CONSTRUCTION NOISE AND VIBRATION IMPACT ASSESSMENT

Marsden Park Data Centre Campus

Marsden Park NSW 2765

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PREPARED FOR
CDC Data Centre
17 Roberts Rd,
Eastern Creek NSW 2766

Construction Noise and Vibration Impact Assessment

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Executive Summary

Northrop Consulting Engineers (Northrop Acoustics) has been engaged by CDC Data Centre to provide a Construction Noise and Vibration Impact Assessment (CNVIA) for the proposed Marsden Park Data Centre Campus located at 105 – 113 Hollinsworth Road, Marsden Park NSW 2765 (the Project). This acoustic report will form part of the State Significant Development Application (SSDA) documents to be submitted to the Department of Planning, Housing and Infrastructure (DPHI).

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the Project (SSD- 70889211). Long term unattended noise monitoring was undertaken by Stantec (ref: 301351444 dated 25 September 2024) to determine the existing ambient noise levels at the affected residential receivers surrounding the Project.

The construction noise and vibration concerns associated with the development have been addressed and summarised below.

Construction Noise

In accordance with the NSW Department of Environment and Climate Change's document *Interim Construction Noise Guideline* (2009), the Noise Management Levels (NMLs) were determined to assess the noise impacts associated with the construction of the Project.

The noise emissions from construction works were predicted using a 3D noise modelling software (CadnaA). The predicted construction noise levels showed exceedances above the NMLs at the nearest affected receivers. Therefore, reasonable and feasible mitigation measures are proposed in Section 4.6 to reduce noise to acceptable levels.

Construction Vibration

For vibration intensive works, minimum working distances were established Table 18 to minimise the potential for cosmetic damages on nearby buildings.

Road Traffic Generated by the Construction of the Project

The noise associated with the traffic generated by the construction of the Project travelling on public roads was assessed under the EPA's *Road Noise Policy (RNP)*. The Traffic Impact Assessment prepared by Stantec (ref:301351444 dated 18 September 2024) provided the existing traffic volumes and the predicted traffic volumes associated with the construction of the Project. The traffic volumes were used to predict the existing and future construction road noise levels at the nearest affected receivers. The noise prediction indicated that the predicted existing and future construction traffic noise levels were under the RNP criteria, therefore no further mitigation measures were proposed.

Conclusion

Provided the recommendations are implemented, the Project is expected to comply with the relevant noise and vibration criteria

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1. Introduction

Northrop Consulting Engineers (Northrop) has been engaged by CDC Data Centre to provide a Construction Noise and Vibration Impact Assessment (CNVIA) for the proposed Marsden Park Data Centre Campus located at 105 – 113 Hollinsworth Road, Marsden Park NSW 2765 (the Project). This acoustic report will form part of the State Significant Development Application (SSDA) documents to be submitted to the Department of Planning, Housing and Infrastructure (DPHI).

The report has assessed the noise impacts associated with the Project as outlined in Section 1.1. As part of the assessment, unattended long term noise measurements were conducted by Stantec within their operational noise impact assessment (ref: 301351444 dated 25 September 2024). Attended measurements were carried out to characterise the ambient noise levels at the noise monitoring locations.

Provided our recommendations are implemented, the Project is predicted to comply with the acoustic requirements of Blacktown City Council, NSW Department of Environment, Climate Change and Water's *Interim Construction Noise Guideline* (ICNG) and other relevant Australian standards and guidelines.

1.1 Acoustic Considerations

Table 1 details the acoustic considerations that were taken into account for the assessment of the Project.

Table 1: Acoustic considerations

Acoustic Consideration	Comments
Construction noise and vibration assessment	Noise emissions from the construction has been assessed in accordance with the NSW Department of Environment, Climate Change and Water *Interim Construction Noise Guideline* (ICNG). The vibration criteria were based on DIN4150-3 and NSW Department of Environment and Conservation *Assessing Vibration a Technical Guideline (AVaTG)*.
Generated traffic noise assessment	The noise associated with the generated traffic associated with the Project have been based on the Transport Impact Report provided by Stantec (ref:301351444 dated 18/09/2024). Section 5 covers the assessment, where the results are compared with the criteria provided by the Department of Environment, Climate Change and Water's Road Noise Policy (RNP).

1.2 Referenced Documents

This assessment has been prepared considering the following documentation:

1.2.1 Project Documents:

- Architectural drawings provided by EJE Architecture dated 21/08/2024 (see Appendix A)
- Planning Secretary's Environmental Assessment Requirements (SEARs) dated 11/06/2024 (ref: SSD-70889211)
- Transport Impact Assessment provided by Stantec dated 18/09/2024 (ref:301351444)
- Operational Noise Impact Assessment (ONIA) by Stantec (ref: 301351444 dated 25 September 2024)

1.2.2 Consent Authority, Design Guidelines and Standards:

- Blacktown City Council Development Control Plan, 2015 (DCP)
- Schedule 3: Marsden Park Industrial Precinct, 2011
- NSW Environmental Protection Authority (EPA) *Noise Policy for Industry*, 2017 (NPfI)
- NSW Department of Environment, Climate Change and Water, *Interim Construction Noise Guideline*, 2009 (ICNG)
- NSW Government Department of Environment, Climate Change and Water *Road Noise Policy,* 2011 (RNP)
- German Standard DIN4150-3 2016 '*Structural vibration: Effects of vibration on structures'* (DIN 4150)
- Australian Standard AS2436:2010 *Guide to noise and vibration control on construction, demolition and maintenance sites*
- Department of Environment and Conservation *Assessing Vibration: A Technical Guideline*, 2006 (AVaTG);
- TfNSW, *Construction Noise and Vibration Guideline*, 2023 (CNVG);
- UK Department for Environment Food and Rural Affairs, *Update of Noise Data Base for the Prediction of Noise on Construction Sites*, 2005 (DEFRA Database);

1.2.3 SEARs Requirements

The acoustic requirements from the SEARs provided by DPHI are reproduced below.

