



# Appendix 18 – Noise and Vibration Impact Assessment

**LCI Consultants**

Report number: GRDC86-PWN-00-XX-RP-SSDA-Y-0000  
Date: 31 October 2025  
Version: K

## DOCUMENT CONTROL

<b>Project Name</b>	Appendix 18 – Noise and Vibration Impact Assessment
<b>Project Number</b>	240182
<b>Report Reference</b>	GRDC86-PWN-00-XX-RP-SSDA-Y-0000
<b>Client:</b>	LCI Consultants

Revision	Description	Reference	Date	Prepared	Checked	Authorised
A	50%	GRDC86-PWN-00-XX-RP-Y-0000	13 September 2024	NDC	AD	MH
B	100%	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	4 October 2024	NDC	AD	MH
C	Issue for Adequacy Review	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	2 December 2024	NDC	AD	MH
D	Issued for Public Exhibition – SSDA 73761707	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	6 March 2025	NDC	AD	MH
E	Issued for Public Exhibition – SSDA 73761707 – Minor amendments.	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	6 March 2025	NDC	AD	MH
F	Issued for Public Exhibition – SSDA 73761707 – Minor amendments.	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	13 March 2025	NDC	AD	MH
G	Issued for Public Exhibition – SSDA 73761707 – Minor amendments.	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	14 March 2025	NDC	AD	MH
H	Issued for RTS SSDA 73761707	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	3 October 2025	NDC	AD	MH
I	Minor internal changes, before formal submission.	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	23 October 2025	NDC	AD	MH
J	Minor internal changes, before formal submission.	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	29 October 2025	NDC	AD	MH
K	Minor internal changes, before formal submission.	GRDC86-PWN-00-XX-RP-SSDA-Y-0000	31 October 2025	NDC	AD	MH

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# 1 INTRODUCTION

## 1.1 Background

Pulse White Noise Acoustics (PWNA) has been engaged to undertake a Noise and Vibration Impact Assessment of the proposed Datacentres (3) to be located at 2 Glendenning Road, Glendenning NSW 2761. This document provides high level acoustic advice for the proposed datacentres to ensure compliance with the relevant environmental noise requirements.

This document includes receptor identification, background noise measurements, criteria derivation, and conceptual noise control measures that may be required for the facility development. Project criteria have been derived with respect to the NSW Noise Policy for Industry (EPA, 2017) and the NSW Interim Construction Noise Guideline (DECC, 2009).

This report provides an assessment of possible operational impacts of the proposed Datacentres against the derived noise criteria. This report provides conceptual noise mitigation measures to address potential noise and vibration impacts, where relevant.

## 1.2 Planning Secretary’s Environmental Assessment Requirements

The project Planning Secretary’s Environmental Assessment Requirements (SEARs) were received for this project on 25 July 2024 Application Number: SSD-73761707. This report has been specifically developed to address the development proposal SEARs. Presented in **Table 1** below is a summary of the SEARs relevant noise and vibration requirements and where they have been addressed in the report.

**Table 1 SEARs relevant to acoustic and vibration assessment – SSD-73761707.**

Requirement	Where it is addressed
Provide a noise and vibration assessment prepared in accordance with the relevant EPA guidelines and Australian/International Standards. The assessment detail the following items:	This report.
Construction noise and vibration impacts on nearby sensitive receivers and structures, and outline the proposed mitigation, management and monitoring measures that would be implemented.	Sections 4 and Sections 7.1.
Operational noise and vibration impacts (including testing of any back-up power systems) on nearby sensitive receivers and structures, and outline the proposed mitigation, management and monitoring measures that would be implemented.	Sections 5 and Sections 7.2

## 1.3 The Site

The subject site is located at 2 Glendenning Road, Glendenning and is legally described as Lot 2 DP 1137162. It is zoned E4 General Industrial under the Blacktown Local Environmental Plan 2015.

The subject site comprises a total area of 10.44 ha and exhibits a primary frontage to Glendenning Road at the western boundary for approximately 295 m. A secondary frontage to Woodstock Avenue is located along the southern boundary, for a length of approximately 335 m.

The subject site comprises three (3) existing warehouse buildings that undertake various operations, including storage and logistics and a transport vehicle centre. The buildings are positioned toward the Glendenning Road frontage and cover approximately one half of the subject site. The remainder of the subject site to the rear is vacant and contains a mix of grass, native vegetation and sporadic trees. A patch of mature native vegetation exists along the southern boundary, which is identified as outstanding biodiversity value. An established landscaping strip is located along the Glendenning Road frontage, providing some screening of the existing buildings.

The subject site is traversed by overhead 132 kV transmission lines and towers, managed by Endeavour Energy. A drainage reserve also exists directly north of the subject site, which is managed by Blacktown City Council.

The subject site is surrounded by industrial land to the north, west and south (refer to the site context in **Figure 2**). Directly adjoining the subject site to the east is the Nurragingy Reserve, which falls under the jurisdiction of the Western Parklands. The Eastern Creek is located within the reserve and runs along the eastern boundary of the subject site. The closest residential area is located approximately 400 m to the west of the subject site on the opposite side of the Westlink M7 Motorway.

The subject site is depicted in **Figure 1** below.



**Figure 1. Aerial Map of Subject Site (Source: NearMap, 2024)**



**Figure 2. Site Context and Zoning (Source: Blacktown Local Environmental Plan, 2024)**

## 1.4 Proposed Development

The proposed development is known as the Glendenning Road Data Centre and includes the construction and operation of three (3) data centre buildings and associated infrastructure, with a total power consumption of approximately 235 MW.

The proposed development seeks consent for the following aspects of development:

- Site preparation and establishment works including:
  - Bulk earthworks to create proposed site levels;
  - In-ground building services and utility work;
  - Clearance of trees and vegetation within the proposed development extent;
- Construction and operation of three (3) data centre buildings, known as DC01, DC02 and DC03, comprising:
  - A total Gross Floor Area (GFA) of 50,233 m<sup>2</sup> (DC01 – 19,985 m<sup>2</sup>, DC02 – 10,263 m<sup>2</sup> and DC03 – 19,985 m<sup>2</sup>);
  - A maximum building height of 45.3 m, including five (5) storeys for each building;
  - Three (3) internal substations;
  - A total IT capacity of approximately 193.6 MW (DC01 – 79.2 MW, DC02 – 35.2 MW and DC03 – 79.2 MW);
- Total diesel fuel storage of 2,736,030 L within underground bulk fuel storage tanks and generator day tanks;
- 97 back-up generators across the full development;

- External plant and equipment (including water tanks and pump rooms);
- Installation of evaporative cooling units;
- Three (3) vehicle crossovers to Glendenning Road and internal access roads;
- Security fencing surrounding the development, including a controlled entry and exit point;
- 165 on-site car parking spaces (including 6 accessible parking spaces and 12 EV parking spaces);
- Landscaping across the subject site;
- Hours of operation being on a 24 hours per day, seven (7) days per week basis.

The proposed works would be constructed in three (3) stages, as follows:

- **Stage 1:** The first stage would include the construction of DC01, located at the rear of the subject site. The three existing site buildings would be demolished\*.
- **Stage 2:** The second stage would involve the construction of DC02.
- **Stage 3:** The construction of DC03.

\* The demolition of the existing tenant buildings is not covered within this assessment. The demolition of the existing buildings will be undertaken via separate approval pathways. The northernmost existing warehouse building will be used as a construction site office (during the construction / operation for DC01), before being demolished to make way for DC02 and DC03.

The orientation of the proposed development with respect to the closest noise sensitive receivers is shown as an overview in **Figure 3**, and detailed receiver locations are illustrated in **Figure 4**, **Figure 5**, and **Figure 6** for the northwestern, southwestern, and eastern receiver respectively.

Figure 3 Project site relative to surrounding receivers – Overview.



Figure 4 Project site relative to surrounding receivers – Northwest.



Figure 5 Project site relative to surrounding receivers – Southwest.



Figure 6 Project site relative to surrounding receivers – Eastern.



## 1.5 Nearest Sensitive Receivers

Noise sensitive receivers are located within proximity to the project site (approximately 400 m west, and 850 m east). Additionally, multiple industrial receivers are located around the proposed development site. A passive recreation area (Nurranginy Reserve) is located along the eastern boundary of the development site. Three receivers have been placed at typical representative usage locations within the Nurranginy Reserve (passive recreation). The function centre, The Colebee, located within the Nurranginy Reserve has also been considered within this assessment.

To ensure that the most affected noise sensitive receivers were considered in the assessment, a detailed site inspection was undertaken to understand the likely noise propagation paths from the site. This site inspection considered apparent site features (including natural and constructed (e.g. road corridor cutout for the M7 motorway), established tree canopy within the Nurranginy Reserve), developments (including the large surrounding industrial warehouses positioned between some noise sensitive receivers and the proposed development site), and surrounding land uses that may affect noise propagation pathways / efficiency.

Following this initial noise calculations, including point receivers and noise contour maps were completed, to confirm the assumptions made in the site inspection were appropriate. The noise contour maps presented in Appendix D: Operational Noise Contours highlight that the most affected noise sensitive receivers are R11 – R12, located on Polonia Avenue, Plumpton, adjacent to the M7 motorway.

Prior to the commencement of the determination of rating background noise levels using the noise monitoring equipment, PWNA undertook a site inspection to understand the existing acoustic amenity of the surrounding catchment to determine the most adequate noise monitoring locations.

During this survey it was observed that existing ambient noise levels from the traffic noise of the M7 motorway was a similar level along the Polonia Avenue (in which the noise monitoring was conducted) to that at the end (caul-de-sac) of Cheryl Place. It was observed due to the local ground topography less shielding reduction is experienced due to the higher topography in this location.

It was also observed that the local area away from Polonia Avenue creates its own suburban hum which collectively resulted in a similar ambient noise level as that experienced at Polonia Avenue.

The receivers in this report are therefore considered representative of the closest off-site receivers for the proposed datacentre campus development.

The considered receivers ID, address, receiver type, Noise Catchment Area (NCA), and considered receiver heights are listed in **Table 2** below and illustrated in **Figure 4**, **Figure 5**, and **Figure 6** above.

**Table 2 Nearest potentially affected receivers.**

Receiver ID	Address	Type of Receiver	Noise Catchment Area	Receiver Height (m)
R01	29 GLENDENNING ROAD GLENDENNING	Industrial	N/A	1.5 m
R02	1 GLENDENNING ROAD GLENDENNING	Industrial	N/A	1.5 m
R03	600 WOODSTOCK AVENUE ROOTY HILL	Industrial	N/A	1.5 m, 4.5 m
R04	604 WOODSTOCK AVENUE ROOTY HILL	Industrial	N/A	1.5 m
R05	26 KILTO CRESCENT GLENDENNING	Industrial	N/A	1.5 m, 4.5 m
R06	10 KILTO CRESCENT GLENDENNING	Industrial	N/A	1.5 m, 4.5 m
R07	42 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m
R08	38 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m
R09	34 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m



Receiver ID	Address	Type of Receiver	Noise Catchment Area	Receiver Height (m)
R10	30 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m
R11	46 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m
R12	50 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m
R13	54 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m
R14	11 GILPIN PLACE PLUMPTON	Suburban Residential	NCA01	1.5 m
R15	26 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m
R16	28 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m
R17	75 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R18	71 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R19	67 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R20	61 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R21	59 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R22	55 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R23	51A KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R24	45 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R25	39 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m, 4.5 m
R26	33 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R27	29 KNOX ROAD DOONSIDE	Suburban Residential	NCA03	1.5 m
R28	38 CROSS STREET DOONSIDE	Suburban Residential	NCA03	1.5 m
R29	59 COGHLAN CRESCENT DOONSIDE	Suburban Residential	NCA03	1.5 m
R30	53 COGHLAN CRESCENT DOONSIDE	Suburban Residential	NCA03	1.5 m
R31	47 COGHLAN CRESCENT DOONSIDE	Suburban Residential	NCA03	1.5 m
R32	43 COGHLAN CRESCENT DOONSIDE	Suburban Residential	NCA03	1.5 m
R33	15 CHERYL PLACE PLUMPTON	Suburban Residential	NCA01	1.5 m, 4.5 m



Receiver ID	Address	Type of Receiver	Noise Catchment Area	Receiver Height (m)
R34	69 GRAHAM STREET DOONSIDE	Suburban Residential	NCA03	1.5 m, 4.5 m
R35	556 WOODSTOCK AVENUE ROOTY HILL	Suburban Residential	NCA02	1.5 m, 4.5 m
R36	132 STATION STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m, 4.5 m
R37	130 STATION STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m
R38	126 STATION STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m
R39	122 STATION STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m
R40	114 STATION STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m
R41	106 STATION STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m
R42	100-102 STATION STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m, 4.5 m
R43	2A WOLSELEY STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m
R44	86 STATION STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m
R45	78 STATION STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m
R46	9 DERBY STREET ROOTY HILL	Suburban Residential	NCA02	1.5 m, 4.5 m
R47	NURRAGINGY RESERVE, KNOW ROAD, DOONSIDE	Passive Recreation	N/A	1.5 m
R48	NURRAGINGY RESERVE, KNOW ROAD, DOONSIDE	Passive Recreation	N/A	1.5 m
R49	NURRAGINGY RESERVE, KNOW ROAD, DOONSIDE	Passive Recreation	N/A	1.5 m
R50	NURRAGINGY RESERVE, KNOW ROAD, DOONSIDE	Commercial	N/A	1.5 m
R51	15 DARICE PLACE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R52	13 DARICE PLACE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R53	11 DARICE PLACE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R54	24 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01	1.5 m
R55	22 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R56	20 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R57	9 DARICE PLACE PLUMPTON	Suburban Residential	NCA01B	1.5 m



Receiver ID	Address	Type of Receiver	Noise Catchment Area	Receiver Height (m)
R58	14 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R59	13 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R60	19 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R61	1 CHERYL PLACE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R62	2 CHERYL PLACE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R63	27 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R64	47 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R65	56 POLONIA AVENUE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R66	6 GILPIN PLACE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R67	4 GILPIN PLACE PLUMPTON	Suburban Residential	NCA01B	1.5 m
R68	7 HALELUKA CRESCENT PLUMPTON	Suburban Residential	NCA01B	1.5 m
R69	9 HALELUKA CRESCENT PLUMPTON	Suburban Residential	NCA01B	1.5 m
R70	9 GILPIN PLACE PLUMPTON	Suburban Residential	NCA01	1.5 m
R71	7 GILPIN PLACE PLUMPTON	Suburban Residential	NCA01	1.5 m
R72	5 GILPIN PLACE PLUMPTON	Suburban Residential	NCA01	1.5 m
R73	3 GILPIN PLACE PLUMPTON	Suburban Residential	NCA01	1.5 m
R74	22 HALELUKA CRESCENT PLUMPTON	Suburban Residential	NCA01	1.5 m
R75	24 HALELUKA CRESCENT PLUMPTON	Suburban Residential	NCA01	1.5 m



## 2 EXISTING ACOUSTIC ENVIRONMENT

### 2.1 Noise Descriptors and Terminology

Environmental noise constantly varies in level with time. Therefore, it is necessary to measure noise in terms of quantifiable time periods with statistical descriptors. Typically, environmental noise is measured over 15 minute periods and relevant statistical descriptors of the fluctuating noise are determined to quantify the measured level.

Noise (or sound) consists of minute fluctuations in atmospheric pressure capable of detection by human hearing. Noise levels are expressed in terms of decibels, abbreviated as dB or dB(A), the "A" indicating that the noise levels have been frequency weighted to approximate the characteristics of normal human hearing. Because noise is measured using a logarithmic scale, 'normal' linear arithmetic does not apply, e.g., adding two sound sources of equal values result in an increase of 3 dB (i.e., 60 dB(A) plus 60 dB(A) results in 63 dB(A)). A change of 1 dB or 2 dB in the sound level is difficult for most people to detect, whilst a 3 dB – 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change roughly corresponds to a doubling or halving in loudness.

The most relevant environmental noise descriptors are the  $L_{Aeq}$ ,  $LA_{01}$ ,  $LA_{10}$  and  $LA_{90}$  noise levels. The  $L_{Aeq}$  noise level represents the "equivalent energy average noise level". This parameter is derived by integrating the noise level measured over the measurement period. It represents the level that the fluctuating noise with the same acoustic energy would be if it were constant over the measured time period.

The  $LA_{01}$ ,  $LA_{10}$  and  $LA_{90}$  levels are the levels exceeded for 1%, 10% and 90% of the sample period. These levels can be considered as the maximum noise level, the average repeatable maximum and average repeatable minimum noise levels, respectively.

Specific acoustic terminology is used in this assessment report. An explanation of common acoustic terms is included in Appendix A.

### 2.2 Unattended Noise Measurements

#### 2.2.1 Monitoring Details

Background noise logging was undertaken in three locations between 8<sup>th</sup> April and 17<sup>th</sup> April 2024. The noise logging data has been measured, analysed and reported in accordance with Australian Standard 1055:2018 Acoustics – Description and measurement of environmental noise and the EPAs NPfI. The noise logger locations illustrated in **Figure 7** below have been selected to measure the existing noise environment of the nearby residential receivers. Specifically, unattended noise monitoring has been undertaken at three locations; Logger 01 – 44 Polonia Avenue, Plumpton, Logger 02 – 78 Station Road, Rooty Hill, and Logger 03 – 41 Knox Road, Doonside.

An additional noise logger was located at 9 Carroll Crescent, Plumpton, Logger 04. This logger was used to establish the appropriate noise criteria for NCA01 (further setback from the M7). Logger 04 was deployed from the 19<sup>th</sup> of September – 29<sup>th</sup> September.

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the 90<sup>th</sup> percentile of the daily background noise levels during each assessment period, being day, evening and night. The  $L_{Aeq}$  is the ambient noise level (logarithmically averaged) over the period.

The standard measurement periods used in NSW for site noise impacts are:

- Daytime – 7:00 am to 6:00 pm
- Evening – 6:00 pm to 10:00 pm
- Night-time – 10:00 pm to 7:00 am

Figure 7 Unattended noise logger locations.





## 2.2.2 Monitoring Instrumentation

Instrumentation used for the noise survey comprised of the following equipment;

- Logger 01 (representing NCA01) – 44 Polonia Avenue, Plumpton – Rion NL-42 (serial number: 00998081)
- Logger 02 – (representing NCA02) 78 Station Road, Rooty Hill - Rion NL-42 (serial number: 01000231)
- Logger 03 – (representing NCA03) 41 Knox Road, Doonside - Rion NL-42 (serial number: 00396932)
- Logger 04 – (representing NCA01B) – 9 Carroll Crescent, Plumpton – Rion NL-42 (serial number: 998081)

Prior to deploying the noise loggers, a desktop study was conducted to determine the likely suitable noise monitoring areas (including identifying extraneous noise sources that may affect the validity of the background noise logging, proximity of noise sensitive receivers to the proposed development site, effects of any significant screening etc.). Upon visiting the previously identified noise logging areas, suitable, specific noise monitoring locations were selected to capture the noise environment that is most typical of the surrounding noise sensitive receivers.

The dominant noise source for Noise Logger 01 consists of heavy road traffic noise (resulting from the nearby M7 motorway) and general residential receiver noise during all measurement periods.

The dominant noise source of Noise Logger 02 also consists of heavy road traffic noise (resulting from the nearby M7 motorway) and general residential receiver noise during all measurement periods.

The dominant noise source for Noise Logger 03 consists of moderate / heavy road traffic noise during the daytime and evening periods only (primarily resulting from the nearby Knox Road) and general residential receiver noise.

The dominant noise source for Noise Logger 04 consists of general suburban noise and distant road traffic noise from Woodstock Avenue and the M7.

Unattended noise loggers were positioned more than 3.5 m from reflecting structures, and at a height of between 1.2 m – 1.5 m above the ground as defined in part 6.2.2 of AS1055:2018.

Calibration of all equipment was checked prior to and following the measurements. Drift in calibration did not exceed  $\pm 0.5$  dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Charts presenting summaries of the measured daily noise data are attached in Appendix B. These charts, representing each 24-hour period, show the LA01, LA10, LAeq and LA90 noise levels measured over 15-minute time periods. A photograph of the noise loggers on site are also included.

Logging was conducted from Monday 8 April 2024 to Wednesday 17 April 2024 for noise loggers 01 - 03. Logging for noise logger 04 was conducted between the Friday 19 September 2025 – Monday 29 September 2025. The measurement results have been filtered to remove data affected by adverse weather conditions, such as excessively windy or rainy time periods, as recorded by the nearest Bureau of Meteorology weather station at Horsley Park (AWS 067119). Detailed noise logging results for each noise logger are presented in Appendix B: Noise Logging Data.

The measured background noise data of the logger was processed in accordance with the recommendations contained in the NSW Environment Protection Authority's (EPA) Noise Policy for Industry (NPII).

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the 90<sup>th</sup> percentile of the daily background noise levels during each assessment period, being day, evening and night. The RBL LA90 (15minute) and LAeq noise levels are presented in **Table 3** below.

The results of the measurement survey provide ambient noise levels that are considered to be representative of the levels to be expected at the nearest and most affected residences to the proposed development.



**Table 3 Measured Ambient Noise Levels corresponding to the NPfI’s Assessment Time Periods.**

Measurement Location	Daytime <sup>1</sup> 7:00 am to 6:00 pm		Evening <sup>1</sup> 6:00 pm to 10:00 pm		Night-time <sup>1</sup> 10:00 pm to 7:00 am	
	RBL <sup>2</sup>	LAeq <sup>3</sup>	RBL <sup>2</sup>	LAeq <sup>3</sup>	RBL <sup>2</sup>	LAeq <sup>3</sup>
Logger 01 (NCA01) - 44 Polonia Avenue, Plumpton.	50	58	47	57	43	53
Logger 02 (NCA02) – 78 Station Road, Rooty Hill.	53	60	48	57	44	54
Logger 03 (NCA03) – 41 Knox Road, Doonside.	52	64	52	62	43	60
Logger 04 (NCA01B) – 9 Carroll Crescent, Plumpton	40	50	40	47	38	46

*Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am*

*Note 2: The RBL noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.*

*Note 3: The LAeq is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.*



### 3 NOISE EMISSION CRITERIA

#### 3.1 Construction Noise

The EPA's Interim Construction Noise Guideline (ICNG) provides guidance on appropriate construction noise management levels that should be adhered to on construction projects throughout NSW. This guideline identifies that potential impacts from construction noise are determined based on time of day of the noise, the increase in site noise above background noise, the duration of the event, and any adverse characteristics of the noise.

The ICNG provides assessment procedures for the assessment of noise impacts, and management and mitigation measures procedures to address potential impacts on sensitive receivers. The main objectives of the ICNG are:

- Promote a clear understanding of ways to identify and minimise noise from construction works,
- Focus on applying all feasible and reasonable work practices to minimise construction noise impacts,
- Encourage construction to be undertaken only during the recommended standard hours unless approval is given for works that cannot be undertaken during these hours,
- Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage; and
- Provide flexibility in selecting site-specific feasible and reasonable work practices to minimise noise impacts.

The ICNG identifies a quantitative assessment approach which is applicable to this project. The quantitative assessment method involves predicting noise levels at sensitive receivers and comparing them with site specific Noise Management Levels (NMLs). The NML affectation categories for receivers have been reproduced from the guideline and are listed in **Table 4** below.



**Table 4 Construction noise management levels – residential receivers.**

Time of Day	Noise Management Level $L_{Aeq}(15\text{minute})^{1,2}$	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	<p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <ul style="list-style-type: none"> <li>Where the predicted or measured <math>L_{Aeq}(15\text{minute})</math> is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</li> </ul>
	Highly noise affected 75 dB(A)	<p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <ul style="list-style-type: none"> <li>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:                             <ol style="list-style-type: none"> <li>Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences).</li> <li>If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ol> </li> </ul>
Outside recommended standard hours	Noise affected RBL + 5 dB	<ul style="list-style-type: none"> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.</li> </ul>
<p><i>Note 1</i> Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.</p> <p><i>Note 2</i> The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Industrial Noise Policy (EPA 2000).</p>		

The ICNG also provides NMLs for non-residential land uses. Unlike residential receivers, these criteria are fixed levels, independent of local background noise levels. Presented below in **Table 5** are NMLs for non-residential land uses.



**Table 5 Construction noise management levels – other receivers.**

Land use	Location applied	Noise management level, $L_{Aeq,15min}$
Places of worship	Internal noise level	45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level	65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level	60 dB(A)
Community centres	Refer to the recommended “maximum” internal levels in AS2107 for specific uses	
Industrial premises	External noise level	75 dB(A)
Offices, retail outlets	External noise level	70 dB(A)

### 3.1.1 Site specific noise management levels

Presented below in **Table 6** is the receiver specific external construction noise management criteria.

**Table 6 Site specific external construction noise management levels, dB(A).**

Area	Type	Daytime 7:00 am to 6:00 pm <sup>1</sup>	Evening 6:00 pm – 10:00 pm <sup>2</sup>	Nighttime 10:00 pm – 7:00 am <sup>2</sup>	Highly noise affected
NCA01	Residential	60	52	48	75
NCA01B	Residential	50	45	43	75
NCA02	Residential	63	53	49	75
NCA03	Residential	62	57	48	75
All areas	Industrial Receivers	75	75	75	N/A
All areas	Passive recreation areas	60	60	60	N/A
All areas	Commercial	70	70	70	N/A

*Note 1 Site specific construction noise management levels are equated from the measured RBL + 10 dB during the daytime period (7:00 am – 6:00 pm).*

*Note 2 Site specific construction noise management levels are equated from the measured RBL + 5 dB when outside of standard construction hours.*

### 3.2 Construction vibration criteria

Effects of ground borne vibration on buildings may be segregated into two major categories:

- Human comfort – vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.
- Effects on building structures – where vibration can compromise the integrity of the building or structure itself



**Vibration criteria – human comfort**

Vibration effects relating specifically to the human comfort aspects of the project are taken from the guideline titled “Assessing Vibration – A Technical Guideline” (AVATG). Vibration impacts can be defined based on the nature of the construction works and vibration generated, specifically:

- Continuous vibration – from uninterrupted sources (refer to **Table 7**).
- Impulsive vibration – up to three instances of sudden impact e.g. dropping heavy items, per monitoring period (refer to **Table 8**).
- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (refer to **Table 9**).

Presented below in **Table 7, Table 8, Table 9** and is a summary of the applicable human comfort vibration criteria, for continuous, impulsive, and intermittent vibration respectively.

**Table 7 Continuous vibration acceleration criteria (m/s<sup>2</sup>) 1 - 80 Hz.**

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
		0.04	0.029	0.080	0.058
Workshops	Day or night-time	0.04	0.029	0.080	0.058

**Table 8 Impulsive vibration acceleration criteria (m/s<sup>2</sup>) 1 – 80 Hz.**

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

**Table 9 Intermittent vibration impacts criteria (m/s<sup>1.75</sup>) 1 -80 Hz.**

Location	Preferred Values		Maximum Values	
	z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

**Vibration criteria – building contents and structures**

The vibration effects on the building are provided by British Standard BS 7385: Part 2-1993 'Evaluation and measurement for vibration in buildings part 2: Guide to damage levels from ground borne vibration' (BSI 1993).

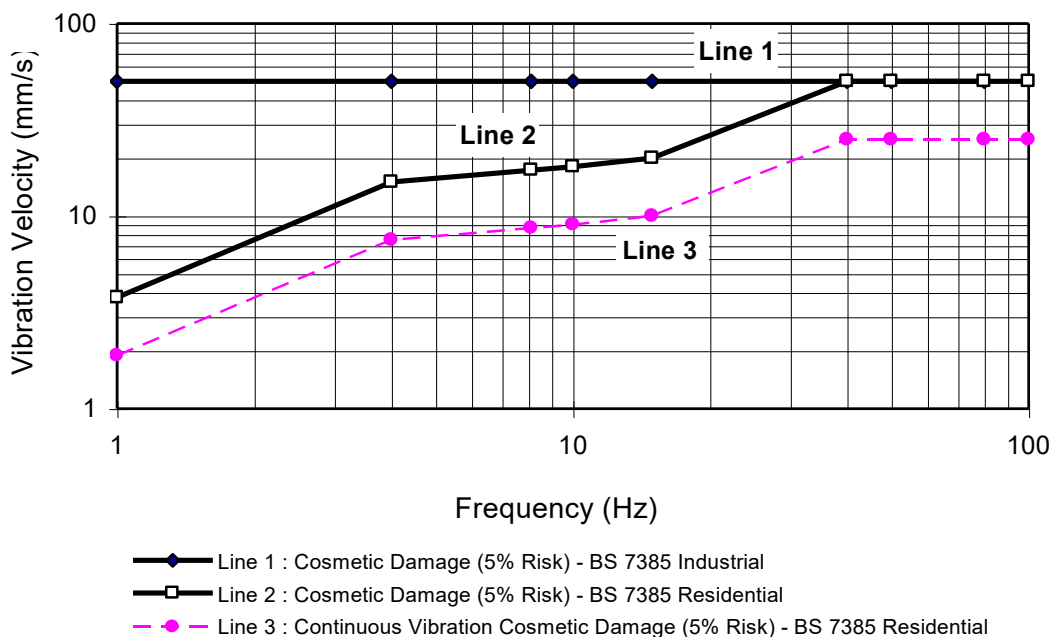
The criteria are based on peak particle velocity (mm/s) which is to be measured at the base of the building. These are summarised in **Table 10** and illustrated in **Figure 8**.

**Table 10 Transient vibration criteria as per standard BS 7385 Part 2 – 1993.**

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

The vibration standard BS 7385 Part 2 – 1993 states that the values in **Table 10** relate to transient vibration which does not cause resonant responses in buildings.

Where the dynamic loading caused by continuous vibration events is such as that results in dynamic magnification due to resonance (especially at the lower frequencies where lower guide values apply), then the values in **Table 10** may need to be reduced by up to 50% (refer to Line 3 in **Figure 8**).



**Figure 8 BS 7385 Part 2 – 1993, graph of transient vibration values for cosmetic damage.**

In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the recommended values corresponding to Line 2 are reduced. Below a frequency of 4 Hz where a high displacement is associated with the relatively low peak component particle velocity value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz.

The standard also states that minor damage is possible at vibration magnitudes which are greater than twice those given in **Table 10**, and major damage to a building structure may occur at values greater than four times the tabulated values.



Fatigue considerations are also addressed in the standard and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the values in **Table 10** should not be reduced for fatigue considerations.

### Project vibration criteria

Based on the details included in the sections above the project specific vibration criteria to protect the surrounding lightweight industrial and heavy industrial receivers from structural or architectural damage includes the following:

- Project construction vibration management level at all surrounding building structures – 7.5 mm/s.

In the event that this vibration criterion is exceeded, further investigation is required, including an assessment of the nature of the vibration and frequency characteristics to determine if the vibration criterion can be relaxed for the specific nature of the works.

## 3.3 Operational noise criteria

### 3.3.1 Blacktown Development Control Plan 2015

Section 4.3 *Consideration of adjoining land* from the Blacktown Development Control Plan (DCP) 2015 states the following in relation to industrial developments:

*Where development is proposed on major traffic routes or on land near to or adjoining a residential zone, a RE1 Public Recreation zone, or sensitive uses such as schools, Council will have particular regard to the following:*

- (d) *The likely level of noise to be emitted by the development, particularly its effect on the use of adjoining residential land. In general, noise generated by a development should not exceed the existing background sound pressure level by more than 5 dB(A). A statement of compliance with this standard from an acoustic consultant may be required to be submitted with the DA.*

### 3.3.2 NSW Noise Policy for Industry

In NSW, the control of noise emissions is the responsibility of Local Governments and the NSW Environment Protection Authority (NSW EPA).

The NSW EPA has recently released a document titled *Noise Policy for Industry* (NSW NPfI) which provides a framework and process for determining external noise criteria for the assessment of noise emission from industrial developments. The NSW NPfI criteria for industrial noise sources have two components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

#### 3.3.2.1 Intrusive Noise Impacts (Residential Receivers)

The NSW NPfI states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (LAeq), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is often termed the Intrusiveness Criterion.

The 'Rating Background Level' (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in the NSW NPfI. Using the rating background noise level approach results in the intrusiveness criterion being met for 90% of the time. Adjustments are to be applied to the level of noise produced by the source that is received at the assessment point where the noise source contains annoying characteristics such as tonality or impulsiveness.



### 3.3.2.2 Protecting Noise Amenity (All Receivers)

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NSW NPfI. That is, the ambient LAeq noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the 'Background Creep' or Amenity Criterion.

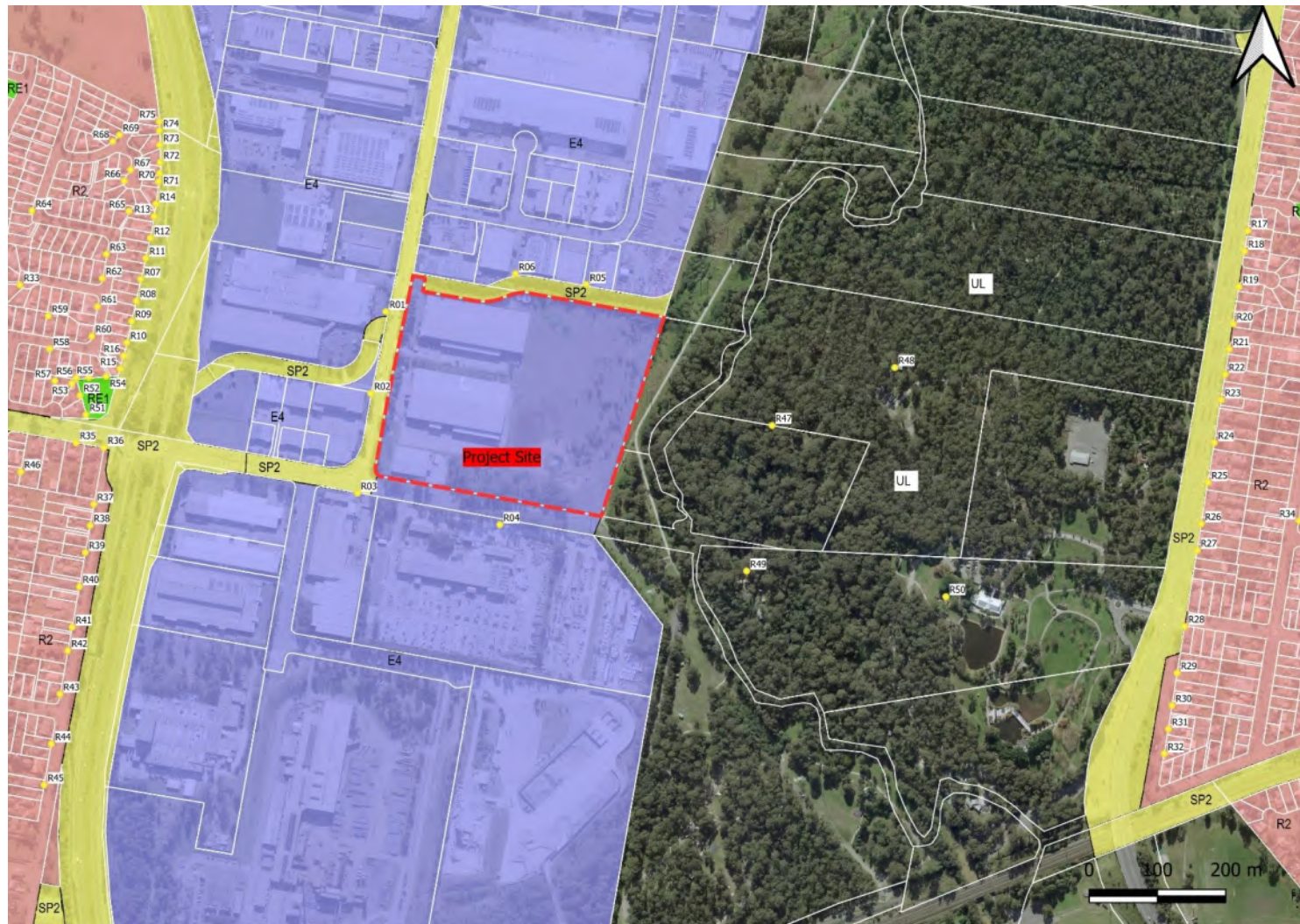
The amenity assessment is based on noise criteria specified for a particular land use and corresponding sensitivity to noise. The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. These criteria relate only to other continuous industrial-type noise and do not include road, rail or community noise. If the existing (measured) industrial-type noise level approaches the criterion value, then the NSW NPfI sets maximum noise emission levels from new sources with the objective of ensuring that the cumulative levels do not significantly exceed the criterion.

### 3.3.2.3 Area Classification

The NSW NPfI characterises the "Suburban Residential" noise environment as an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.

Additionally, **Figure 9** below is obtained from the NSW Planning ePlanning Spatial Viewer Zoning Maps and shows the land zoning map of the proposed data centre and the nearest sensitive receivers.

Figure 9 NSW ePlanning Spatial Viewer – Project site.





To ensure industrial noise levels do not gradually increase with new developments, a minus 5 dB correction is applied to the amenity noise level. The amenity noise levels have been presented in **Table 11** below.

**Table 11 NSW NPFI – Recommended LAeq Noise Levels from Industrial Noise Sources.**

Type of Receiver	Indicative Noise Amenity Area	Time of Day <sup>1</sup>	Recommended Amenity Noise Level (LAeq, period) <sup>2</sup>
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day		
School classroom	All	Noisiest 1-hour period	35 internal
Hospital ward	All	Noisiest 1-hour period	35 internal 50 external
Place of worship	All	When in use	40
Passive recreation	All	When in use	50
Active recreation	All	When in use	55
Commercial	All	When in use	65
Industrial	All	When in use	70
Industrial interface	Add 5 dB(A) to recommended noise amenity area		
<i>Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am</i>			
<i>Note 2: The LAeq is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.</i>			

As such, a conservative approach has been taken to class all surrounding residential receivers as “Suburban Residential” receivers, directly applied from the land zoning. Additionally, the nearby Nurragingy Reserve is zoned as unzoned land (UL). However, based on its typical usage (National Park, bushwalking, picnicking etc.) this area has been classed as a passive recreational receiver.

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

This high traffic project amenity noise level may be applied only if all the following apply:

- The road traffic noise is the dominant noise source
- The existing noise is 10 dB(A) or more above the recommended ANL for the area
- It is highly unlikely the road traffic noise levels would reduce in the near future



### 3.3.2.4 Project Trigger Noise Levels

Generally speaking, the noise criteria is determined by both the intrusiveness and amenity criteria. The intrusive and amenity criteria for industrial noise emissions, derived from the measured data, are presented in **Table 12**. The criteria are nominated for the purpose of determining the operational noise limits for mechanical plant associated with the development which can potentially affect noise sensitive receivers.

The current project site is proposed to facilitate a data centre campus that will include a total of three data centres. As such, the cumulative impact of all three data centres operating must be assessed.

As such, the entire data centre campus (three data centres) has been modelled to accurately determine the resulting noise level impacts to the surrounding receivers and simplify the noise emission criteria. Due to the fact that the cumulative impact of the full extent of the data centre is equated directly, hence the noise emission criteria for the entire campus can be directly determined.

For each assessment period, the lower (i.e., the more stringent) of the amenity or intrusive criteria are adopted. These are shown in bold text in **Table 12**.



**Table 12 External noise level criteria in accordance with the NSW NPfI.**

Location	Time of Day	Project Amenity Noise Level, LAeq, period <sup>1</sup> (dB(A))	Measured LA90, 15 min (RBL) <sup>2</sup> (dB(A))	Measured LAeq, period Noise Level (dB(A))	Intrusive LAeq, 15 min Criterion <sup>3</sup> for New Sources (dB(A))	Amenity LAeq, 15 min Criterion for New Sources (dB(A)) <sup>4</sup>	Noise Criterion
Residences (NCA01)	Day	50	50	58	55	<b>53</b>	53
	Evening	40	47	57	52	<b>45<sup>6</sup></b>	45
	Night	35	43	53	48	<b>41<sup>6</sup></b>	41
Residences (NCA01B)	Day	50	40	50	<b>45</b>	53	45
	Evening	40	40	47	45	<b>43</b>	43
	Night	35	38	46	43	<b>38</b>	38
Residences (NCA02)	Day	50	53	60	58	<b>53</b>	53
	Evening	40	48	57	53	<b>45<sup>6</sup></b>	45
	Night	35	44	54	49	<b>42<sup>6</sup></b>	42
Residences (NCA03)	Day	50	52	64	57	<b>53</b>	53
	Evening	40	52	62	57	<b>50<sup>6</sup></b>	50
	Night	35	43	60	48	<b>38</b>	38
Industrial Premises (R01 – R06)	When in use	65	N/A	N/A	N/A	<b>68</b>	68
Passive Recreation (R47 – R49)	When in use	45	N/A	N/A	N/A	<b>48</b>	48
Commercial (R50)	When in use	60	N/A	N/A	N/A	<b>63</b>	63

*Note 1: Project Amenity Noise Levels corresponding to "Suburban" areas, equivalent to the Recommended Amenity Noise Levels (from the NPfI) minus 5 dB(A)*

*Note 2: LA90 Background Noise or Rating Background Level (RBL)*

*Note 3: Intrusive criterion is equal to the RBL + 5 dB*

*Note 4: According to Section 2.2 of the NSW NPfI, the LAeq, 15 minutes is equal to the LAeq, period + 3 dB*

*Note 5: The lower of the amenity and the intrusiveness level is typically used as the applicable overall noise criterion for the day, evening and nighttime periods.*

*Note 6: Where the project amenity noise levels is 15 dB below the existing traffic noise level, the amenity criteria can be set at 15 dB below the existing LAeq noise level. This is based on the following criteria: road traffic noise is identified as the dominant noise source of the site, the measured existing traffic noise level (noting the measurement of traffic noise and not industrial noise) is 10 dB or more above the recommended amenity noise level of the area, and the existing noise levels are highly unlikely to decrease in the future.*

### 3.4 Operational road traffic noise

Individual developments have the potential to generate additional road traffic and associated noise impacts from vehicles accessing the site. The EPAs Road Noise Policy provides guidance on appropriate noise criteria which should be considered.



Presented below are the applicable noise criteria for road traffic on arterial and sub-arterial roads. Access routes for vehicles accessing the site at 2 Glendenning Road, Glendenning, is limited to arterial and sub-arterial roads only (Power Street, Glendenning Road, and Woodstock avenue). Hence, the noise criteria for local roads has not been provided. Additionally, Glendenning Road does not feature any residential receivers, as such receivers affected by traffic noise along Glendenning Road has not been considered.

**Table 13 Road Traffic Noise Assessment Criteria for Residential Land Uses.**

Road category	Type of project/land use	Assessment Criteria – dB(A)	
		Day (7:00 am to 10:00 pm)	Night (10:00 pm to 7:00 am)
<b>Freeway/arterial/sub-arterial roads – residential receivers</b>	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,(15\text{ hour})}$ 60 (external)	$L_{Aeq,(9\text{ hour})}$ 55 (external)

Where the predicted noise levels with the project indicate likelihood to exceed the noise criteria presented in **Table 13**, it is considered not reasonable and feasible to provide noise mitigation measures if the project does not increase noise by greater than 2.0 dB. A change of 2 dB to 3 dB in road traffic noise is often considered to be indiscernible.

### 3.5 Criteria for Emergency Generators

Section 1.4 of the Noise Policy for Industry is shown below:

#### Noise Policy for Industry

### 1.4 What noise sources does the policy apply to?

The policy applies to industrial noise sources from activities listed in **Schedule 1 of the POEO Act and regulated by the EPA.** All scheduled activities require an environment protection licence issued under the POEO Act. The policy is also an appropriate reference document for DP&E when assessing major development proposals under the EP&A Act.

Local government is an independent regulator for noise under the legislation, and has discretion in dealing with noise within its area of responsibility.

The policy is designed for large industrial and agricultural sources and specifies substantial monitoring and assessment procedures that may not always be applicable to the types of sources councils need to address. However, local government may find the policy helpful in assessing noise from premises it regulates and in the carrying-out of its land-use planning responsibilities as outlined in Section 1.1.1. Information on noise management for local government is also provided in the EPA's [Noise guide for local government 2013](#).

In general, the types of premises dealt with in the policy include:

As can be seen above, the Noise Policy for Industry states that "The policy applies to industrial noise sources from activities listed in Schedule 1 of the Protection of the Environment Operations (POEO) Act and regulated by the EPA". Schedule 1 of the POEO Act is highlighted in bold for emphasis. Schedule 1 of the POEO Act, Section 17 (1A) is shown below

**17 Electricity generation**

(1) This clause applies to the following activities—

*electricity works (wind farms)*, meaning the generation of electricity by means of wind turbines.

*general electricity works*, meaning the generation of electricity by means of electricity plant that, wherever situated, is based on, or uses, any energy source other than wind power or solar power.

*metropolitan electricity works (gas turbines)*, meaning the generation of electricity by means of electricity plant—

(a) that is based on, or uses, a gas turbine, and

(b) that is situated in the metropolitan area or in the local government area of Port Stephens, Maitland, Cessnock, Singleton, Wollondilly or Kiama.

*metropolitan electricity works (internal combustion engines)*, meaning the generation of electricity by means of electricity plant—

(a) that is based on, or uses, an internal combustion engine, and

(b) that is situated in the metropolitan area or in the local government area of Port Stephens, Maitland, Cessnock, Singleton, Wollondilly or Kiama.

(1A) However, this clause does not apply to the generation of electricity by means of electricity plant that is emergency stand-by plant operating for less than 200 hours per year.

As seen above, Schedule 1, Section 17 (1A) of the POEO Act, states that

*"this clause does not apply to the generation of electricity by means of electricity plant that is emergency stand-by plant operating for less than 200 hours per year".*

Therefore, under the POEO Act, the Noise Policy for Industry is only applicable to generator events that occur more than 200 hours a year. Note that the Noise Policy for Industry is applicable to the assessment of all other noise sources.

It is understood that, as part of this proposal, generators are proposed to be used in the event of a total systems power failure as a backup power system. Additionally, the generators are also proposed to be tested periodically, with up to 20x generators (and 3 corresponding load banks) operating in parallel at a time during the daytime period only. Additionally, 1 generator (and 1 corresponding load bank) has also been considered to operate for testing during the evening period. No generator testing is proposed to occur during the nighttime period. The generator testing regime sums to a total of less than 200 hours per year.

Therefore, use of all generators at once for power generation is outside the framework of the POEO Act and the Noise Policy for Industry.

Testing of up to 20 generators (and 3 corresponding load banks) operating in parallel during the daytime period, and 1 generator (and 1 corresponding load bank) is within the framework of the Noise Policy for Industry and is analysed within this report.

It is our understanding that the above interpretation only applies to developments that do not require an Environmental Protection Licence (EPL). In the event that the proposed development is required to obtain an EPL (for any reason), the above interpretation does not apply.

Despite this, the emergency generator scenario has also been assessed to equate the noise levels at the nearby noise sensitive receivers. See Sections 5.4 and 7.2.2.2 for additional details.



## 4 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

### 4.1 Construction site noise

Noise impacts from construction works associated with the project have been predicted in accordance with the requirements in the EPAs ICNG. A three-dimensional noise model was developed using SoundPLAN v9.1 using the ISO9613 noise propagation algorithm and the noise impacts modelled for each major construction scenario.

Presented below is a summary of the construction activities, equipment and associated sound power levels, and a summary of the predicted noise impacts from the works. An assessment has been completed of the typical worst-case noise impacts. Noise from the project is often likely to be lower than the noise levels presented in this assessment.

In the absence of the appointment of a construction contractor, a schedule identifying the duration and timing of construction works is not available at the time of writing this report. Further detail would be provided in the contractors Construction Noise and Vibration Management Plan (CNVMP) which will be developed before construction is commenced.

### 4.2 Construction noise scenarios

The equipment anticipated for use in each task is based on previous project experience. The sound power levels for the equipment likely to be used for each of the listed task is provided in **Table 14** below.

**Table 14 Summary of predicted sound power levels, dB(A).**

Tasks	Equipment	Sound Power Levels (dB(A) re 1 pW)	Aggregate per task (dB(A) re 1 pW) <sup>1</sup>
<b>Construction Stage 1</b>			
Site Clearance (site establishment including excavation / earthworks)	Excavators	103	120
	Backhoe	101	
	Bulldozer	110	
	Grader	113	
	Wheel Tractor Scraper	103	
	Trencher	109	
	Wheel Loader	106	
	B Double (Tipper)	108	
	Haulage Trucks	108	
Excavation of existing building piles <sup>2</sup>	Excavators	103	118
	Hydraulic hammers	118	
	Dump Trucks	103	
	Power hand tools	99	
Piling Works	Piling rig	116	116
	Excavators	103	
	Water pumps	90	
	Concrete pumps	97	
	Concrete agitators	105	
	Dump trucks	103	
	Power hand tools	99	
Structure Construction	Excavator	109	116
	Water pump	90	



Tasks	Equipment	Sound Power Levels (dB(A) re 1 pW)	Aggregate per task (dB(A) re 1 pW) <sup>1</sup>
	Concrete pumps and booms	97	
	Concrete trucks	109	
	Hand tools	99	
	Tower cranes	113	
	Mobile cranes	93	
Fitout & Finishes	Delivery vehicle (flat bed)	108	117
	Tower cranes	113	
	Mobile cranes	93	
	Power hand tools	99	
<b>Construction Stage 2</b>			
Site Clearance (site establishment including excavation / earthworks)	Excavators	103	120
	Backhoe	101	
	Bulldozer	110	
	Grader	113	
	Wheel Tractor Scraper	103	
	Trencher	109	
	Wheel Loader	106	
	B Double (Tipper)	108	
	Haulage Trucks	108	
Piling Works	Piling rig	116	116
	Excavators	103	
	Water pumps	90	
	Concrete pumps	97	
	Concrete agitators	105	
	Dump trucks	103	
	Power hand tools	99	
Structure Construction	Excavator	109	116
	Water pump	90	
	Concrete pumps and booms	97	
	Concrete trucks	109	
	Hand tools	99	
	Tower cranes	113	
	Mobile cranes	93	
Fitout & Finishes	Delivery vehicle (flat bed)	108	117
	Tower cranes	113	
	Mobile cranes	93	
	Power hand tools	99	
<b>Construction Stage 3</b>			
Site Clearance	Excavators	103	120



Tasks	Equipment	Sound Power Levels (dB(A) re 1 pW)	Aggregate per task (dB(A) re 1 pW) <sup>1</sup>
(site establishment including excavation / earthworks)	Backhoe	101	
	Bulldozer	110	
	Grader	113	
	Wheel Tractor Scraper	103	
	Trencher	109	
	Wheel Loader	106	
	B Double (Tipper)	108	
	Haulage Trucks	108	
Excavation of existing building piles <sup>2</sup>	Excavators	103	118
	Hydraulic hammers	118	
	Dump Trucks	103	
	Power hand tools	99	
Piling Works	Piling rig	116	116
	Excavators	103	
	Water pumps	90	
	Concrete pumps	97	
	Concrete agitators	105	
	Dump trucks	103	
	Power hand tools	99	
Structure Construction	Excavator	109	116
	Water pump	90	
	Concrete pumps and booms	97	
	Concrete trucks	109	
	Hand tools	99	
	Tower cranes	113	
	Mobile cranes	93	
Fitout & Finishes	Delivery vehicle (flat bed)	108	117
	Tower cranes	113	
	Mobile cranes	93	
	Power hand tools	99	

Note 1: Aggregate sound power determined by the logarithmic addition of each individual sound power level component.

Note 2: The demolition of the existing tenant buildings is not covered within this assessment (excluding the excavation of the existing building piles). The demolition of the existing buildings will be undertaken via separate approval pathways.

### 4.3 Assessment methodology

Calculations of the noise impacts have been undertaken in accordance with the ISO9613 noise propagation algorithm at the most affected sensitive receiver locations. Receivers located further from the site would have lower noise levels from the proposed works.

The construction hours are generally restricted to:

- Monday to Friday 7:00 am to 6:00 pm
- Saturday 8:00 am to 1:00 pm



- Sunday/Public Holiday                      No work or ancillary activity

Evening / Night-time construction works are not envisaged to be required for this project.

The following modelling assumptions are utilised for the construction noise assessment:

- The noise generating scenario is a worst case 15-minute period;
- Terrain has been sourced from the NSW Land and Property Information database Six Maps;
- Ground Absorption has been included in the model with the project site as 0, and the surrounding residential areas have a ground absorption of 0.3;
- Receptors located on ground level has been modelled at a receiver height of 1.5 m above ground, receptors located on level 1 have been modelled at a height of 4.5 m above ground.

Presented in **Table 15** is a summary of the representative sensitive receivers which have been assessed for this project. The location of the receivers listed below in relation to the site and noise catchment area is illustrated in **Figure 3**. Construction noise contours for all surrounding receivers are also included in this assessment within Appendix C: Construction Noise Contours.

**Table 15 Sensitive receiver daytime construction noise management levels, dB(A).**

ID	Address	Noise Catchment Area	Construction noise management level (standard construction hours)	Highly noise affected level
R01	29 GLENDENNING ROAD GLENDENNING	N/A	75	N/A
R02	1 GLENDENNING ROAD GLENDENNING	N/A	75	N/A
R03	600 WOODSTOCK AVENUE ROOTY HILL	N/A	75	N/A
R04	604 WOODSTOCK AVENUE ROOTY HILL	N/A	75	N/A
R05	26 KILTO CRESCENT GLENDENNING	N/A	75	N/A
R06	10 KILTO CRESCENT GLENDENNING	N/A	75	N/A
R07	42 POLONIA AVENUE PLUMPTON	NCA01	60	75
R08	38 POLONIA AVENUE PLUMPTON	NCA01	60	75
R09	34 POLONIA AVENUE PLUMPTON	NCA01	60	75
R10	30 POLONIA AVENUE PLUMPTON	NCA01	60	75
R11	46 POLONIA AVENUE PLUMPTON	NCA01	60	75
R12	50 POLONIA AVENUE PLUMPTON	NCA01	60	75
R13	54 POLONIA AVENUE PLUMPTON	NCA01	60	75
R14	11 GILPIN PLACE PLUMPTON	NCA01	60	75
R15	26 POLONIA AVENUE PLUMPTON	NCA01	60	75
R16	28 POLONIA AVENUE PLUMPTON	NCA01	60	75
R17	75 KNOX ROAD DOONSIDE	NCA03	62	75
R18	71 KNOX ROAD DOONSIDE	NCA03	62	75
R19	67 KNOX ROAD DOONSIDE	NCA03	62	75



ID	Address	Noise Catchment Area	Construction noise management level (standard construction hours)	Highly noise affected level
R20	61 KNOX ROAD DOONSIDE	NCA03	62	75
R21	59 KNOX ROAD DOONSIDE	NCA03	62	75
R22	55 KNOX ROAD DOONSIDE	NCA03	62	75
R23	51A KNOX ROAD DOONSIDE	NCA03	62	75
R24	45 KNOX ROAD DOONSIDE	NCA03	62	75
R25	39 KNOX ROAD DOONSIDE	NCA03	62	75
R26	33 KNOX ROAD DOONSIDE	NCA03	62	75
R27	29 KNOX ROAD DOONSIDE	NCA03	62	75
R28	38 CROSS STREET DOONSIDE	NCA03	62	75
R29	59 COGHLAN CRESCENT DOONSIDE	NCA03	62	75
R30	53 COGHLAN CRESCENT DOONSIDE	NCA03	62	75
R31	47 COGHLAN CRESCENT DOONSIDE	NCA03	62	75
R32	43 COGHLAN CRESCENT DOONSIDE	NCA03	62	75
R33	15 CHERYL PLACE PLUMPTON	NCA01	60	75
R34	69 GRAHAM STREET DOONSIDE	NCA03	62	75
R35	556 WOODSTOCK AVENUE ROOTY HILL	NCA02	63	75
R36	132 STATION STREET ROOTY HILL	NCA02	63	75
R37	130 STATION STREET ROOTY HILL	NCA02	63	75
R38	126 STATION STREET ROOTY HILL	NCA02	63	75
R39	122 STATION STREET ROOTY HILL	NCA02	63	75
R40	114 STATION STREET ROOTY HILL	NCA02	63	75
R41	106 STATION STREET ROOTY HILL	NCA02	63	75
R42	100-102 STATION STREET ROOTY HILL	NCA02	63	75
R43	2A WOLSELEY STREET ROOTY HILL	NCA02	63	75
R44	86 STATION STREET ROOTY HILL	NCA02	63	75
R45	78 STATION STREET ROOTY HILL	NCA02	63	75
R46	9 DERBY STREET ROOTY HILL	NCA02	63	75
R47	NURRAGINGY RESERVE, KNOW ROAD, DOONSIDE	N/A	60	N/A
R48	NURRAGINGY RESERVE, KNOW ROAD, DOONSIDE	N/A	60	N/A

ID	Address	Noise Catchment Area	Construction noise management level (standard construction hours)	Highly noise affected level
R49	NURRAGINGY RESERVE, KNOW ROAD, DOONSIDE	N/A	60	N/A
R50	NURRAGINGY RESERVE, KNOW ROAD, DOONSIDE	N/A	70	N/A
R51	15 DARICE PLACE PLUMPTON	NCA01B	50	75
R52	13 DARICE PLACE PLUMPTON	NCA01B	50	75
R53	11 DARICE PLACE PLUMPTON	NCA01B	50	75
R54	24 POLONIA AVENUE PLUMPTON	NCA01	60	75
R55	22 POLONIA AVENUE PLUMPTON	NCA01B	50	75
R56	20 POLONIA AVENUE PLUMPTON	NCA01B	50	75
R57	9 DARICE PLACE PLUMPTON	NCA01B	50	75
R58	14 POLONIA AVENUE PLUMPTON	NCA01B	50	75
R59	13 POLONIA AVENUE PLUMPTON	NCA01B	50	75
R60	19 POLONIA AVENUE PLUMPTON	NCA01B	50	75
R61	1 CHERYL PLACE PLUMPTON	NCA01B	50	75
R62	2 CHERYL PLACE PLUMPTON	NCA01B	50	75
R63	27 POLONIA AVENUE PLUMPTON	NCA01B	50	75
R64	47 POLONIA AVENUE PLUMPTON	NCA01B	50	75
R65	56 POLONIA AVENUE PLUMPTON	NCA01B	50	75
R66	6 GILPIN PLACE PLUMPTON	NCA01B	50	75
R67	4 GILPIN PLACE PLUMPTON	NCA01B	50	75
R68	7 HALELUKA CRESCENT PLUMPTON	NCA01B	50	75
R69	9 HALELUKA CRESCENT PLUMPTON	NCA01B	50	75
R70	9 GILPIN PLACE PLUMPTON	NCA01	60	75
R71	7 GILPIN PLACE PLUMPTON	NCA01	60	75
R72	5 GILPIN PLACE PLUMPTON	NCA01	60	75
R73	3 GILPIN PLACE PLUMPTON	NCA01	60	75
R74	22 HALELUKA CRESCENT PLUMPTON	NCA01	60	75
R75	24 HALELUKA CRESCENT PLUMPTON	NCA01	60	75

#### 4.4 Out of hours works

Out of hours works are currently not proposed as part of this project. However, out of hours works may be required under the following limited circumstances:

- The delivery of materials as required by the Police or other authorities for safety reasons,
- Where it is required to avoid the loss of lives, property and/or to prevent environmental harm in an emergency; or
- Where agreement is reached with affected receivers work may also be undertaken where explicitly approved through an Environment Protection Licence.



### 4.5 Predicted construction noise impacts

An assessment of the likely construction noise impacts has been calculated using the ISO9613 noise propagation algorithm. The assessment has been based on the likely equipment which would be used during the proposed works as identified in Section 4.2.

Presented below in **Table 16** is a summary of the worst-case predicted noise impacts for standard construction hours for all proposed construction phases. Construction noise contours for each construction scenario are also presented in Appendix C: Construction Noise Contours.

