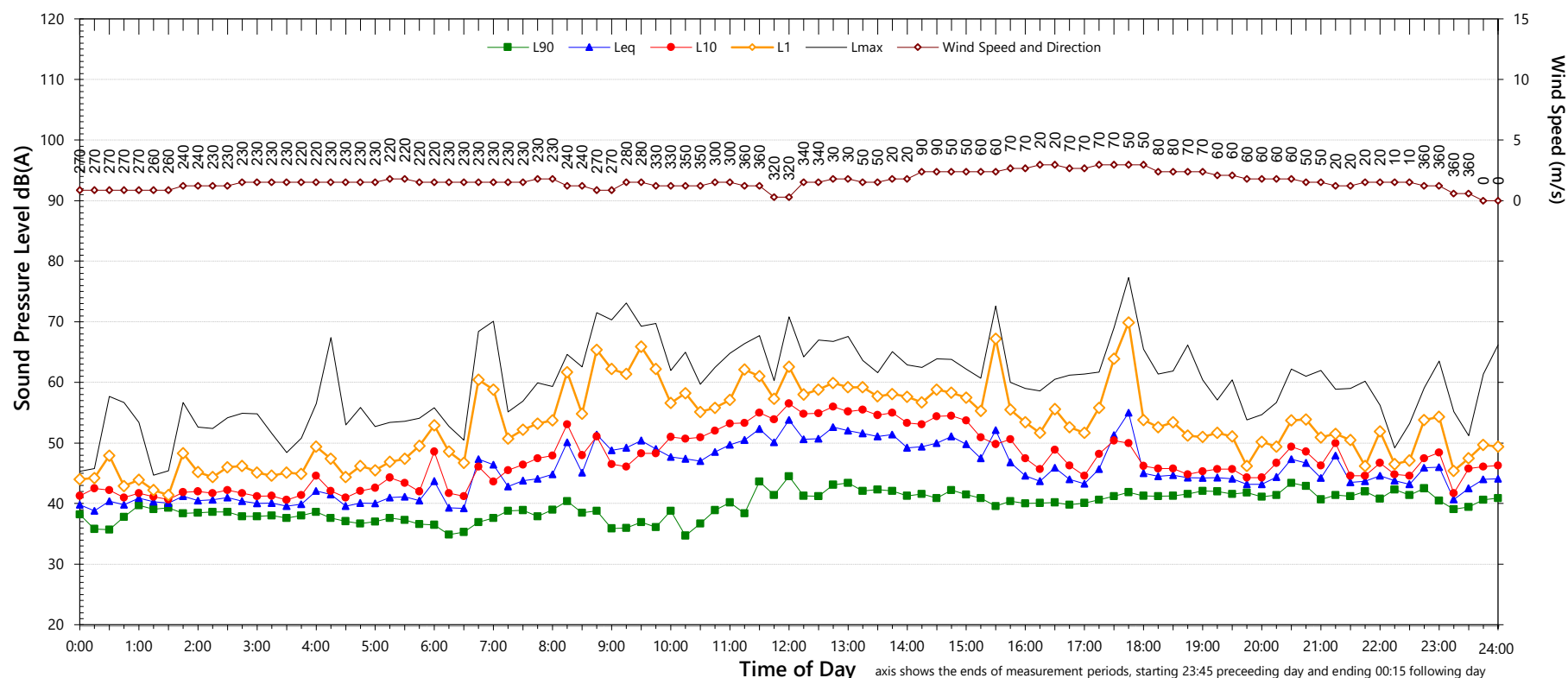
WH5 East L1(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH5 East L1

Sunday, 7 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	37	41	39
L _{Aeq}	50	45	48

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	66	to	81
L _{Max} - L _{eq} (Range)	15	to	26

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	51	51
L _{eq} 1hr upper 10 percentile	54	53
L _{eq} 1hr lower 10 percentile	47	44