Noise and Vibration *– a quantitative noise and vibration impact assessment undertaken by a suitably qualified acoustic consultant in accordance with the relevant Environment Protection Authority guidelines and Australian Standards which includes:*

- *identification of impacts associated with construction, site emission and traffic generation at noise affected sensitive receivers, including the provision of operational noise contours and a detailed sleep disturbance assessment*
- *details of noise monitoring survey, background noise levels and amenity noise levels at the most-affected residential receivers*
- *details of manufacturer specifications for plant and equipment and noise source inventory (demonstrating worst-case modelling of plant and equipment)*
- *an assessment of 'worst case' noise emission scenarios (including testing of any back-up power system and critical power failure scenario)*
- *if operation of the development is staged, an assessment of each stage in isolation to accurately represent the predicted noise impacts of each stage*
- *consideration of annoying characteristics of noise and prevailing meteorological conditions in the study area*
- *details and analysis of the effectiveness of proposed management and mitigation measures to adequately manage identified impacts, including a clear identification of residual noise and*

vibration impacts following application of these mitigation measures and details of any proposed compliance monitoring programs.

2. Project and Site Description

2.1 Project Understanding

The SSDA seeks approval for the construction and operation of a data centre campus with an operational capacity of 504 megawatts (MW), comprising six (6) four (4) storey data centre buildings, ancillary office space, generators, substation, diesel storage, hardstand and landscaping. The facility will operate 24 hours a day, 7 days a week. In summary, approval for the following is sought:

- Minor site preparation works and the installation of services to enable the construction of the data centre campus;
- Staged construction of six (6) x four (4) storey data centre buildings, each containing: 12 data halls, 12 battery rooms, 40 generators (20 double stacked), loading docks, ancillary office space and associated mechanical, electrical and water infrastructure;
- The proposed development will have a typical height of 35m above ground and a maximum height of 37.515m;
- Construction of 12 two-storey skybridges linking the data centres;
- Provision for a dedicated 720MVA substation at the northern boundary with direct access to Hollinsworth Road, to serve the data centre campus in its entirety, subject to future detailed design;
- Construction of an internal road network to enable vehicular circulation around the campus, loading areas and on-site car parking;
- Removal of four (4) trees to facilitate the creation of Asset Protection Zones;
- Landscaping works, including the retention of a landscaped buffer along the southern and eastern boundary of the site and the introduction of a landscaped buffer along the northern and western boundaries of the site; and
- Construction of a 3m high security fence along the perimeter of the site.

2.2 Site Description

The site is located at 105 – 113 Hollinsworth Road, Marsden Park NSW 2765 and has residential receivers to the south and north west. Industrial buildings are located directly west and north of the Project. Additionally, a commercial building and a place of worship is located to the east of the Project.

As per Local Environmental Plan 2015 by Blacktown city council, the site is located within an IN2 – Light Industrial zone. It is bounded by IN1 – General Industrial zones at the northwest boundary and IN2- Light Industrial zones at the north and west boundaries. East of the site is a B5 – Business Zone. South of the site is R2 – Low Density Residential. Figure 2 illustrates the land zoning of the Project and its surroundings.