**Table 16 Predicted standard hours work construction noise impacts,  $L_{Aeq,15min}$  dB(A).**

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
<b>Construction Scenario 1 – Site clearance</b>				
R01 (1.5 m)	75	63	-	N/A
R02 (1.5 m)	75	61	-	N/A
R03 (1.5 m, 4.5 m)	75	56 / 56	-	N/A
R04 (1.5 m)	75	64	-	N/A
R05 (1.5 m, 4.5 m)	75	79 / 79	4	N/A
R06 (1.5 m, 4.5 m)	75	73 / 73	-	N/A
R07 (1.5 m)	60	50	-	-
R08 (1.5 m)	60	48	-	-
R09 (1.5 m)	60	51	-	-
R10 (1.5 m)	60	51	-	-
R11 (1.5 m)	60	50	-	-
R12 (1.5 m)	60	37	-	-
R13 (1.5 m)	60	44	-	-
R14 (1.5 m)	60	37	-	-
R15 (1.5 m)	60	53	-	-
R16 (1.5 m)	60	51	-	-
R17 (1.5 m)	62	42	-	-
R18 (1.5 m)	62	42	-	-
R19 (1.5 m)	62	42	-	-
R20 (1.5 m)	62	42	-	-
R21 (1.5 m)	62	42	-	-
R22 (1.5 m)	62	43	-	-
R23 (1.5 m)	62	43	-	-
R24 (1.5 m)	62	43	-	-
R25 (1.5 m, 4.5 m)	62	43 / 43	-	-
R26 (1.5 m)	62	43	-	-
R27 (1.5 m)	62	43	-	-
R28 (1.5 m)	62	44	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R29 (1.5 m)	62	44	-	-
R30 (1.5 m)	62	44	-	-
R31 (1.5 m)	62	44	-	-
R32 (1.5 m)	62	45	-	-
R33 (1.5 m, 4.5 m)	60	49 / 49	-	-
R34 (1.5 m, 4.5 m)	62	45 / 46	-	-
R35 (1.5 m, 4.5 m)	63	48 / 49	-	-
R36 (1.5 m, 4.5 m)	63	48 / 48	-	-
R37 (1.5 m)	63	41	-	-
R38 (1.5 m)	63	38	-	-
R39 (1.5 m)	63	39	-	-
R40 (1.5 m)	63	42	-	-
R41 (1.5 m)	63	36	-	-
R42 (1.5 m, 4.5 m)	63	36 / 37	-	-
R43 (1.5 m)	63	38	-	-
R44 (1.5 m)	63	40	-	-
R45 (1.5 m)	63	37	-	-
R46 (1.5 m, 4.5 m)	63	48 / 48	-	-
R47 (1.5 m)	60	52	-	N/A
R48 (1.5 m)	60	45	-	N/A
R49 (1.5 m)	60	48	-	N/A
R50 (1.5 m)	70	42	-	N/A
R51 (1.5 m)	50	50	-	-
R52 (1.5 m)	50	50	-	-
R53 (1.5 m)	50	50	-	-
R54 (1.5 m)	60	50	-	-
R55 (1.5 m)	50	50	-	-
R56 (1.5 m)	50	50	-	-
R57 (1.5 m)	50	49	-	-
R58 (1.5 m)	50	49	-	-
R59 (1.5 m)	50	49	-	-
R60 (1.5 m)	50	51	1	-
R61 (1.5 m)	50	49	-	-
R62 (1.5 m)	50	49	-	-
R63 (1.5 m)	50	49	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R64 (1.5 m)	50	48	-	-
R65 (1.5 m)	50	50	-	-
R66 (1.5 m)	50	49	-	-
R67 (1.5 m)	50	48	-	-
R68 (1.5 m)	50	49	-	-
R69 (1.5 m)	50	46	-	-
R70 (1.5 m)	60	44	-	-
R71 (1.5 m)	60	42	-	-
R72 (1.5 m)	60	43	-	-
R73 (1.5 m)	60	40	-	-
R74 (1.5 m)	60	41	-	-
R75 (1.5 m)	60	41	-	-
<b>Construction Scenario 1 – Excavation of existing piles</b>				
R01 (1.5 m)	75	61	-	N/A
R02 (1.5 m)	75	59	-	N/A
R03 (1.5 m, 4.5 m)	75	54 / 54	-	N/A
R04 (1.5 m)	75	62	-	N/A
R05 (1.5 m, 4.5 m)	75	77 / 77	2	N/A
R06 (1.5 m, 4.5 m)	75	71 / 71	-	N/A
R07 (1.5 m)	60	48	-	-
R08 (1.5 m)	60	46	-	-
R09 (1.5 m)	60	49	-	-
R10 (1.5 m)	60	49	-	-
R11 (1.5 m)	60	48	-	-
R12 (1.5 m)	60	35	-	-
R13 (1.5 m)	60	42	-	-
R14 (1.5 m)	60	35	-	-
R15 (1.5 m)	60	51	-	-
R16 (1.5 m)	60	49	-	-
R17 (1.5 m)	62	40	-	-
R18 (1.5 m)	62	40	-	-
R19 (1.5 m)	62	40	-	-
R20 (1.5 m)	62	40	-	-
R21 (1.5 m)	62	40	-	-
R22 (1.5 m)	62	41	-	-
R23 (1.5 m)	62	41	-	-
R24 (1.5 m)	62	41	-	-



Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R25 (1.5 m, 4.5 m)	62	41 / 41	-	-
R26 (1.5 m)	62	41	-	-
R27 (1.5 m)	62	41	-	-
R28 (1.5 m)	62	42	-	-
R29 (1.5 m)	62	42	-	-
R30 (1.5 m)	62	42	-	-
R31 (1.5 m)	62	42	-	-
R32 (1.5 m)	62	43	-	-
R33 (1.5 m, 4.5 m)	60	47 / 47	-	-
R34 (1.5 m, 4.5 m)	62	43 / 44	-	-
R35 (1.5 m, 4.5 m)	63	46 / 47	-	-
R36 (1.5 m, 4.5 m)	63	46 / 46	-	-
R37 (1.5 m)	63	39	-	-
R38 (1.5 m)	63	36	-	-
R39 (1.5 m)	63	37	-	-
R40 (1.5 m)	63	40	-	-
R41 (1.5 m)	63	34	-	-
R42 (1.5 m, 4.5 m)	63	34 / 35	-	-
R43 (1.5 m)	63	36	-	-
R44 (1.5 m)	63	38	-	-
R45 (1.5 m)	63	35	-	-
R46 (1.5 m, 4.5 m)	63	46 / 46	-	-
R47 (1.5 m)	60	50	-	N/A
R48 (1.5 m)	60	43	-	N/A
R49 (1.5 m)	60	46	-	N/A
R50 (1.5 m)	70	40	-	N/A
R51 (1.5 m)	50	48	-	-
R52 (1.5 m)	50	48	-	-
R53 (1.5 m)	50	48	-	-
R54 (1.5 m)	60	48	-	-
R55 (1.5 m)	50	48	-	-
R56 (1.5 m)	50	48	-	-
R57 (1.5 m)	50	47	-	-
R58 (1.5 m)	50	47	-	-



Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R59 (1.5 m)	50	47	-	-
R60 (1.5 m)	50	49	-	-
R61 (1.5 m)	50	47	-	-
R62 (1.5 m)	50	47	-	-
R63 (1.5 m)	50	47	-	-
R64 (1.5 m)	50	46	-	-
R65 (1.5 m)	50	48	-	-
R66 (1.5 m)	50	47	-	-
R67 (1.5 m)	50	46	-	-
R68 (1.5 m)	50	47	-	-
R69 (1.5 m)	50	44	-	-
R70 (1.5 m)	60	42	-	-
R71 (1.5 m)	60	40	-	-
R72 (1.5 m)	60	41	-	-
R73 (1.5 m)	60	38	-	-
R74 (1.5 m)	60	39	-	-
R75 (1.5 m)	60	39	-	-
<b>Construction Scenario 1 – Piling works</b>				
R01 (1.5 m)	75	59	-	N/A
R02 (1.5 m)	75	57	-	N/A
R03 (1.5 m, 4.5 m)	75	52 / 52	-	N/A
R04 (1.5 m)	75	60	-	N/A
R05 (1.5 m, 4.5 m)	75	75 / 75	-	N/A
R06 (1.5 m, 4.5 m)	75	69 / 69	-	N/A
R07 (1.5 m)	60	46	-	-
R08 (1.5 m)	60	44	-	-
R09 (1.5 m)	60	47	-	-
R10 (1.5 m)	60	47	-	-
R11 (1.5 m)	60	46	-	-
R12 (1.5 m)	60	33	-	-
R13 (1.5 m)	60	40	-	-
R14 (1.5 m)	60	33	-	-
R15 (1.5 m)	60	49	-	-
R16 (1.5 m)	60	47	-	-
R17 (1.5 m)	62	38	-	-
R18 (1.5 m)	62	38	-	-
R19 (1.5 m)	62	38	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R20 (1.5 m)	62	38	-	-
R21 (1.5 m)	62	38	-	-
R22 (1.5 m)	62	39	-	-
R23 (1.5 m)	62	39	-	-
R24 (1.5 m)	62	39	-	-
R25 (1.5 m, 4.5 m)	62	39 / 39	-	-
R26 (1.5 m)	62	39	-	-
R27 (1.5 m)	62	39	-	-
R28 (1.5 m)	62	40	-	-
R29 (1.5 m)	62	40	-	-
R30 (1.5 m)	62	40	-	-
R31 (1.5 m)	62	40	-	-
R32 (1.5 m)	62	41	-	-
R33 (1.5 m, 4.5 m)	60	45 / 45	-	-
R34 (1.5 m, 4.5 m)	62	41 / 42	-	-
R35 (1.5 m, 4.5 m)	63	44 / 45	-	-
R36 (1.5 m, 4.5 m)	63	44 / 44	-	-
R37 (1.5 m)	63	37	-	-
R38 (1.5 m)	63	34	-	-
R39 (1.5 m)	63	35	-	-
R40 (1.5 m)	63	38	-	-
R41 (1.5 m)	63	32	-	-
R42 (1.5 m, 4.5 m)	63	32 / 33	-	-
R43 (1.5 m)	63	34	-	-
R44 (1.5 m)	63	36	-	-
R45 (1.5 m)	63	33	-	-
R46 (1.5 m, 4.5 m)	63	44 / 44	-	-
R47 (1.5 m)	60	48	-	N/A
R48 (1.5 m)	60	41	-	N/A
R49 (1.5 m)	60	44	-	N/A
R50 (1.5 m)	70	38	-	N/A
R51 (1.5 m)	50	46	-	-
R52 (1.5 m)	50	46	-	-
R53 (1.5 m)	50	46	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R54 (1.5 m)	60	46	-	-
R55 (1.5 m)	50	46	-	-
R56 (1.5 m)	50	46	-	-
R57 (1.5 m)	50	45	-	-
R58 (1.5 m)	50	45	-	-
R59 (1.5 m)	50	45	-	-
R60 (1.5 m)	50	47	-	-
R61 (1.5 m)	50	45	-	-
R62 (1.5 m)	50	45	-	-
R63 (1.5 m)	50	45	-	-
R64 (1.5 m)	50	44	-	-
R65 (1.5 m)	50	46	-	-
R66 (1.5 m)	50	45	-	-
R67 (1.5 m)	50	44	-	-
R68 (1.5 m)	50	45	-	-
R69 (1.5 m)	50	42	-	-
R70 (1.5 m)	60	40	-	-
R71 (1.5 m)	60	38	-	-
R72 (1.5 m)	60	39	-	-
R73 (1.5 m)	60	36	-	-
R74 (1.5 m)	60	37	-	-
R75 (1.5 m)	60	37	-	-
<b>Construction Scenario 1 – Structure Construction</b>				
R01 (1.5 m)	75	59	-	N/A
R02 (1.5 m)	75	57	-	N/A
R03 (1.5 m, 4.5 m)	75	52 / 52	-	N/A
R04 (1.5 m)	75	60	-	N/A
R05 (1.5 m, 4.5 m)	75	75 / 75	-	N/A
R06 (1.5 m, 4.5 m)	75	69 / 69	-	N/A
R07 (1.5 m)	60	46	-	-
R08 (1.5 m)	60	44	-	-
R09 (1.5 m)	60	47	-	-
R10 (1.5 m)	60	47	-	-
R11 (1.5 m)	60	46	-	-
R12 (1.5 m)	60	33	-	-
R13 (1.5 m)	60	40	-	-
R14 (1.5 m)	60	33	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R15 (1.5 m)	60	49	-	-
R16 (1.5 m)	60	47	-	-
R17 (1.5 m)	62	38	-	-
R18 (1.5 m)	62	38	-	-
R19 (1.5 m)	62	38	-	-
R20 (1.5 m)	62	38	-	-
R21 (1.5 m)	62	38	-	-
R22 (1.5 m)	62	39	-	-
R23 (1.5 m)	62	39	-	-
R24 (1.5 m)	62	39	-	-
R25 (1.5 m, 4.5 m)	62	39 / 39	-	-
R26 (1.5 m)	62	39	-	-
R27 (1.5 m)	62	39	-	-
R28 (1.5 m)	62	40	-	-
R29 (1.5 m)	62	40	-	-
R30 (1.5 m)	62	40	-	-
R31 (1.5 m)	62	40	-	-
R32 (1.5 m)	62	41	-	-
R33 (1.5 m, 4.5 m)	60	45 / 45	-	-
R34 (1.5 m, 4.5 m)	62	41 / 42	-	-
R35 (1.5 m, 4.5 m)	63	44 / 45	-	-
R36 (1.5 m, 4.5 m)	63	44 / 44	-	-
R37 (1.5 m)	63	37	-	-
R38 (1.5 m)	63	34	-	-
R39 (1.5 m)	63	35	-	-
R40 (1.5 m)	63	38	-	-
R41 (1.5 m)	63	32	-	-
R42 (1.5 m, 4.5 m)	63	32 / 33	-	-
R43 (1.5 m)	63	34	-	-
R44 (1.5 m)	63	36	-	-
R45 (1.5 m)	63	33	-	-
R46 (1.5 m, 4.5 m)	63	44 / 44	-	-
R47 (1.5 m)	60	48	-	-
R48 (1.5 m)	60	41	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R49 (1.5 m)	60	44	-	-
R50 (1.5 m)	70	38	-	N/A
R51 (1.5 m)	50	46	-	-
R52 (1.5 m)	50	46	-	-
R53 (1.5 m)	50	46	-	-
R54 (1.5 m)	60	46	-	-
R55 (1.5 m)	50	46	-	-
R56 (1.5 m)	50	46	-	-
R57 (1.5 m)	50	45	-	-
R58 (1.5 m)	50	45	-	-
R59 (1.5 m)	50	45	-	-
R60 (1.5 m)	50	47	-	-
R61 (1.5 m)	50	45	-	-
R62 (1.5 m)	50	45	-	-
R63 (1.5 m)	50	45	-	-
R64 (1.5 m)	50	44	-	-
R65 (1.5 m)	50	46	-	-
R66 (1.5 m)	50	45	-	-
R67 (1.5 m)	50	44	-	-
R68 (1.5 m)	50	45	-	-
R69 (1.5 m)	50	42	-	-
R70 (1.5 m)	60	40	-	-
R71 (1.5 m)	60	38	-	-
R72 (1.5 m)	60	39	-	-
R73 (1.5 m)	60	36	-	-
R74 (1.5 m)	60	37	-	-
R75 (1.5 m)	60	37	-	-
<b>Construction Scenario 1 – Fitout &amp; Finishes</b>				
R01 (1.5 m)	75	60	-	N/A
R02 (1.5 m)	75	58	-	N/A
R03 (1.5 m, 4.5 m)	75	53 / 53	-	N/A
R04 (1.5 m)	75	61	-	N/A
R05 (1.5 m, 4.5 m)	75	76 / 76	1	N/A
R06 (1.5 m, 4.5 m)	75	70 / 70	-	N/A
R07 (1.5 m)	60	47	-	-
R08 (1.5 m)	60	45	-	-
R09 (1.5 m)	60	48	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R10 (1.5 m)	60	48	-	-
R11 (1.5 m)	60	47	-	-
R12 (1.5 m)	60	34	-	-
R13 (1.5 m)	60	41	-	-
R14 (1.5 m)	60	34	-	-
R15 (1.5 m)	60	50	-	-
R16 (1.5 m)	60	48	-	-
R17 (1.5 m)	62	39	-	-
R18 (1.5 m)	62	39	-	-
R19 (1.5 m)	62	39	-	-
R20 (1.5 m)	62	39	-	-
R21 (1.5 m)	62	39	-	-
R22 (1.5 m)	62	40	-	-
R23 (1.5 m)	62	40	-	-
R24 (1.5 m)	62	40	-	-
R25 (1.5 m, 4.5 m)	62	40 / 40	-	-
R26 (1.5 m)	62	40	-	-
R27 (1.5 m)	62	40	-	-
R28 (1.5 m)	62	41	-	-
R29 (1.5 m)	62	41	-	-
R30 (1.5 m)	62	41	-	-
R31 (1.5 m)	62	41	-	-
R32 (1.5 m)	62	42	-	-
R33 (1.5 m, 4.5 m)	60	46 / 46	-	-
R34 (1.5 m, 4.5 m)	62	42 / 43	-	-
R35 (1.5 m, 4.5 m)	63	45 / 46	-	-
R36 (1.5 m, 4.5 m)	63	45 / 45	-	-
R37 (1.5 m)	63	38	-	-
R38 (1.5 m)	63	35	-	-
R39 (1.5 m)	63	36	-	-
R40 (1.5 m)	63	39	-	-
R41 (1.5 m)	63	33	-	-
R42 (1.5 m, 4.5 m)	63	33 / 34	-	-
R43 (1.5 m)	63	35	-	-
R44 (1.5 m)	63	37	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R45 (1.5 m)	63	34	-	-
R46 (1.5 m, 4.5 m)	63	45 / 45	-	-
R47 (1.5 m)	60	49	-	N/A
R48 (1.5 m)	60	42	-	N/A
R49 (1.5 m)	60	45	-	N/A
R50 (1.5 m)	70	39	-	N/A
R51 (1.5 m)	50	47	-	-
R52 (1.5 m)	50	47	-	-
R53 (1.5 m)	50	47	-	-
R54 (1.5 m)	60	47	-	-
R55 (1.5 m)	50	47	-	-
R56 (1.5 m)	50	47	-	-
R57 (1.5 m)	50	46	-	-
R58 (1.5 m)	50	46	-	-
R59 (1.5 m)	50	46	-	-
R60 (1.5 m)	50	48	-	-
R61 (1.5 m)	50	46	-	-
R62 (1.5 m)	50	46	-	-
R63 (1.5 m)	50	46	-	-
R64 (1.5 m)	50	45	-	-
R65 (1.5 m)	50	47	-	-
R66 (1.5 m)	50	46	-	-
R67 (1.5 m)	50	45	-	-
R68 (1.5 m)	50	46	-	-
R69 (1.5 m)	50	43	-	-
R70 (1.5 m)	60	41	-	-
R71 (1.5 m)	60	39	-	-
R72 (1.5 m)	60	40	-	-
R73 (1.5 m)	60	37	-	-
R74 (1.5 m)	60	38	-	-
R75 (1.5 m)	60	38	-	-
<b>Construction Scenario 2 – Site Clearance</b>				
R01 (1.5 m)	75	71	-	N/A
R02 (1.5 m)	75	75	-	N/A
R03 (1.5 m, 4.5 m)	75	65 / 66	-	N/A
R04 (1.5 m)	75	65	-	N/A
R05 (1.5 m, 4.5 m)	75	70 / 71	-	N/A

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R06 (1.5 m, 4.5 m)	75	71 / 72	-	N/A
R07 (1.5 m)	60	50	-	-
R08 (1.5 m)	60	48	-	-
R09 (1.5 m)	60	54	-	-
R10 (1.5 m)	60	55	-	-
R11 (1.5 m)	60	49	-	-
R12 (1.5 m)	60	39	-	-
R13 (1.5 m)	60	44	-	-
R14 (1.5 m)	60	39	-	-
R15 (1.5 m)	60	56	-	-
R16 (1.5 m)	60	56	-	-
R17 (1.5 m)	62	42	-	-
R18 (1.5 m)	62	42	-	-
R19 (1.5 m)	62	42	-	-
R20 (1.5 m)	62	42	-	-
R21 (1.5 m)	62	42	-	-
R22 (1.5 m)	62	42	-	-
R23 (1.5 m)	62	42	-	-
R24 (1.5 m)	62	42	-	-
R25 (1.5 m, 4.5 m)	62	42 / 43	-	-
R26 (1.5 m)	62	43	-	-
R27 (1.5 m)	62	43	-	-
R28 (1.5 m)	62	43	-	-
R29 (1.5 m)	62	43	-	-
R30 (1.5 m)	62	44	-	-
R31 (1.5 m)	62	44	-	-
R32 (1.5 m)	62	44	-	-
R33 (1.5 m, 4.5 m)	60	49 / 49	-	-
R34 (1.5 m, 4.5 m)	62	44 / 45	-	-
R35 (1.5 m, 4.5 m)	63	48 / 49	-	-
R36 (1.5 m, 4.5 m)	63	47 / 48	-	-
R37 (1.5 m)	63	40	-	-
R38 (1.5 m)	63	38	-	-
R39 (1.5 m)	63	39	-	-
R40 (1.5 m)	63	41	-	-



Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R41 (1.5 m)	63	36	-	-
R42 (1.5 m, 4.5 m)	63	36 / 36	-	-
R43 (1.5 m)	63	37	-	-
R44 (1.5 m)	63	38	-	-
R45 (1.5 m)	63	35	-	-
R46 (1.5 m, 4.5 m)	63	48 / 49	-	-
R47 (1.5 m)	60	48	-	N/A
R48 (1.5 m)	60	42	-	N/A
R49 (1.5 m)	60	45	-	N/A
R50 (1.5 m)	70	42	-	N/A
R51 (1.5 m)	50	52	2	-
R52 (1.5 m)	50	53	3	-
R53 (1.5 m)	50	53	3	-
R54 (1.5 m)	60	52	-	-
R55 (1.5 m)	50	53	3	-
R56 (1.5 m)	50	53	3	-
R57 (1.5 m)	50	52	2	-
R58 (1.5 m)	50	52	2	-
R59 (1.5 m)	50	53	3	-
R60 (1.5 m)	50	53	3	-
R61 (1.5 m)	50	51	1	-
R62 (1.5 m)	50	52	2	-
R63 (1.5 m)	50	51	1	-
R64 (1.5 m)	50	52	2	-
R65 (1.5 m)	50	51	1	-
R66 (1.5 m)	50	51	1	-
R67 (1.5 m)	50	49	-	-
R68 (1.5 m)	50	51	1	-
R69 (1.5 m)	50	48	-	-
R70 (1.5 m)	60	46	-	-
R71 (1.5 m)	60	44	-	-
R72 (1.5 m)	60	45	-	-
R73 (1.5 m)	60	42	-	-
R74 (1.5 m)	60	42	-	-
R75 (1.5 m)	60	41	-	-
<b>Construction Scenario 2 – Piling Works</b>				
R01 (1.5 m)	75	67	-	N/A
R02 (1.5 m)	75	71	-	N/A

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R03 (1.5 m, 4.5 m)	75	61 / 62	-	N/A
R04 (1.5 m)	75	61	-	N/A
R05 (1.5 m, 4.5 m)	75	66 / 67	-	N/A
R06 (1.5 m, 4.5 m)	75	67 / 68	-	N/A
R07 (1.5 m)	60	46	-	-
R08 (1.5 m)	60	44	-	-
R09 (1.5 m)	60	50	-	-
R10 (1.5 m)	60	51	-	-
R11 (1.5 m)	60	45	-	-
R12 (1.5 m)	60	35	-	-
R13 (1.5 m)	60	40	-	-
R14 (1.5 m)	60	35	-	-
R15 (1.5 m)	60	52	-	-
R16 (1.5 m)	60	52	-	-
R17 (1.5 m)	62	38	-	-
R18 (1.5 m)	62	38	-	-
R19 (1.5 m)	62	38	-	-
R20 (1.5 m)	62	38	-	-
R21 (1.5 m)	62	38	-	-
R22 (1.5 m)	62	38	-	-
R23 (1.5 m)	62	38	-	-
R24 (1.5 m)	62	38	-	-
R25 (1.5 m, 4.5 m)	62	38 / 39	-	-
R26 (1.5 m)	62	39	-	-
R27 (1.5 m)	62	39	-	-
R28 (1.5 m)	62	39	-	-
R29 (1.5 m)	62	39	-	-
R30 (1.5 m)	62	40	-	-
R31 (1.5 m)	62	40	-	-
R32 (1.5 m)	62	40	-	-
R33 (1.5 m, 4.5 m)	60	45 / 45	-	-
R34 (1.5 m, 4.5 m)	62	40 / 41	-	-
R35 (1.5 m, 4.5 m)	63	44 / 45	-	-
R36 (1.5 m, 4.5 m)	63	43 / 44	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R37 (1.5 m)	63	36	-	-
R38 (1.5 m)	63	34	-	-
R39 (1.5 m)	63	35	-	-
R40 (1.5 m)	63	37	-	-
R41 (1.5 m)	63	32	-	-
R42 (1.5 m, 4.5 m)	63	32 / 32	-	-
R43 (1.5 m)	63	33	-	-
R44 (1.5 m)	63	34	-	-
R45 (1.5 m)	63	31	-	-
R46 (1.5 m, 4.5 m)	63	44 / 45	-	-
R47 (1.5 m)	60	44	-	N/A
R48 (1.5 m)	60	38	-	N/A
R49 (1.5 m)	60	41	-	N/A
R50 (1.5 m)	70	38	-	N/A
R51 (1.5 m)	50	48	-	-
R52 (1.5 m)	50	49	-	-
R53 (1.5 m)	50	49	-	-
R54 (1.5 m)	60	48	-	-
R55 (1.5 m)	50	49	-	-
R56 (1.5 m)	50	49	-	-
R57 (1.5 m)	50	48	-	-
R58 (1.5 m)	50	48	-	-
R59 (1.5 m)	50	49	-	-
R60 (1.5 m)	50	49	-	-
R61 (1.5 m)	50	47	-	-
R62 (1.5 m)	50	48	-	-
R63 (1.5 m)	50	47	-	-
R64 (1.5 m)	50	48	-	-
R65 (1.5 m)	50	47	-	-
R66 (1.5 m)	50	47	-	-
R67 (1.5 m)	50	45	-	-
R68 (1.5 m)	50	47	-	-
R69 (1.5 m)	50	44	-	-
R70 (1.5 m)	60	42	-	-
R71 (1.5 m)	60	40	-	-
R72 (1.5 m)	60	41	-	-
R73 (1.5 m)	60	38	-	-
R74 (1.5 m)	60	38	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R75 (1.5 m)	60	37	-	-
<b>Construction Scenario 2 – Structure Construction</b>				
R01 (1.5 m)	75	67	-	N/A
R02 (1.5 m)	75	71	-	N/A
R03 (1.5 m, 4.5 m)	75	61 / 62	-	N/A
R04 (1.5 m)	75	61	-	N/A
R05 (1.5 m, 4.5 m)	75	66 / 67	-	N/A
R06 (1.5 m, 4.5 m)	75	67 / 68	-	N/A
R07 (1.5 m)	60	46	-	-
R08 (1.5 m)	60	44	-	-
R09 (1.5 m)	60	50	-	-
R10 (1.5 m)	60	51	-	-
R11 (1.5 m)	60	45	-	-
R12 (1.5 m)	60	35	-	-
R13 (1.5 m)	60	40	-	-
R14 (1.5 m)	60	35	-	-
R15 (1.5 m)	60	52	-	-
R16 (1.5 m)	60	52	-	-
R17 (1.5 m)	62	38	-	-
R18 (1.5 m)	62	38	-	-
R19 (1.5 m)	62	38	-	-
R20 (1.5 m)	62	38	-	-
R21 (1.5 m)	62	38	-	-
R22 (1.5 m)	62	38	-	-
R23 (1.5 m)	62	38	-	-
R24 (1.5 m)	62	38	-	-
R25 (1.5 m, 4.5 m)	62	38 / 39	-	-
R26 (1.5 m)	62	39	-	-
R27 (1.5 m)	62	39	-	-
R28 (1.5 m)	62	39	-	-
R29 (1.5 m)	62	39	-	-
R30 (1.5 m)	62	40	-	-
R31 (1.5 m)	62	40	-	-
R32 (1.5 m)	62	40	-	-
R33 (1.5 m, 4.5 m)	60	45 / 45	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R34 (1.5 m, 4.5 m)	62	40 / 41	-	-
R35 (1.5 m, 4.5 m)	63	44 / 45	-	-
R36 (1.5 m, 4.5 m)	63	43 / 44	-	-
R37 (1.5 m)	63	36	-	-
R38 (1.5 m)	63	34	-	-
R39 (1.5 m)	63	35	-	-
R40 (1.5 m)	63	37	-	-
R41 (1.5 m)	63	32	-	-
R42 (1.5 m, 4.5 m)	63	32 / 32	-	-
R43 (1.5 m)	63	33	-	-
R44 (1.5 m)	63	34	-	-
R45 (1.5 m)	63	31	-	-
R46 (1.5 m, 4.5 m)	63	44 / 45	-	-
R47 (1.5 m)	60	44	-	N/A
R48 (1.5 m)	60	38	-	N/A
R49 (1.5 m)	60	41	-	N/A
R50 (1.5 m)	70	38	-	N/A
R51 (1.5 m)	50	48	-	-
R52 (1.5 m)	50	49	-	-
R53 (1.5 m)	50	49	-	-
R54 (1.5 m)	60	48	-	-
R55 (1.5 m)	50	49	-	-
R56 (1.5 m)	50	49	-	-
R57 (1.5 m)	50	48	-	-
R58 (1.5 m)	50	48	-	-
R59 (1.5 m)	50	49	-	-
R60 (1.5 m)	50	49	-	-
R61 (1.5 m)	50	47	-	-
R62 (1.5 m)	50	48	-	-
R63 (1.5 m)	50	47	-	-
R64 (1.5 m)	50	48	-	-
R65 (1.5 m)	50	47	-	-
R66 (1.5 m)	50	47	-	-
R67 (1.5 m)	50	45	-	-
R68 (1.5 m)	50	47	-	-
R69 (1.5 m)	50	44	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R70 (1.5 m)	60	42	-	-
R71 (1.5 m)	60	40	-	-
R72 (1.5 m)	60	41	-	-
R73 (1.5 m)	60	38	-	-
R74 (1.5 m)	60	38	-	-
R75 (1.5 m)	60	37	-	-
<b>Construction Scenario 2 – Fitout &amp; Finishes</b>				
R01 (1.5 m)	75	68	-	N/A
R02 (1.5 m)	75	72	-	N/A
R03 (1.5 m, 4.5 m)	75	62 / 63	-	N/A
R04 (1.5 m)	75	62	-	N/A
R05 (1.5 m, 4.5 m)	75	67 / 68	-	N/A
R06 (1.5 m, 4.5 m)	75	68 / 69	-	N/A
R07 (1.5 m)	60	47	-	-
R08 (1.5 m)	60	45	-	-
R09 (1.5 m)	60	51	-	-
R10 (1.5 m)	60	52	-	-
R11 (1.5 m)	60	46	-	-
R12 (1.5 m)	60	36	-	-
R13 (1.5 m)	60	41	-	-
R14 (1.5 m)	60	36	-	-
R15 (1.5 m)	60	53	-	-
R16 (1.5 m)	60	53	-	-
R17 (1.5 m)	62	39	-	-
R18 (1.5 m)	62	39	-	-
R19 (1.5 m)	62	39	-	-
R20 (1.5 m)	62	39	-	-
R21 (1.5 m)	62	39	-	-
R22 (1.5 m)	62	39	-	-
R23 (1.5 m)	62	39	-	-
R24 (1.5 m)	62	39	-	-
R25 (1.5 m, 4.5 m)	62	39 / 40	-	-
R26 (1.5 m)	62	40	-	-
R27 (1.5 m)	62	40	-	-
R28 (1.5 m)	62	40	-	-
R29 (1.5 m)	62	40	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R30 (1.5 m)	62	41	-	-
R31 (1.5 m)	62	41	-	-
R32 (1.5 m)	62	41	-	-
R33 (1.5 m, 4.5 m)	60	46 / 46	-	-
R34 (1.5 m, 4.5 m)	62	41 / 42	-	-
R35 (1.5 m, 4.5 m)	63	45 / 46	-	-
R36 (1.5 m, 4.5 m)	63	44 / 45	-	-
R37 (1.5 m)	63	37	-	-
R38 (1.5 m)	63	35	-	-
R39 (1.5 m)	63	36	-	-
R40 (1.5 m)	63	38	-	-
R41 (1.5 m)	63	33	-	-
R42 (1.5 m, 4.5 m)	63	33 / 33	-	-
R43 (1.5 m)	63	34	-	-
R44 (1.5 m)	63	35	-	-
R45 (1.5 m)	63	32	-	-
R46 (1.5 m, 4.5 m)	63	45 / 46	-	-
R47 (1.5 m)	60	45	-	N/A
R48 (1.5 m)	60	39	-	N/A
R49 (1.5 m)	60	42	-	N/A
R50 (1.5 m)	70	39	-	N/A
R51 (1.5 m)	50	49	-	-
R52 (1.5 m)	50	50	-	-
R53 (1.5 m)	50	50	-	-
R54 (1.5 m)	60	49	-	-
R55 (1.5 m)	50	50	-	-
R56 (1.5 m)	50	50	-	-
R57 (1.5 m)	50	49	-	-
R58 (1.5 m)	50	49	-	-
R59 (1.5 m)	50	50	-	-
R60 (1.5 m)	50	50	-	-
R61 (1.5 m)	50	48	-	-
R62 (1.5 m)	50	49	-	-
R63 (1.5 m)	50	48	-	-
R64 (1.5 m)	50	49	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R65 (1.5 m)	50	48	-	-
R66 (1.5 m)	50	48	-	-
R67 (1.5 m)	50	46	-	-
R68 (1.5 m)	50	48	-	-
R69 (1.5 m)	50	45	-	-
R70 (1.5 m)	60	43	-	-
R71 (1.5 m)	60	41	-	-
R72 (1.5 m)	60	42	-	-
R73 (1.5 m)	60	39	-	-
R74 (1.5 m)	60	39	-	-
R75 (1.5 m)	60	38	-	-
<b>Construction Scenario 3 – Site Clearance</b>				
R01 (1.5 m)	75	80	5	N/A
R02 (1.5 m)	75	73	-	N/A
R03 (1.5 m, 4.5 m)	75	65 / 66	-	N/A
R04 (1.5 m)	75	62	-	N/A
R05 (1.5 m, 4.5 m)	75	71 / 72	-	N/A
R06 (1.5 m, 4.5 m)	75	75 / 75	-	N/A
R07 (1.5 m)	60	50	-	-
R08 (1.5 m)	60	48	-	-
R09 (1.5 m)	60	48	-	-
R10 (1.5 m)	60	54	-	-
R11 (1.5 m)	60	49	-	-
R12 (1.5 m)	60	39	-	-
R13 (1.5 m)	60	44	-	-
R14 (1.5 m)	60	40	-	-
R15 (1.5 m)	60	56	-	-
R16 (1.5 m)	60	55	-	-
R17 (1.5 m)	62	42	-	-
R18 (1.5 m)	62	42	-	-
R19 (1.5 m)	62	42	-	-
R20 (1.5 m)	62	42	-	-
R21 (1.5 m)	62	42	-	-
R22 (1.5 m)	62	42	-	-
R23 (1.5 m)	62	42	-	-
R24 (1.5 m)	62	43	-	-



Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R25 (1.5 m, 4.5 m)	62	42 / 43	-	-
R26 (1.5 m)	62	43	-	-
R27 (1.5 m)	62	43	-	-
R28 (1.5 m)	62	43	-	-
R29 (1.5 m)	62	43	-	-
R30 (1.5 m)	62	44	-	-
R31 (1.5 m)	62	44	-	-
R32 (1.5 m)	62	44	-	-
R33 (1.5 m, 4.5 m)	60	49 / 49	-	-
R34 (1.5 m, 4.5 m)	62	44 / 45	-	-
R35 (1.5 m, 4.5 m)	63	49 / 50	-	-
R36 (1.5 m, 4.5 m)	63	48 / 48	-	-
R37 (1.5 m)	63	43	-	-
R38 (1.5 m)	63	43	-	-
R39 (1.5 m)	63	42	-	-
R40 (1.5 m)	63	42	-	-
R41 (1.5 m)	63	43	-	-
R42 (1.5 m, 4.5 m)	63	43 / 43	-	-
R43 (1.5 m)	63	38	-	-
R44 (1.5 m)	63	40	-	-
R45 (1.5 m)	63	40	-	-
R46 (1.5 m, 4.5 m)	63	48 / 49	-	-
R47 (1.5 m)	60	48	-	N/A
R48 (1.5 m)	60	42	-	N/A
R49 (1.5 m)	60	45	-	N/A
R50 (1.5 m)	70	42	-	N/A
R51 (1.5 m)	50	51	1	-
R52 (1.5 m)	50	53	3	-
R53 (1.5 m)	50	53	3	-
R54 (1.5 m)	60	52	-	-
R55 (1.5 m)	50	53	3	-
R56 (1.5 m)	50	53	3	-
R57 (1.5 m)	50	52	2	-
R58 (1.5 m)	50	52	2	-



Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R59 (1.5 m)	50	51	1	-
R60 (1.5 m)	50	51	1	-
R61 (1.5 m)	50	46	-	-
R62 (1.5 m)	50	51	1	-
R63 (1.5 m)	50	51	1	-
R64 (1.5 m)	50	51	1	-
R65 (1.5 m)	50	48	-	-
R66 (1.5 m)	50	51	1	-
R67 (1.5 m)	50	49	-	-
R68 (1.5 m)	50	49	-	-
R69 (1.5 m)	50	48	-	-
R70 (1.5 m)	60	46	-	-
R71 (1.5 m)	60	45	-	-
R72 (1.5 m)	60	45	-	-
R73 (1.5 m)	60	40	-	-
R74 (1.5 m)	60	39	-	-
R75 (1.5 m)	60	41	-	-
<b>Construction Scenario 3 – Excavation of existing piles</b>				
R01 (1.5 m)	75	78	3	N/A
R02 (1.5 m)	75	71	-	N/A
R03 (1.5 m, 4.5 m)	75	63 / 64	-	N/A
R04 (1.5 m)	75	60	-	N/A
R05 (1.5 m, 4.5 m)	75	69 / 70	-	N/A
R06 (1.5 m, 4.5 m)	75	73 / 73	-	N/A
R07 (1.5 m)	60	48	-	-
R08 (1.5 m)	60	46	-	-
R09 (1.5 m)	60	46	-	-
R10 (1.5 m)	60	52	-	-
R11 (1.5 m)	60	47	-	-
R12 (1.5 m)	60	37	-	-
R13 (1.5 m)	60	42	-	-
R14 (1.5 m)	60	38	-	-
R15 (1.5 m)	60	54	-	-
R16 (1.5 m)	60	53	-	-
R17 (1.5 m)	62	40	-	-
R18 (1.5 m)	62	40	-	-
R19 (1.5 m)	62	40	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R20 (1.5 m)	62	40	-	-
R21 (1.5 m)	62	40	-	-
R22 (1.5 m)	62	40	-	-
R23 (1.5 m)	62	40	-	-
R24 (1.5 m)	62	41	-	-
R25 (1.5 m, 4.5 m)	62	40 / 41	-	-
R26 (1.5 m)	62	41	-	-
R27 (1.5 m)	62	41	-	-
R28 (1.5 m)	62	41	-	-
R29 (1.5 m)	62	41	-	-
R30 (1.5 m)	62	42	-	-
R31 (1.5 m)	62	42	-	-
R32 (1.5 m)	62	42	-	-
R33 (1.5 m, 4.5 m)	60	47 / 47	-	-
R34 (1.5 m, 4.5 m)	62	42 / 43	-	-
R35 (1.5 m, 4.5 m)	63	47 / 48	-	-
R36 (1.5 m, 4.5 m)	63	46 / 46	-	-
R37 (1.5 m)	63	41	-	-
R38 (1.5 m)	63	41	-	-
R39 (1.5 m)	63	40	-	-
R40 (1.5 m)	63	40	-	-
R41 (1.5 m)	63	41	-	-
R42 (1.5 m, 4.5 m)	63	41 / 41	-	-
R43 (1.5 m)	63	36	-	-
R44 (1.5 m)	63	38	-	-
R45 (1.5 m)	63	38	-	-
R46 (1.5 m, 4.5 m)	63	46 / 47	-	-
R47 (1.5 m)	60	46	-	N/A
R48 (1.5 m)	60	40	-	N/A
R49 (1.5 m)	60	43	-	N/A
R50 (1.5 m)	70	40	-	N/A
R51 (1.5 m)	50	49	-	-
R52 (1.5 m)	50	51	1	-
R53 (1.5 m)	50	51	1	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R54 (1.5 m)	60	50	-	-
R55 (1.5 m)	50	51	1	-
R56 (1.5 m)	50	51	1	-
R57 (1.5 m)	50	50	-	-
R58 (1.5 m)	50	50	-	-
R59 (1.5 m)	50	49	-	-
R60 (1.5 m)	50	49	-	-
R61 (1.5 m)	50	44	-	-
R62 (1.5 m)	50	49	-	-
R63 (1.5 m)	50	49	-	-
R64 (1.5 m)	50	49	-	-
R65 (1.5 m)	50	46	-	-
R66 (1.5 m)	50	49	-	-
R67 (1.5 m)	50	47	-	-
R68 (1.5 m)	50	47	-	-
R69 (1.5 m)	50	46	-	-
R70 (1.5 m)	60	44	-	-
R71 (1.5 m)	60	43	-	-
R72 (1.5 m)	60	43	-	-
R73 (1.5 m)	60	38	-	-
R74 (1.5 m)	60	37	-	-
R75 (1.5 m)	60	39	-	-
<b>Construction Scenario 3 – Piling works</b>				
R01 (1.5 m)	75	76	1	N/A
R02 (1.5 m)	75	69	-	N/A
R03 (1.5 m, 4.5 m)	75	61 / 62	-	N/A
R04 (1.5 m)	75	58	-	N/A
R05 (1.5 m, 4.5 m)	75	67 / 68	-	N/A
R06 (1.5 m, 4.5 m)	75	71 / 71	-	N/A
R07 (1.5 m)	60	46	-	-
R08 (1.5 m)	60	44	-	-
R09 (1.5 m)	60	44	-	-
R10 (1.5 m)	60	50	-	-
R11 (1.5 m)	60	45	-	-
R12 (1.5 m)	60	35	-	-
R13 (1.5 m)	60	40	-	-
R14 (1.5 m)	60	36	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R15 (1.5 m)	60	52	-	-
R16 (1.5 m)	60	51	-	-
R17 (1.5 m)	62	38	-	-
R18 (1.5 m)	62	38	-	-
R19 (1.5 m)	62	38	-	-
R20 (1.5 m)	62	38	-	-
R21 (1.5 m)	62	38	-	-
R22 (1.5 m)	62	38	-	-
R23 (1.5 m)	62	38	-	-
R24 (1.5 m)	62	39	-	-
R25 (1.5 m, 4.5 m)	62	38 / 39	-	-
R26 (1.5 m)	62	39	-	-
R27 (1.5 m)	62	39	-	-
R28 (1.5 m)	62	39	-	-
R29 (1.5 m)	62	39	-	-
R30 (1.5 m)	62	40	-	-
R31 (1.5 m)	62	40	-	-
R32 (1.5 m)	62	40	-	-
R33 (1.5 m, 4.5 m)	60	45 / 45	-	-
R34 (1.5 m, 4.5 m)	62	40 / 41	-	-
R35 (1.5 m, 4.5 m)	63	45 / 46	-	-
R36 (1.5 m, 4.5 m)	63	44 / 44	-	-
R37 (1.5 m)	63	39	-	-
R38 (1.5 m)	63	39	-	-
R39 (1.5 m)	63	38	-	-
R40 (1.5 m)	63	38	-	-
R41 (1.5 m)	63	39	-	-
R42 (1.5 m, 4.5 m)	63	39 / 39	-	-
R43 (1.5 m)	63	34	-	-
R44 (1.5 m)	63	36	-	-
R45 (1.5 m)	63	36	-	-
R46 (1.5 m, 4.5 m)	63	44 / 45	-	-
R47 (1.5 m)	60	44	-	N/A
R48 (1.5 m)	60	38	-	N/A

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R49 (1.5 m)	60	41	-	N/A
R50 (1.5 m)	70	38	-	N/A
R51 (1.5 m)	50	47	-	-
R52 (1.5 m)	50	49	-	-
R53 (1.5 m)	50	49	-	-
R54 (1.5 m)	60	48	-	-
R55 (1.5 m)	50	49	-	-
R56 (1.5 m)	50	49	-	-
R57 (1.5 m)	50	48	-	-
R58 (1.5 m)	50	48	-	-
R59 (1.5 m)	50	47	-	-
R60 (1.5 m)	50	47	-	-
R61 (1.5 m)	50	42	-	-
R62 (1.5 m)	50	47	-	-
R63 (1.5 m)	50	47	-	-
R64 (1.5 m)	50	47	-	-
R65 (1.5 m)	50	44	-	-
R66 (1.5 m)	50	47	-	-
R67 (1.5 m)	50	45	-	-
R68 (1.5 m)	50	45	-	-
R69 (1.5 m)	50	44	-	-
R70 (1.5 m)	60	42	-	-
R71 (1.5 m)	60	41	-	-
R72 (1.5 m)	60	41	-	-
R73 (1.5 m)	60	36	-	-
R74 (1.5 m)	60	35	-	-
R75 (1.5 m)	60	37	-	-
<b>Construction Scenario 3 – Structure Construction</b>				
R01 (1.5 m)	75	76	1	N/A
R02 (1.5 m)	75	69	-	N/A
R03 (1.5 m, 4.5 m)	75	61 / 62	-	N/A
R04 (1.5 m)	75	58	-	N/A
R05 (1.5 m, 4.5 m)	75	67 / 68	-	N/A
R06 (1.5 m, 4.5 m)	75	71 / 71	-	N/A
R07 (1.5 m)	60	46	-	-
R08 (1.5 m)	60	44	-	-
R09 (1.5 m)	60	44	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R10 (1.5 m)	60	50	-	-
R11 (1.5 m)	60	45	-	-
R12 (1.5 m)	60	35	-	-
R13 (1.5 m)	60	40	-	-
R14 (1.5 m)	60	36	-	-
R15 (1.5 m)	60	52	-	-
R16 (1.5 m)	60	51	-	-
R17 (1.5 m)	62	38	-	-
R18 (1.5 m)	62	38	-	-
R19 (1.5 m)	62	38	-	-
R20 (1.5 m)	62	38	-	-
R21 (1.5 m)	62	38	-	-
R22 (1.5 m)	62	38	-	-
R23 (1.5 m)	62	38	-	-
R24 (1.5 m)	62	39	-	-
R25 (1.5 m, 4.5 m)	62	38 / 39	-	-
R26 (1.5 m)	62	39	-	-
R27 (1.5 m)	62	39	-	-
R28 (1.5 m)	62	39	-	-
R29 (1.5 m)	62	39	-	-
R30 (1.5 m)	62	40	-	-
R31 (1.5 m)	62	40	-	-
R32 (1.5 m)	62	40	-	-
R33 (1.5 m, 4.5 m)	60	45 / 45	-	-
R34 (1.5 m, 4.5 m)	62	40 / 41	-	-
R35 (1.5 m, 4.5 m)	63	45 / 46	-	-
R36 (1.5 m, 4.5 m)	63	44 / 44	-	-
R37 (1.5 m)	63	39	-	-
R38 (1.5 m)	63	39	-	-
R39 (1.5 m)	63	38	-	-
R40 (1.5 m)	63	38	-	-
R41 (1.5 m)	63	39	-	-
R42 (1.5 m, 4.5 m)	63	39 / 39	-	-
R43 (1.5 m)	63	34	-	-
R44 (1.5 m)	63	36	-	-

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R45 (1.5 m)	63	36	-	-
R46 (1.5 m, 4.5 m)	63	44 / 45	-	-
R47 (1.5 m)	60	44	-	N/A
R48 (1.5 m)	60	38	-	N/A
R49 (1.5 m)	60	41	-	N/A
R50 (1.5 m)	70	38	-	N/A
R51 (1.5 m)	50	47	-	-
R52 (1.5 m)	50	49	-	-
R53 (1.5 m)	50	49	-	-
R54 (1.5 m)	60	48	-	-
R55 (1.5 m)	50	49	-	-
R56 (1.5 m)	50	49	-	-
R57 (1.5 m)	50	48	-	-
R58 (1.5 m)	50	48	-	-
R59 (1.5 m)	50	47	-	-
R60 (1.5 m)	50	47	-	-
R61 (1.5 m)	50	42	-	-
R62 (1.5 m)	50	47	-	-
R63 (1.5 m)	50	47	-	-
R64 (1.5 m)	50	47	-	-
R65 (1.5 m)	50	44	-	-
R66 (1.5 m)	50	47	-	-
R67 (1.5 m)	50	45	-	-
R68 (1.5 m)	50	45	-	-
R69 (1.5 m)	50	44	-	-
R70 (1.5 m)	60	42	-	-
R71 (1.5 m)	60	41	-	-
R72 (1.5 m)	60	41	-	-
R73 (1.5 m)	60	36	-	-
R74 (1.5 m)	60	35	-	-
R75 (1.5 m)	60	37	-	-
<b>Construction Scenario 3 – Fitout &amp; Finishes</b>				
R01 (1.5 m)	75	77	2	N/A
R02 (1.5 m)	75	70	-	N/A
R03 (1.5 m, 4.5 m)	75	62 / 63	-	N/A
R04 (1.5 m)	75	59	-	N/A
R05 (1.5 m, 4.5 m)	75	68 / 69	-	N/A

Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R06 (1.5 m, 4.5 m)	75	72 / 72	-	N/A
R07 (1.5 m)	60	47	-	-
R08 (1.5 m)	60	45	-	-
R09 (1.5 m)	60	45	-	-
R10 (1.5 m)	60	51	-	-
R11 (1.5 m)	60	46	-	-
R12 (1.5 m)	60	36	-	-
R13 (1.5 m)	60	41	-	-
R14 (1.5 m)	60	37	-	-
R15 (1.5 m)	60	53	-	-
R16 (1.5 m)	60	52	-	-
R17 (1.5 m)	62	39	-	-
R18 (1.5 m)	62	39	-	-
R19 (1.5 m)	62	39	-	-
R20 (1.5 m)	62	39	-	-
R21 (1.5 m)	62	39	-	-
R22 (1.5 m)	62	39	-	-
R23 (1.5 m)	62	39	-	-
R24 (1.5 m)	62	40	-	-
R25 (1.5 m, 4.5 m)	62	39 / 40	-	-
R26 (1.5 m)	62	40	-	-
R27 (1.5 m)	62	40	-	-
R28 (1.5 m)	62	40	-	-
R29 (1.5 m)	62	40	-	-
R30 (1.5 m)	62	41	-	-
R31 (1.5 m)	62	41	-	-
R32 (1.5 m)	62	41	-	-
R33 (1.5 m, 4.5 m)	60	46 / 46	-	-
R34 (1.5 m, 4.5 m)	62	41 / 42	-	-
R35 (1.5 m, 4.5 m)	63	46 / 47	-	-
R36 (1.5 m, 4.5 m)	63	45 / 45	-	-
R37 (1.5 m)	63	40	-	-
R38 (1.5 m)	63	40	-	-
R39 (1.5 m)	63	39	-	-
R40 (1.5 m)	63	39	-	-



Receiver (Height from ground (m))	Noise management level	Predicted Levels (dB(A))	Exceedance	Highly noise affected
R41 (1.5 m)	63	40	-	-
R42 (1.5 m, 4.5 m)	63	40 / 40	-	-
R43 (1.5 m)	63	35	-	-
R44 (1.5 m)	63	37	-	-
R45 (1.5 m)	63	37	-	-
R46 (1.5 m, 4.5 m)	63	45 / 46	-	-
R47 (1.5 m)	60	45	-	N/A
R48 (1.5 m)	60	39	-	N/A
R49 (1.5 m)	60	42	-	N/A
R50 (1.5 m)	70	39	-	N/A
R51 (1.5 m)	50	48	-	-
R52 (1.5 m)	50	50	-	-
R53 (1.5 m)	50	50	-	-
R54 (1.5 m)	60	49	-	-
R55 (1.5 m)	50	50	-	-
R56 (1.5 m)	50	50	-	-
R57 (1.5 m)	50	49	-	-
R58 (1.5 m)	50	49	-	-
R59 (1.5 m)	50	48	-	-
R60 (1.5 m)	50	48	-	-
R61 (1.5 m)	50	43	-	-
R62 (1.5 m)	50	48	-	-
R63 (1.5 m)	50	48	-	-
R64 (1.5 m)	50	48	-	-
R65 (1.5 m)	50	45	-	-
R66 (1.5 m)	50	48	-	-
R67 (1.5 m)	50	46	-	-
R68 (1.5 m)	50	46	-	-
R69 (1.5 m)	50	45	-	-
R70 (1.5 m)	60	43	-	-
R71 (1.5 m)	60	42	-	-
R72 (1.5 m)	60	42	-	-
R73 (1.5 m)	60	37	-	-
R74 (1.5 m)	60	36	-	-
R75 (1.5 m)	60	38	-	-

As presented within **Table 16 above**, minor exceedances are predicted for the nearby industrial receivers (Specifically, Receiver 01 & 05) by up to 5 dB. Additional exceedances are predicted for multiple residential receivers (namely those located within NCA01B) ranging from 1 – 3 dB above the construction noise management level. No



sensitive receivers have been identified to be highly noise affected by the any stages of the proposed construction works, particularly the nearest sensitive receiver locations.

Provided in Section 7.1 is a summary of recommended management and mitigation measures which should be followed to reduce the impacts on the surrounding receivers / local community.

#### 4.6 Construction traffic noise assessment

Construction traffic movements will occur on Power Street, Glendenning Road, and Woodstock Avenue, which are all classed as sub-arterial roads. Residential receivers are located along Woodstock Avenue and Power Street to the west of the project site only. As such, traffic noise impacts to the industrial receivers located along Glendenning Road have not been considered.

Based on a review of the forecasted construction traffic movements, the anticipated truck and vehicle movements would be:

- Construction Scenarios:
  - Up to 7 heavy vehicles per day (typical);
  - Localised periods during concrete pours of up to 30 per day.

Equating to a worst-case construction traffic scenario of 37 heavy vehicles per day.

The noise propagation algorithm Calculation of Road Traffic Noise (CoRTN) has been proven to effectively calculate road traffic noise from free-flowing traffic throughout Australia. Construction noise levels have been predicted for noise sensitive receivers along Power Street and Woodstock Avenue (all classed as Sub-arterial roads).

Presented in **Table 17** is the predicted existing and predicted worst-case construction noise impacts, assessed against the applicable criteria.

The additional car / truck volumes would increase noise levels by approximately 0.1 dB in the peak AM period, with an increase for the afternoon peak of approximately 0.2 dB.

**Table 17 Worst-case construction traffic noise impacts.**

Period	Criteria	Existing, dB(A)	Future, dB(A)	Change in noise, dB
<b>Construction Traffic Noise Impacts</b>				
<b>Woodstock Avenue (AM peak)</b>	$L_{Aeq(15\text{ hour})}$ External 60 dB(A)	73.6	73.7	0.1
<b>Woodstock Avenue (afternoon peak)</b>	$L_{Aeq(15\text{ hour})}$ External 60 dB(A)	73.7	73.8	0.1
<b>Power Street (AM Peak)</b>	$L_{Aeq(15\text{ hour})}$ External 60 dB(A)	69.6	69.8	0.2
<b>Power Street (afternoon Peak)</b>	$L_{Aeq(15\text{ hour})}$ External 60 dB(A)	72.2	72.3	0.1

As evident in **Table 17** above, the existing road traffic noise resulting from both Woodstock and Power Street exceeds the sub-arterial road noise criteria at the nearest residential receivers, however the predicted change in noise levels as a result of the development is less than 0.3 dB. It is therefore not considered reasonable, nor feasible to provide noise mitigation to reduce road traffic noise impacts as part of this proposal.

Despite this, construction management of potential impacts is still recommended, and are included in Section 7.1.

#### 4.7 Construction vibration assessment

To maintain compliance with the human comfort vibration criteria identified in Section 3.2, it is recommended that the indicative safe distances listed in **Table 18** should be maintained. These indicative safe distances should be validated prior to the start of construction works by undertaking operator-attended measurements of vibration levels generated by construction equipment to be used on site.

If applicable, the criteria for scientific or medical equipment (should any of these exist close to the site) can be more stringent than those required for human comfort. Vibration validating measurements should be conducted at each site to determine the vibration level and potential impact onto this sensitive equipment.

Recommended safe working distances for various typical items of plant are included in **Table 18** below.

**Table 18 Recommended indicative safe working distances for vibration intensive plant.**

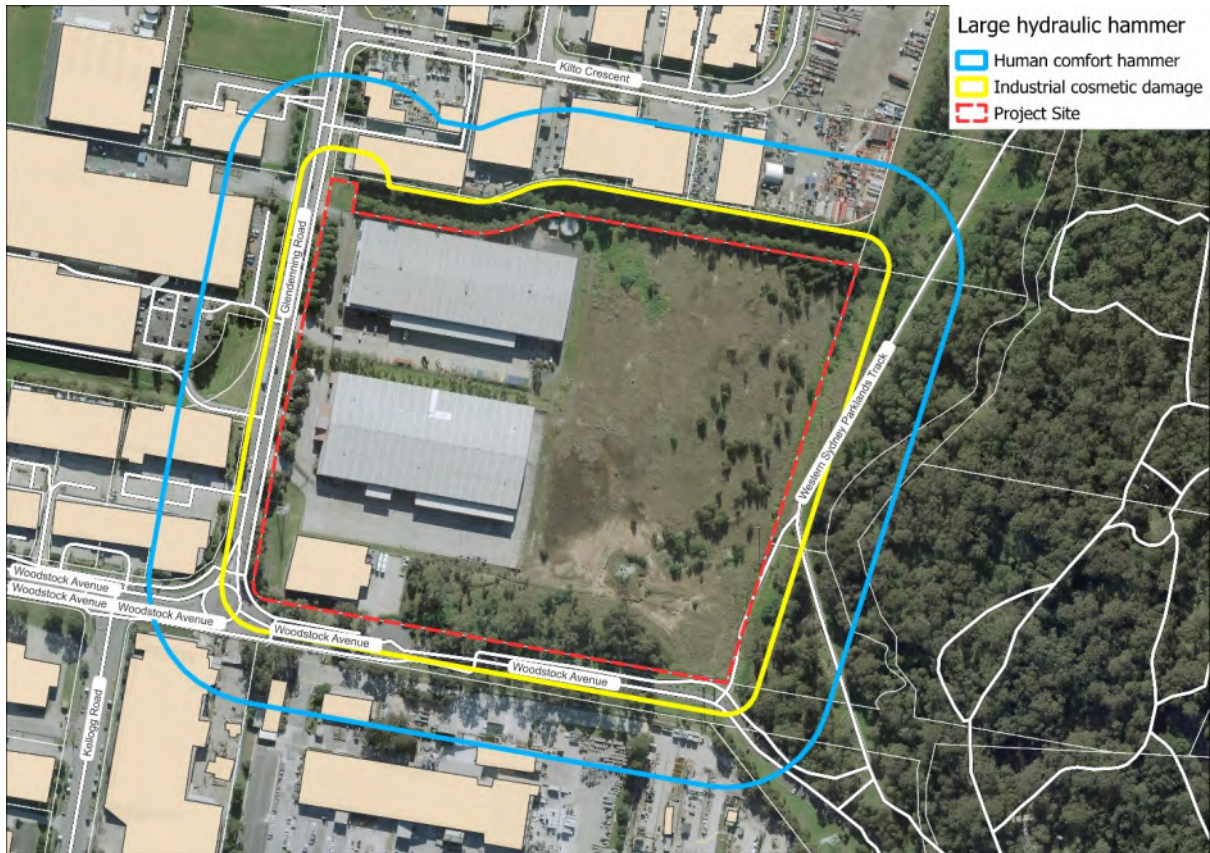
Plant	Rating / Description	Safe Working Distances (m)	
		Cosmetic Damage	Human Comfort (AVTG)
Vibratory roller	< 50 kN (Typically 1 – 2 tonnes)	5	15 – 20
	< 100 kN (Typically 2 – 4 tonnes)	6	20
Small hydraulic hammer	300 kg, typically 5 – 12 tonnes excavator	2	7
Medium hydraulic hammer	900 kg, typically 12 – 18 tonnes excavator	7	23
Large hydraulic hammer	1600 kg, typically 18 – 34 tonnes excavator	22	73
Vibratory pile driver	Sheet piles	2 - 20	20
CFA piling	≤ 800 mm	2	< 1 m
Jackhammer	Hand Held	1	Avoid contact with structure and steel reinforcements

An assessment of the potential for vibration generated as part of the required construction activities on the project (excluding demolition) have been undertaken based on the project safe working distances. Dependant on the location of the vibration intensive work and size of the equipment, exceedances of the vibration safe working distances are possible at nearby industrial receivers. Residential receivers will not be subject to vibration levels that may exceed the relevant vibration criteria. The safe working distances are illustrated below in **Figure 10** below. These represent vibration impacts from the project. Each contour indicates a vibration level:

- Human comfort –  $0.40 \text{ m/s}^{1.75}$  (VDV)
- Nearby industrial / residential buildings – 7.5 mm/s

Generally, exceedances of the cosmetic damage vibration criteria for industrial receivers are unusual, however exceedances of the human comfort criteria can occur. Vibration management measures are discussed further in Section 7.1.4 to manage vibration impacts for nearby industrial receivers.

Figure 10 Vibration impacts.





## 5 OPERATIONAL NOISE IMPACTS

### 5.1 Predictive Noise Modelling Methodology

Site operational noise emissions have been calculated using the CONCAWE algorithm. The CONCAWE algorithm has been selected to ensure that noise enhancing weather conditions including temperature inversions and downwind conditions have been appropriately considered in the noise assessment. These effects will have a moderate impact on some of the residential receivers due to the distance of the residential receivers to the site (furthest receiver approximately 1 km away).

CONCAWE provides six meteorological categories, which are different to the Pasquill Stability Category usually referenced. Both adverse wind and temperature inversions fall into CONCAWE Category 6.

The meteorological assessment has assessed a worst-case situation, which entails the calculation of the worst-case weather in all directions for all receivers. The following weather conditions have been included in the assessment, in accordance with the requirements of the NPfI – Fact Sheet D.

#### Standard meteorological conditions:

- 0.5 m/s wind speeds; and
- Stability category D.

This is equivalent to CONCAWE Meteorological Category 4.

#### Daytime and evening noise enhancing properties:

- 3 m/s wind speeds; and
- Stability category D.

This is equivalent to CONCAWE Meteorological Category 5.

#### Night-time noise enhancing properties:

- 2 m/s wind speeds; and
- Stability category F.

This is equivalent to CONCAWE Meteorological Category 6 (the highest category).

This approach has ensured that a consistently verifiable approach to ground absorption, air absorption and barrier attenuation has been chosen with the added advantage of the consideration of adverse weather conditions for noise sensitive receivers at distances greater than 100 m.

### 5.2 Nominal Equipment Sound Power Levels

To predict potential noise levels at the considered receivers, the noise models consider major mechanical equipment including data hall air handling units (DAHU), exhaust fan units and generators.

#### Generators and Load Banks:

In this noise model, it is assumed that the generator units feature a maximum sound power levels as defined in **Table 19** when operating at 100% load. Generators are assumed to feature a maximum sound power level as defined in **Table 20** when operating at 25% load. It is assumed that the generators will only operate at the 100% load condition when tested in combination with a load bank or during an emergency power failure. Otherwise, when performing the confidence testing scenario (without a load bank) the generators will operate with a reduced sound power level, as detailed in **Table 20**.

Generators are assumed to be tested up to twenty (20) units at a time with up to three (3) generators operating in combination with the load banks (100% load) and the remaining seventeen (17) generators operating at a reduced 25% load for confidence testing purposes (with 3 x corresponding load banks featuring a sound power level presented in **Table 21**), during the daytime period.

Additionally, one generator (and corresponding load bank) is proposed to be tested during the evening period (assumed to be operating at 100% load in combination with the load banks).

The Glendenning Road Data Centre Campus is proposed to contain 97 diesel generators, which are proposed to be positioned in the corners of the data centres (stacked several generators high) located within a louvred plantroom.

Exhaust from the generators will be plumbed to all four corners of the data centre buildings, with exhaust stack bundles that discharge above the rooftop level. Discharge from the generators is also plumbed vertically through the building to the roof level via a discharge stack.

