REPORT

GPT INDUSTRIAL ESTATE

MAMRE ROAD, KEMPS CREEK

NOISE & VIBRATION IMPACT ASSESSMENT
RWDI # 2102701
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SUBMITTED TO

Tom Falconer
Assistant Development Manager
Tom.Falconer@gpt.com.au

The GPT Group
Level 51, 19 Martin Place
Sydney, NSW, 2000

SUBMITTED BY

David Perry
Project Engineer
Dave.Perry@rwdi.com

Neil Gross
Senior Technical Director
Neil.Gross@rwdi.com

Davis Lai
Project Manager
Davis.Lai@rwdi.com

RWDI Australia Pty Ltd (RWDI)
Level 4, 272 Pacific Highway
Crows Nest, NSW, 2065, Australia
T: +61.2.9437.4611
E-mail: solutions@rwdi.com
ABN: 86 641 303 871

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CONTENTS

1 INTRODUCTION

RWDI was retained by the GPT Group (the client) to conduct a noise and vibration assessment for the proposed warehouse estate (the Project) located on Lots 59-60 in DP 259135, Kemps Creek (the site).

The following report forms part of the State Significant Development Application (SSD 9138102) for the proposed warehouse and addresses the Secretary's Environmental Assessment Requirements (SEARs) relevant to the development issued November 2020.

This report responds to the Secretary's Environmental Assessment Requirements (SEARs) as they relate to noise and vibration. This report supports an Environmental Impact Statement (EIS) prepared in respect of the proposal and should be read in conjunction with the EIS and development plans submitted with the SSDA.

The SEARs relevant to this report have been considered and are addressed as outlined in Table 1-1.

Table 1-1 Secretary's Environmental Assessment Requirements (SEARs)

Relevant SEARs	Response
- 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	This report includes a description of potential noise sources associated with the development. Operational noise including traffic noise is addressed in **Section 5**. Construction noise and vibration is addressed in **Section 6**.
- cumulative impacts of other existing and proposed developments	This assessment includes consideration of the cumulative noise impacts of the potential noise emissions from the development in accordance with relevant Environmental Protection Authority guidelines (refer to **Section 4.2.3**).
- details and justification of the proposed noise mitigation, management and monitoring measures	An assessment of potential impacts on proposed nearby residential receivers has been undertaken for operational noise and construction noise in **Section 5** and **Section 6,** respectively.

Noise from the operation of the proposal has been assessed in accordance with the NSW *Noise Policy for Industry* (NPfI), NSW EPA,2017, which is used to set trigger levels to manage cumulative noise.

- Construction noise has been assessed in accordance with the *Interim Construction Noise Guideline* (ICNG), DECC, 2009.
- Vibration from operation and construction has been assessed in accordance with *Assessing Vibration: A Technical Guideline*, DEC, 2006.
- Traffic noise associated with the site has been assessed in accordance with the NSW *Road Noise Policy* (RNP), DECCW, 2011

2 PROJECT DESCRIPTION

2.1 Site Location

The site is located at Lots 59-60 in DP 259135, Kemps Creek as shown in Figure 1 below.

Figure 1 - Site Location

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 1.3 km to the east of the site.

The site is bounded by Mamre Road to the west and agricultural uses to the north, south and east. It is assumed that historical land uses on the site include rural residential, grazing, dairy farming, poultry farming and horticulture. This land is identified for future employment land, as indicated by the recent rezoning of Mamre Road Precinct to from RU2 Rural Landscape zone to IN1 General Industrial zoning under the State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP). The Mamre Road Precinct Development Control Plan map is presented below in Figure 2.

For the purpose of this assessment existing residential uses within the IN1 zone have been ignored on the basis none will be occupied by the time the development is occupied.

