200 Aldington Road Industrial Estate

SSD-10479 MOD 2 Updated Noise Impact Assessment and SSDA for Lot G, H and J

Stockland Fife Kemps Creek Pty Ltd

Level 12, 89 York Street,
Sydney NSW 2000

Prepared by:

SLR Consulting Australia

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SLR Project No.: 610.31010.00001

17 May 2024

Revision: v2.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
v2.0	17 May 2024	Antony Williams	Aaron McKenzie	Antony Williams

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Stockland Fife Kemps Creek Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Stockland Fife Kemps Creek Pty Ltd (SKFC) to predict the potential operational noise impacts from 200 Aldington Road Industrial Estate (ARIE), formally known as Lot 200 DP 1285691, 106-228 Aldington Road, Kemps Creek.

A Concept Master Plan for the estate was approved by the Department of Planning and Environment (DPE) on 5 May 2023 pursuant to State Significant Development (SSD) project approval SSD-10479.

Following further detailed design, the applicant, SKFC, lodged a Section 4.55(1A) Modification Application to the approved Concept Master Plan SSD-10479 MOD 1 (hereafter, MOD 1).

The following Noise Impact Assessments have been completed for the ARIE:

- A Noise Impact Assessment was prepared by White Noise Acoustics as part of the SSD-10479 application, reference '*Report 20141_200819, Revision 8*', issued 26 August 2022 (the SSDA NIA).
- A modification NIA was prepared by SLR Consulting for MOD 1, reference *'200 Aldington Road Industrial Estate, SSD – 10479 MOD 1, Operational Noise Impact Assessment'* 610.31010-R02-v1.3, issued 22 October 2023 (the MOD 1 NIA).

The MOD 1, 200 Aldington Road Concept Masterplan (MOD 1) has been updated as part of a Modification Application (MOD 2) to Development Consent SSD-10479. SSD-10479 Consent Condition A4 states that, in accordance with Section 4.22 of the Environmental Planning and Assessment Act 1979, each subsequent stage of the development is to be subject to further development applications.

This report has been prepared in support of a Section 4.55(1A) Modification Application to the approved MOD 1 Concept Masterplan and presents a review of the potential operational noise impacts for MOD 2 by comparing the predicted noise levels to the noise limits for the site, as specified in Development Consent SSD-10479.

This report also addresses the potential operational noise impacts for additional SSD applications for on-lot development, including:

- SSD-64583708 LOT G
- SSD-64589711 LOT H
- SSD-61212208 LOT J.

SLR is suitably qualified to produce this noise impact assessment. SLR is a member of the Australian Acoustical Society (AAS) and a member firm of the Association of Australasian Acoustical Consultants (AAAC).

The following report uses specialist acoustic terminology. An explanation of common terms is provided in **Appendix A**.

2.0 Project Description

200 Aldington Road Industrial Estate is legally described as Lot 200 in DP1285691. The site is located on the east side of Aldington Road, Kemps Creek and encompasses approximately 72.08 hectares (ha) of land within the Penrith Local Government Area (LGA).

The estate is approximately 6 kilometres (km) north-east of the future Western Sydney Nancy-Bird Walton Airport, 13 km south-east of the Penrith CBD and 40 km west of the Sydney CBD. The ARIE site is part of the broader Mamre Road Precinct (MRP) which is zoned IN1 General Industrial under Chapter 2 of the State Environmental Planning Policy (Industry and Employment) 2021 (I&E SEPP).

ARIE has around 1,242 metres (m) of direct frontage to Aldington Road with one proposed signalised intersection providing vehicular access to the southern side of the development, with a three-way junction (designed for a future signalised four-way intersection) providing access to the northern side of the development. Until the connection of Aldington Road to the future Southern Link Road (located to the north) is constructed, the access to Aldington Road will be provided from Abbots Road.

The proposed State Significant Development (SSD) SSD-10479 seeks approval for the following, as established under the Concept Masterplan:

- Modification of the ARIE Concept Masterplan, approved in SSD-10479 (MOD 2)
- MOD 2 to the approved Stage 1 Works.

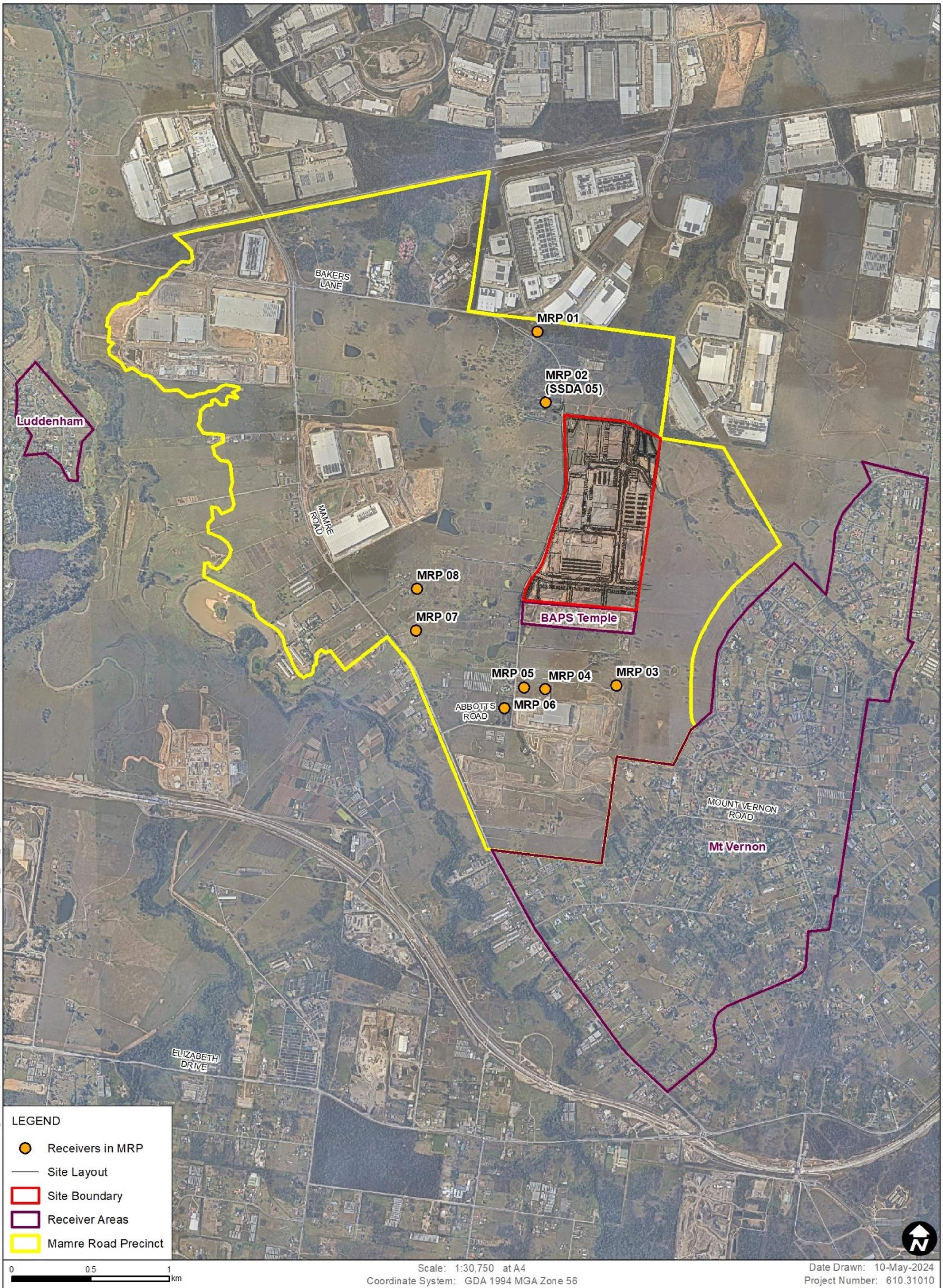
The site location and surrounding noise sensitive receivers are shown in **Figure 1**.

2.1 MOD 2 Concept Masterplan

Modification to the approved MOD 1 Concept Masterplan under MOD 2 includes the following:

- Amendment to the proposed Subdivision Plan for Lot 200 DP 1285691:
  - Amalgamate Lots E, H and F to create Lot H
  - Amalgamate Lots I and K to create Lot K.
- Revisions to the general arrangement for the future industrial facility on Lot K, J, H and G, including updates to the built form, vehicular access, parking, landscaping and hardstand for the site**.**

The MOD 1 Concept Masterplan is shown in **Figure 2** and the proposed MOD 2 Concept Masterplan is shown in **Figure 3**.



Scale: 1:30,750 at A4
Coordinate System: GDA 1994 MGA Zone 56

Date Drawn: 10-May-2024
Project Number: 610.31010

Data Source:
Nearmap Imagery April 2024

DISCLAIMER: All information within this document may be based on external sources. SLR Consulting Pty Ltd makes no warranty regarding the data's accuracy or reliability for any purpose.

SLR

SITE PLAN

FIGURE 1

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Figure 2 MOD 1 Concept Masterplan

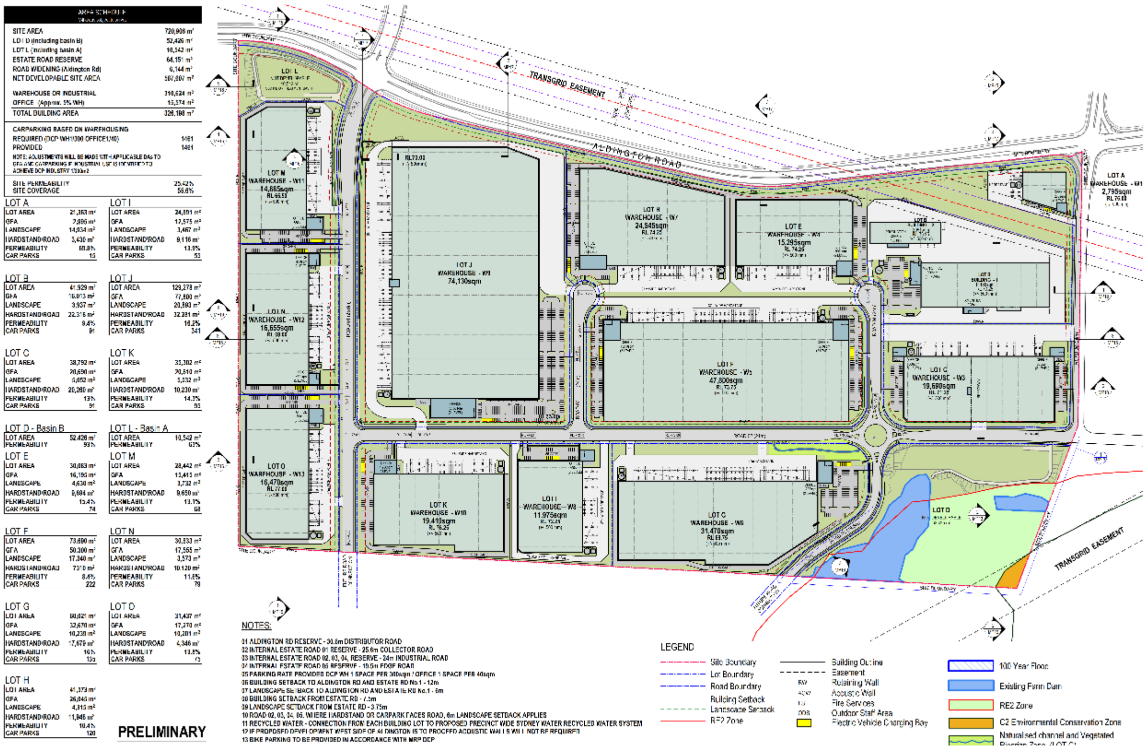
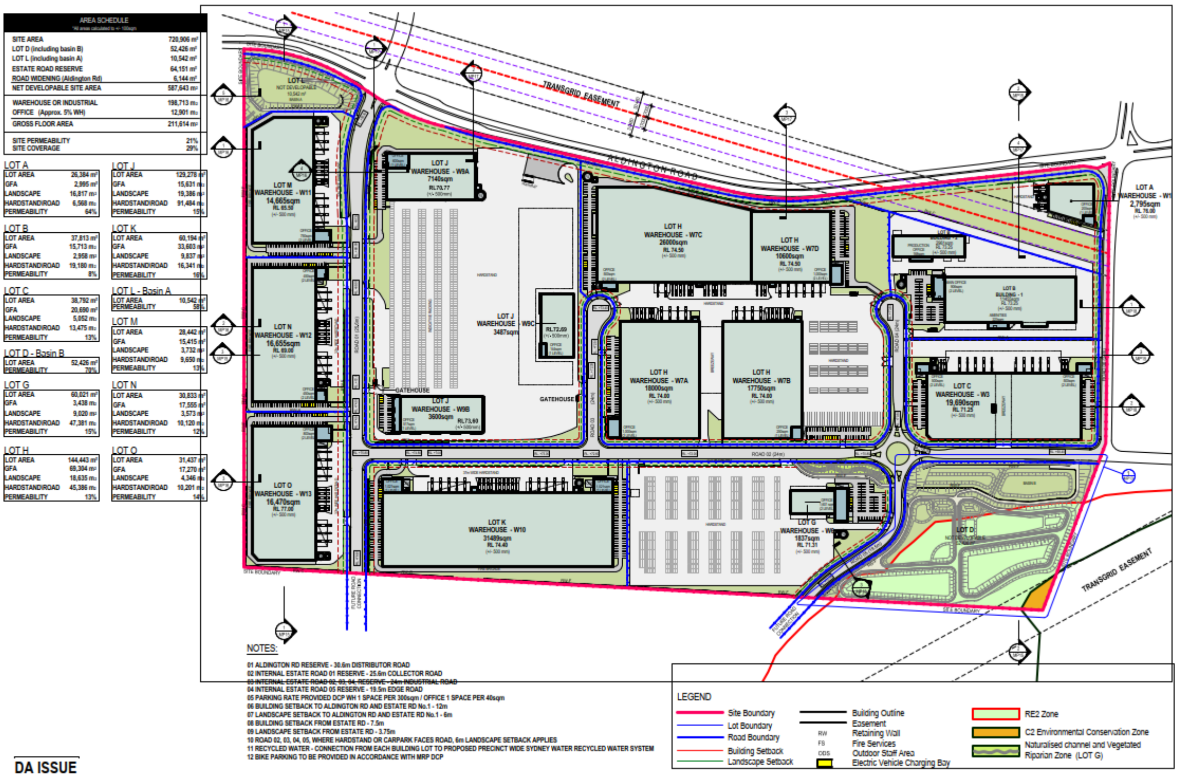


Figure 3 Proposed MOD 2 Concept Masterplan



2.2 Nearest Receivers

Nearby sensitive receiver areas outside the MRP are identified in Appendix 3 of the Development Consent.