Up to 20 generators (and 3 load banks) are permitted to operate under the condition that operational generators (and load banks) are split into the following groups and operational conditions per data centre during the daytime period (7:00 am – 6:00 pm).

- DC01 – up to 8 generators (1 generator operating under load bank conditions and the remaining 7 generators operating at 25% load) and 1 load bank operating during the daytime period.
- DC02 – up to 4 generators (1 generator operating under load bank conditions and the remaining 3 generators operating at 25% load) and 1 load bank operating during the daytime period.
- DC03 – up to 8 generators (1 generator operating under load bank conditions and the remaining 7 generators operating at 25% load) and 1 load bank operating during the daytime period.

Up to 1 generator (1 generator operating under 100% load bank conditions) (and 1 load bank) is permitted to operate under the condition that operational generator (and load bank) is split into the following groups per data centre during the evening period (6:00 pm – 10:00 pm).

- DC01 or DC02 or DC03 – up to 1 generator (operating at 100% load bank conditions) and 1 load bank operating at any time during the evening period.

Refer to **Figure 11** for detailed locations of the emergency generators.

The diesel generators are modelled inside an acoustic enclosure rated, which features treatment where necessary (including acoustic treatment to the exhaust discharge in the form of a muffler or similar, treatment to the radiator discharge / discharge stack where necessary, air intake face where necessary (in the form of acoustic louvres or similar), and enclosure treatment) to reach a maximum combined sound power level of 104.5 dB(A). The maximum overall sound power level (logarithmic summation of all noise emitting components / faces of the generator) of the diesel generators have been provided in **Table 19** below.

**Table 19 Nominated sound power Level (SWL) for the generators in acoustic enclosures – 100% load.**

Generator Model	Octave Band Centre Frequencies, dB (Hz)								Overall (dB(A))
	63	125	250	500	1000	2000	4000	8000	
Air Intake	105	105	80	66	62	61	60	71	90
Roof – Discharge	111	114	91	67	65	65	70	95	100
Engine Exhaust Outlet	104	103	89	83	79	77	73	69	90
Combined (other sources)	106	112	97	98	95	94	89	95	103
Overall Sound Power	113	116	99	98	95	94	89	98	<b>104</b>



**Table 20 Nominated sound power level (SWL) for generators in acoustic enclosures – 25% load.**

Generator Model	Octave Band Centre Frequencies, dB (Hz)								Overall (dB(A))
	63	125	250	500	1000	2000	4000	8000	
Air Intake	100	100	75	61	57	56	55	66	85
Roof – Discharge	106	109	86	62	60	60	65	90	95
Engine Exhaust Outlet	97	96	82	76	72	70	66	62	83
Combined (other sources)	101	107	92	93	90	89	84	90	98
Overall Sound Power	108	112	93	93	90	89	84	93	<b>100</b>

Additionally, one Load bank is proposed to be located on the rooftop of each data centre within the campus (totalling three load banks) to enable periodic generator testing at 100% load conditions. As such, during the generator maintenance testing regime, up to three load banks may be operating in parallel along with the emergency generators during the daytime period. Up to one load bank may be operating in parallel along with 1 emergency generator during the evening period.

The maximum allowable load bank sound power level is provided in **Table 21** below. The proposed locations of the load banks are depicted in **Figure 11** below.

**Table 21 Nominated sound power level (SWL) for load bank.**

Load Bank	Octave Band Centre Frequencies, dB (Hz)								Overall (dB(A))
	63	125	250	500	1000	2000	4000	8000	
Overall Sound Power	86	91	98	95	93	91	84	80	<b>95</b>

**Data Centre Mechanical Plant:**

The Data Hall Air Handling Units (DAUHs) are all direct evaporative cooling units, located indoors, drawing air in through openings in the façade. Each DAHU features an intake and exhaust fan.

**Data Centre Campus Noise Generating Plant Details:**

**DC01:**

DC01 is proposed to comprise 153 (144 operational, 9 standby) Data Hall Air Handling Units (DAHU) and 39 generators. The modelled scenarios are based directly on documentation provided by the client regarding realistic worst-case operating scenarios.

Specifically, our modelling assumes the following operational scenario for the DAHUs:

- 9 x data halls, each with 16 operational DAHUs, running at 100% load, and 1 Standby DAHU. This represents the worst-case operating scenario for this data centre

**DC02:**

DC02 is proposed to comprise 68 (64 operational, 4 standby) Data Hall Air Handling Units (DAHU) and 19 generators. The modelled scenarios are based directly on documentation provided by the client regarding realistic worst-case operating scenarios.

Specifically, our modelling assumes the following operational scenario for the DAHUs:

- 4 x data halls, each with 16 operational DAHUs, running at 100% load, and 1 Standby DAHU. This represents the worst-case operating scenario for this data centre



The exhaust fan outlet for DC02 has been assessed with acoustic attenuators fitted. The insertion loss of the acoustic attenuators to be fitted to all exhaust fan discharge from DC02 must satisfy the minimum acoustic performance requirements presented in **Table 22** below.

**Table 22 DC02 Exhaust fan discharge acoustic attenuator performance.**

Acoustic Attenuator	Octave Band Centre Frequencies, dB (Hz)								Overall $R_w$ rating
	63	125	250	500	1000	2000	4000	8000	
Insertion loss performance (dB)	4	5	8	9	12	9	7	6	<b>11 dB</b>

All further assessments that include noise emission predictions from DC02 assume that the above insertion losses listed in **Table 22** are added to the design and operation of DC02.

**DC03:**

DC03 is proposed to comprise 153 (144 operational, 9 standby) Data Hall Air Handling Units (DAHU) and 39 generators. The modelled scenarios are based directly on documentation provided by the client regarding realistic worst-case operating scenarios.

Specifically, our modelling assumes the following operational scenario for the DAHUs:

- 9 x data halls, each with 16 operational DAHUs, running at 100% load, and 1 Standby DAHU. This represents the worst-case operating scenario for this data centre

Details of the considered sound power levels of the major noise generating plant is presented below.

**Table 23** below presents the maximum allowable 100% intake side operational noise levels for the individual DAHUs.

**Table 23 DAHU model sound power levels – intake.**

DAHU Type	Fans	Octave Band Centre Frequencies, dB (Hz)								Overall (dB(A))
		63	125	250	500	1000	2000	4000	8000	
Danann	100% Load	88	88	84	78	71	66	56	58	<b>80<sup>1</sup></b>

*Note 1: Overall SWL includes inbuilt attenuation from evaporative cooler and filter wall / filters.*

A worst-case scenario of Danann DAHU units has been modelled. See Section 5.3 for additional details.

**Table 24** below presents the maximum allowable 100% exhaust side operational noise levels for the individual DAHUs.

**Table 24 Exhaust fan unit sound power levels.**

AHU Type	Fans	Octave Band Centre Frequencies, dB (Hz)								Overall (dB(A))
		63	125	250	500	1000	2000	4000	8000	
Exhaust Unit Fan	100% Load	85	88	85	89	86	82	77	74	<b>91</b>

Sound power data for the worst-case mechanical plant selection, obtained from the manufacturer has been provided within Appendix E: Mechanical Equipment Sound Power Data.

Sound power data sheets obtained from the manufacturer for the major electrical equipment has been provided within Appendix F: Electrical Equipment Sound Power Data.

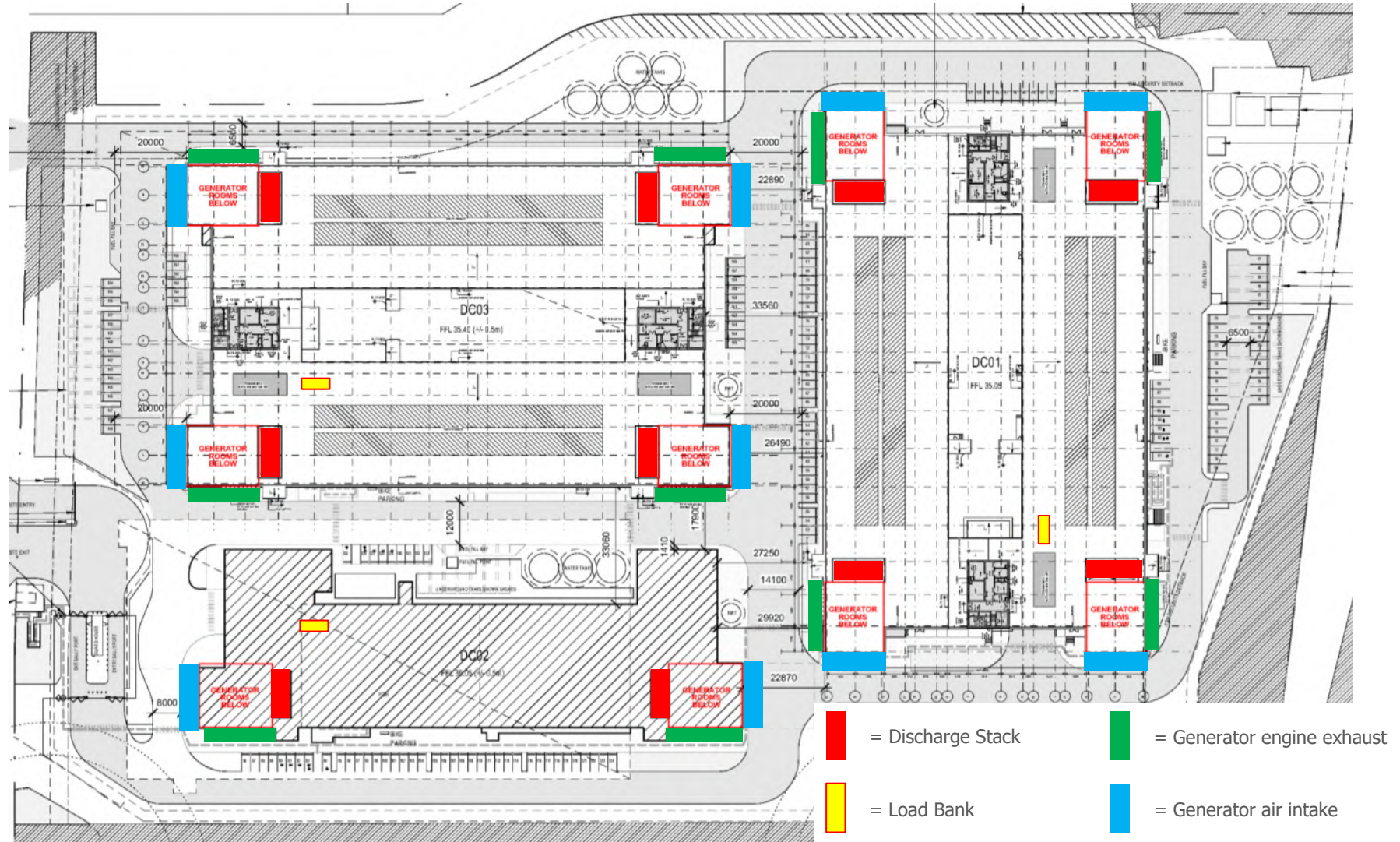
### **Data Centre Substations:**

Additional high voltage Substation Services (HVSS) are positioned within the ground floor of each data centre, with the following capacities:

- DC01 – 2x 100 MVA 132 kV / 22 kV transformers.
- DC02 – 1x 65 MVA 132 kV / 22 kV transformer.
- DC03 – 1 1x 100 MVA 132 kV / 22 kV transformer.

It is anticipated that the HVSS transformers, assumed with a maximum sound power level of 85 dB(A) (located internally, within the HVSS substation) will not significantly contribute the overall noise emissions to the datacentre campus, once the effects of the noise propagation have been equated.

Figure 11 Proposed data centre campus emergency generator and load bank locations.





### 5.3 Modelling Assumptions

In this assessment, the following assumptions have been incorporated:

- Noise generating scenarios are modelled on a worst case 15-minute period;
- Terrain has been sourced from the NSW Land and Property Information database Six Maps;
- Ground Absorption has been included in the model with the entire model having an absorption factor of 0.25, indicative of the combination of surrounding grass areas and hard surfaces;
- A volumetric region has been included in the model for the Nurragingy Reserve forest area. The height of the volumetric region is set to 9 m, indicative of the average tree canopy height within the reserve.
- Ground level Receivers are modelled at 1.5 m above the ground, and two storey receivers are modelled at 4.5 m above ground.
- On site (data centres) and surrounding buildings have been included in the model;
- HVSS substation transformers associated with the three data centre buildings.
- Internal noise levels resulting within the data halls (noise from server racks, fan noise) has been considered in the external noise emissions from the data centre.
- Generators (up to 20x generators and 3x load banks) are to be tested during the daytime period only refer to Section 5.2 for additional details for the generator testing regime.
- Generators (up to 1x generators and 1x load banks) are to be tested during the evening period only refer to Section 5.2 for additional details for the generator testing regime.
- The primary noise sources modelled are continuous in nature. The data hall air handling units will run continuously, over a 24-hour period (as is the nature of a datacentre, which runs continuously) and will not cycle on / off.

### 5.4 Modelled Scenarios

The assessments consist of the following modelled scenarios. A summary of the assessed scenarios is presented in **Table 25** below.

- **Operational Scenario 01 – Standard Metrological Conditions – Daytime / Evening / Nighttime periods**

DC01 & DC03 Data Centres have been assessed to include the following: The assessment for the proposed equipment is based on the sound power levels listed for the 144 x data hall air handling units (DAHU – Danann) and 144 x exhaust fan units in **Table 23** and **Table 24** respectively.

DC02 Data Centre has been assessed to include the following: The assessment for the proposed equipment is based on the sound power levels listed for the 64 x data hall air handling units (DAHU – Danann - Selection 3 (worst-case) and 64 x exhaust fan units in **Table 23** and **Table 24** respectively. DC02 features the acoustic mitigation measures detailed within Section 5.2.

All modelled noise emission sources are illustrated in **Figure 12** below.

- **Operational Scenario 02 – Noise Enhancing Metrological Conditions – Daytime / Evening / Nighttime periods**

DC01 & DC03 Data Centres have been assessed to include the following: The assessment for the proposed equipment is based on the sound power levels listed for the 144 x data hall air handling units (DAHU – Danann) and 144 x exhaust fan units in **Table 23** and **Table 24** respectively.

DC02 Data Centre has been assessed to include the following: The assessment for the proposed equipment is based on the sound power levels listed for the 64 x data hall air handling units (DAHU – Danann - Selection 3 (worst-case) and 64 x exhaust fan units in **Table 23** and **Table 24** respectively. DC02 features the acoustic mitigation measures detailed within Section 5.2.

All modelled noise emission sources are illustrated in **Figure 12** below.



- **Operational Scenario 03 – Noise Enhancing Metrological Conditions – Nighttime period**

DC01 Data Centre only has been assessed to include the following: The assessment for the proposed equipment is based on the sound power levels listed for the 144 x data hall air handling units (DAHU – Danann) and 144 x exhaust fan units in **Table 23** and **Table 24** respectively.

Note, due to the steady nature of the mechanical equipment, the nighttime period represents the most stringent time period for this scenario. Hence, the daytime and evening periods have not been presented.

All modelled noise emission sources are illustrated in **Figure 13** below.

- **Operational Scenario 04 – Noise Enhancing Metrological Conditions – Nighttime period**

DC01 and DC02 Data Centres only have been assessed to include the following: The assessment for the proposed equipment is based on the sound power levels listed for the 144 x data hall air handling units (DAHU – Danann) and 144 x exhaust fan units in **Table 23** and **Table 24** respectively.

DC02 Data Centre has been assessed to include the following: The assessment for the proposed equipment is based on the sound power levels listed for the 64 x data hall air handling units (DAHU – Danann - Selection 3 (worst-case) and 64 x exhaust fan units in **Table 23** and **Table 24** respectively. DC02 features the acoustic mitigation measures detailed within Section 5.2.

Note, due to the steady nature of the mechanical equipment, the nighttime period represents the most stringent time period for this scenario. Hence, the daytime and evening periods have not been presented.

All modelled noise emission sources are illustrated in **Figure 14** below.

- **Operational Scenario 05 – Enhancing Metrological Conditions - Evening**

In addition to the sources listed in Operational Scenarios 01 & 02, the following quantity of emergency generator / load bank plant has been modelled:

1 x generators as per **Table 19** and 1 x Load Banks as per **Table 21**. Source height and positioning has been obtained from the project drawings from LCI Consultants.

Generator testing is assumed to take place using one generator and one load bank operating in parallel throughout the entire data centre campus (generator operating at 100% load condition).

The generator was positioned at Level 4 (top floor) of DC03 within the north-western corner, representing the worst-case scenario for noise emissions to the nearest noise sensitive receivers during the evening period (located within noise catchment area 01 and 01B). Source height and positioning has been obtained from the project drawings from LCI Consultants. The approximate locations of the mechanical plant and generator / load bank sources are depicted in **Figure 15**. The emergency generator testing has been modelled to occur in addition to the continuously operating mechanical noise sources of the data centres (detailed within Scenarios 01 & 02 above).

- **Operational Scenario 06 – Enhancing Metrological Conditions - Evening**

In addition to the sources listed in Operational Scenarios 01 & 02, the following quantity of emergency generator / load bank plant has been modelled:

1 x generators as per **Table 19** and 1 x Load Banks as per **Table 21**. Source height and positioning has been obtained from the project drawings from LCI Consultants.

Generator testing is assumed to take place using one generator and one load bank operating in parallel throughout the entire data centre campus (generator operating at 100% load condition).

The generator was positioned at Level 4 (top floor) of DC02 within the western corner, representing the worst-case scenario for noise emissions to the nearest noise sensitive receivers during the evening period (located within noise catchment area 02). Source height and positioning has been obtained from the project drawings from LCI Consultants. The approximate locations of the mechanical plant and generator / load bank sources are depicted in **Figure 16**. The emergency generator testing has been modelled to occur in addition to the continuously operating mechanical noise sources of the data centres (detailed within Scenarios 01 & 02 above).

- **Operational Scenario 07 – Enhancing Metrological Conditions - Evening**

In addition to the sources listed in Operational Scenarios 01 & 02, the following quantity of emergency generator / load bank plant has been modelled:

1 x generators as per **Table 19** and 1 x Load Banks as per **Table 21**. Source height and positioning has been obtained from the project drawings from LCI Consultants.

Generator testing is assumed to take place using one generator and one load bank operating in parallel throughout the entire data centre campus (generator operating at 100% load condition).

The generator was positioned at Level 4 (top floor) of DC01 within the southeastern corner, representing the worst-case scenario for noise emissions to the nearest noise sensitive receivers during the evening period (located within noise catchment area 03 and the nearby passive recreation receivers). Source height and positioning has been obtained from the project drawings from LCI Consultants. The approximate locations of the mechanical plant and generator / load bank sources are depicted in **Figure 17**. The emergency generator testing has been modelled to occur in addition to the continuously operating mechanical noise sources of the data centres (detailed within Scenarios 01 & 02 above).

- **Operational Scenario 08 – Noise Enhancing Metrological Conditions – Daytime**

In addition to the sources listed in Operational Scenario 01 & 02, the following quantity of emergency generator / load bank plant has been modelled:

20 x generators in total (3 x as per **Table 19** operating at 100% load and 17 x as per **Table 20** operating at 25% load) and 3 x Load Banks as per **Table 21**. Source height and positioning has been obtained from the project drawings from LCI Consultants. Generators are restricted to 8 x generators for DC01 and DC03 (1 x operating at 100% load and 7 x operating at 25% load) and 4 x generators for DC02 (1 x operating at 100% load and 3 x operating at 25% load) at any one time.

The generators have been positioned at Level 4 (top floor) of the data centres, representing the worst-case scenario for noise emissions to the nearest noise sensitive receivers. Source height and positioning has been obtained from the project drawings from LCI Consultants. The approximate locations of the mechanical plant and generator / load bank sources are depicted in **Figure 18**. The emergency generator testing has been modelled to occur in addition to the continuously operating mechanical noise sources of the data centres (detailed within Scenarios 01 & 02 above).

- **Emergency Operational Scenario 09 – Noise Enhancing Metrological Conditions – Nighttime**

This scenario considers all (97) emergency generators operating at full capacity. This worst-case scenario is to simulate the unlikely event of a full systems power outage during the nighttime period.

97 x generators operating at full capacity as per **Table 19**. Source height and positioning has been obtained from the project drawings from LCI Consultants.

The emergency generator scenario has been modelled to occur in addition to the continuously operating mechanical noise sources of the data centres (detailed within Scenarios 01 & 02 above). This scenario has been assessed against the nighttime noise criteria, under noise enhancing metrological conditions.

Outside of a full systems power failure, the emergency generators would not operate for any other purpose than occasional testing. It is not considered reasonable to assess the emergency generator scenario against the project noise trigger levels presented in Section 3.3.2.4. This is due to the fact that a full systems power failure is an extremely unlikely event, and if it was to occur, the estimated duration of the emergency generators operating is expected to be hours rather than days, minimising the overall impact to the nearby community.

The purpose of this emergency scenario is to quantify the numerical noise predictions to the nearest noise sensitive receivers in the unlikely event of a full systems power outage at the data centre during the most sensitive time period (nighttime). A further discussion has been provided on the design considerations to the emergency generators within Section 7.2.2.2.

Figure 12 Operational scenario 01 & 02 - modelled mechanical noise emission sources visualised for the Day / Evening / Night Period.



Figure 13 Operational scenario 03 - modelled mechanical noise emission sources visualised for the Day / Evening / Night Period.



Figure 14 Operational scenario 04 - modelled mechanical noise emission sources visualised for the Day / Evening / Night Period.



Figure 15 Operational Scenario 05 - Proposed evening emergency generators / load bank position (in addition to mechanical services).

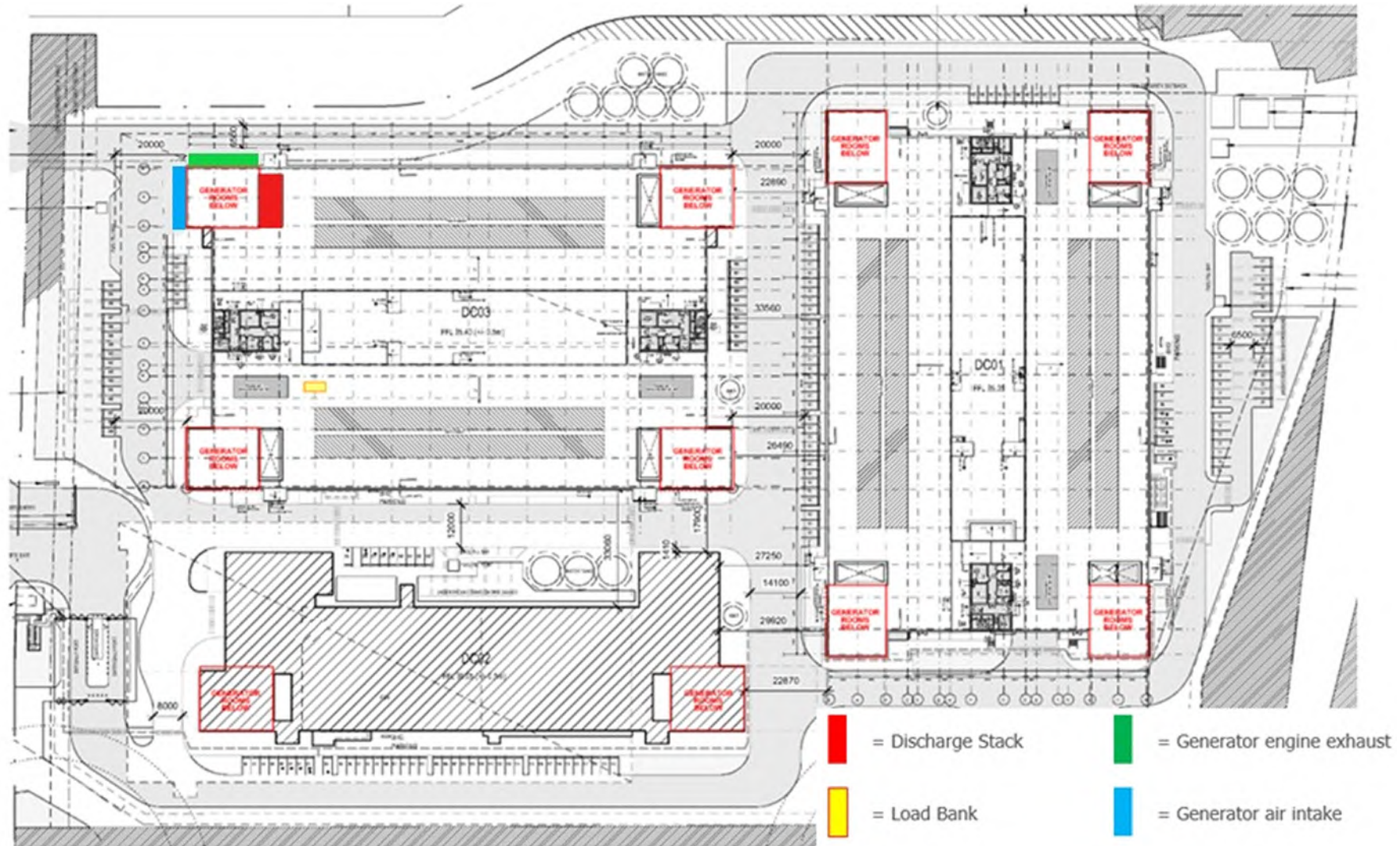


Figure 16 Operational Scenario 06 - Proposed evening emergency generators / load bank position (in addition to mechanical services).

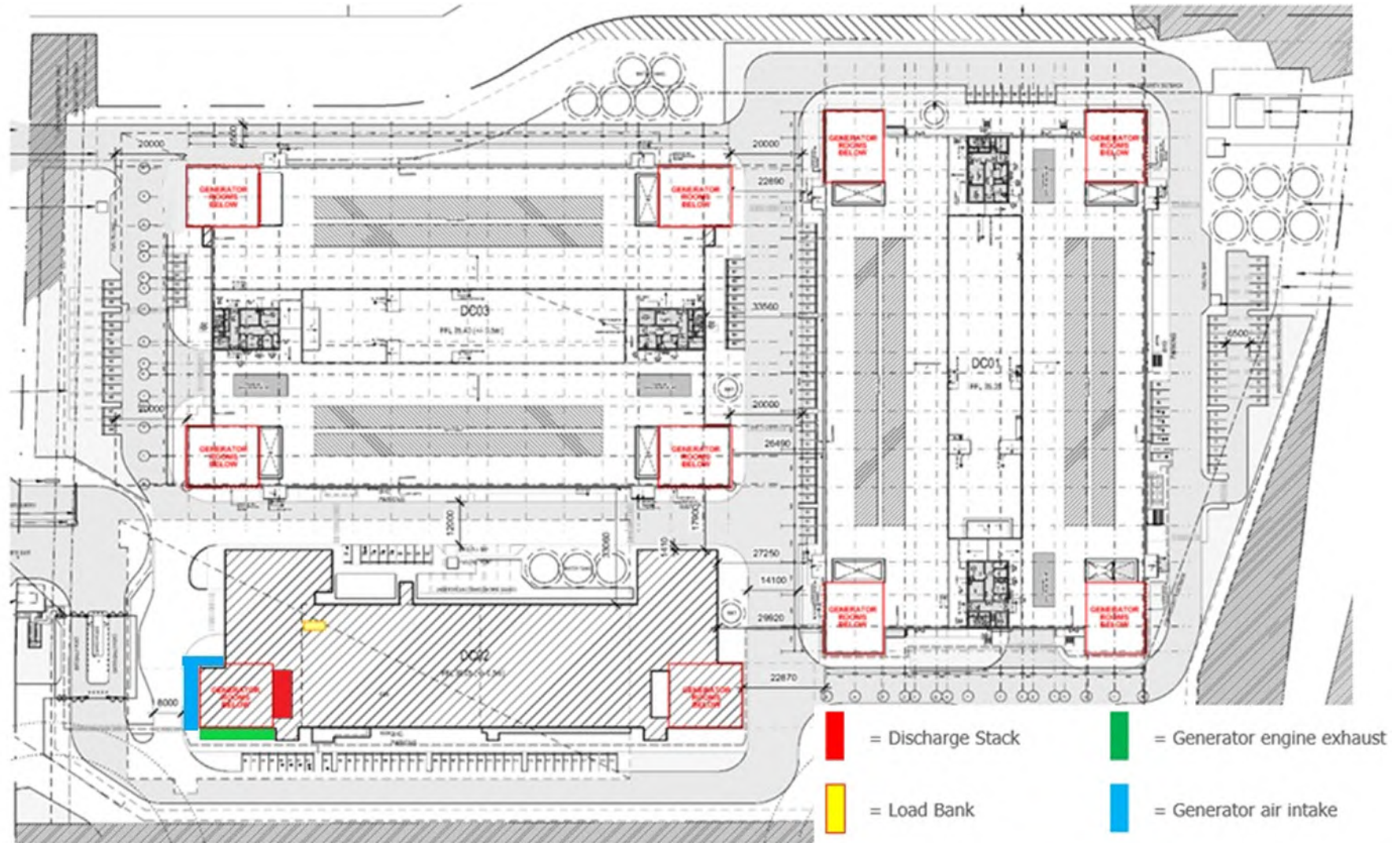


Figure 17 Operational Scenario 07 - Proposed evening emergency generators / load bank position (in addition to mechanical services).

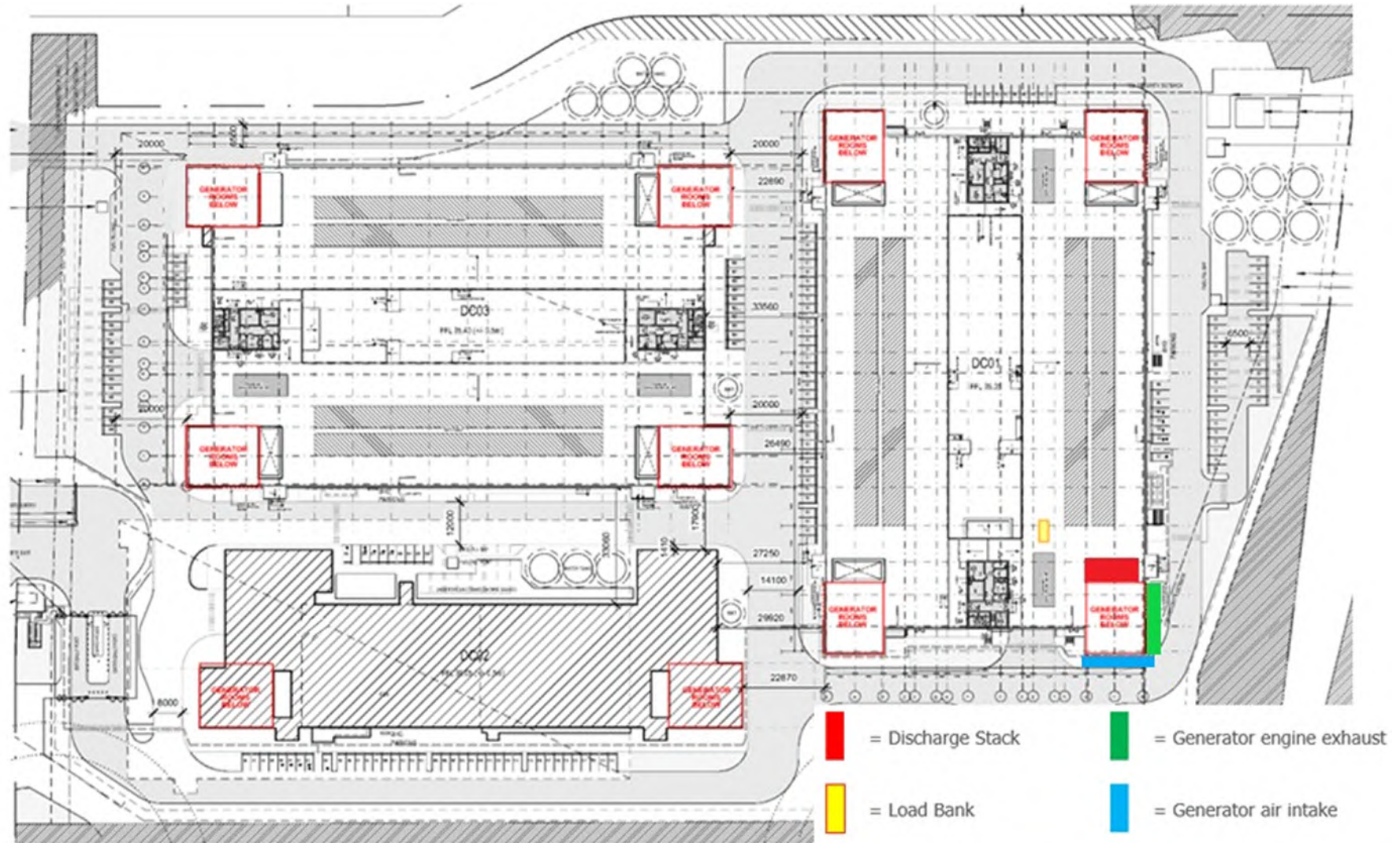
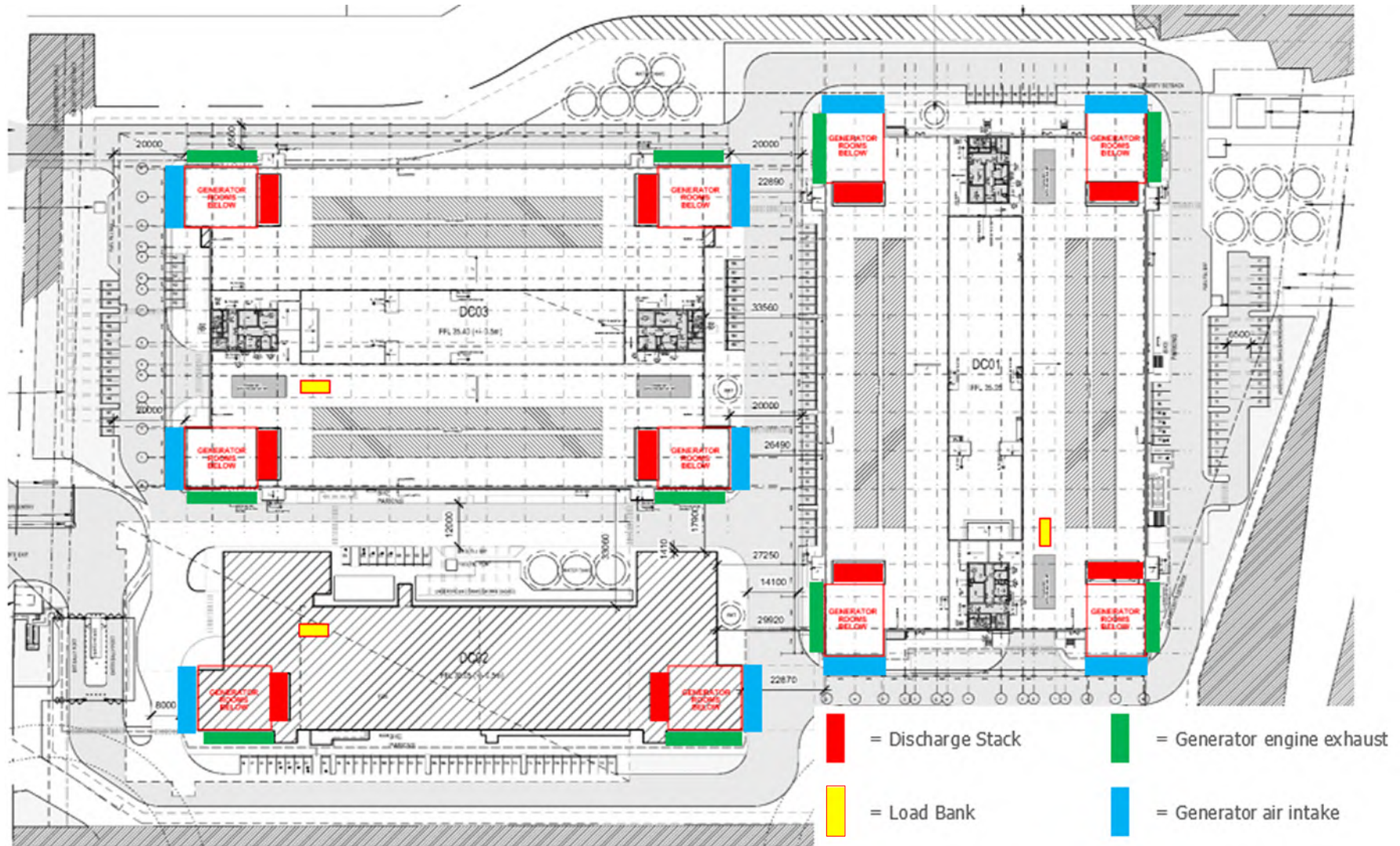


Figure 18 Operational Scenario 08 - Proposed daytime emergency generators / load bank positions (in addition to mechanical services).





**Table 25 Operational scenario summary**

Operational Scenario	Data Centre Operating	Generators Operating	Meteorological Conditions	Time Periods
01	DC01, DC02, DC03	N / A	Standard	Day, evening, night
02	DC01, DC02, DC03	N / A	Enhancing	Day, evening, night
03	DC01	N / A	Enhancing	Night
04	DC01 & DC02	N / A	Enhancing	Night
05	DC01, DC02, DC03	1x Gen. & 1x load bank – DC03	Enhancing	Evening
06	DC01, DC02, DC03	1x Gen. & 1x load bank – DC02	Enhancing	Evening
07	DC01, DC02, DC03	1x Gen. & 1x load bank – DC01	Enhancing	Evening
08	DC01, DC02, DC03	20x Gen. & 3x load bank – Site campus – See Section 5.4 for full details	Enhancing	Day
09	DC01, DC02, DC03	97x Gen. – Site campus – See Section 5.4 for full details	Enhancing	Night

## 5.5 Predicted Noise Levels

### 5.5.1 Operational Scenarios

The predicted  $L_{Aeq}$  results of the modelled operational scenarios (refer to Section 5.4) are presented below in the following tables.

Note: the operational noise levels of the entire data centre campus have been designed to be compliant with the overall data centre campus criteria, as determined in Section 3.3.2.4, and in line with the criteria of Blacktown DCP 2015 and NSW NPfI. Hence, no further cumulative noise impacts will need to be considered for this development.

Operational contours are presented in Appendix D: Operational Noise Contours for all of the above modelled scenarios.

**Table 26 Operational Scenario 01 - Predicted Noise Levels,  $L_{Aeq}$  (15 minute).**

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R01 (1.5 m)	68	68	68	47	47	47
R02 (1.5 m)	68	68	68	50	50	50
R03 (1.5 m, 4.5 m)	68	68	68	39 / 39	39 / 39	39 / 39
R04 (1.5 m)	68	68	68	50	50	50
R05 (1.5 m, 4.5 m)	68	68	68	53 / 53	53 / 53	53 / 53



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R06 (1.5 m, 4.5 m)	68	68	68	57 / 57	57 / 57	57 / 57
R07 (1.5 m)	53	45	41	30	30	30
R08 (1.5 m)	53	45	41	34	34	34
R09 (1.5 m)	53	45	41	34	34	34
R10 (1.5 m)	53	45	41	36	36	36
R11 (1.5 m)	53	45	41	30	30	30
R12 (1.5 m)	53	45	41	29	29	29
R13 (1.5 m)	53	45	41	32	32	32
R14 (1.5 m)	53	45	41	29	29	29
R15 (1.5 m)	53	45	41	37	37	37
R16 (1.5 m)	53	45	41	37	37	37
R17 (1.5 m)	53	50	38	30	30	30
R18 (1.5 m)	53	50	38	31	31	31
R19 (1.5 m)	53	50	38	31	31	31
R20 (1.5 m)	53	50	38	31	31	31
R21 (1.5 m)	53	50	38	31	31	31
R22 (1.5 m)	53	50	38	31	31	31
R23 (1.5 m)	53	50	38	30	30	30
R24 (1.5 m)	53	50	38	31	31	31
R25 (1.5 m, 4.5 m)	53	50	38	31 / 31	31 / 31	31 / 31
R26 (1.5 m)	53	50	38	31	31	31
R27 (1.5 m)	53	50	38	31	31	31
R28 (1.5 m)	53	50	38	32	32	32
R29 (1.5 m)	53	50	38	32	32	32
R30 (1.5 m)	53	50	38	31	31	31
R31 (1.5 m)	53	50	38	30	30	30
R32 (1.5 m)	53	50	38	26	26	26
R33 (1.5 m, 4.5 m)	53	45	41	34 / 34	34 / 34	34 / 34
R34 (1.5 m, 4.5 m)	53	50	38	30 / 30	30 / 30	30 / 30
R35 (1.5 m, 4.5 m)	53	45	42	37 / 37	37 / 37	37 / 37
R36 (1.5 m, 4.5 m)	53	45	42	37 / 37	37 / 37	37 / 37
R37 (1.5 m)	53	45	42	30	30	30
R38 (1.5 m)	53	45	42	29	29	29
R39 (1.5 m)	53	45	42	27	27	27
R40 (1.5 m)	53	45	42	27	27	27
R41 (1.5 m)	53	45	42	25	25	25



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R42 (1.5 m, 4.5 m)	53	45	42	25 / 25	25 / 25	25 / 25
R43 (1.5 m)	53	45	42	24	24	24
R44 (1.5 m)	53	45	42	24	24	24
R45 (1.5 m)	53	45	42	24	24	24
R46 (1.5 m, 4.5 m)	53	45	42	38 / 38	38 / 38	38 / 38
R47 (1.5 m)	48	48	48	43	43	43
R48 (1.5 m)	48	48	48	36	36	36
R49 (1.5 m)	48	48	48	40	40	40
R50 (1.5 m)	63	63	63	34	34	34
R51 (1.5 m)	45	43	38	37	37	37
R52 (1.5 m)	45	43	38	38	38	38
R53 (1.5 m)	45	43	38	38	38	38
R54 (1.5 m)	53	45	41	36	36	36
R55 (1.5 m)	45	43	38	37	37	37
R56 (1.5 m)	45	43	38	38	38	38
R57 (1.5 m)	45	43	38	38	38	38
R58 (1.5 m)	45	43	38	36	36	36
R59 (1.5 m)	45	43	38	35	35	35
R60 (1.5 m)	45	43	38	34	34	34
R61 (1.5 m)	45	43	38	33	33	33
R62 (1.5 m)	45	43	38	33	33	33
R63 (1.5 m)	45	43	38	35	35	35
R64 (1.5 m)	45	43	38	36	36	36
R65 (1.5 m)	45	43	38	34	34	34
R66 (1.5 m)	45	43	38	36	36	36
R67 (1.5 m)	45	43	38	35	35	35
R68 (1.5 m)	45	43	38	36	36	36
R69 (1.5 m)	45	43	38	36	36	36
R70 (1.5 m)	53	45	41	30	30	30
R71 (1.5 m)	53	45	41	30	30	30
R72 (1.5 m)	53	45	41	31	31	31
R73 (1.5 m)	53	45	41	29	29	29
R74 (1.5 m)	53	45	41	30	30	30
R75 (1.5 m)	53	45	41	29	29	29

**Table 27 Operational Scenario 02 - Predicted Noise Levels, LAeq (15 minute).**

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R01 (1.5 m)	68	68	68	48	48	48
R02 (1.5 m)	68	68	68	51	51	51
R03 (1.5 m, 4.5 m)	68	68	68	39 / 39	39 / 39	39 / 39
R04 (1.5 m)	68	68	68	50	50	50
R05 (1.5 m, 4.5 m)	68	68	68	53 / 53	53 / 53	53 / 53
R06 (1.5 m, 4.5 m)	68	68	68	58 / 58	58 / 58	58 / 58
R07 (1.5 m)	53	45	41	31	31	36
R08 (1.5 m)	53	45	41	35	35	35
R09 (1.5 m)	53	45	41	35	35	35
R10 (1.5 m)	53	45	41	37	37	38
R11 (1.5 m)	53	45	41	31	31	36
R12 (1.5 m)	53	45	41	30	30	30
R13 (1.5 m)	53	45	41	33	33	33
R14 (1.5 m)	53	45	41	30	30	30
R15 (1.5 m)	53	45	41	38	38	39
R16 (1.5 m)	53	45	41	37	37	38
R17 (1.5 m)	53	50	48	32	32	32
R18 (1.5 m)	53	50	48	32	32	32
R19 (1.5 m)	53	50	48	33	33	33
R20 (1.5 m)	53	50	48	32	32	32
R21 (1.5 m)	53	50	48	32	32	32
R22 (1.5 m)	53	50	48	32	32	32
R23 (1.5 m)	53	50	48	32	32	32
R24 (1.5 m)	53	50	48	32	32	32
R25 (1.5 m, 4.5 m)	53	50	48	32 / 32	32 / 32	32 / 32
R26 (1.5 m)	53	50	48	32	32	32
R27 (1.5 m)	53	50	48	32	32	32
R28 (1.5 m)	53	50	48	33	33	33
R29 (1.5 m)	53	50	48	34	34	34
R30 (1.5 m)	53	50	48	32	32	32
R31 (1.5 m)	53	50	48	32	32	32
R32 (1.5 m)	53	50	48	27	27	27
R33 (1.5 m, 4.5 m)	53	45	41	35 / 35	35 / 35	35 / 35
R34 (1.5 m, 4.5 m)	53	50	48	32 / 32	32 / 32	32 / 32



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R35 (1.5 m, 4.5 m)	53	45	42	37 / 37	37 / 37	37 / 37
R36 (1.5 m, 4.5 m)	53	45	42	37 / 37	37 / 37	37 / 37
R37 (1.5 m)	53	45	42	31	31	31
R38 (1.5 m)	53	45	42	30	30	30
R39 (1.5 m)	53	45	42	28	28	28
R40 (1.5 m)	53	45	42	29	29	29
R41 (1.5 m)	53	45	42	27	27	27
R42 (1.5 m, 4.5 m)	53	45	42	26 / 26	26 / 26	26 / 26
R43 (1.5 m)	53	45	42	25	25	25
R44 (1.5 m)	53	45	42	26	26	26
R45 (1.5 m)	53	45	42	25	25	25
R46 (1.5 m, 4.5 m)	53	45	42	39 / 39	39 / 39	39 / 39
R47 (1.5 m)	48	48	48	43	43	43
R48 (1.5 m)	48	48	48	37	37	37
R49 (1.5 m)	48	48	48	40	40	40
R50 (1.5 m)	63	63	63	35	35	35
R51 (1.5 m)	45	43	38	38	38	35
R52 (1.5 m)	45	43	38	38	38	34
R53 (1.5 m)	45	43	38	39	39	36
R54 (1.5 m)	53	45	41	37	37	37
R55 (1.5 m)	45	43	38	38	38	36
R56 (1.5 m)	45	43	38	39	39	35
R57 (1.5 m)	45	43	38	38	38	38
R58 (1.5 m)	45	43	38	37	37	37
R59 (1.5 m)	45	43	38	36	36	36
R60 (1.5 m)	45	43	38	35	35	35
R61 (1.5 m)	45	43	38	34	34	34
R62 (1.5 m)	45	43	38	34	34	34
R63 (1.5 m)	45	43	38	35	35	35
R64 (1.5 m)	45	43	38	37	37	37
R65 (1.5 m)	45	43	38	35	35	35
R66 (1.5 m)	45	43	38	37	37	37
R67 (1.5 m)	45	43	38	36	36	36
R68 (1.5 m)	45	43	38	36	36	36
R69 (1.5 m)	45	43	38	37	37	37
R70 (1.5 m)	53	45	41	31	31	31
R71 (1.5 m)	53	45	41	31	31	31



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R72 (1.5 m)	53	45	41	32	32	32
R73 (1.5 m)	53	45	41	30	30	30
R74 (1.5 m)	53	45	41	31	31	31
R75 (1.5 m)	53	45	41	30	30	30

**Table 28 Operational Scenario 03 - Predicted Noise Levels, LAeq (15 minute).**

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R01 (1.5 m)	68	68	68	-	-	46
R02 (1.5 m)	68	68	68	-	-	47
R03 (1.5 m, 4.5 m)	68	68	68	-	-	33 / 33
R04 (1.5 m)	68	68	68	-	-	45
R05 (1.5 m, 4.5 m)	68	68	68	-	-	44 / 44
R06 (1.5 m, 4.5 m)	68	68	68	-	-	51 / 51
R07 (1.5 m)	53	45	41	-	-	30
R08 (1.5 m)	53	45	41	-	-	31
R09 (1.5 m)	53	45	41	-	-	32
R10 (1.5 m)	53	45	41	-	-	34
R11 (1.5 m)	53	45	41	-	-	29
R12 (1.5 m)	53	45	41	-	-	26
R13 (1.5 m)	53	45	41	-	-	29
R14 (1.5 m)	53	45	41	-	-	26
R15 (1.5 m)	53	45	41	-	-	36
R16 (1.5 m)	53	45	41	-	-	35
R17 (1.5 m)	53	50	48	-	-	30
R18 (1.5 m)	53	50	48	-	-	30
R19 (1.5 m)	53	50	48	-	-	30
R20 (1.5 m)	53	50	48	-	-	30
R21 (1.5 m)	53	50	48	-	-	30
R22 (1.5 m)	53	50	48	-	-	31
R23 (1.5 m)	53	50	48	-	-	31
R24 (1.5 m)	53	50	48	-	-	31
R25 (1.5 m, 4.5 m)	53	50	48	-	-	31 / 31
R26 (1.5 m)	53	50	48	-	-	31
R27 (1.5 m)	53	50	48	-	-	31
R28 (1.5 m)	53	50	48	-	-	32
R29 (1.5 m)	53	50	48	-	-	32

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R30 (1.5 m)	53	50	48	-	-	31
R31 (1.5 m)	53	50	48	-	-	30
R32 (1.5 m)	53	50	48	-	-	25
R33 (1.5 m, 4.5 m)	53	45	41	-	-	35 / 35
R34 (1.5 m, 4.5 m)	53	50	48	-	-	31 / 31
R35 (1.5 m, 4.5 m)	53	45	42	-	-	35 / 35
R36 (1.5 m, 4.5 m)	53	45	42	-	-	35 / 35
R37 (1.5 m)	53	45	42	-	-	27
R38 (1.5 m)	53	45	42	-	-	26
R39 (1.5 m)	53	45	42	-	-	25
R40 (1.5 m)	53	45	42	-	-	25
R41 (1.5 m)	53	45	42	-	-	22
R42 (1.5 m, 4.5 m)	53	45	42	-	-	22 / 22
R43 (1.5 m)	53	45	42	-	-	22
R44 (1.5 m)	53	45	42	-	-	23
R45 (1.5 m)	53	45	42	-	-	22
R46 (1.5 m, 4.5 m)	53	45	42	-	-	36 / 36
R47 (1.5 m)	48	48	48	-	-	43
R48 (1.5 m)	48	48	48	-	-	36
R49 (1.5 m)	48	48	48	-	-	39
R50 (1.5 m)	63	63	63	-	-	33
R51 (1.5 m)	45	43	38	-	-	34
R52 (1.5 m)	45	43	38	-	-	35
R53 (1.5 m)	45	43	38	-	-	36
R54 (1.5 m)	53	45	41	-	-	34
R55 (1.5 m)	45	43	38	-	-	35
R56 (1.5 m)	45	43	38	-	-	36
R57 (1.5 m)	45	43	38	-	-	35
R58 (1.5 m)	45	43	38	-	-	35
R59 (1.5 m)	45	43	38	-	-	35
R60 (1.5 m)	45	43	38	-	-	31
R61 (1.5 m)	45	43	38	-	-	31
R62 (1.5 m)	45	43	38	-	-	32
R63 (1.5 m)	45	43	38	-	-	34
R64 (1.5 m)	45	43	38	-	-	34
R65 (1.5 m)	45	43	38	-	-	31



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R66 (1.5 m)	45	43	38	-	-	34
R67 (1.5 m)	45	43	38	-	-	31
R68 (1.5 m)	45	43	38	-	-	33
R69 (1.5 m)	45	43	38	-	-	33
R70 (1.5 m)	53	45	41	-	-	26
R71 (1.5 m)	53	45	41	-	-	27
R72 (1.5 m)	53	45	41	-	-	28
R73 (1.5 m)	53	45	41	-	-	25
R74 (1.5 m)	53	45	41	-	-	26
R75 (1.5 m)	53	45	41	-	-	27

**Table 29 Operational Scenario 04 - Predicted Noise Levels, LAeq (15 minute).**

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R01 (1.5 m)	68	68	68	-	-	51
R02 (1.5 m)	68	68	68	-	-	47
R03 (1.5 m, 4.5 m)	68	68	68	-	-	35 / 35
R04 (1.5 m)	68	68	68	-	-	50
R05 (1.5 m, 4.5 m)	68	68	68	-	-	48 / 48
R06 (1.5 m, 4.5 m)	68	68	68	-	-	53 / 53
R07 (1.5 m)	53	45	41	-	-	31
R08 (1.5 m)	53	45	41	-	-	32
R09 (1.5 m)	53	45	41	-	-	32
R10 (1.5 m)	53	45	41	-	-	34
R11 (1.5 m)	53	45	41	-	-	30
R12 (1.5 m)	53	45	41	-	-	29
R13 (1.5 m)	53	45	41	-	-	33
R14 (1.5 m)	53	45	41	-	-	27
R15 (1.5 m)	53	45	41	-	-	35
R16 (1.5 m)	53	45	41	-	-	35
R17 (1.5 m)	53	50	48	-	-	30
R18 (1.5 m)	53	50	48	-	-	30
R19 (1.5 m)	53	50	48	-	-	30
R20 (1.5 m)	53	50	48	-	-	30
R21 (1.5 m)	53	50	48	-	-	31
R22 (1.5 m)	53	50	48	-	-	31
R23 (1.5 m)	53	50	48	-	-	31

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R24 (1.5 m)	53	50	48	-	-	31
R25 (1.5 m, 4.5 m)	53	50	48	-	-	31 / 31
R26 (1.5 m)	53	50	48	-	-	32
R27 (1.5 m)	53	50	48	-	-	32
R28 (1.5 m)	53	50	48	-	-	33
R29 (1.5 m)	53	50	48	-	-	33
R30 (1.5 m)	53	50	48	-	-	32
R31 (1.5 m)	53	50	48	-	-	31
R32 (1.5 m)	53	50	48	-	-	27
R33 (1.5 m, 4.5 m)	53	45	41	-	-	35 / 35
R34 (1.5 m, 4.5 m)	53	50	48	-	-	31 / 31
R35 (1.5 m, 4.5 m)	53	45	42	-	-	35 / 35
R36 (1.5 m, 4.5 m)	53	45	42	-	-	35 / 35
R37 (1.5 m)	53	45	42	-	-	28
R38 (1.5 m)	53	45	42	-	-	26
R39 (1.5 m)	53	45	42	-	-	26
R40 (1.5 m)	53	45	42	-	-	26
R41 (1.5 m)	53	45	42	-	-	23
R42 (1.5 m, 4.5 m)	53	45	42	-	-	23 / 23
R43 (1.5 m)	53	45	42	-	-	23
R44 (1.5 m)	53	45	42	-	-	23
R45 (1.5 m)	53	45	42	-	-	23
R46 (1.5 m, 4.5 m)	53	45	42	-	-	37 / 37
R47 (1.5 m)	48	48	48	-	-	43
R48 (1.5 m)	48	48	48	-	-	36
R49 (1.5 m)	48	48	48	-	-	40
R50 (1.5 m)	63	63	63	-	-	35
R51 (1.5 m)	45	43	38	-	-	37
R52 (1.5 m)	45	43	38	-	-	37
R53 (1.5 m)	45	43	38	-	-	37
R54 (1.5 m)	53	45	41	-	-	34
R55 (1.5 m)	45	43	38	-	-	36
R56 (1.5 m)	45	43	38	-	-	36
R57 (1.5 m)	45	43	38	-	-	37
R58 (1.5 m)	45	43	38	-	-	35

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R59 (1.5 m)	45	43	38	-	-	35
R60 (1.5 m)	45	43	38	-	-	31
R61 (1.5 m)	45	43	38	-	-	32
R62 (1.5 m)	45	43	38	-	-	32
R63 (1.5 m)	45	43	38	-	-	35
R64 (1.5 m)	45	43	38	-	-	36
R65 (1.5 m)	45	43	38	-	-	34
R66 (1.5 m)	45	43	38	-	-	37
R67 (1.5 m)	45	43	38	-	-	35
R68 (1.5 m)	45	43	38	-	-	36
R69 (1.5 m)	45	43	38	-	-	36
R70 (1.5 m)	53	45	41	-	-	29
R71 (1.5 m)	53	45	41	-	-	29
R72 (1.5 m)	53	45	41	-	-	29
R73 (1.5 m)	53	45	41	-	-	27
R74 (1.5 m)	53	45	41	-	-	28
R75 (1.5 m)	53	45	41	-	-	28

**Table 30 Operational Scenario 05 – Predicted Noise Levels, LAeq (15 minutes).**

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R01 (1.5 m)	68	68	68	-	53	-
R02 (1.5 m)	68	68	68	-	53	-
R03 (1.5 m, 4.5 m)	68	68	68	-	45 / 45	-
R04 (1.5 m)	68	68	68	-	50	-
R05 (1.5 m, 4.5 m)	68	68	68	-	53 / 53	-
R06 (1.5 m, 4.5 m)	68	68	68	-	58 / 58	-
R07 (1.5 m)	53	45	41	-	40	-
R08 (1.5 m)	53	45	41	-	40	-
R09 (1.5 m)	53	45	41	-	40	-
R10 (1.5 m)	53	45	41	-	41	-
R11 (1.5 m)	53	45	41	-	41	-
R12 (1.5 m)	53	45	41	-	34	-
R13 (1.5 m)	53	45	41	-	36	-
R14 (1.5 m)	53	45	41	-	33	-
R15 (1.5 m)	53	45	41	-	42	-
R16 (1.5 m)	53	45	41	-	41	-



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R17 (1.5 m)	53	50	48	-	33	-
R18 (1.5 m)	53	50	48	-	33	-
R19 (1.5 m)	53	50	48	-	33	-
R20 (1.5 m)	53	50	48	-	33	-
R21 (1.5 m)	53	50	48	-	33	-
R22 (1.5 m)	53	50	48	-	33	-
R23 (1.5 m)	53	50	48	-	33	-
R24 (1.5 m)	53	50	48	-	33	-
R25 (1.5 m, 4.5 m)	53	50	48	-	33 / 33	-
R26 (1.5 m)	53	50	48	-	34	-
R27 (1.5 m)	53	50	48	-	34	-
R28 (1.5 m)	53	50	48	-	34	-
R29 (1.5 m)	53	50	48	-	35	-
R30 (1.5 m)	53	50	48	-	33	-
R31 (1.5 m)	53	50	48	-	32	-
R32 (1.5 m)	53	50	48	-	28	-
R33 (1.5 m, 4.5 m)	53	45	41	-	39 / 39	-
R34 (1.5 m, 4.5 m)	53	50	48	-	33 / 33	-
R35 (1.5 m, 4.5 m)	53	45	42	-	40 / 40	-
R36 (1.5 m, 4.5 m)	53	45	42	-	40 / 40	-
R37 (1.5 m)	53	45	42	-	35	-
R38 (1.5 m)	53	45	42	-	35	-
R39 (1.5 m)	53	45	42	-	35	-
R40 (1.5 m)	53	45	42	-	32	-
R41 (1.5 m)	53	45	42	-	29	-
R42 (1.5 m, 4.5 m)	53	45	42	-	28 / 28	-
R43 (1.5 m)	53	45	42	-	27	-
R44 (1.5 m)	53	45	42	-	28	-
R45 (1.5 m)	53	45	42	-	29	-
R46 (1.5 m, 4.5 m)	53	45	42	-	41 / 41	-
R47 (1.5 m)	48	48	48	-	43	-
R48 (1.5 m)	48	48	48	-	37	-
R49 (1.5 m)	48	48	48	-	40	-
R50 (1.5 m)	63	63	63	-	36	-
R51 (1.5 m)	45	43	38	-	38	-



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R52 (1.5 m)	45	43	38	-	37	-
R53 (1.5 m)	45	43	38	-	39	-
R54 (1.5 m)	53	45	41	-	40	-
R55 (1.5 m)	45	43	38	-	38	-
R56 (1.5 m)	45	43	38	-	38	-
R57 (1.5 m)	45	43	38	-	41	-
R58 (1.5 m)	45	43	38	-	40	-
R59 (1.5 m)	45	43	38	-	39	-
R60 (1.5 m)	45	43	38	-	38	-
R61 (1.5 m)	45	43	38	-	38	-
R62 (1.5 m)	45	43	38	-	39	-
R63 (1.5 m)	45	43	38	-	39	-
R64 (1.5 m)	45	43	38	-	40	-
R65 (1.5 m)	45	43	38	-	40	-
R66 (1.5 m)	45	43	38	-	41	-
R67 (1.5 m)	45	43	38	-	40	-
R68 (1.5 m)	45	43	38	-	40	-
R69 (1.5 m)	45	43	38	-	40	-
R70 (1.5 m)	53	45	41	-	36	-
R71 (1.5 m)	53	45	41	-	35	-
R72 (1.5 m)	53	45	41	-	36	-
R73 (1.5 m)	53	45	41	-	35	-
R74 (1.5 m)	53	45	41	-	35	-
R75 (1.5 m)	53	45	41	-	34	-

**Table 31 Emergency operational scenario 06 – Predicted Noise Levels, LAeq (15 minutes).**

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R01 (1.5 m)	68	68	68	-	50	-
R02 (1.5 m)	68	68	68	-	54	-
R03 (1.5 m, 4.5 m)	68	68	68	-	47 / 47	-
R04 (1.5 m)	68	68	68	-	51	-
R05 (1.5 m, 4.5 m)	68	68	68	-	53 / 53	-
R06 (1.5 m, 4.5 m)	68	68	68	-	58 / 58	-
R07 (1.5 m)	53	45	41	-	40	-
R08 (1.5 m)	53	45	41	-	40	-
R09 (1.5 m)	53	45	41	-	40	-