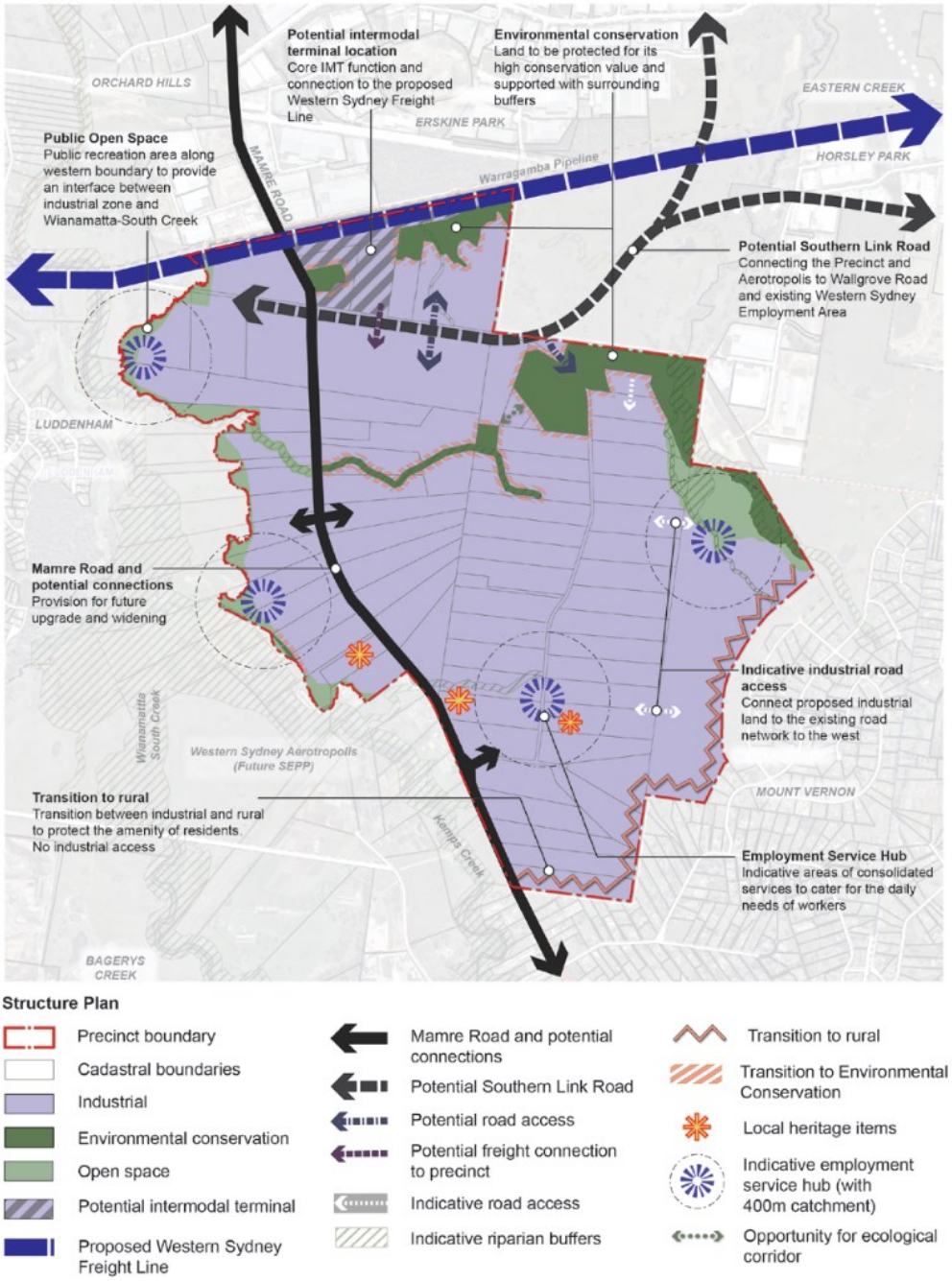

Figure 2 - Mamre Road Precinct

The Ministerial Local Planning Direction 3.5 precludes future residential development, as the site is affected by the Western Sydney International Airport's ANEF 20 noise contours. The NSW Government has identified an opportunity for land uses which are not sensitive land uses to locate in this precinct, such as warehouse and logistics facilities.

2.2 Development Layout

Proposed layout for the site is presented in Figure 3.