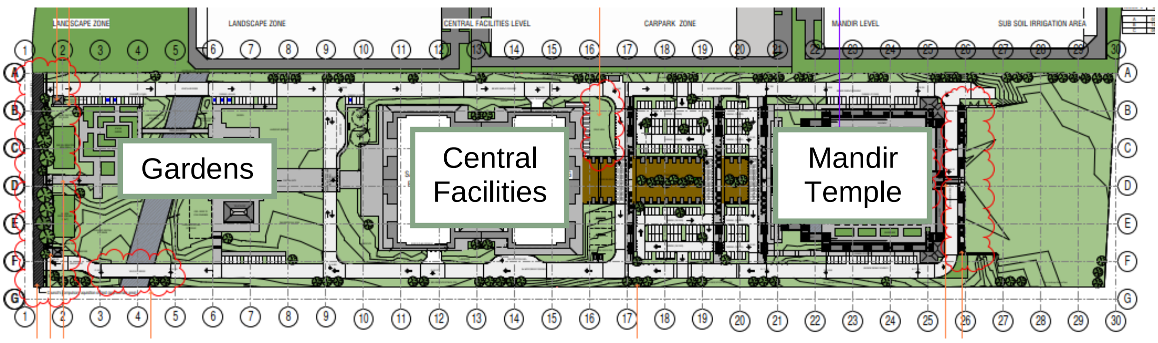
Sensitive receivers adjacent to the ARIE (within the MRP) were previously identified in the SSDA NIA. While the majority of these receivers are now demolished, or on land subject to separate SSD Applications, one receiver to the north-west is currently existing (identified as Receiver 05 in the SSDA NIA). Additional existing receivers within the MRP have been identified as part of this assessment which were not considered in the SSDA NIA.

The various sensitive receivers are in shown in **Figure 1** and detailed in **Table 1**.

Table 1 Surrounding Sensitive Receivers

NCA/ID	Description	Receiver Type	Approx. Distance (m)
Receivers Within MRP			
MRP 01	Newly identified residential receiver	Residential	570
MRP 02 (SSDA NIA 05)	Residential receiver identified in SSDA NIA	Residential	200
MRP 03	Newly identified residential receiver	Residential	500
MRP 04	Newly identified residential receiver	Residential	550
MRP 05	Newly identified residential receiver	Residential	550
MRP 06	Newly identified residential receiver	Residential	700
MRP 07	Newly identified residential receiver	Residential	720
MRP 08	Newly identified residential receiver	Residential	690
Receiver Areas Outside MRP / Receivers Identified in the Development Consent			
West Residential	Residences near Medinah Avenue, Luddenham	Residential	2,950
East Residential	Residences near Mount Vernon Road and Kerrs Road, Mount Vernon	Residential	610
BAPS Temple	232 Aldington Road, Kemps Creek. Areas include (see **Figure 4**): - Gardens - Central Facilities - Mandir Temple.	Place of Worship	Adjoining southern boundary of site

Figure 4 BAPS Temple



2.3 Development Consent Conditions

The Development Consent Conditions for SSD-10479 were issued in May 2023. The conditions relevant to this assessment are shown in **Table 2**.

Table 2 Development Consent Conditions

<table>
<tr><th>Noise</th><th>Where Addressed</th></tr>
<tr><td>Noise
A16. The Applicant must ensure that noise generated by operation of the development does not exceed the noise limits in Table 2.
Table 2 Noise Limits (dB(A))
<table>
<tr><th>Location</th><th>Day $L_{Aeq(15minute)}$</th><th>Evening $L_{aeq(15minute)}$</th><th>Night $L_{aeq(15minute)}$</th></tr>
<tr><td>Residential receivers near Medinah Avenue (Luddenham), Mount Vernon Road (Mount Vernon) and Kerrs Road (Mount Vernon)</td><td>40</td><td>35</td><td>30</td></tr>
<tr><td>BAPS Temple – Outdoor Use Area (Except Car Parking Area)</td><td colspan="3">33 (When in use)</td></tr>
</table>
Note Noise generated by the development is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Noise Policy for Industry (EPA, 2017) (as may be updated or replaced from time to time). Refer to Figure 5 in Appendix 3 for the location of residential sensitive receivers.</td>
<td>Operational noise assessment with respect to Noise Limits detailed in Section 5.0.

Noise mitigation and management measures discussed in Section 7.0.</td></tr>
<tr><td>A17. The Applicant must ensure that noise generated by any activity on the site does not exceed a sound power level of LAMax 115 dB(A) or result in annoying noise characteristics as determined in accordance with the Noise Policy for Industry (EPA, 2017) and Australian Standard AS 1055:2018 Acoustics – Description and measurement of environmental noise (Standards Australia, 2018).</td><td>Sleep disturbance assessment detailed in Section 5.2.</td></tr>
<tr><td>Noise and Vibration
B15. Future DAs must be accompanied by a Noise and Vibration Impact Assessment. The assessment must:
(a) identify the noise and vibration impacts during construction and operation;
(b) demonstrate compliance with the noise limits in Condition A16;
(c) demonstrate compliance with the noise limits in Condition A17;
(d) provide an analysis of all external plant and equipment, including but not limited to, forklifts, air conditioners and refrigeration systems and on-site vehicle movements;
(e) incorporate noise mitigation measures, such as increased building setbacks, building insulation, noise barriers, layout of truck loading areas or source controls, to demonstrate the noise limits in Condition A16 can be achieved;</td><td>Operational noise sources detailed in Section 4.1.

Operational noise assessment with respect to Noise Limits detailed in Section 5.0.

Noise mitigation and management measures discussed in Section 7.0.

Construction noise & vibration detailed in SLR Report 610.31010.00000-</td></tr>
</table>

Noise	Where Addressed
(f) analyse the need for noise barriers to meet relevant noise limits at residential receivers within the MRP, if they are occupied residences at the time of the application; and (g) recommend mitigation and management measures (excluding measures at receivers) to be implemented to minimise noise during construction and operation.	*R04 – Lots G, H and J SSD Applications – Construction Noise and Vibration Impact Statement*, dated February 2024.
Operational Noise Limits D53. The Applicant must: (a) establish intermediate noise monitoring locations in accordance with the Operational Noise Management Plan (refer to condition A18) prior to commencement of operation of the MOD 2 Stage 1 Development; (b) ensure the cumulative noise emission of fixed external mechanical plant for the Stage 1 warehouse building do not exceed 80 dB(A) and do not exhibit tonal characteristics or strong low frequency content; and (c) ensure the noise generated by operation of the Stage 1 Development does not exceed the noise limits in condition A16.	The Operational Noise Management Plan, including setting of intermediate noise monitoring locations, would be completed as part of future work. Operational noise sources detailed in **Section 4.1**. Operational noise assessment with respect to Noise Limits detailed in **Section 5.0**.
Noise Verification D54. Within three months of the commencement of earthworks for the development, the Applicant must prepare and submit a Design Noise Verification Report for the Stage 1 development to the satisfaction of the Planning Secretary. The Applicant must not commence construction of any warehouse buildings until the Design Noise Verification Report is approved by the Planning Secretary. The Design Noise Verification Report must: (a) be prepared by a suitably qualified, experienced and independent acoustic consultant whose appointment has been endorsed by the Planning Secretary; (b) identify and justify the design noise emission scenario, including the adopted engineering safety factor, schedule of all noise generating sources on the site (including but not limited to, all vehicle types, mechanical plant and waste areas), stationary equipment specification and verifiable data of dynamic noise emission activities; (c) demonstrate the noise propagation modelling is capable of accurately predicting noise levels under noise enhancing meteorological conditions to surrounding receivers in Mount Vernon and Luddenham; (d) provide updated noise modelling to verify the predicted performance of the development and the predicted noise levels identified in the report titled *200 Aldington Road Industrial Estate, Noise and Vibration Impact Assessment*, prepared by White Noise Acoustics, dated 26 August 2022; (e) have regard to the Operational Noise Management Plan prepared in accordance with condition A18; (f) include: (i) an analysis of compliance with noise limits specified in conditions A16, A17 and D53(b);	The Design Noise Verification Report would be completed as part of future work.

Noise	Where Addressed
(ii) an outline of at-source and transmission path mitigation measures required to ensure compliance with the limits specified in conditions A16, A17 and D53(b); (iii) a description of contingency measures (including specific measures to manage noise generating activities during the night time period) in the event management actions are not effective at reducing noise levels to comply with limits specified in conditions A16, A17 and D53(b).	
D55. Should the Design Noise Verification Report identify that the noise limits in Conditions A16 cannot be achieved through the mitigation measures and contingency measures required to be considered under Condition D54, the Applicant must: (a) offer to enter into noise agreement(s) with eligible receivers outside of the Mamre Road Precinct where noise limits are predicted to be exceeded (b) provide written evidence to the Planning Secretary that an agreement is in place with these receivers.	The Design Noise Verification Report would be completed as part of future work.
D56. If a Noise Agreement is in place with specific receiver(s) to exceed the noise limits in Condition A16, the noise limits in Table 2 do not apply to that receiver(s).	Noise Agreements discussed in **Section 7.2.3**.
D57. Within three months of the commencement of operation of the development, the Applicant must prepare and submit an Operational Noise Verification Report for the development to the satisfaction of the Planning Secretary. The Operational Noise Verification Report must: (a) be prepared by a suitably qualified, experienced and independent acoustic consultant whose appointment has been endorsed by the Planning Secretary; (b) demonstrate that noise verification has been carried out in accordance with: (i) the Australian Standard AS 1055:2018 Acoustics – Description and measurement of environmental noise (Standards Australia, 2018); (ii) the EPA Approved Methods for the Measurement and Analysis of Environmental Noise in NSW (EPA, 2022); and (iii) the Operational Noise Management Plan established under condition A18 and D54(e); (c) include: (i) an analysis of compliance with noise limits specified in conditions A16, A17 and D53(b); (ii) an outline of implemented at-source and transmission pathway mitigation measures and their effectiveness at reducing operational noise; and (iii) a description of contingency measures in the event implemented mitigation measures are not effective at reducing noise levels to comply with limits specified in conditions A16, A17 and D53(b) at all times.	The Operational Noise Verification Report would be completed as part of future work.

2.4 Secretary's Environmental Assessment Requirements

This report has also been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for Lot G, H and J in September and December 2023.

Specifically, this report has been prepared to respond to the SEARs requirements shown in **Table 3**.

Table 3 Secretary's Environmental Assessment Requirements

Description of Requirement	Where Addressed
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:	This report
- the identification of impacts associated with construction, operation and traffic generation at noise affected sensitive receivers, including the provision of operational noise contours and a detailed sleep disturbance assessment	**Section 5.0** Construction noise & vibration detailed in SLR Report *610.31010.00000*.
- details of noise monitoring survey, background noise levels, noise source inventory and 'worst case' noise emission scenarios	**Section 3.1** and **4.1**
- a detailed noise source inventory describing all potential noise and vibration sources during construction and operation of the development, including but not limited to external plant and equipment (e.g., air conditioners, ventilation units, compactors, and containers), vehicle maintenance and repair activities, on-site vehicle movements (e.g., gas-powered/electric forklifts, loading/unloading activities and manoeuvring within loading areas), and on-site and off-site traffic noise. Noise levels for all plant and equipment must be supported by manufacturer specifications	**Section 4.1** Construction noise & vibration detailed in SLR Report *610.31010.00000*.
- consideration of annoying characteristics of noise and prevailing meteorological conditions in the study area	**Section 4.1.7** and **4.3**
- a description of 'worst-case' noise emission scenarios considering noise-enhancing meteorological conditions	**Section 4.1** and **4.3**
- a cumulative construction and operational noise impact assessment inclusive of impacts from approved and proposed developments in the 200 Aldington Road Industrial Estate and the broader Mamre Road Precinct	**Section 6.0**
- demonstration of compliance with the noise limits set out in Conditions A16 and A17 of the SSD-10479 development consent	**Section 5.1**
- 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 following application of mitigation these measures and details of any proposed compliance monitoring programs.	**Section 7.0** Construction noise & vibration detailed in SLR Report *610.31010.00000*.

2.5 Mamre Road Precinct Development Control Plan

The Mamre Road Precinct (MRP) Development Control Plan (DCP) also applies to the proposal. The requirements of the MRP DCP relevant to noise and vibration are shown in **Table 4**.

Table 4 Mamre Road Precinct Development Control Plan

Noise and Vibration	Where Addressed
2.2.3 Biodiversity Conservation and Management	
16) Where noise adjacent to natural areas is likely to impact wildlife, the proponent must manage the timing of noise producing activities, including installing appropriate noise treatment barriers along major roads and other attenuation measures.	Noise from the development is not expected to impact on wildlife.
2.11 Aviation Safeguarding	
3) Development is constructed in accordance with Australian Standards AS2021 – Acoustics Noise Intrusion – Building Siting and Construction.	The site is within ANEC20-25 and is therefore acceptable for light industry, as per AS2021.
4.3 Amenity – 4.3.1 Noise and Vibration	
1) Any machinery or activity considered to produce noise emissions from a premise shall be adequately sound-proofed so that noise emissions are in accordance with the provisions of the Protection of the Environment Operations Act 1997.	**Section 4.1**, **5.0** and **7.0**
2) Noise should be assessed in accordance with Noise Policy for Industry (EPA, 2017) and NSW Road Noise Policy (Department of Environment, Climate Change and Water, 2011).	**Section 3.0**
3) An Acoustic Report by a qualified acoustical engineer must be submitted where proposed development, including traffic generated by that development, will create noise and/or vibration impacts, either during construction or operation, that impacts on adjoining developments or nearby rural-residential areas. The Acoustic Report should outline the proposed noise amelioration strategies and management methods.	This report **Section 5.0** and **7.0**
4) An Acoustic Report shall be prepared for developments within 500m of rural-residential areas and other sensitive receivers, including educational establishments.	This report **Section 2.2** and **5.0**
5) Acoustic Reports for individual developments must assess cumulative noise impacts, including likely future noise emissions from the development and operation of the Precinct. The consultant should liaise with the relevant consent authority to determine acceptable amenity goals for individual industrial developments and background noise levels.	This report **Section 6.0**
6) The use of mechanical plant and equipment may be restricted in areas close to sensitive receivers, such as adjoining rural-residential development and educational establishments.	**Section 4.1**, **5.0** and **7.0**
7) Building design is to incorporate noise amelioration features. Roof elements are to control potential breakout noise, having regard to surrounding topography.	**Section 4.1**, **5.0** and **7.0**
8) Boundary fences are to incorporate noise amelioration features and control breakout noise having regard to developments adjoining rural-residential areas.	**Section 4.1**, **5.0** and **7.0**

Noise and Vibration	Where Addressed
9) Development shall comply with the relevant Australian Standards for noise and vibration.	**Section 5.0** and **7.0**
10) A qualified acoustical consultant is to certify any acoustic design measures have been satisfactorily incorporated into the development at construction certificate stage and validate the criteria at occupation certificate stage.	Will be undertaken following approval at construction certificate stage and occupation certificate stage

3.0 Operational Noise Criteria

3.1 Noise Limits and Project Noise Trigger Levels

Operational noise criteria for the proposal have been taken from the noise limits specified in the Development Consent and the criteria defined in the SSDA NIA. The criteria defined in the SSDA NIA were based on background noise levels measured at the time of that assessment. The noise criteria for the development are detailed in **Table 5**.