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R10 (1.5 m)	53	45	41	-	41	-
R11 (1.5 m)	53	45	41	-	39	-
R12 (1.5 m)	53	45	41	-	33	-
R13 (1.5 m)	53	45	41	-	34	-
R14 (1.5 m)	53	45	41	-	33	-
R15 (1.5 m)	53	45	41	-	42	-
R16 (1.5 m)	53	45	41	-	41	-
R17 (1.5 m)	53	50	48	-	33	-
R18 (1.5 m)	53	50	48	-	33	-
R19 (1.5 m)	53	50	48	-	33	-
R20 (1.5 m)	53	50	48	-	33	-
R21 (1.5 m)	53	50	48	-	33	-
R22 (1.5 m)	53	50	48	-	33	-
R23 (1.5 m)	53	50	48	-	33	-
R24 (1.5 m)	53	50	48	-	33	-
R25 (1.5 m, 4.5 m)	53	50	48	-	33 / 33	-
R26 (1.5 m)	53	50	48	-	34	-
R27 (1.5 m)	53	50	48	-	34	-
R28 (1.5 m)	53	50	48	-	34	-
R29 (1.5 m)	53	50	48	-	35	-
R30 (1.5 m)	53	50	48	-	33	-
R31 (1.5 m)	53	50	48	-	32	-
R32 (1.5 m)	53	50	48	-	28	-
R33 (1.5 m, 4.5 m)	53	45	41	-	38 / 38	-
R34 (1.5 m, 4.5 m)	53	50	48	-	32 / 32	-
R35 (1.5 m, 4.5 m)	53	45	42	-	41 / 41	-
R36 (1.5 m, 4.5 m)	53	45	42	-	41 / 41	-
R37 (1.5 m)	53	45	42	-	35	-
R38 (1.5 m)	53	45	42	-	33	-
R39 (1.5 m)	53	45	42	-	32	-
R40 (1.5 m)	53	45	42	-	31	-
R41 (1.5 m)	53	45	42	-	28	-
R42 (1.5 m, 4.5 m)	53	45	42	-	27 / 27	-
R43 (1.5 m)	53	45	42	-	27	-
R44 (1.5 m)	53	45	42	-	30	-
R45 (1.5 m)	53	45	42	-	29	-

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R46 (1.5 m, 4.5 m)	53	45	42	-	41 / 41	-
R47 (1.5 m)	48	48	48	-	43	-
R48 (1.5 m)	48	48	48	-	37	-
R49 (1.5 m)	48	48	48	-	41	-
R50 (1.5 m)	63	63	63	-	36	-
R51 (1.5 m)	45	43	38	-	39	-
R52 (1.5 m)	45	43	38	-	38	-
R53 (1.5 m)	45	43	38	-	39	-
R54 (1.5 m)	53	45	41	-	40	-
R55 (1.5 m)	45	43	38	-	39	-
R56 (1.5 m)	45	43	38	-	38	-
R57 (1.5 m)	45	43	38	-	41	-
R58 (1.5 m)	45	43	38	-	40	-
R59 (1.5 m)	45	43	38	-	39	-
R60 (1.5 m)	45	43	38	-	38	-
R61 (1.5 m)	45	43	38	-	39	-
R62 (1.5 m)	45	43	38	-	37	-
R63 (1.5 m)	45	43	38	-	38	-
R64 (1.5 m)	45	43	38	-	39	-
R65 (1.5 m)	45	43	38	-	38	-
R66 (1.5 m)	45	43	38	-	39	-
R67 (1.5 m)	45	43	38	-	39	-
R68 (1.5 m)	45	43	38	-	39	-
R69 (1.5 m)	45	43	38	-	39	-
R70 (1.5 m)	53	45	41	-	35	-
R71 (1.5 m)	53	45	41	-	34	-
R72 (1.5 m)	53	45	41	-	35	-
R73 (1.5 m)	53	45	41	-	34	-
R74 (1.5 m)	53	45	41	-	34	-
R75 (1.5 m)	53	45	41	-	33	-

**Table 32 Emergency operational scenario 07 – Predicted Noise Levels, LAeq (15 minutes).**

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R01 (1.5 m)	68	68	68	-	48	-
R02 (1.5 m)	68	68	68	-	51	-
R03 (1.5 m, 4.5 m)	68	68	68	-	40 / 40	-
R04 (1.5 m)	68	68	68	-	51	-



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R05 (1.5 m, 4.5 m)	68	68	68	-	53 / 53	-
R06 (1.5 m, 4.5 m)	68	68	68	-	58 / 58	-
R07 (1.5 m)	53	45	41	-	37	-
R08 (1.5 m)	53	45	41	-	37	-
R09 (1.5 m)	53	45	41	-	37	-
R10 (1.5 m)	53	45	41	-	38	-
R11 (1.5 m)	53	45	41	-	37	-
R12 (1.5 m)	53	45	41	-	31	-
R13 (1.5 m)	53	45	41	-	34	-
R14 (1.5 m)	53	45	41	-	31	-
R15 (1.5 m)	53	45	41	-	39	-
R16 (1.5 m)	53	45	41	-	38	-
R17 (1.5 m)	53	50	48	-	33	-
R18 (1.5 m)	53	50	48	-	34	-
R19 (1.5 m)	53	50	48	-	34	-
R20 (1.5 m)	53	50	48	-	34	-
R21 (1.5 m)	53	50	48	-	34	-
R22 (1.5 m)	53	50	48	-	34	-
R23 (1.5 m)	53	50	48	-	34	-
R24 (1.5 m)	53	50	48	-	34	-
R25 (1.5 m, 4.5 m)	53	50	48	-	34 / 34	-
R26 (1.5 m)	53	50	48	-	34	-
R27 (1.5 m)	53	50	48	-	34	-
R28 (1.5 m)	53	50	48	-	35	-
R29 (1.5 m)	53	50	48	-	35	-
R30 (1.5 m)	53	50	48	-	34	-
R31 (1.5 m)	53	50	48	-	34	-
R32 (1.5 m)	53	50	48	-	30	-
R33 (1.5 m, 4.5 m)	53	45	41	-	36 / 36	-
R34 (1.5 m, 4.5 m)	53	50	48	-	33 / 33	-
R35 (1.5 m, 4.5 m)	53	45	42	-	38 / 38	-
R36 (1.5 m, 4.5 m)	53	45	42	-	38 / 38	-
R37 (1.5 m)	53	45	42	-	32	-
R38 (1.5 m)	53	45	42	-	31	-
R39 (1.5 m)	53	45	42	-	30	-



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R40 (1.5 m)	53	45	42	-	30	-
R41 (1.5 m)	53	45	42	-	27	-
R42 (1.5 m, 4.5 m)	53	45	42	-	26 / 26	-
R43 (1.5 m)	53	45	42	-	27	-
R44 (1.5 m)	53	45	42	-	28	-
R45 (1.5 m)	53	45	42	-	28	-
R46 (1.5 m, 4.5 m)	53	45	42	-	40 / 40	-
R47 (1.5 m)	48	48	48	-	45	-
R48 (1.5 m)	48	48	48	-	39	-
R49 (1.5 m)	48	48	48	-	43	-
R50 (1.5 m)	63	63	63	-	38	-
R51 (1.5 m)	45	43	38	-	37	-
R52 (1.5 m)	45	43	38	-	35	-
R53 (1.5 m)	45	43	38	-	37	-
R54 (1.5 m)	53	45	41	-	38	-
R55 (1.5 m)	45	43	38	-	37	-
R56 (1.5 m)	45	43	38	-	36	-
R57 (1.5 m)	45	43	38	-	39	-
R58 (1.5 m)	45	43	38	-	38	-
R59 (1.5 m)	45	43	38	-	37	-
R60 (1.5 m)	45	43	38	-	36	-
R61 (1.5 m)	45	43	38	-	35	-
R62 (1.5 m)	45	43	38	-	35	-
R63 (1.5 m)	45	43	38	-	36	-
R64 (1.5 m)	45	43	38	-	37	-
R65 (1.5 m)	45	43	38	-	36	-
R66 (1.5 m)	45	43	38	-	38	-
R67 (1.5 m)	45	43	38	-	37	-
R68 (1.5 m)	45	43	38	-	37	-
R69 (1.5 m)	45	43	38	-	37	-
R70 (1.5 m)	53	45	41	-	31	-
R71 (1.5 m)	53	45	41	-	32	-
R72 (1.5 m)	53	45	41	-	32	-
R73 (1.5 m)	53	45	41	-	31	-
R74 (1.5 m)	53	45	41	-	32	-
R75 (1.5 m)	53	45	41	-	31	-

**Table 33 Emergency operational scenario 08 – Predicted Noise Levels, LAeq (15 minutes).**

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R01 (1.5 m)	68	68	68	55	-	-
R02 (1.5 m)	68	68	68	57	-	-
R03 (1.5 m, 4.5 m)	68	68	68	51 / 51	-	-
R04 (1.5 m)	68	68	68	54	-	-
R05 (1.5 m, 4.5 m)	68	68	68	58 / 58	-	-
R06 (1.5 m, 4.5 m)	68	68	68	59 / 59	-	-
R07 (1.5 m)	53	45	41	44	-	-
R08 (1.5 m)	53	45	41	44	-	-
R09 (1.5 m)	53	45	41	44	-	-
R10 (1.5 m)	53	45	41	45	-	-
R11 (1.5 m)	53	45	41	44	-	-
R12 (1.5 m)	53	45	41	37	-	-
R13 (1.5 m)	53	45	41	39	-	-
R14 (1.5 m)	53	45	41	37	-	-
R15 (1.5 m)	53	45	41	46	-	-
R16 (1.5 m)	53	45	41	45	-	-
R17 (1.5 m)	53	50	48	37	-	-
R18 (1.5 m)	53	50	48	37	-	-
R19 (1.5 m)	53	50	48	37	-	-
R20 (1.5 m)	53	50	48	37	-	-
R21 (1.5 m)	53	50	48	37	-	-
R22 (1.5 m)	53	50	48	37	-	-
R23 (1.5 m)	53	50	48	37	-	-
R24 (1.5 m)	53	50	48	38	-	-
R25 (1.5 m, 4.5 m)	53	50	48	38 / 38	-	-
R26 (1.5 m)	53	50	48	38	-	-
R27 (1.5 m)	53	50	48	38	-	-
R28 (1.5 m)	53	50	48	38	-	-
R29 (1.5 m)	53	50	48	39	-	-
R30 (1.5 m)	53	50	48	38	-	-
R31 (1.5 m)	53	50	48	37	-	-
R32 (1.5 m)	53	50	48	34	-	-
R33 (1.5 m, 4.5 m)	53	45	41	42 / 42	-	-
R34 (1.5 m, 4.5 m)	53	50	48	36 / 36	-	-

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R35 (1.5 m, 4.5 m)	53	45	42	44 / 44	-	-
R36 (1.5 m, 4.5 m)	53	45	42	45 / 45	-	-
R37 (1.5 m)	53	45	42	40	-	-
R38 (1.5 m)	53	45	42	39	-	-
R39 (1.5 m)	53	45	42	37	-	-
R40 (1.5 m)	53	45	42	37	-	-
R41 (1.5 m)	53	45	42	32	-	-
R42 (1.5 m, 4.5 m)	53	45	42	31 / 31	-	-
R43 (1.5 m)	53	45	42	31	-	-
R44 (1.5 m)	53	45	42	35	-	-
R45 (1.5 m)	53	45	42	34	-	-
R46 (1.5 m, 4.5 m)	53	45	42	44 / 44	-	-
R47 (1.5 m)	48	48	48	46	-	-
R48 (1.5 m)	48	48	48	41	-	-
R49 (1.5 m)	48	48	48	45	-	-
R50 (1.5 m)	63	63	63	41	-	-
R51 (1.5 m)	45	43	38	43	-	-
R52 (1.5 m)	45	43	38	42	-	-
R53 (1.5 m)	45	43	38	43	-	-
R54 (1.5 m)	53	45	41	44	-	-
R55 (1.5 m)	45	43	38	43	-	-
R56 (1.5 m)	45	43	38	42	-	-
R57 (1.5 m)	45	43	38	44	-	-
R58 (1.5 m)	45	43	38	44	-	-
R59 (1.5 m)	45	43	38	43	-	-
R60 (1.5 m)	45	43	38	43	-	-
R61 (1.5 m)	45	43	38	43	-	-
R62 (1.5 m)	45	43	38	42	-	-
R63 (1.5 m)	45	43	38	42	-	-
R64 (1.5 m)	45	43	38	43	-	-
R65 (1.5 m)	45	43	38	43	-	-
R66 (1.5 m)	45	43	38	44	-	-
R67 (1.5 m)	45	43	38	44	-	-
R68 (1.5 m)	45	43	38	44	-	-
R69 (1.5 m)	45	43	38	44	-	-
R70 (1.5 m)	53	45	41	40	-	-
R71 (1.5 m)	53	45	41	39	-	-



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R72 (1.5 m)	53	45	41	39	-	-
R73 (1.5 m)	53	45	41	40	-	-
R74 (1.5 m)	53	45	41	39	-	-
R75 (1.5 m)	53	45	41	39	-	-

**Table 34 Emergency operational scenario 09 – Predicted Noise Levels, LAeq (15 minutes).**

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R01 (1.5 m)	68	68	68	-	-	65
R02 (1.5 m)	68	68	68	-	-	65
R03 (1.5 m, 4.5 m)	68	68	68	-	-	60 / 60
R04 (1.5 m)	68	68	68	-	-	61
R05 (1.5 m, 4.5 m)	68	68	68	-	-	67 / 67
R06 (1.5 m, 4.5 m)	68	68	68	-	-	67 / 67
R07 (1.5 m)	53	45	41	-	-	49
R08 (1.5 m)	53	45	41	-	-	51
R09 (1.5 m)	53	45	41	-	-	51
R10 (1.5 m)	53	45	41	-	-	52
R11 (1.5 m)	53	45	41	-	-	48
R12 (1.5 m)	53	45	41	-	-	42
R13 (1.5 m)	53	45	41	-	-	43
R14 (1.5 m)	53	45	41	-	-	41
R15 (1.5 m)	53	45	41	-	-	53
R16 (1.5 m)	53	45	41	-	-	52
R17 (1.5 m)	53	50	48	-	-	44
R18 (1.5 m)	53	50	48	-	-	44
R19 (1.5 m)	53	50	48	-	-	44
R20 (1.5 m)	53	50	48	-	-	44
R21 (1.5 m)	53	50	48	-	-	45
R22 (1.5 m)	53	50	48	-	-	45
R23 (1.5 m)	53	50	48	-	-	45
R24 (1.5 m)	53	50	48	-	-	45
R25 (1.5 m, 4.5 m)	53	50	48	-	-	45 / 45
R26 (1.5 m)	53	50	48	-	-	45
R27 (1.5 m)	53	50	48	-	-	46
R28 (1.5 m)	53	50	48	-	-	46
R29 (1.5 m)	53	50	48	-	-	46

Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R30 (1.5 m)	53	50	48	-	-	44
R31 (1.5 m)	53	50	48	-	-	44
R32 (1.5 m)	53	50	48	-	-	41
R33 (1.5 m, 4.5 m)	53	45	41	-	-	50 / 50
R34 (1.5 m, 4.5 m)	53	50	48	-	-	43 / 43
R35 (1.5 m, 4.5 m)	53	45	42	-	-	52 / 52
R36 (1.5 m, 4.5 m)	53	45	42	-	-	52 / 52
R37 (1.5 m)	53	45	42	-	-	48
R38 (1.5 m)	53	45	42	-	-	47
R39 (1.5 m)	53	45	42	-	-	46
R40 (1.5 m)	53	45	42	-	-	45
R41 (1.5 m)	53	45	42	-	-	40
R42 (1.5 m, 4.5 m)	53	45	42	-	-	38 / 38
R43 (1.5 m)	53	45	42	-	-	38
R44 (1.5 m)	53	45	42	-	-	43
R45 (1.5 m)	53	45	42	-	-	42
R46 (1.5 m, 4.5 m)	53	45	42	-	-	51 / 51
R47 (1.5 m)	48	48	48	-	-	51
R48 (1.5 m)	48	48	48	-	-	48
R49 (1.5 m)	48	48	48	-	-	52
R50 (1.5 m)	63	63	63	-	-	47
R51 (1.5 m)	45	43	38	-	-	51
R52 (1.5 m)	45	43	38	-	-	52
R53 (1.5 m)	45	43	38	-	-	52
R54 (1.5 m)	53	45	41	-	-	52
R55 (1.5 m)	45	43	38	-	-	52
R56 (1.5 m)	45	43	38	-	-	52
R57 (1.5 m)	45	43	38	-	-	52
R58 (1.5 m)	45	43	38	-	-	51
R59 (1.5 m)	45	43	38	-	-	51
R60 (1.5 m)	45	43	38	-	-	50
R61 (1.5 m)	45	43	38	-	-	51
R62 (1.5 m)	45	43	38	-	-	51
R63 (1.5 m)	45	43	38	-	-	50
R64 (1.5 m)	45	43	38	-	-	51
R65 (1.5 m)	45	43	38	-	-	50



Receiver (Height from ground (m))	Criteria (dB(A))			Predicted Noise Levels (dB(A))		
	Day	Evening	Night	Day	Evening	Night
R66 (1.5 m)	45	43	38	-	-	51
R67 (1.5 m)	45	43	38	-	-	51
R68 (1.5 m)	45	43	38	-	-	51
R69 (1.5 m)	45	43	38	-	-	51
R70 (1.5 m)	53	45	41	-	-	48
R71 (1.5 m)	53	45	41	-	-	47
R72 (1.5 m)	53	45	41	-	-	47
R73 (1.5 m)	53	45	41	-	-	48
R74 (1.5 m)	53	45	41	-	-	48
R75 (1.5 m)	53	45	41	-	-	47

### 5.6 Annoying characteristics of noise

The operations of the DAHUs, exhaust fans, load banks, and generators have the potential to generate low-frequency noise issues. The NPfI considers a low frequency noise issue to exist where:

- The C minus A weight noise level is 15 dB or greater; and
- The spectrum is considered to be unbalanced.

The standard noise modelling algorithm, ISO9613, is unable to calculate low frequency and tonal noise impacts. Below 63 Hz, SoundPLAN uses the 63Hz correction, an approach which has never been validated. For one-third octave bands, SoundPLAN uses the octave band correction. Again, this approach has not been validated.

To resolve the limitations in modelling, the EPA have written an article in the AAS Journal, An example approach to consider low frequency noise in the context of the NSW noise policy for industry. This provides an example approach on how a low frequency assessment can be completed. The approach is summarised below:

- Undertake one-third octave noise measurements between 10 Hz to 20 kHz at a similar site and comparable location,
- Identify the 10 Hz to 63 Hz spectrum components level by taking the logarithmic average of the measured noise levels,
- Predict one-third octave band noise levels, and apply the tail below 63 Hz; and
- Undertake a screening analysis of the one-third octave noise levels to assess the C-weighted minus A-weighted noise levels. Where the difference is greater than or equal to 15 dB, determine if the spectrum is considered to be unbalanced, in accordance with the Noise Policy for Industry.

PWNA has previously undertaken detailed low frequency noise measurements of operational data centres and generators at representative measurement locations. These noise measurements have been used to calculate the A and C weighted noise levels presented in **Table 35** below, following the method presented above.

The scenario which has the greatest potential for a low frequency issue is Operational Scenario 08, which includes the constant data centre mechanical noise (DAHUs and exhaust fans) as well as 20 x simultaneous generators and 3 x load banks operating for the purpose of confidence testing and load testing (specifically, 17 x generators operating at 25% load for confidence testing and 3 x generators operating at 100% for load testing).

The results of the low frequency screening test for this scenario at each of the identified sensitive receivers are presented in **Table 35** below.



**Table 35 Low frequency noise screening test.**

Receiver (Height from ground (m))	Operational Scenario 08 – Day		
	dB(A)	dB(C)	Difference
R01 (1.5 m)	55	53	5
R02 (1.5 m)	57	58	8
R03 (1.5 m, 4.5 m)	51 / 51	44	4
R04 (1.5 m)	54	64	12
R05 (1.5 m, 4.5 m)	58 / 58	59	7
R06 (1.5 m, 4.5 m)	59 / 59	68	11
R07 (1.5 m)	44	46	9
R08 (1.5 m)	44	46	9
R09 (1.5 m)	44	45	8
R10 (1.5 m)	45	47	9
R11 (1.5 m)	44	48	10
R12 (1.5 m)	37	45	14
R13 (1.5 m)	39	47	13
R14 (1.5 m)	37	45	14
R15 (1.5 m)	46	48	9
R16 (1.5 m)	45	48	9
R17 (1.5 m)	37	47	14
R18 (1.5 m)	37	48	14
R19 (1.5 m)	37	48	14
R20 (1.5 m)	37	47	14
R21 (1.5 m)	37	47	14
R22 (1.5 m)	37	47	14
R23 (1.5 m)	37	47	13
R24 (1.5 m)	38	47	13
R25 (1.5 m, 4.5 m)	38 / 38	47	14
R26 (1.5 m)	38	48	14
R27 (1.5 m)	38	48	13
R28 (1.5 m)	38	49	14
R29 (1.5 m)	39	49	13
R30 (1.5 m)	38	47	13
R31 (1.5 m)	37	47	13
R32 (1.5 m)	34	44	14
R33 (1.5 m, 4.5 m)	42 / 42	47	10
R34 (1.5 m, 4.5 m)	36 / 36	47	14
R35 (1.5 m, 4.5 m)	44 / 44	48	10
R36 (1.5 m, 4.5 m)	45 / 45	48	9
R37 (1.5 m)	40	42	10
R38 (1.5 m)	39	40	9
R39 (1.5 m)	37	41	11



Receiver (Height from ground (m))	Operational Scenario 08 – Day		
	dB(A)	dB(C)	Difference
R40 (1.5 m)	37	41	11
R41 (1.5 m)	32	40	13
R42 (1.5 m, 4.5 m)	31 / 31	40 / 40	14
R43 (1.5 m)	31	41	14
R44 (1.5 m)	35	39	12
R45 (1.5 m)	34	39	12
R46 (1.5 m, 4.5 m)	44 / 44	50 / 50	10
R47 (1.5 m)	46	57	14
R48 (1.5 m)	41	53	14
R49 (1.5 m)	45	56	14
R50 (1.5 m)	41	52	14
R51 (1.5 m)	43	48	12
R52 (1.5 m)	42	47	12
R53 (1.5 m)	43	48	11
R54 (1.5 m)	44	49	11
R55 (1.5 m)	43	48	12
R56 (1.5 m)	42	47	12
R57 (1.5 m)	44	50	11
R58 (1.5 m)	44	49	10
R59 (1.5 m)	43	47	10
R60 (1.5 m)	43	46	10
R61 (1.5 m)	43	45	9
R62 (1.5 m)	42	45	10
R63 (1.5 m)	42	47	11
R64 (1.5 m)	43	48	10
R65 (1.5 m)	43	46	10
R66 (1.5 m)	44	48	10
R67 (1.5 m)	44	46	9
R68 (1.5 m)	44	47	9
R69 (1.5 m)	44	47	9
R70 (1.5 m)	40	42	11
R71 (1.5 m)	39	43	11
R72 (1.5 m)	39	44	12
R73 (1.5 m)	40	41	10
R74 (1.5 m)	39	44	12
R75 (1.5 m)	39	43	12

The results in **Table 35** indicate that compliance with the low frequency screening test is achieved at all locations. This analysis has confirmed that the low frequency correction is not required and further consideration of the unbalanced spectrum is not required.



### 5.7 Operational road traffic noise

Operational road traffic movements will occur on Power Street, Glendenning Road, and Woodstock Avenue, which are all classed as sub-arterial roads. Residential receivers are located along Woodstock Avenue and Power Street to the west of the project site only. As such, traffic noise impacts to the industrial receivers located along Glendenning Road have not been considered.

Based on a review of the forecasted operational traffic movements, the anticipated net increase to traffic arriving / leaving the development would be:

- 180 peak hour trips in the AM peak; and
- 183 peak hour trips in the PM peak.

The noise propagation algorithm Calculation of Road Traffic Noise (CoRTN) has been proven to effectively calculate road traffic noise from free-flowing traffic throughout Australia. Operational noise levels have been predicted for noise sensitive receivers along Power Street and Woodstock Avenue (all Sub-arterial roads).

Presented in **Table 36** is the predicted existing and predicted operational noise impacts, assessed against the applicable criteria.

The additional car / truck volumes would increase noise levels by approximately 0.9 dB in the peak AM period, with an even lower increase for the PM peak of approximately 0.4 dB.

**Table 36 Operational Road Traffic Noise Impacts.**

Period	Criteria	Existing, dB(A)	Future, dB(A)	Change in noise, dB
<b>Operational Road Traffic Noise Impacts</b>				
<b>Woodstock Avenue (AM peak)</b>	$L_{Aeq(15\text{ hour})}$ External 60 dB(A)	73.6	73.9	0.3
<b>Woodstock Avenue (PM peak)</b>	$L_{Aeq(15\text{ hour})}$ External 60 dB(A)	73.7	74.1	0.4
<b>Power Street (AM Peak)</b>	$L_{Aeq(15\text{ hour})}$ External 60 dB(A)	69.6	70.5	0.9
<b>Power Street (PM Peak)</b>	$L_{Aeq(15\text{ hour})}$ External 60 dB(A)	72.2	72.7	0.5

As evident in **Table 36** above, the existing road traffic noise resulting from both Woodstock and Power Street exceeds the sub-arterial road noise criteria at the nearest residential receivers, however the predicted change in noise levels as a result of the development is less than 1.0 dB. It is therefore not considered reasonable, nor feasible to provide noise mitigation to reduce road traffic noise impacts as part of this proposal.

Additionally, road traffic impacts due to nighttime operations are expected to be negligible. The proposed development is proposed to have up to 18 staff working during the nighttime period. The impact of these additional vehicle movements will not increase road traffic noise at the worst affected receiver by greater than 2.0 dB. A change of 2 dB to 3 dB in road traffic noise does not warrant additional acoustic treatment or consideration.



## 6 CUMULATIVE NOISE IMPACTS

### 6.1 Cumulative construction noise impacts with other construction sites

Construction noise from multiple sites has the potential to increase noise at sensitive receiver locations. Dependent on the nature of the work, multiple construction sites have the potential to:

- Increase overall noise levels by as much as 3 dB greater than noise from the loudest site; and/or
- Impact sensitive receivers by generating noise on multiple sides of the property simultaneously.

Both of these impacts can increase the annoyance from construction activities. At the planning stage of the project, it is very difficult to determine the likelihood of impacts. Specific timing and noise impacts from this project can be estimated, but cannot be confirmed until a contractor has been appointed and the construction methodology and programme confirmed.

This project is currently unaware of other planned construction works that may occur at the time of this proposal, however this does not rule out the potential for cumulative noise impacts. The chance of simultaneous construction projects is potentially likely due to the geographic location of the development site (multiple adjacent industrial development lots).

Additionally, there will not be any cumulative impacts from the construction of the Glendenning Road Data Centre Campus due to the proposed construction staging, whereby each stage will not take place concurrently.

The uncertainty highlights the importance of the contractors Construction Noise and Vibration Management Plan (CNVMP). Construction works from other projects should be identified during the establishment of this plan, and management strategies established to minimise the potential impacts of the surrounding community. The plan will require:

- consultation with other projects to confirm their construction schedules,
- identification of the potential of cumulative noise and vibration impacts,
- a plan to establish how these impacts would be managed on an ongoing basis; and
- a communication strategy to provide notifications to the surrounding community.

### 6.2 Operational cumulative impacts

In the designation of the operational project noise trigger levels, the NPfI requires the consideration of intrusiveness and amenity levels.

The intrusiveness level considers the existing noise environment, with existing noise generating sources active. The background noise level is measured, and the intrusiveness set 5 dB above this level. For this project the intrusiveness level was not used to establish the operational noise criteria.

The amenity noise level establishes noise targets for different areas and the project specific amenity noise criteria for the project specific noise trigger levels. The final design predicted site operational noise impacts of the data centre campus have been established to range from 6 – 20 dB below the existing ambient noise level for the worst-case operational scenario (residential receivers).

In summary, cumulative operational noise levels have been considered throughout the development of the project noise trigger levels by basing the noise trigger levels on:

- The existing noise generated by operational industrial noise (the intrusiveness level); and
- The potential for future developments to generate noise (the amenity noise level)

Further consideration of the potential for cumulative noise impacts is therefore not required.



Additionally, cumulative impacts between any data centre operational scenarios and any remaining construction stages (for the remaining data centre campus) do not need to be considered as operational noise and construction noise are assessed against two separate requirements. Operational noise is assessed against the NPfI, and construction noise is assessed against the Interim Construction Noise Guideline.

Additionally, it is to be noted that all existing structures (excluding the northernmost warehouse building) located on the project site will / have already been demolished prior to the construction / operational phase of the proposed development, and will not create any cumulative noise / vibration impacts that will affect the construction / operational phases of the proposed development (including the construction / operation of DC01, DC02, and DC03).

The northernmost existing warehouse building will be used as a construction site office during the construction / operation for DC01, before being demolished to make way for DC02 and DC03.



## 7 MANAGEMENT AND MITIGATION MEASURES

### 7.1 Construction management measures

The construction predicted noise levels identified in Section 4 indicate that the noise impacts have the potential occur from the proposed works. These impacts are typical for a construction such as this and highlight the importance for appropriate noise management and mitigation measures.

Presented in **Table 37** is a summary of site-specific management procedures recommended to manage the predicted airborne noise and vibration impacts.

**Table 37 Summary of mitigation procedures.**

Procedure	Abbreviation	Description	Further Reference
General Management Measures	GMM	Introduce best-practice general mitigation measures in the workplace which are aimed at reducing the acoustic impact onto the nearest affected receivers.	Refer to Section 7.1.3 For vibration impacts, also refer to Section 4.7
Project Notification	PN	Issue project updates to stakeholders, discussing overviews of current and upcoming works. Advanced warning of potential disruptions can be included.  Content and length to be determined on a project-by-project basis.	Refer to Section 7.1.6
Verification Monitoring	V	Monitoring to comprise attended or unattended acoustic surveys. The purpose of the monitoring is to confirm measured levels are consistent with the predictions in the acoustic assessment, and to verify that the mitigation procedures are appropriate for the affected receivers.  If the measured levels are higher than those predicted, then the measures will need to be reviewed and the management plan will need to be amended.	For noise impact, refer to Section 7.1.3. For vibration impacts, Refer to Section 4.7
Complaints Management System	CMS	Implement a management system which includes procedures for receiving and addressing complaints from affected stakeholders	Refer to Section 7.1.6
Specific Notification	SN	Individual letters or phone calls to notify stakeholders that noise levels are likely to exceed noise objectives.  Alternatively, contractor could visit stakeholders individually in order to brief them in regards to the noise impact and the mitigation measures that will be implemented.	Refer to Section 7.1.6
Respite Offer	RO	Offer provided to stakeholders subjected to an ongoing impact.	-
Alternative Construction Methodology	AC	Contractor to consider alternative construction options that achieve compliance with relevant criteria. Alternative option to be determined on a case-by-case basis. It is recommended that the selection of the alternative option should also be determined by considering the assessment of on-site measurements (refer to Verification Monitoring above).	-

The application of these procedures is in relation to the exceedances over the relevant criteria. For airborne noise, the criteria are based on NMLs. The allocation of these procedures is discussed in Section 7.1.1.



For vibration, the criteria either correspond to human comfort, building damage or scientific and medical equipment. The application of these procedures is discussed in Section 3.2.

### 7.1.1 Allocation of Noise management Procedures

For residences, the management procedures have been allocated based on noise level exceedances at the affected properties, which occur over the designated NMLs (refer to Section 4.5). The allocation of these procedures is summarised in **Table 38** below.

**Table 38 Allocation of noise management procedures – residential receivers.**

Construction Hours	Exceedance over NML (dB)	Management Procedures (see definition above)
Mon – Fri: 7:00 am to 6:00 pm	0 - 3	GMM
Sat: 8:00 am – 1:00 pm	4 - 10	GMM, PN, V <sup>1</sup> , CMS, AC
No work on Sunday or Public Holidays.	> 10	GMM, PN, V, CMS, SN, AC
<i>Notes</i>		
1. Verification monitoring to be undertaken upon complaints received from affected receivers		

Please note the following regarding the allocation of these procedures:

- The exceedances have been predicted as part of the acoustic assessment, and these are summarised in Section 4.5.
- The allocation of procedures is based on the assumptions used for noise level predictions (refer to Section 4.5).

### 7.1.2 Allocation of vibration management procedures

**Table 39** summarises the vibration management procedures to be adopted based on exceedance scenarios (i.e., whether the exceedance occurs over human comfort criteria, building damage criteria, or criteria for scientific and medical equipment). Please note these management procedures apply for any type of affected receiver.

**Table 39 Allocation of vibration management procedures.**

Construction Hours	Exceedance Scenario	Management Procedures
<b>Standard Hours</b> Mon – Fri: 7:00 am to 6:00 pm Sat: 8:00 am – 1:00 pm	Over human comfort criteria (refer to Section 4.7)	GMM, PN, V, RO
	Over building damage criteria (refer to Section 4.7)	GMM, V, AC
<b>Outside Standard Hours</b> No works are proposed to occur outside of standard hours.	Over human comfort criteria (refer to Section 4.7)	GMM, SN, V, RO, CMS
	Over building damage criteria (refer to Section 4.7)	GMM, V, AC

### 7.1.3 General comments

The contractor will, where reasonable and feasible, apply best practice noise mitigation measures. These measures shall include the following:

- Maximising the offset distance between plant items and nearby noise sensitive receivers.
- Preventing noisy plant working simultaneously and adjacent to sensitive receivers.
- Minimising consecutive works in the same site area.
- Orienting equipment away from noise sensitive areas.
- Carrying out loading and unloading away from noise sensitive areas.
- Care should be taken to avoid placing noise-producing equipment within close proximity to large reflecting surfaces (such as the partially construction facades of the data centre buildings) as this may result in an increase to construction noise at sensitive receiver locations.

To minimise noise impacts during the works, the contractor will take all reasonable and feasible measures to mitigate noise effects.

The contractor will also take reasonable steps to control noise from all plant and equipment. Examples of appropriate noise control include efficient silencers and low noise mufflers.

The contractor should apply all feasible and reasonable work practices to meet the NMLs and inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels, duration of noise generating construction works, and the contact details for the proposal.

### **Alternate equipment or process**

Exceedance of the site's NMLs should result in an investigation as to whether alternate equipment could be used, or a difference process could be undertaken.

In some cases, the investigation may conclude that no possible other equipment can be used, however, a different process could be undertaken.

### **Acoustic enclosures/screening**

Typically, on a construction site there are three different types of plant that will be used: mobile plant (i.e., excavators, skid steers, etc.), semi mobile plant (i.e., hand tools generally) or static plant i.e. (diesel generators).

For plant items which are static it is recommended that, in the event exceedances are being measured due to operation of the plant item, an acoustic enclosure/screen is constructed to reduce impacts. These systems can be constructed from Fibre Cement (FC) sheeting or, if airflow is required, acoustic attenuators or louvres.

For semi mobile plant, relocation of plant should be investigated to either be operated in an enclosed space or at locations away from a receiver.

With mobile plant it is generally not possible to treat these sources. However, investigations into the machine itself may result in a reduction of noise (i.e., mufflers/attenuators etc).

### **General mitigation measures (Australia Standard 2436-2010)**

As well as the above project specific noise mitigation controls, AS 2436-2010 "Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites" sets out numerous practical recommendations to assist in mitigating construction noise emissions. Examples of strategies that could be implemented on the subject project are listed below, including the typical noise reduction achieved, where applicable.

### **Adoption of universal work practices**

- Regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration.
- Regular identification of noisy activities and adoption of improvement techniques.
- Avoiding the use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby sensitive receivers.
- Where possible, avoiding the use of equipment that generates impulsive noise.
- Minimising the need for vehicle reversing for example (particularly at night), by arranging for one-way site traffic routes.
- Use of broadband audible alarms on vehicles and elevating work platforms used on site.
- Minimising the movement of materials and plant and unnecessary metal-on-metal contact.
- Minimising truck movements.

### **Plant and equipment**

Where possible, the operation of plant and equipment on the site should be undertaken with the following considerations, where practicable, including the following:

- Choosing quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks.
- Selecting plant and equipment with low vibration generation characteristics.
- Operating plant and equipment in the quietest and most efficient manner.

### **Work scheduling**

- Providing respite periods which could include restricting very noisy activities to time periods that least affect the nearby noise sensitive locations, restricting the number of nights that after-hours work is conducted near residences or by determining any specific requirements.

- Scheduling work to coincide with non-sensitive periods.
- Planning deliveries and access to the site to occur quietly and efficiently and organising parking only within designated areas located away from the sensitive receivers.
- Optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours.

### Source noise control strategies

Some ways of controlling noise at the source are:

- Where reasonably practical, noisy plant or processes should be replaced by less noisy alternatives.
- Modify existing equipment: Engines and exhausts are typically the dominant noise sources on mobile plant such as cranes, graders, excavators, trucks, etc. To minimise noise emissions, residential grade mufflers should be fitted on all mobile plant utilised on site.
- Siting of equipment: locating noisy equipment behind structures that act as barriers, or at the greatest distance from the noise-sensitive area; or orienting the equipment so that noise emissions are directed away from any sensitive areas, to achieve the maximum attenuation of noise.
- Regular and effective maintenance.

### Miscellaneous comments

Deliveries should be undertaken, where possible, during standard construction hours.

Maximise hammer penetration (and reduce blows) by using sharp hammer tips. Keep stocks of sharp profiles at site and monitor the profiles in use.

It is advised that mobile plant and trucks operating on site for a significant portion of the project are to have reversing alarm noise emissions minimised. This is to be implemented subject to recognising the need to maintain occupational safety standards.

No public address system should be used on site.

### 7.1.4 Construction vibration mitigation measures

The following vibration mitigation measures should be considered, where practicable:

- Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment.
- Use lower vibration generating items of construction plant and equipment; that is, smaller capacity plant.
- Minimise conducting vibration generating works consecutively in the same area (if applicable).
- Undertake the removal of concrete within the building using saw cutting or pulverising where possible.

### 7.1.5 Noise and vibration monitoring

Noise monitoring, if required, will be performed by an acoustical consultant directly engaged by the contractor in accordance with the projects Conditions of Consent.

Noise monitoring is recommended to be undertaken by attended noise measurements at the start of any new phase of works (i.e. ground works or remediation works etc.). The statistical parameters to be measured should include the following noise descriptors: LAmin, LA90, LA10, LA01, LAmx and LAeq. Unattended noise measurements should be conducted over consecutive 15-minute periods.

The survey methodology and any equipment should comply with the requirements discussed in Standard AS 1055.1-1997.

As part of the management of noise and vibration from the proposed ground works activities to be undertaken on the site the following noise and vibration measurements are recommended to be undertaken:

1. Noise Monitoring –
  - a. Attended noise level measurements of typical ground works activities should be undertaken at site. Attended construction noise surveys of the site and surrounding impacts on neighbours should be undertaken during the following as a minimum:
    - i. In response to any ongoing complaints received from neighbours.
2. Vibration Monitoring– To confirm vibration magnitudes are within the expected levels the following attended vibration measurements are required:

- a. Short term attended vibration measurements – Attended short term vibration measurement of activities with the potential to generate maximum vibration to be undertaken on commencement at the site, including the following:
  - i. Measurements to be undertaken at a representative location from the activity being conducted with a similar distance to the potentially affected receiver.
  - ii. Activities with the potential to generate the greatest magnitudes of vibration include:
  - iii. Piling works.

The above recommendations serve as high level advice to address the requirements of the SEARs. It is recommended that the construction noise and vibration impacts be reviewed during the site-specific construction noise and vibration management plan, once detailed construction staging / operations are known.

### **7.1.6 Community consultation**

Active community consultation and the maintenance of positive relations with nearby court houses, local residents, and businesses would assist in alleviating concerns and thereby minimising complaint.

This form of notification should provide specific notification of the duration and timing of the required ground works activities so that residents are informed about the works ahead of time. The letter should also provide the community with a hotline number for a community liaison officer available to adequately respond to all project related enquiries.

Ideally the hotline number should provide concerned locals an opportunity to raise any concerns with the project proponent and provide an opportunity to determine the best method to satisfy all requirements.

Prior to the works onsite being undertaken, community consultation with the neighbouring affected parties be undertaken. Community engagement and consultation should not be limited to the beginning of the onsite works but throughout, providing the community with constant updates on the progress and upcoming works. In our experience these could include:

- Site noticeboard,
- Email notifications; and
- Letterbox drops.

#### **Complaints management system**

Should complaints arise they must be dealt with in a responsible and uniform manner, therefore, a management system to deal with complaints is detailed below:

Local residents and landowners should be informed by direct mail of a direct 24-hour telephone line where any noise complaints related to the required ground works will be recorded. The 24-hour telephone line number will be made available on the construction site signage.

All complaints should be investigated by the Contractor in accordance with the procedures outlined in Australia Standard 2436-2010. Consequently, a complaint response procedure should be implemented. Information to be gathered as part of this process should include:

- location of complainant
- time/s of occurrence of alleged noise or vibration impacts
- nature of impact particularly with respect to vibration
- Perceived source
- Prevailing weather conditions and similar details that could be utilised to assist in the investigation of the complaint.

All resident complaints will be responded to in the required timeframe and action taken recorded.

Post receiving a noise and or vibration complaint, the process outlined in the Contingency Plans below should be undertaken.

#### **Contingency plans**

Contingency plans are required to address noise or vibration problems if excessive levels are measured at surrounding sensitive receivers and/or if justified complaints occur. Such plans include:

- Stop the onsite works.
- Identify the source of the main equipment within specific areas of the site which is producing the most required ground works noise and vibration at the sensitive receivers; and

- Review the identified equipment and determine if an alternate piece of equipment can be used or the process can be altered.
- In the event an alternate piece of equipment or process can be used, works can re-commence.
- In the event an alternate piece of equipment or process cannot be determined implement a construction assessment to be performed by a suitably qualified acoustic consultant.
- Respite periods to be scheduled during potentially noise sensitive periods of the surrounding receivers.

The Superintendent (if the Superintendent has been allocated to the project) shall have access to view the Contractor's noise measurement records on request. The Superintendent may undertake noise monitoring if and when required.

## 7.2 Operational noise management and mitigation measures

The noise impact assessment has predicted compliance with the operational noise criteria for all assessment periods. However, noise management measures are recommended to minimise the potential impact on the surrounding noise sensitive receivers.

### 7.2.1 Operational management measures

Majority of the noise emissions from the proposed datacentre campus consists of constant, continuous mechanical plant operations. As such, minimal operational management measures are available / relevant. However, operational management measures for light / heavy vehicles and delivery of goods via trucks, whilst not required, are recommended to minimise the impact on nearby receivers outside the daytime period.

Noise management measures can be effective to control noise impacts associated with behaviours. The corner stone to noise management measures is making employees and people accessing the site aware of their site requirements and obligations.

Clear signage should be provided for drivers to limit noise, and all conversations should be encouraged to be completed inside where the building fabric can reduce the transmission of noise.

### 7.2.2 Recommended operational mitigation measures

The modelling conducted in Section 0 finds that, should certain noise mitigation measures be adopted, as discussed further below, compliance with the noise criteria set out in the Blacktown DCP 2015 and NSW NPfI is predicted at all sensitive receivers during all operating scenarios.

#### 7.2.2.1 Electrical and Mechanical Plant Selection

In the event that the proposed Danann DAHUs - **Table 23**, and the exhaust fans - **Table 24** are selected, no additional acoustic attenuation will be required for the DAHU / exhaust fan (excluding DC02) units to achieve compliance with the noise criteria set out in the Blacktown DCP 2015 and the NSW NPfI at all sensitive receivers during the operating scenarios outlined in Section 5.4. The following conceptual noise controls are recommended for the project:

- All of the exhaust fans installed at DC02 are to be fitted with acoustic attenuators or similar, which achieve the acoustic insertion losses presented within **Table 22**.
- Generators (up to 20x generators and 3x load banks) distributed into 8 generators and 1 load bank per large data centre (DC01 & DC03) and 4 generators with 1 load bank per small data centre (DC02) operating in parallel are to be tested during the daytime period only (of the 20x generators 17x are to operate at 25% load, and 3x are permitted to operate at 100% load in combination with a load bank for testing purposes.).
- Generators (up to 1x generators and 1x load banks) are to be tested during the evening period only. Totalling 1x generator and 1x load bank for the entire data centre campus.
- The diesel generators are to be located inside an acoustic enclosure, which features treatment where necessary (including acoustic treatment to the exhaust discharge in the form of a muffler or similar, treatment to the radiator discharge / discharge stack where necessary, air intake face where necessary (in the form of acoustic louvres or similar), and enclosure treatment) to reach a maximum combined sound power level of 104.5 dB(A) for each individual emergency generator. The maximum overall allowable sound power levels (logarithmic summation of all noise emitting components / faces of the generator) of the diesel generators have been provided in **Table 19**.

- The sound power levels of the load bank units are to be at or below the levels listed in **Table 21**.
- It is recommended that during the detailed design phases of DC02 and DC03, a detailed acoustic study is complete to ensure that the mechanical and electrical equipment selections, and corresponding acoustic mitigation measures recommended within this assessment are still applicable, such that the completed data centre campus will achieve compliance with the operational noise criteria established within this assessment.

As such, the majority of the mitigation measures for the proposed development have been achieved by careful selection of mechanical equipment that do not require additional, extensive noise mitigation / treatments. Additionally, the proximity of the proposed development to the nearest noise sensitive receivers provides significant noise pathway mitigation.

Therefore, this assessment has integrated many of the 'best practice' noise mitigation strategies that are presented within the NPfI.

### 7.2.2.2 Emergency generator scenario

Outside of a full systems power failure, the emergency generators would not operate for any other purpose than occasional testing (operating with a maximum of 20 generators simultaneously during the daytime period for testing purposes).

A review of the latest information supplied to the 2023 Distribution Annual Planning Report (DAPR) and associated network reliability, the average unplanned outage duration per year per customer from financial year 2013 – financial year 2023 equates to approximately 82 minutes. Further, the probability of a power failure occurring is estimated to be 0.00016 per year.

The predicted noise levels resulting from Operational Scenario 09 (full systems power failure) have been presented in **Table 34** above, to equate the expected noise levels in the unlikely event of a full systems power failure. Due to the minimal probability of a total power failure, it is not considered reasonable to apply the PNTLs established in accordance with the NPfI (Section 3.3.2.4) for this scenario.

Additionally, if a full systems power failure was to occur, the estimated duration of the emergency generators operating is expected to be limited to hours of operation, rather than days (with an average power outage duration of 82 minutes per year, based on 2013 – 2023 statistics). Further reducing the overall noise impact to the nearby community.

It is not considered reasonable to assess the emergency generator scenario against the project noise trigger levels presented in Section 3.3.2.4, this is due to the fact that a full systems power failure is an extremely unlikely event, and if it was to occur, the estimated duration of the emergency generators operating is expected to be limited to hours of operation, rather than days. Reducing the overall noise impact to the nearby community.

A detailed list of the mitigation and management measures that has been incorporated to the selection and design of the emergency generators to minimise the overall noise impacts to the noise sensitive receivers in the event of a full systems power failure are presented in **Table 40** below.

**Table 40 Generators design considerations**

Considered Mitigation	Effect of noise emissions / benefit
Selection of closed generator set	The selection of a closed generator set was selected compared to an open generator set, this was due to the inherent reduction of noise emissions due to the substantial screening / transmission losses from the solid enclosure fitted to each generator.
Selection of mufflers to generator exhaust	The selected closed generator set featured an optional exhaust muffler which provides significant noise reduction to the exhaust component of the generators.



Considered Mitigation	Effect of noise emissions / benefit
Selection of generators that feature a sound pressure level of 75 dB(A) at 1 m	All of the selected generators featured a sound pressure level of not greater than 75 dB(A) when measured at a distance of 1 m. This represents a sound pressure level that is among the lowest for closed generator sets of this class. Providing benefits to both the operators of the generators (reduced noise levels for WHS purposes) and also reducing the overall noise impact to the nearest noise sensitive receivers during operational testing and in the unlikely event of a full systems power failure.
Inclusion of multiple 90° bends to the exhaust discharge of the generators	The decision to include multiple 90° bends to the generator exhaust provides a quantifiable reduction to the overall noise emissions from the emergency generators.
Inclusion of louvres to the façade of the plant rooms which house the generators	Louvres have been included to the façade of the plant rooms which house the emergency generators. These louvres provide a quantifiable insertion loss to the overall noise emissions from the emergency generators.
Optimisation of the positioning of the emergency generators around the data centre campus	The emergency generators have been positioned around the corners of each data centre building. This design decision provides the acoustic benefit of spreading out the emergency generators where possible, as opposed to positioning all generators within close proximity to each other. This is particularly relevant to this project site, due to the presence of noise sensitive receivers in the surrounding area.

It is therefore not considered reasonable or feasible to provide additional mitigation measures to the emergency generators when considering the noise impacts from the full systems power outage scenario.

## 8 CONCLUSION

Pulse White Noise Acoustics (PWNA) has been engaged to undertake a Noise and Vibration Impact Assessment of the proposed Datacentre to be located at 2 Glendenning Road, Glendenning NSW 2761. This report provides an assessment of possible operational impacts of the proposed Datacentre against the derived noise criteria. This report provides conceptual noise mitigation measures to address potential noise and vibration impacts, where relevant. Specially, this report responds to the Industry Specific Secretary's Environmental Assessment Requirements (SEARs) issued on 25 July 2024.

The subject site is located at 2 Glendenning Road, Glendenning and is legally described as Lot 2 DP 1137162. It is zoned E4 General Industrial under the Blacktown Local Environmental Plan 2015.

The subject site comprises a total area of 10.44 ha and exhibits a primary frontage to Glendenning Road at the western boundary for approximately 295 m. A secondary frontage to Woodstock Avenue is located along the southern boundary, for a length of approximately 335 m.

Background noise logging was undertaken in three locations between 8<sup>th</sup> April and 17<sup>th</sup> April 2024 to establish the existing noise environment at noise sensitive receivers near the site.

An additional noise logger was located at 9 Carroll Crescent, Plumpton, Logger 04. This logger was used to establish the appropriate noise criteria for NCA01 (further setback from the M7). Logger 04 was deployed from the 19<sup>th</sup> of September – 29<sup>th</sup> September.

Appropriate construction noise management noise levels have been established in accordance with the EPAs Interim Construction Noise Guideline and the background noise logging. Appropriate vibration criteria were derived from the EPAs Assessing vibration: a technical guideline. The EPAs Road Noise Policy provided appropriate noise criteria for the assessment of construction traffic noise associated with the site.

A range of construction noise scenarios were modelled using SOUNDPLAN v9.1 and assessed against the derived project specific NMLs. The assessment identified that there were no noise sensitive receivers which would be Highly Noise Affected or significantly above the project NMLs. A limited number of nearby industrial receivers were predicted to exceed the NMLs by up to 5 dB at time. Appropriate construction noise management and mitigation measures have been recommended to reduce the potential for impacts on the surrounding community.

Construction vibration has been assessed based on a range of equipment that could be used on the project. The most significant vibration impacts would be experienced during excavation activities.

Noise impacts from construction traffic are predicted to increase road traffic noise levels by less than 1 dB as a result of the additional construction vehicle movements. A change in noise of less than 2 or 3 dB is typically not considered discernible.

Operational noise emission criteria have been derived from the background noise logging in accordance with the EPAs Noise Policy for Industry and background noise logging undertaken for this project.

An operational noise model has been developed using SOUNDPLAN v9.1. The noise model assessed the dominant noise sources generated from the operation of the site (including major mechanical equipment such as: data hall air handling units (DAHU), exhaust fan units and generators). The predicted noise levels identified compliance at all noise sensitive receivers during both standard and adverse meteorological weather conditions.

This report has identified that with the inclusion of appropriate noise management and mitigation measures, compliance with appropriate noise criteria would be achieved. The mitigation recommendations will be incorporated in the design of the project to ensure noise (and vibration) emitted from the development is appropriately controlled.

It is recommended that during the detailed design phases of DC02 and DC03, a detailed acoustic study is completed to ensure that the mechanical and electrical equipment selections, and corresponding acoustic mitigation measures recommended within this assessment are still applicable, such that the complete data centre campus will achieve compliance with the operational noise criteria established within this assessment



## APPENDIX A: ACOUSTIC TERMINOLOGY

The following is a brief description of the acoustic terminology used in this report.

<i>Sound power level</i>	The total sound emitted by a source																						
<i>Sound pressure level</i>	The amount of sound at a specified point																						
<i>Decibel [dB]</i>	The measurement unit of sound																						
<i>A Weighted decibels [dB(A)]</i>	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).																						
<i>Decibel scale</i>	<p>The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:</p> <table border="0" style="margin-left: 20px;"> <tr><td>0 dB(A)</td><td>Threshold of human hearing</td></tr> <tr><td>30 dB(A)</td><td>A quiet country park</td></tr> <tr><td>40 dB(A)</td><td>Whisper in a library</td></tr> <tr><td>50 dB(A)</td><td>Open office space</td></tr> <tr><td>70 dB(A)</td><td>Inside a car on a freeway</td></tr> <tr><td>80 dB(A)</td><td>Outboard motor</td></tr> <tr><td>90 dB(A)</td><td>Heavy truck pass-by</td></tr> <tr><td>100 dB(A)</td><td>Jackhammer/Subway train</td></tr> <tr><td>110 dB(A)</td><td>Rock Concert</td></tr> <tr><td>115 dB(A)</td><td>Limit of sound permitted in industry</td></tr> <tr><td>120 dB(A)</td><td>747 take off at 250 metres</td></tr> </table>	0 dB(A)	Threshold of human hearing	30 dB(A)	A quiet country park	40 dB(A)	Whisper in a library	50 dB(A)	Open office space	70 dB(A)	Inside a car on a freeway	80 dB(A)	Outboard motor	90 dB(A)	Heavy truck pass-by	100 dB(A)	Jackhammer/Subway train	110 dB(A)	Rock Concert	115 dB(A)	Limit of sound permitted in industry	120 dB(A)	747 take off at 250 metres
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100 dB(A)	Jackhammer/Subway train																						
110 dB(A)	Rock Concert																						
115 dB(A)	Limit of sound permitted in industry																						
120 dB(A)	747 take off at 250 metres																						
<i>Frequency [f]</i>	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.																						
<i>Ambient sound</i>	The all-encompassing sound at a point composed of sound from all sources near and far.																						
<i>Equivalent continuous sound level [L<sub>eq</sub>]</i>	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.																						
<i>Reverberation</i>	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)																						
<i>Air-borne sound</i>	The sound emitted directly from a source into the surrounding air, such as speech, television or music																						
<i>Impact sound</i>	The sound emitted from force of one object hitting another such as footfalls and slamming cupboards.																						
<i>Air-borne sound isolation</i>	The reduction of airborne sound between two rooms.																						
<i>Sound Reduction Index [R] (Sound Transmission Loss)</i>	The ratio the sound incident on a partition to the sound transmitted by the partition.																						
<i>Weighted sound reduction index [R<sub>w</sub>]</i>	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.																						
<i>Level difference [D]</i>	The difference in sound pressure level between two rooms.																						

<i>Normalised level difference</i> [ $D_n$ ]	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
<i>Standardised level difference</i> [ $D_{nT}$ ]	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
<i>Weighted standardised level difference</i> [ $D_{nT,w}$ ]	A single figure representation of the air-borne sound insulation of a partition based upon the level difference. Generally used to present the performance of a partition when measured in situ on site.
$C_{tr}$	A value added to an $R_w$ or $D_{nT,w}$ value to account for variations in the spectrum.
<i>Impact sound isolation</i>	The resistance of a floor or wall to transmit impact sound.
<i>Impact sound pressure level</i> [ $L_i$ ]	The sound pressure level in the receiving room produced by impacts subjected to the adjacent floor or wall by a tapping machine.
<i>Normalised impact sound pressure level</i> [ $L_{i,n}$ ]	The impact sound pressure level normalised for the absorption area of the receiving room.
<i>Weighted normalised impact sound pressure level</i> [ $L_{i,n,w}$ ]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in a laboratory.
<i>Weighted standardised impact sound pressure level</i> [ $L'_{i,nT,w}$ ]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in situ on site.
$C_i$	A value added to an $L_{i,nw}$ or $L'_{i,nT,w}$ value to account for variations in the spectrum.
<i>Energy Equivalent Sound Pressure Level</i> [ $L_{A,eq,T}$ ]	'A' weighted, energy averaged sound pressure level over the measurement period T.
<i>Percentile Sound Pressure Level</i> [ $L_{Ax,T}$ ]	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.