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

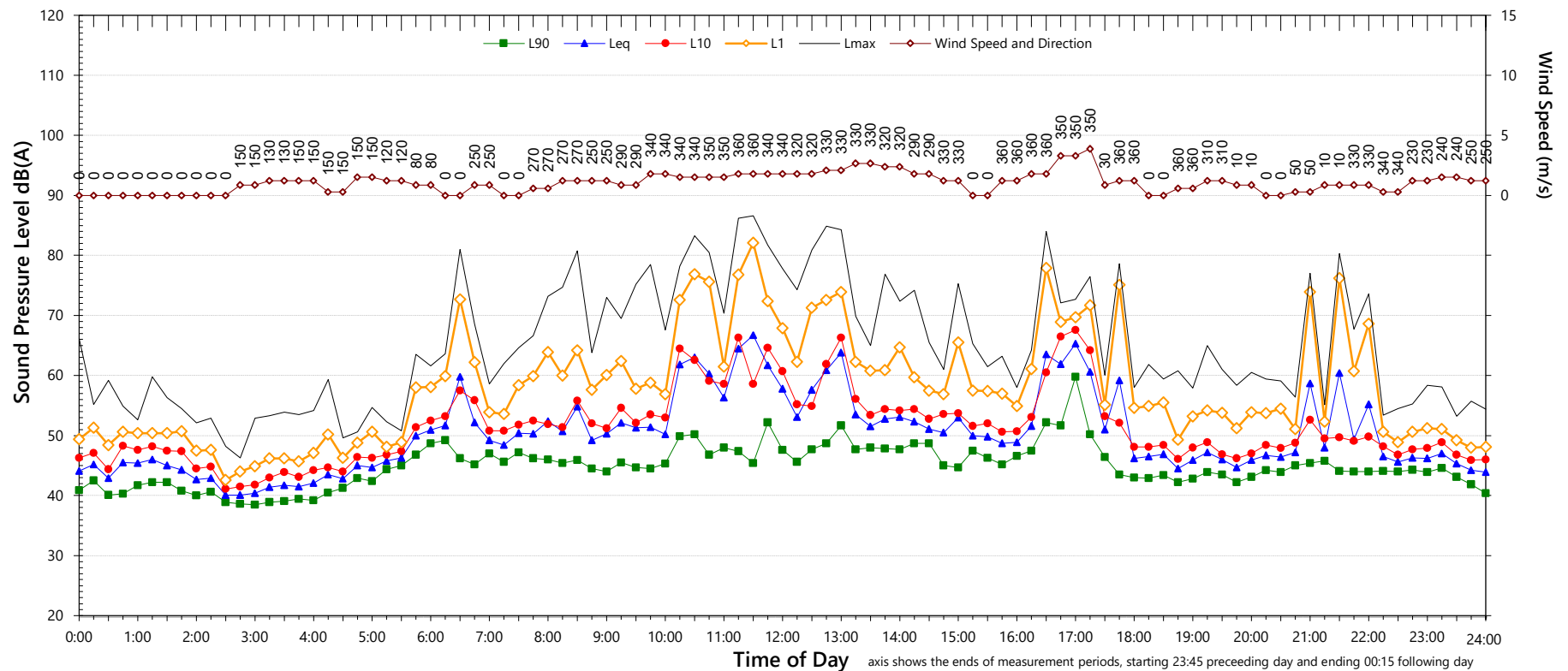
WH5 East L1(r0)

QTE-26 Logger Graphs Program (r34)

Unattended Noise Monitoring Results

WH5 East L1

Monday, 8 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	45	43	40
L _{Aeq}	59	52	57

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	90	to	90
L _{Max} - L _{eq} (Range)	15	to	25

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	60	59
L _{eq} 1hr upper 10 percentile	64	56
L _{eq} 1hr lower 10 percentile	50	46

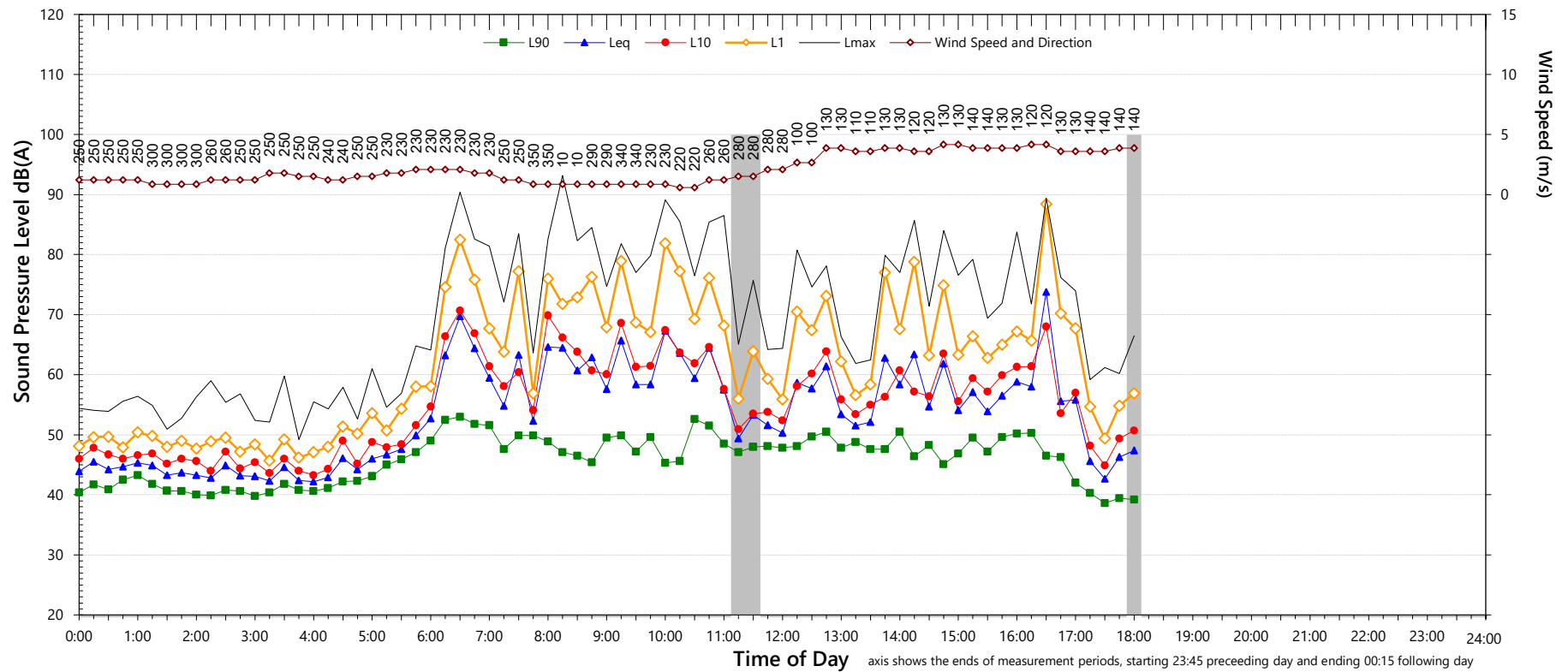
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Unattended Noise Monitoring Results