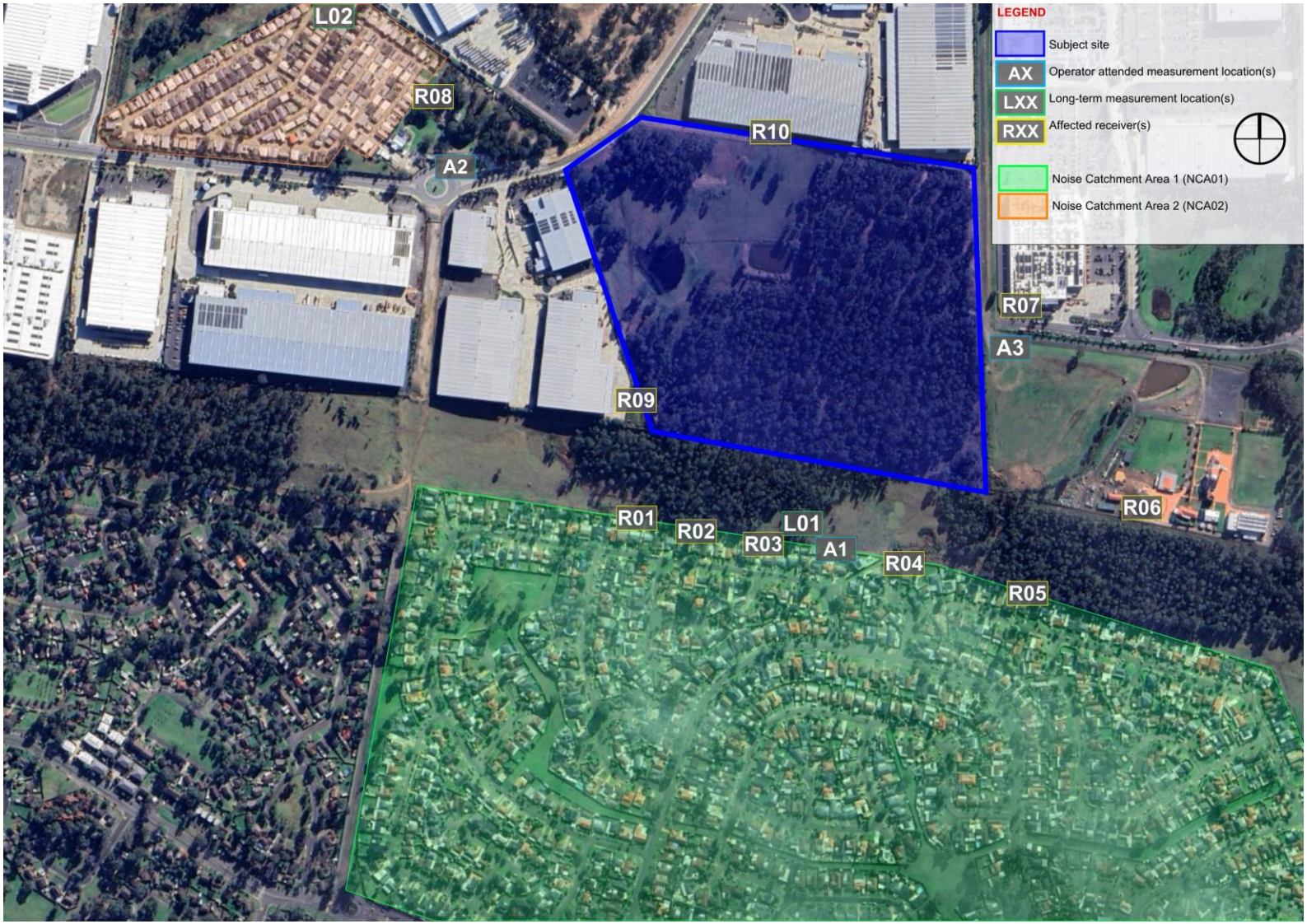

Figure 1: Aerial view of Project with nearest affected receivers (source: Sixmaps)

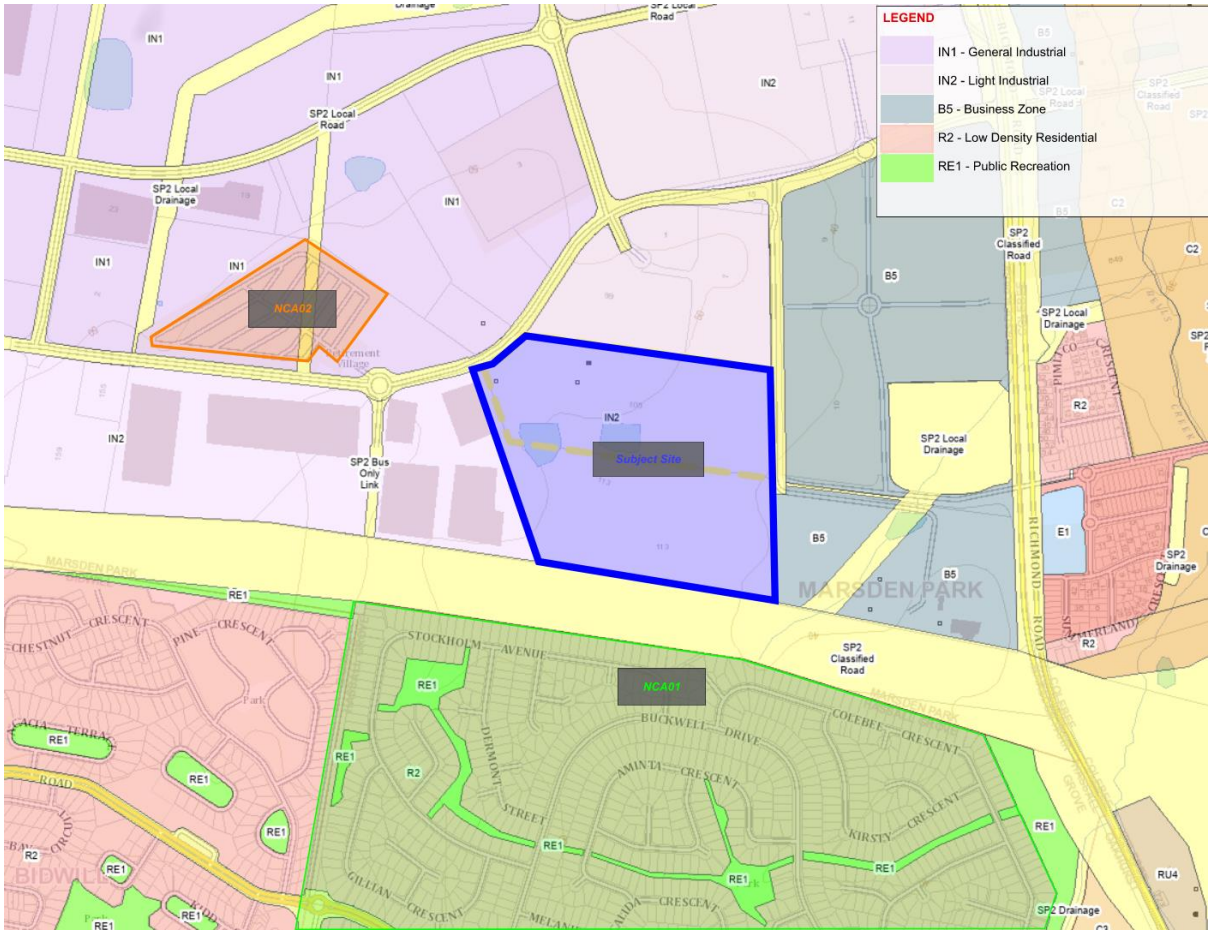

Figure 2: Land zoning map of Project and its surroundings

2.3 Noise Catchment Areas

A noise catchment area is used to group receivers within a similar noise environment. Two residential catchment areas were identified closest to the Project were identified. Table 2 outlines each of the noise catchment areas.

Table 2: Noise Catchment Areas

Noise Catchment Area (NCA)	Description
NCA01	Residential dwellings located south of the Project. Background noise dominated by distant traffic noise from Richmond Road, with ambient bird noise. During the evening and night, insect/ frog noise can be heard within the NCA.
NCA02	Residential dwellings within the Ingenia Lifestyle retirement community located northwest of the Project. Ambient noise consisting of industrial noise from nearby warehouses and road traffic noise from Hollinsworth Road. During the evening and night, the ambient noise is dominated by bird and tree rustling noise.

2.4 Sensitive Receivers

The nearest representative receivers which have potential of being impacted by noise associated with the Project are summarised in Table 3.

The residential receivers to the east are significantly far from the development and are heavily impacted by traffic noise from Richmond Road. It is anticipated that noise compliance at the closer receivers would also result in compliance at the further eastern residential receivers and therefore have not been considered further.

