REPORT

ESR KEMPS CREEK LOGISTICS PARK

KEMPS CREEK

NOISE AND VIBRATION ASSESSMENT
RWDI # 2101343
February 5, 2021

SUBMITTED TO

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1 INTRODUCTION

RWDI was retained by ESR Australia to conduct a noise and vibration assessment for the proposed warehouse and distribution facility known as the 'ESR Kemps Creek Logistics Park '(the Project) located on the corner of Abbotts Road and Aldington Road, Kemps Creek.

The following report forms part of the State Significant Development Application for a proposed warehouse and distribution development located across three separate allotments: 290-308 Aldington Road, 59-62 Abbotts Road, and 63 Abbotts Road.

This report addresses the Secretary's Environmental Assessment Requirements (SEARs) relevant to the development (SSD 9138102) issued September 2020.

2 SITE LOCATION

The site is located at 290-308 Aldington Road, 59-62 Abbotts Road, and 63 Abbotts Road as shown in Figure 2-1 below.

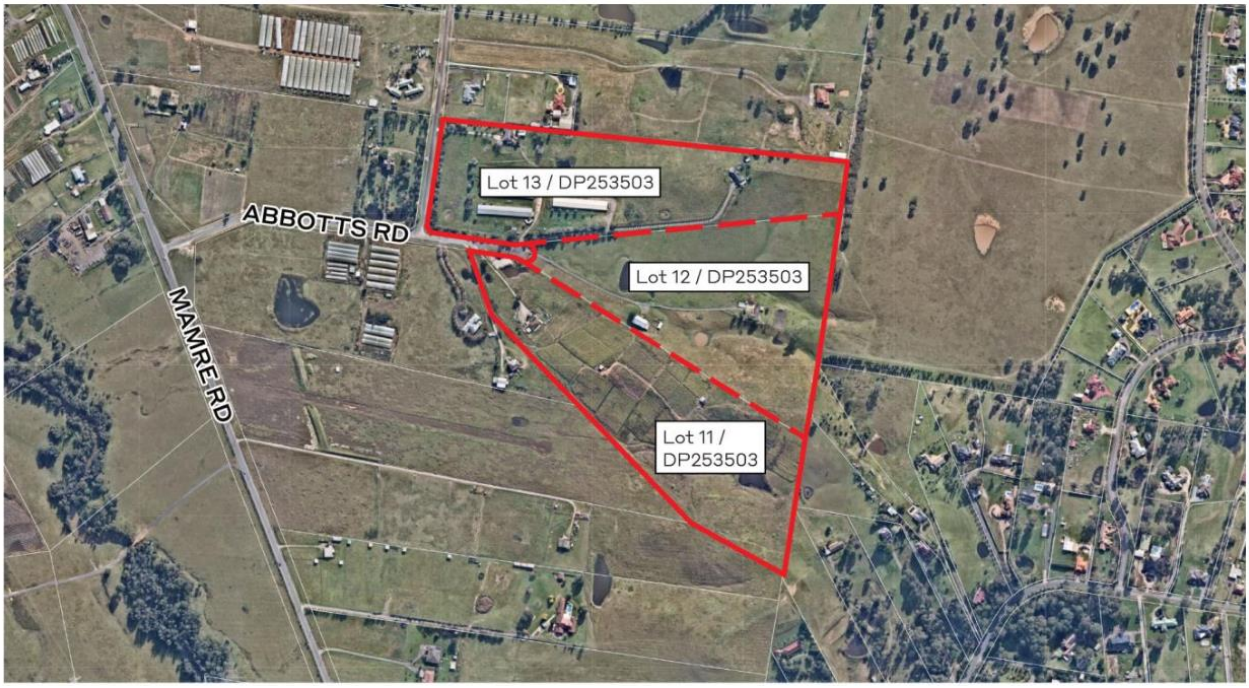

Figure 2-1 : Site aerial

The site consists of the following features:

- Single storey residential dwellings currently occupy the site.
- Mamre Road located to the west of the development
- Several single storey and double story residential dwellings bound the site to the north, south-east and south-west

Surrounding land uses currently comprise a predominantly rural typology, with a variety of rural dwellings, rural land, farm dams and scattered vegetation. Beyond this, the Oakdale South industrial estate is located approximately 2.2km to the northeast of the site, and the established large lot residential housing community of Mount Vernon is located to the south east.

3 PROJECT DESCRIPTION

3.1 Masterplan

The Masterplan for the site comprising seven industrial buildings, includes:

- an indicative total building area of 158,135 m2
- internal road layout and connection to Abbotts Road
- conceptual building locations, car parking arrangements, building heights, setbacks and built form parameters; and
- associated conceptual site landscaping.
- Café/amenity area

3.2 Stage 1

This SSDA includes detailed plans for Lots 1-7 of the Masterplan including the first stage (Stage 1) on Lot 1 of the estate. Construction of Stage 1 includes site preparation, earthworks and infrastructure work onsite. Accordingly, consent is sought for the following:

- Demolition and clearing of all existing built form structures;
- Clearing of all existing vegetation;
- Construction of a warehouse building with ancillary office ('Building 1' under the Concept Masterplan) comprising:
  - 28, 644m^2 of warehouse GFA;
  - 900m^2 of office GFA;
- Site wide bulk earthworks including 'cut and fill' to create flat development platforms for the warehouse buildings, and topsoiling and grassing/site stabilisation works;
- Site wide roadworks and access infrastructure;
- Stormwater and drainage works including stormwater basins, diversion of stormwater lines, gross pollutant traps and associated swale works;
- Sewer and potable water reticulation;
- Inter-allotment, road and boundary retaining walls; and
- External road upgrades including Aldington and Abbotts Road and a new signalised intersection at Mamre and Abbotts Road.

3.3 Development Layout

The location of the development and surrounding receivers categorised in noise catchment areas (NCAs) are shown in Figure 3-1. The Concept Masterplan and the proposed layout for Stage 1 is presented in Figure 3-2.