WH5 East L1

Tuesday, 9 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L ₉₀	45	-	-
L _{Aeq}	62	-	-

Night Time Maximum Noise Levels (see note 7)			
L _{Max} (Range)	-	to	-
L _{Max} - L _{eq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. Night time L_{Max} values are shown only where L_{Max} > 65dB(A) and where L_{Max} - L_{eq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{eq} 15 hr and L _{eq} 9 hr	65	-
L _{eq} 1hr upper 10 percentile	67	-
L _{eq} 1hr lower 10 percentile	53	-

Data File: 2021-03-02_SLM_000_123_Rpt_Report.txt

WH5 East L1(r0)

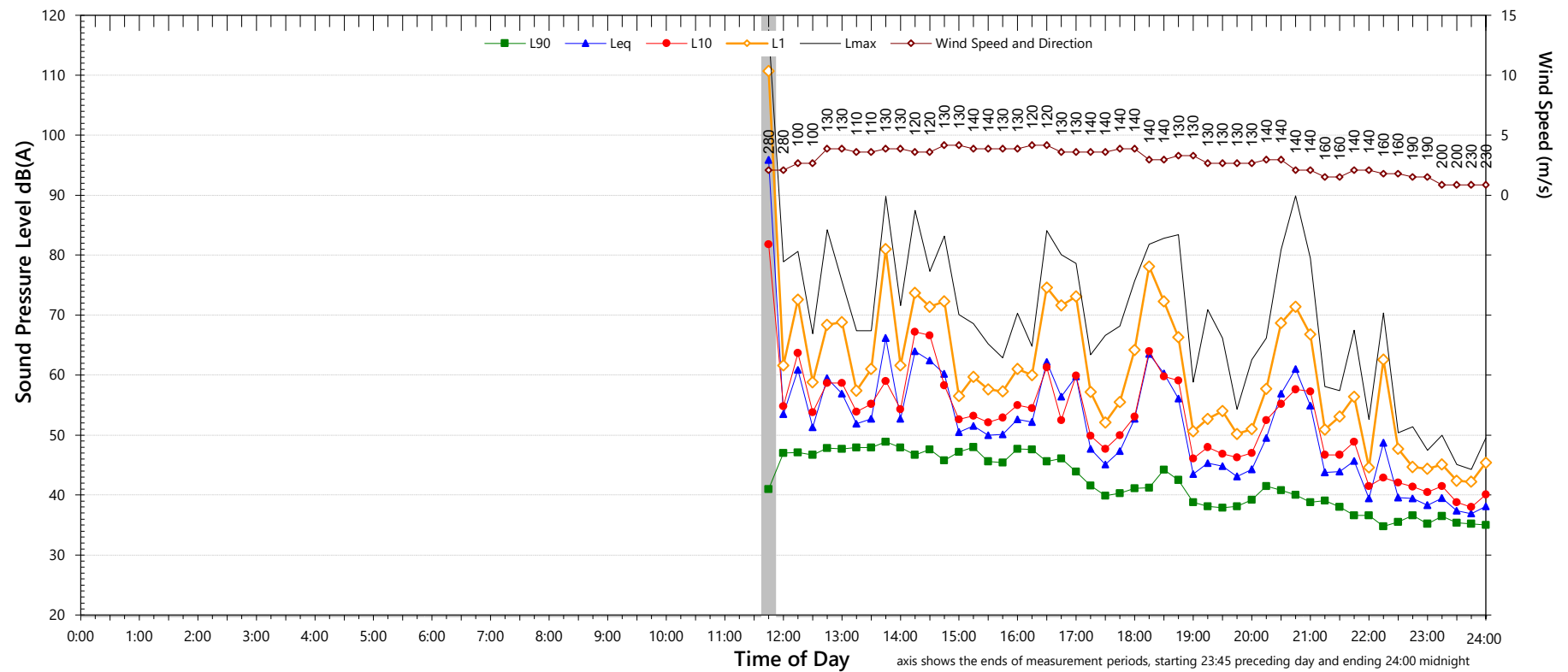
QTE-26 Logger Graphs Program (r34)

APPENDIX D **Logger location 3 – WH5 – East side (L2)**

Unattended Noise Monitoring Results

0

Tuesday, 9 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	-	37	35
L _{Aeq}	-	56	52

Night Time Maximum Noise Levels		(see note 7)	
L _{AFMax} (Range)	68	to	88
L _{AFMax} - L _{Aeq} (Range)	17	to	27

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	-	54
L _{Aeq} 1hr upper 10 percentile	-	52
L _{Aeq} 1hr lower 10 percentile	-	39