Table 3: Identified affected receivers

NCA	Receiver ID	Address	Land use	Description
NCA01	R01	99 Stockholm Avenue, Hassall Grove	Residential	Single storey residential building
	R02	105 Stockholm Avenue, Hassall Grove	Residential	Single storey residential building
	R03	117 Stockholm Avenue, Hassall Grove	Residential	Double storey residential building
	R04	6 Helga Place, Hassall Grove	Residential	Double storey residential building
	R05	21 Colebee Crescent, Hassall Grove	Residential	Double storey residential building
-	R06	45 Hollinsworth Road, Marsden Park	Place of worship	Baitul Huda Mosque
-	R07	10 Langford Drive, Marsden Park	Commercial	Costco Wholesale Marsden Park
NCA02	R08	10 Canary Street, Marsden Park	Residential	Ingenia Lifestyle – Stoney Creek Single storey retirement dwelling
-	R09	Lot 23 of DP262886	Industrial	Industrial estate
-	R10	Lot 1 of DP1214328	Industrial	Industrial estate

3. Existing Environment

A site survey was undertaken as part of the noise assessment, where the existing noise levels were determined. The survey included long term unattended noise monitoring and operator attended noise measurements.

The results of the survey are summarised in the following sections.

3.1 Long Term Noise Monitoring

Long term unattended noise monitoring was conducted by Stantec as detailed in the ONIA (ref: 301351444 dated 25 September 2024). The noise monitoring was undertaken between 23rd July 2024 to 30th July 2024. Details of the noise monitoring locations are summarised in Table 4.

Table 4: Noise monitoring locations

Logger ID	Installation period	Equipment used	Representative NCA	Installation location description
L01	23/07/2024 to 30/07/2024	ARL NL-42X, (serial number: 01173759)	NCA01	The logger was installed on the back of the residential properties within the grassed open area as shown in Figure 1
L02	23/07/2024 to 30/07/2024	ARL NL-42X, (serial number: 00184110)	NCA02	The logger was installed on the back side of the retirement village in the empty land as shown in Figure 1

The measured ambient (L_{eq}) and RBLs (L_{90}) are presented in Table 5. A graphical representation of the data can be found in Appendix C of the ONIA report by Stantec.

Table 5: Long term noise monitoring results

Location	Rating Background Level (RBL) – L_{90} dBA			Ambient noise levels – L_{eq} dBA		
	Day	Evening	Night	Day	Evening	Night
L01	41	38	34	51	45	43
L02	42	43	39	52	48	46

1. Time periods defined as: Day 7am to 6pm; Evening 6pm to 10pm; Night 10pm to 7am

3.2 Operator Attended Noise Measurements

Attended noise monitoring was undertaken by Stantec as detailed in Section 3.3 of the ONIA. The results from the attended noise survey are reproduced in Table 6 below.

Table 6: Attended noise measurements

Measurement location[1]	Measurement time	$L_{eq,15min}$ dBA	$L_{90,15min}$ dBA	Comments
A1	31/07/2024 10:10 am	50	46	Local Noise environment is characterised by Wildlife noises (birds and dogs occasionally barking). Trees rustling. Distant Traffic hum from Richmond Road can be heard.
A2	31/07/2024 10:58am	65	50	Local Noise environment is characterised by industrial hum from industrial developments in the surrounding area. Intermittent vehicle pass-bys on Hollinsworth with high percentage of heavy vehicles
A3	31/07/2024 11:28am	54	50	Local Noise environment is characterised by wildlife noise (Birds). High Traffic is audible along Richmond Road. Occasional distant activities are audible within Costco Loading Dock (pallet movements, loading and unloading, etc.)

1. Measurement location shown in Figure 1

3.3 Meteorological Environment

3.3.1 Wind

The effects of wind on noise propagation are important to be considered if it is known that wind is a feature of the area within a site and its surrounding receivers. As per Fact Sheet D of the NPfI, when the wind in the area reaches speeds up to 3 m/s for more than 30% of the time, noise enhancing-weather conditions will need to be considered in the assessment.

For this assessment, 5 years worth of wind data were taken from a nearby BOM weather station within 30km (Horsley Park), where it was found that winds that blew in the north west direction were found to be prevalent and was considered in the noise emission assessment.

3.3.2 Temperature Inversions

Temperature inversions, when they occur, have the ability to increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night period during the winter months. This occurs throughout the night and early morning. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night-time during winter, or about two nights per week.

Temperature inversions occur during E, F and G stability categories. These three categories are considered to represent weak, moderate and strong inversions respectively. For noise assessment purposes, only moderate and strong inversions are considered significant enough to require assessment.

However, for a more conservative assessment, the modelling was assumed that temperature inversions are consistently present in the area during the night period. Additionally, wind speeds at night were assumed to be 2 m/s when temperature inversion occurs. Temperature inversion are classified under Class F stability conditions as per Table D1 of the NPfI (2017).

4. Construction Noise and Vibration

4.1 Construction Proposal

The construction works are proposed to occur anywhere within the site boundary.

The works are proposed to be undertaken in stages with the following durations:

- Stage 1 – MP1.S2 & MP4: 1.5 years
- Stage 2 – MP5 then MP2: 1.5 years
- Stage 3 – MP6 then MP3: 2 years

For modelling purposes, three separate construction scenarios were assessed for each stage and are detailed in Table 7.

Table 7: Construction modelling scenarios

Scenario ID	Construction activity
SC01	Early works
SC02	Excavation and piling
SC03	Structural works

4.1.1 Construction Hours

The proposed hours of construction are specified below:

- Monday to Friday 7am to 6pm
- Saturday 8am to 1pm
- No work on Sundays or public holidays

4.2 Construction Noise Objectives

Construction noise can adversely affect sleep, concentration, learning performance and mental and physical health. Therefore, it is critical to feasible and reasonably minimise construction noise impacts.

In NSW, the construction noise is usually assessed using the NSW ICNG.

Blacktown City Council does not provide a guideline for noise from construction works, hence the NSW ICNG has been adopted to provide a quantitative guideline.