\*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 "Acoustics – Glossary of terms and related symbols"



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## **APPENDIX B: NOISE LOGGING DATA**

# 44 POLONIA AVENUE, PLUMPTON

## Ambient noise monitoring report



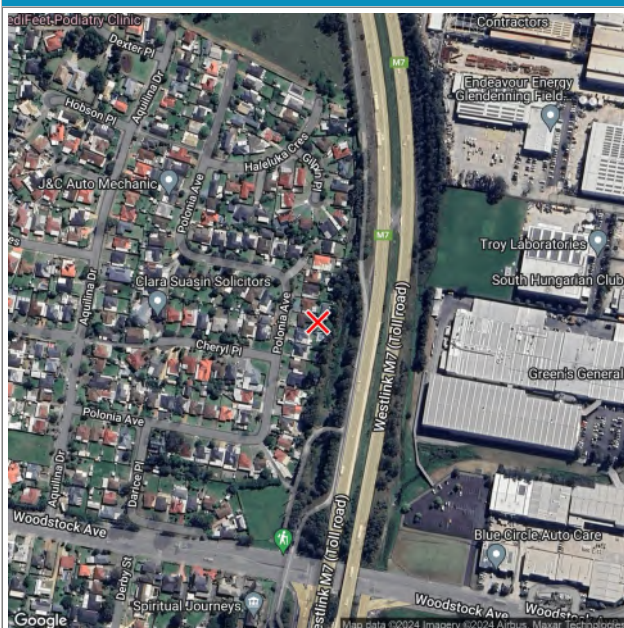
Item	Information
Logger Type	NL-42
Serial number	998081
Address	44 POLONIA AVENUE, PLUMPTON
Location	44 POLONIA AVENUE, PLUMPTON
Facade / free field	Free field
Environment	

### Measured noise levels

Logging date	Rating Background Level			L <sub>Aeq,period</sub>		
	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am
Mon 08 Apr 2024	-	51	-	58	58	53
Tue 09 Apr 2024	53	51	47	60	61	54
Wed 10 Apr 2024	-	-	-	-	-	53
Thu 11 Apr 2024	51	47	44	57	54	54
Fri 12 Apr 2024	51	49	43	57	55	54
Sat 13 Apr 2024	46	47	43	55	57	52
Sun 14 Apr 2024	45	46	42	54	56	50
Mon 15 Apr 2024	50	48	44	60	54	53
Tue 16 Apr 2024	50	47	42	58	55	53
Wed 17 Apr 2024	-	-	-	57	-	54
<b>Summary</b>	<b>50</b>	<b>47</b>	<b>43</b>	<b>58</b>	<b>57</b>	<b>53</b>

Note: Results with a '-' identify that there were not enough measurements available to correctly calculate the level, in accordance with the Noise Policy for Industry. The data has been excluded either from weather or manual exclusions. See the charts for more information

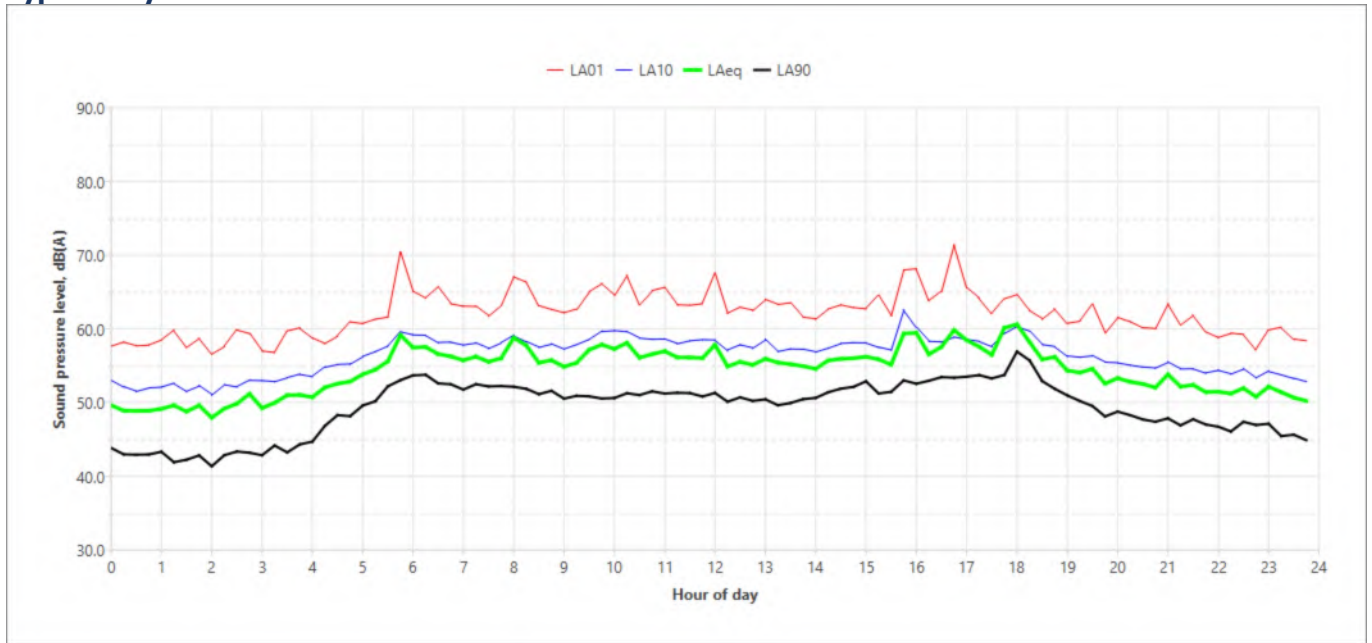
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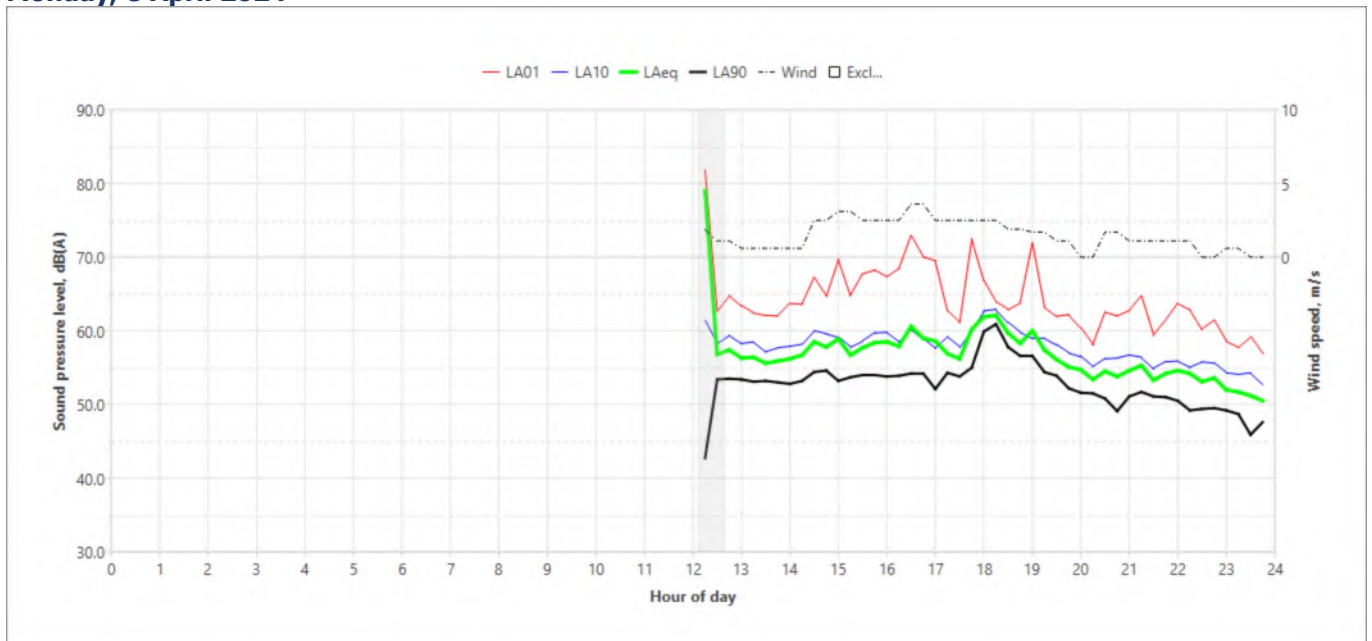
#### Logger deployment photo



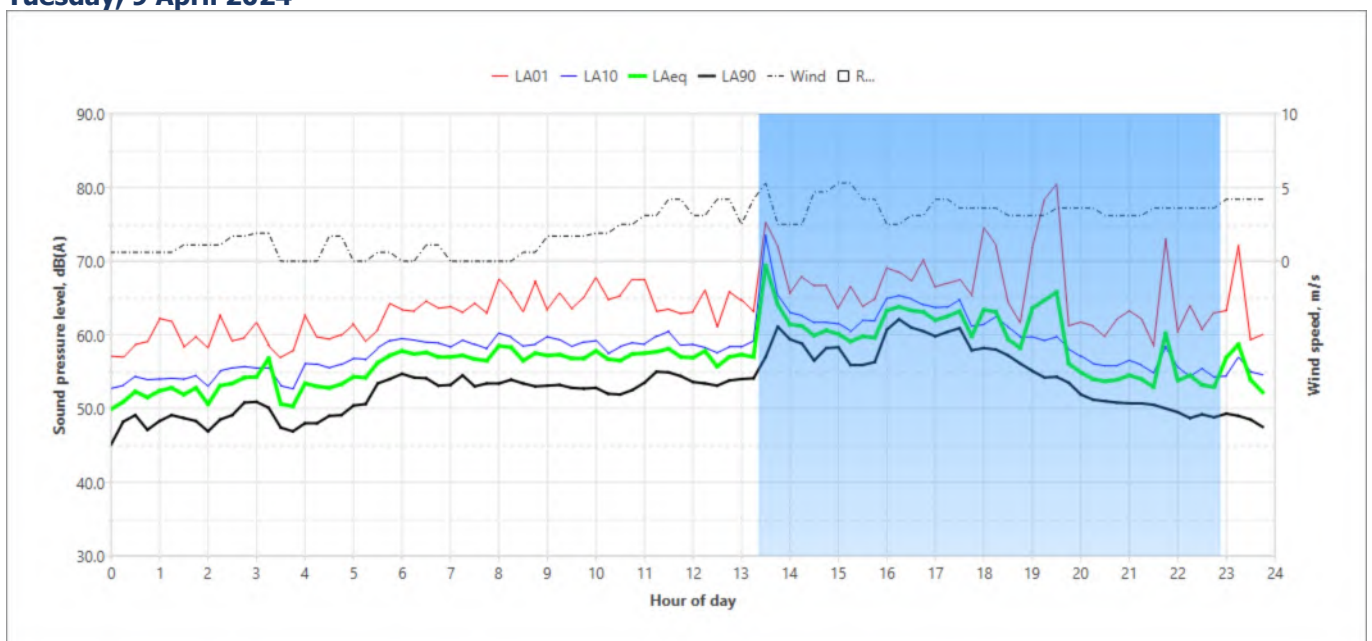
## Typical Day



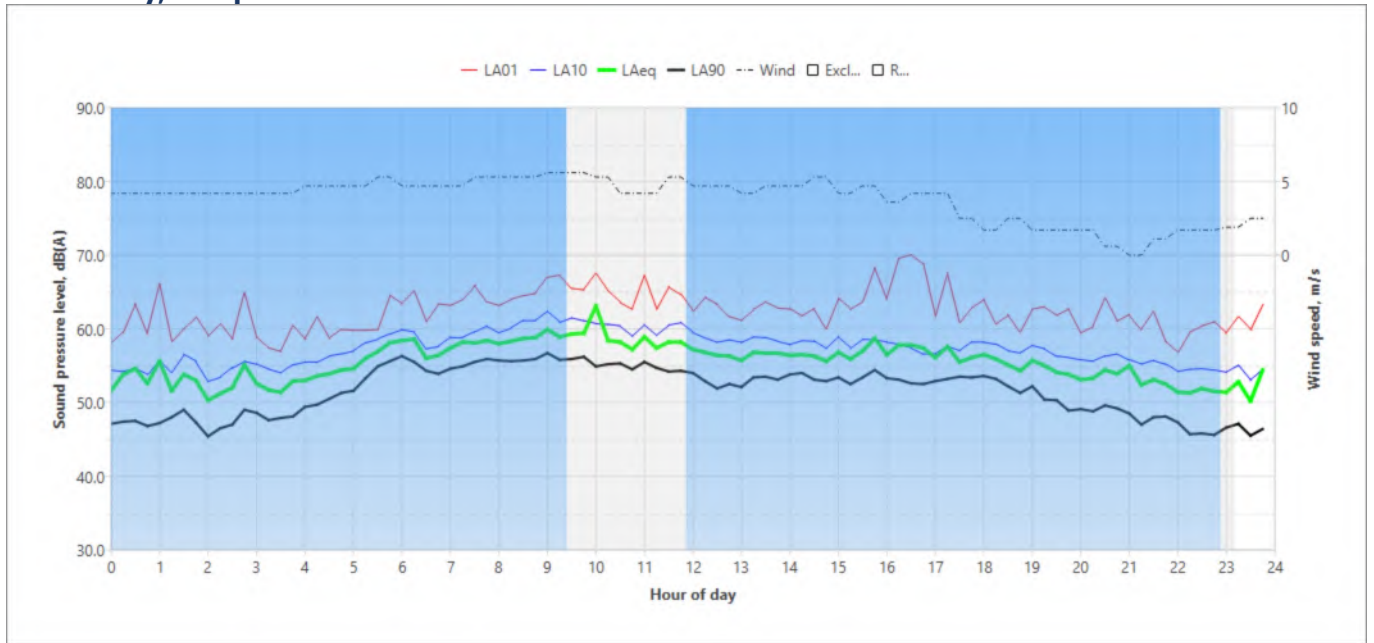
## Monday, 8 April 2024



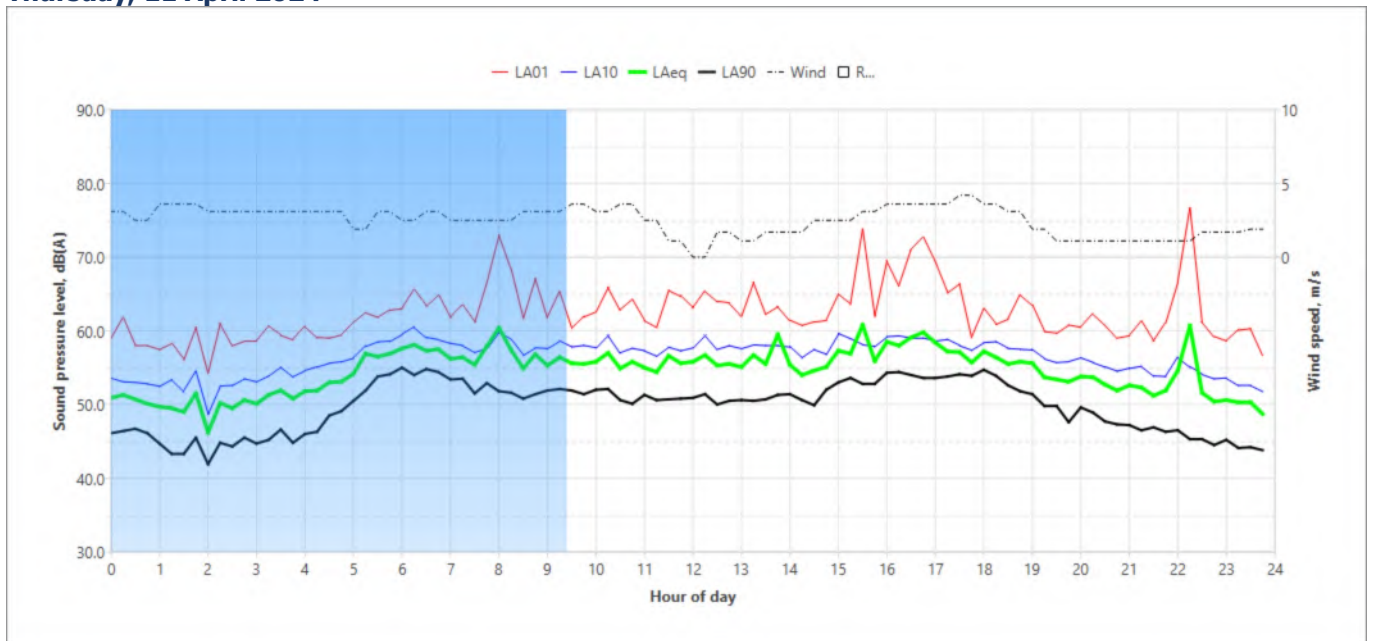
## Tuesday, 9 April 2024



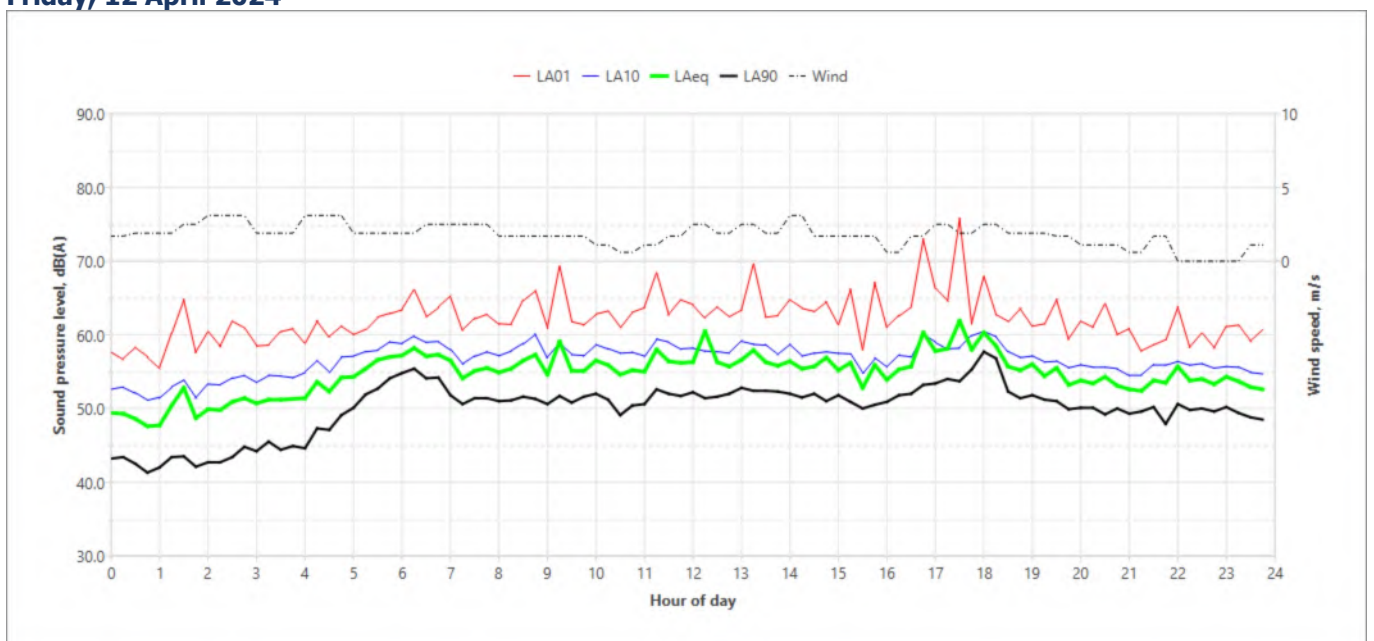
**Wednesday, 10 April 2024**



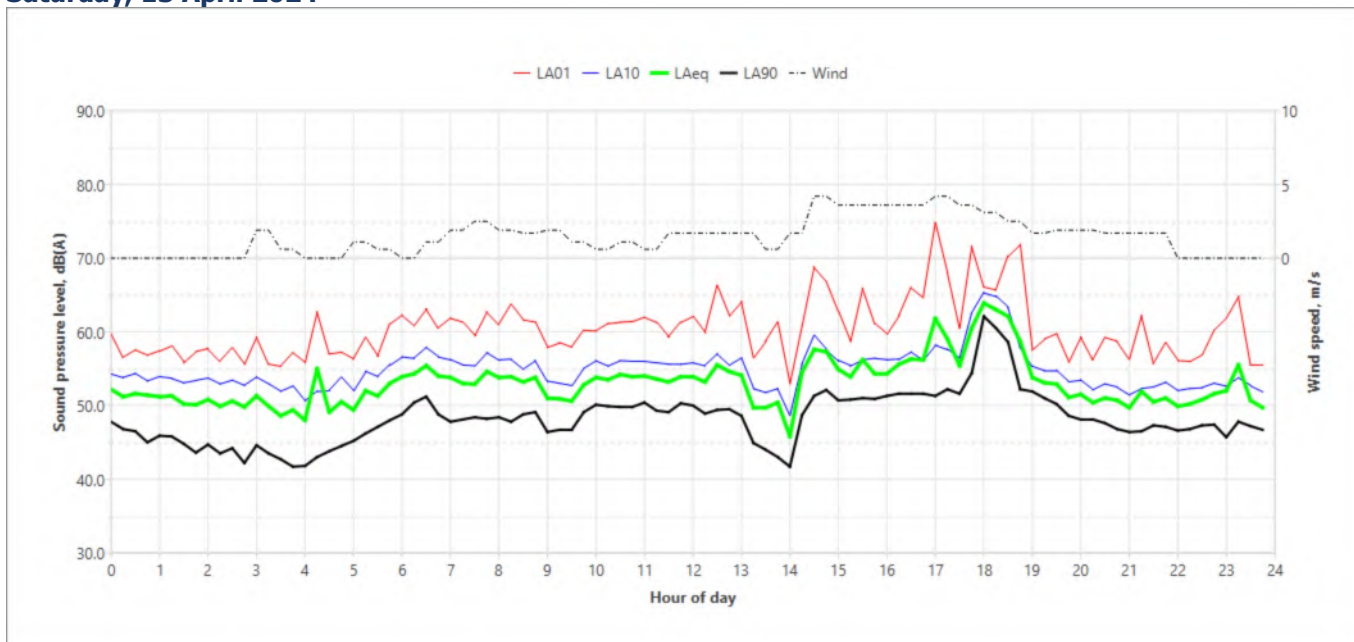
**Thursday, 11 April 2024**



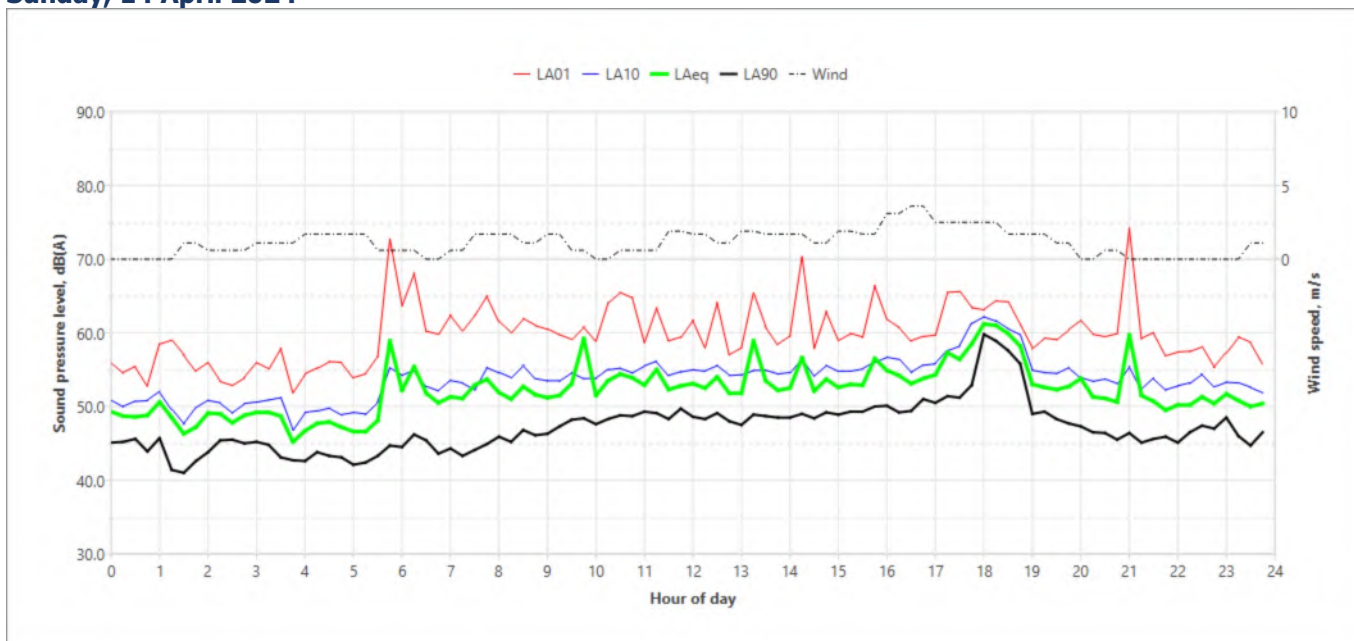
**Friday, 12 April 2024**



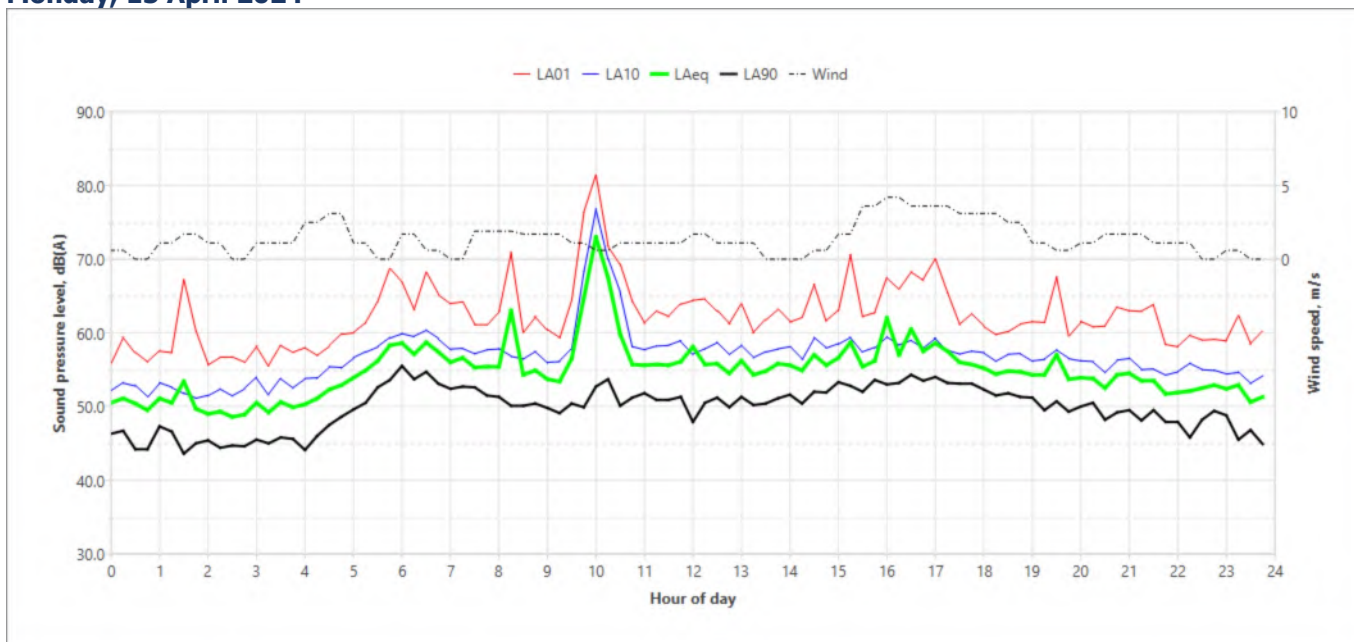
**Saturday, 13 April 2024**



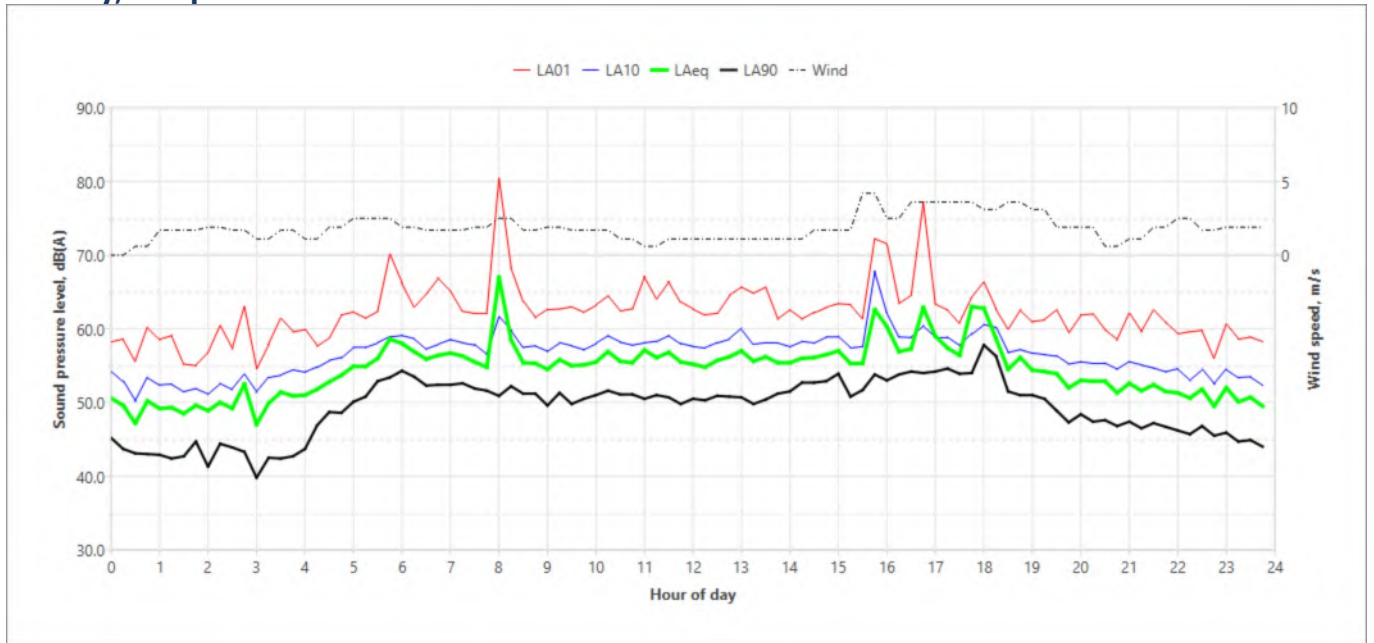
**Sunday, 14 April 2024**



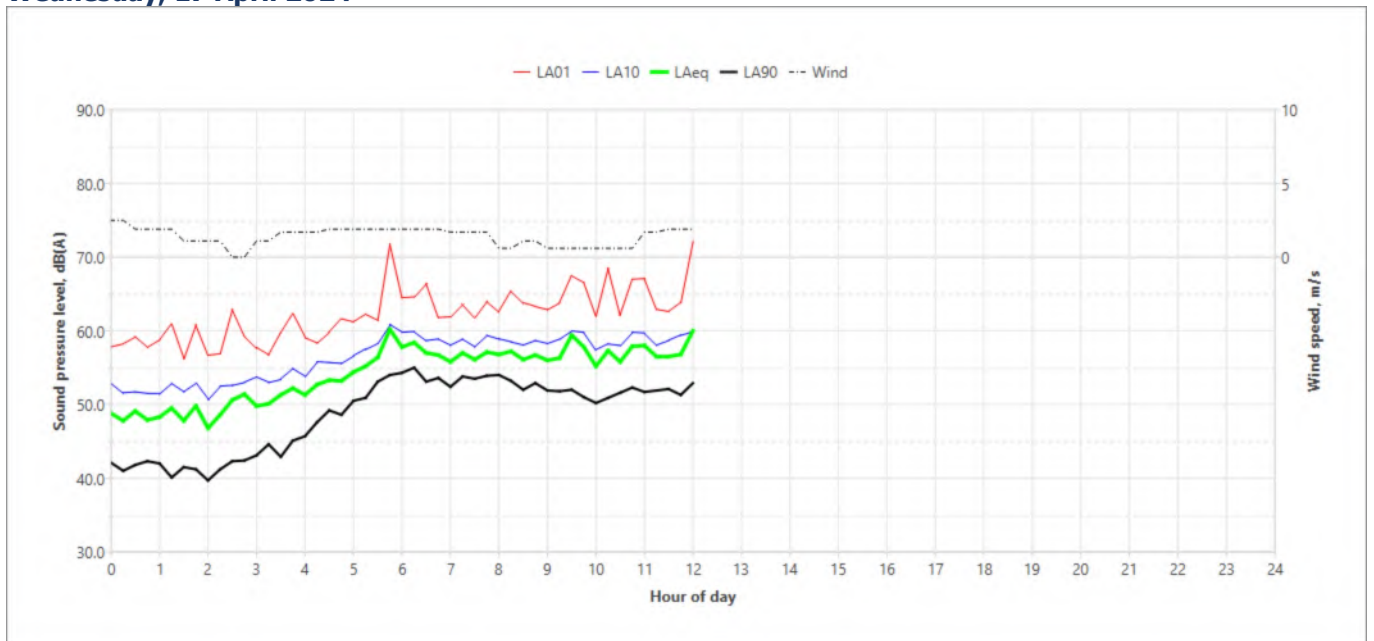
**Monday, 15 April 2024**



Tuesday, 16 April 2024



Wednesday, 17 April 2024



# 78 Station Street, Rooty Hill

## Ambient noise monitoring report



Item	Information
Logger Type	NL-42
Serial number	1000231
Address	78 Station Street, Rooty Hill
Location	78 Station Street, Rooty Hill
Facade / free field	Free field
Environment	

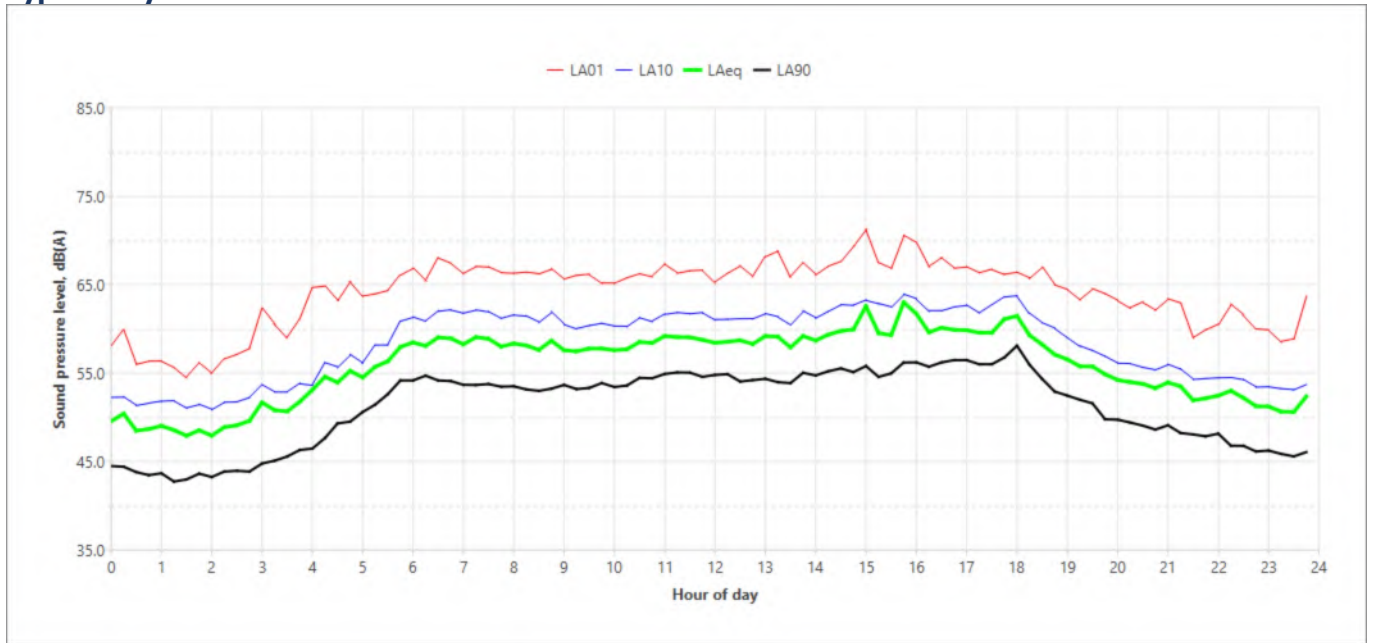
### Measured noise levels

Logging date	Rating Background Level			L <sub>Aeq,period</sub>		
	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am
Mon 08 Apr 2024	-	49	-	61	57	52
Tue 09 Apr 2024	51	49	45	61	58	53
Wed 10 Apr 2024	-	-	-	-	-	54
Thu 11 Apr 2024	54	48	45	60	57	56
Fri 12 Apr 2024	53	49	42	59	57	55
Sat 13 Apr 2024	50	48	41	61	55	52
Sun 14 Apr 2024	48	47	41	57	56	49
Mon 15 Apr 2024	53	49	45	60	56	53
Tue 16 Apr 2024	54	47	44	59	56	55
Wed 17 Apr 2024	-	-	-	59	-	55
<b>Summary</b>	<b>53</b>	<b>48</b>	<b>44</b>	<b>60</b>	<b>57</b>	<b>54</b>

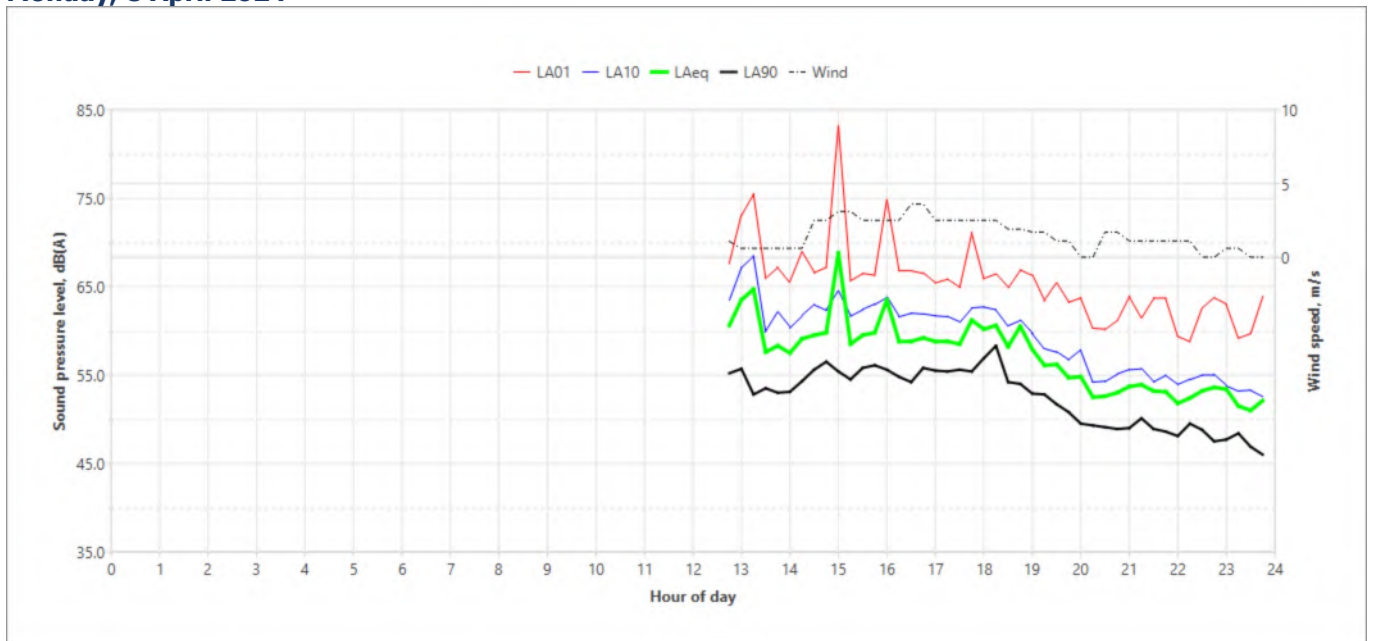
Note: Results with a '-' identify that there were not enough measurements available to correctly calculate the level, in accordance with the Noise Policy for Industry. The data has been excluded either from weather or manual exclusions. See the charts for more information

Logger location	Logger deployment photo

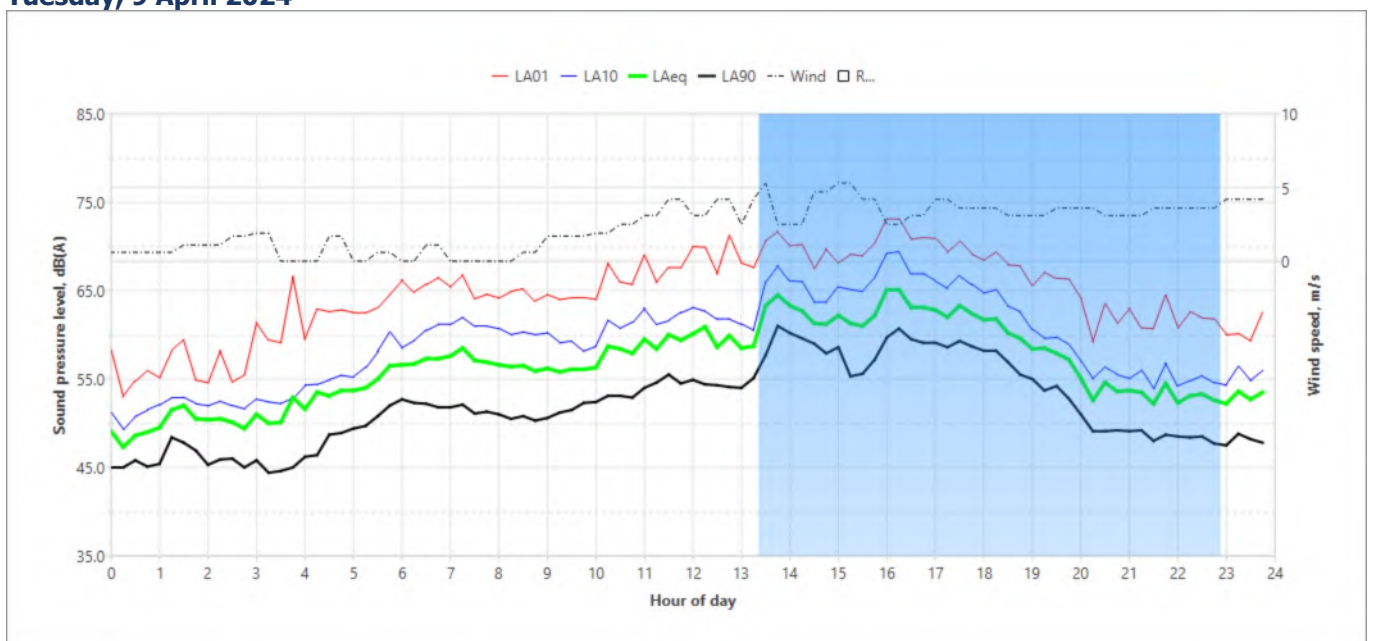
## Typical Day



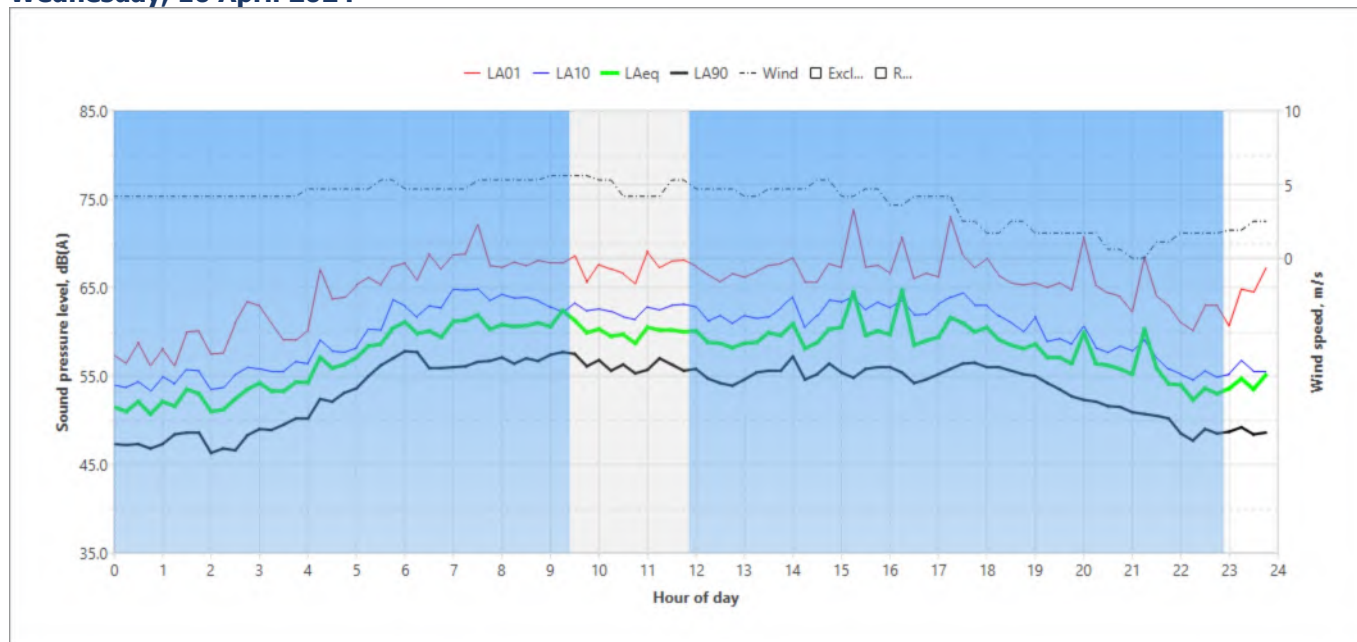
## Monday, 8 April 2024



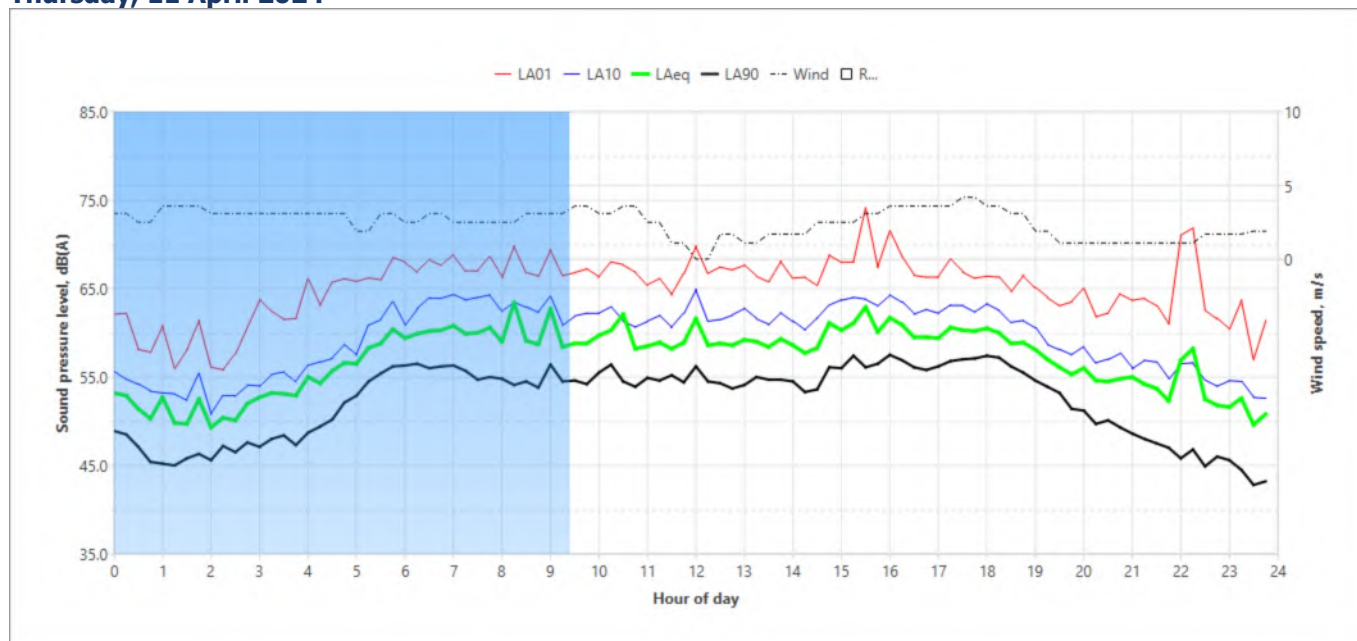
## Tuesday, 9 April 2024



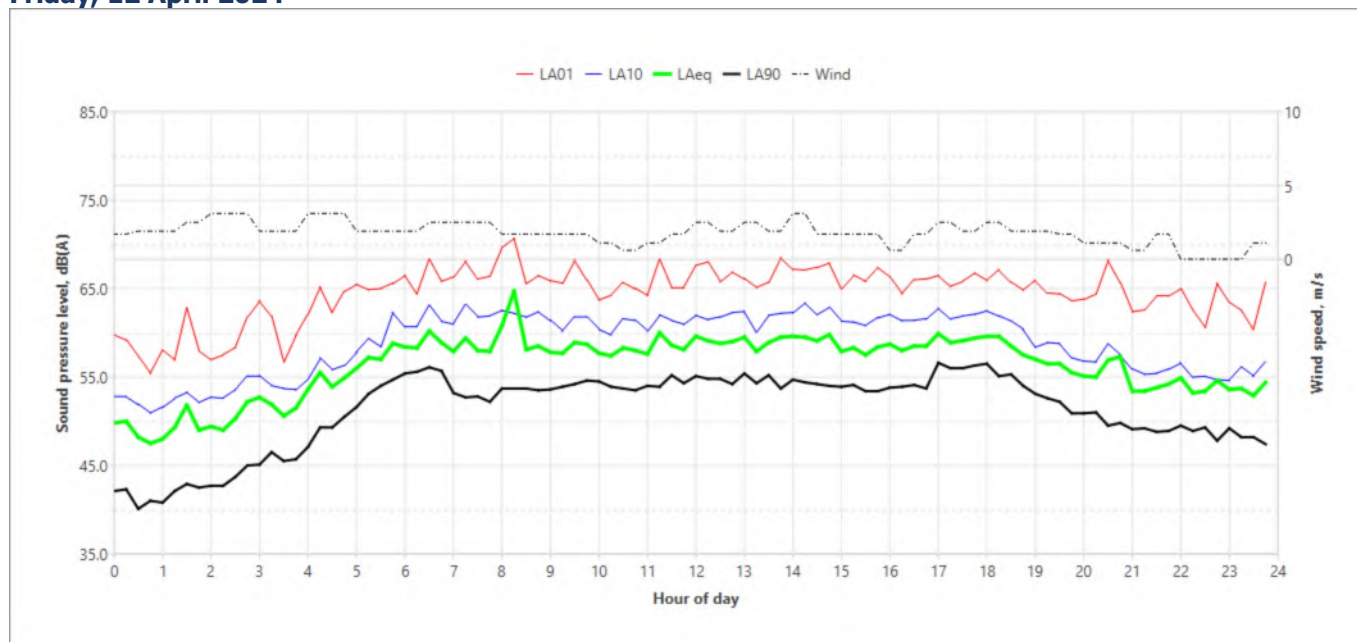
**Wednesday, 10 April 2024**



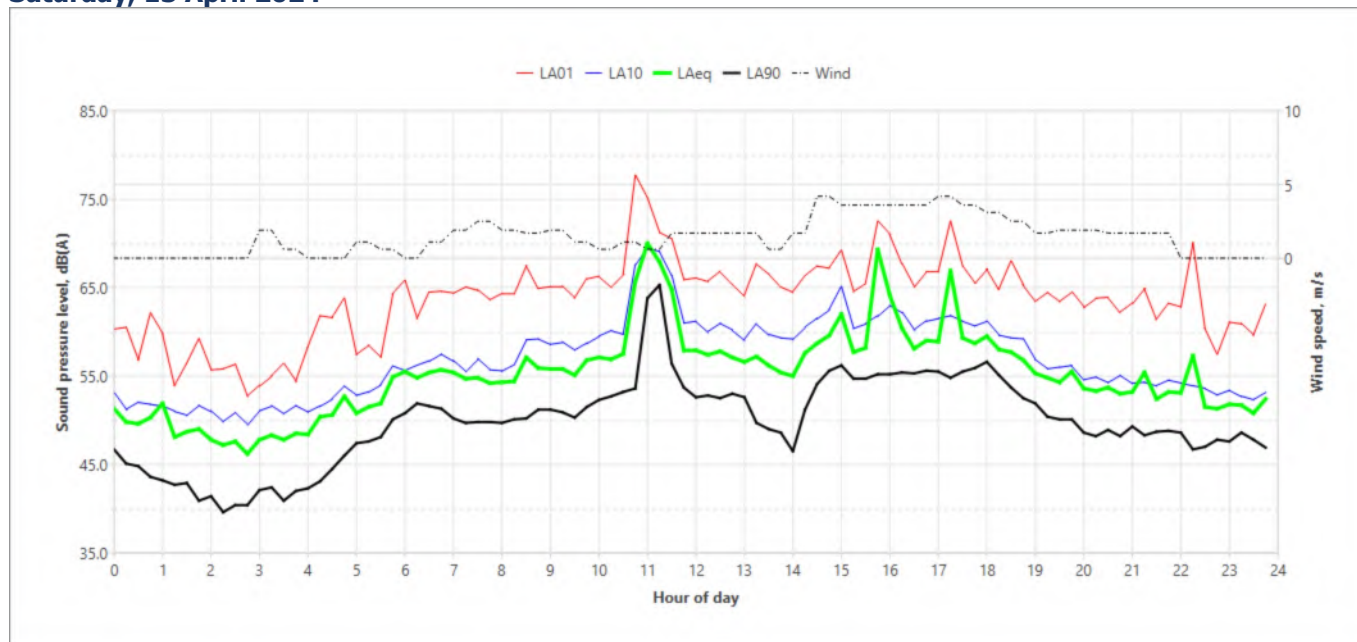
**Thursday, 11 April 2024**



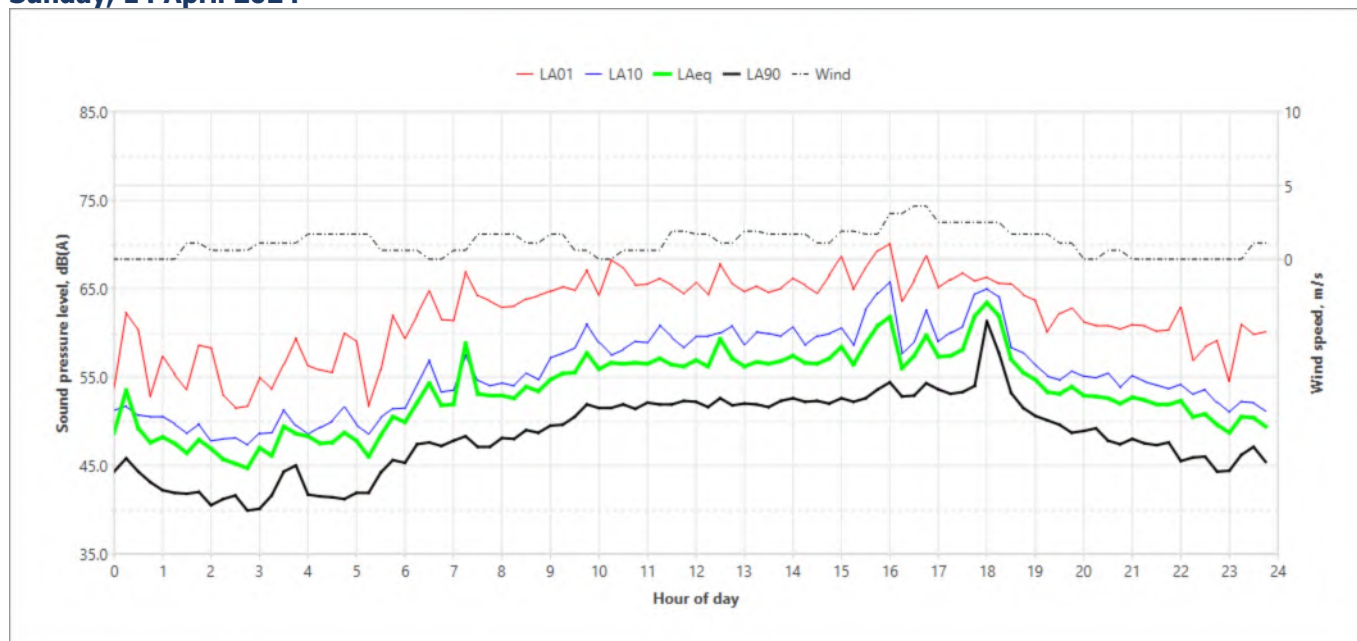
**Friday, 12 April 2024**



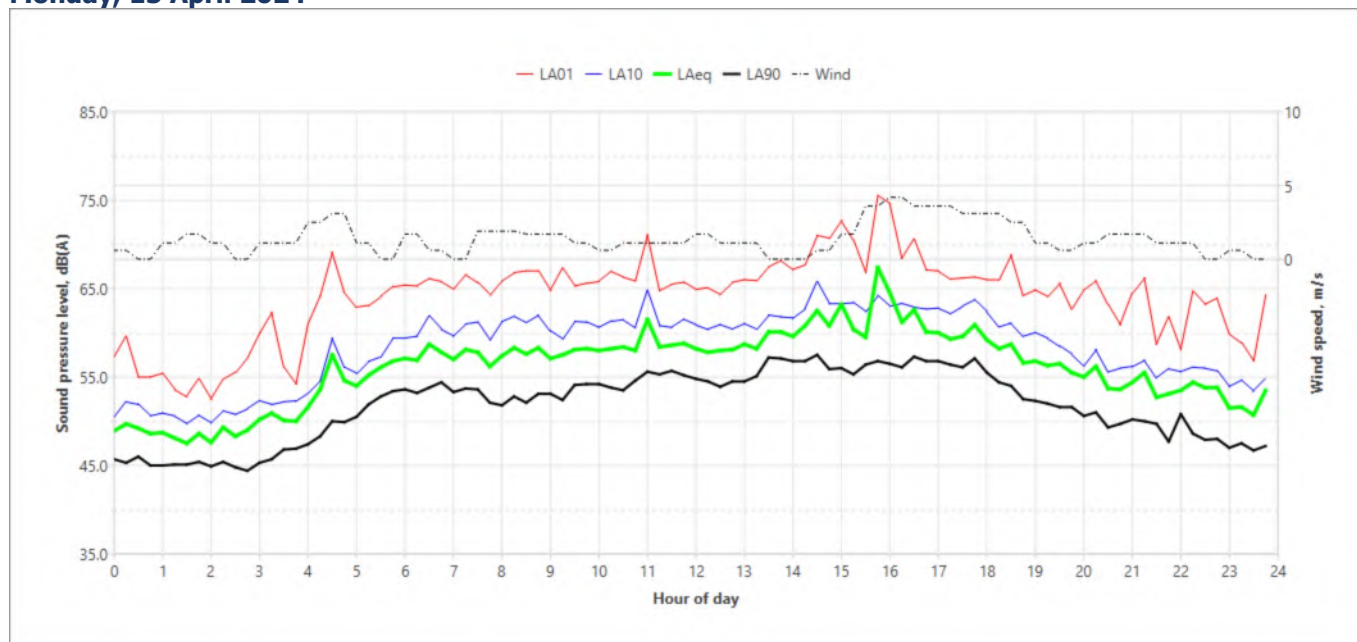
**Saturday, 13 April 2024**



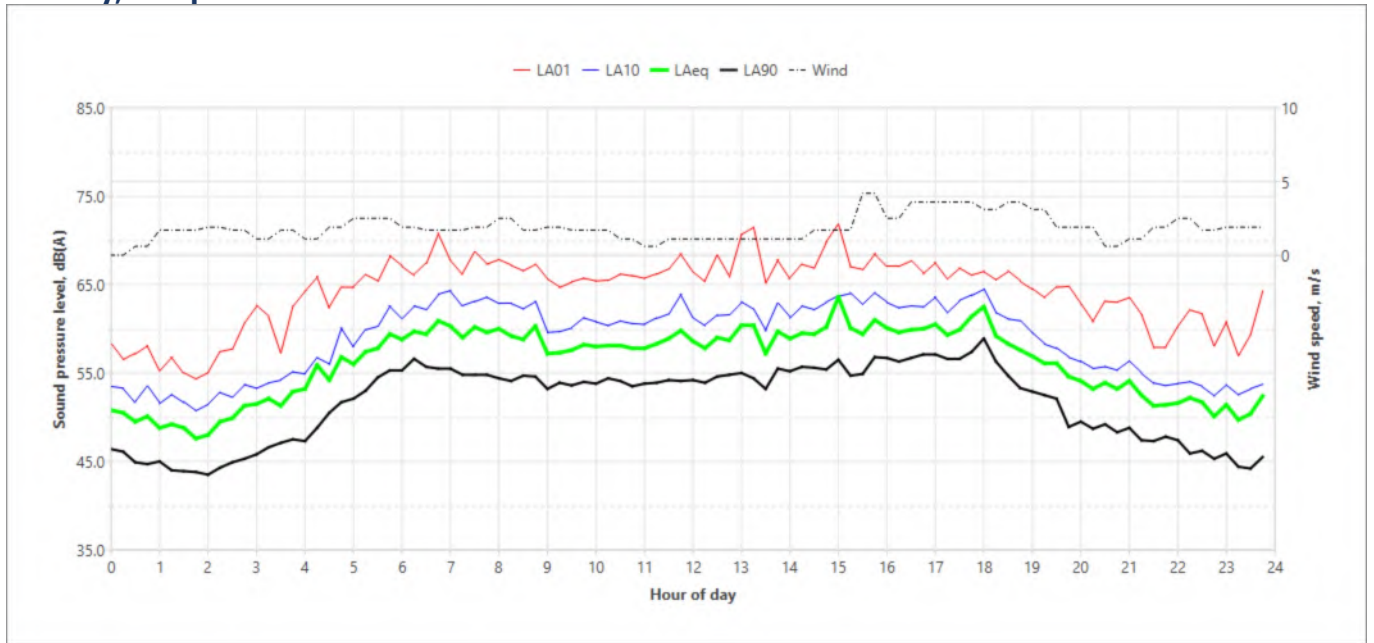
**Sunday, 14 April 2024**



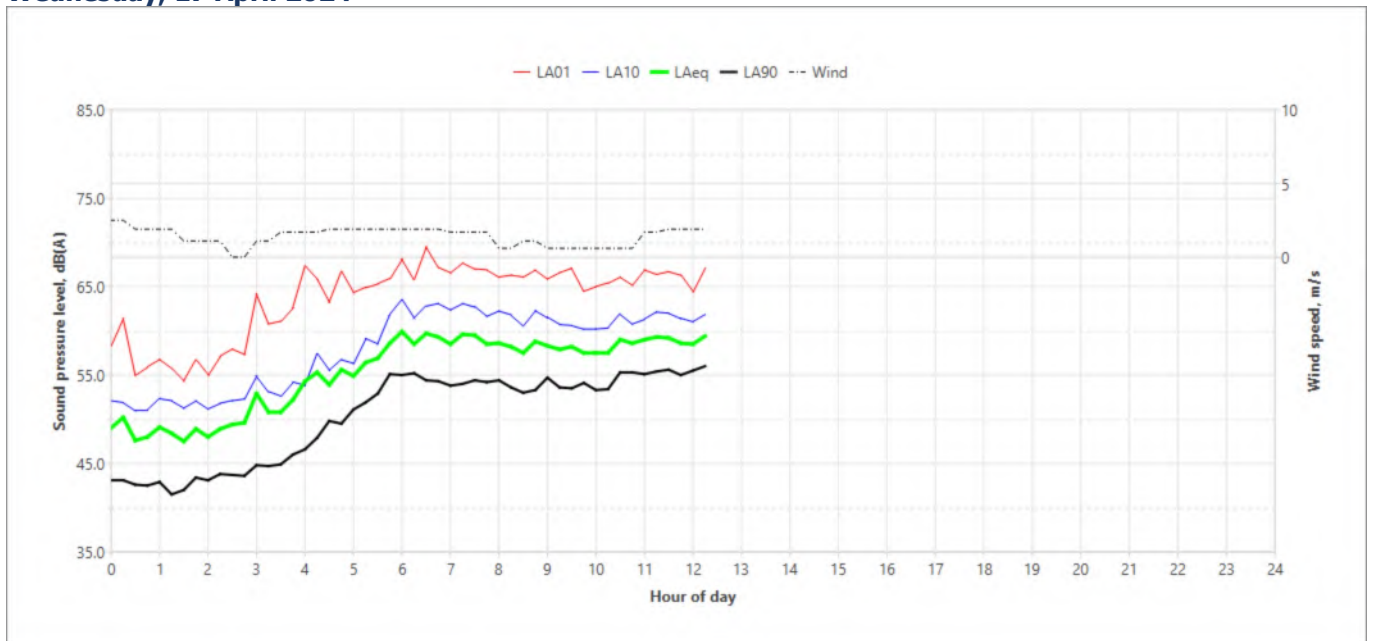
**Monday, 15 April 2024**



## Tuesday, 16 April 2024



## Wednesday, 17 April 2024



# 41 KNOX ROAD, DOONSIDE

## Ambient noise monitoring report



Item	Information
Logger Type	NL-42
Serial number	396932
Address	41 KNOX ROAD, DOONSIDE
Location	41 KNOX ROAD, DOONSIDE
Facade / free field	Free field
Environment	

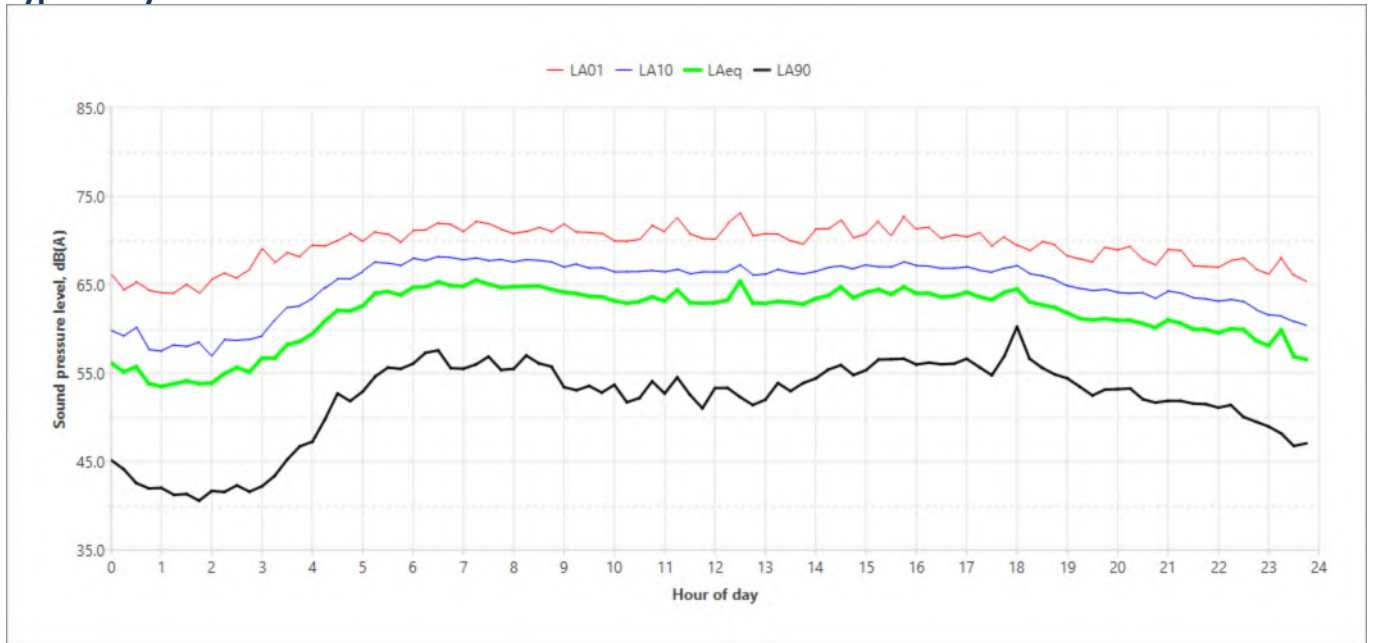
### Measured noise levels

Logging date	Rating Background Level			L <sub>Aeq,period</sub>		
	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am
Mon 08 Apr 2024	-	50	-	64	62	58
Tue 09 Apr 2024	54	52	43	66	64	61
Wed 10 Apr 2024	-	-	-	-	-	58
Thu 11 Apr 2024	53	53	46	64	62	61
Fri 12 Apr 2024	52	52	44	64	63	61
Sat 13 Apr 2024	52	52	43	63	62	59
Sun 14 Apr 2024	49	51	41	62	61	57
Mon 15 Apr 2024	51	51	41	64	61	61
Tue 16 Apr 2024	51	52	42	64	62	61
Wed 17 Apr 2024	-	-	-	65	-	61
<b>Summary</b>	<b>52</b>	<b>52</b>	<b>43</b>	<b>64</b>	<b>62</b>	<b>60</b>