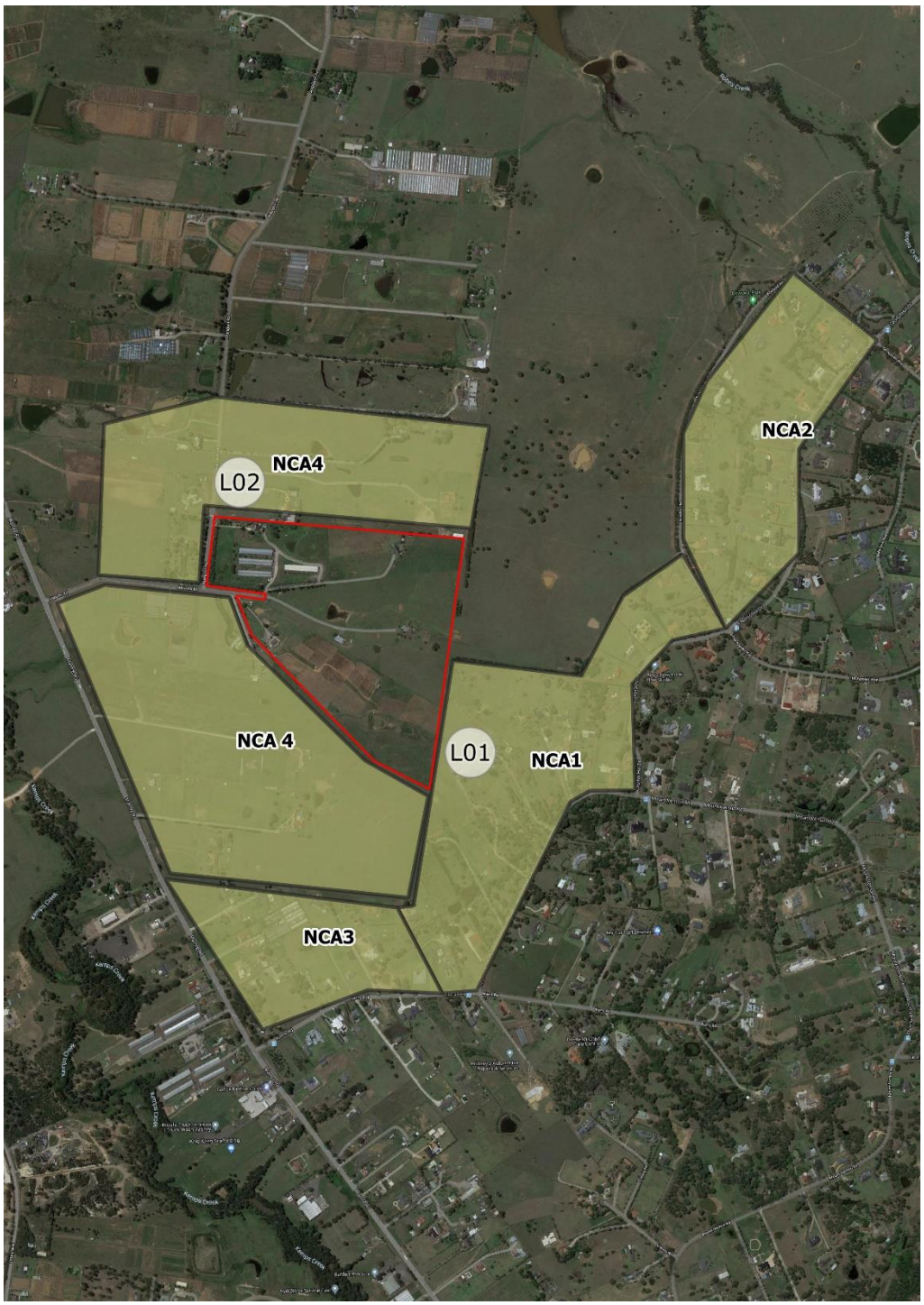

Figure 3-1 : Site location, noise logging and Noise Catchment Areas

Figure 3-2 : Layout of Concept Master Plan and Stage 1

4 EXISTING ACOUSTIC ENVIRONMENT

4.1 Sensitive Receiver Locations and Land Use

The State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP) has been subject to a recent amendment extending the controls of the SEPP to include the Mamre Road Precinct and rezoning it primarily for General Industrial (IN1).

The eastern boundary of the site has been identified as 'Transition to rural', and hence must be compatible with the adjacent R5 Large Lot Residential zoning at Mount Vernon. Sensitive receivers located in the vicinity of the development are located on the eastern boundary are located on Mt Vernon Road, Kerrs Road, and Bowood Road and make up NCA1, NCA2 and NCA3 respectively. The receivers are located at distances between 52m to 955m.

Residential properties located within General Industrial (IN1) zones make up NCA4 and NCA5.

4.2 Unattended Noise Monitoring

The surrounding area is primarily affected by road traffic from Mamre Road and potentially noise from existing nearby commercial/industrial activities. Unattended and attended noise monitoring was conducted between Thursday 18 and Monday 30 November 2020.

4.2.1 Equipment

The noise monitoring equipment used for this measurement consisted of two ARL environmental noise loggers set to A-weighted, fast response, continuously monitoring and recording in 15-minute intervals at locations shown in Figure 3-1. Equipment calibration was checked before and after the survey and no significant drift was noted.

The loggers determine L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10} and L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary of Acoustic Terms for definitions). The L_{A1} is indicative of maximum noise levels due to individual noise events. This is used for the assessment of sleep disturbance. The L_{A90} level is normally taken as the background noise level during the relevant period.

To quantify and characterise the existing ambient noise environment around the project site a baseline noise survey was undertaken at sensitive receiver locations to the north and south. The noise monitoring locations detailed in Table 4-1 were selected to be representative of the surrounding sensitive receivers potentially affected by the construction and operation of the development. The noise monitoring locations are indicated in Figure 3-2.

The measured noise levels have been used to establish appropriate noise goals for operation of the development and as a basis for assessing potential noise impacts during construction.