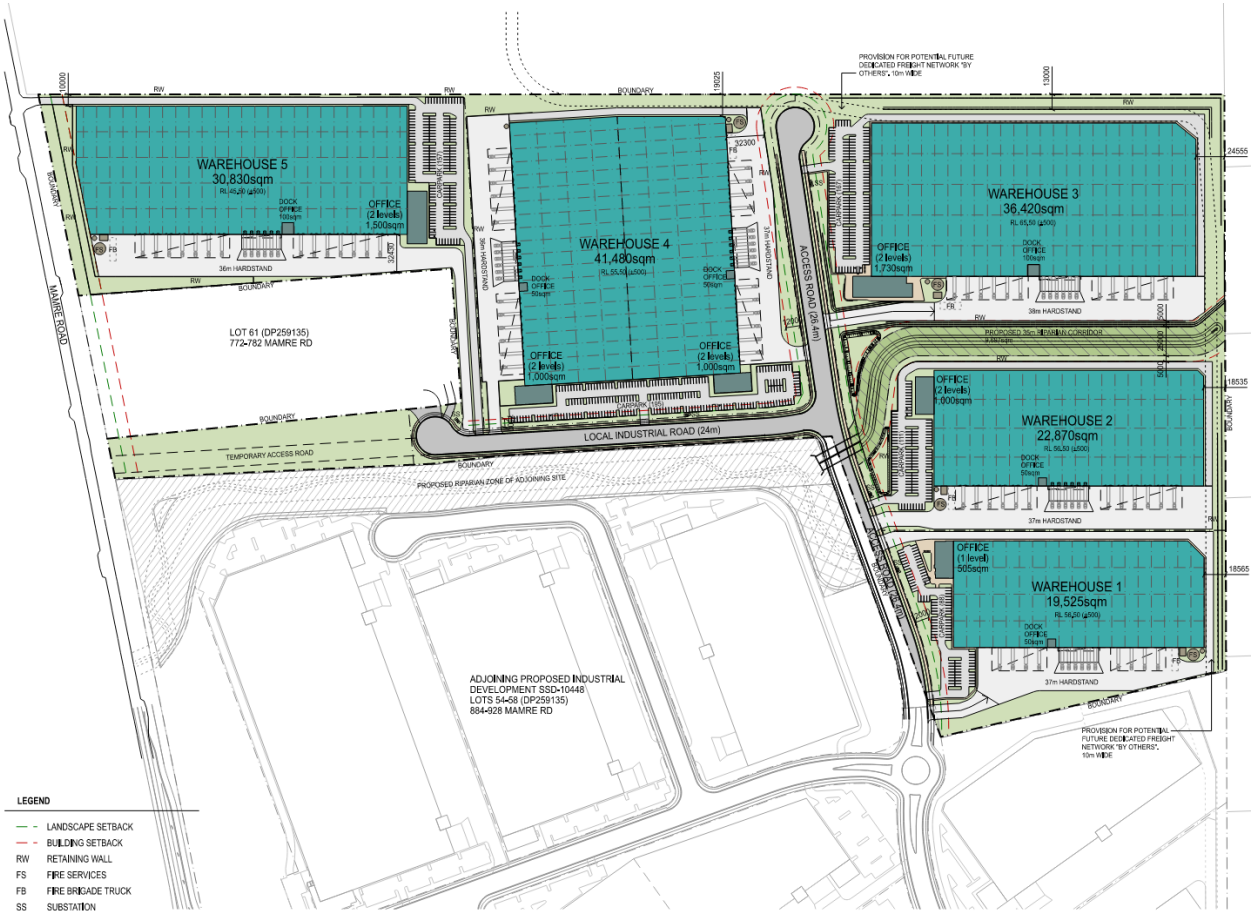

Figure 3 - Site Layout

2.3 Proposed Development

Operational noise impacts for all warehouses (Masterplan) and construction of Warehouse 1&3 (Stage 1) have been assessed, as detailed below.