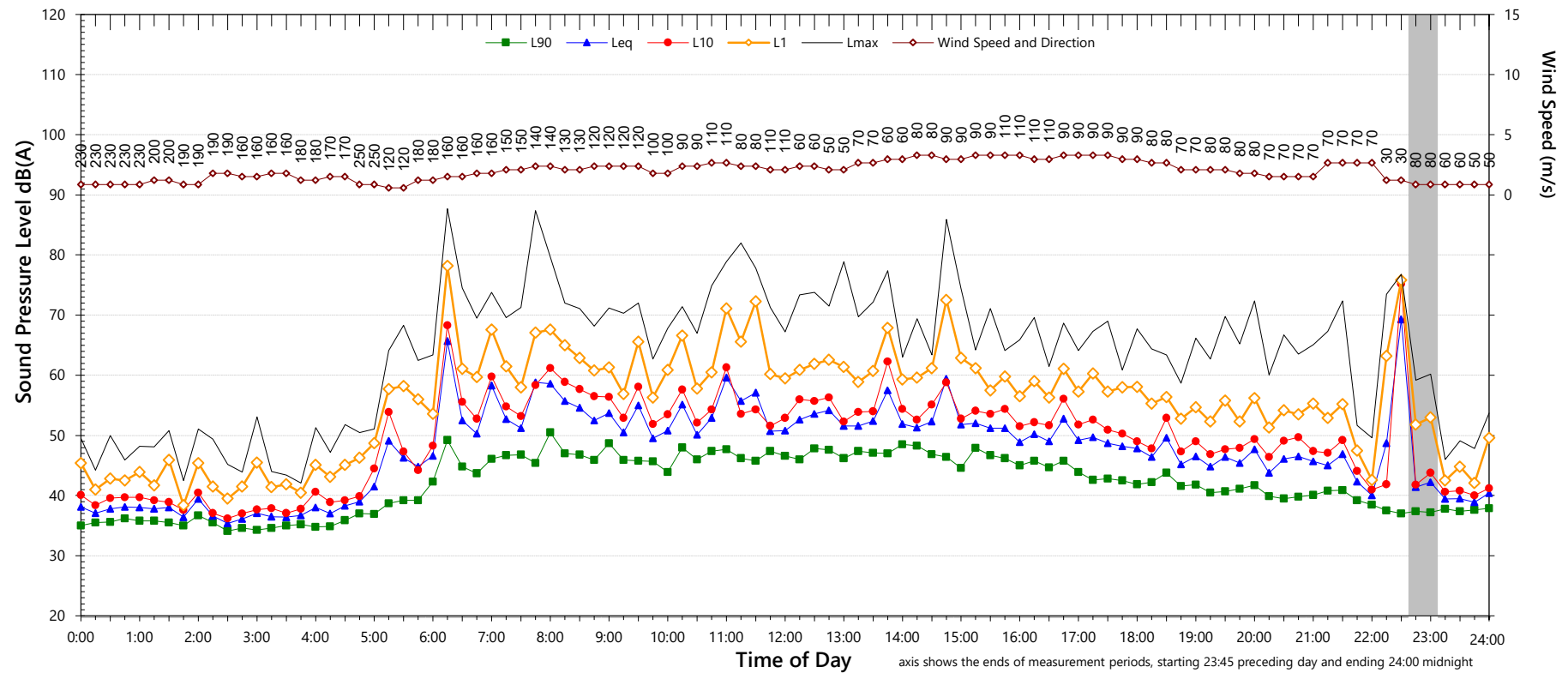
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Unattended Noise Monitoring Results

0

Wednesday, 10 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	44	39	36
L _{Aeq}	54	46	60

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	72	to	96
L _{AFMax} - L _{Aeq} (Range)	18	to	28

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

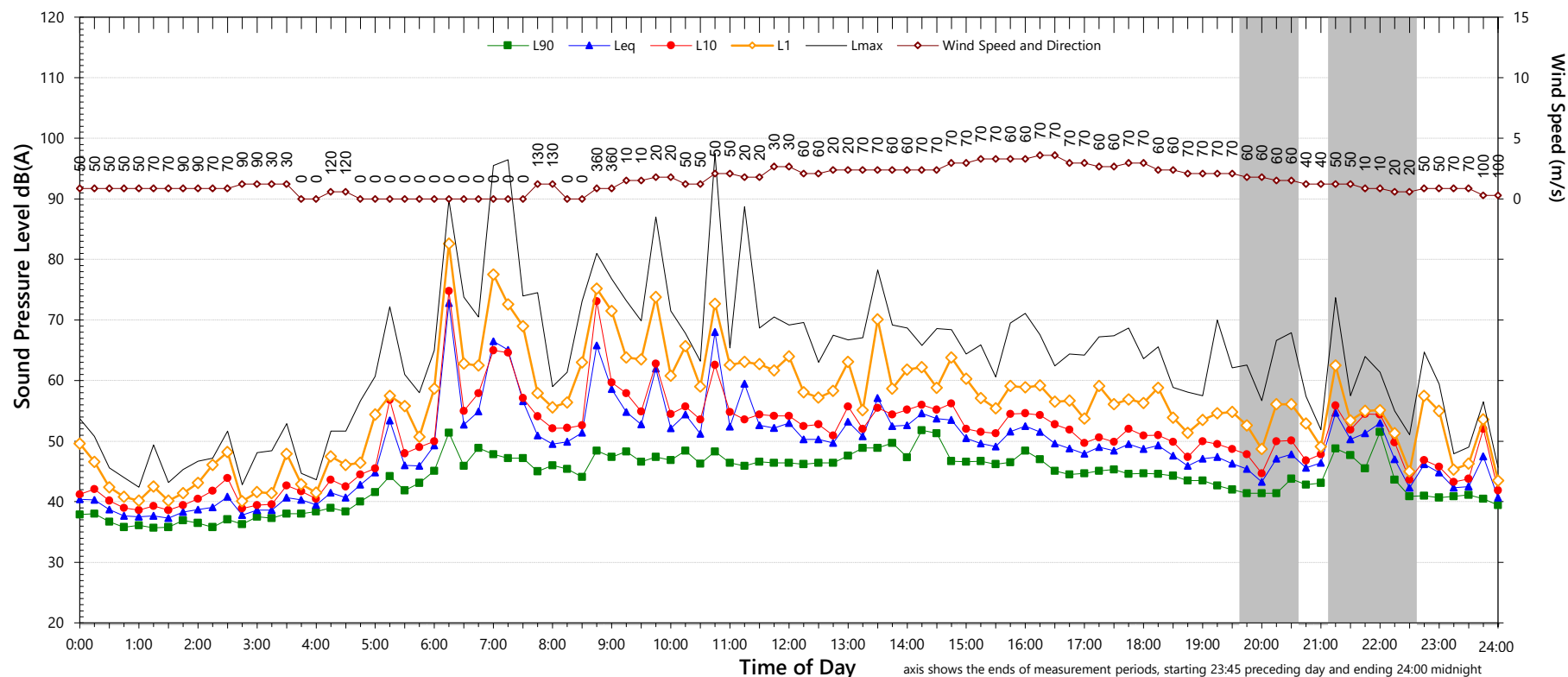
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	55	62
L _{Aeq} 1hr upper 10 percentile	58	69
L _{Aeq} 1hr lower 10 percentile	48	41