Table 5 Project Related Noise Criteria

Receiver Location	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)	
		Consent Noise Limit	Project Noise Trigger Level[1]
Receivers Within MRP			
Rural residences (north / west / south of site)	Day	n/a	40
	Evening	n/a	35
	Night	n/a	35
Receiver Areas Outside MRP / Receivers Identified in the Development Consent			
Residential receivers near Medinah Avenue (Luddenham), Mount Vernon Road (Mount Vernon) and Kerrs Road (Mount Vernon)	Day	40	n/a
	Evening	35	n/a
	Night	30	n/a
BAPS Temple[2] – Outdoor Use Area	When in use	33	48 (50-5+3)[2]

Note 1: Project Noise Trigger Levels were previously identified in the SSDA NIA.

Note 2: Project Noise Trigger Level based on the Recommended Amenity Noise Level for areas reserved for passive recreation in the *Noise Policy for Industry*. The Project Noise Trigger Level has been reduced by 5 dB to give the project amenity noise levels due to other sources of industrial noise and converted to a 15-minute level by adding 3 dB, as outlined in the *Noise Policy for Industry*.

The NSW EPA *Noise Policy for Industry* (NPfI) provides procedures for the development of appropriate and achievable statutory noise limits. Section 5 of the NPfI notes that a planning approval or licence condition arrived at through the process described in the NPfI should have taken various matters into account. These include *"identification of a practicable (achievable) noise limit"* after adopting all feasible and reasonable mitigation measures.

The Development Consent for the project specifies a noise limit for the BAPS Temple of 33 dBA $L_{Aeq(15minute)}$ in Condition A16. Reference to **Figure 1** shows that the BAPS Temple is immediately adjacent to the south boundary of the development site. The southern boundary is around 15 m from the BAPS Temple site, and Warehouses N, M and O are located around 40 m away.

It is unclear how the 33 dBA noise limit for the BAPS Temple has been derived, however, it is expected to be based on an equivalent contribution from the entire Mamre Road Precinct. When considering the proximity of the BAPS Temple to the development site, and that the development site and surrounding land in the MRP has been rezoned as IN1, it is difficult to justify that the 33 dBA noise limit meets the NPfI principle of being 'practicable' or 'achievable'. For reference, the NSW EPA *Road Noise Policy* describes common noise levels, with noise levels of around 30 dBA being typical of *"quiet countryside"*. It is reasonable to conclude that noise levels immediately adjacent to IN1 zoned land would be expected to be higher than those typical of quiet countryside.

It is noted that the acoustic assessment for the BAPS Temple (Acoustic Logic Report 20171171.1/1001A/R2/TT, dated November 2017) indicates that the site would generate its own noise, including the following sources:

- Up to 300 vehicle movements per hour
- Daily congregation of 50 people chanting
- Weekly congregation of 600 people
- Special event congregation of around 800 people.

For comparison, a Project Noise Trigger Level has been included in **Table 5** for external areas of the BAPS Temple based on the Recommended Amenity Noise Level for areas reserved for passive recreation, as taken from the *Noise Policy for Industry*. This Project Noise Trigger Level equates to 48 dBA (calculated as 50 – 5 + 3). This would allow for the other industrial sites adjacent BAPS to have a similar contribution while meeting the NPfI amenity objective of 50 dBA for passive recreation.

3.2 Cumulative Noise Impacts

The NSW Government *Cumulative Impact Assessment Guidelines for State Significant Projects* requires that the potential combined effect of cumulative impacts on all nearby industrial developments to be considered when assessing potential noise impacts from state significant projects. The guideline references the NPfI when determining the approach to assessing the cumulative industrial noise impacts.

The NPfI states that it aims to limit continuing increases in cumulative industrial noise through the application of amenity noise levels, which are applicable to all industrial noise sources in an area.

The NPfI requires that the amenity noise levels which are applied to an individual project be reduced by 5 dB (or by the value determined when using the formula relevant to areas near clusters of industry) to allow for the potential cumulative impact from multiple sources of industrial noise in an area (including existing and new).

By doing this, the policy accounts for potential cumulative impacts by lowering the criteria for each individual development to ensure that the ambient noise level within an area from all industrial noise sources combined remains below the recommended amenity noise levels, where feasible and reasonable. The NPfI states that *"where the project amenity noise level applies and it can be met, no additional consideration of cumulative industrial noise is required"*.

The potential cumulative impacts from the development and other sources of industrial noise in the area are therefore accounted for in the proposal-specific PNTLs and/or Development Consent Noise Limits (see **Table 5**).

3.3 Sleep Disturbance

The potential for sleep disturbance from maximum noise level events from the proposal during the night-time period is required to be considered. This is applicable only to residential receivers.

The NPfI defines the sleep disturbance screening level as 52 dBA L_{Amax} or the prevailing background level plus 15 dB, whichever is greater.

The Development Consent does not specify a maximum noise level criteria for sleep disturbance events during the night-time. The 52 dBA L_{Amax} screening level has been used for this proposal, which is consistent with the SSDA NIA.

A detailed maximum noise level event assessment should be completed where the sleep disturbance screening level is exceeded. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night-time period.

The NPfI refers to the *Road Noise Policy* (RNP) for additional information regarding sleep disturbance. enHealth Council studies are referenced which indicate that for short-term or transient noise events, for good sleep over eight hours the indoor L_{Amax} sound pressure level should ideally not exceed around 45 dBA more than 10 or 15 times per night.

The RNP goes on to conclude that from the research on sleep disturbance to date:

- Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to awaken people from sleep
- One or two events per night with maximum internal noise levels of 65-70 dBA are not likely to affect health and wellbeing significantly.

3.4 Corrections for Annoying Noise Characteristics

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, intermittency or dominant low-frequency content. The NPfI specifies the following modifying factor corrections, shown in **Table 6**, which are to be applied where annoying characteristics are present. The corrections are to be added to the noise level at the receiver before comparison with the Project Noise Trigger Levels.

Table 6 NPfI Modifying Factor Corrections

Factor	Assessment/ Measurement	When to Apply	Correction[1]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by the levels defined in the NPfI.	5 dB[2]
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements	Measure/assess source contribution C and A weighted $L_{eq,t}$ levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and the level to which the thresholds defined in the NPfI are exceeded.	2 or 5 dB[2]
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level	The source noise heard at the receiver varies by more than 5 dB and the intermittent nature of the noise is clearly audible. The NPfI further defines intermittent noise as noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB, for example, equipment cycling on and off. The EPA has confirmed[4] that the intermittent correction does not apply to short-term events that emerge above the general industrial noise level and is therefore not applicable to industrial or commercial sites that have vehicle or plant movements at night, including audible reversing alarms. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.	5 dB[3]

Factor	Assessment/ Measurement	When to Apply	Correction[1]
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated.	Maximum correction of 10 dB[2] (excluding duration correction)

Note 1: Corrections to be added to the measured or predicted levels.

Note 2: Where a source emits tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

Note 3: Adjustment to be applied to night-time only.

Note 4: *How to Apply the Noise Policy for Industry Intermittent Modifying Factor Corrections*, NSW Environment Protection Authority, Acoustics Australia Vol. 50, No. 3, September 2022.

Details of the modifying factor corrections applied in the assessment are provided in **Section 4.1.7**.

3.5 Residual Impacts

The NPfI defines residual noise impacts as exceedances of the Project Noise Trigger Levels which remain after all feasible and reasonable source and pathway mitigation measures have been considered.

The significance of residual noise impacts, as defined in the NPfI, is shown in **Table 7**. Examples of receiver-based treatments that can be used to mitigate residual impacts are shown in **Table 8**.

Table 7 NPfI Significance of Residual Noise Impacts

If the Predicted Noise Level minus the Project Noise Trigger Level is:	And the Total Cumulative Industrial Noise Levels is:	Then the Significance of the Residual Noise Level is:
≤ 2 dBA	Not applicable	Negligible
≥ 3 but ≤ 5 dBA	< recommended amenity noise level or > recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1dB	Marginal
≥ 3 but ≤ 5 dBA	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB	Moderate
> 5 dBA	≤ recommended amenity noise level	Moderate
	> recommended amenity noise level	Significant

Table 8 NPfI Examples of Receiver-based Treatments to Mitigate Residual Noise Impacts

Significance of Residual Noise Impact	Example of Potential Treatment
Negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls.
Marginal	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
Moderate	As for ‘marginal’, but also upgraded facade elements, such as windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels.
Significant	May include suitable commercial agreements where considered feasible and reasonable.

4.0 Operational Noise Assessment Methodology

The potential operational noise levels from the proposal have been predicted to the surrounding receivers using the ISO 9613-2 algorithm in SoundPLAN, implemented in accordance with ISO 17534.

ISO 9613-2 was used in the SSDA NIA and is an industry standard algorithm that is considered suitable for use in the prediction of noise from industrial sources where intervening objects provide acoustic shielding, such as at the subject site and surrounding area.

The ISO 9613-2 algorithm predicts continuous A-weighted sound pressure levels under noise-enhancing meteorological conditions favourable to downwind propagation, or equivalently, propagation under a well-developed, moderate, ground-based temperature inversion, such as commonly occurs on clear calm nights.

Downwind propagation conditions include wind from source to receiver, with wind speeds of around 1 to 5 m/s, measured at a height of 3 to 11 m above the ground. These propagation conditions are considered consistent with the noise-enhancing weather conditions specified in *Fact Sheet D: Accounting for noise-enhancing weather conditions* of the NPfI.

ISO 9613-2 has been used extensively on industrial projects in Australia over several decades and has been accepted previously by NSW DPE (now DPHI) in numerous environmental noise assessments.

The CONCAWE algorithm in SoundPLAN was also investigated for use in this project, however, given the project area, terrain and separation distances between sources and receivers, ISO 9613-2 was considered to be more appropriate.

The noise model includes ground topography, ground type (ground absorption modelled at 0.75 in the surrounding residential areas and 0.0 within the MRP), buildings and representative worst-case noise sources from the proposal.

The potential noise impacts from the development have been determined by comparing the predicted noise levels to the noise limits in 15-minute assessment periods which are representative of the worst-case expected activity from the development.

The worst-case 15-minute periods have been determined as those with the highest expected volumes of on-site traffic and corresponding activity for the daytime, evening and night-time periods.

The following assessment assumptions are considered to be conservatively representative of the realistic worst-case scenario:

- Vehicle volumes are representative of the expected realistic worst-case 15-minute period occurring simultaneously for each individual lot within the ARIE during the daytime, evening, and night-time periods. This approach assumes that realistic worst-case deliveries, vehicle movements and site activities occur at all lots during the same 15-minute period. In reality, the realistic worst-case 15-minute vehicle volumes would likely occur at different times for each warehouse, based on delivery schedules and shift times.
- All forklifts are conservatively modelled as operating continuously for the full 15-minute period.

- All mechanical plant is conservatively assumed to be operating continuously 24/7. Office plant would most likely be limited to the operating hours of the office, and other individual items of plant may not operate on a 24/7 basis.
- Hard ground (0.00 absorption) has conservatively been modelled across the entire developable area of the MRP. In reality, the area will consist of a mix of hard pavements (such as hardstands and roads), and softer surfaces such as vegetation, foliage and landscaping, and would achieve more absorption.

Based on the above, sufficient conservatism has been included in the modelling assumptions for the realistic worst-case scenarios and an additional engineering safety factor is not considered necessary.

4.1 Operational Noise Sources

At this stage of the development, no information is available regarding future tenants within the ARIE, with the exception of known tenants at Lot G (Swift Transport), Lot H (Icehouse & Ferrero) and Lot J (Mannheim).

Operational details have been provided by the project team and are detailed in the following sections. Several assumptions have been made regarding unknown future tenants and sources of noise, based on the likely uses as warehousing, distribution and light-industry as per the approved concept DA. These assumptions, along with supplied operational information regarding the known tenants have formed the basis of the representative realistic worst-case noise modelling scenarios that reflect the expected highest noise emissions that the development would likely emit.

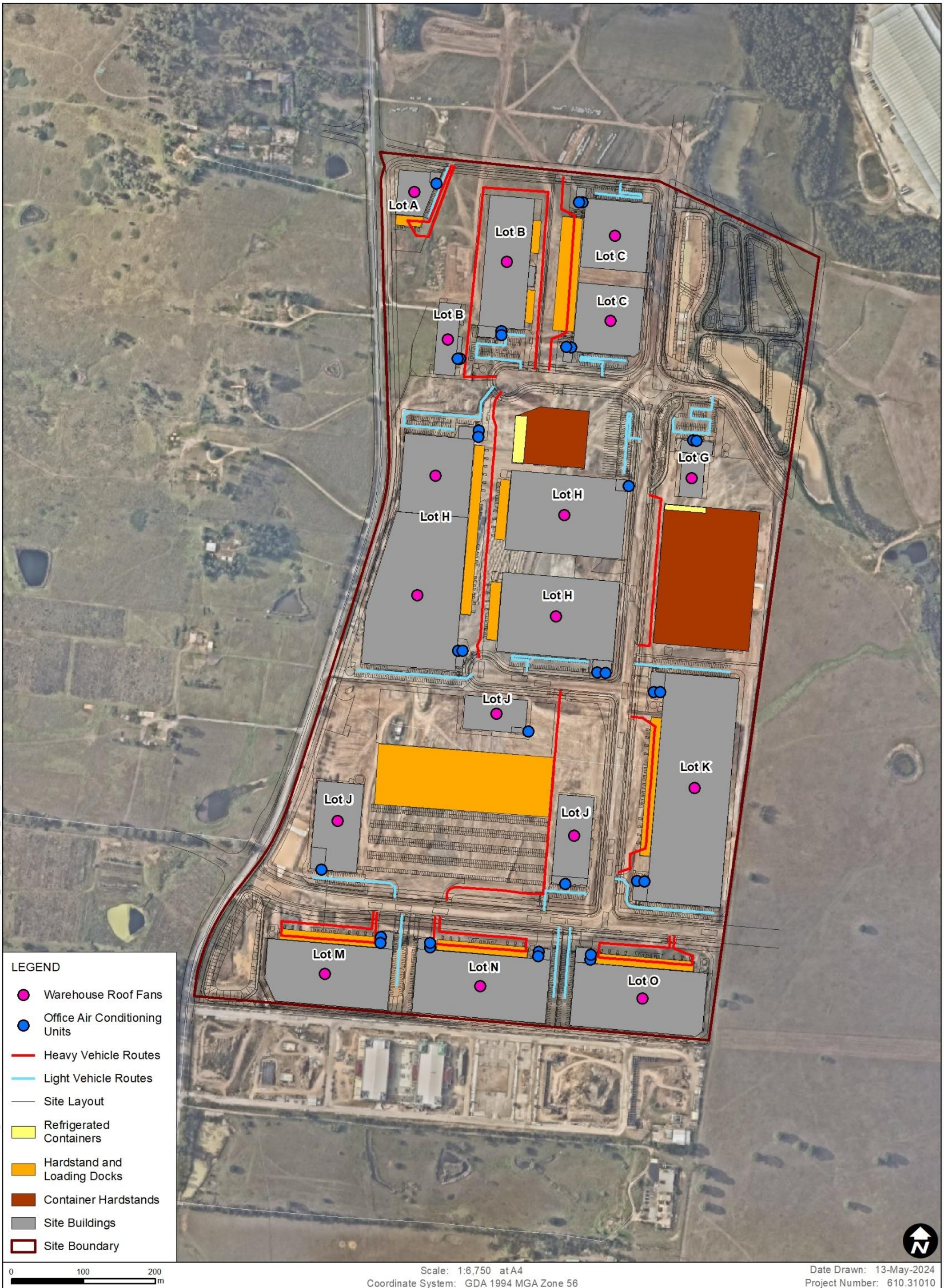
ARIE consists of 13 warehouse buildings with ancillary offices, carparking, loading areas and landscaping. Heavy vehicle deliveries would park in the hardstand loading areas or recessed loading docks while they are loaded/unloaded, before exiting the site. Light vehicle carparking is provided at each warehouse which would generally be used by staff.