2.3.1 Stage 1

The detailed Stage 1 development application will seek consent for site preparation works, construction, fit out and operation of two (2) warehouse buildings for warehouse or distribution uses. Specifically, approval is sought for the:

- Construction and use of Warehouse 1&3 for the purposes of other manufacturing industries and/or warehouse and distribution centres which will operate 24 hours/day, seven days/week.
- Provision of site servicing infrastructure to allow the operation of the industrial unit for warehouse and distribution and/or other manufacturing industries.
- Bulk earth works and the construction of retaining walls.

- Internal road network (and carpark construction and operation)

Stage 2 including construction of warehouse buildings 2, 4 and 5 will be subject to separate development applications.

2.3.2 Masterplan

Operational noise assessment for Masterplan comprising five (5) industrial warehouses, internal road network and offsite traffic noise impacts.

2.3.3 Hours of Operation

For the purpose of this assessment, it has been assumed that the development will operate 24 hours a day, 7 days a week.

3 EXISTING NOISE ENVIRONMENT

3.1 Noise Catchment Areas

The areas for assessment have been divided into three Noise Catchment Areas (NCAs). The NCAs group together sensitive receivers with similar existing noise environments. The NCAs and sensitive receivers in the area around the development are detailed in Table 3-1 and are shown in Figure 1.

The nearest residential receivers are located in Twin Creeks and Mount Vernon approximately 1400 m west of the site in NCA01 and 3 km east in NCA03, respectively.

Additionally, there are two private education establishments and a senior living development approximately 2km north of the site (NCA02). Both uses are within the Mamre Road Precinct and identified for future industrial land. In the interim, they will likely continue operating under their existing uses and are considered sensitive receivers for the purpose of this SSDA.

Lots on all sides of the site are future industrial buildings in various stages of development. These have been assessed as commercial receivers at a distance of 10 m, as this is the required setback specified in the Mamre Road Precinct Development Control Plan.

Table 3-1 - Noise Catchment Areas (NCAs)

NCA	Direction from Development	Description
NCA01	West	Receivers to the west of the GPT development where noise environment is currently influenced by road traffic (Luddenham Road and Mamre Road), and other local traffic on the surrounding roads network. The closest residential receivers are 1.4 km from the site boundary.
NCA02	North	Receivers to the north of the GPT development where noise environment is primarily influenced by road traffic on Mamre Road. Notable sensitive receivers include two educational facilities (Mamre Anglican School, Emmaus Catholic College), one Aged Care living facility (Emmaus Retirement Village) and one Early Childhood facility (Little Smarties Early Learning Centre). The closest receivers are 550 m from the site boundary.
NCA03 (North)	East	Receivers to the east of the GPT development where noise environment is influenced by distant road traffic on Mamre Road, local traffic, and distant industrial activity. The closest residential receivers are 2.9 km from the site boundary.
NCA03 (South)	South East	Receivers to the south east of the GPT development where noise environment is influenced by distant road traffic on Mamre Road, local traffic, and distant industrial activity. The closest residential receivers are 2.1 km from the site boundary.

3.2 Established Ambient Background Levels

Noise monitoring data has been sourced from unattended background noise monitoring carried out as part of the following assessments:

- 1018022 *R01AB Mamre Road Kemps Creek ENV* (Acoustic Works, 2020)
- 610.15617-R2 *Oakdale West Estate DA Noise Impact Assessment*, (SLR, 2017)
- 630.11166 *Oakdale South Estate DA Noise Impact Assessment*, (SLR, 2015)

The results of the various unattended ambient noise surveys are presented in Table 3-2 as the Rating Background Level (RBL) noise levels for the daytime, evening, and night-time periods.

Locations of the noise loggers is presented below in Figure 4.