Unattended Noise Monitoring Results

0

Thursday, 11 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	45	-	38
L _{Aeq}	57	-	45

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	69	to	69
L _{AFMax} - L _{Aeq} (Range)	19	to	20

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

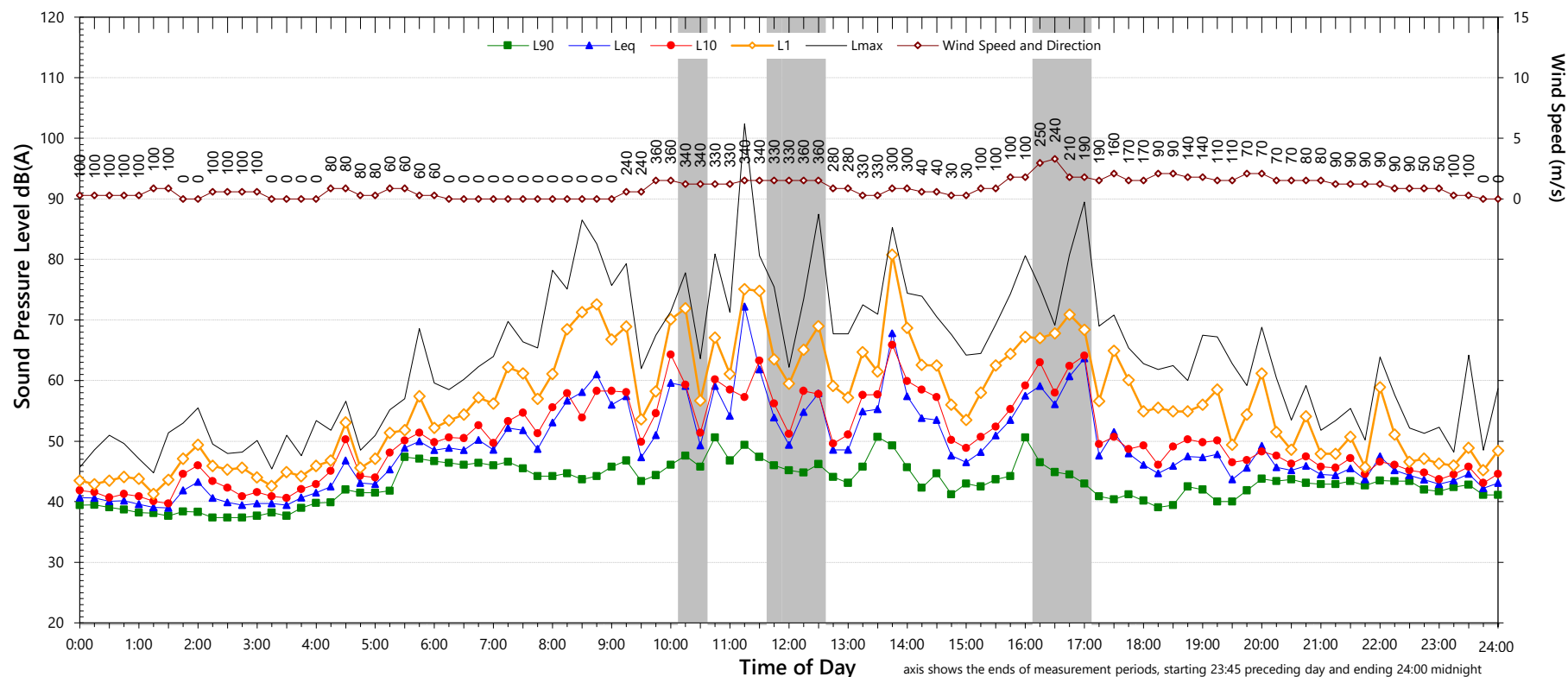
7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day 7am-10pm	Night ⁵ 10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	-	-
L _{Aeq} 1hr upper 10 percentile	-	-
L _{Aeq} 1hr lower 10 percentile	-	-

Unattended Noise Monitoring Results

0

Friday, 12 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	-	40	39
L _{Aeq}	-	46	52

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	75	to	89
L _{AFMax} - L _{Aeq} (Range)	16	to	32

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	61	54
L _{Aeq} 1hr upper 10 percentile	64	60
L _{Aeq} 1hr lower 10 percentile	48	44