The NSW ICNG specifically focuses on applying a range of work practices most suited to minimise construction noise impacts. The ICNG provides Noise Management Levels (NMLs) as a benchmark for assessing construction noise emissions. The NMLs for residential receivers are presented in Table 8.

Table 8: ICNG Noise Management Level (residential receivers)

Time of day	Management Level – $L_{eq,15min}$ dBA	How to apply
Recommended Hours:	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise.

7am to 5pm, Mondays to Fridays inclusive; and 8am to 1pm, Saturdays.		Where the predicted or measured $L_{Aeq\ (15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration as well as contact details.
No work may be carried out on Sundays or public holidays	Highly noise affected (HNA) 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining, regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 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) If the community is prepared to accept longer period of construction in exchange for restrictions on construction times.
Outside recommended hours	Noise affected RBL + 5 dB	A strong justification would typically be required for work outside the recommended hours The proponent should apply all feasible and reasonable work practices to meet the noise affected level Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community For guidance on negotiating agreements see Section 7.2.2 (NSW Interim Construction Noise Guideline)

Table 9 presents the site specific NMLs for the nearby residential receivers.

Table 9: Construction Noise Management Levels at residential receivers

Receivers	Measured RBL, L_{90} dBA			NML, $L_{eq,15min}$ dBA	
	Day	Evening	Night	Day (SH)[1]	Day (OOWH)[2]
R01	41	38	34	51	46
R02	41	38	34	51	46
R03	41	38	34	51	46
R04	41	38	34	51	46

R05	41	38	34	51	46
R08	42	43	39	52	47

1. Standard Hours. Recommended hours of constriction, 7am to 5pm Monday to Friday, 8am to 1pm Saturday
2. Outside of work hours (OOWH)

The NMLs for other sensitive land uses surrounding the Project are provided in Table 10.

Table 10: Construction Noise Management Levels for other sensitive land uses

Land use	NML, $L_{eq,15min}$ dBA[1]
Places of worship	55 (external)[2]
Commercial	70 (external)
Industrial	75 (external)

1. NML only applies when premise is in use
2. As per Section 4.1.1. and Section 4.1.2. of the ICNG, a 10dB noise reduction across the facade was assumed to determine the equivalent external noise level criteria

4.3 Construction Noise Assessment

4.3.1 Noise Source Levels

The proposed plant and equipment are summarised in Table 11. The sound power levels have been sourced from TfNSW CNVG and the DEFRA Database.

Table 11: Proposed construction plant and equipment

Equipment	Sound Power Level, dBA	No. of equipment per scenario		
		SC01	SC02	SC03
Truck (medium rigid)	103	1	2	5
Excavator (35 tonne)	110	3	5	2
Front end loader (23 tonne)	112	1	2	1
Truck and dog	108	5	10	5
Concrete saws	119[1]	1	1	1
Concrete truck	109	0	0	10
Concrete pump	102	0	0	2
Franna crane	98	0	0	4
Hand tools	104	1	1	1
Forklifts	106	0	0	2
Compressor	109	0	1	1
Generator	103	1	1	1

Jack hammer[1]	113	0	1	1
Vibrating roller	114	0	5	0
Water truck	107	3	3	0
Grader	113	0	4	0

1. Noise Includes a 5dB penalty to account for annoying characteristics

4.3.2 Modelling Methodology

Noise emissions from construction works were predicted using Cadna-A (version 2023) noise modelling program. For modelling purposes, it was assumed that the construction noise would be distributed evenly across the entire site.

Equipment with special audible characteristics is not expected to operate for the majority of the construction works. Therefore, the predicted noise levels have been presented as a worst case scenario (includes noise generated by equipment with special audible characteristics) and a typical scenario (does not include noise generated by equipment with special audible characteristics).

For a conservative assessment, it is assumed that all the plant and equipment are operating concurrently. However, in reality, not all plant and equipment will be operating concurrently, therefore the actual construction noise levels will be lower than the predicted maximum noise levels presented below.

The noise model takes the following into account:

- Distance from source to receiver
- Ground type/absorption between the source and the receiver
- Shielding from surrounding buildings and barriers
- Cumulative noise of the equipment when they are working concurrently

The noise modelling inputs are summarised in Table 12.

Table 12: Noise modelling inputs

Modelling inputs	Description
Calculation method	CONCAWE
Source height	Construction plant and equipment: 2m above ground level
Receiver height	• R01, R02, R05, R06, R07, R08, R09, R10: 1.5m above ground level • R03, R04, R05: 4.5m above ground level
Receiver location	As shown in Figure 1
Ground contours	1m ground contours obtained from ELVIS
Ground absorption[1]	0.5 – Global 0.9 – Vegetation between Project and southern residential receivers

1. The ground surface with NCA01 and NCA02 would be a mix of hard surfaces (such as pavements) and soft surfaces (such as landscaped areas). Therefore, a global ground absorption correction of 0.5 was adopted for the entire model. To take into account that the area between

the Project and NCA01 is heavily vegetated, a specific ground correction of 0.9 was adopted for this vegetated area

4.3.2.1 Meteorological Conditions

Based on Section 3.3, it was determined that prevailing winds are characteristic of the area of the Project and its receivers.

Noise predictions were undertaken under calm and enhanced meteorological conditions (prevailing wind) using the CONCAWE calculation method. The atmospheric parameters for each conditions are shown in Table 13 below.

Table 13: Atmospheric parameters for each meteorological condition

Meteorological Condition	Air Temperature (°C)	Relative Humidity (%)	Wind Speeds (m/s)	Stability Category	Wind Direction
Calm winds	20	70	0.5	D	All directions
Prevailing winds	20	70	3.0	D	Northwest

4.3.3 Predicted Noise Levels

Noise emissions from construction equipment /activities were predicted at the nearest sensitive receivers and are presented in Table 14.