Internal noise sources are expected to be minimal and associated with typical logistical, distribution, warehousing and commercial office activities. The ARIE would operate 24 hours a day.

The main sources of operational noise at the development include:

- On-site light and heavy vehicle movements
- Loading dock activities in hardstands
- Container hardstand activities (Lots G and H, only)
- Mechanical plant.

A summary of the expected noise sources and representative worst-case assessment scenarios associated with the operation of the development is provided below. The locations of all modelled noise sources are shown in **Figure 5**.



Scale: 1:6,750 at A4
Coordinate System: GDA 1994 MGA Zone 56

Date Drawn: 13-May-2024
Project Number: 610.31010

Data Source:
Nearmap Imagery April 2024

DISCLAIMER: All information within this document may be based on external sources. SLR Consulting Pty Ltd makes no warranty regarding the data's accuracy or reliability for any purpose.

SLR

OPERATIONAL SOURCES

FIGURE 5

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4.1.1 On-Site Traffic

Realistic worst-case vehicle volumes for each lot in the ARIE have been provided by the project's traffic consultant. Volumes specific to customer's operations have been provided for Lots G, H and J. Volumes for lots with unknown tenants are understood to have been based on the total Gross Floor Area (GFA) of the warehouse relevant to that lot.

Additional analysis of the volumes has been completed to split delivery vehicles into heavy vehicles (ie semi-trailers, B-doubles and A-doubles) and medium vehicles (ie rigid trucks). The modelled vehicle routes are shown in **Figure 5**.

On-site vehicles have been modelled using the data in **Table 9** and **Table 10**. The volumes are representative of the expected realistic worst-case 15-minute period for the daytime, evening, and night-time. Medium and heavy vehicles have been modelled in hardstands and on-lot truck access roads. Light vehicles have been modelled in car parks and on-lot light-vehicle access roads.

Table 9 On-Site Traffic Data – Worst-case 15-Minute Period

Lot	Location	Vehicle Type	Number of Vehicles in Worst-case 15-minute Period[1]		
			Daytime	Evening	Night-time
A	Lot access road/car park	Light vehicle	2	1	2
	Lot access road/hardstand	Medium vehicle	1	1	1
	Lot access road/hardstand	Heavy vehicle	1	1	1
B	Lot access road/car park	Light vehicle	8	3	7
	Lot access road/hardstand	Medium vehicle	2	1	2
	Lot access road/hardstand	Heavy vehicle	1	1	1
C	Lot access road/car park	Light vehicle	10	4	9
	Lot access road/hardstand	Medium vehicle	3	1	2
	Lot access road/hardstand	Heavy vehicle	2	1	1
G	Lot access road/car park	Light vehicle	8	2	7
	Lot access road/hardstand	Medium vehicle	3	2	1
	Lot access road/hardstand	Heavy vehicle	3	2	1
H	Lot access road/car park	Light vehicle	12	5	11
	Lot access road/hardstand	Medium vehicle	9	4	4
	Lot access road/hardstand	Heavy vehicle	3	1	1
J	Lot access road/car park	Light vehicle	28	2	3
	Lot access road/hardstand	Medium vehicle	6	1	1
	Lot access road/hardstand	Heavy vehicle	4	1	1
K	Lot access road/car park	Light vehicle	16	6	15
	Lot access road/hardstand	Medium vehicle	4	2	1
	Lot access road/hardstand	Heavy vehicle	3	1	1
M	Lot access road/car park	Light vehicle	8	3	7
	Lot access road/hardstand	Medium vehicle	2	1	2
	Lot access road/hardstand	Heavy vehicle	1	1	1

Lot	Location	Vehicle Type	Number of Vehicles in Worst-case 15-minute Period[1]		
			Daytime	Evening	Night-time
N	Lot access road/car park	Light vehicle	9	3	8
	Lot access road/hardstand	Medium vehicle	2	1	2
	Lot access road/hardstand	Heavy vehicle	1	1	1
O	Lot access road/car park	Light vehicle	8	3	8
	Lot access road/hardstand	Medium vehicle	2	1	2
	Lot access road/hardstand	Heavy vehicle	1	1	1

Note 1: Total vehicles, includes both inbound and outbound vehicles. Volumes have been rounded up to whole numbers for display purposes.

Table 10 Vehicle Sound Power Levels

Vehicle Classification	Location	Sound Power Level (dBA)	Vehicle Speed (km/h)
Heavy vehicles	Hardstands and on-lot truck access roads	108[1]	10
Medium vehicles	Hardstands and on-lot truck access roads	97[2]	10
Light vehicles	Car parks and on-lot light-vehicle access roads	90[3]	20

Note 1: Sound power level for 'heavy vehicles' based on 106 dBA for trucks at slow speed for 80% of the time and 111 dBA for trucks accelerating for 20% of the time. Sound power levels taken from the Federal Highway Administration's Traffic Noise Model and is representative of trucks with three or more axles.

Note 2: Sound power level for 'medium vehicles' based on 95 dBA for trucks at slow speed for 80% of the time and 100 dBA for trucks accelerating for 20% of the time. Sound power level for 'medium vehicles' is based on measurement data.

Note 3: Sound power level for light vehicles based on measurement data.

The sound power level for medium vehicles is based on SLR measurement data taken over multiple years at multiple locations and includes various medium truck types and models in the approximate 5 to 15 tonne range. Sound power level data is based on pass-by measurement at a known distance with the passby L_{Amax} measurement used to develop the source sound power level. The measured sound power levels ranged from 91-100 dBA for low-speed (5-20km/h) manoeuvring including acceleration. A sound power level of 97 dBA has been used for this assessment.

The sound power level for light vehicles is based on measurement data from SLR's noise measurement database taken over multiple years at multiple locations and includes various light vehicle types and models. Measurements of the L_{Amax} sound power level were made of light vehicle passbys at speeds of up to around 40 km/h, including accelerating conditions. SLR's database for light vehicles indicates a SWL range of 73-90 dBA. A sound power level of 90 dBA has been used for this assessment.

The modelling conservatively assumes that all light, medium and heavy vehicles concurrently access all warehouses during the realistic worst-case 15-minute assessment periods. In reality, vehicle access across the lots would be spread over a longer period, particularly during the night-time.

4.1.2 Hardstand and Loading Docks

Details of the hardstand and loading dock noise sources are shown in **Table 11**. The various sources have been modelled in the hardstand areas (see **Figure 5**) based on the corresponding number of heavy vehicle movements occurring in the worst-case 15-minute periods (see **Table 9**).

Table 11 Typical Loading Dock Noise Sources – All Buildings

Noise Source	Sound Power Level (dBA)[1]	Typical Duration of Use in Realistic Worst-case 15-minute Period
Truck reversing alarm	107[2]	30 seconds
Forklift reversing alarm	102[2]	90 seconds
Truck air brakes	118	1 second
Roller door	94	15 Seconds
Electric forklift	84	900 seconds

Note 1: Sound power level taken from SLR's measurement database unless specified otherwise.
Note 2: Sound power level includes a -3 dB reduction due to alarms being discrete events.

4.1.3 Container Hardstands

Container hardstands are proposed at Lot G (Swift Transport) and Lot H (Icehouse/Ferrero), which include the use of both reach stackers and refrigerated containers.

Attended noise measurements were completed at an existing Icehouse site to determine suitable sound power levels for container hardstand noise sources. The measurements are summarised in **Appendix B**. Details of the container hardstand noise sources are shown in **Table 12**.

Table 12 Container Hardstands

Item	Sound Power Level (dBA)	Typical Duration of Use in Realistic Worst-case 15-minute Period
Reach stacker	109	Depends on number of work cycles[1]
Refrigerated containers	78	900 seconds

Note 1: See **Appendix B** for further details of work cycle sound power levels.

Reach stackers have been modelled in container hardstand areas (see **Figure 5**) based on the corresponding number of heavy vehicle movements occurring in the worst-case 15-minute periods (see **Table 9**).

It is currently unknown how many refrigerated containers would be required at Lot G and H. A nominal 10 refrigerated containers have been assumed at each lot, based on the expected worst-case operations.

Five containers have been assumed to be at ground level, with an additional five stacked on-top. The resultant height of each source has been modelled at 1 m (for the ground stack) and 3.6 m (for the elevated stack), based on a typical 2.6 m height for a standard shipping container.

The refrigerated containers have been assumed to be located in one bay of both container hardstand areas, and the containers are assumed to be continuously operational during all periods.

4.1.4 Internal Activities

The future tenants of the warehouses would likely be associated with typical warehousing and distribution or light industrial uses. Internal noise-generating activities at all warehouses are generally expected to be minimal. A sound power level of 75 dBA has been applied at openings on the facades of each warehouse to cover potential break-out noise from general internal activities. The sound power level is based on observations of loading activities at similar warehouse facilities. Warehouse roller shutter doors are assumed to be open during loading activities.

4.1.5 Mechanical Plant

At this early stage of the development, specific mechanical plant requirements for each building have not been determined. External mechanical plant noise emissions would be reassessed during the production of Design Noise Verification Reports during the detailed design stage of the project, when more definitive information is available.

Indicative external mechanical plant types, sound power levels and number of units have been assumed based on the requirements of similar warehouse developments.

The assumed sound power levels and hours of operation for fixed external mechanical plant are detailed in **Table 13**. Equipment locations are shown in **Figure 5**.

Table 13 External Mechanical Plant Details

Noise Source	Sound Power Level (dBA)	Location and Operating Hours
Office air conditioning condenser units	78 (per unit)	At ground level, adjacent to each office building (one per floor). Assumed operational 24/7
Roof fans	80[1] Stage 1 warehouse 90 All other warehouses (one source has been modelled per warehouse building, which represents the cumulative sound power level of all roof mounted mechanical plant for that warehouse)	Warehouse roofs. Assumed operational 24/7

Note 1: Condition D53(b) requires cumulative noise emission of fixed external mechanical plant for the Stage 1 warehouse building to not exceed 80 dBA. This is considered unreasonable and not achievable and is discussed further below.

It is noted that Condition D53(b) requires the cumulative sound power level from fixed mechanical plant for the Stage 1 warehouse building to not exceed 80 dBA $L_{Aeq(15minute)}$. While the noise model has applied 80 dBA for Stage 1, this limit is not considered reasonable or achievable for an industrial warehouse on IN1 zoned land. Any warehouse on IN1 zoned land would be required to have several items of externally mounted mechanical plant, such as roof mounted fans and air-conditioning units, which would cumulatively add to more than 80 dBA. For reference, a single air-conditioning condenser serving a small office would typically have a sound power level of around 80 dBA.

The consent defined sound power level limit does not account for any source directivity or allow for other forms of mitigation to reduce the potential impacts, such as source positioning or path control measures (ie at-source barriers), should they be required. It also does not allow for the optimisation of individual items of mechanical plant within the development to reduce noise levels at receivers.

4.1.6 Noise Sources with Potential for Sleep Disturbance

As the development is to operate 24-hours a day, noise emissions during the night-time require assessment for potential sleep disturbance at the nearest residential receivers. The details of typical activities with the potential to cause sleep disturbance are shown in **Table 14**.

Table 14 Sleep Disturbance Noise Sources

Noise Source	Sound Power Level L_{Amax} (dBA)
Accelerating trucks in on-lot truck access and hardstands	110
Truck air brakes in hardstands	118[1]
Truck reversing alarm in hardstands	110
Forklift reversing alarm in hardstands	105
Light vehicle movements in carparks and on-lot light-vehicle access	100

Note 1: Condition A17 requires activities at the site to not exceed a sound power level of L_{Amax} 115 dBA. This is considered unreasonable and not achievable and is discussed further below.

Truck air brakes are the source with the highest maximum sound power level on the site of L_{Amax} 118 dBA. It is noted that Condition A17 requires all activities on site to not exceed a sound power level of L_{Amax} 115 dBA.

However, 115 dBA is less than what can potentially be expected from truck airbrakes. Given that this noise source would be produced by an external vehicle fleet and not directly controlled by the development's clients, it is impractical to apply the sound power level restriction as it is currently worded in Condition A17. A sound power level of 118 dBA has conservatively been applied to air brakes in the noise model, consistent with SLR's measurement database.

As discussed in **Section 4.1.5**, sound power level limits are considered unnecessary and do not account for the benefit of mitigation measures. A sleep disturbance assessment and further discussion regarding L_{Amax} sound power levels is provided in **Section 5.2**.

4.1.7 Corrections for Annoying Noise Characteristics.

The potential annoying noise characteristics and modifying factor corrections relevant to the project are:

- **Tonality** – the only source identified with potential tonal characteristics is reversing alarms. However, when considering broadband reversing alarms have been recommended as a noise mitigation measure (see **Section 7.2**), it is unlikely that this noise source would result in tonal noise impacts at the receivers and no corrections have been applied.
- **Low frequency noise** – review of the predicted noise levels at the nearest receivers and previous measurements of sources similar to those operating at the development indicate that low frequency noise impacts are not expected, and no corrections have been applied.

- **Intermittent noise –** the NPfI defines intermittent noise as noise heard at the receiver where the level suddenly drops or increases several times during the assessment period, with a noticeable change of at least 5 dB. The intermittent correction does not apply to short-term events that emerge above the general industrial noise level and is therefore not applicable to industrial or commercial sites that have vehicle or plant movements at night, including audible reversing alarms. No sources have been identified with potential intermittent characteristics.