Data File: 2021-03-09_SLM_000_123_Rpt_Report.txt

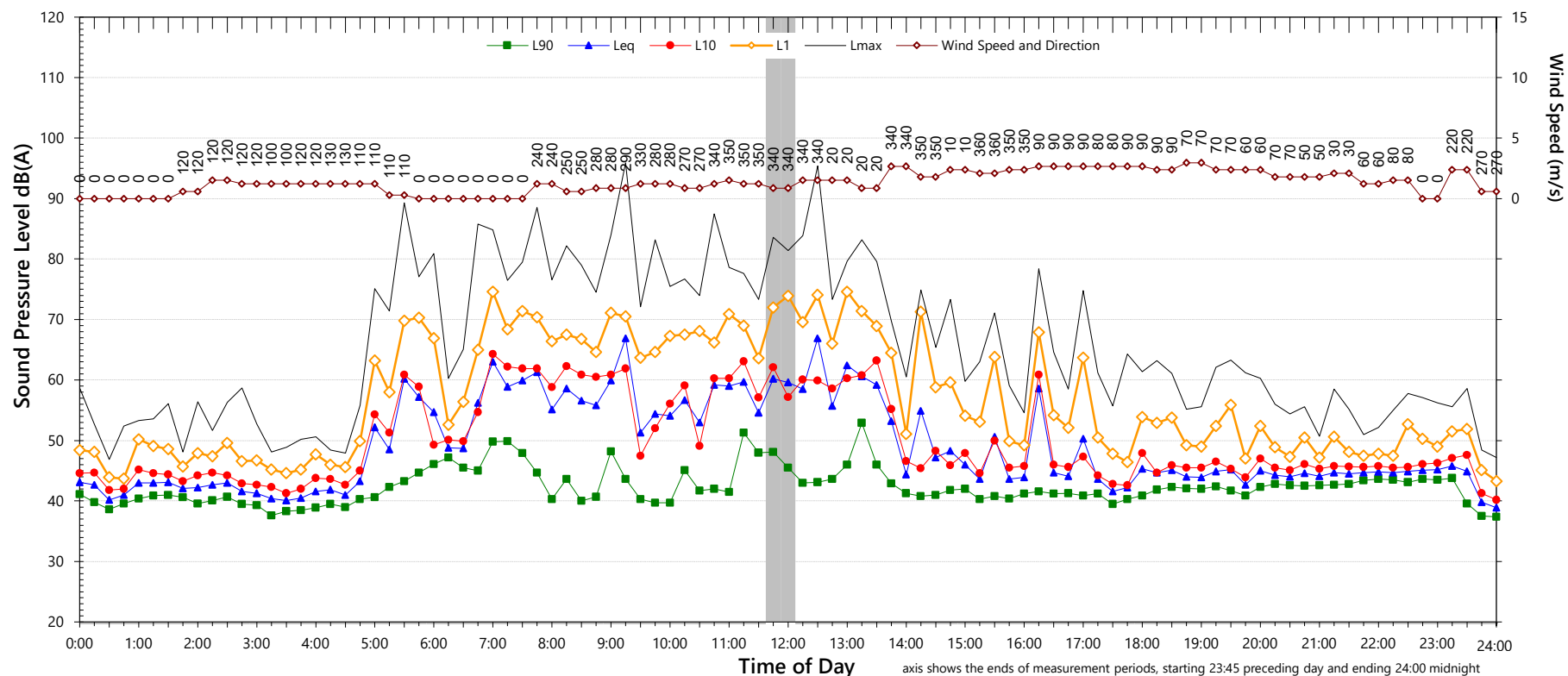
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QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

0

Saturday, 13 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	40	42	-
L _{Aeq}	58	44	-

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	-	to	-
L _{AFMax} - L _{Aeq} (Range)	15	to	18

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	59	-
L _{Aeq} 1hr upper 10 percentile	63	-
L _{Aeq} 1hr lower 10 percentile	47	-

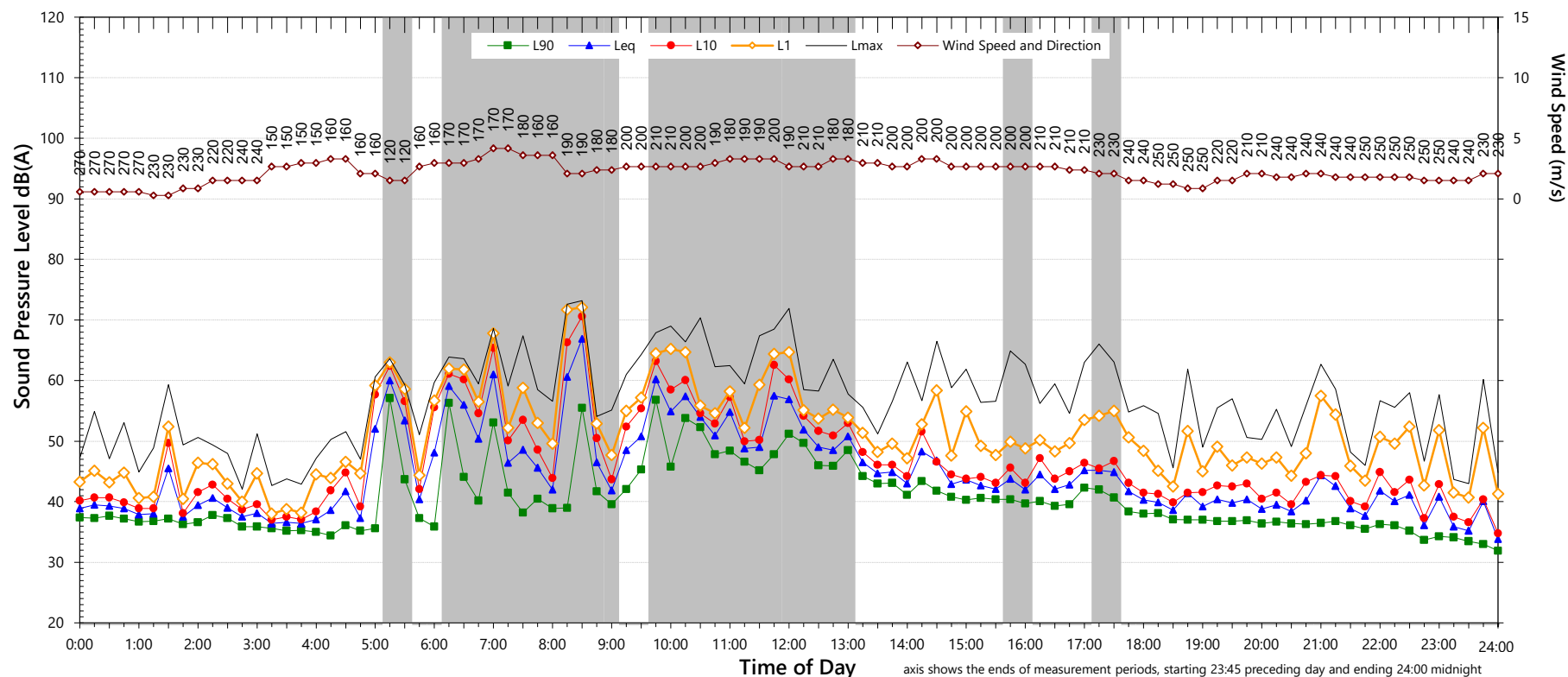
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Unattended Noise Monitoring Results