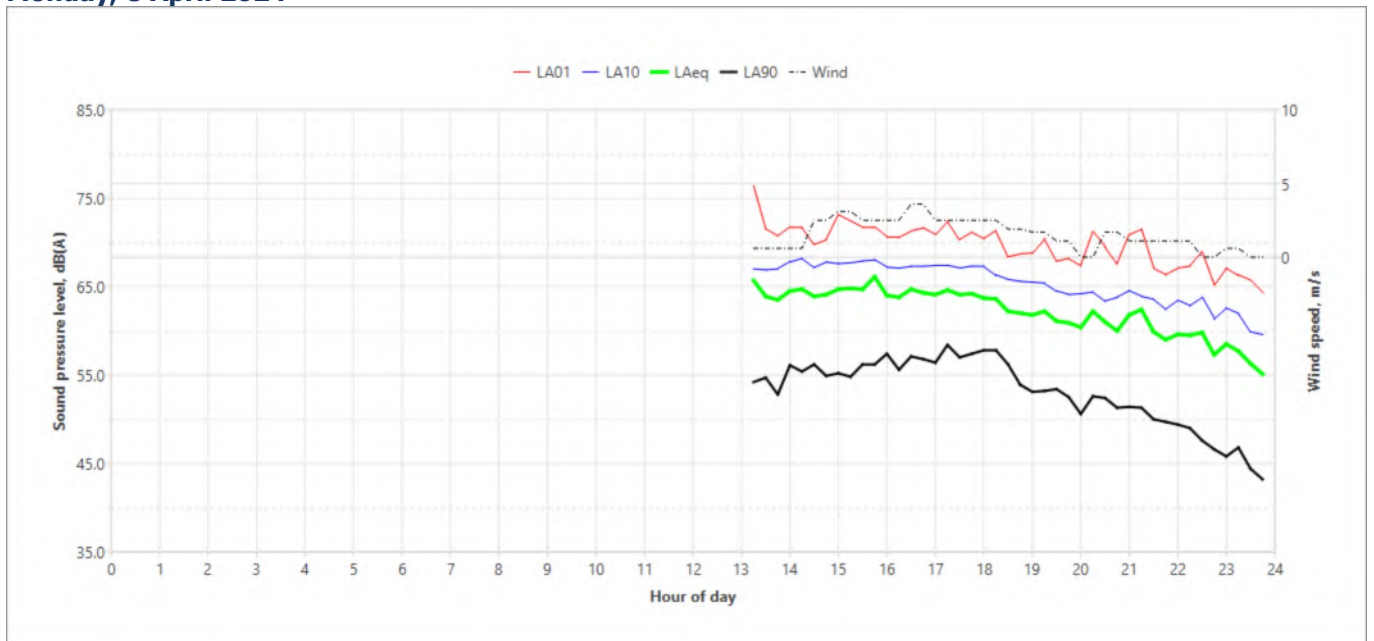
Note: Results with a '-' identify that there were not enough measurements available to correctly calculate the level, in accordance with the Noise Policy for Industry. The data has been excluded either from weather or manual exclusions. See the charts for more information

Logger location	Logger deployment photo

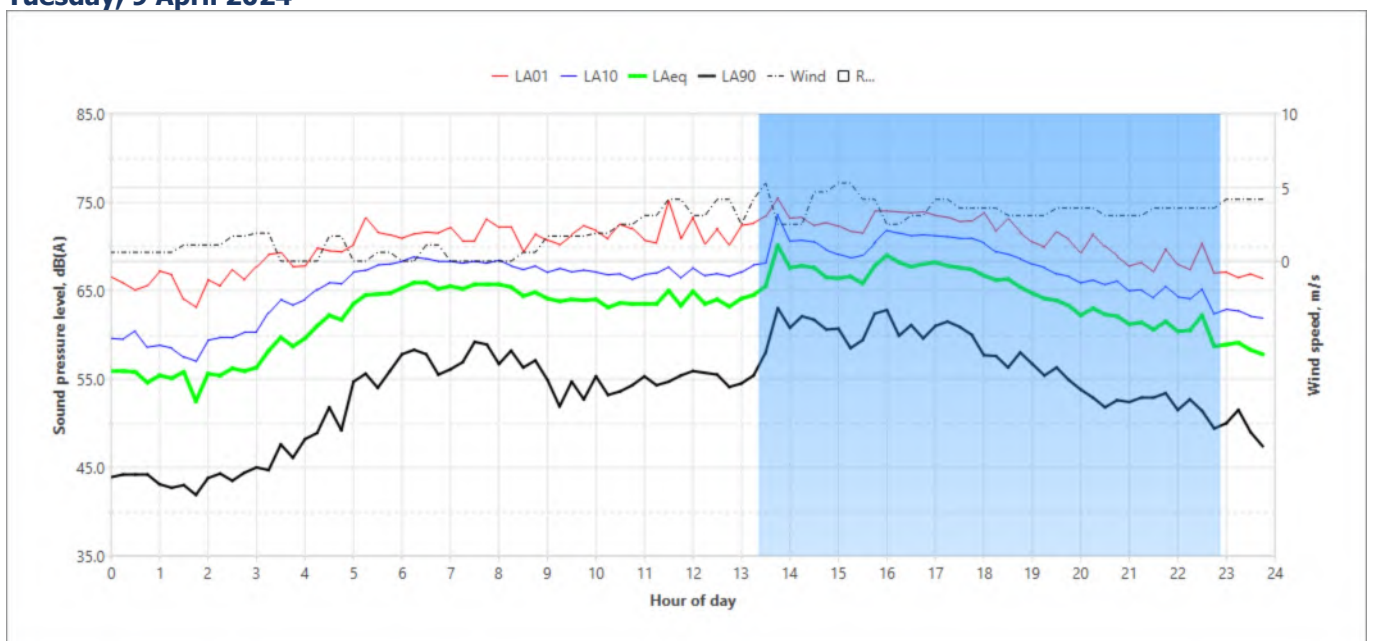
## Typical Day



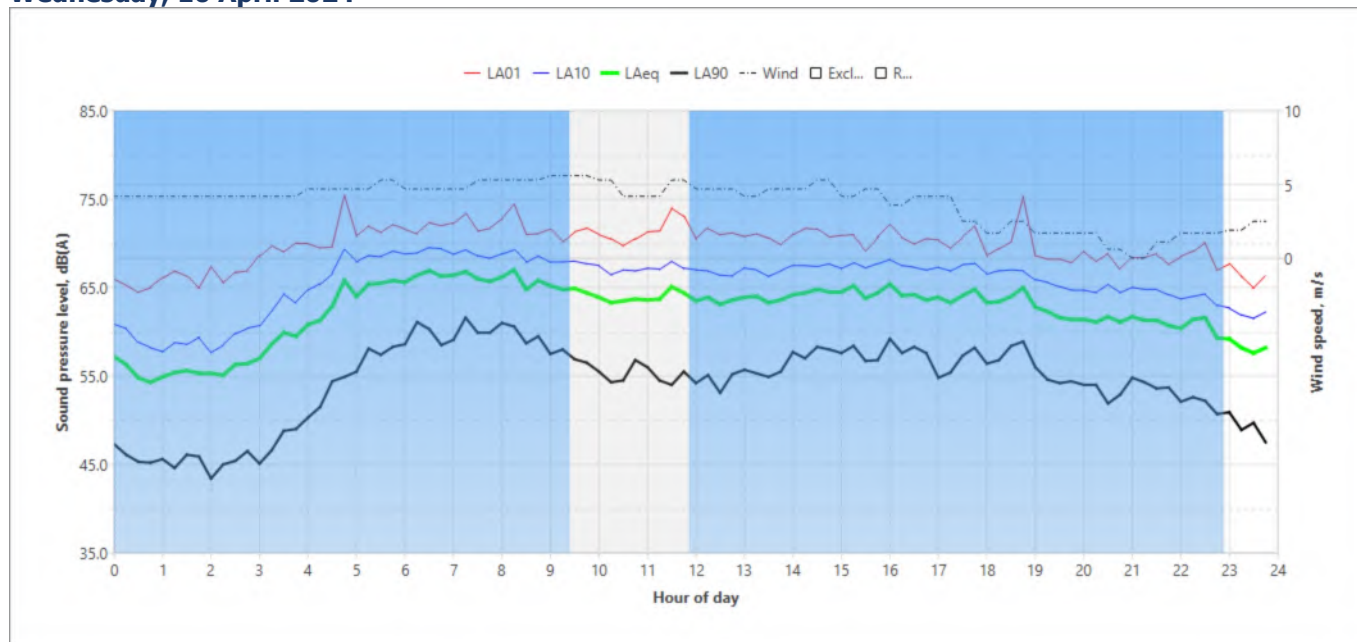
## Monday, 8 April 2024



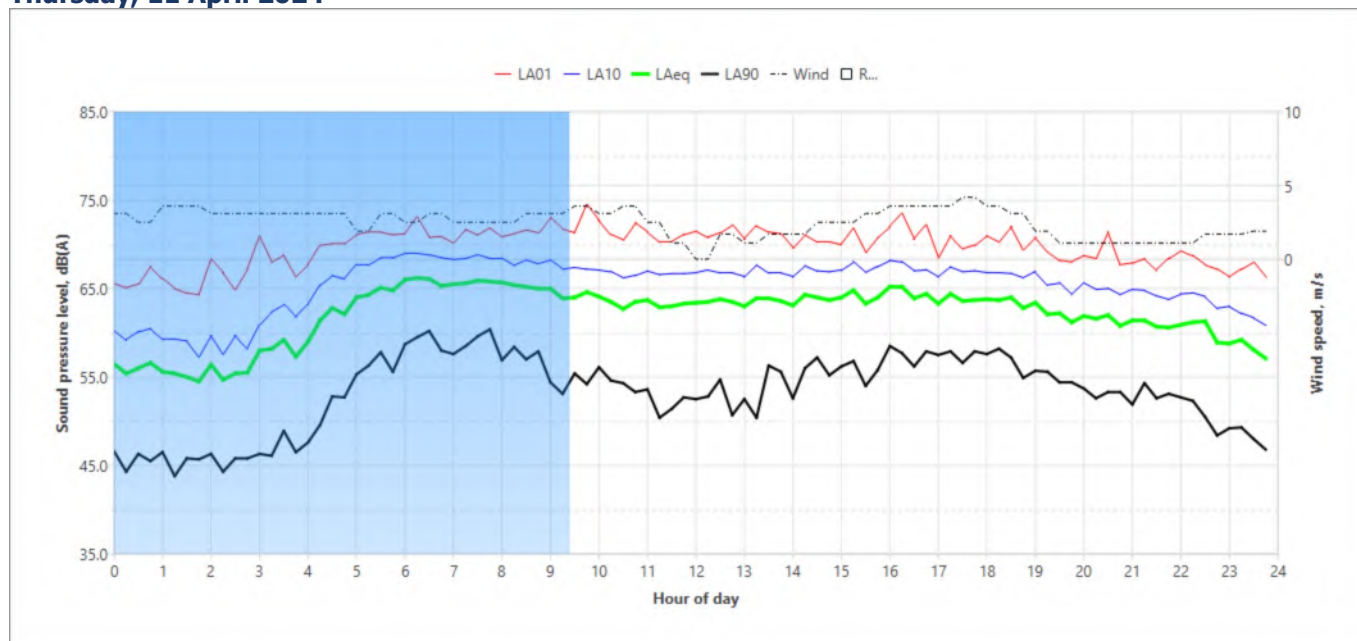
## Tuesday, 9 April 2024



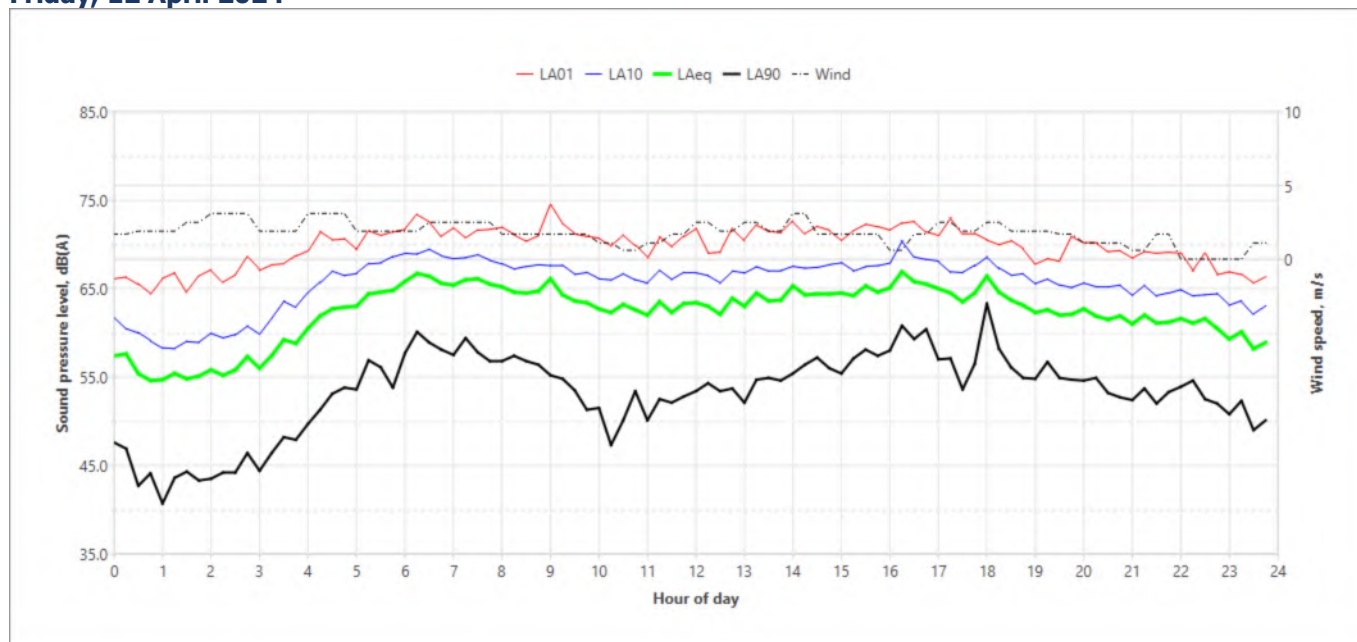
**Wednesday, 10 April 2024**



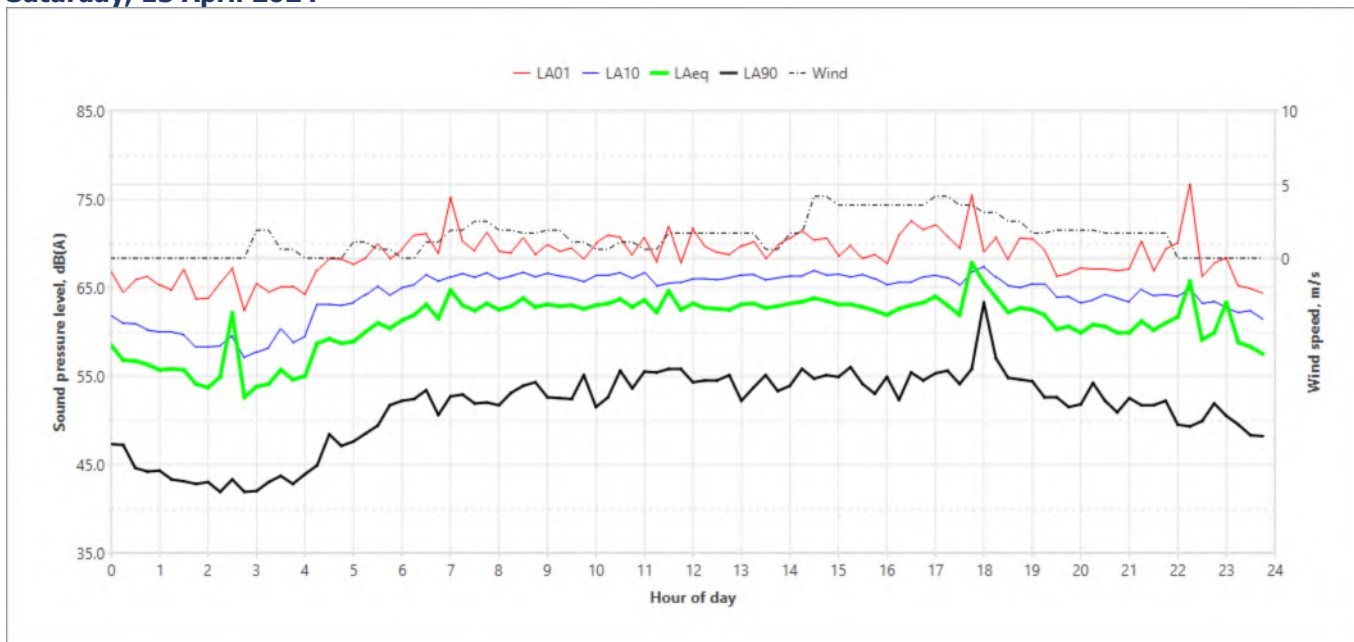
**Thursday, 11 April 2024**



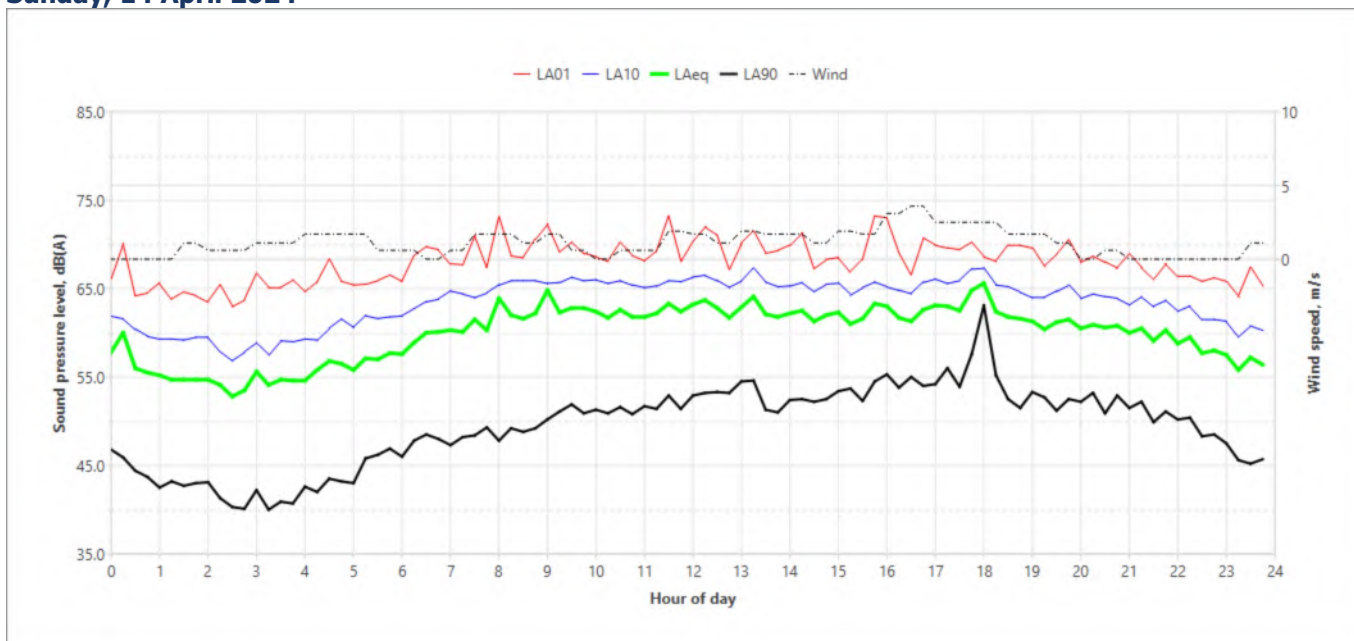
**Friday, 12 April 2024**



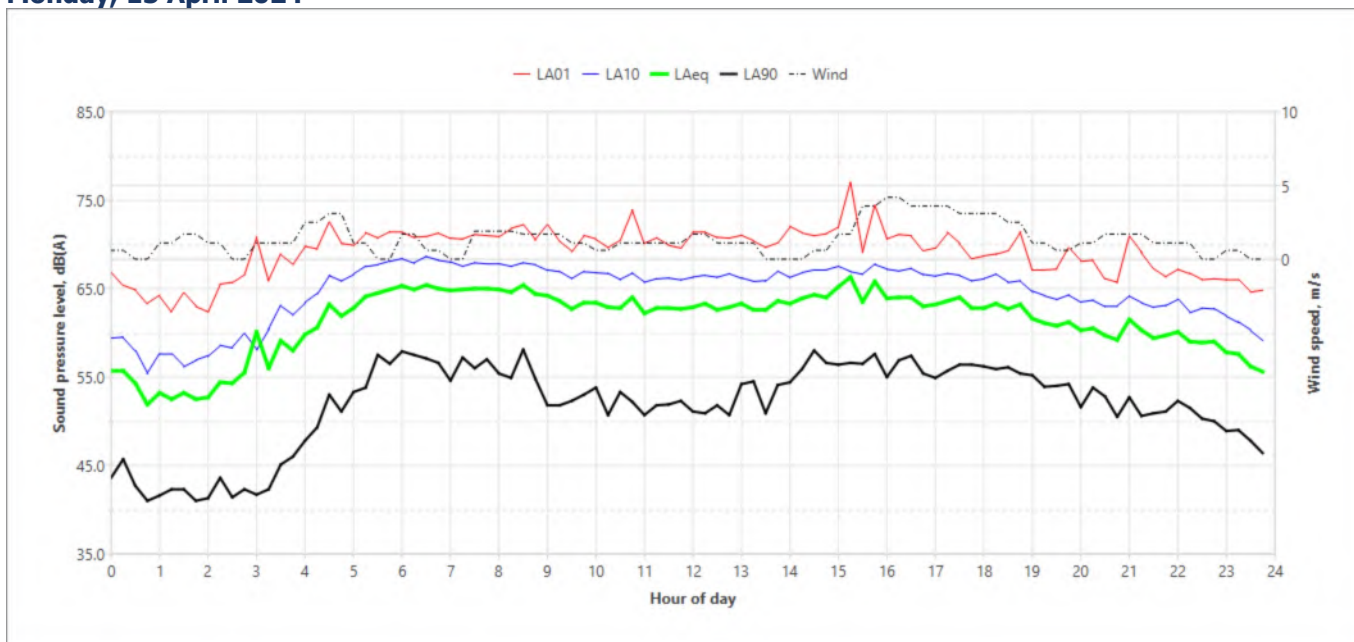
Saturday, 13 April 2024



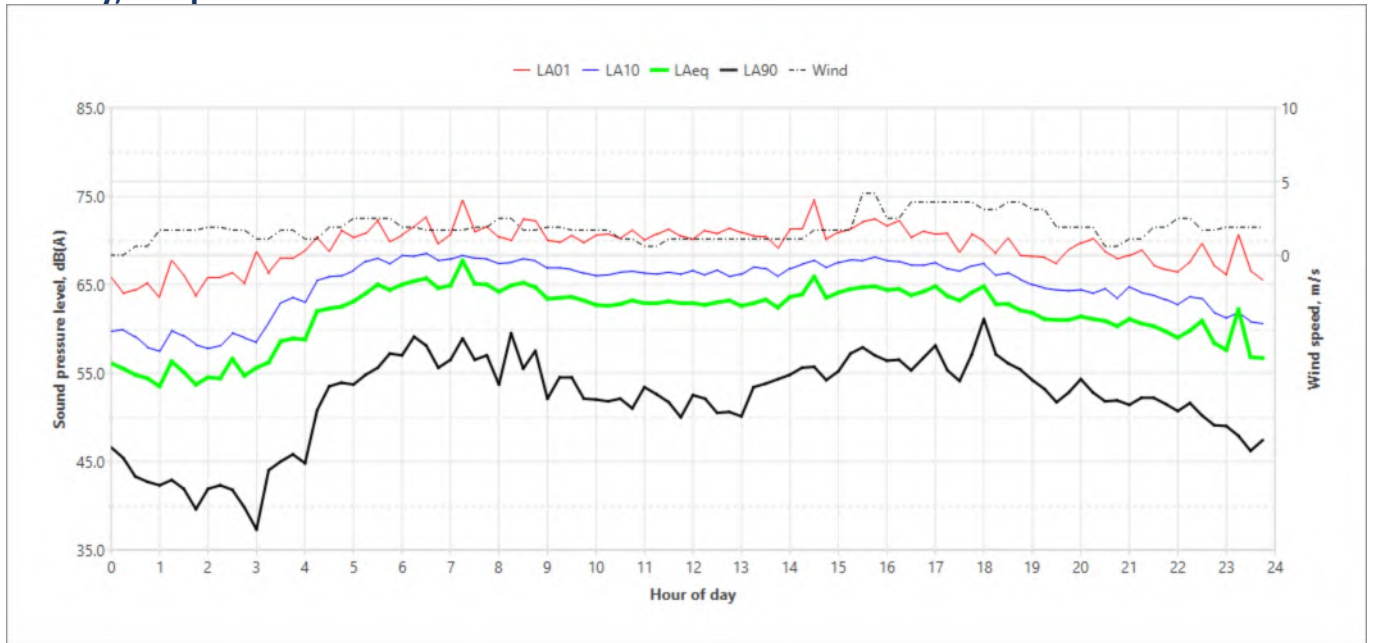
Sunday, 14 April 2024



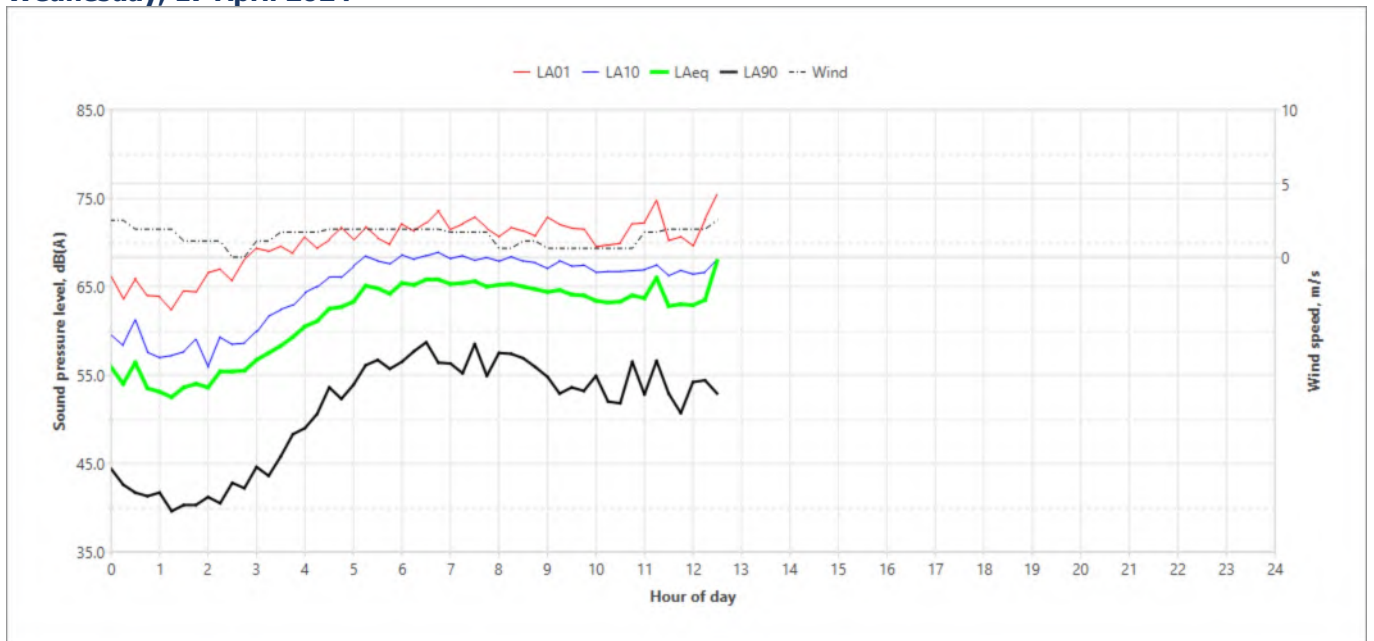
Monday, 15 April 2024



**Tuesday, 16 April 2024**



**Wednesday, 17 April 2024**



# 9 Carroll Crescent, Plumpton

## Ambient noise monitoring report



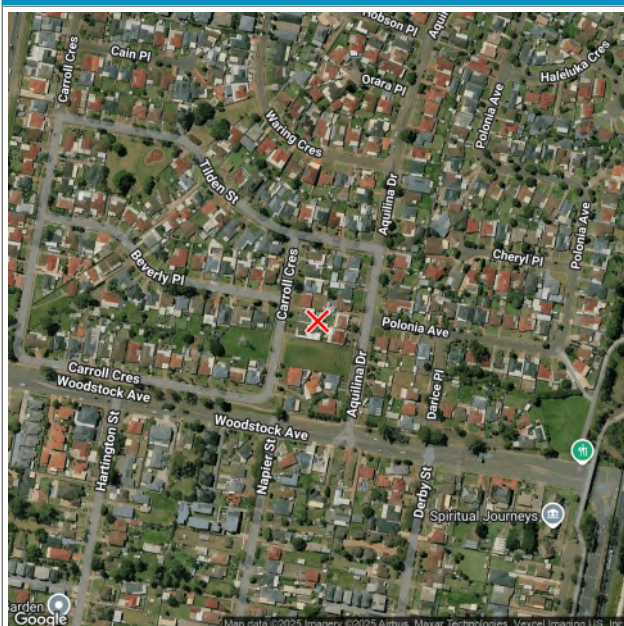
Item	Information
Logger Type	NL-42
Serial number	998081
Address	9 Carroll Crescent, Plumpton
Location	Rear garden of property.
Facade / free field	Free field
Environment	Ambient noise levels from general suburban noise and surrounding roads (M7 and Woodstock Ave)

### Measured noise levels

Logging date	Rating Background Level			L <sub>Aeq,period</sub>		
	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am
Fri 19 Sep 2025	-	39	-	-	46	-
Sat 20 Sep 2025	40	35	38	47	43	46
Sun 21 Sep 2025	36	36	36	45	43	44
Mon 22 Sep 2025	38	43	40	57	49	48
Tue 23 Sep 2025	40	41	38	47	46	45
Wed 24 Sep 2025	37	40	37	48	45	47
Thu 25 Sep 2025	38	40	34	45	49	47
Fri 26 Sep 2025	41	42	38	49	46	46
Sat 27 Sep 2025	41	44	39	50	47	46
Sun 28 Sep 2025	43	39	35	51	46	44
Mon 29 Sep 2025	-	-	-	45	-	43
<b>Summary</b>	<b>40</b>	<b>40</b>	<b>38</b>	<b>50</b>	<b>47</b>	<b>46</b>

Note: Results with a '-' identify that there were not enough measurements available to correctly calculate the level, in accordance with the Noise Policy for Industry. The data has been excluded either from weather or manual exclusions. See the charts for more information

#### Logger location

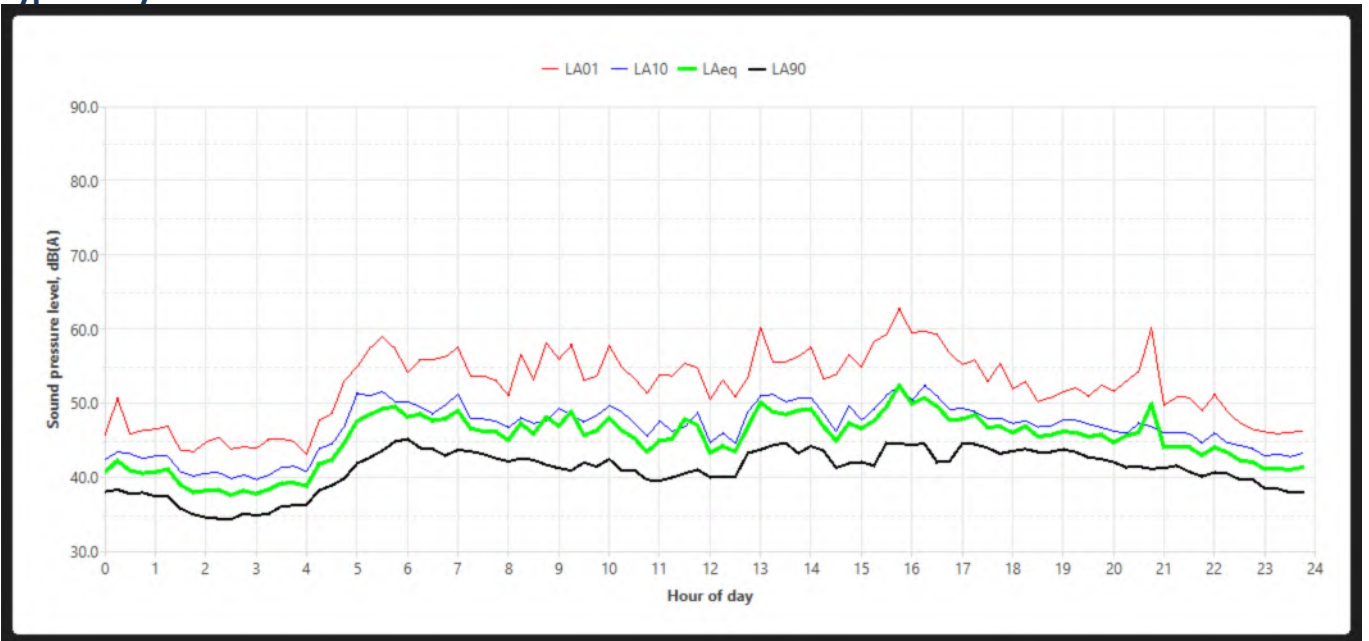


9 Carroll Crescent, Plumpton

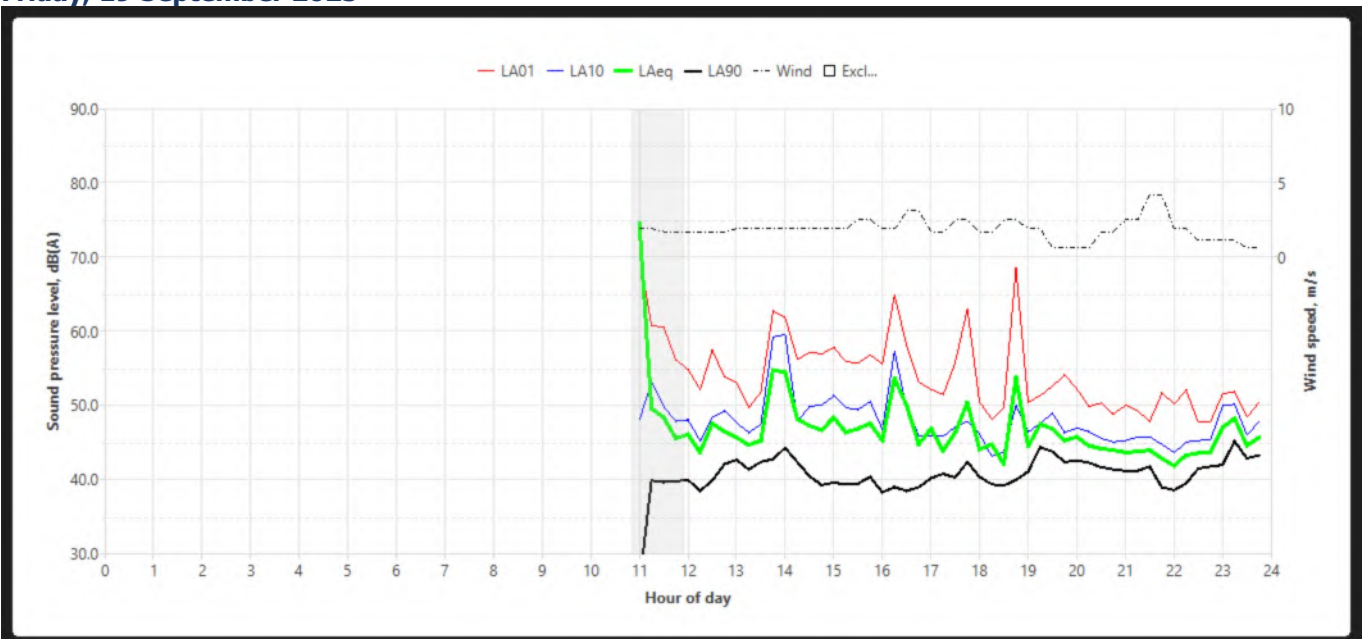
#### Logger deployment photo



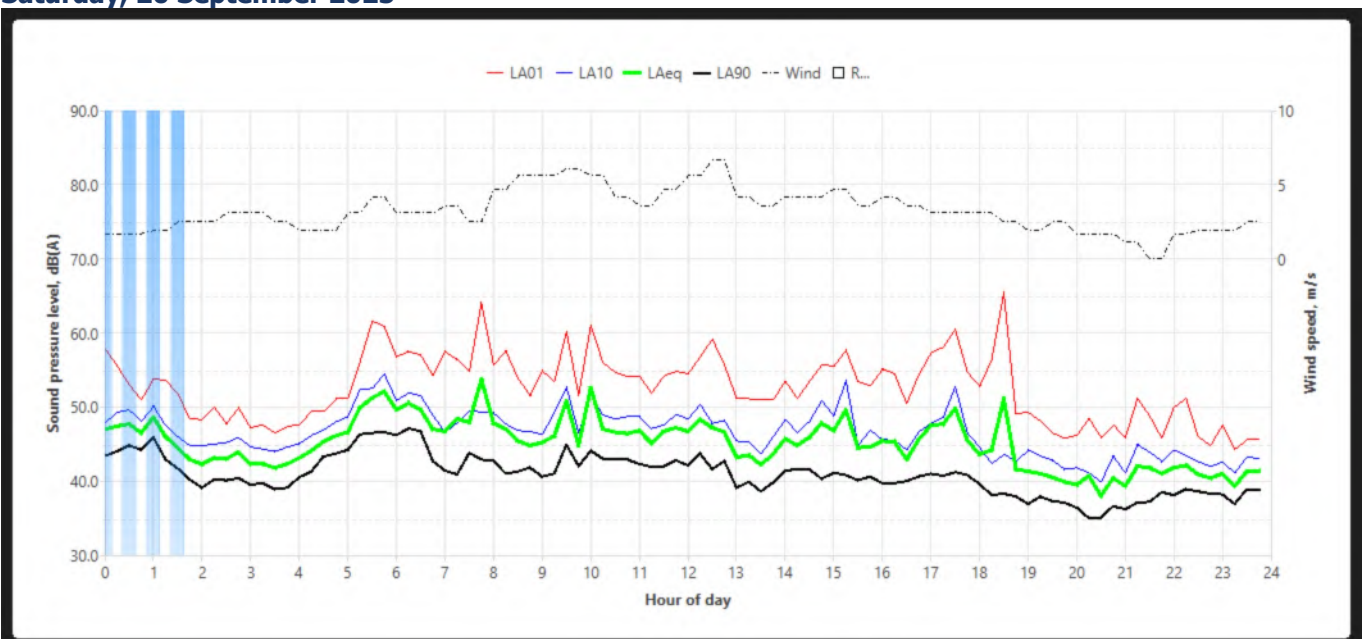
## Typical Day



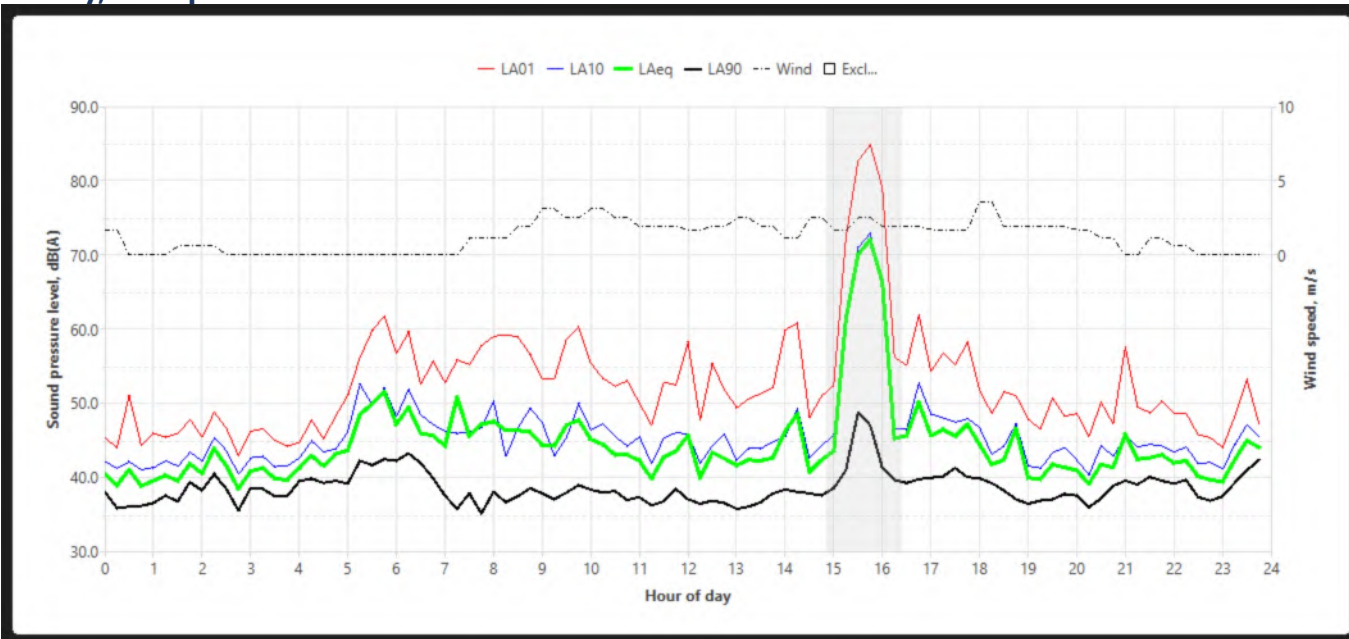
## Friday, 19 September 2025



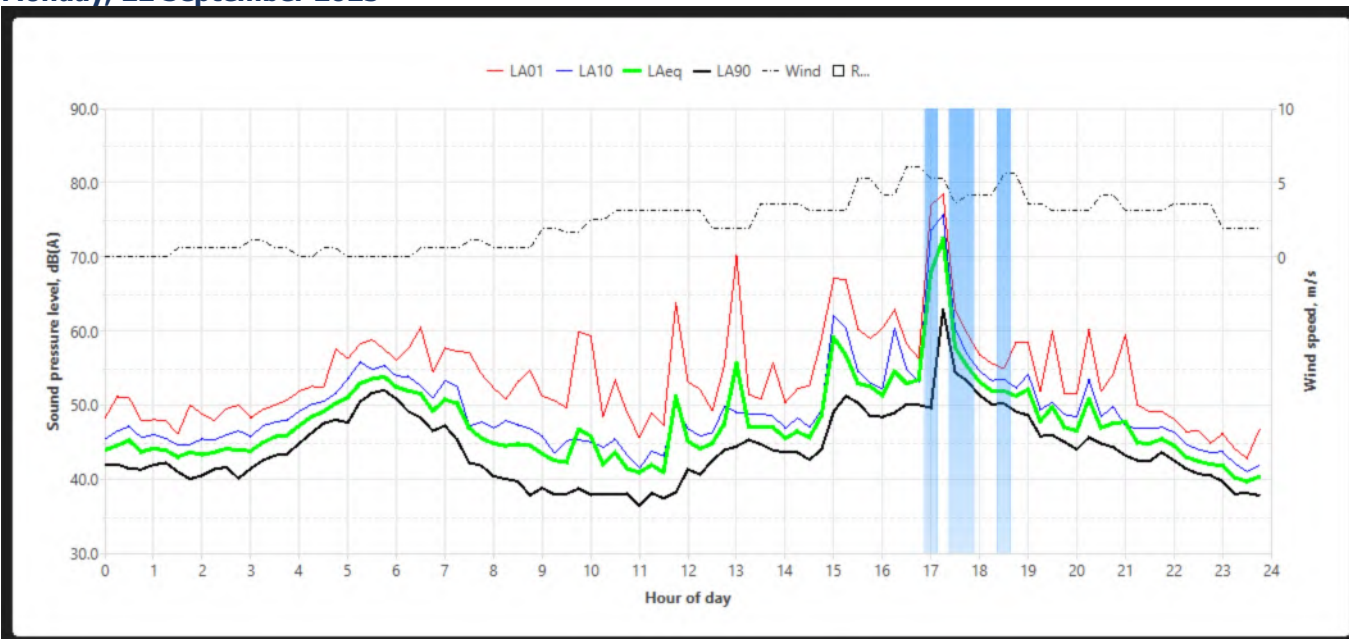
## Saturday, 20 September 2025



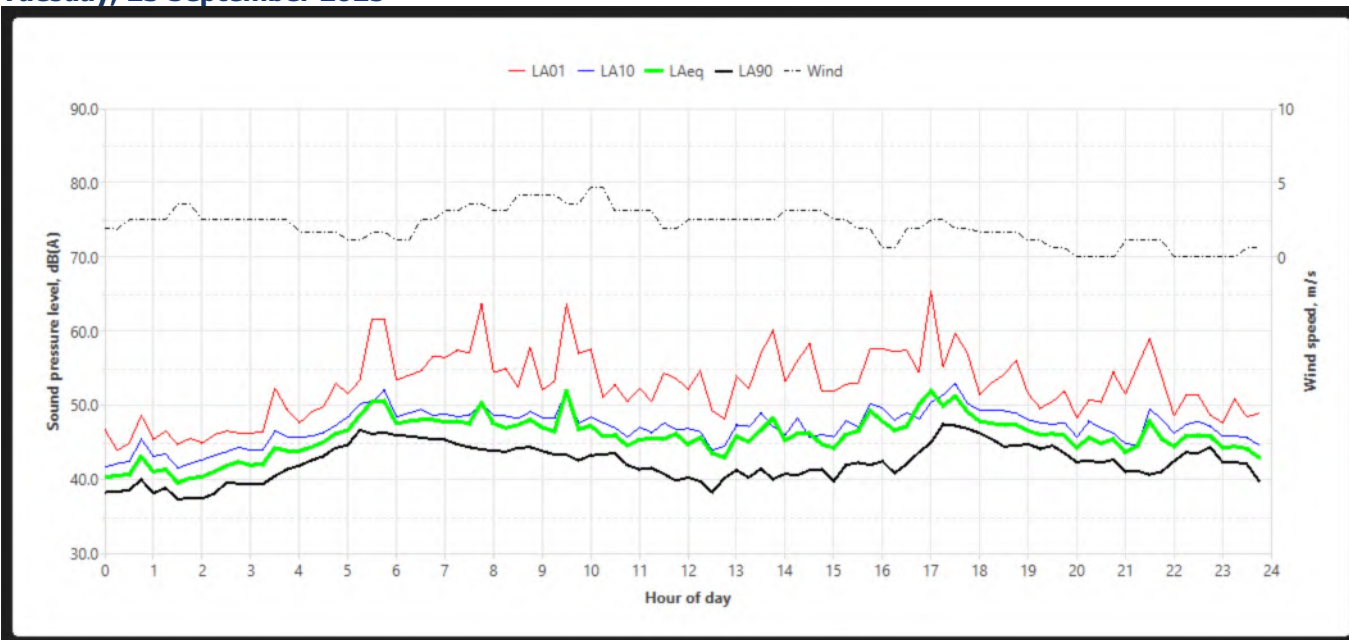
**Sunday, 21 September 2025**



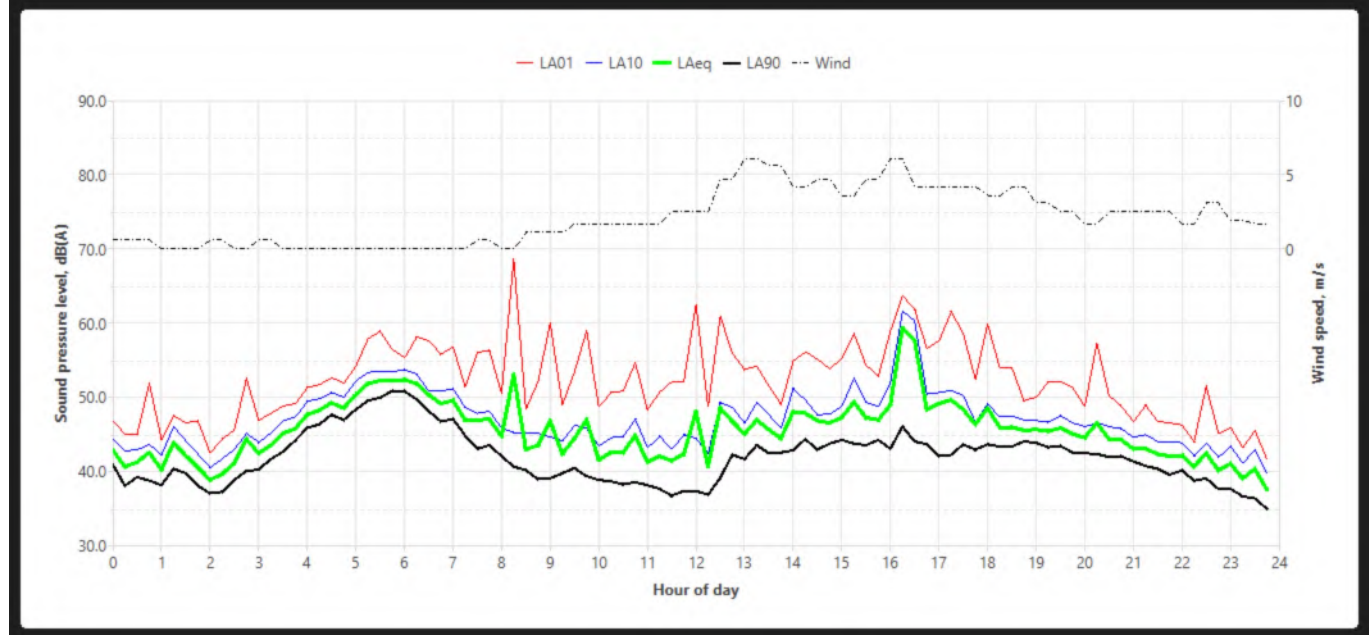
**Monday, 22 September 2025**



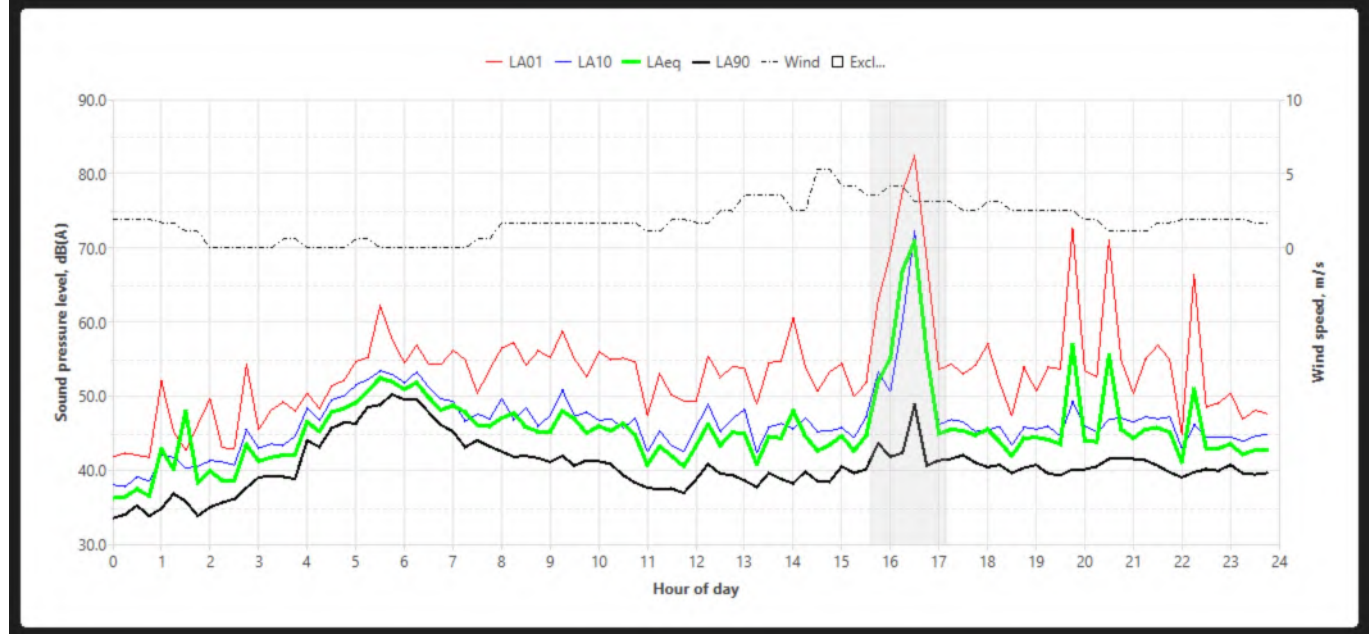
**Tuesday, 23 September 2025**



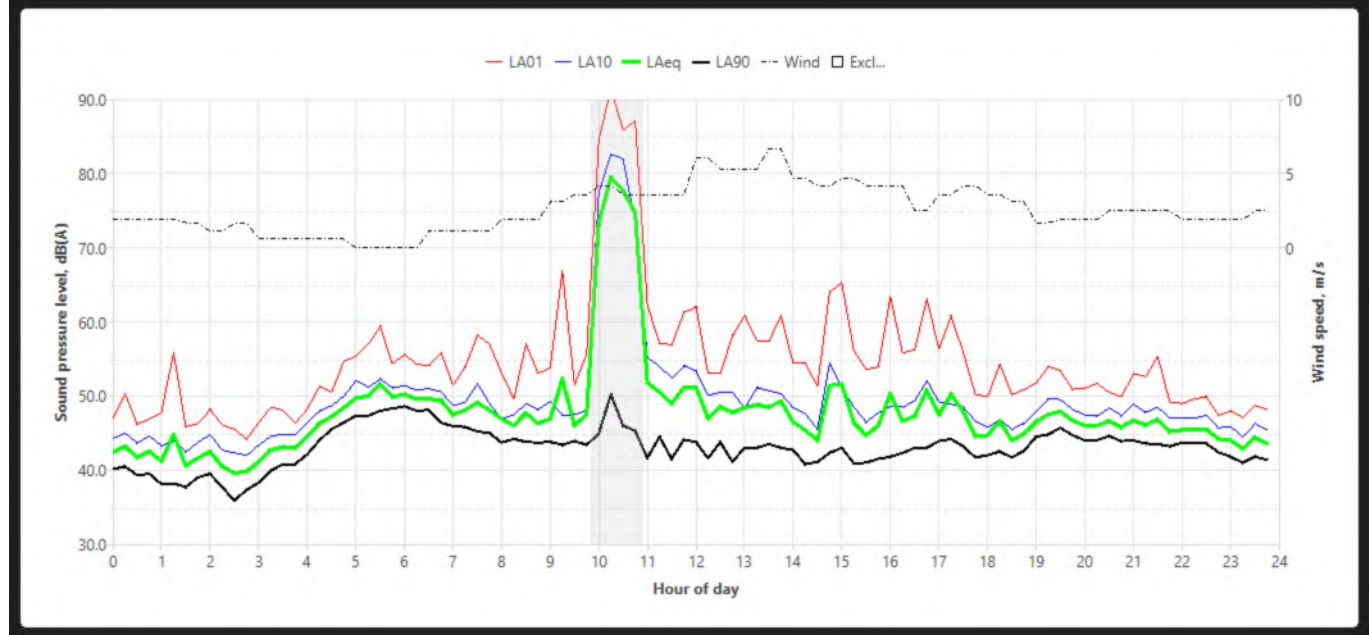
Wednesday, 24 September 2025



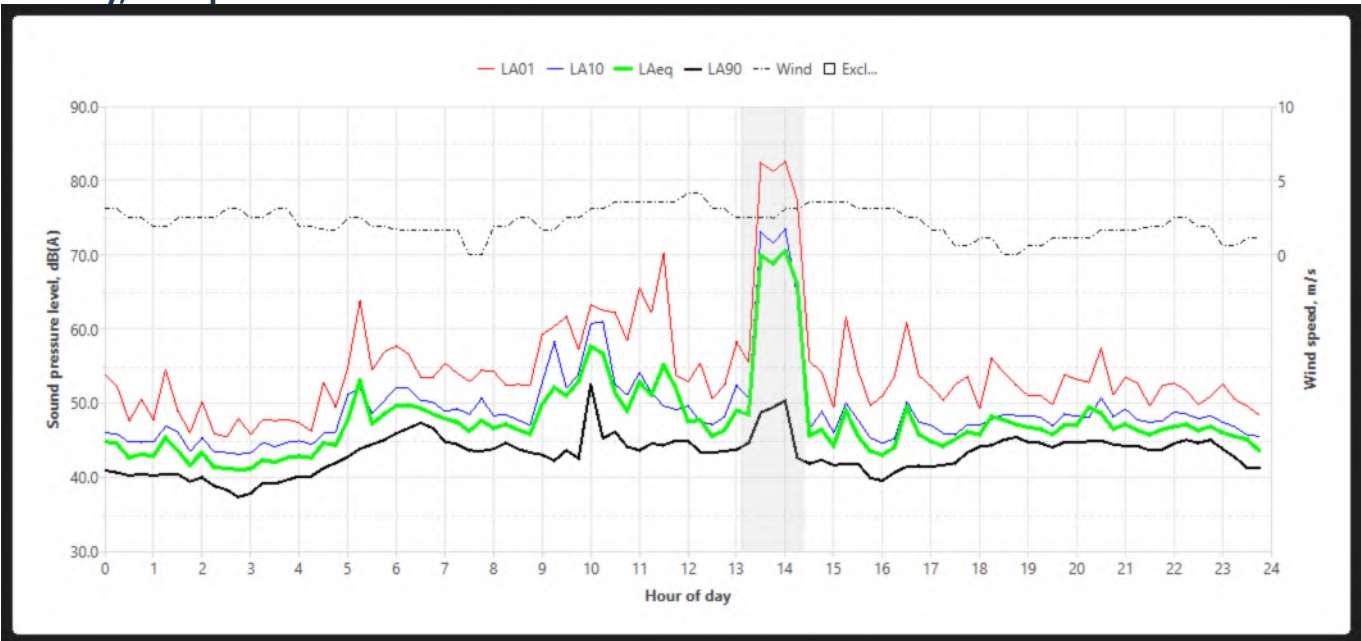
Thursday, 25 September 2025



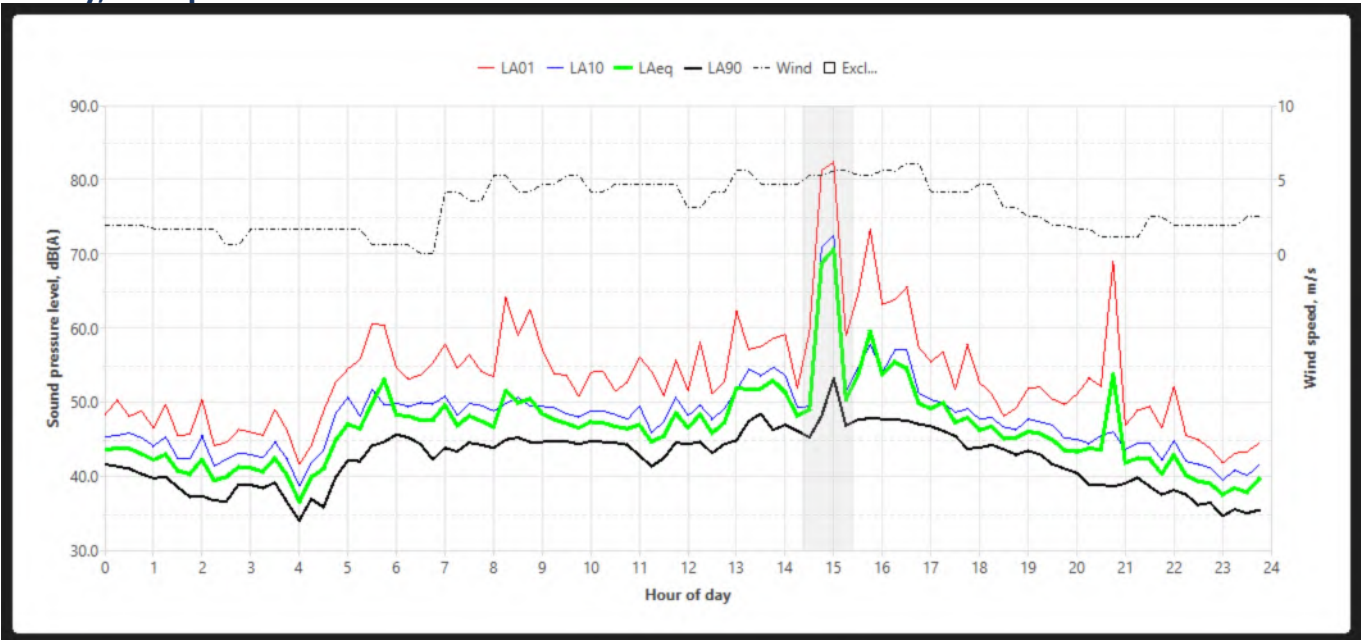
Friday, 26 September 2025



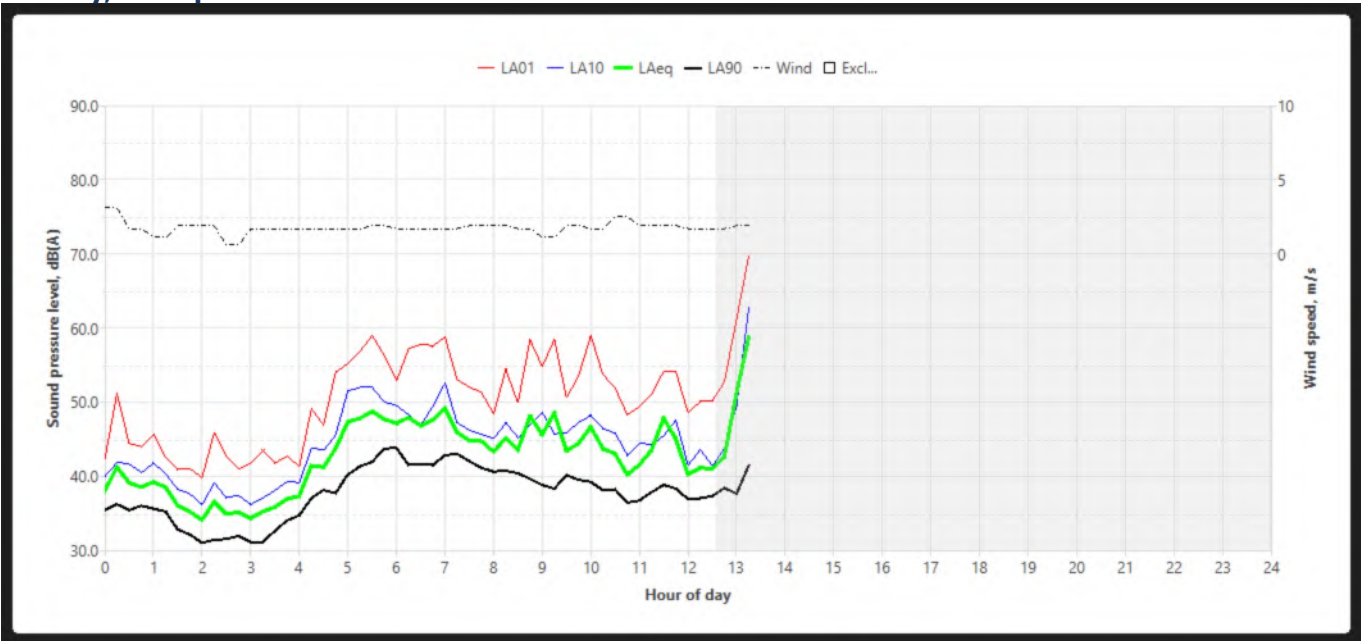
**Saturday, 27 September 2025**



**Sunday, 28 September 2025**



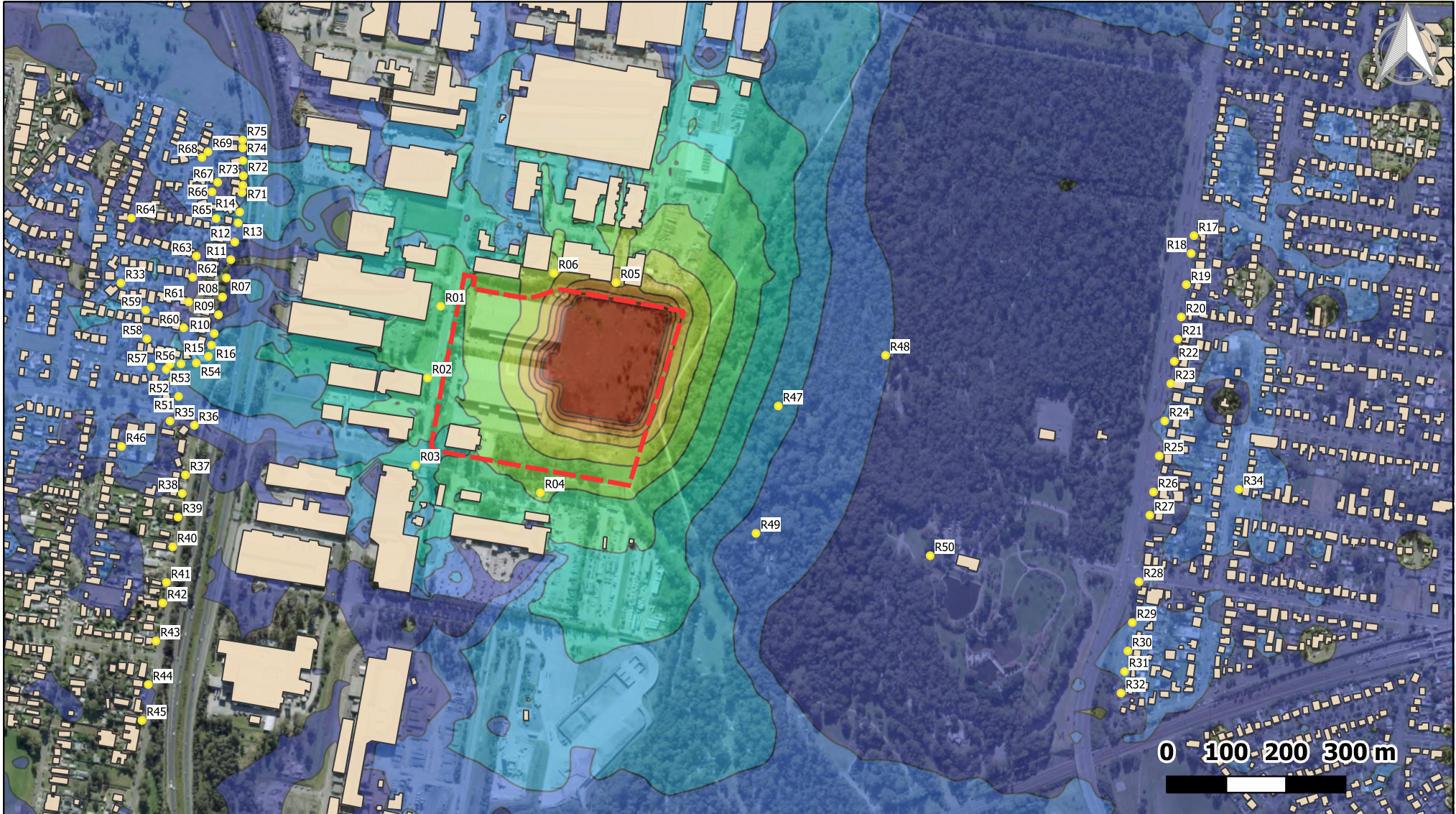
**Monday, 29 September 2025**





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## **APPENDIX C: CONSTRUCTION NOISE CONTOURS**