Table 14: Predicted construction noise levels

Receiver ID	Receiver Type	Meteorological Condition	NML (WH)[1]	NML (OOWH)[2]	Predicted Noise Levels					
					SC01		SC02		SC03	
					Typical	Worst Case	Typical	Worst Case	Typical	Worst Case
R01	Residential	Calm Winds	51	46	57	60	63	64	60	62
		Prevailing Winds	51	46	53	56	59	60	56	58
R02	Residential	Calm Winds	51	46	59	62	65	66	62	64
		Prevailing Winds	51	46	54	57	60	61	57	59
R03	Residential	Calm Winds	51	46	59	62	65	66	62	64
		Prevailing Winds	51	46	52	55	58	59	55	57
R04	Residential	Calm Winds	51	46	61	64	67	68	64	66
		Prevailing Winds	51	46	52	55	58	59	55	57
R05	Residential	Calm Winds	51	46	58	61	64	65	61	63
		Prevailing Winds	51	46	47	50	53	54	50	52
R06	Place of Worship	Calm Winds	55[3]	55[3]	58	61	64	65	61	63
		Prevailing Winds	55[3]	55[3]	47	50	53	54	50	52
R07	Commercial	Calm Winds	70[3]	70[3]	65	68	71	72	68	70
		Prevailing Winds	70[3]	70[3]	62	65	68	69	65	67
R08	Residential	Calm Winds	52	47	41	44	47	48	44	46
		Prevailing Winds	52	47	41	44	47	48	44	46
R09	Industrial	Calm Winds	75[3]	75[3]	65	68	71	72	68	70

		Prevailing Winds	75[3]	75[3]	65	68	71	72	68	70
R10	Industrial	Calm Winds	75[3]	75[3]	53	56	59	60	56	58
		Prevailing Winds	75[3]	75[3]	53	56	59	60	56	58

1. Standard Hours. Recommended hours of constriction, 7am to 5pm Monday to Friday, 8am to 1pm Saturday
2. Outside of work hours (OOWH)
3. When in use

Based on Table 14, in construction scenarios SC01, SC02 and SC03, the noise levels are predicted to exceed the NML. However, none of the residential receivers were predicted to exceed the highly noise affected criteria of 75 dBA.

Additionally, the above noise levels are considered conservative as it is unlikely that all plant and equipment will be operating concurrently. Therefore, the actual construction noise levels may be lower than the levels presented above.

Where exceedances occur, the ICNG provides recommendations to minimise construction noise impacts and are detailed in Section 4.6.

4.4 Construction Vibration Objectives

The following criteria are considered applicable when assessing vibration emission levels from the construction works.

The effects of ground vibration on buildings near construction sites may be broadly defined by the following two categories:

- Effects on building structures - vibration that can result into cosmetic building damage
- Disturbance to building occupants - vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.

Vibration criteria is provided for both scenarios in Section 4.4.1 and 4.4.2.

4.4.1 Cosmetic Building Damage and Structural Integrity

The vibration criteria for cosmetic damage have been taken from the German Standard DIN 4150 2016 '*Structural vibration: Effects of vibration on structures'*. DIN 4150 provides recommended limits to ensure minimal risk of damage. Furthermore, it presents different sets of criteria for different types of structures. The DIN 4150 vibration limits used for this Project are provided in Table 15.

Table 15: DIN 4150-3:2016 cosmetic damage criteria, Peak Particle Velocity (PPV)

Group	Type of structure	Vibration velocity, mm/s				
		At foundation in all directions at frequency of			Plane of floor uppermost storey in horizontal direction	Floor slabs, vertical direction
		1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz	All frequencies	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/oroccupancy	5	5 to 15	15 to 20	15	20
3	Structures that because of their particular sensitivity to vibration, cannot be classified under Groups 1 and 2 and are of great intrinsic value (e.g. listed buildings)	3	3 to 8	8 to 10	8	20

4.4.2 Human Comfort

For disturbance to human occupants of buildings, guidance has been taken from the AVaTG. This document provides criteria which are based on the British Standard BS 6472-1992, *Evaluation of human exposure to vibration in buildings (1-80Hz)*.

Vibration sources are defined as Continuous, Impulsive or Intermittent. Section 2 of the AVaTG guideline defines each type of vibration as follows:

Continuous vibration continues uninterrupted for a defined period (usually throughout the day time and/or night time).

Impulsive vibration is a rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds.

Intermittent vibration can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude.

The criteria are to be applied to a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).

Preferred and maximum values for continuous and impulsive vibration are defined in Table 16.

Table 16: Preferred and maximum weighted RMS values for continuous and impulsive vibration acceleration (m/s^2) 180Hz

Location	Assessment period	Preferred values		Maximum values	
		z axis	x & y axis	z axis	x & y axis
Continuous vibration					
Residences	Day time (7am to 10pm)	0.010	0.0071	0.020	0.014
	Night time (10pm to 7am)	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night time	0.020	0.015	0.040	0.028
Workshops	Day or night time	0.04	0.029	0.080	0.058
Impulsive vibration					
Residences	Daytime (7am to 10pm)	0.30	0.21	0.60	0.42
	Night time (10pm to 7am)	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

Intermittent vibration is to be assessed using Vibration Dose Value (VDV). The VDV method is a fourth power approach which is more sensitive to peaks in the acceleration waveform and makes corrections to the criteria based on the duration of the source's operation.

The VDV can be calculated using the overall weighted rms acceleration of the vibrating source in each orthogonal axis and the total period during which the vibration may occur. Weighting curves are provided in each orthogonal axis.

Preferred and maximum VDV values are defined in Table 17 below (extracted from Table 2.4 of the AVaTG).

Table 17: Preferred and maximum VDV Values, m/s$^{1.75}$

Location	Day time (7am to 10pm)		Night time (10pm to 7am)	
	Preferred values	Maximum values	Preferred values	Maximum values
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

4.5 Construction Vibration Assessment

The management objective for the Project is to limit vibration from construction activities so as to avoid building damage and human discomfort associated with the construction works. It is noted that buildings in the vicinity of development are industrial. Residential receivers are further set back from the Project. Vibration impacts on the buildings and their occupants should be considered for the assessment of cosmetic damage and human annoyance.