Table 4-1 : Unattended noise monitoring details

Noise Monitoring Location ID	Noise Monitoring Location Details	Equipment Serial Number
L01	NCA1-3	ARL-16-707-014
L02	NCA4-5	ARL-16-707-015

4.3 Existing Background Noise Levels

The following tables present the measured existing ambient noise levels from the unattended noise survey. Any periods of inclement weather or extraneous noise are omitted from the measured data prior to determining the overall results.

4.3.1 Ambient background noise level

The measured rating background noise levels (RBL) were determined in accordance with the NSW Noise Policy for Industry with levels for the different monitoring locations presented in Table 4-2. The unattended noise monitoring data has been filtered with meteorological data obtained from Horsley Park weather station as per *NPfI* methodology.

Table 4-2 : Measured background levels

Noise Logger	RBL			$L_{Aeq,period}$ (dBA) [1]		
	Daytime	Evening	Night-time	Daytime	Evening	Night-time
L01	32	33	38	44	46	52
L02	34	34	33	47	48	46

Note 1: Daytime (6am – 7pm), Evening (7pm – 10pm), and Night-time (10pm – 6am) during weekdays and Saturday (8am – 1pm).

5 NOISE AND VIBRATION CRITERIA

The relevant noise criteria have been determined in consultation with Penrith City Council requirements, the Secretary's Environmental Assessment Requirements and the Mamre Road Precinct Draft Development Control Plan.

5.1 Secretary's Environmental Assessment Requirements (SEARs)

The Secretary's Environmental Assessment Requirements (SEARs) outline the requirements for the construction and operational use of the proposed development. With relation to noise SSD-9138102 states the following:

Key issues	The EIS must address the following specific matters: **Noise and Vibration** – including: a quantitative noise and vibration impact assessment for construction and operation of the development, including traffic noise, undertaken by a suitably qualified person in accordance with the relevant Environment Protection Authority guidelines and including an assessment of nearby sensitive receivers; – cumulative impacts of other existing and proposed developments; and – details of the proposed noise mitigation, management and monitoring measures

As a specific criterion is not specified, further reference is made to Assessing Vibration: A Technical Guide 2006, the NSW *Noise Policy for Industry*, NSW *Road Noise Policy* and the NSW *Interim Construction Guideline* which are outlined below.

5.2 Mamre Road Precinct Draft Development Control Plan

The Mamre Road Precinct Development Control Plan (DCP) 2020 applies to the Mamre Road Precinct within the State Environmental Planning Policy (Western Sydney Employment Area) 2009. Sections 4.3.1 relates to Noise and Vibration and is presented below.

> *4.3.1 Noise and Vibration*
>
> ***Objectives***
>
> *a) Establish design criteria for noise emissions from industrial or other employment generating development.*
>
> *b) Establish acoustic environmental goals for existing and future adjacent residential areas.*
>
> *c) Establish noise contributions for individual allotments within the employment zones when related to residential boundaries.*
>
> ***Controls***
>
> *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.*
>
> *2) The use of mechanical plant and equipment may be restricted in areas close to sensitive receivers, such as adjoining rural residential development. Developers in all areas should ensure through design of their development that no offensive noise is emitted.*
>
> *3) Where it is considered likely that a development may cause an adverse impact on nearby rural or residential areas, an acoustic report from a qualified acoustical engineer will be required to be submitted for consideration with the development application. The acoustic report will need to demonstrate that the proposed development will not create any adverse impact.*
>
> *4) All development shall comply with the requirements of relevant Australian Standards and State Government policies and guidelines relating to noise*

Section 2.11 is concerned with Aviation Safeguarding and is presented below:

> ***Noise***
>
> *3) Development is constructed in accordance with Australian Standards AS2021 – Acoustics Noise Intrusion – Building Siting and Construction.*
>
> *4) Renovations to existing houses or minor extensions within ANEC/ANEF 20 and above must be constructed in accordance with Australian Standard AS2021 – Acoustics – Aircraft Noise Intrusion – Building Siting and Construction*
>
> *b) Establish acoustic environmental goals for existing and future adjacent residential areas.*

5.3 AS2021 – Acoustics Noise Intrusion – Building Siting and Construction

With regard to requirement Section 2.11 of the Mamre Road Precinct Development Control Plan (DCP), Table 2.1 of AS 2021:2015 specifies the following requirements for building siting in relation to ANEF contours and is reproduced below in Table 5-1.

Table 5-1 : Building site acceptability based on ANEF zones[1]

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

Note 1: To be used in conjunction with Table 5.2.

Table 3.3 of AS 2021:2015 sets limits for noise intrusion when a new development is located in an area within ANEF (Aircraft Noise Exposure Forecast) contours and is reproduced below in Table 5-2.

Table 5-2 : Indoor sound design levels for aircraft noise

Building type and activity	Indoor design sound level (dBA)
Commercial buildings, offices, and shops	
Drafting, open offices	65
Industrial	
Inspection, analysis, precision work	75
Light machinery, assembly, bench work	80

The Project is located across the 20-25 ANEF contour.

5.4 Assessing Vibration: A Technical Guideline 2006

5.4.1 Types of vibration

There are three types of vibration as classified in the guide.

- *Continuous* - vibration continues uninterrupted for a defined period (usually throughout daytime and/or night-time). This type of vibration is assessed on the basis of weighted RMS (root mean squared) acceleration values.

- *Impulsive* - rapid build up to a peak followed by a damped decay that may or may not involve several cycles. The duration is short, typically less than 2 seconds. Impulsive vibration (no more than three occurrences in an assessment period) is assessed on the basis of acceleration values.

- *Intermittent* - interrupted periods of continuous (e.g. a drill) or repeated periods of impulsive vibration (e.g. a pile driver), or continuous vibration that varies significantly in magnitude. Assessed on the basis of vibration dose values.