4.2 Mamre Road Precinct

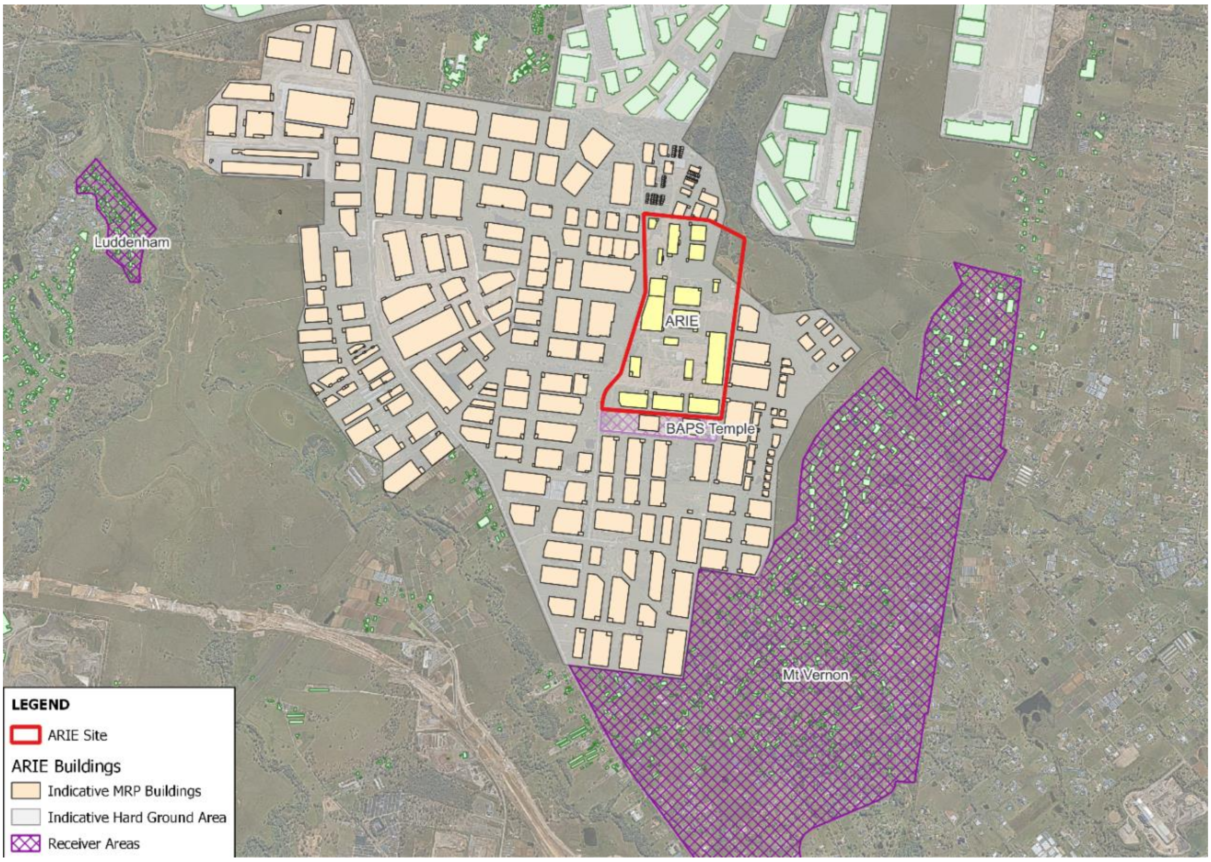
Indicative future warehouse buildings in the MRP have been included in the noise model, along with associated areas of hard ground (modelled with a ground absorption of 0.00). Areas outside of the MRP have been modelled as rural soft ground (with a ground absorption of 0.75).

Future warehouse buildings are based on an indicative layout of the MRP which considered the MRP Development Control Plan built form controls, including proposed road corridors and other easements, and existing ground levels. The indicative layout of buildings within the MRP is based on Figure 1 of Renzo Tonin Report TN328-02F02 DNVR (r6) 'Aspect Industrial Estate Stage 2 Warehouse 9 Design Noise Verification Report,' issued 17 July 2023, which has been approved by the DPE. All future buildings are indicative and subject to change in their respective development applications.

The indicative buildings have been modelled at the existing ground level and are assumed to be 16 m height.

The modelled indicative buildings with associated hard ground are shown in **Figure 6**.

Figure 6 Indicative Future MRP Warehouse Buildings



4.3 Prevailing Weather Conditions

Fact Sheet D of the NPfI requires noise assessments to consider the potential effects of noise-enhancing weather conditions, such as wind from the source to the receiver and/or temperature inversions.

Analysis of the prevailing weather conditions has been undertaken in accordance with the NPfI for a 10-year period from 2013 to 2022 to determine the prevailing wind and temperature inversion conditions at the site. Wind data was obtained from the Bureau of Meteorology automatic weather station at Horsley Park, and cloud cover data (to determine the occurrence of temperature inversions) from the Bureau of Meteorology automatic weather station at Bankstown Airport.

The weather data was analysed to determine the frequency of occurrence of wind speeds up to 3 m/s in each period. The NPfI states that where wind blows from the source to the receiver at speeds of up to 3 m/s for more than 30% of the daytime, evening or night-time in any season, then wind is considered to be a feature of the area. The results of the wind analysis are presented for the daytime, evening and night-time periods in **Table 15**, **Table 16**, and **Table 17** respectively.

Table 15 Occurrence of Noise-Enhancing Winds for Daytime Period

Season	Percentage of Occurrence of Noise-Enhancing Winds (0.5-3 m/s) (Winds Blowing From)							
	North	Northeast	East	Southeast	South	Southwest	West	Northwest
Summer	7.4%	19.0%	12.5%	13.4%	14.0%	10.6%	7.2%	10.2%
Autumn	5.6%	13.3%	8.7%	10.3%	14.1%	19.0%	17.7%	16.4%
Winter	6.2%	7.4%	3.8%	5.8%	9.2%	18.5%	23.1%	23.4%
Spring	7.4%	14.6%	8.7%	7.7%	8.5%	10.8%	12.2%	16.5%

Note 1: Noise-enhancing winds (0.5-3 m/s) were calculated per direction ±45 degrees during the daytime (7 am to 6 pm) for each season.

Table 16 Occurrence of Noise-Enhancing Winds for Evening Period

Season	Percentage of Occurrence of Noise-Enhancing Winds (0.5-3 m/s) (Winds Blowing From)							
	North	Northeast	East	Southeast	South	Southwest	West	Northwest
Summer	1.6%	13.3%	20.6%	16.4%	9.6%	3.6%	2.1%	2.4%
Autumn	1.9%	13.3%	19.6%	22.3%	22.2%	16.8%	10.5%	6.8%
Winter	4.0%	6.2%	8.8%	14.3%	20.6%	25.1%	21.4%	16.8%
Spring	2.5%	14.9%	20.2%	16.8%	11.4%	7.3%	7.5%	6.7%

Note 1: Noise-enhancing winds (0.5-3 m/s) were calculated per direction ±45 degrees during the daytime (6 pm to 10 pm) for each season.

Table 17 Occurrence of Noise-Enhancing Winds for Night-time Period

Season	Percentage of Occurrence of Noise-Enhancing Winds (0.5-3 m/s) (Winds Blowing From)							
	North	Northeast	East	Southeast	South	Southwest	West	Northwest
Summer	2.5%	11.0%	13.6%	19.6%	28.4%	22.8%	9.0%	4.1%
Autumn	1.3%	2.8%	2.5%	6.1%	21.2%	**35.7%**	24.0%	9.9%
Winter	3.9%	1.9%	0.3%	1.2%	10.0%	**33.0%**	**33.0%**	20.5%
Spring	3.8%	6.9%	7.0%	10.3%	20.7%	26.1%	17.2%	10.5%

Note 1: Noise-enhancing winds (0.5-3 m/s) were calculated per direction ±45 degrees during the daytime (10 pm to 7 am) for each season.

The analysis determined that standard weather conditions are prevalent in the MRP during the daytime, evening and night-time periods, with noise-enhancing wind only during the night-time period.

The weather data was also analysed to estimate the frequency of occurrence of temperature inversions during the night-time in winter. This analysis used the Pasquill-Gifford stability classification scheme based on cloud cover as detailed in Fact Sheet D of the NPfI. The NPfI states that where the sum total of F and G category inversions occur for at least 30% of the total night-time during the winter, then temperature inversions are considered to be a feature of the area. The results of the stability class analysis are presented in **Table 18**.

Table 18 Occurrence of Stability Classification Distribution during the Night-time Period in Winter

Stability Class	Category Description	Frequency of Occurrence During Night-time in Winter
D	Neutral	3%
E	Slightly stable	10%
F	Moderately stable	17%
G	Extremely stable	31%
Sum Total: F+G	**Moderately to Extremely Stable**	**48%**

Note 1: Stability classes A (extremely unstable), B (moderately unstable) and C (slightly unstable) have not been shown as they are not relevant to the analysis of temperature inversions.

The above analysis shows that noise-enhancing temperature inversions are a feature of the area during the night-time in winter. Temperature inversions can occur under calm wind conditions (up to 0.5 m/s), and also under winds up to 2 m/s.

The noise prediction modelling uses ISO 9613-2 algorithms which include noise-enhancing weather conditions including downwind propagation, or equivalently, propagation under a well-developed moderate ground-based temperature inversion.

As such, the assessment has conservatively applied noise-enhancing weather conditions for all periods as per Option 1 of Fact Sheet D of the NPfI.

5.0 Assessment of Operational Impacts

5.1 Predicted Noise Levels

A summary of the worst-case operational noise assessment at the receivers surrounding the proposal is shown in **Table 19**. The predicted levels include all noise sources operating simultaneously across the entire ARIE and represent the expected highest cumulative noise emissions that the development would likely emit. Noise contours for the realistic worst-case noise emission scenarios are in **Appendix C**.

Feasible and reasonable mitigation measures have been investigated for the development with the aim of minimising noise emissions from the site as far as practicable. A detailed investigation of all potential feasible and reasonable mitigation measures considered and applied to the development is provided in **Section 7.2**. The following predictions include the recommended mitigation measures.

Table 19 Operational Noise Assessment

Receiver	Period	Noise Level $L_{Aeq(15minute)}$ (dBA)					Compliance (Consent Limit / PNTL)
		Noise Criteria		Predicted	Exceedance		
		Consent Noise Limit	PNTL		Consent Noise Limit	PNTL	
Receivers Within MRP							
MRP 01	Daytime	n/a	40	36	n/a	-	n/a / Yes
	Evening	n/a	35	32	n/a	-	n/a / Yes
	Night-time	n/a	35	33	n/a	-	n/a / Yes
MRP 02 (SSDA NIA 05)	Daytime	n/a	40	38	n/a	-	n/a / Yes
	Evening	n/a	35	34	n/a	-	n/a / Yes
	Night-time	n/a	35	35	n/a	-	n/a / Yes
MRP 03 to MRP 06	Daytime	n/a	40	36	n/a	-	n/a / Yes
	Evening	n/a	35	30	n/a	-	n/a / Yes
	Night-time	n/a	35	30	n/a	-	n/a / Yes
MRP 07 to MRP 08	Daytime	n/a	40	34	n/a	-	n/a / Yes
	Evening	n/a	35	28	n/a	-	n/a / Yes
	Night-time	n/a	35	29	n/a	-	n/a / Yes
Receiver Areas Outside MRP / Receivers Identified in the Development Consent							
Medinah Avenue, Luddenham	Daytime	40	n/a	23	-	n/a	Yes / n/a
	Evening	35	n/a	17	-	n/a	Yes / n/a
	Night-time	30	n/a	18	-	n/a	Yes / n/a
Mt. Vernon Road, Capitol Hill & Kerrs Road, Mt, Vernon	Daytime	40	n/a	34	-	n/a	Yes / n/a
	Evening	35	n/a	30	-	n/a	Yes / n/a
	Night-time	30	n/a	30	-	n/a	Yes / n/a
BAPS – Gardens	When in use	33	48	37	4	-	No / Yes
BAPS – Central	When in use	33	48	39	6	-	No / Yes
BAPS – Mandir L	When in use	33	48	49	16	1	No / No
BAPS – Mandir U	When in use	33	48	47	14	-	No / Yes

The above assessment indicates the following:

- Noise from the development is predicted to comply with the Project Noise Trigger Levels at all existing receivers within the MRP during all periods.
- Noise from the development is predicted to comply with the Consent Noise Limits at the residential receivers near Medinah Avenue (Luddenham), Mount Vernon Road (Mount Vernon) and Kerrs Road (Mount Vernon).
- Noise levels at the BAPS Temple are predicted to generally comply with the Project Noise Trigger Level, except for a 1 dB exceedance at the Mandir Temple during the worst-case noise emission scenarios.
- Noise levels at the BAPS Temple are predicted to exceed the Consent Noise Limit during the worst-case noise emission scenarios by between 4 and 16 dB, depending on location. The following is noted with regard to these predicted exceedances:
  - The assessment predicts the worst-case noise emissions from the site which assumes the highest amount of deliveries, vehicle movements and site activities all occur at all lots simultaneously during the same 15-minute period. This scenario is not expected to happen frequently (if at all). Noise levels and impacts outside of the worst-case scenario would be much lower than predicted.
  - The Development Consent specifies a noise limit of 33 dBA for the BAPS Temple. **Section 3.1** discusses that this is neither a practicable nor achievable noise criteria, given the proximity of the development site (which has been rezoned as IN1 land) to the BAPS Temple.
  - For comparison, a Project Noise Trigger Level has been included in **Table 19** for external areas of the BAPS Temple based on the Recommended Amenity Noise Level for areas reserved for passive recreation, as taken from the *Noise Policy for Industry*. Noise levels from the development are predicted to generally comply with this Project Noise Trigger Level, except for a 1 dB exceedance at the Mandir Temple during the worst-case noise emission scenarios.
- The exceedances at the BAPS Temple are mostly due to heavy vehicle movements and loading dock activities on Lots J and K, with noise from other lots also contributing but to a lesser degree.

Further discussion of the feasible and reasonable mitigation measures considered and applied to the development, including specific measures to reduce impacts at the BAPS Temple are provided in **Section 7.2**.

5.2 Sleep Disturbance

A summary of L_{Amax} noise levels predicted at the nearest residential receivers is shown in **Table 20**. The predicted L_{Amax} levels are compared to the sleep disturbance screening level for each residential receiver.

Table 20 Sleep Disturbance Assessment

Receiver Location	Source	Noise Level L_{Amax} (dBA)			Below Screening Level
		Sleep Disturbance Screening Level (dBA)	Predicted Noise Level (dBA)	Exceedance (dB)	
Receivers Within MRP					
MRP 01	All sources	52	≤48	-	Yes
MRP 02 (SSDA NIA 05)	All sources	52	≤52	-	Yes
MRP 03 to MRP 06	All sources	52	≤42	-	Yes
MRP 07 to MRP 08	All sources	52	≤41	-	Yes
Receiver Areas Outside MRP / Receivers Identified in the Development Consent					
Medinah Avenue, Luddenham	All sources	52	≤30	-	Yes
Mt. Vernon Road, Capitol Hill & Kerrs Road, Mt, Vernon	All sources	52	≤44	-	Yes

The above assessment indicates that maximum noise events from the proposal are predicted to be below the sleep disturbance screening level at all surrounding residential receivers.

The assessment demonstrates that the development is not expected to cause sleep disturbance at the nearest residential receivers when operating with truck airbrakes with a sound power level of L_{Amax} 118 dBA.

5.3 Off-site Traffic Assessment

Traffic associated with the development would enter and exit from Aldington Road. Traffic would initially travel south on Aldington Road to Abbotts Road, then north or south along Mamre Road. In the future, following construction of the Southern Link Road to the north of the site, traffic would either travel north or south on Aldington Road.

It is expected that traffic noise levels in the wider MRP would increase as the precinct is progressively developed and the various estates become operational. Impacts from increased traffic noise are likely to occur at certain receivers within the MRP as the precinct is developed.