Table 3-2 - Measured Noise Levels

Noise Logger	Applicable Noise Logging Location	RBL (dBA) [1]		
		Daytime	Evening	Night-time
L01[3]	NCA01	36	33	30 (actual 28)[2]
L02[4]	NCA02	35	34	32
L03[5]	NCA03	39	46[6]	47[6]

Note 1: Daytime (6am – 7pm), Evening (7pm – 10pm), and Night-time (10pm – 6am).
Note 2: Minimum RBL for 'Night-time' used for assessment.
Note 3: Logger location 7 Medinah Avenue, Twin Peaks as part of 1018022 *R01AB Mamre Road Kemps Creek ENV* (Acoustic Works, 2020)
Note 4: Logger location Emmaus Retirement Village as part of 610.15617-R2 Oakdale West Estate DA Noise Impact Assessment, (SLR, 2017)
Note 5: Logger location Lot, 5a/25 Ottelia Rd, Kemps Creek as part of 630.11166 Oakdale South Estate DA Noise Impact Assessment, (SLR, 2015)
Note 6: Daytime RBL used for Evening and Night-time used as per NPfI methodology for high Evening and Night-time levels.

Figure 4 - Noise Logger Locations

4 OPERATIONAL NOISE & VIBRATION ASSESSMENT CRITERIA

4.1 Secretary's Environmental Assessment Requirements (SEARs)

The SEARs relevant to this report have been considered and are addressed as outlined in Table 4-1.

Table 4-1 - Secretary's Environmental Assessment Requirements (SEARs)

Relevant SEARs	Response
- 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	This report includes a description of potential noise sources associated with the development. Operational noise including traffic noise is addressed in **Section 5**. Construction noise and vibration is addressed in **Section 6**.
- cumulative impacts of other existing and proposed developments	This assessment includes consideration of the cumulative noise impacts of the potential noise emissions from the development in accordance with relevant Environmental Protection Authority guidelines (refer to **Section 4.2.3**).
- details and justification of the proposed noise mitigation, management and monitoring measures	An assessment of potential impacts on proposed nearby residential receivers has been undertaken for operational noise and construction noise in **Section 5** and **Section 6,** respectively.

4.2 Operational Noise Level Criteria

4.2.1 Noise Policy for Industry

The *Noise Policy for Industry* (NPfI) was released in 2017 and sets out the NSW Environment Protection Authority's (EPA's) requirements for the assessment and management of noise from industry in NSW.

4.2.1.1 Trigger Levels

The *NPfI* describes 'trigger levels' which indicate the noise level at which feasible and reasonable noise management measures should be considered. Two forms of noise criteria are provided – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses.

- The intrusiveness of an industrial noise source is generally considered acceptable if the L_{Aeq} noise level of the source, measured over a period of 15 minutes, does not exceed the background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.

- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended amenity levels specified in the *NPfI* for that particular land use.

For this assessment, all NCAs have been assessed as 'rural' with recommended $L_{Aeq,period}$ amenity limits of 50dBA day, 45dBA evening and 40dBA night time.

4.2.2 Cumulative Noise Impacts

Cumulative noise needs to be considered from two aspects. Firstly, the cumulative noise from the five separate warehouses within the proposed development and secondly the cumulative noise from this development and noise from existing or potential developments which may affect the sensitive receivers within the NCAs. Other existing and future industrial developments are shown in Figure 5 and identified in Table 4-2 which identifies the NCA they may affect. Those listed first in bold are considered the primary noise sources and those following the secondary noise sources.