5.4.1.1 Acceptable values for continuous and impulsive vibration (1-80Hz)

Table 5-3 : Preferred weighted RMS vibration acceleration values

Type	Location	Assessment period	Preferred values m/s²		Maximum values m/s²	
			z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration	Critical areas	Day or Night-time	0.005	0.0036	0.01	0.0072
	Residences	Daytime	0.01	0.0071	0.02	0.014
		Night-time	0.007	0.005	0.014	0.01
	Offices, schools, educational institutions and places of worship	Day or Night-time	0.02	0.014	0.04	0.028
	Workshops	Day or night time	0.04	0.029	0.08	0.058
Impulsive vibration	Critical areas	Day or night time	0.005	0.0036	0.01	0.0072
	Residences	Daytime	0.3	0.21	0.6	0.42
		Night-time	0.1	0.071	0.2	0.14
	Offices, schools, educational institutions and places of worship	Day or Night-time	0.64	0.46	1.28	0.92
	Workshops	Day or night time	0.64	0.46	1.28	0.92

5.4.1.2 Acceptable values for intermittent vibration

Intermittent vibration is assessed using the vibration dose value (VDV) root-mean-quad method. VDV accumulates the vibration energy received over the daytime and night-time periods. The vibration dose methodology is as per standard BS 6472–1992.

5.5 Noise Policy for Industry

Assessment of noise in accordance with NSW *Noise Policy for Industry* (2017) has two main components: intrusiveness and amenity criteria. These are compared to each other (after conversion of amenity noise level to $L_{Aeq,15min}$ equivalent level) to determine the overall project noise trigger level.

5.5.1 Intrusiveness noise level

The intrusiveness noise level is based on the $L_{Aeq,15min}$ associated with commercial activity being less than or equal to the measured L_{A90} Rating Background Level + 5dB as per Section 2.3 of the policy. A modifying factor should also be added where appropriate to allow for tonality, impulsiveness, and intermittency or low frequency effects.

5.5.2 Amenity noise level

The amenity noise level is determined in accordance with Section 2.3 of the policy based on the land use and relevant noise criteria specified in Tables 2.3 and 2.2 respectively.

The NSW *Noise Policy for Industry* sets out acceptable noise levels for various locations. Under the policy, all receivers would be most likely assessed against the 'rural' criteria. As defined in the policy rural category is an area that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels.

5.5.3 Modifying factors

The NSW *Noise Policy for Industry* includes correction factors such as tonal noise, low-frequency noise, intermittent noise and duration. Where two or more modifying factors are present, the maximum adjustment to a noise source level is 10dBA (excluding duration correction).

5.5.4 Sleep disturbance

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development/premises night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

a detailed maximum noise level event assessment should be undertaken.

5.5.5 Project noise trigger level

To determine the project trigger noise level, the amenity noise level must first be standardised to and equivalent $L_{Aeq,15min}$ in order to compare to the intrusiveness noise level. This is done in accordance with Section 2.2 of the policy as follows;

$$L_{Aeq,15min} = L_{Aeq,\ period} + 3dB$$

Therefore, based on the measured data presented in Section Table 5-4 the project specific noise limits are determined below in Table 5-4.

Table 5-4 : Project Noise Trigger Level (PNTLs)

Receiver	Time of Day	ANL[1] $L_{Aeq(period)}$	Measured RBL[2] $L_{A90,15min}$[3]	Measured Noise Level[3] $L_{Aeq(period)}$	Criteria for New Sources		
					Intrusive $L_{Aeq,15min}$	Amenity[4, 5] $L_{Aeq,15min}$	Sleep Disturbance (L_{Amax})
Residential	Day	50	35[5]	44	**40**	48	-
	Evening	45	33	46	**38**	43	-
	Night	40	33[6]	52	**38**	38	**52**
Industrial[4]	When in Use	70	-	-	-	**70**	-

Note 1: ANL = "Acceptable Noise Level" for receivers in a Rural area.

Note 2: RBL = "Rating Background Level".

Note 3: Assuming existing noise levels are unlikely to decrease in the future.

Note 4: The *NPfI* does not require that intrusive noise be assessed at industrial premises. For industrial receivers, only the amenity criteria apply. Also the NPfI states for isolated residences within an industrial zone the industrial amenity would apply.

Note 5: Minimum assumed RBL applied as measured noise level < 35 dB

Note 6: Measured noise level < 35 dB. Evening RBL applied as *NPfI* recommends Night to be no greater than Day or Evening period

5.6 NSW Road Noise Policy 2008

Additional guidance for the assessment of noise from traffic on public roads are set out in the *RNP* (Department of Environment, Climate Change and Water, 2011).

Table 3 of the *RNP* is reproduced in Table 5-5 and presents the relevant criteria for road use within the Project.

Table 5-5 : Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7 a.m.–10 p.m.)	Night (10 p.m.–7 a.m.)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from **new** freeway/arterial/sub-arterial road corridors	$L_{Aeq, (15\ hour)}$ 55 (external)	$L_{Aeq, (9\ hour)}$ 50 (external)
	2. Existing residences affected by noise from **redevelopment** of existing freeway/arterial/sub-arterial roads 3. Existing residences affected by **additional traffic** on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq, (15\ hour)}$ 60 (external)	$L_{Aeq, (9\ hour)}$ 55 (external)
Local roads	4. Existing residences affected by noise from **new** local road corridors 5. Existing residences affected by noise from **redevelopment** of existing local roads 6. Existing residences affected by **additional traffic** on existing local roads generated by land use developments	$L_{Aeq, (1\ hour)}$ 55 (external)	$L_{Aeq, (1\ hour)}$ 50 (external)

As Mamre Road is an arterial road, the following relative increase criterion applies.

Table 5-6 : Relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase – dB(A)	
		Day (7 a.m.–10 p.m.)	Night (10 p.m.– 7 a.m.)
Freeway/arterial/ sub-arterial roads and transitways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq, (15\ hour)}$ + 12 dB (external)	Existing traffic $L_{Aeq, (9\ hour)}$ + 12 dB (external)

6 OPERATIONAL NOISE IMPACT ASSESSMENT

6.1 Noise Modelling

Noise modelling of the development site was undertaken using the CONCAWE noise prediction algorithm in SoundPLAN V8.0 modelling software.