**L<sub>Aeq, 15min</sub> noise levels, dB(A)**

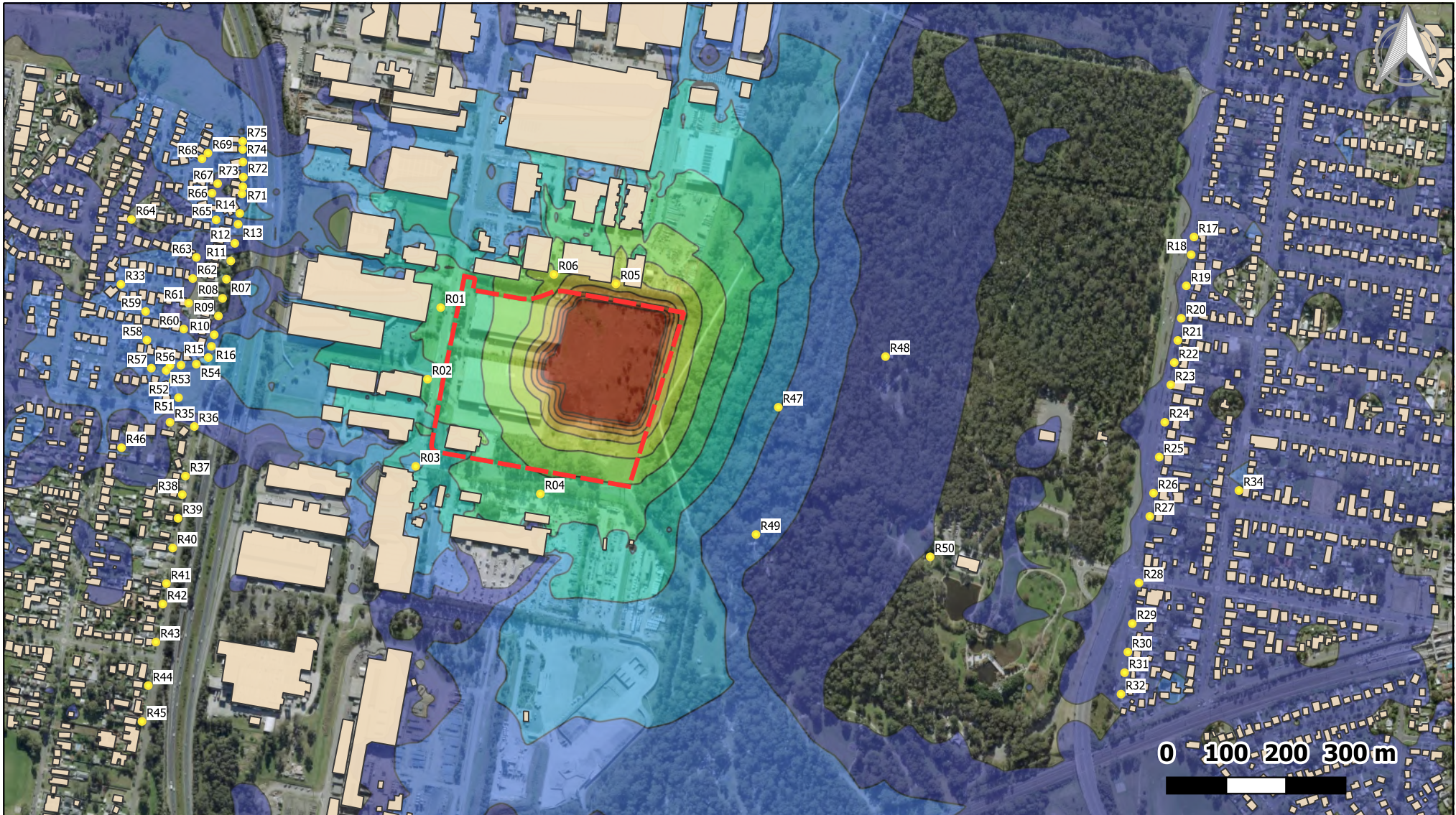
- 40 - 45
- 45 - 50
- 50 - 55

- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80

- 85 - 90
- 90 - 95
- >95

**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Construction Scenario 1 - Site Clearance**  
 L<sub>Aeq, 15 min</sub> noise impacts  
 Contour Height 1.5 m

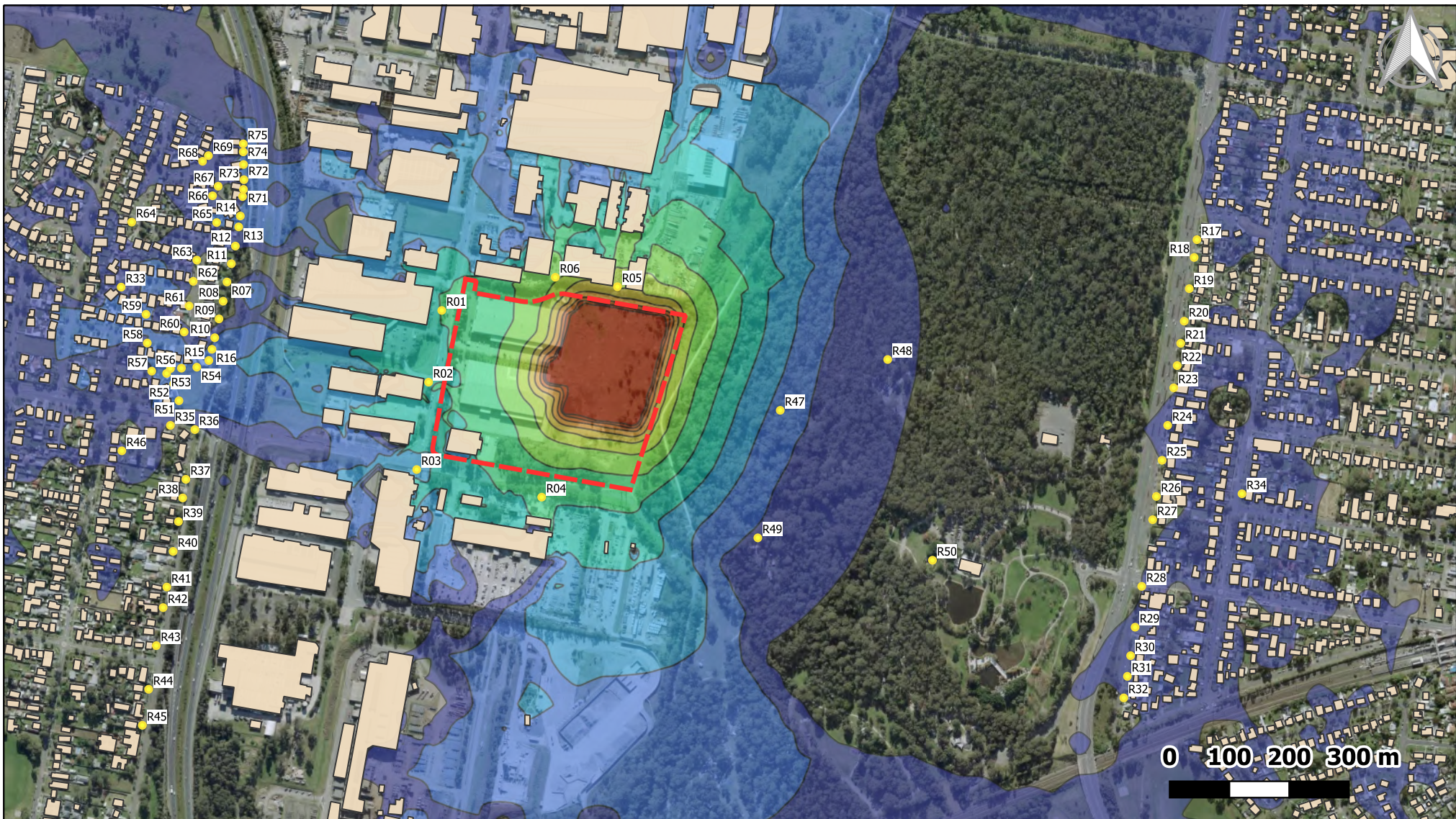




<b>L<sub>Aeq, 15min</sub> noise levels, dB(A)</b>		
	40 - 45	
	45 - 50	
	50 - 55	
	60 - 65	
	65 - 70	
	70 - 75	
	75 - 80	
		85 - 90
		90 - 95
		>95

**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Construction Scenario 1 - Excavation of pile**  
**L<sub>Aeq, 15 min</sub> noise impacts**  
**Contour Height 1.5 m**

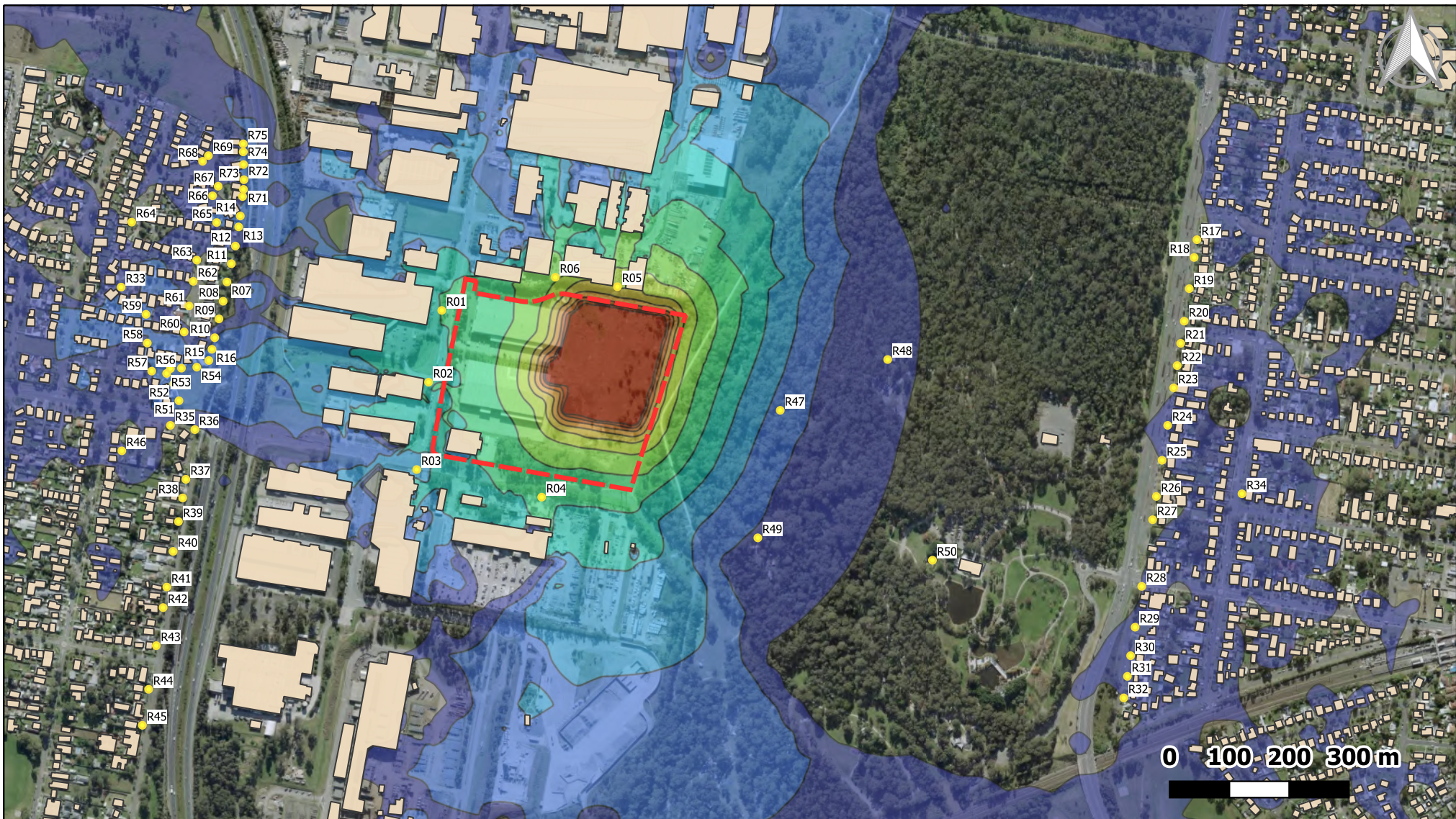




<b>L<sub>Aeq, 15min</sub> noise levels, dB(A)</b>	
	40 - 45
	45 - 50
	50 - 55
	60 - 65
	65 - 70
	70 - 75
	75 - 80
	85 - 90
	90 - 95
	>95

**2 Glendenning Road, Glendenning Data Centre Campus SSDA 73761707**  
**Construction Scenario 1 - Piling Works**  
**L<sub>Aeq, 15 min</sub> noise impacts**  
**Contour Height 1.5 m**

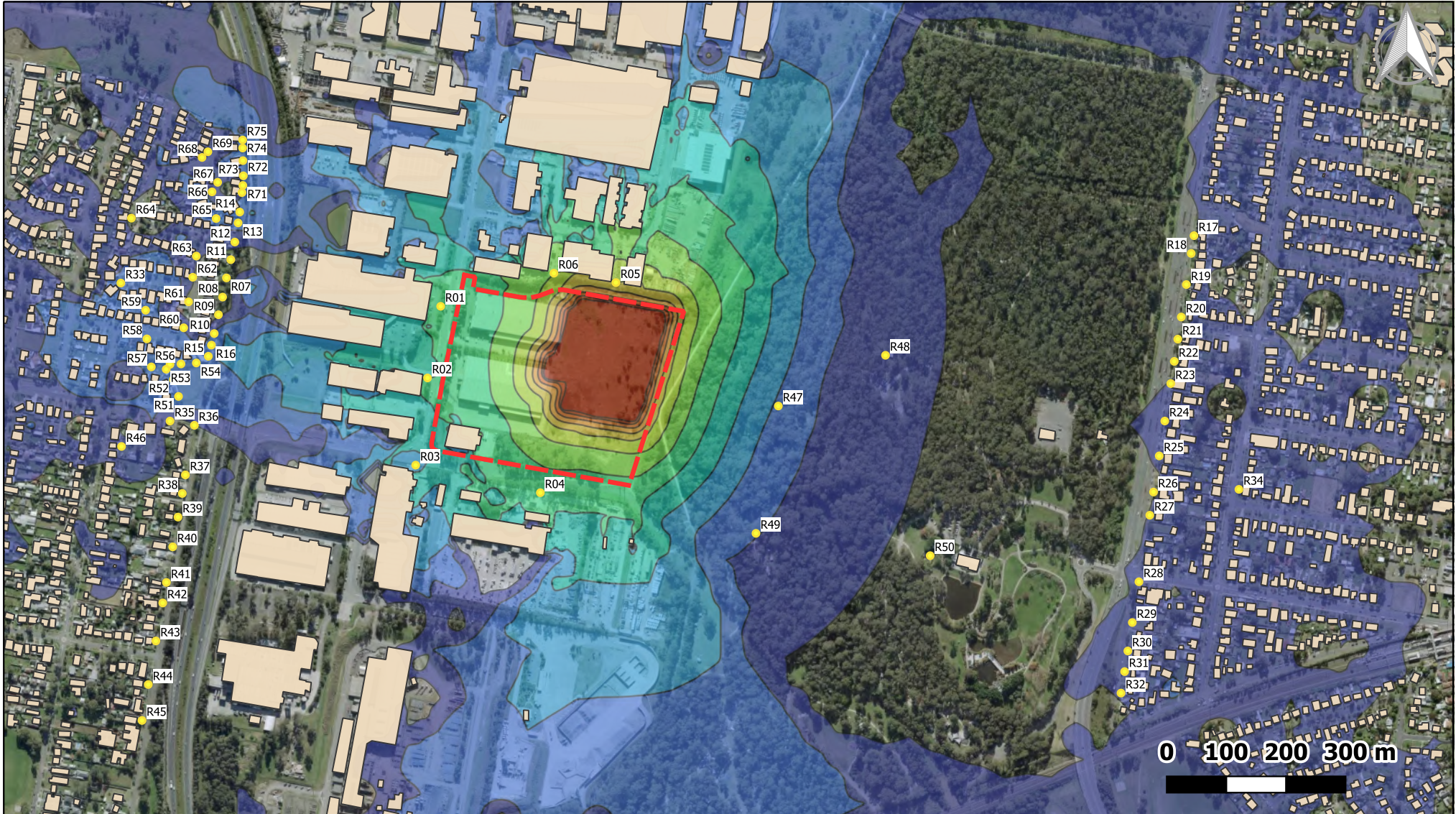




$L_{Aeq, 15min}$ noise levels, dB(A)			
	40 - 45		85 - 90
	45 - 50		90 - 95
	50 - 55		>95
	60 - 65		
	65 - 70		
	70 - 75		
	75 - 80		

2 Glendenning Road, Glendenning Data  
 Centre Campus SSSA 73761707  
 Construction Scenario 1 - Structure  
 Construction  $L_{Aeq, 15 min}$  noise impacts  
 Contour Height 1.5 m





**$L_{Aeq, 15min}$  noise levels, dB(A)**

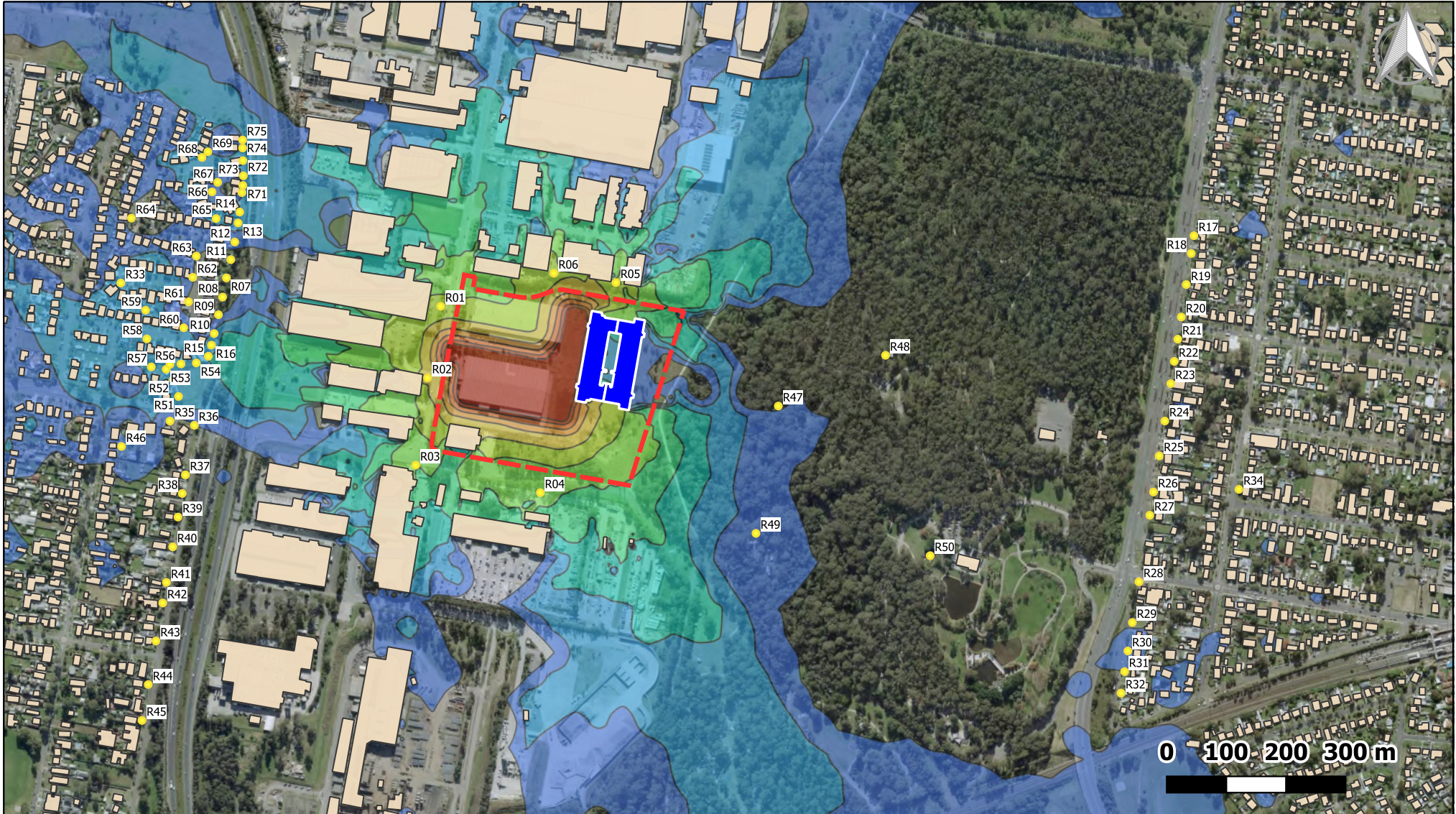
- 40 - 45
- 45 - 50
- 50 - 55

- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80

- 85 - 90
- 90 - 95
- >95

**2 Glendenning Road, Glendenning Data  
Centre Campus SSSA 73761707  
Construction Scenario 1 - Fitout & Finishes**  
 $L_{Aeq, 15min}$  noise impacts  
 Contour Height 1.5 m





**$L_{Aeq, 15min}$  noise levels, dB(A)**

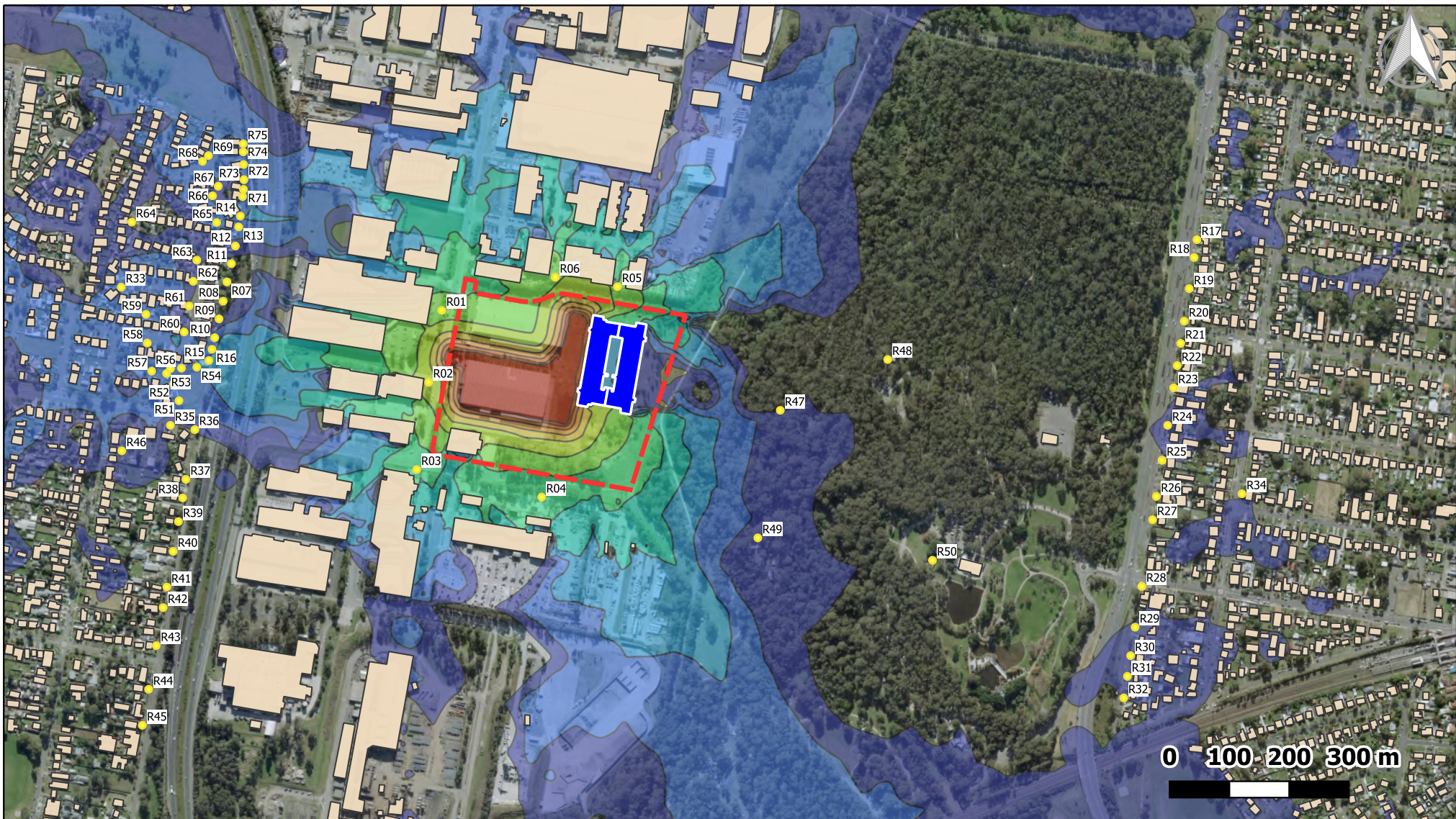
- 40 - 45
- 45 - 50
- 50 - 55

- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80

- 85 - 90
- 90 - 95
- >95

**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Construction Scenario 2 - Site Clearance**  
 $L_{Aeq, 15min}$  noise impacts  
 Contour Height 1.5 m





**$L_{Aeq, 15min}$  noise levels, dB(A)**

- 40 - 45
- 45 - 50
- 50 - 55

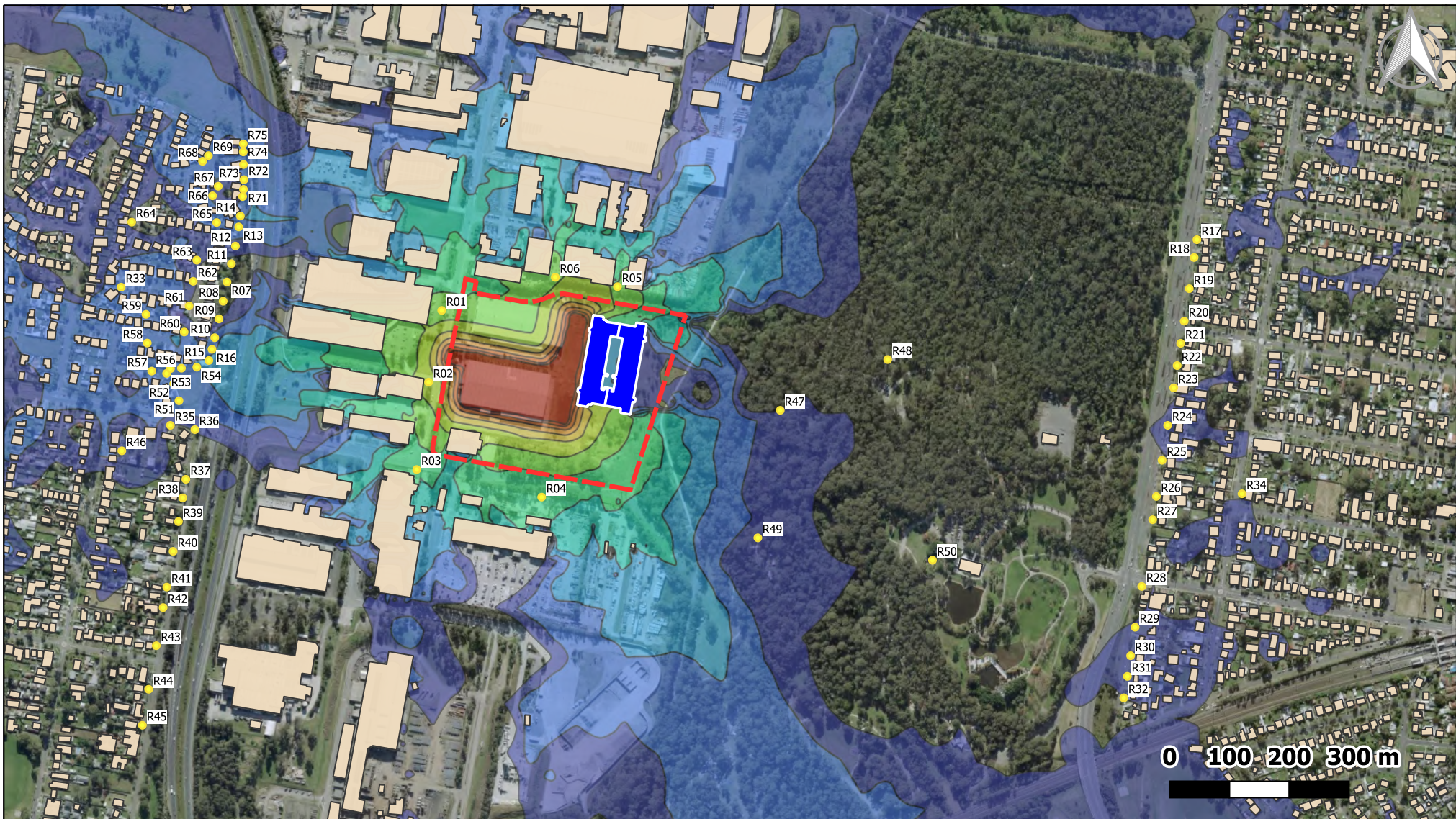
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80

- 85 - 90
- 90 - 95
- >95

**2 Glendenning Road, Glendenning Data  
Centre Campus SSSA 73761707  
Construction Scenario 2 - Piling Works**

**$L_{Aeq, 15min}$  noise impacts  
Contour Height 1.5 m**





**$L_{Aeq, 15min}$  noise levels, dB(A)**

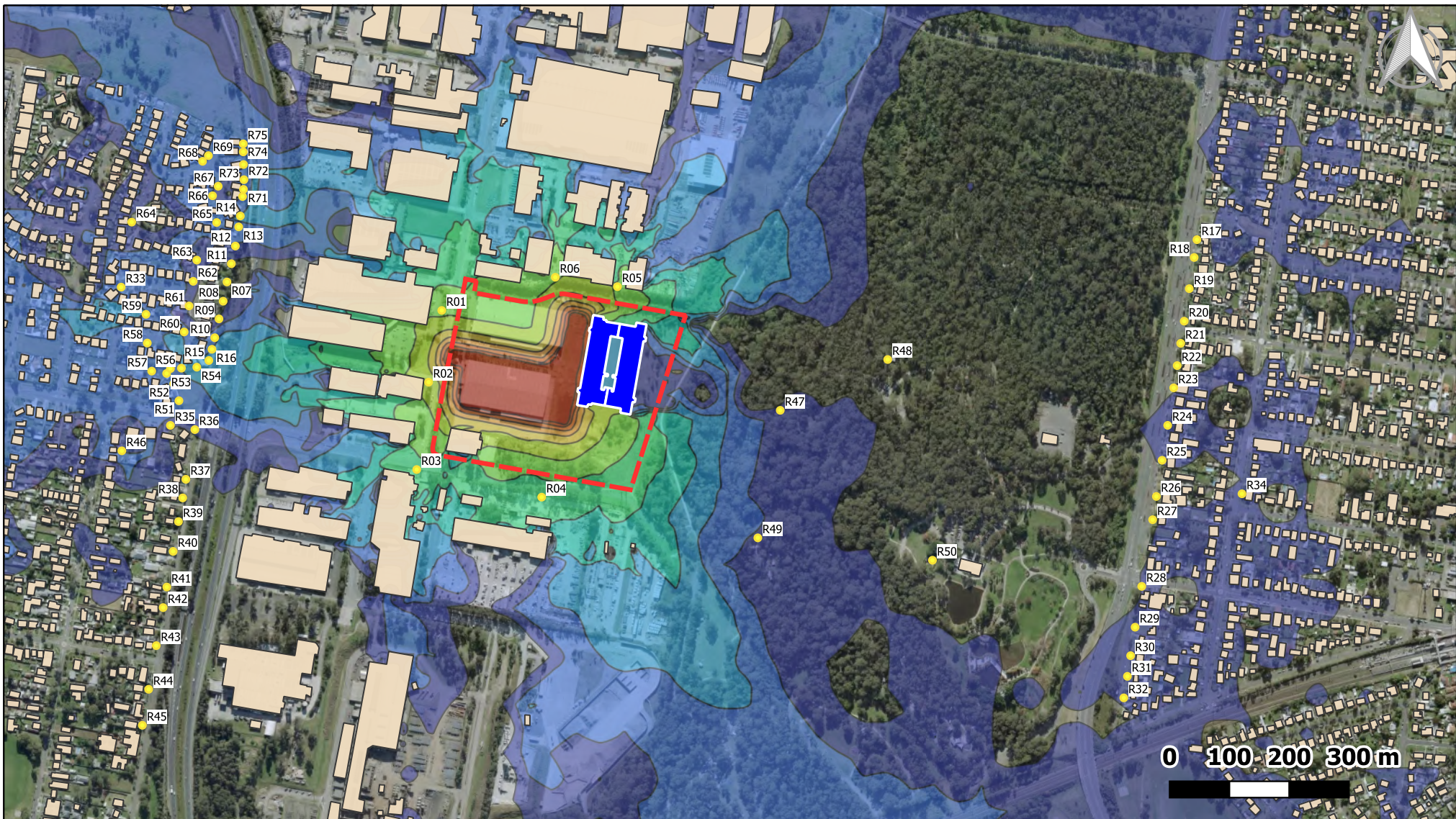
- 40 - 45
- 45 - 50
- 50 - 55

- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80

- 85 - 90
- 90 - 95
- >95

**2 Glendenning Road, Glendenning Data  
Centre Campus SSSA 73761707  
Construction Scenario 2 - Structure  
Construction  $L_{Aeq, 15min}$  noise impacts  
Contour Height 1.5 m**





**$L_{Aeq, 15min}$  noise levels, dB(A)**

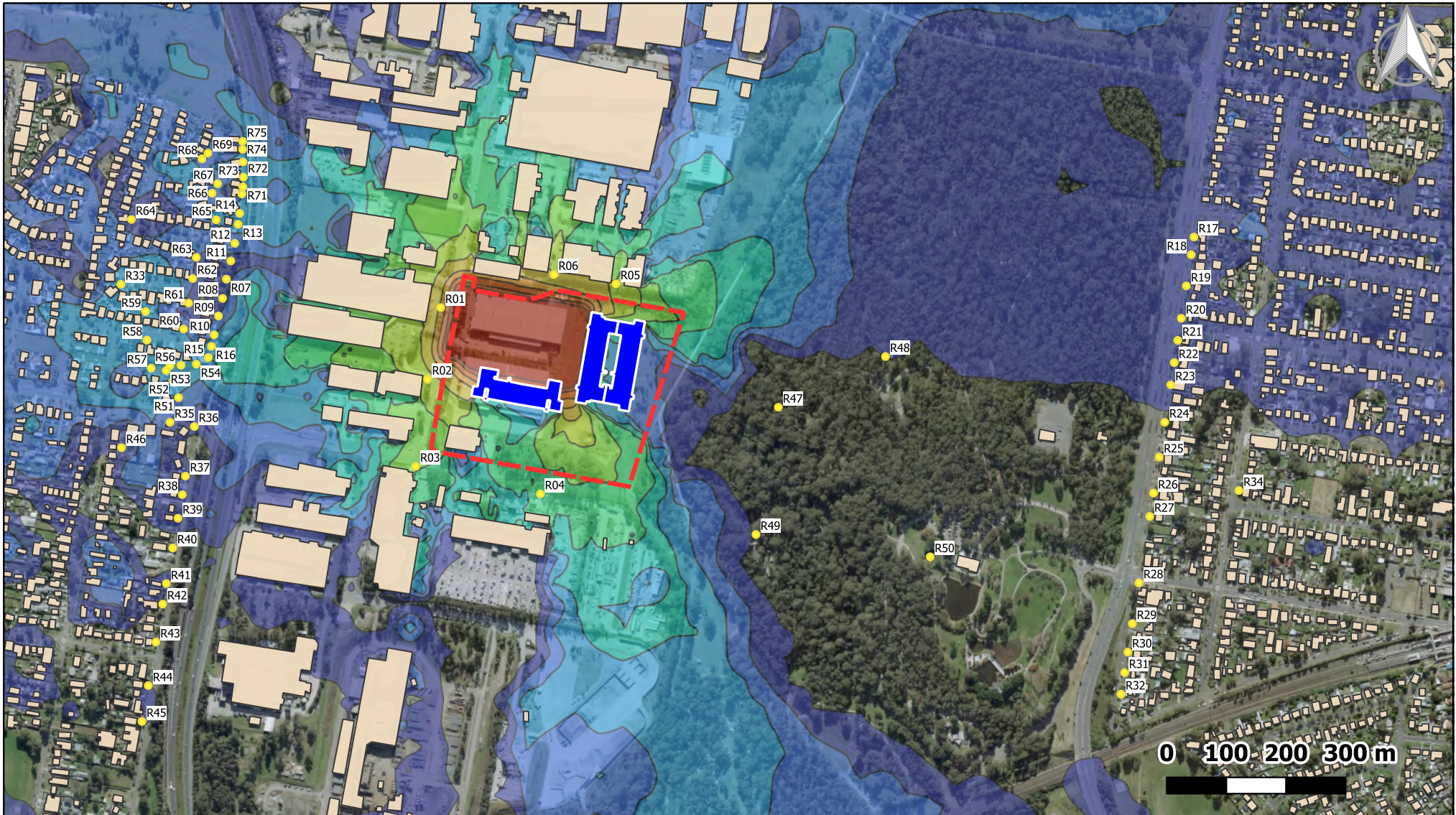
- 40 - 45
- 45 - 50
- 50 - 55

- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80

- 85 - 90
- 90 - 95
- >95

**2 Glendenning Road, Glendenning Data  
Centre Campus SSDA 73761707  
Construction Scenario 2 - Fitout & Finishes**  
 $L_{Aeq, 15min}$  noise impacts  
 Contour Height 1.5 m

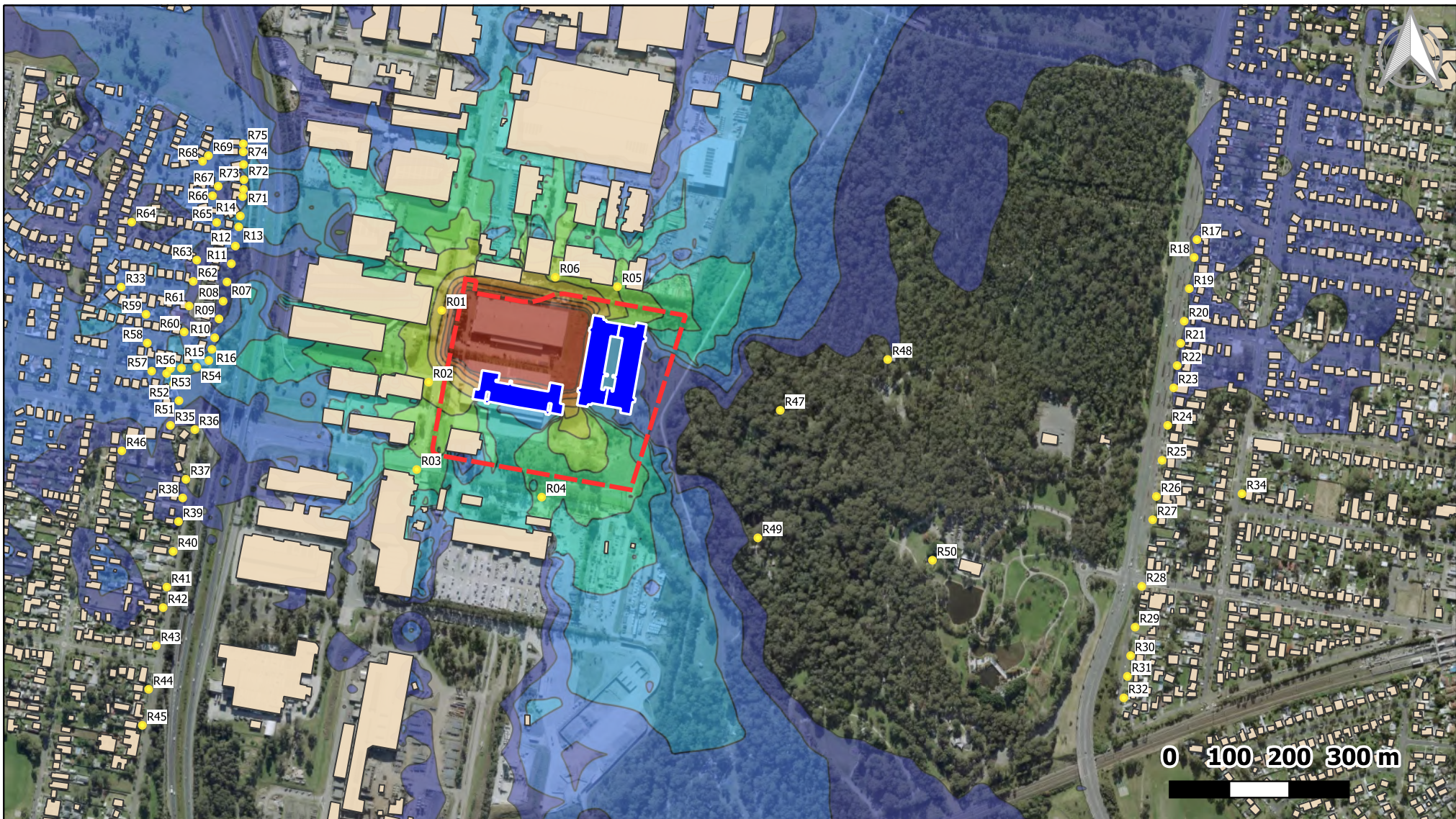




<b>L<sub>Aeq, 15min</sub> noise levels, dB(A)</b>			
	40 - 45		85 - 90
	45 - 50		90 - 95
	50 - 55		>95
	60 - 65		75 - 80
	65 - 70		
	70 - 75		
	75 - 80		

**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Construction Scenario 3 - Site Clearance**  
**L<sub>Aeq, 15 min</sub> noise impacts**  
**Contour Height 1.5 m**

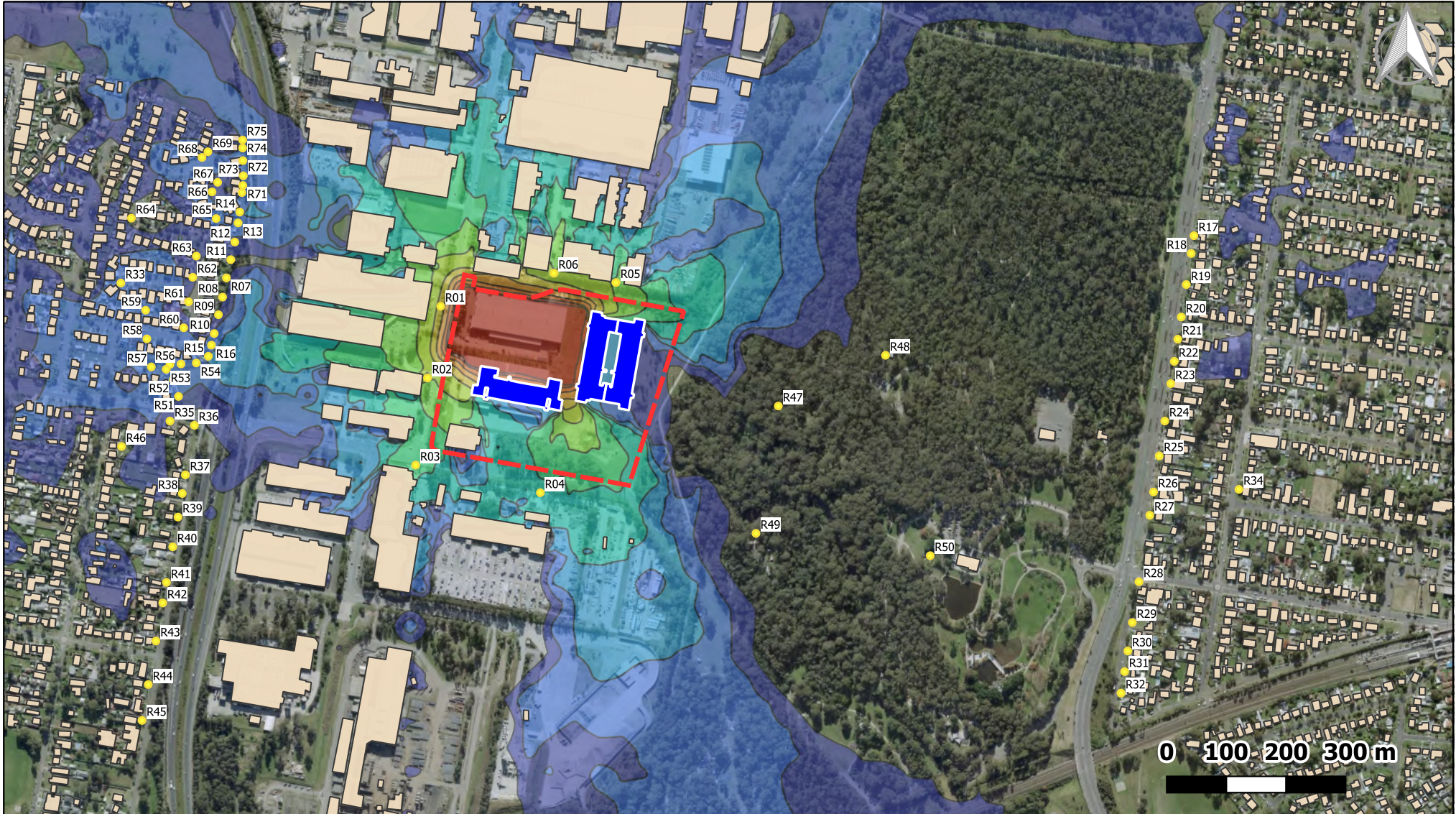




<b>L<sub>Aeq, 15min</sub> noise levels, dB(A)</b>			
	40 - 45		85 - 90
	45 - 50		90 - 95
	50 - 55		>95
	60 - 65		75 - 80
	65 - 70		
	70 - 75		
	75 - 80		

**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Construction Scenario 3 - Excavation of Pile**  
**L<sub>Aeq, 15 min</sub> noise impacts**  
**Contour Height 1.5 m**





**$L_{Aeq, 15min}$  noise levels, dB(A)**

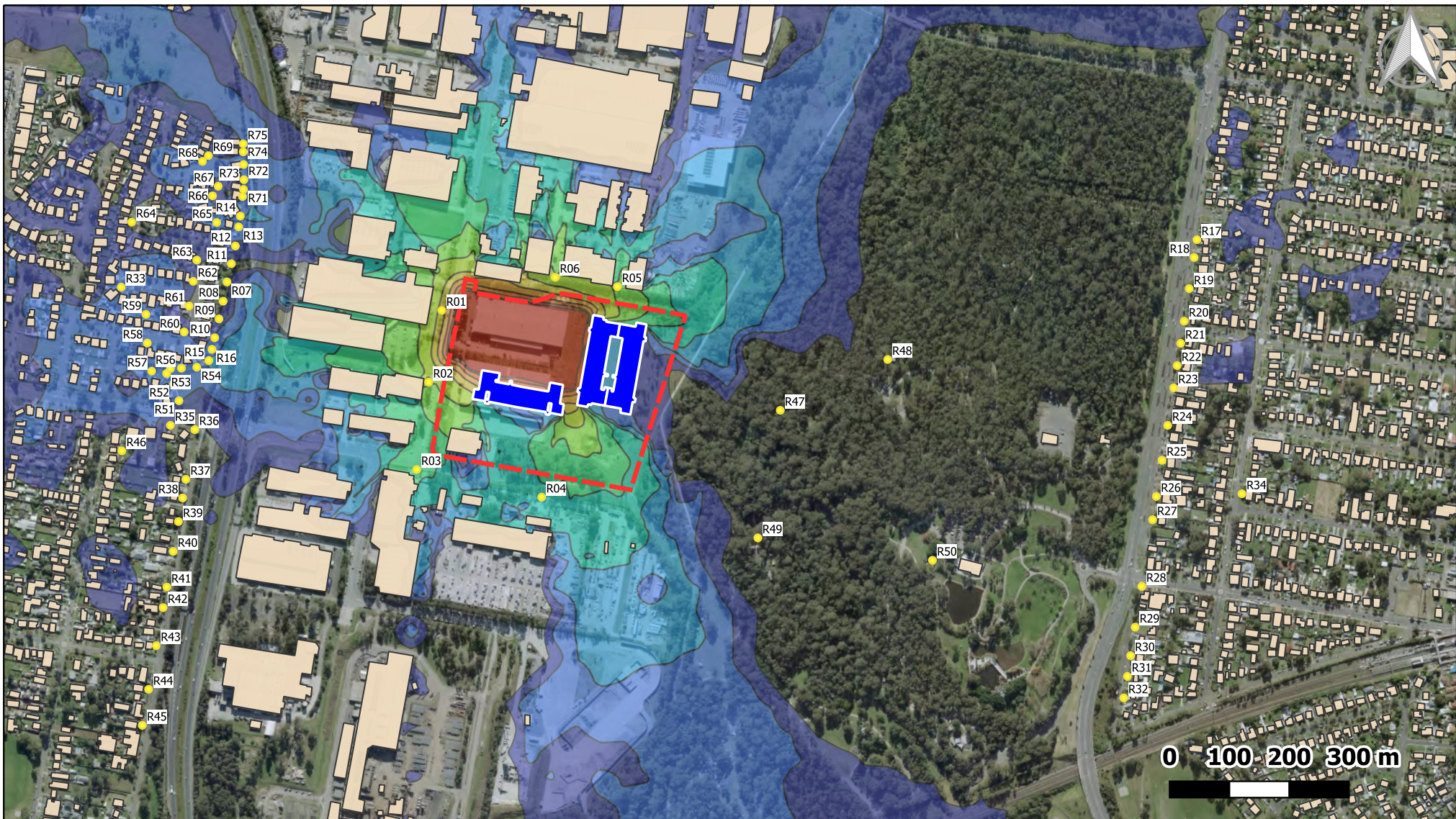
- 40 - 45
- 45 - 50
- 50 - 55

- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80

- 85 - 90
- 90 - 95
- >95

**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Construction Scenario 3 - Piling Works**  
 $L_{Aeq, 15min}$  noise impacts  
 Contour Height 1.5 m

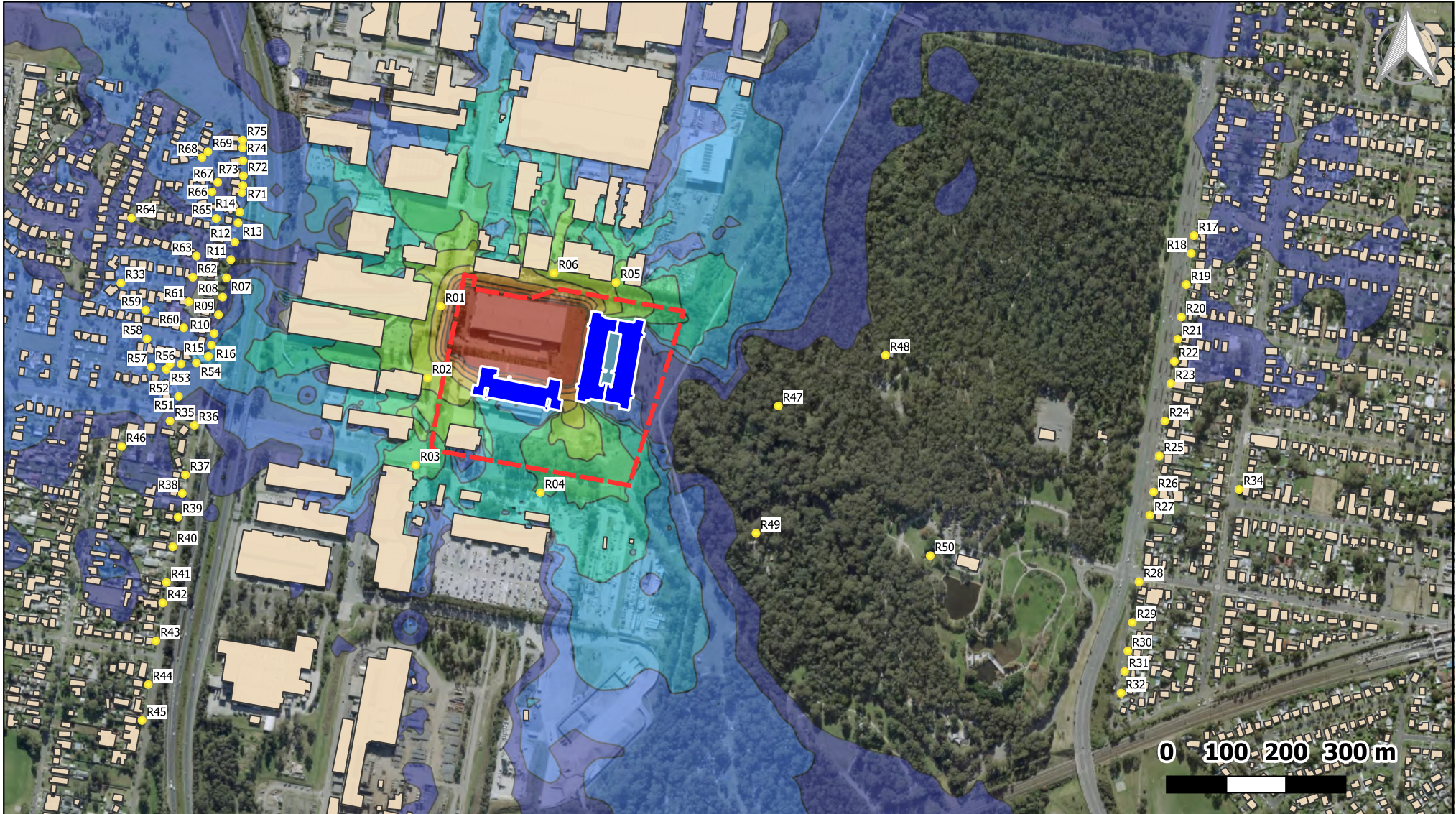




<b>L<sub>Aeq, 15min</sub> noise levels, dB(A)</b>			
	40 - 45		85 - 90
	45 - 50		90 - 95
	50 - 55		>95
	60 - 65		75 - 80
	65 - 70		
	70 - 75		
	75 - 80		

**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Construction Scenario 3 - Structure**  
**Construction L<sub>Aeq,15 min</sub> noise impacts**  
**Contour Height 1.5 m**