6.0 Cumulative Impacts

The NSW Government *Cumulative Impact Assessment Guidelines for State Significant Projects* requires that the potential combined effect of cumulative impacts on all nearby industrial developments to be considered when assessing potential noise impacts from state significant projects.

Cumulative impacts can be caused by the compounding effects of multiple projects in an area, and by the accumulation of effects from past, current and future activities as they arise.

6.1 Construction Noise

Cumulative construction noise impacts can occur where multiple work activities are being completed near to a particular receiver at the same time.

Construction noise impacts were previously assessed in SLR Report *610.31010.00000-R04 – Lots G, H and J SSD Applications – Construction Noise and Vibration Impact Statement*, dated February 2024. This Construction Noise and Vibration Impact Statement (CNVIS) concluded that construction noise levels are generally predicted to comply with the management levels at the nearest sensitive receivers. Low impact exceedances at two of the nearest sensitive receivers were predicted during some of the nosiest work activities.

While construction impacts from the proposal are expected to mostly be compliant, the work has the possibility of interacting with the construction activities of other nearby projects within the MRP, if they are constructed at the same time.

The construction schedules for the various projects are currently unknown, meaning a detailed assessment of the potential for cumulative impacts is not able to be completed.

Since construction scenarios and equipment for the various projects would generally require similar items of equipment to the proposal, concurrent construction work could theoretically increase the worst-case noise levels from the proposal by around 3 dB (ie a logarithmic adding of two sources of noise at the same level). The likelihood of worst-case noise levels being generated by works on different projects at the same time is, however, considered low.

As such, cumulative construction impacts are not considered likely to significantly alter the predictions from the proposal and no specific mitigation to address cumulative impacts is expected to be required.

The potential cumulative impacts from the proposal and other projects would continue to be considered as the project progresses when detailed construction planning is developed as part of preparation of the site's Construction Environmental Management Plans (CEMPs).

6.2 Operational Noise

The *Noise Policy for Industry* states that it aims to limit continuing increases in cumulative industrial noise through the application of amenity noise levels, which are applicable to all industrial noise sources in an area.

The policy accounts for potential cumulative impacts by lowering the criteria for each individual development to ensure that the ambient noise level within an area from all industrial noise sources combined remains below the recommended amenity noise levels, where feasible and reasonable. As such (as discussed in **Section 3.2**), the potential cumulative operational impacts from the proposal and other potential sources of industrial noise in the area are accounted for in the proposal-specific PNTLs and Development Consent Noise Limits and, therefore, do not require further consideration.

7.0 Mitigation and Management Measures

7.1 Construction Impacts

The potential noise and vibration impacts during construction were previously assessed in *SLR Report 610.31010.00000-R04 – Lots G, H and J SSD Applications – Construction Noise and Vibration Impact Statement*, dated February 2024.

The CNVIS report recommended variation mitigation and management measures to control the impacts as far as practicable, and can be referenced where additional information is required.

A Construction Noise and Vibration Management Plan (CNVMP) would be prepared before any work begins for the on-lot development works. This would identify all potentially impacted receivers, assess the potential noise and vibration impacts from the proposal and provide details regarding how the impacts would be minimised through the use of all feasible and reasonable mitigation measures.

The CNVMP would also contain procedures for handling complaints, should they occur, and detail any compliance monitoring requirements.

7.2 Operational Noise Impacts

Where operational noise impacts are predicted from a development, all feasible and reasonable operational noise mitigation and management measures should be considered.

The typical hierarchy for mitigation and management of industrial noise sources is as follows:

- Reducing noise emissions at the source (ie noise source control).
- Reducing noise in transmission to the receiver (ie noise path control).
- Reducing noise at the receiver (ie at-receiver control).

7.2.1 Summary of Feasible and Reasonable Mitigation Measures

A detailed assessment of all feasible and reasonable mitigation measures that could be applied to the development to minimise the operational noise impacts has been completed and is summarised in **Table 21**.

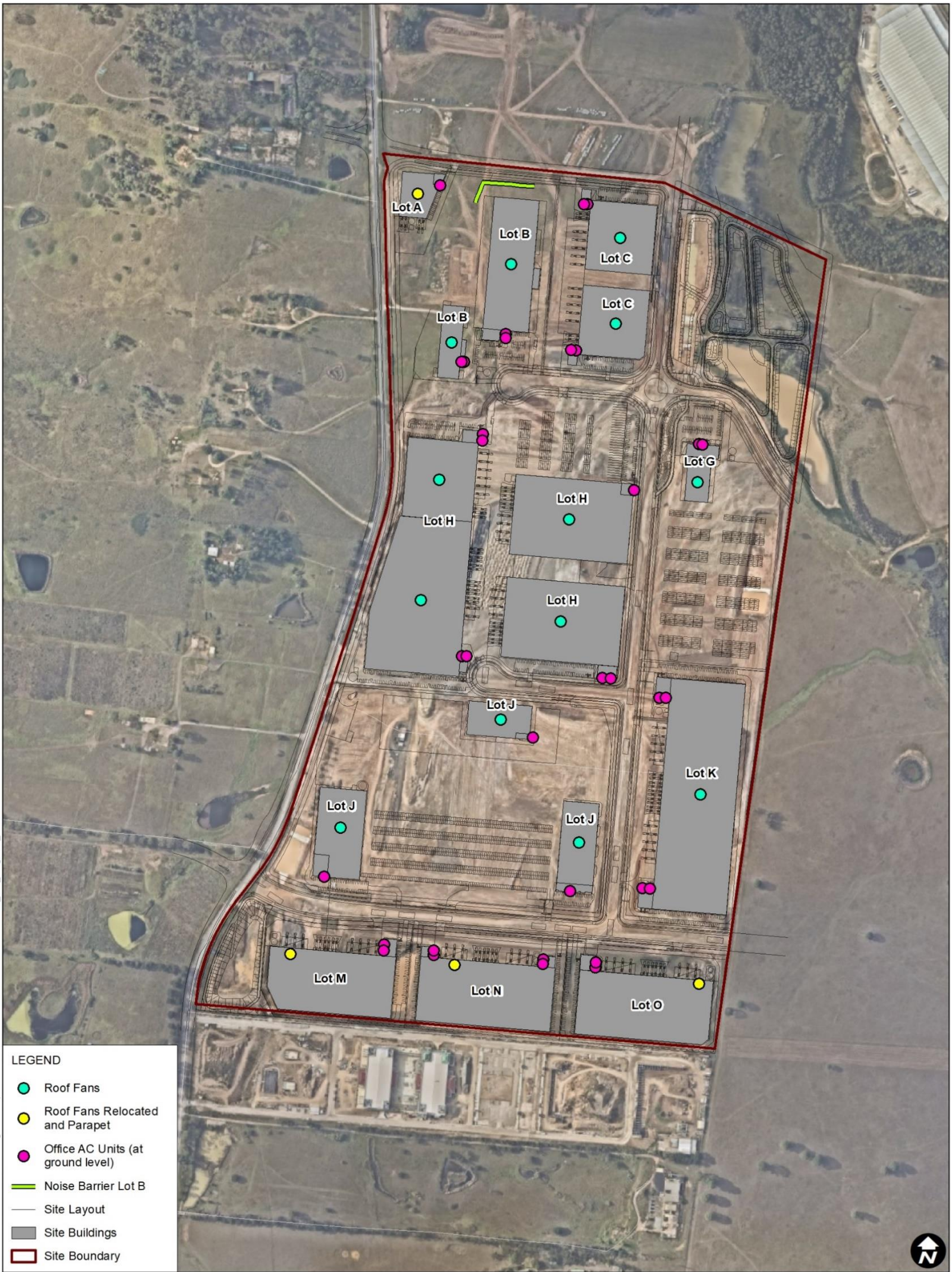
Additional analysis of mitigation measures that were considered but not deemed feasible or reasonable is provided in **Section 7.2.2**.

Table 21 Summary of Considered Feasible and Reasonable Mitigation Measures

Ref.	Mitigation Option	Noise Impact/Benefit	Reasonable and Feasible to Apply
Source Control			
S1	Mechanical plant located at ground, where possible.	Reduce potential noise emissions by locating equipment at ground level as opposed to elevated positions.	**Yes** – all office air-conditioning units have been located at ground level (see **Figure 7**) to minimise noise emissions.
S2	Mechanical plant on warehouse roofs of Lot M, N and O relocated to northern side.	Reduce potential noise impacts to BAPS Temple	**Yes** – the roof mounted mechanical plant has been relocated to the northern side of the warehouse roofs of Lot M, N and O to maximise the distance to the BAPS Temple (see **Figure 7**). The requirements for roof mounted mechanical plant would be confirmed during production of Detail Noise Verification Reports completed during detailed design.
S3	Parapet around roof mounted mechanical plant on Lots A, M, N and O.	Reduce potential noise emissions by providing screening to roof mounted mechanical equipment.	**Yes** – 1.5 m parapets have been included around roof mounted mechanical plant at Lots A, M, N and O (see **Figure 7**). This reduces noise impacts at BAPS Temple and other nearby receivers. The requirements for parapets would be confirmed during production of Detail Noise Verification Reports completed during detailed design.
S4	Optimised site layout to minimise noise emissions from the site	Where possible, the site layout has been designed so that the warehouse buildings screen the noisier areas of the development (ie hardstands and truck routes) from the nearest receivers.	**Yes** – applied during design of the masterplan.
S6	Limit vehicle movements	A reduction in vehicle volumes across the site could reduce noise emissions.	No – a reduction in heavy vehicles of 25% at lots with unknown tenants was considered. This, however, was not considered feasible and reasonable as it would not result in a perceptible change to noise impacts. See **Section 7.2.2** for further discussion.
S7	Use broadband and/or ambient sensing alarms on trucks and forklifts where they are required to reverse during the night-time.	Reduce potential for annoying noise emissions during the night-time from forklifts and trucks.	**Yes** – use broadband and/or ambient sensing alarms on forklifts and trucks where they are required to reverse during the night-time.

Ref.	Mitigation Option	Noise Impact/Benefit	Reasonable and Feasible to Apply
S8	Appropriate design of site layout to minimise the need for trucks to stop or brake outside of loading docks with line of sight to residential receivers.	Minimise noise emissions, particularly from truck airbrakes.	**Yes** – applied during design of the concept masterplan
S9	Production of an Operational Noise Management Plan.	This would detail the measures that could be used by the various tenants to minimise general noise emissions from the site, such as restricting the use of truck air brakes, where possible. Reference can be made to the Best Management Practice (BMP) and Best Available Technology Economically Available (BATEA) measures listed in the NPfI.	**Yes** – an Operational Noise Management Plan will be prepared for the ARIE, as required by Condition A18 of the Development Consent.
Path Control			
P1	Localised noise barrier on Lot B	Use of localised noise barrier to reduce noise emissions from Lot B truck access routes.	**Yes** – a 2.5 m noise barrier on Lot B is considered reasonable and is included in the assessment (see **Figure 7**).
P2	Localised noise barrier on Lot J and K	Localised noise barriers could be used to reduce noise emissions from Lot J and K truck access routes and hardstands to the BAPS Temple.	No – 5 m noise barriers at these lots were investigated, however they were not considered feasible and reasonable as they would not result in a perceptible change to noise impacts. See **Section 7.2.2** for further discussion.
P3	Southern boundary noise barrier	A noise barrier could be constructed along the entire southern site boundary to minimise noise levels at the BAPS Temple.	No – a large 10 m noise barrier on the southern boundary was investigated, however it was not considered feasible and reasonable as it would not result in a perceptible change to noise impacts. The use of a 10 m noise barrier would also likely introduce significant impacts to visual amenity and result in potential overshadowing impacts. See **Section 7.2.2** for further discussion.
P4	Awnings above hardstands	Reduce potential noise emissions from the site.	**Yes** – awnings have been included in the noise model as per the architectural drawings.
Receiver Control			
R1	Treatment to residential receiver properties	Not required	Not required

Ref.	Mitigation Option	Noise Impact/Benefit	Reasonable and Feasible to Apply
R2	Noise Agreements	Condition D55 requires the applicant to offer to enter into a Noise Agreement(s) with eligible receivers (outside of the Mamre Road Precinct) where noise limits are predicted to be exceeded. Condition D56 notes that where a Noise Agreement is in place with specific receiver(s), the noise limits do not apply to that receiver(s).	**Yes** – the assessment predicts residual impacts at the BAPS Temple. As such, it is recommended that an offer to enter into a Noise Agreement is made with the BAPS Temple. See **Section 7.2.3** for further discussion.
Verification			
V1	Design Noise Verification Report	Undertake further assessment of the proposal and associated impacts when more detailed information is available.	**Yes** – Design Noise Verification Reports would be completed during detailed design. These would confirm the noise predictions, impacts and mitigation requirements discussed in this report.
V2	Noise monitoring	Verify post-construction operational noise levels are compliant with the relevant noise limits.	**Yes** – verification monitoring would be completed within three months of commencement of operation, as per the requirements Condition D57 of the Development Consent.



0 100 200 m

Scale: 1:6,750 at A4
Coordinate System: GDA 1994 MGA Zone 56

Date Drawn: 13-May-2024
Project Number: 610.31010

Data Source:
Nearmap Imagery April 2024

SLR

DISCLAIMER: All information within this document may be based on external sources. SLR Consulting Pty Ltd makes no warranty regarding the data's accuracy or reliability for any purpose.

PROPOSED FEASIBLE AND REASONABLE MITIGATION

FIGURE 7

H:\Projects-SLR\610-SrvSYD\610-SYD\610.31010.00000 200 Aldington Road, MRP\06 SLR Data\01 CADGIS\GIS\SLR61031010_F07_Mitigation_02.mxd

7.2.2 BAPS Temple – Mitigation Considered but Not Feasible or Reasonable

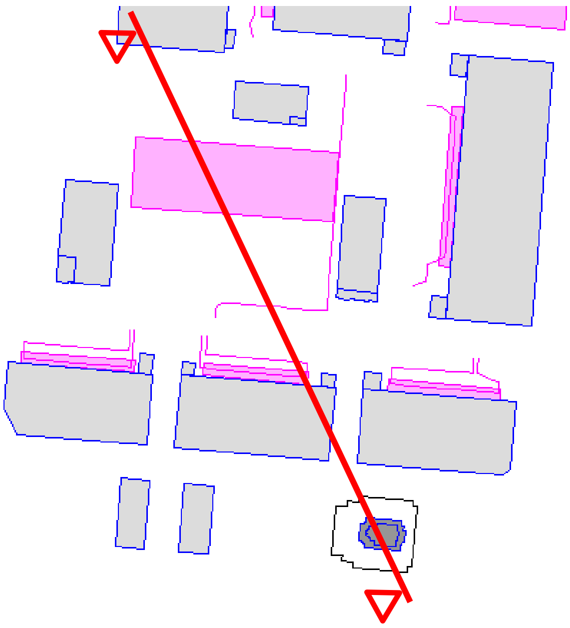
The noise assessment in **Section 5.0** concluded that operational noise levels are expected to comply with the noise criteria at most of the surrounding receivers. Exceedances were, however, predicted at the BAPS Temple during the assessed worst-case noise emission scenarios.