Vibration management strategies shall be implemented on site for the vibration intensive equipment. Typical construction plant equipment most likely to cause significant vibration are listed below.

- Piling rig;
- Jackhammer; and
- Vibratory roller

4.5.1 Indicative Minimum Working Distances for Vibration Intensive Equipment

To minimise the risk of cosmetic damage, minimum working distances for vibration intensive activities have been provided. The minimum working distances are based on the TfNSW CNVG and are presented in Table 18.

Table 18: Recommended minimum buffer distances for construction plant (cosmetic damage)

Plant item	Rating/ Description	Minimum working distance	
		Cosmetic	Human response
Piling rig - bored	≤ 800mm	2 metres (nominal)	N/A
Vibratory roller	< 200 kN (typically 4-6 t)	12 metres	40 metres
Jackhammer	Hand held	1 metre (nominal)	Avoid contact with structure

The relationship between vibration and the probability of causing human annoyance or damage to structures is complex. This complexity is due to the magnitude of the vibration source, the particular ground conditions between the source and receiver, the foundation-to-footing interaction and the large range of structures that exist in terms of design (i.e. dimensions, materials, type and quality of construction and footing conditions). Therefore, determining site specific minimum buffer through attended vibration monitoring is recommended.

The vibration intensive works must comply with the minimum working distances, where feasible. When works need to occur within these recommended minimum buffer distances, vibration monitoring is proposed.

4.6 Indicative Recommendations

Specific construction noise and vibration mitigation measures should be determined as part of a Construction Noise and Vibration Management Plan (CNVMP).

Feasible and reasonable work practices should be implemented to reduce the noise impact to the nearest affected receivers. Indicative recommendations that can be considered during construction are provided below.

- Community engagement / liaison: Notify the community of planned noisy activities. The community should be notified at least two weeks prior to works beginning and should include the duration and reason for the activity. There should be a communication system such as letter dropping, availability of a site contact and a complaint handling system in place;
- Locating plant and equipment as far away from sensitive receivers;
- Where feasible, find “less noisy” alternative construction processes;
- Select quieter equipment or fit equipment with silencers, where feasible;
- Regularly inspecting and maintaining equipment;
- Schedule noisy activities during less sensitive times of the day. The time of day will depend on the specific receivers and should be determined through community consultation;
- Organising the site layout to promote one-way traffic to reduce vehicle reversing movements;
- No idling of delivery trucks;
- Switch off any equipment not in use for extended periods of time;
- Educating staff and contractors about noise and quiet work practices. This could include signage and site inductions; and
- Construction noise and/or vibration monitoring may be required to respond to noise and/or vibration complaints. A qualified acoustic consultant should determine the monitoring program and methodology.

Table 19 provides the typical noise reductions for standard engineering mitigation measures.

Table 19: AS 2436:2010 – Possible construction noise mitigation measures

Noise mitigation measure	Typical noise reduction
Distance attenuation	6 dB per doubling of distance
Screening and barriers	Typically, 5 to 10 dBA maximum 15 dBA
Enclosure	Typically, 15 to 25 dBA maximum 50 dBA
Silencing	Typically, 5 to 10 dBA maximum 20 dBA

5. Construction Road Traffic Noise

The following section details the possible noise impact by generated traffic from the Project travelling on surrounding public roads during the construction period. For the purpose of this assessment, the road traffic noise impacts have been assessed at the most sensitive receivers. It is expected that when compliance is achieved at the most sensitive receivers, compliance will also be achieved at the less sensitive receivers. In this instance, the most sensitive receivers are the residential receivers located within the Ingenia Lifestyle retirement village (NCA02), located northwest of the Project. This is due to the traffic generation only affecting Hollinsworth Road and its subsequent connected roads.

5.1 Road Traffic Noise Criteria

The noise from traffic associated with the Project travelling on public roads are assessed under the RNP. From a noise perspective, it is assumed that the surrounding roads are considered as local roads. The road traffic noise criteria for the nearby sensitive receivers are summarised in Table 20.

Table 20: Road traffic noise criteria for residential receivers affected by additional traffic from land use developments

Receiver	Road traffic noise criteria	
	Day time[1]	Night time[1]
Residential (NCA02)	55 $L_{eq,1hr}$ dBA	50 $L_{eq,1hr}$ dBA

1. Day time defined as 7am to 10pm and night time is 10pm to 7am.

Additionally, the RNP further states:

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

Therefore, if the road traffic noise associated with additional traffic from the development exceeds the road traffic noise criteria in Table 20 and the relative increase is more than 2 dBA, then mitigation measures should be considered for the affected receivers.

5.2 Existing Traffic Volumes

The existing traffic volumes are detailed in the Transport Impact Assessment (ref:301351444 dated 18 September 2024) and are presented in Table 21.

Table 21: Existing traffic volumes along Hollinsworth Road

Peak	Time	Eastbound movements		Westbound movements	
		Heavy vehicle	Light vehicle	Heavy vehicle	Light vehicle
AM Peak	7.45am – 8.45am	25	78	11	98
PM Peak	5.00pm – 6.00pm	5	71	1	15

5.3 Traffic Generation

From Section 8.7 of the Transport Impact Assessment (ref:301351444 dated 18 September 2024), the additional trip generation due to construction is predicted to be up to 50 trucks per day during peak activities. The additional trip generation is predicted to travel via Hollinsworth Road. This peak traffic generation is assumed to only occur on Mondays to Fridays (7am to 5pm).

The truck movements are assumed to be distributed evenly throughout the construction work hours of Monday to Friday (7am to 5pm), which results to approximately 5 truck movements per hour. The number of truck movements per hour (5) is assumed to also apply on Saturdays.

Additionally, Section 8.7 does not mention the number of light vehicle generation from the construction of the Project, hence, for a conservative assessment, the number of light vehicle generation from Table 6.1 of the Transport Impact Assessment (ref:301351444 dated 18 September 2024) has been adopted. Table 6.1 mentions that 113 light vehicles would be generated (133 total vehicles with 15% heavy vehicles).