0

Sunday, 14 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4 5}
L _{A90} ABL	-	36	31
L _{Aeq}	-	40	49

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	68	to	85
L _{AFMax} - L _{Aeq} (Range)	18	to	28

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	-	52
L _{Aeq} 1hr upper 10 percentile	-	50
L _{Aeq} 1hr lower 10 percentile	-	36

Data File: 2021-03-09_SLM_000_123_Rpt_Report.txt

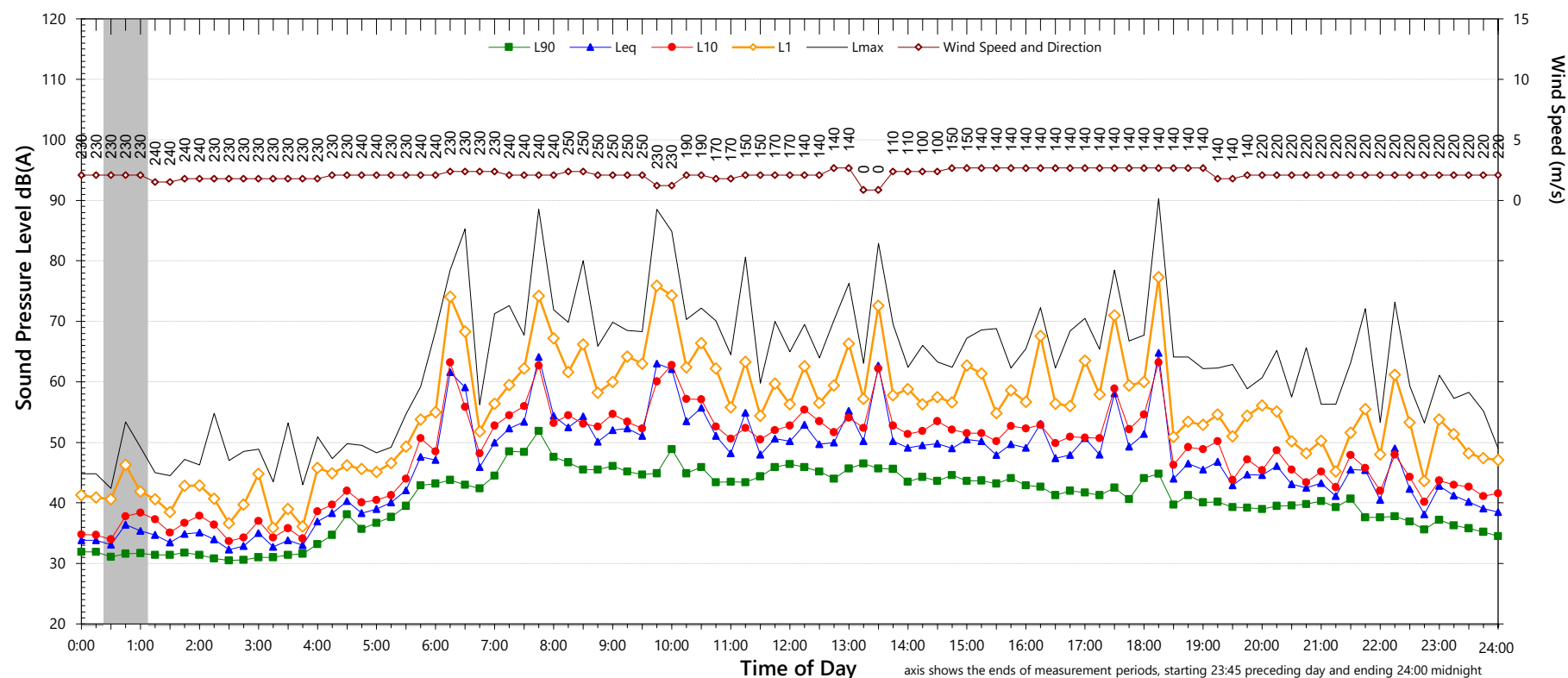
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QTE-26 Logger Graphs Program (r36)