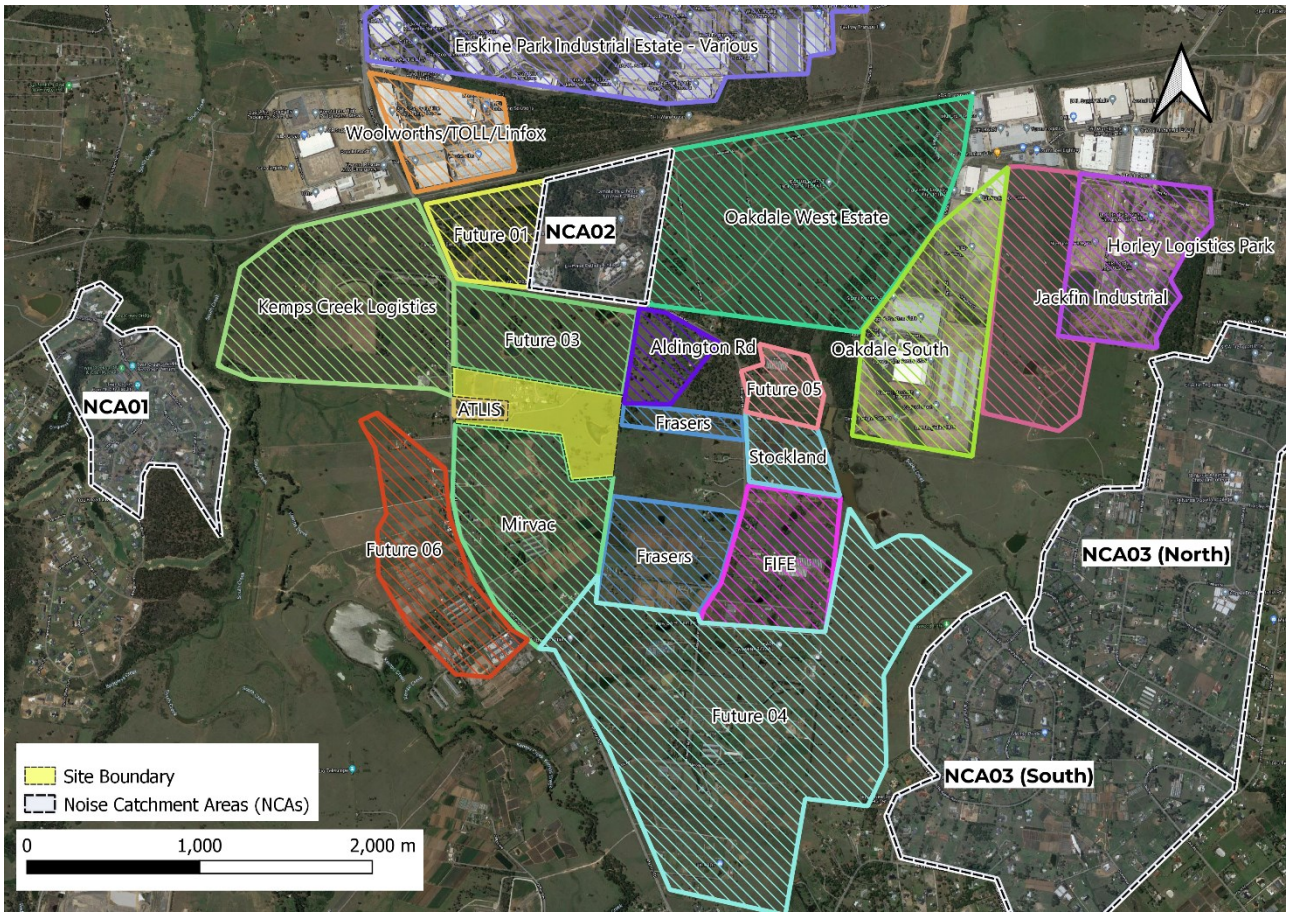

Figure 5 – Surrounding existing and future subdivisions

Table 4-2 - Cumulative Noise Source Developments

Receiver NCA	Development	SSDA #	Distance (approx.)
NCA01	**Kemps Creek Logistics**	**SSD-9522**	**300 m**
	Future 06	**-**	**750 m**
	GPT Group (subject site)	SSD-9138102	1400 m
	Mirvac	SSD-10448	1400 m
	Atlis	-	1400 m
	Future 01	-	1400 m
	Future 03	-	1400 m
	Woolworths/TOLL/Linfox		1500 m
NCA02	**Oakdale West Estate**	**SSD-7348**	**> 100 m**
	Future 01	**-**	**> 100 m**
	Future 02	**-**	**> 100 m**
	Future 03	**-**	**> 100 m**
	Erskine Park Industrial Estate - various	**-**	**350 m**
	Woolworths/TOLL/Linfox	**-**	**400 m**
	1-51 Adlington Road	-	200m
	Kemps Creek Logistics	SSD-9522	500 m
	Future 05	-	800 m
	Frasers	-	1200 m
	GPT Group (subject site)	SSD-9138102	500 m
NCA03 (Nth)	**Horsley Logistics Park**	**SSD-10436**	**150 m**
	Jacfin Industrial	**MP07_0153**	**475 m**
	Oakdale South Estate	SSD-6917	630 m
	Future 04	-	380 m
	GPT Group (subject site)	SSD-9138102	2600 m
NCA03 (Sth)	**Future 04**	**-**	**170 m**
	FIFE	**-**	**700 m**
	Oakdale South Estate	SSD-6917	900 m
	Stockland	-	1000 m
	Jacfin Industrial	MP07_0153	900 m
	GPT Group (subject site)	SSD-9138102	2600 m