The noise model was constructed from a combination of aerial photography, existing ground topography, design ground topography and design masterplans for the development. The local terrain, design of the development, receiver buildings and structures have been digitised in the noise model to develop a three-dimensional representation of the operations of the development and surrounding environment.

Noise modelling was conducted for day, evening and night time as the warehouses would be operating 24 hours per day.

6.1.1 Modelled Onsite Vehicle Movements

Estimated onsite vehicle movements were provided by the client based on the RMS *Guide to Traffic Generating Developments*.

The following outlines the peak hour traffic volumes for light and heavy vehicles movements onsite. The vehicle movements have been modelled to reflect realistic operations, with heavy vehicles accessing hardstand areas and light vehicles utilising carparking facilities.

Sound power levels of 90 dBA for light vehicles travelling at 40 km/hr and 103 dBA for heavy vehicles travelling at 25 km/hr have been applied per vehicle movement.

Consistent with other ESR developments external forklift movements (ie outside of the warehouses) have been modelled with a sound power level of 93 dBA.

Stage 1 (Lot 1) vehicle movements and the Masterplan (all lots) is presented below in Table 6-1.

Table 6-1 : Onsite vehicle movements

Assessment Period[1]		Light Vehicles per 15min	Heavy Vehicles per 15min	Total per 15min	Total per 1hr
Stage 1 (Lot 1)	Day	6	5	11	44
	Eve	2	2	4	15
	Night	8	1	9	34
Masterplan (Lots 1-6)	Day	30	26	55	221
	Eve	12	8	21	82
	Night	38	6	43	173

Note 1: Daytime (7am – 6pm), Evening (6pm – 10pm), Night-time (10pm – 7am).

6.1.2 Modelled Fixed Sources

Fixed noise sources such as mechanical plant have been modelled throughout the development. As details of specific items of plant and exact locations are not yet known, a conservative approach to modelling has been conducted. Fixed noise sources with a reference sound power level (SWL) have been modelled at rooftop locations around the development to provide a worst-case prediction of noise impacts on the surrounding sensitive receivers. By predicting the noise levels at the sensitive receivers using this method, we are able to determine the maximum SWL of plant items required to meet the noise criteria.

Table 6-2 outlines the indicative mechanical plant to be located on rooftops.

Table 6-2 : Rooftop mechanical plant

Lot Number	Rooftop mechanical plant items
Lot 1	10
Lot 2A	6
Lot 2B	6
Lot 3	10
Lot 4	10
Lot 5	10
Lot 6	10

6.2 Predicted Operational Noise Impacts

Operational noise level predictions have been carried out for both Stage 1 (Lot 1) and Masterplan (Lots 1-6) operations. Predictions for Stage 1 are assessed for project application while Masterplan predictions are used to assess cumulative impacts in the future. The predicted levels with reference to the relevant criteria are presented in Table 6-3 and Table 6-4, below.

Table 6-3 : Predicted operational noise impact (Stage 1)

Assessment	Receiver Location	Time of Day[1]	Criteria for New Sources $L_{Aeq,15min}$ dBA	Worst-Case Predicted $L_{Aeq,15min}$ dBA	Exceedance
Stage 1 (Lot 1)	NCA1	Day	**40**	33	-
		Evening	**38**	33	-
		Night	**38**	32	-
	NCA2	Day	**40**	29	-
		Evening	**38**	29	-
		Night	**38**	27	-
	NCA3	Day	**40**	32	-
		Evening	**38**	31	-
		Night	**38**	30	-
	NCA4	Day	**70**	50	-
		Evening		48	-
		Day		47	-
	NCA5	Day	**70**	44	-
		Evening		47	-
		Day		44	

Table 6-4 : Predicted operational noise impact (Masterplan)

Assessment	Receiver Location	Time of Day[1]	Criteria for New Sources $L_{Aeq,15min}$ dBA	Worst-Case Predicted $L_{Aeq,15min}$ dBA	Exceedance
Masterplan (Lots 1-6)	NCA1	Day	**40**	37	-
		Evening	**38**	35	-
		Night	**38**	35	-
	NCA2	Day	**40**	< 30	-
		Evening	**38**	< 30	-
		Night	**38**	< 30	-
	NCA3	Day	**40**	37	-
		Evening	**38**	37	-
		Night	**38**	37	-
	NCA4	Day	**70**	57	-
		Evening		54	-
		Night		54	-
	NCA5	Day	**70**	50	-
		Evening		46	-
		Night		46	-

Note 1: Daytime (7am – 6pm), Evening (6pm - 10pm), Night-time (10pm – 7am)

6.3 Offsite Traffic Movements

The surrounding road network servicing the proposed development is located within the Mamre Road Precinct Structure Plan (the MRP Structure Plan). Mamre Road and surrounding road network is described within the Transport Assessment prepared by Ason Group, dated 22 December 2020, and is reproduced below:

"TfNSW is currently in the process of more detailed investigations into the transport network infrastructure required for the rezoning of the Mamre Road Precinct, and specifically road network requirements. The TfNSW investigations include detailed traffic modelling of the MRP and its connectivity to the broader regional road network, a task which will also inform the MRP specific Development Control Plan (the Precinct DCP) also being prepared by TfNSW and DPIE."

Outcomes of the Precinct DCP and several other key planning policies and strategies will determine the potential for traffic noise impacts at sensitive receiver locations, and assessment of offsite road traffic noise associated with the Masterplan is premature at this design stage. In addition, with regard to Aldington Road, the Transport Assessment concludes the following:

"It is critical to note that at this stage in the process of planning the wider MRP, the form and function of Aldington Road (including whether there will be a connection the SLR), and therefore the anticipated future background traffic flows, are totally unknown."

Notwithstanding, estimates of projected traffic volumes associated with the development are taken from the Transport Assessment and potential noise impacts are assessed below.