**$L_{Aeq, 15min}$  noise levels, dB(A)**

- 40 - 45
- 45 - 50
- 50 - 55

- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80

- 85 - 90
- 90 - 95
- >95

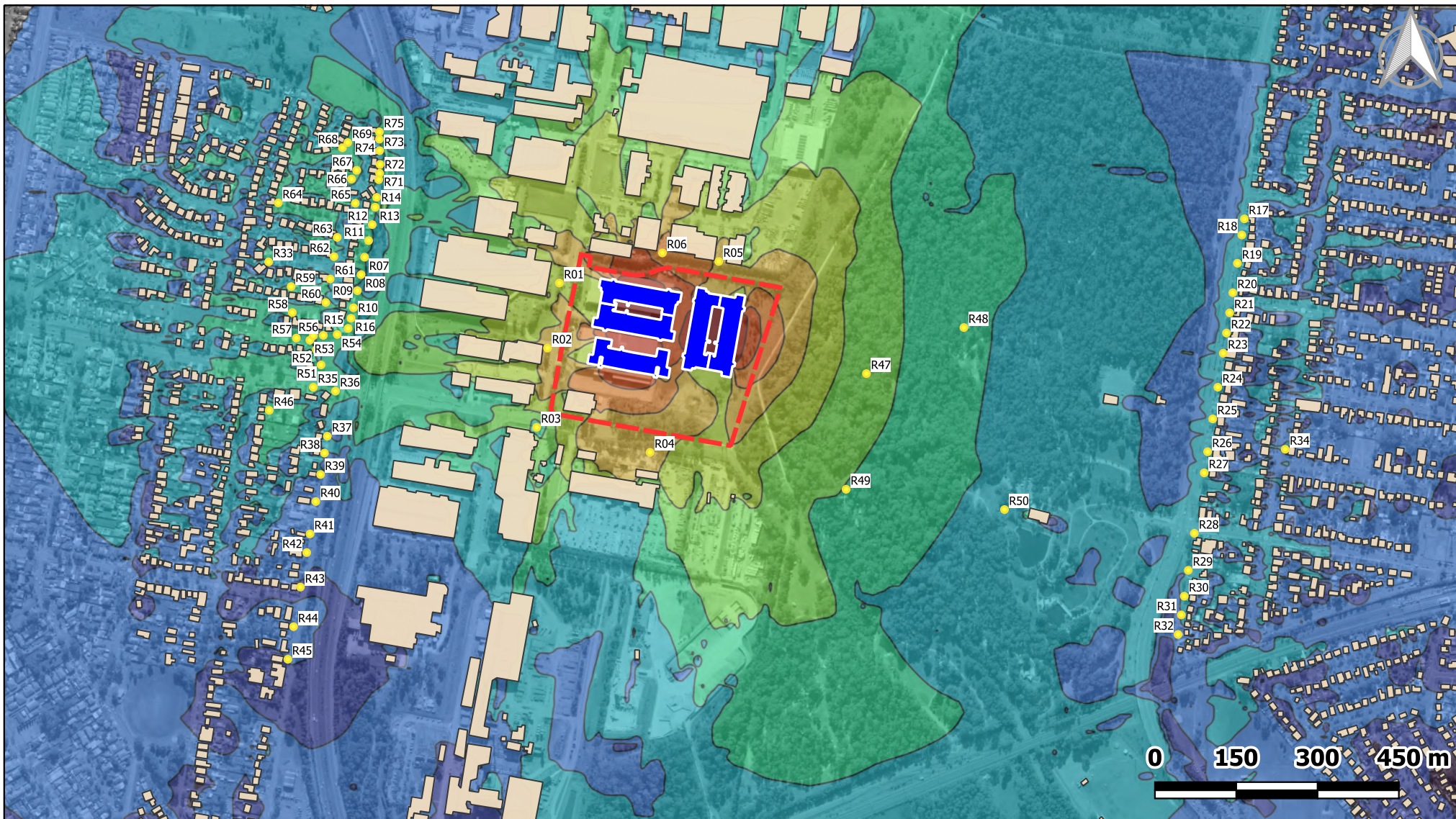
**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Construction Scenario 3 - Fitout & Finishes**  
 $L_{Aeq, 15min}$  noise impacts  
 Contour Height 1.5 m





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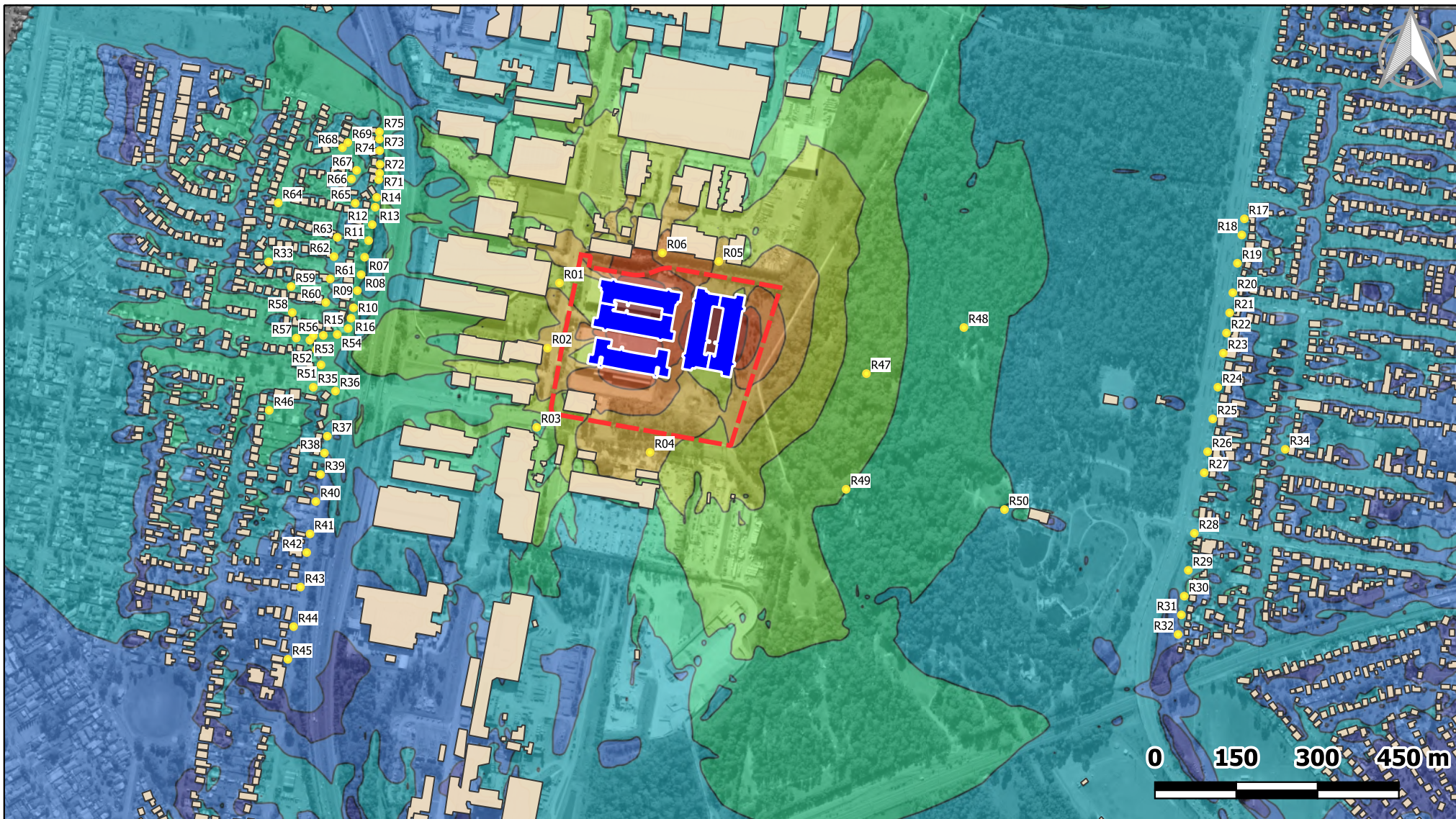
## **APPENDIX D: OPERATIONAL NOISE CONTOURS**



$L_{Aeq,15min}$ noise levels, dB(A)	
15 - 20	35 - 40
20 - 25	40 - 45
25 - 30	45 - 50
30 - 35	50 - 55
	55 - 60
	60 - 65
	65 - 70
	>70

2 Glendenning Road, Glendenning Data  
 Centre Campus SSDA 73761707  
 Operational Scenario 01 Day / Evening /  
 Night  $L_{Aeq,15 min}$  noise impacts  
 Contour Height 1.5 m





**$L_{Aeq,15min}$  noise levels, dB(A)**

15 - 20

20 - 25

25 - 30

30 - 35

35 - 40

40 - 45

45 - 50

50 - 55

55 - 60

60 - 65

65 - 70

>70

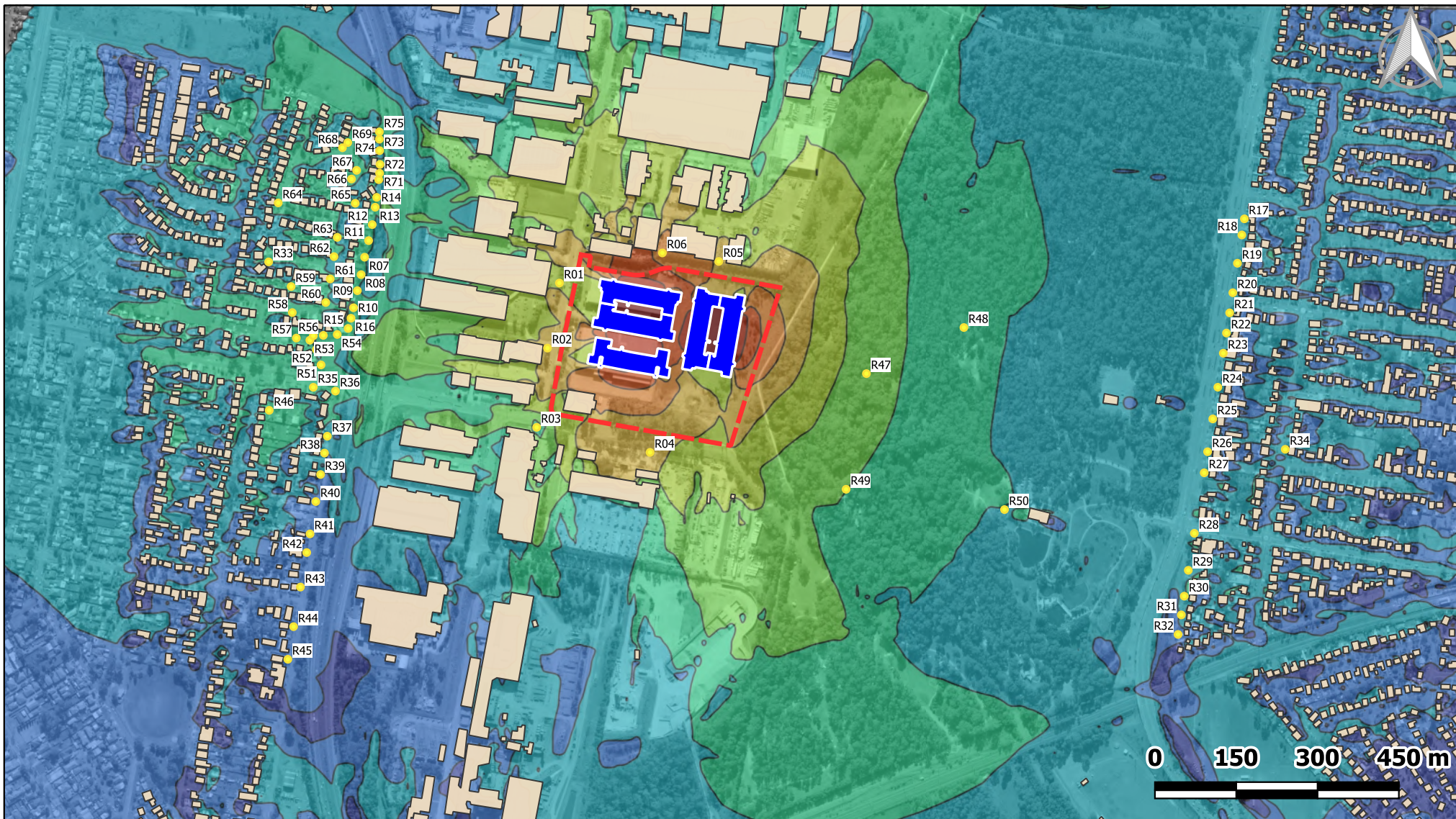
**2 Glendenning Road, Glendenning Data  
Centre Campus SSDA 73761707**

**Operational Scenario 02 Day / Evening**

**$L_{Aeq,15 min}$  noise impacts**

**Contour Height 1.5 m**



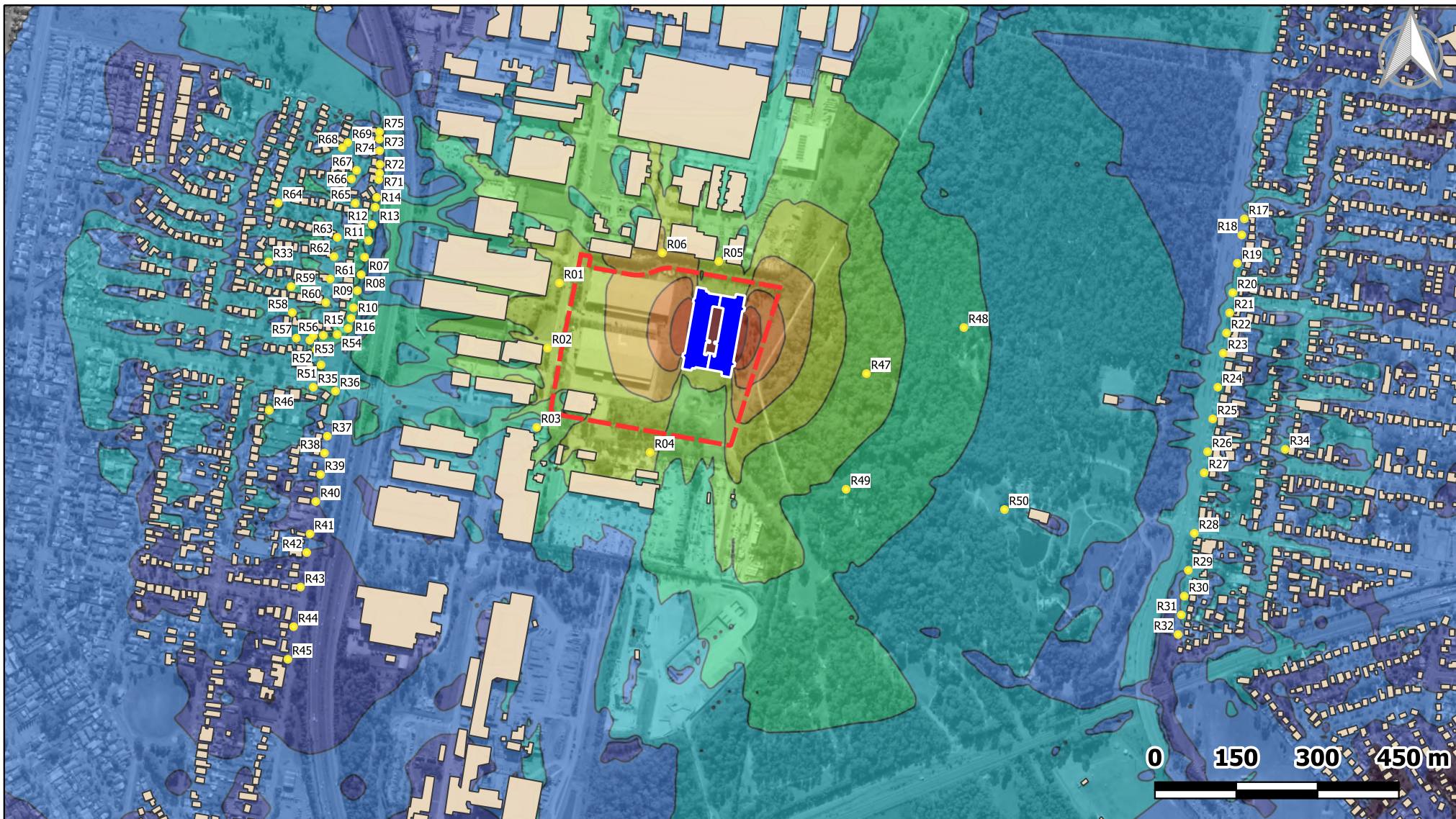


**$L_{Aeq,15min}$  noise levels, dB(A)**

	15 - 20		35 - 40		60 - 65
	20 - 25		40 - 45		65 - 70
	25 - 30		45 - 50		>70
	30 - 35		50 - 55		
			55 - 60		

**2 Glendenning Road, Glendenning Data Centre Campus SSDA 73761707**  
**Operational Scenario 02 Night**  
 $L_{Aeq,15 min}$  noise impacts  
 Contour Height 1.5 m

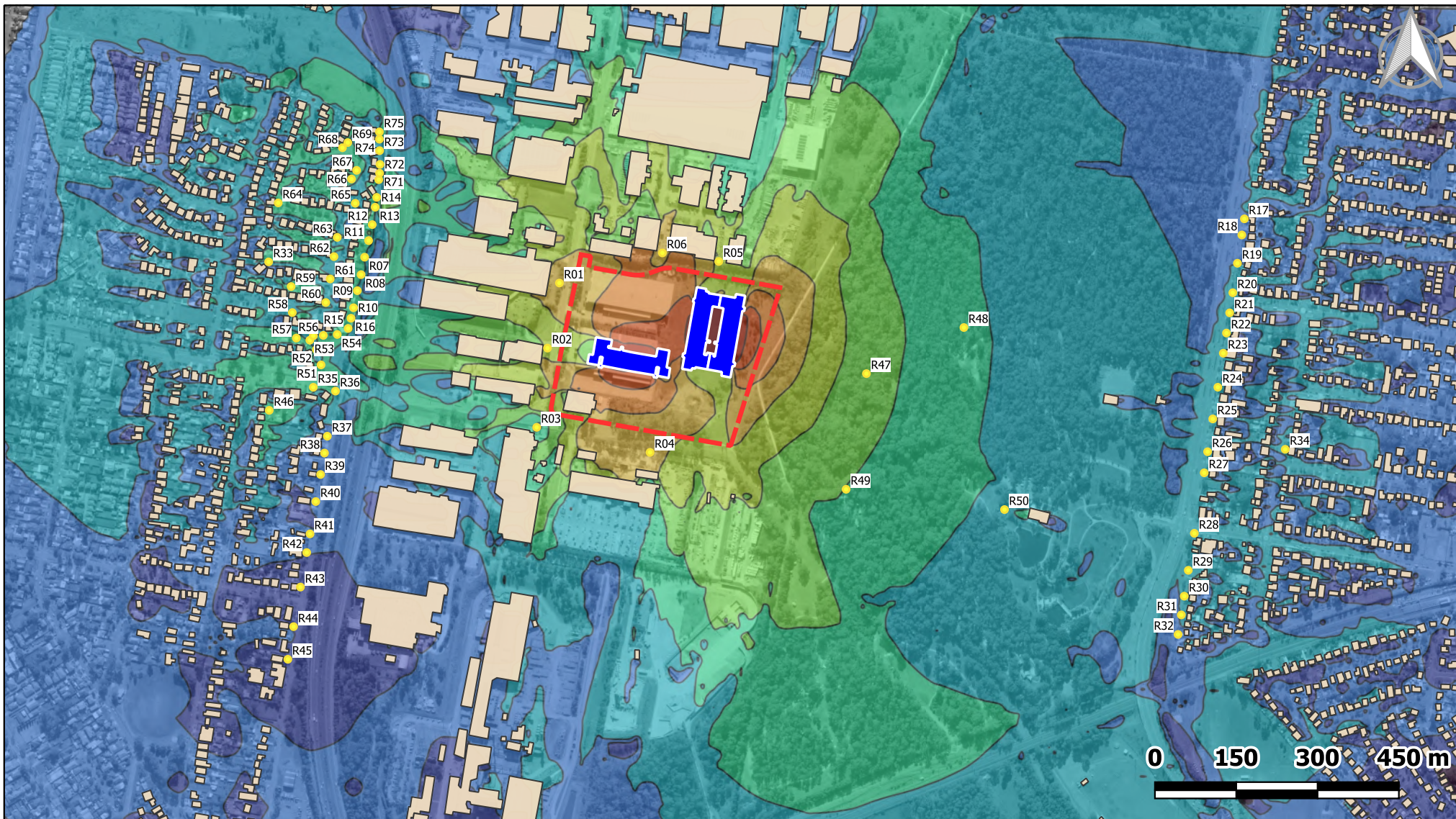




$L_{Aeq,15min}$ noise levels, dB(A)	
	15 - 20
	20 - 25
	25 - 30
	30 - 35
	35 - 40
	40 - 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	65 - 70
	>70

**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Operational Scenario 03 Night**  
 $L_{Aeq,15 min}$  noise impacts  
 Contour Height 1.5 m

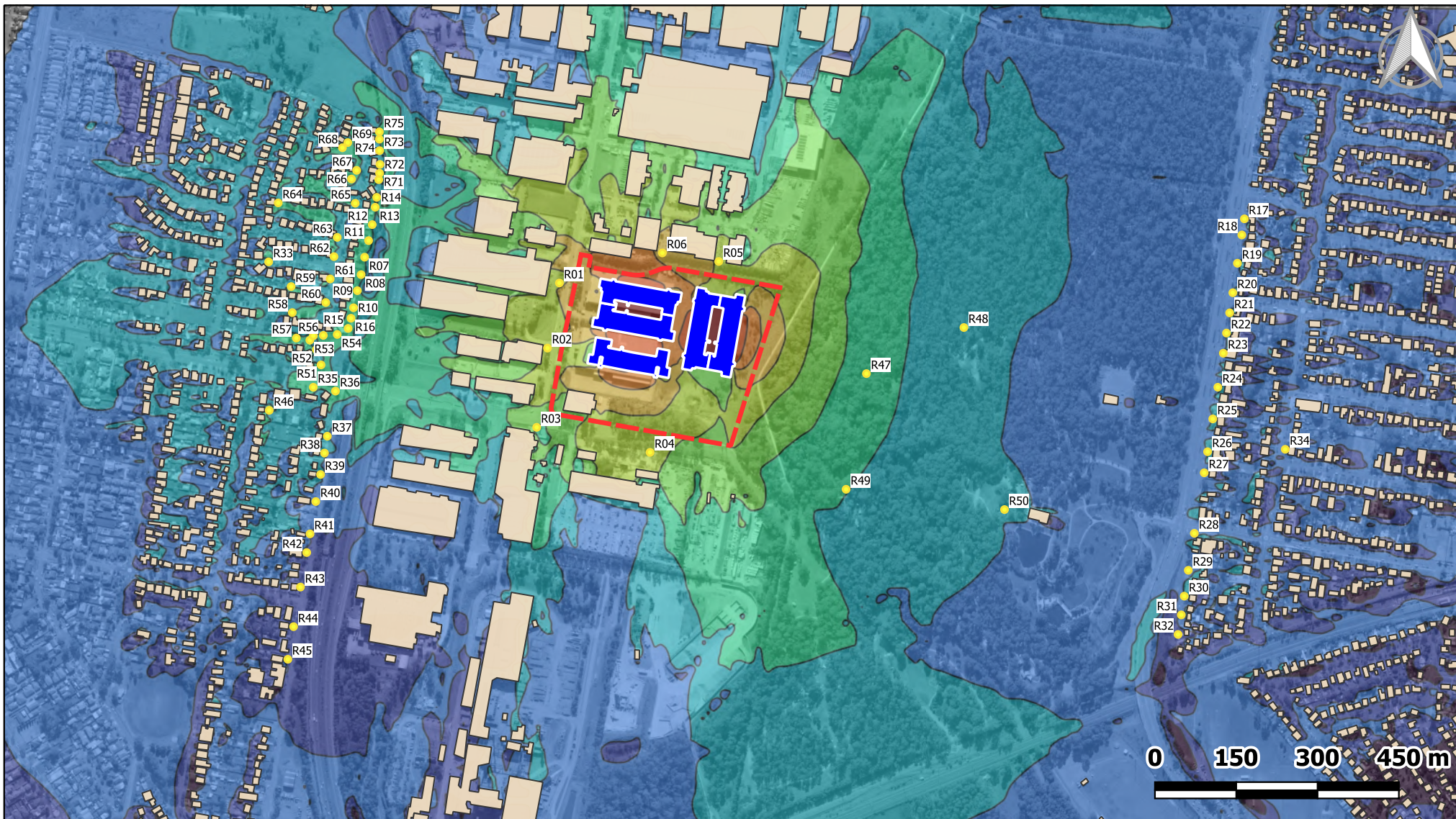




$L_{Aeq,15min}$ noise levels, dB(A)	
15 - 20	35 - 40
20 - 25	40 - 45
25 - 30	45 - 50
30 - 35	50 - 55
	55 - 60
	60 - 65
	65 - 70
	>70

**2 Glendenning Road, Glendenning Data**  
**Centre Campus SSDA 73761707**  
**Operational Scenario 04 Night**  
 $L_{Aeq,15 min}$  noise impacts  
 Contour Height 1.5 m

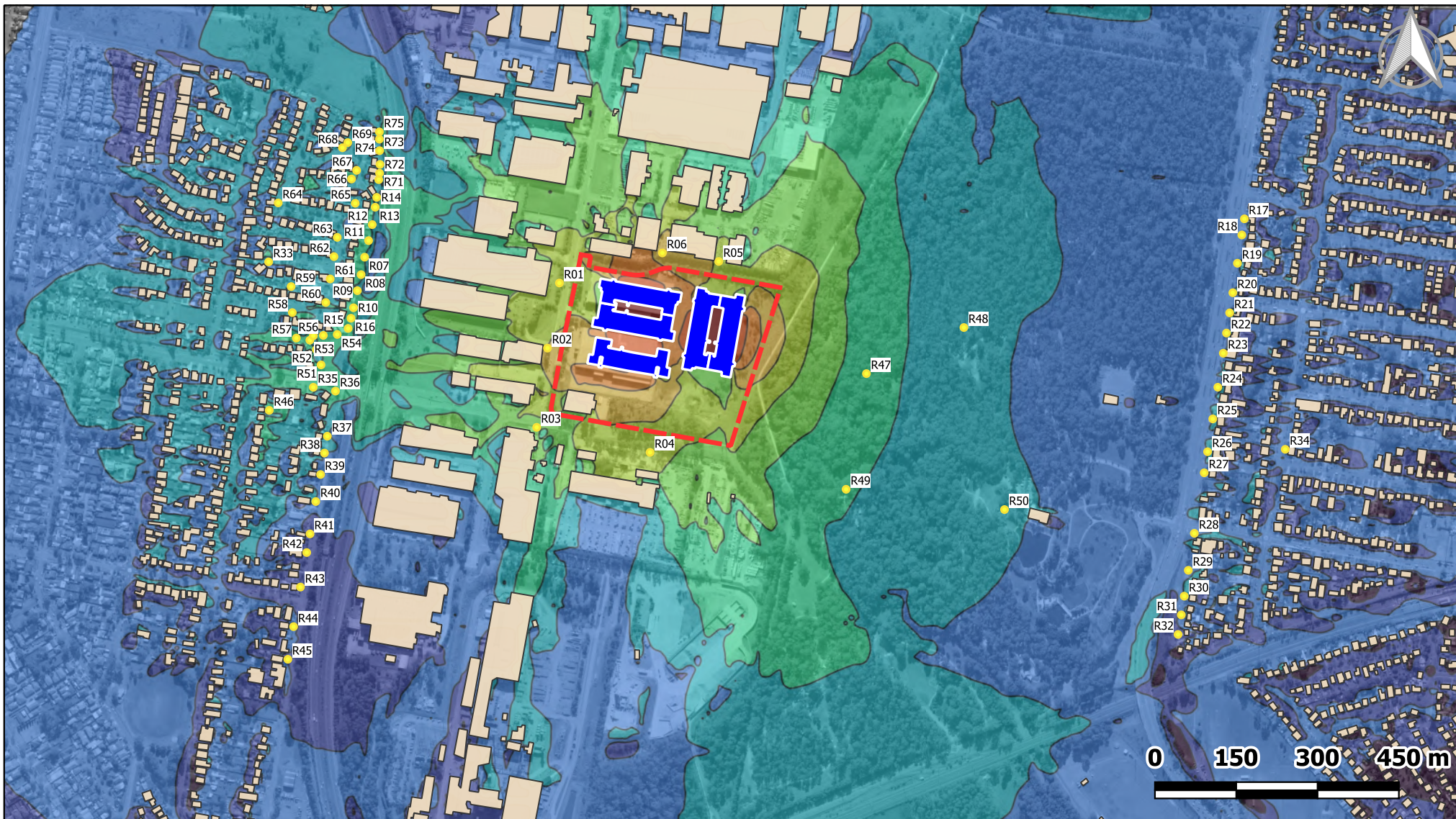




$L_{Aeq,15min}$ noise levels, dB(A)	
	20 - 25
	25 - 30
	30 - 35
	35 - 40
	40 - 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	65 - 70
	70 - 75
	>75

**2 Glendenning Road, Glendenning Data Centre Campus SSDA 73761707**  
**Operational Scenario 05 Evening**  
 $L_{Aeq,15 min}$  noise impacts  
 Contour Height 1.5 m

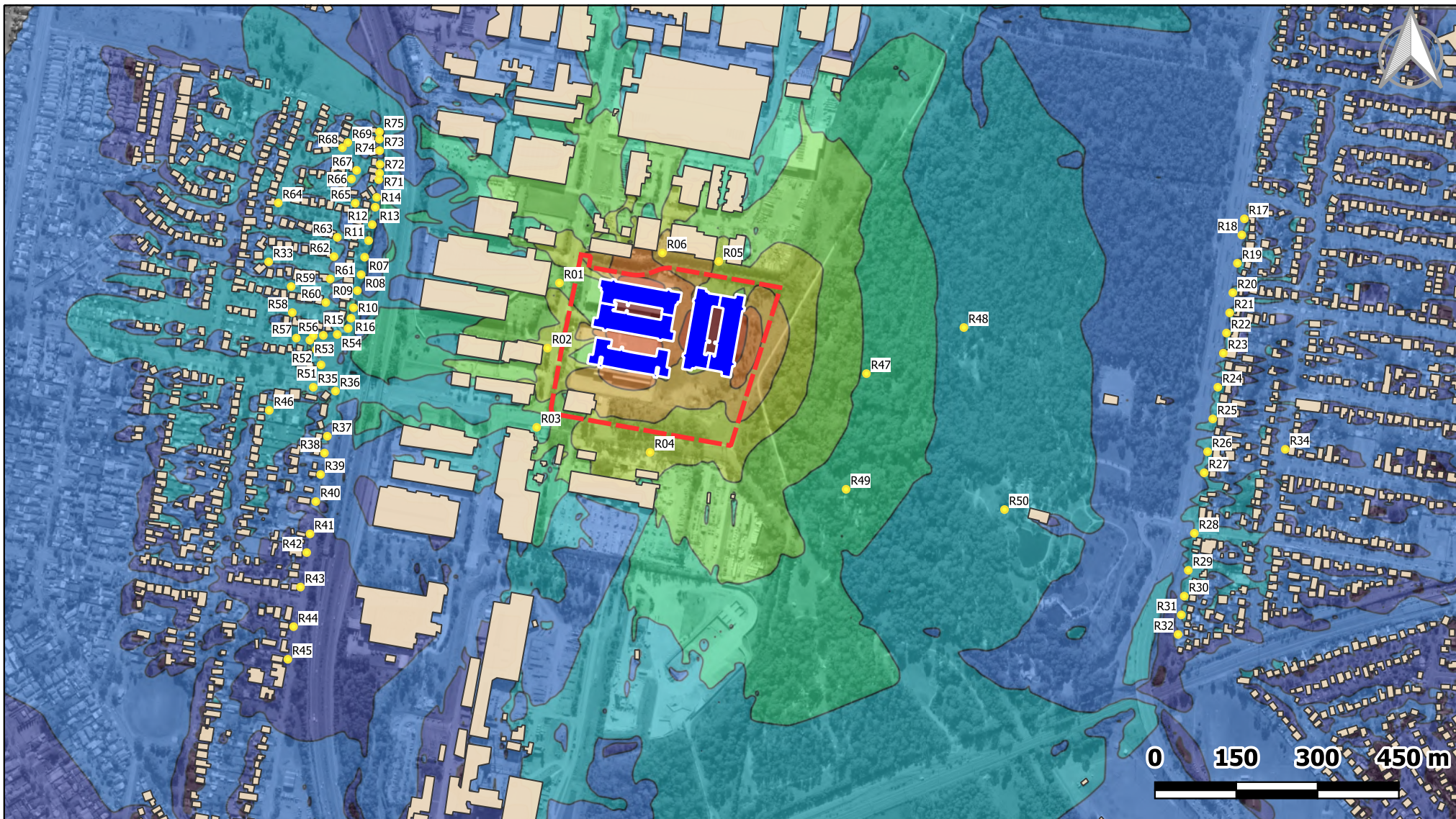




$L_{Aeq,15min}$ noise levels, dB(A)	
	20 - 25
	25 - 30
	30 - 35
	35 - 40
	40 - 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	65 - 70
	70 - 75
	>75

**2 Glendenning Road, Glendenning Data Centre Campus SSDA 73761707**  
**Operational Scenario 06 Evening**  
 $L_{Aeq,15 min}$  noise impacts  
 Contour Height 1.5 m

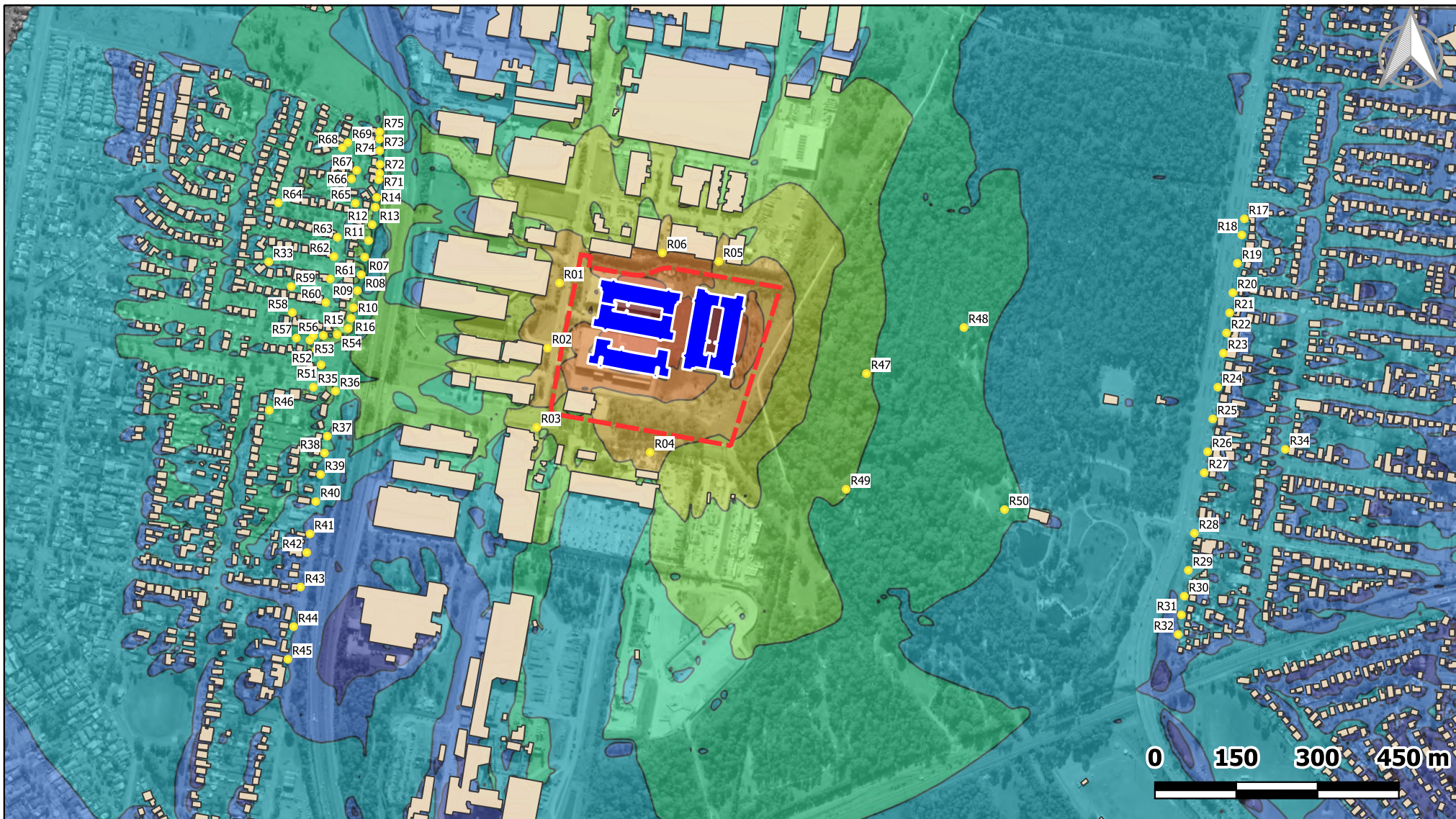




$L_{Aeq,15min}$ noise levels, dB(A)	
	20 - 25
	25 - 30
	30 - 35
	35 - 40
	40 - 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	65 - 70
	70 - 75
	>75

**2 Glendenning Road, Glendenning Data Centre Campus SSDA 73761707**  
**Operational Scenario 07 Evening**  
 $L_{Aeq,15 min}$  noise impacts  
 Contour Height 1.5 m





**L<sub>Aeq,15min</sub> noise levels, dB(A)**

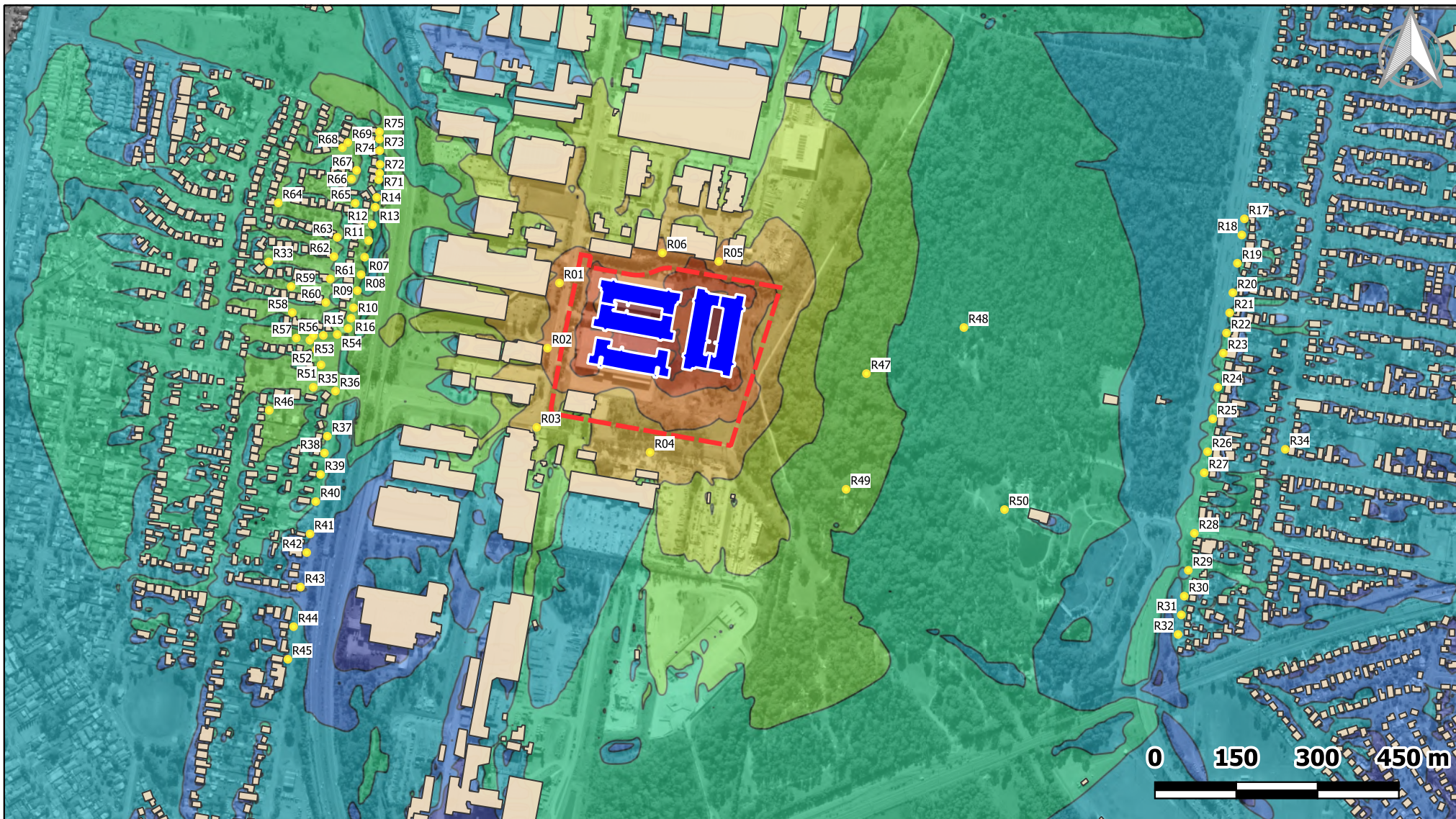
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 40

- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65

- 65 - 70
- 70 - 75
- >75

**2 Glendenning Road, Glendenning Data Centre Campus SSDA 73761707**  
**Operational Scenario 08 Day**  
**L<sub>Aeq,15 min</sub> noise impacts**  
**Contour Height 1.5 m**





$L_{Aeq,15min}$ noise levels, dB(A)	
	20 - 25
	25 - 30
	30 - 35
	35 - 40
	40 - 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	65 - 70
	70 - 75
	>75

**2 Glendenning Road, Glendenning Data Centre Campus SSSA 73761707**  
**Operational Scenario 09 Night**  
 $L_{Aeq,15 min}$  noise impacts  
 Contour Height 1.5 m





---

## **APPENDIX E: MECHANICAL EQUIPMENT SOUND POWER DATA**

**Client:**  
**Project:**  
**Title:**

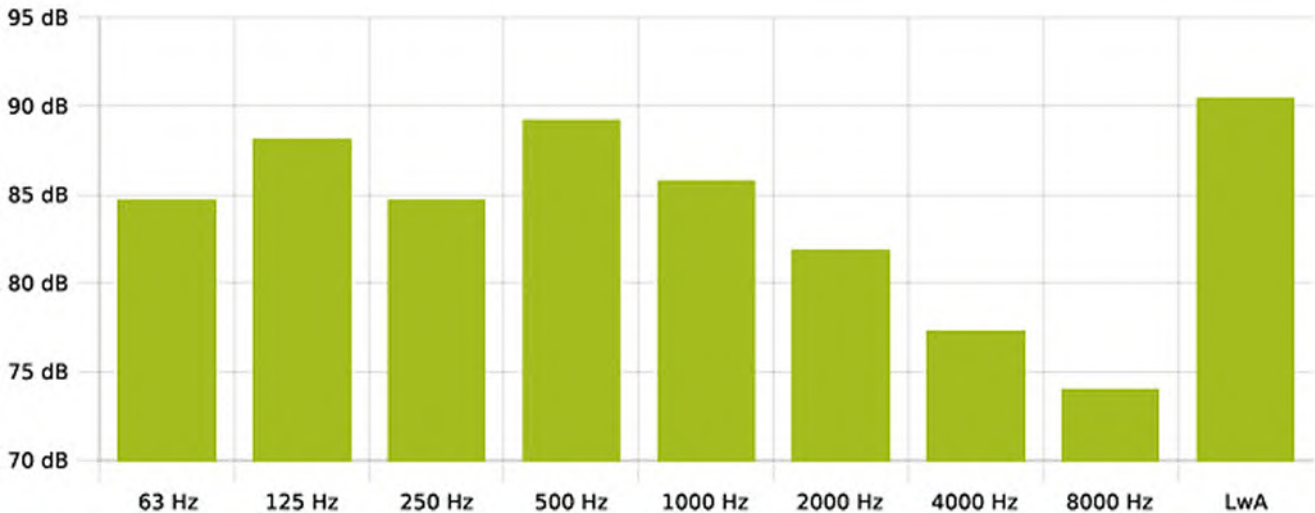
**AWS**  
**SYD067 Project**  
**Noise Details at AHU Connections**

**AHU 01**

**Fresh Air Inlet Connection**

Octave Band centre frequency (Hz)	63	125	250	500	1000	2000	4000	8000	
Supply Fan Intake S.W.L	92	92	89	84	81	78	74	79	See Fan Curve
Insertion Loss due to Merv 8 Filters	0	1	1	1	2	2	2	2	
Insertion Loss due to Merv 13 Filters	1	1	2	2	3	4	4	4	
Insertion Loss due to Evaporative Cooler	3	2	2	3	5	6	12	15	
S.W.L @ Fresh Air Connection	88	88	84	78	71	66	56	58	
Octave Band centre frequency (Hz)	63	125	250	500	1000	2000	4000	8000	
S.W.L @ Fresh Air Connection	88	88	84	78	71	66	56	58	
A Weighting	25	16	9	3	0	-1	-1	1	
Sound Power Level @ Fresh Air Connection (A Weighted)	63	72	75	75	71	67	57	57	
	73		78		72		60		
	79				72				
Sound Power Level @ Fresh Air Connection	80								dB(A)

## Outlet side - Exhaust Fan



	$q_v$	$p_{Es}$	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	LwA
	m <sup>3</sup> /h	Pa	dB	dB	dB	dB	dB	dB	dB	dB	dB(A)
●	159760	201	84.7	88.1	84.7	89.2	85.8	81.9	77.3	74	90.5



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## **APPENDIX F: ELECTRICAL EQUIPMENT SOUND POWER DATA**



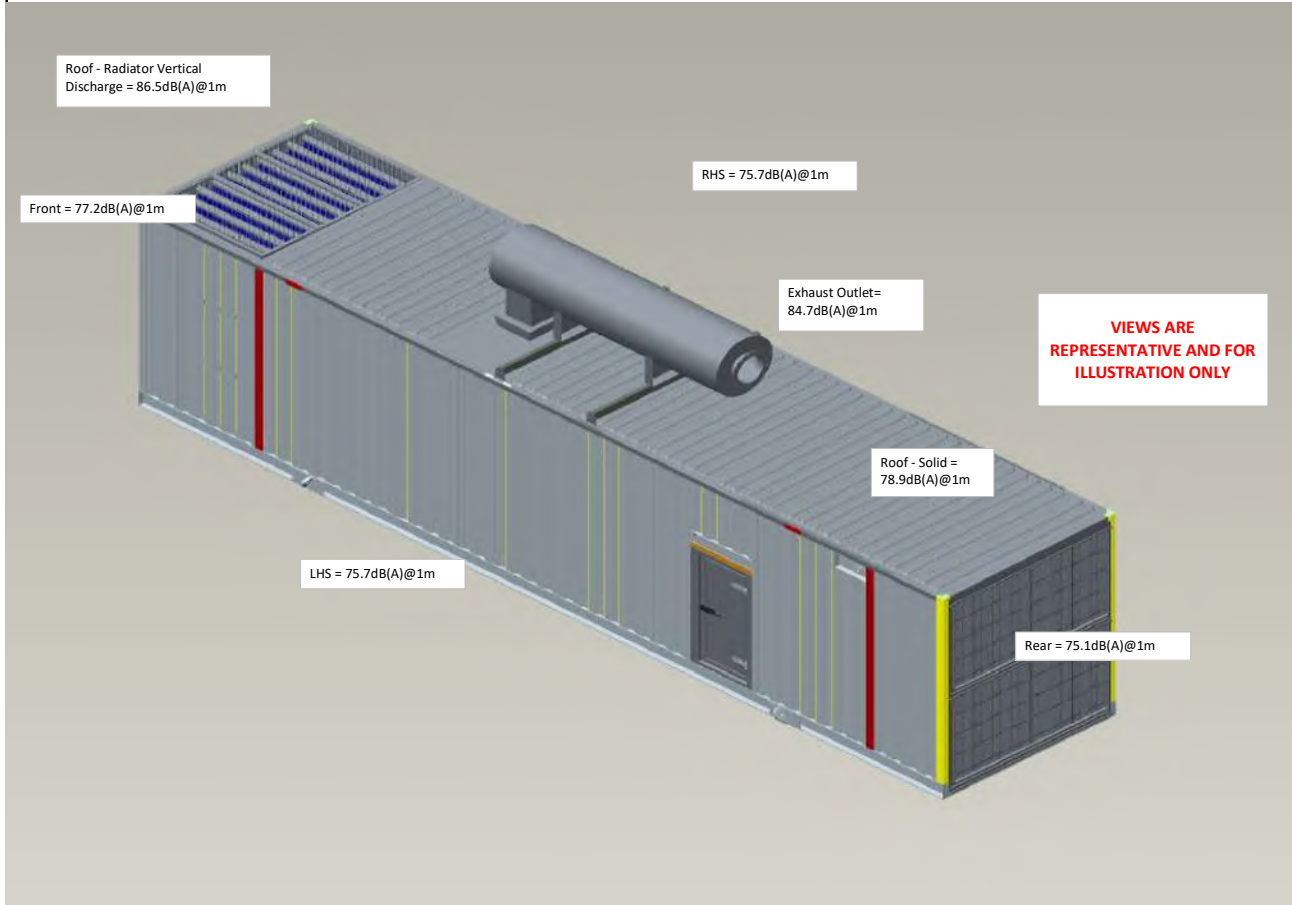
DESCRIPTION:

**75dBA @ 1m Container Attenuation - SWL Estimate (+/- 2 dB tolerance)  
Drawing 624-2429\_02**

WORKS ORDER NO:

**PROJECT#NI-10439**

Surface	SPL @ 1m (dBA) (+/- 2 dB)	Conformal Surface Area @ 1m				SWL (dBA) (+/- 2 dB)	SPL Octave Spectrum (Hz) - For reference (+/- 2 dB)								
		Radius	Width	Height	Area		63 dB(A)	125 dB(A)	250 dB(A)	500 dB(A)	1000 dB(A)	2000 dB(A)	4000 dB(A)	8000 dB(A)	
LHS	75.7	-	20.880	5.050	105.444	95.9	52.8	68.8	62.0	68.1	68.2	68.8	63.1	66.9	<b>75.7</b>
RHS	75.7	-	20.880	5.050	105.444	95.9	52.8	68.8	62.0	68.1	68.2	68.8	63.1	66.9	<b>75.7</b>
Front	77.2	-	5.800	5.050	29.290	91.9	60.5	68.8	68.8	68.8	70.3	71.4	65.4	60.6	<b>77.2</b>
Rear (intake)	75.1	-	5.800	5.050	29.290	89.8	64.5	74.5	57.6	48.8	47.9	48.1	46.8	56.2	<b>75.1</b>
Roof - Solid	78.9	-	5.800	17.280	100.224	98.9	59.4	73.8	70.3	70.0	70.8	70.8	65.7	66.9	<b>78.9</b>
Roof - Discharge	86.5	-	5.800	3.600	20.880	99.7	71.9	84.8	69.4	50.3	52.0	53.3	57.8	81.0	<b>86.5</b>
Exhaust Outlet	84.7	1	-	-	3.142	89.6	73.0	81.9	75.0	75.0	73.7	73.4	69.1	63.1	<b>84.7</b>
						<b>104.5</b>									



REVISION:	<b>A</b>	APPROVED BY:		DATE:	<b>30-Mar-22</b>
COMPILED BY:	<b>Gavin Lenaghan</b>			SHEET:	<b>1</b> OF <b>1</b>

## PACKAGE DATA [EM2118]

**JANUARY 15, 2023**

For Help Desk Phone Numbers [Click here](#)

<b>Feature Code:</b>	516DRS3	<b>Rating Type:</b>	STANDBY	<b>Sales model Package:</b>	
<b>Engine Sales Model:</b>		<b>Engine Arrangement Number:</b>	5272963	<b>Hertz:</b>	50
<b>EKW W/F:</b>	2800.0	<b>Noise Reduction:</b>	0 dBA	<b>Back Pressure:</b>	0.0 kPa

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### Engine Package Information

Engine Package Data

### Package Cooling Information

Data not available.

### Package Sound Information

Sound Comments :

### Open Exhaust Sound Data

Distance: 1 Meter

EKW W/F	% LOAD	OVERALL SOUND DB(A)	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
2800.0	100.0	121.7	119.3	122.5	116.6	117.8	114.7	105.3	91.1
2100.0	75.0	119.8	117.7	121.6	114.4	115.5	113.1	102.6	94.7
1400.0	50.0	118.6	115.7	121.2	113.9	114.2	111.6	100.3	92.2
700.0	25.0	115.0	113.2	117.1	111.0	110.3	107.1	96.5	92.2

Distance: 7 Meters

EKW W/F	% LOAD	OVERALL SOUND DB(A)	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
2800.0	100.0	104.8	102.4	105.6	99.7	100.9	97.8	88.4	74.2
2100.0	75.0	102.9	100.8	104.7	97.5	98.6	96.2	85.7	77.7
1400.0	50.0	101.7	98.8	104.3	97.0	97.3	94.7	83.4	75.3
700.0	25.0	98.1	96.3	100.2	94.1	93.4	90.2	79.6	75.3

Distance: 15 Meters

EKW W/F	% LOAD	OVERALL SOUND DB(A)	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
2800.0	100.0	98.2	95.8	99.0	93.1	94.3	91.2	81.8	67.6
2100.0	75.0	96.3	94.2	98.1	90.8	91.9	89.6	79.0	71.1
1400.0	50.0	95.1	92.1	97.7	90.4	90.6	88.1	76.7	68.7
700.0	25.0	91.5	89.7	93.6	87.5	86.8	83.6	73.0	68.7

### Open Mechanical Sound Data

Distance: 1 Meter

EKW W/F	% LOAD	OVERALL SOUND DB(A)	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
2800.0	100.0	110.9	104.6	104.9	104.2	105.5	104.1	101.5	97.0
2100.0	75.0	110.2	104.6	104.9	103.2	105.4	103.8	99.6	103.0
1400.0	50.0	108.6	104.0	104.5	102.1	103.8	102.6	98.2	96.7
700.0	25.0	106.0	104.4	103.9	101.6	101.0	99.5	95.1	90.1

Distance: 7 Meters

EKW W/F	% LOAD	OVERALL SOUND DB(A)	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
2800.0	100.0	101.2	98.7	95.7	95.1	95.8	94.3	90.7	86.2
2100.0	75.0	99.9	98.2	94.9	94.1	94.4	93.6	89.0	92.8
1400.0	50.0	98.5	97.7	94.7	93.2	93.2	92.4	87.8	86.4
700.0	25.0	96.1	97.6	93.6	93.0	90.7	89.3	85.1	79.5

Distance: 15 Meters

<b>EKW W/F</b>	<b>% LOAD</b>	<b>OVERALL SOUND DB(A)</b>	<b>OBCF 125HZ DB</b>	<b>OBCF 250HZ DB</b>	<b>OBCF 500HZ DB</b>	<b>OBCF 1000HZ DB</b>	<b>OBCF 2000HZ DB</b>	<b>OBCF 4000HZ DB</b>	<b>OBCF 8000HZ DB</b>
2800.0	100.0	96.1	94.9	91.1	89.9	90.7	89.3	85.9	81.5
2100.0	75.0	95.2	93.7	91.3	89.6	89.6	88.6	84.1	88.3
1400.0	50.0	93.6	93.1	90.6	88.7	88.4	87.4	82.7	81.7
700.0	25.0	91.6	92.7	90.3	88.8	85.7	84.7	80.6	75.5

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Caterpillar Confidential: **Green**

Content Owner: Commercial Processes Division

Web Master(s): [PSG Web Based Systems Support](#)

Current Date: 1/16/2023, 10:55:22 AM

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[Data Privacy Statement](#).

# 8200-3000-SIG S.no 42259 & 42260 Sound test @ 1m

Start: 2018-11-23 09:35:30

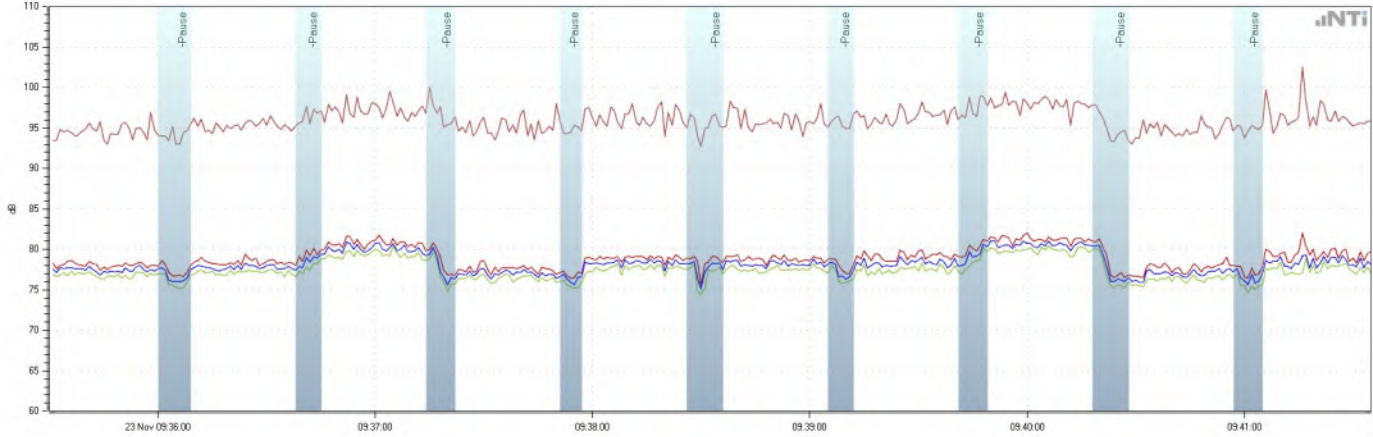
End: 2018-11-23 09:41:35

Representative test on similar load bank (40483) fitted with the same type of fan units.

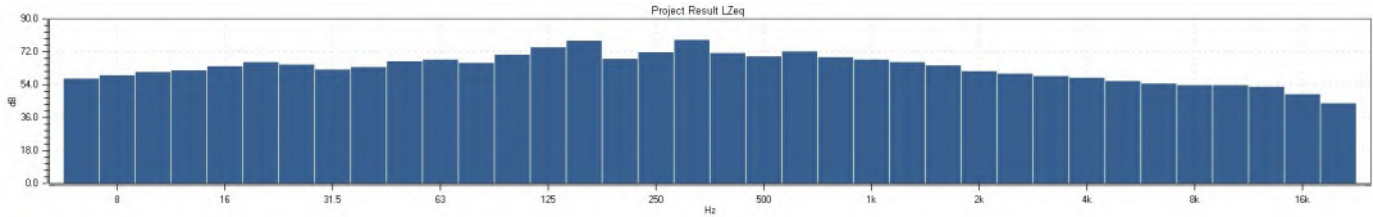
Test conducted 23rd November 2018

Ambient noise measured at 49dB(A)

Readings measured at 10 Points around the load bank at a distance of 1 metre.



— LAFeq\_dt    — LAFmax\_dt    — LAFmin\_dt    — LCPKmax\_dt



## Results

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	LAFmin [dB]	LCPKmax [dB]
<b>Recorded</b>	<b>2018-11-23 09:35:30</b>	<b>00:06:05</b>	<b>78.3</b>	<b>82.0</b>	<b>74.4</b>	<b>102.5</b>
<b>-Pause (9)</b>		<b>00:01:13</b>	<b>77.7</b>	<b>81.3</b>	<b>74.4</b>	<b>100.0</b>
<b>Project Result</b>		<b>00:04:52</b>	<b>78.5</b>	<b>82.0</b>	<b>75.3</b>	<b>102.5</b>

Average measurement of load bank noise = 78.5 dB(A)

# 8200-3000-SIG S.no 42259 & 42260 Sound test @ 3m

Start: 2018-11-23 09:50:04

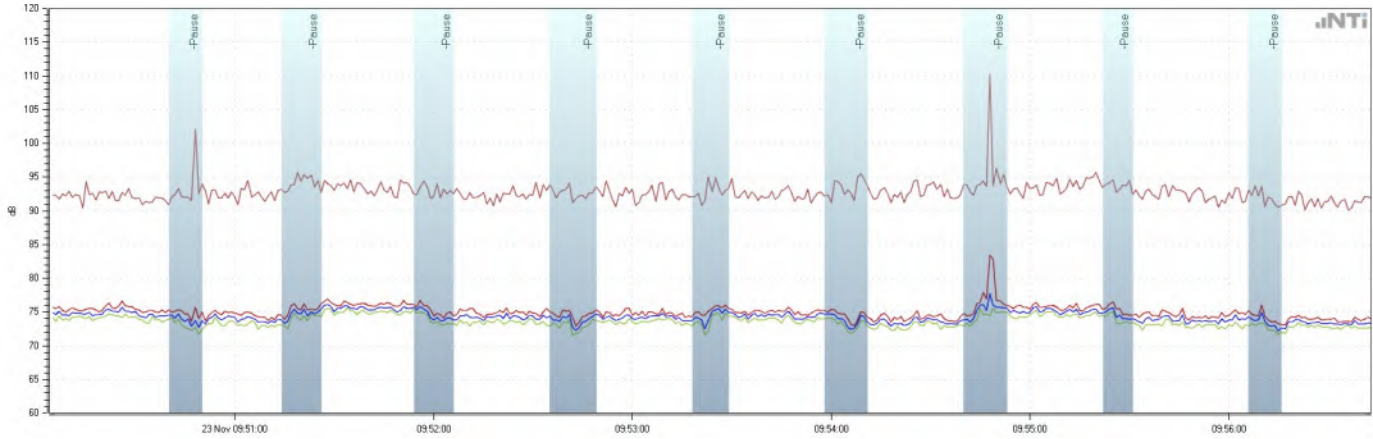
End: 2018-11-23 09:56:43

Representative test on similar load bank (40483) fitted with the same type of fan units.

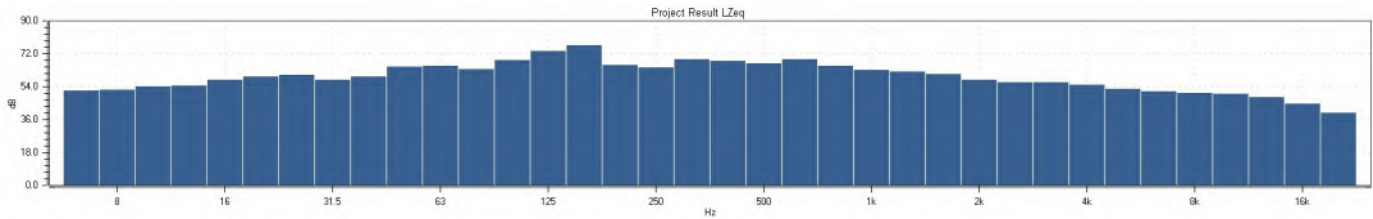
Test conducted 23rd November 2018

Ambient noise measured at 49dB(A)

Readings measured at 10 Points around the load bank at a distance of 3 metres.



— LAeq\_dt      — LAFmax\_dt      — LAFmin\_dt      — LCPKmax\_dt



## Results

Type	Start	Duration	LAeq [dB]	LAFmax [dB]	LAFmin [dB]	LCPKmax [dB]
<b>Recorded</b>	<b>2018-11-23 09:50:04</b>	<b>00:06:39</b>	<b>74.4</b>	<b>83.4</b>	<b>71.5</b>	<b>110.3</b>
<b>-Pause (9)</b>		<b>00:01:44</b>	<b>74.4</b>	<b>83.4</b>	<b>71.5</b>	<b>110.3</b>
<b>Project Result</b>		<b>00:04:55</b>	<b>74.3</b>	<b>76.9</b>	<b>71.8</b>	<b>95.7</b>

Average measurement of load bank noise = 74.3 dB(A)