The exceedances at the BAPS Temple are mostly due to heavy vehicle movements and loading dock activities on Lots J and K, with noise from other lots also contributing but to a lesser degree.

It is noted that the BAPS Temple site is in an elevated location and overlooks the development site, as shown in **Figure 8** and **Figure 9**.

Figure 8 Cross Section of Development Site and BAPS Temple

Figure 9 Cross Section Alignment



All feasible and reasonable noise mitigation measures have been considered to reduce noise levels from the development as far as practicable (see summary in **Table 21**).

Additional discussion regarding mitigation measures aimed at reducing noise impacts at the BAPS Temple but which were not considered feasible or reasonable is provided below.

7.2.2.1 Localised Noise Barriers at Lot J and K

Localised 5 m noise barriers around the hardstands of Lot J and K were considered with the aim of reducing noise from heavy vehicle movements and loading dock activities at these lots. The location of the noise barrier is shown in **Figure 10**.

Figure 10 Localised Noise Barriers at Lot J and K

This exercise concluded that these noise barriers generally provided around 1 dB of additional noise benefit at most of the assessment locations at the BAPS Temple, with up to 2 dB being provided a small number of locations.

The poor performance of these noise barriers is due to the BAPS Temple overlooking the development site, as shown in **Figure 8**. The elevated nature of the BAPS Temple means that noise barriers are not able to block line of sight to the various sources of noise effectively.

Noise barriers are generally considered feasible and reasonable where they provide at least 5 dB benefit. Changes in noise of 2 dB or less are not considered perceptible to the average person. As such, localised noise barriers around Lot J and K are not considered feasible and reasonable due to the negligible benefit they would provide.

7.2.2.2 Southern Boundary Noise Barrier

A large 10 m noise barrier along the southern boundary of the site was considered with the aim of reducing noise from the entire development site to the BAPS Temple. The location of the noise barrier is shown in **Figure 11**.

Figure 11 Southern Boundary Noise Barrier

This exercise concluded that the noise barrier provided around 0.5 dB additional noise benefit at most impacted assessment locations at the BAPS Temple, with around 1 dB being generally provided at most other locations.

The poor performance of the noise barriers is again due to the BAPS Temple site overlooking the development site, as shown in **Figure 8**. The elevated nature of the BAPS Temple means that the noise barrier is not able to block line of sight to the various sources of noise effectively.

Noise barriers of greater than 5 m in height are generally considered feasible and reasonable where they provide at least 10 dB benefit. Changes in noise of 2 dB or less are not considered perceptible to the average person. The use of a 10 m noise barrier in this location would also likely introduce impacts to visual amenity and result in potential overshadowing impacts. As such, the southern boundary noise barrier is not considered feasible and reasonable due to the negligible benefit it would provide and associated visual impacts if would introduce.

7.2.2.3 Limit Heavy Vehicle Movements

A reduction in heavy vehicle movements of 25% at lots with unknown tenants was considered with the aim of reducing noise from the dominant sources at the development site (ie heavy vehicle movements and loading dock activities).

This exercise resulted in the worst-case noise impacts at the BAPS Temple site being reduced by around 1 dB.

As such, the reduction in heavy vehicle movements would not result in a noticeable change in noise impacts at the BAPS Temple and is therefore not considered feasible and reasonable.

7.2.2.4 Summary

The above discussion shows that all feasible and reasonable mitigation measures have been considered. There are limited options for using source or path control mitigation to reduce the potential noise impacts at the BAPS Temple.

The predicted exceedances are a result of:

- The close proximity of the BAPS Temple to the development site.
- The elevated nature of the BAPS Temple site with respect to the development site.
- The Development Consent specifying a noise limit of 33 dBA for the BAPS Temple, which is considered neither a practicable nor achievable criteria for noise from the immediately adjacent IN1 rezoned land (see discussion in **Section 3.1** for more detail).
- It is noted that the BAPS Temple would generate its own noise, including the following sources:
  - Up to 300 vehicle movements per hour
  - Daily congregation of 50 people chanting
  - Weekly congregation of 600 people
  - Special event congregation of around 800 people.

7.2.3 BAPS Temple – Noise Agreement

Notwithstanding the above discussion, Condition D55 of the Development Consent states that where the Design Noise Verification Report identifies that the Noise Limits in Condition A16 cannot be achieved through the use of mitigation and contingency measures, the Applicant must offer to enter into a Noise Agreement with the eligible receiver(s).

Condition D56 states that where a Noise Agreement is in place, the Noise Limits do not apply to that receiver.

As such, given the predicted residual impacts, it is recommended that, as per the requirements of Condition D55, should the Design Noise Verification Report confirm the predicted exceedances at the BAPS Temple, an offer be made to enter into a Noise Agreement with the BAPS Temple. The Design Noise Verification Report would be prepared as part of future work during detailed design.

8.0 Conclusion

SLR has been engaged to assess the potential construction and operational noise impacts associated with MOD 2 of the Aldington Road Industrial Estate Concept Masterplan.

This report also addresses the operational noise impacts for additional SSD applications for on-lot development of Lot G (SSD-64583708), Lot H (SSD-64589711) and Lot J (SSD-61212208).

Construction noise and vibration from the proposal was previously assessed in SLR Report *610.31010.00000-R04 – Lots G, H and J SSD Applications – Construction Noise and Vibration Impact Statement*, dated February 2024.

Operational noise levels have been predicted from the development to the surrounding sensitive receivers.

Operational noise levels are predicted to generally comply with the relevant noise criteria at the nearest sensitive receivers. Noise levels are, however, predicted to result in exceedances of the criteria at the BAPS Temple during the worst-case noise emission scenarios. The following is noted with regard to these predicted exceedances:

- The assessment predicts the worst-case noise emissions from the site which assumes the highest amount of deliveries, vehicle movements and site activities all occur at all lots simultaneously during the same 15-minute period. This scenario is not expected to happen frequently (if at all). Noise levels and impacts outside of the worst-case scenario would be much lower.
- The Development Consent specifies a noise limit of 33 dBA for the BAPS Temple. This is considered neither a practicable nor achievable noise criteria, given the proximity of the development site (which has been rezoned as IN1 land) to the BAPS Temple.
- For comparison, a Project Noise Trigger Level has been included in the assessment for external areas of the BAPS Temple based on the Recommended Amenity Noise Level for areas reserved for passive recreation, as taken from the *Noise Policy for Industry*. Noise levels from the development are predicted to comply with this Project Noise Trigger Level, except for a 1 dB exceedance at the Mandir Temple during the worst-case noise emission scenarios.

A range of feasible and reasonable operational noise mitigation and management measures have been evaluated and recommended to control the potential operational noise impacts from the development.

Appendix A Acoustic Terminology

200 Aldington Road Industrial Estate

SSD-10479 MOD 2 Updated Noise Impact Assessment and SSDA for Lot G, H and J

Stockland Fife Kemps Creek Pty Ltd

SLR Project No.: 610.31010.00001

17 May 2024

Sound Level or Noise Level

The terms ‘sound’ and ‘noise’ are almost interchangeable, except that ‘noise’ often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2 x 10^{-5} Pa.

‘A’ Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an ‘A-weighting’ filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People’s hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as ‘linear’, and the units are expressed as dB(lin) or dB.

Sound Power Level

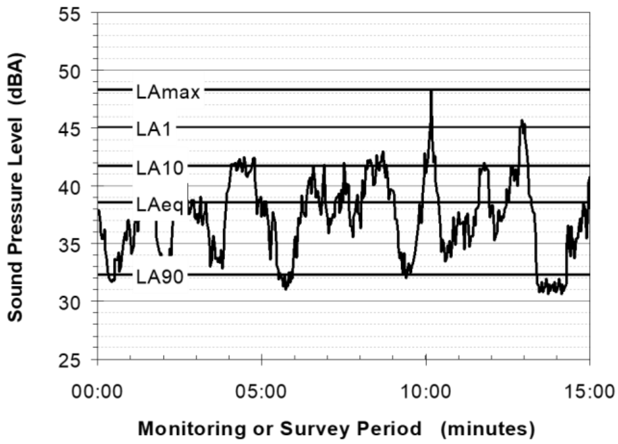
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

Frequency Analysis

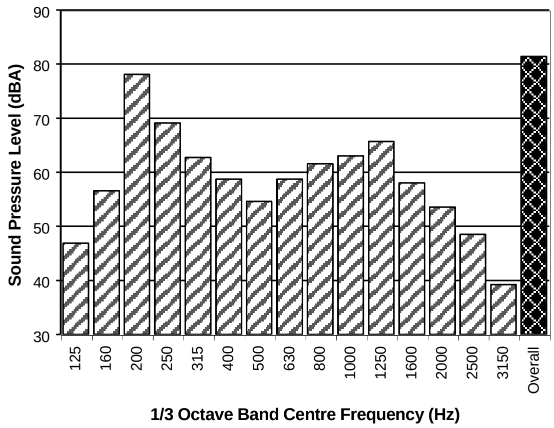
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)
- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

Human Perception of Vibration

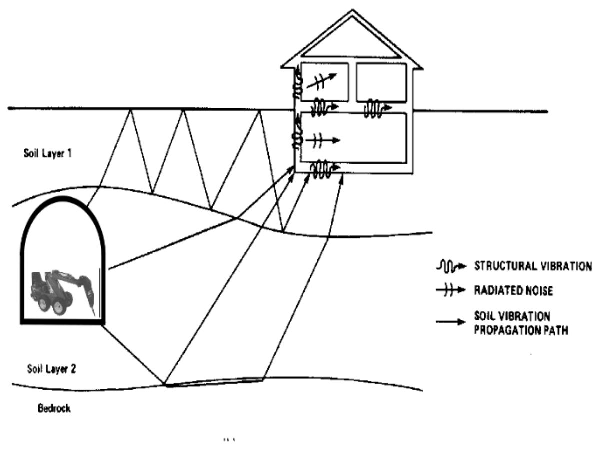
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

Appendix B Sound Power Measurements – Icehouse

200 Aldington Road Industrial Estate

SSD-10479 MOD 2 Updated Noise Impact Assessment and SSDA for Lot G, H and J

Stockland Fife Kemps Creek Pty Ltd

SLR Project No.: 610.31010.00001

17 May 2024

7 February 2024

SLR Ref No.: 610.031353.00001-L02-V0.1-20240122.docx

Attention: Debbie Fransen
Fife Kemps Creek Pty Ltd c/o AT&L
Level 7, 153 Walker Street,
North Sydney NSW 2060

SLR Project No.: 610.31010.00001

RE: Sound Power Measurements – ICEHOUSE Logistics Container Yard, Spring Farm

1.0 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Stockland Fife Kemps Creek Pty Ltd to conduct attended noise measurements to verify the sound power level (SWL) of a reach stacker and a refrigerated container (reefer) which would be in use at Lot G of the proposed 200 Aldington Road Industrial Estate (ARIE).

Noise measurements were undertaken on 21 November 2023 at the ICEHOUSE Logistics Container Yard, Spring Farm NSW (the site). The attended measurements included operation of a reach stacker, associated impact noise from the stacking of containers and a reefer.

2.0 Noise Measurement Overview

Noise measurements were taken during typical operation, which involved reach stacker movements, arrangement and stacking of containers. Measurements were also conducted under controlled test conditions, where the reach stacker performed repeated movements at a known distance from the measurement locations.

The reach stacker work area on the site is shown in **Figure 1** and the measured model is shown in **Figure 2**. The noise measurement locations varied based on the work activity and varied between around 6 m and 60 m from the source.

Figure 1 Measurement Location

Note: Container locations during the measurements differ from those shown in the aerial imagery.

Figure 2 Reach Stacker

There was one reefer in use on the site at the time of the noise measurements. The reefer was located directly adjacent to a container, such that there was less than a 1 m gap between the reefer end with noise producing plant and the adjacent container.

The measured reefer is shown in **Figure 3**, with the noise producing plant area highlighted.

Figure 3 Reefer

The instruments used for the noise measurements are listed in **Table 1**.

Table 1 Noise Measurement Instrumentation

Instrument[1]	Manufacturer	Type	Serial Number
Sound Level Meter[2]	Brüel & Kjær	2270	3008204
Sound Level Meter[2]	Brüel & Kjær	2270	3029485
Acoustic Calibrator	GRAS	42AG	279662

Note 1: All measurement instruments carried an appropriate and current NATA or manufacturer calibration certificate.

Note 2: Instrument is Class 1 in accordance with the requirements of AS/NZS IEC 61672.1:2019 Electroacoustics – Sound level meters Part 1 Specifications and was fitted with a microphone windshield. Reference field checks of the logger calibration were performed prior to and following the measurements, with the drift in calibration not exceeding ±1 dB (as required by AS 1055).

3.0 Methodology

The measurements were conducted within the following constraints:

- All noise measurements were required to be conducted at a safe location and a safe distance from the item being measured. This also includes being a safe distance from surrounding plant, equipment and hazards.
- Where practicable, the measurement location was optimised with consideration of offset distance to the plant, operating condition of the plant and proximity to other noise sources. The measurement locations were chosen so that the acoustic influence from other noise sources was minimised as far as practical.
- Due to the nature of the site, the measurement locations were chosen with consideration of shipping container locations to minimise reflections. However, it should be noted that although minimised as far as practical, the effect of reflections on the measurements would be unavoidable.

All noise measurements were undertaken using the sound level meter (SLM) on a tripod at 1.5 m height above ground level.

The measurements recorded one second and overall sound pressure level statistics, including one-third octave band data from 12.5 Hz to 20 kHz. The measured noise levels were used to calculate the equivalent plant SWLs based on the distance between the each source and measurement location.

L_{Aeq} (average) SWLs were calculated based on the logarithmic average of the few seconds when the source was closest to the SLM during each activity. L_{AFmax} (maximum) SWLs were calculated based on the maximum one second result for each activity.

The noise survey methodology was undertaken following the requirements of Australian Standard AS 1055.1 – 2018 '*Acoustics – Description and measurement of environmental noise, Part 1: General procedures*' where practicable.

4.0 Noise Assessment

The assessment to determine the sound power level of the various measured noise sources is presented in the following sections.

4.1 Reach Stacker

The measured noise levels were evaluated based on discrete events within the observed reach stacker work cycles. The calculated equivalent SWLs are conservatively based on the peak of each event (ie the noisiest period) and are summarised in **Table 2**. The presented range of levels is based on all measured events, including typical operation and test conditions.

Table 2 Reach Stacker Calculated SWL

Operation Mode	Distance from Source (m)	Calculated Equivalent Sound Power Level (dBA)	
		L_{Aeq}	L_{AFmax}
Driving forward with container	6 – 60	111 – 115	112 – 119
Driving forward without container		108 – 111	107 – 114
Reversing with container		107 – 114	112 – 118
Reversing without container		104 – 112	107 – 116
Boom movement with container		111 – 115	114 – 117
Boom movement without container		104 – 106	105 - 111
Idling / positioning with low engine revs		96 – 103	97 – 108

The measurement results show:

- Noise from the reach stacker engine noise varies based on the operation mode, with notably higher noise levels when the reach stacker is carrying a container.
- Measurements of reversing movements include noise from a broadband reversing alarm which could not readily be isolated but was considered to be insignificant in comparison to the engine noise under load.