6.3.1 Predicted Traffic Volumes and Assessment

Operational activity associated with the Masterplan is expected to generate an additional 3367 vehicles per day, made up of 2482 light vehicles and 885 heavy vehicles. Daytime (7am -10pm) traffic is predicted to be made up of 2138 light vehicles and 801 heavy vehicles, while Night-time (10pm -7am) traffic is predicted to be made up of 344 light vehicles and 84 heavy vehicles.

The noise prediction software SoundPLAN v8.0 utilising the Calculation of Road Traffic Noise (CORTN) has been used to model operational road traffic noise emissions associated with the Masterplan development.

For receivers located on Mamre Road a maximum of noise level of $L_{Aeq,15hr}$ of 57 dB(A) during the day and a $L_{Aeq,9hr}$ 50.8 dB(A) during the night-time period is predicted. For receivers on Abbotts Road the maximum predicted $L_{Aeq,15hr}$ for is calculated to be 55.2 dB(A) during the day and $L_{Aeq,9hr}$ 48.9 dB(A) during the night-time period.

Thus, predicted levels for Mamre and Abbotts road comply with the criterion for 'Arterial' and 'Sub-arterial' roads respectively, as outlined in Section 5.6. and no mitigation is likely to be required as a result.

7 CONSTRUCTION NOISE AND VIBRATION IMPACT ASSESSMENT

People are usually more tolerant to noise and vibration during the construction phase of proposals than during normal operation. This response results from recognition that the construction emissions are of a temporary nature – especially if the most noise-intensive construction impacts occur during the less sensitive daytime period. For these reasons, acceptable noise and vibration levels are normally higher during construction than during operations.

Construction often requires the use of heavy machinery which can generate high noise and vibration levels at nearby buildings and receivers. For some equipment, there is limited opportunity to mitigate the noise and vibration levels in a cost-effective manner and hence the potential impacts should be minimised by using feasible and reasonable management techniques.

At any particular location, the potential impacts can vary greatly depending on factors such as the relative proximity of sensitive receivers, the overall duration of the construction works, the intensity of the noise and vibration levels, the time at which the construction works are undertaken and the character of the noise or vibration emissions.

The following section details the assessment of potential noise and vibration impacts associated with the construction of Stage 1. Construction noise goals have been determined based on the relevant government guidelines and industry standards. Potential noise levels have been predicted at sensitive receivers for expected activities and where levels are above the goals, feasible and reasonable noise mitigation measures are considered.

It should be noted that the methodology for establishing noise and vibration criteria detailed in the following sections is applicable to all stages of the Masterplan.

7.1 Interim Construction Noise Guideline (DECC, 2009)

The NSW EPA *Interim Construction Noise Guideline (ICNG)* requires project-specific Noise Management Levels (NMLs) to be established for noise affected receivers. In the event construction noise levels are predicted to be above the NMLs, all feasible and reasonable work practices are investigated to minimise noise emissions.

Having investigated all feasible and reasonable work practices, if construction noise levels are still predicted to exceed the NMLs then the potential noise impacts would be managed via site specific construction noise management plans, to be prepared in the detailed design phase.

Figure 7-1 details the *ICNG* noise management levels.

Time of day	Management level $L_{Aeq\ (15\ min)}$ *	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2.

Figure 7-1 : Interim Construction Noise Guideline criteria

In addition, the following construction noise management levels $L_{Aeq,15min}$ are recommended for other receivers and areas:

- Industrial premises: external $L_{Aeq,15min}$ 75dBA
- Offices, retail outlets: external $L_{Aeq,15min}$ 70dBA
- Classrooms at schools and other educational institutions: internal $L_{Aeq,15min}$ 45dBA

Based on the above, Table 7-1 presents the applicable noise management levels for construction activities at surrounding receivers that have been adopted for all applications.

Table 7-1 : Site-specific construction Noise Management Levels

Location	Construction Noise Management Level (NMLs) - $L_{Aeq,15min}$			Highly Noise Affected Noise Level – $L_{Aeq,15min}$
	Day Standard Hours[1]	Evening OOH[2]	Night OOH[3]	
NCA1	45	43	43	75
NCA2				
NCA3				
NCA4	75	75	75	
NCA5				

Note 1: Standard Hours (7am – 6pm Monday to Friday, 8am – 1am Saturday with no work on Sundays or Public Holidays)

Note 2: Evening OOH (6pm – 10pm)

Note 3: Night OOH (10pm – 7am)

7.2 Proposed Construction Activities

7.2.1 Proposed Works

This report provides an assessment of the potential noise and vibration impacts associated with the proposed activities required in Stage 1, specifically the construction of Lot 1 and supporting road network. The construction noise and vibration assessment has considered the following construction activities:

Stage 1 *(Lot 1)*

- Site Clearing and Enabling Works
- Excavation
- Building Construction

Stage 1 *(Roadworks)*

- Site Clearing and Enabling Works
- Widening of Abbotts Road and Adlington Road
- Construction of Access Road

7.2.2 Construction Hours

Where possible, works would be completed during the standard daytime construction hours of Monday to Friday 7.00am to 6.00pm and Saturday 8.00am to 1.00pm. Where Out-of-Hours Works (OOHWs) are required (for emergency works, oversized equipment delivery, etc) it is likely that they would require separate approval.

7.3 Construction Noise Modelling

Noise modelling of the development site was undertaken using the CONCAWE noise prediction algorithm in SoundPLAN V8.0 modelling software.

The noise model was constructed from a combination of aerial photography, existing ground topography, design ground topography and design masterplans for the development. The local terrain, receiver buildings and structures have been digitised in the noise model to develop a three-dimensional representation of the construction works and surrounding environment.

Maximum sound power levels (SWLs) for the typical operation of construction equipment applied in the modelling are listed in Table 7-2. To assess construction noise levels against the NMLs, the maximum noise levels have been converted to equivalent $L_{Aeq,15min}$ noise emissions. Based on previous experience on large construction proposals, suitable adjustments of between 2 dB to 5 dB have been applied to convert the L_{Amax} noise levels in to L_{Aeq} noise levels for assessment against the NMLs.