Unattended Noise Monitoring Results

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Monday, 15 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	42	38	32
L _{Aeq}	55	53	43

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	72	to	73
L _{AFMax} - L _{Aeq} (Range)	16	to	28

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	57	46
L _{Aeq} 1hr upper 10 percentile	62	48
L _{Aeq} 1hr lower 10 percentile	47	39

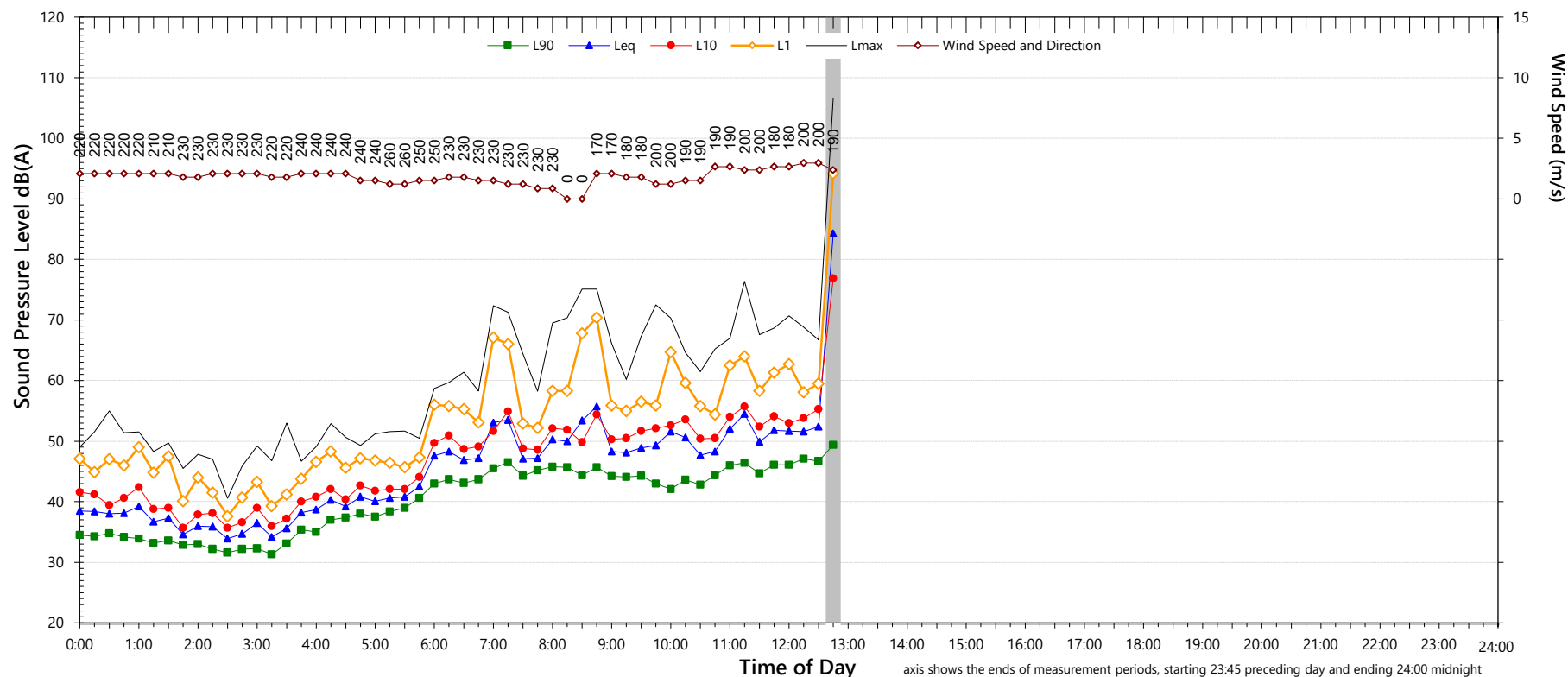
2. "Day" is the period from 8am till 6pm on Sundays and 7am till 6pm on other days

5. "Night" relates to period from 10pm on this graph to morning on the following graph.

Unattended Noise Monitoring Results

0

Tuesday, 16 March 2021



NSW Noise Policy for Industry (Free Field)			
Descriptor	Day ²	Evening ³	Night ^{4,5}
L _{A90} ABL	-	-	-
L _{Aeq}	-	-	-

Night Time Maximum Noise Levels (see note 7)			
L _{AFMax} (Range)	-	to	-
L _{AFMax} - L _{Aeq} (Range)	-	to	-

Notes:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

3. "Evening" is the period from 6pm till 10pm

6. Graphed data measured in free-field; tabulated results facade corrected

4. "Night" relates to the remaining periods

7. 1-hour values for L_{AFMax} are shown only where L_{AFMax} > 65dB(A) and where L_{AFMax} - L_{Aeq} ≥ 15dB(A)

NSW Road Noise Policy (1m from facade) (see note 6)		
Descriptor	Day	Night ⁵
	7am-10pm	10pm-7am
L _{Aeq} 15 hr and L _{Aeq} 9 hr	-	-
L _{Aeq} 1hr upper 10 percentile	-	-
L _{Aeq} 1hr lower 10 percentile	-	-

Data File: 2021-03-09_SLM_000_123_Rpt_Report.txt

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QTE-26 Logger Graphs Program (r36)

B.12 Existing Levels of Rail Noise and Residential Receivers (2017-2018)

Renzo Tonin & Associates Report TJ741-04F03 Existing Levels of Rail Noise (r3)