Based on the observed reach stacker operation, a typical work cycle consists of the following movements:

- Driving forward to a container location
- Lifting a container
- Reversing with container
- Driving forward with a container
- Positioning and placing the container
- Reversing without container.

On average, each phase of a typical cycle was observed to take around 10 seconds with a total of around 30 seconds of idling and positioning time between movements, resulting in a 90 second average cycle.

The equivalent continuous L_{Aeq} SWL for an average cycle observed at the site is calculated as **109 dBA**, considering the average of the measured SWL range for each operation mode and on-time corrections.

The equivalent $L_{Aeq15min}$ SWLs are shown in **Table 3** for different numbers of 90 second work cycles occurring in a 15 minute period.

Table 3 Reach Stacker Calculated 15 minute SWL

Number of Work Cycles (On-Time)	$L_{Aeq,15minute}$ SWL (dBA)[1]
1 (1.5 minutes)	99
2 (3 minutes)	102
3 (4.5 minutes)	104
4 (6 minutes)	105
5 (7.5 minutes)	106
6 (9 minutes)	107
7 (10.5 minutes)	107
8 (12 minutes)	108
9 (13.5 minutes)	109
10 (15 minutes)	109

Note 1: It is assumed that the reach stacker is turned off, or otherwise not producing significant noise levels for the portion of the 15 minute period when it is not working.

4.2 Container Impacts

Measurements of the reach stacker also included transient impact noise, or 'metal clanging', from picking up and placing shipping containers.

The calculated SWL for these container impacts are summarised in **Table 4**. The SWLs were calculated based on the measured sound pressure level and measurement distance.

Table 4 Container Impacts Calculated SWL

Distance from Source (m)	Calculated Equivalent Sound Power Level (dBA)	
	L_{Aeq}	L_{AFmax}
9 – 60	108 – 115	111 – 119

The above indicates that a wide range of SWLs were calculated for the measured container impact events. Observations indicated that container impacts were variable and likely depend on the container mass, wind conditions and operator behaviour.

4.3 Reefer

The noise producing side of the reefer was positioned directly adjacent to another container, as detailed in **Section 2.0**. This is a key limitation in the calculation of a representative sound power level, since it introduces a reflected noise component with an unknown magnitude to the measured noise levels.

Measurement locations were taken directly in front of the reefer, between adjacent containers, and 1 m to either side of the reefer.

SoundPLAN noise modelling software was used to assist in the calculation of a representative sound power level, including consideration of the reflected component of the measured noise. The noise model was developed based on the geometry measured on site, and predicted noise levels to the measurement locations using the ISO 9613-2 prediction methodology. The modelled noise source was then adjusted to align the predicted levels with the measured levels.

The noise source was observed to be relatively constant and the equivalent L_{Aeq} SWL was calculated as **78 dBA**.

5.0 Conclusion

SLR has conducted an attended noise measurements at the ICEHOUSE Logistics Container Yard to determine the sound power level of typical reach stacker and reefer operation.

The calculated sound power levels of the measured noise sources are presented in this document, noting the limitations where appropriate.

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Appendix C Operational Noise Contours

200 Aldington Road Industrial Estate

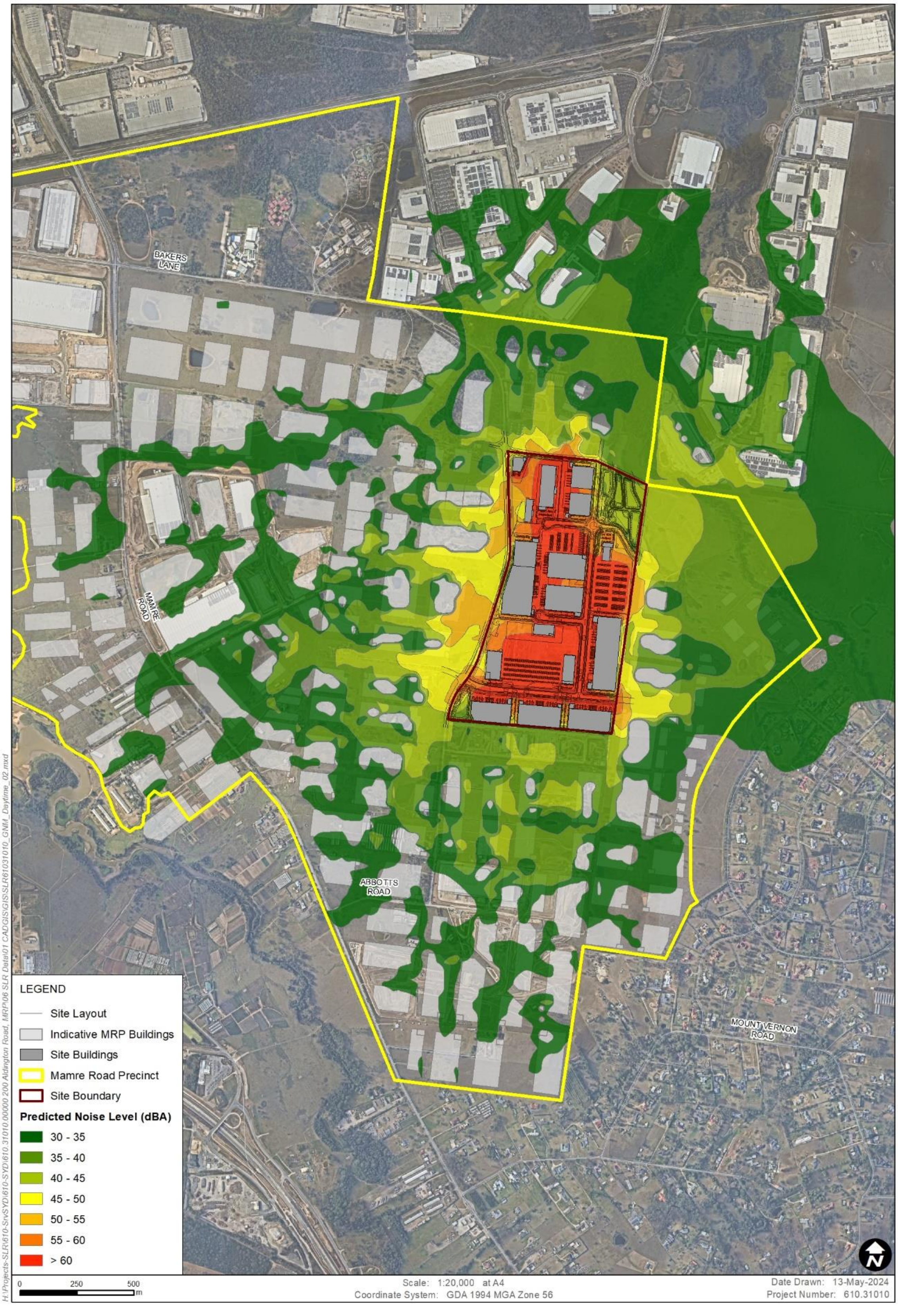
SSD-10479 MOD 2 Updated Noise Impact Assessment and SSDA for Lot G, H and J

Stockland Fife Kemps Creek Pty Ltd

SLR Project No.: 610.31010.00001

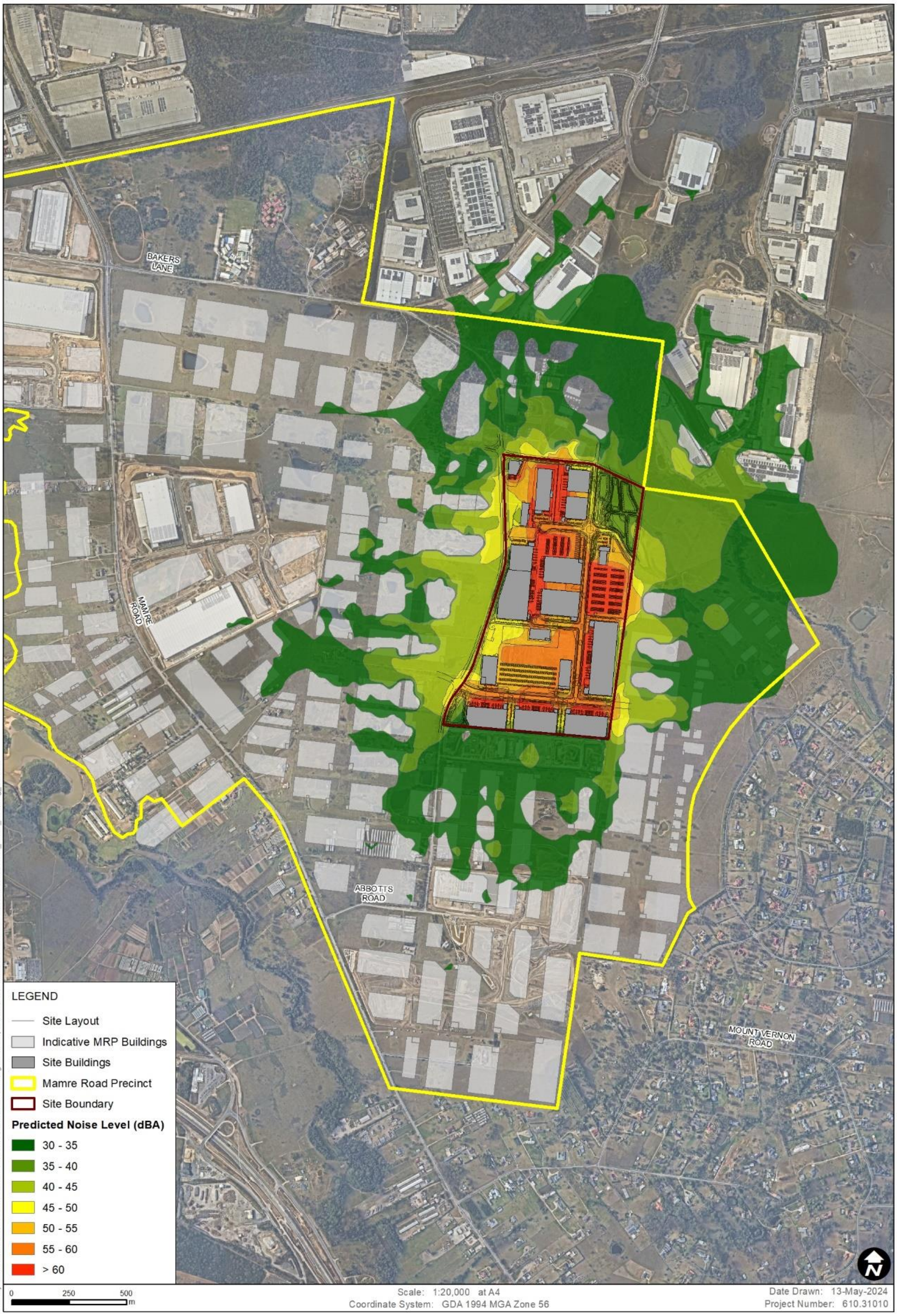
17 May 2024

Daytime Grid Noise Map



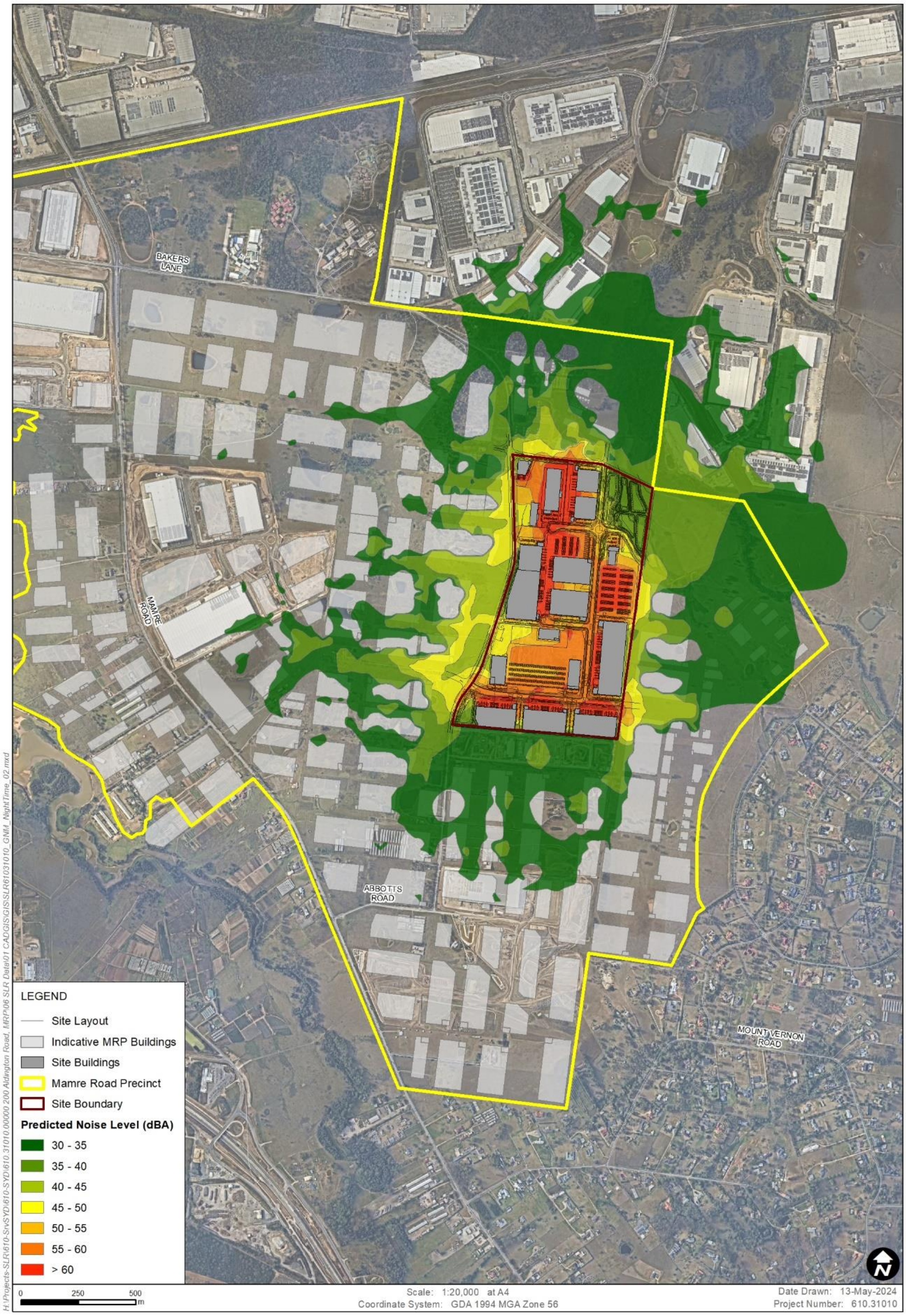
Note: Contours at 1.5m above existing ground elevation.

Evening Grid Noise Map



Note: Contours at 1.5m above existing ground elevation.

Night-time Grid Noise Map



Note: Contours at 1.5m above existing ground elevation.

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