Table 7-2 : Construction noise sources

Stage	Phase	Equipment	Operating minutes in 15-min period	Number of items in same location	Sound Power Level (dB)		
					Maximum Item (SWL)	L_{Aeq} Activity	L_{Amax} Activity
Stage 1 *(Lot 1)*	Site Establishment and Clearing	Chainsaw	5	1	108	**111**	118
		Dozer	15	1	110		
		Dump Truck (15 t)	15	1	98		
	Excavation	Piling (Bored)	7.5	1	108	**117**	123
		Dozer (D10)	15	1	115		
		Dump Truck (15 t)	15	1	100		
		Excavator (40 t)	15	2	109		
	Building Construction	Concrete Truck / Agitator	7.5	2	106	**111**	114
		Forklift	2	2	101		
		Concrete Pump	15	1	106		
		Truck (12-15 tonne)	15	1	103		
Stage 1 *(Roadworks)*	Site Establishment and Clearing	Chainsaw	5	1	108	**111**	118
		Dozer	15	1	110		
		Dump Truck (15 t)	15	1	98		
	Widening of Abbotts Road	Scraper	15	2	108	**117**	121
		Grader	15	2	108		
		Compactor	15	2	108		

Stage	Phase	Equipment	Operating minutes in 15-min period	Number of items in same location	Sound Power Level (dB)		
					Maximum Item (SWL)	L_{Aeq} Activity	L_{Amax} Activity
	and Adlington Road	Asphalt Paver	15	1	111		
		Concrete Truck	15	1	106		
		Vibratory Roller (10-12 t)	15	1	109		
	Construction of Access Road	Scraper	15	2	108	**117**	121
		Grader	15	2	108		
		Compactor	15	2	108		
		Asphalt Paver	15	1	111		
		Concrete Truck	15	1	106		
		Vibratory Roller (10-12 t)	15	1	109		

Consistent with the requirements of the *ICNG*, and to inform the scheduling of construction activity and management of noise during the detailed design phase, the construction noise impacts are based on a worst-case assessment. The *ICNG* recommends that the realistic worst-case or conservative noise levels from the source should be predicted for assessment locations representing the most noise exposed residences or other sensitive land uses. For each receiver area the noise levels are predicted at the most noise-exposed location, which would usually be the closest receiver.

For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted at the most-exposed receiver as the noise levels presented in this report are based on a realistic worst-case assessment.

7.4 Predicted Construction Noise Impacts

In the area surrounding the development site, the noise impacts have been quantitatively assessed for several construction activities. The activities considered are described in Table 7-2.

The typical $L_{Aeq,15min}$ noise levels at the surrounding noise sensitive receivers are provided in Table 7-3 for each of the construction activities and are representative of the 'noisiest' construction periods allowing for the simultaneous operation of noise intensive construction plant in close proximity.

Table 7-3 : Predicted construction noise impacts

Works	Stage	NCA	Noise Level – $L_{Aeq,15min}$ – dBA		
			NML Day Standard Hours	Worst-case Predicted	Exceedance
Stage 1 *(Lot 1)*	Site Establishment and Clearing	NCA1	42	39	-
		NCA2		35	-
		NCA3		37	-
		NCA4	75	52	-
		NCA5		56	-
	Excavation	NCA1	42	45	3
		NCA2		41	-
		NCA3		43	1
		NCA4	75	60	-
		NCA5		61	-
	Building Construction	NCA1	42	40	-
		NCA2		36	-
		NCA3		38	-
		NCA4	75	42	-
		NCA5		55	-
Stage 1 *(Roadworks)*	Site Establishment and Clearing	NCA1	42	41	-
		NCA2		38	-
		NCA3		41	-
		NCA4	75	57	-
		NCA5		63	-
	Widening of Abbots Road and Adlington Road	NCA1	42	44	2
		NCA2		42	-
		NCA3		45	3
		NCA4	75	62	
		NCA5		67	-
	Construction of Access Road	NCA1	42	46	4
		NCA2		42	-
		NCA3		44	2
		NCA4	75	60	-
		NCA5		69	-

During standard construction hours, exceedances of the NMLs (up to 4 dB) are predicted at the most affected residential receivers located to the south-east, south and south-west of the development during excavation and roadworks. No exceedances are predicted during standard construction hours for the other construction activities modelled.

There are no noise sensitive receivers that are considered to be Highly Noise Affected, i.e. with predicted noise levels exceeding 75 dB L_{Aeq}.

The *ICNG* describes strategies for construction noise mitigation and control that are applicable to this proposal. The strategies are designed to minimise, to the fullest extent practicable, noise during construction.

Where reasonable and feasible, preference should be given to scheduling construction works within the standard construction hours of:

- Monday to Friday 7.00am to 6.00pm.
- Saturday 8.00am to 1.00pm

Typically, any OOHWs would be subject to separate approval on a case-by-case basis.

Where construction noise levels are predicted to exceed the NMLs it is recommended that construction noise mitigation measures should be considered, where reasonable and feasible. Typical construction noise mitigation measures include the following:

- Avoiding the coincidence of noisy plant working simultaneously close together would result in reduced noise emissions.
- Equipment which is used intermittently is to be shut down when not in use.
- Where possible, equipment with directional noise emissions should be oriented away from sensitive receivers.
- Regular compliance checks on the noise emissions of all plant and machinery used for the proposal would indicate whether noise emissions from plant items were higher than predicted.

This also identifies defective silencing equipment on the items of plant.

- Where possible, heavy vehicle movements should be limited to standard construction hours.
- Non-tonal reversing alarms should be used on all items of plants and heavy vehicles used for construction.

7.5 Predicted Construction Vibration Impacts

Impacts associated with construction vibration are most likely to occur during excavation stages for Lot 1 and roadwork activity.

Table 7-4 sets out the typical ground vibration levels at various distances for safe working distances.