No construction works are expected on Sundays, hence excluded from this assessment.

Figure 8.1 of the Transport Impact Assessment (ref:301351444 dated 18 September 2024) provides the directions of the additional trips and has been adopted as the routes for the light and heavy vehicles.

5.4 Road Traffic Noise Predictions

Using the existing and the future generated traffic volumes, the road traffic noise was predicted at the residential receivers located along Hollinsworth Road.

Figure 7.1 of the Transport Impact Assessment (ref:301351444 dated 18 September 2024) shows that the all the generated traffic is predicted to approach the site from the east with no traffic generation from the west. During departure, the movements are predicted to go from the site to the east with no traffic generation towards the west.

Therefore, the road traffic noise was assessed along Hollinsworth Road at the site entrance.

The results are presented in Table 22.

Table 22: Predicted road traffic noise (AM and PM Peak)

Peak Time	Approximate distance from road to receiver	Time period[1]	Criteria $L_{eq,1hr}$ dBA	Predicted $L_{eq,1hr}$ dBA[2, 3]	Compliance
AM	250m	Day	55	48	Yes
PM	250m	Day	55	44	Yes

1. Time periods as defined in the RNP
2. Predicted noise level includes façade reflection (i.e. at façade noise level)
3. Existing + generated construction traffic

Thus, no recommendations are required for noise due to traffic generation from the proposed development.

6. Conclusion

This CNVIA forms part of the SSDA submission for the proposed Marsden Park Data Centre Campus to be located at 105 & 113 Hollinsworth Road, Marsden Park.

A noise survey was conducted by Stantec to measure the ambient noise at the most affected noise receivers in the vicinity of the Project.

A construction noise and vibration assessment were conducted based on different construction scenarios at each identified receiver. Where exceedances occur, recommendations were provided.

The traffic generation along the nearby roads related to the construction of the Project were assessed and were found to comply with the RNP criteria.

Provided our recommendations are implemented, the construction noise and vibration emissions from the subject development are predicted to comply with the acoustic requirements of Blacktown City Council and other relevant Australian standards and guidelines.

Appendix A: Drawings

The following drawings were used in the preparation of this report.

Architectural Drawings

Architectural drawings issued by EJE architecture

Drawing No.	Revision	Title	Date Issued
SSDA-01	C	SITE LOCATION	08/08/2024
SSDA-02	E	SITE ANALYSIS	21/08/2024
SSDA-05	P	SITE PLAN	21/08/2024
SSDA-06	L	SITE PLAN FLOOR PLAN	21/08/2024
SSDA-07	F	SITE SECTIONS 1	21/08/2024
SSDA-08	E	SITE SECTIONS 2	21/08/2024
SSDA-09	F	SITE BOUNDARY ELEVATIONS	21/08/2024
SSDA-13	E	TYPICAL DATA CENTRE - GROUND FLOOR PLAN	21/08/2024
SSDA-14	E	TYPICAL DATA CENTRE - LEVEL 1 PLAN	21/08/2024
SSDA-15	E	TYPICAL DATA CENTRE - LEVEL 2 PLAN	21/08/2024
SSDA-16	E	TYPICAL DATA CENTRE - LEVEL 3 PLAN	21/08/2024
SSDA-17	E	TYPICAL DATA CENTRE - ROOF PLAN	21/08/2024
SSDA-18	E	TYPICAL DATA CENTRE - CHILLER DECK LEVEL	21/08/2024
SSDA-19	E	TYPICAL DATA CENTRE - ELEVATIONS 1 - TYPE A	21/08/2024
SSDA-20	F	TYPICAL DATA CENTRE - ELEVATIONS 2 - TYPE B	21/08/2024
SSDA-21	E	TYPICAL DATA CENTRE - SECTIONS 1	21/08/2024

Appendix B: Glossary of Acoustic Terminology

Decibel – dB – Unit of Acoustic measurements for power, pressure and intensity. Expressed in dB relative to standard levels.

A-weighted decibel – dB(A) – Unit of acoustic measurement weighted approximately to human hearing to sound.

SPL – Sound Pressure Level – 20 times the logarithm to the base 10 of the ratio of r.m.s. sound pressure to the reference pressure of 20 micro Pascals, sound pressure level is measured using a microphone and a sound level meter and varies with distance from the source.

SWL – Sound Power Level – 10 times the logarithm to base 10 of the ratio of the sound power of the source to the reference sound power of 1 Pico Watt. Sound power level cannot be directly measured using a microphone and a sound level meter, and it does not change with distance. The sound power of a machine will vary depending on the operation conditions or load.

R_w – Weighted Sound Reduction Index – Measured sound reduction of a building element in a laboratory, corrected for room volume and reverberation time, the higher values correspond to better sound insulation. It describes the sound-proofing effectiveness of a partition or glazing depending on its material and construction. Each increasing increment in R_w is equivalent to 1 dB of noise reduction. R_w however, is a rating determined in a laboratory - a highly controlled environment - and should only be used as an indicative value for design purposes. Spectrum adaptation terms C and C_{tr} are often added to the measured R_w result to account for low frequency noise.

L_{nw} – Weighted Normalised Impact Sound Pressure Level – the design value of the achievable impact noise attenuation of a building element. L_{nw} measures the perceived impact noise in the receiver room, so maximum values are usually quoted, with lower values corresponding to lower levels of theoretical perceived impact noise. Each increasing increment in L_{nw} is equivalent to 1 dB of impact noise increase. Spectrum adaptation term CI is often added to the L_{nw} result to account for low frequency noise.

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

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

L_{Aeq} – The Equivalent Continuous Sound Level is the energy average of the varying noise over the sample period (often given in the subscript) and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise. L_{Aeq} is measured in dB(A).

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

L_{Amin} – The Minimum Noise Level over a sample period is the minimum level, measured on fast response, during the sample period.

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