Table 7-4 : Ground vibration – minimum working distances from sensitive receivers

Item	Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Vibratory Roller	< 300 kN (Typically 7-13 tonnes)	15m	100m
Small Hydraulic Hammer	(300kg – 5 to 12t Excavator)	2m	7m
Medium Hydraulic Hammer	(900kg – 12 to 18t Excavator)	7m	23m
Large Hydraulic Hammer	(1600kg – 18 to 34t Excavator)	22m	73m
Vibratory Pile Driver	Sheet piles	2m to 20m	20m
Pile Boring	≤ 800mm	2m (nominal)	N/A
Jackhammer	Hand held	1m (nominal)	Avoid contact with structure

Note: Table 2 of RMS *Construction Noise and Vibration Guideline (CNVG).*

7.5.1 Excavation

Proposed construction of Warehouse 1A & 1B located on Lot 1 includes significant earthworks during the excavation phase. Details of proposed plant items and construction methodology are not available at this design stage. Once a contractor has been nominated a detailed Construction Noise and Vibration Management Plan (CNVMP) should be carried out.

Based on the indicative construction equipment proposed Table 7-2 the minimum working distances for the prevention of cosmetic damage are as follows:

- Large Hydraulic Hammer (1600kg – 18 to 34t Excavator): 22m

It is estimated construction activity will occur as close as 18 meters to the sensitive receiver located within Lot 142 (ref DP1033686) and as close as 33 meters to Lot 141 (ref DP1033686).

Review of the relative elevations indicate pilling activity will occur at RL 59 where Lot 142 is at an elevation of RL 68. At this difference of elevation structural damage from piling is unlikely to cause any structural damage, however this should be assessed at a future date and documented with the CNVMP. Further guidance for vibration mitigation is outlined below in Section 7.6

7.5.2 Roadworks

Vibration intensive items of plant proposed for use during the construction of the Access Road and widening of Abbotts and Adlington Road will likely include vibratory rollers and compactors. Based on the indicative construction equipment proposed in Table 7-2, the minimum working distances for the prevention of cosmetic damage are as follows:

- Vibrator Roller < 300 kN (Typically 7-13 tonnes): 15m

Reviewed the proposed work areas and associated vibration generating plant and have confirmed that no receivers buildings fall within the minimum working distances for the proposed vibratory rolling.

7.6 Construction Noise & Vibration Mitigation Measures

Without mitigation, noise levels from construction activities have been predicted to exceed the noise management levels nominated in the guidelines at some surrounding receivers. Therefore, noise control measures are recommended to ensure that noise is reduced where feasible. The following project-specific mitigation measures are recommended.

- Selection of quietest feasible construction equipment;
- Use of saw cutting in preference to rock-breakers where feasible; and
- Localised treatment such as barriers, shrouds, and the like around fixed plant, such as pumps, generators, and concrete pumps.
- In addition, the following measures should be included in a Noise & Vibration Management Plan.
- *Plant Noise Audit* – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing should be established with the contractor.
- *Operator Instruction* – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission.
- *Equipment Selection* – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures, and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines.
- *Site Noise Planning* – Where practical, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels.

The adoption of the above measures is aimed at working towards achieving the noise management levels established at surrounding receivers.

7.6.1 Community Liaison and General Approaches to Mitigation

An effective community relations programme should be put in place to keep the community that has been identified as being potentially affected appraised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with surrounding owners/tenants, etc) of any anticipated changes in noise and vibration emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms. This programme should include a *Community and Stakeholder Engagement Strategy* developed specifically for the Project.

Close liaison should be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

7.6.2 Noise & Vibration Management Plan

A Construction Noise & Vibration Management Plan for the site is recommended which should be prepared by the successful contractor. The plan should reference the findings of this assessment. Areas that should be addressed in plan include:

- Noise and vibration mitigation measures;
- Noise and vibration monitoring;
- Response to complaints**;**
- Responsibilities;
- Monitoring of noise emissions from plant items;
- Reporting and record keeping;
- Non-compliance and corrective action; and
- Community consultation and complaint handling.

8 AIRCRAFT NOISE ASSESSMENT

8.1 Site Location

The Project is located across the 20-25 ANEF contour as presented with Western Sydney Airport (WSA) *Airport Plan June 2020*. As a requirement of the Mamre Road Precinct Draft Development Control Plan all developments within this zone are required to be constructed in accordance with Australian Standards AS2021 – Acoustics Noise Intrusion – Building Siting and Construction.

8.2 Site coordinates

The following dimensions have been determined in accordance with AS2021:2015;

Table 8-1 : Site Coordinates

Description	Dimension (m)
DS, sideline distance	1200
DL, landing distance	6340
DT, takeoff distance	10100
HS, elevation of site	80
HA, elevation of airport	80

8.3 Aircraft noise levels - AS2021:2015

Using the site coordinates, the noise levels for the various types of aircraft are calculated in Table 8-2

Table 8-2 Aircraft noise levels - AS2021:2015

Model	Representative Aircraft	Noise level, dBA L_{max} (Slow)	
		Departure	Arrival
A319-115	Airbus A319-131	62	55
A320-231	Airbus A320-232	61	56
A321-231	Airbus A321-232	61	56
A330-202	Airbus A330-301	69	60
A330-303	Airbus A330-301	69	60
A340-642	Airbus A340-642	64	61
A380-842 (Short haul)	Airbus A380-841 (Short haul)	65	60
A380-842 (Long haul)	Airbus A380-841 (Long haul)	66	60

Model	Representative Aircraft	Noise level, dBA L_{max} (Slow)	
		Departure	Arrival
737-3YO	Boeing 737-300	67	57
737-476	Boeing 737-400	67	58
737-8FE	Boeing 737-800	67	60
747-438 (Short haul)	747-400 (Short haul)	71	64
747-438 (Long haul)	747-400 (Long haul)	72	64
Max. Noise Level Event		72	64

Based on the highest predicted impact of L_{max} 72dBA, no further treatment to the Warehouse or Office building envelopes would be required to comply with AS2021:2015 internal assessment requirements.