The purpose of the amenity criteria is to establish a noise trigger level for a particular development that fairly shares noise between the total number of industrial subdivisions likely to affect a noise sensitive receiver. The approach documented in the NPfI is simplistic in that it assumes each

industrial subdivision only affects the one receiver and it is appropriate to share noise equally, rather than consider that the larger developments or those developments closer to the noise sensitive receivers should have a larger portion of the total noise trigger level as they don't have the benefit of distance and potentially shielding by closer developments to reduce noise.

Cumulative noise from other surrounding developments has been addressed by establishing the amenity trigger level for the proposed development in accordance with the intention of the guidance in the NPfI to address cumulative noise.

Where the proposed development is considered a primary noise contributor, the resulting amenity noise level is calculated using the following consideration.

$$\text{Resulting amenity noise level} = \text{ANL} - 10\log(\text{P} + 1)$$

Where the proposed development is considered a secondary noise contributor, the resulting amenity noise level is calculated using the following consideration for primary and secondary noise contributors.

$$\text{Resulting amenity noise level} = \text{ANL} - 10\log(\text{P} + 1) - 10\log(S)$$

Where the proposed development is considered a minor noise contributor, the resulting amenity noise level is calculated using the following consideration for primary and secondary noise contributors.

$$\text{Resulting amenity noise level} = \text{ANL} - 10\log(\text{P} + 1) - 10$$

where:

ANL = Amenity Noise Level

P = number of proposed additional developments considered to be primary noise contributors

S = number of proposed additional developments considered to be secondary noise contributors

Cumulative noise from the proposed development has been addressed by predicting noise levels from all five warehouses operating at capacity. The development will include its own Noise Masterplan to assign appropriate noise limits to each sub lot within the development to ensure cumulative emissions from the whole development align with the guidance in the NPfI.

Where the intrusiveness limits are the most stringent the noise assessment considers the current development status of the surrounding area, with no new buildings to provide shielding. However, when the cumulative assessment is undertaken it is assumed the precincts are all fully developed and as such there will be new buildings on the sites which are considered to provide significant shielding.

Since designs are unknown at this stage it is assumed the shielding will provide at least 10dBA.

Table 4-3 NPfI Amenity Noise Level for multiple premises

Receiver NCA	Total Developments (including subject site)	Period	Overall recommended Amenity Noise Level (ANL), dBA	Resulting Amenity Noise Level (ANL), dBA
NCA01	2 primary 6 secondary GPT secondary	Day	50	37 (50 - 5 - 8)
		Eve	45	32 (45 - 5 - 8)
		Night	40	27 (40 - 5 - 8)
NCA02	6 primary 5 secondary GPT secondary	Day	50	35 (50 - 8 - 7)
		Eve	45	30 (50 - 8 - 7)
		Night	40	25 (50 - 8 - 7)
NCA03 (North)	2 primary 2 secondary GPT distant	Day	50	35 (50 - 5 - 10)
		Eve	45	30 (50 - 5 - 10)
		Night	40	25 (50 - 5 - 10)
NCA03 (South)	1 primary 5 secondary GPT distant	Day	50	37 (50 - 3 - 10)
		Eve	45	32 (45 - 3 - 10)
		Night	40	26 (40 - 3 - 10)

Based on the above, the Project amenity noise level has been modified to the values presented in Table 4-4.

4.2.3 Project Specific Criteria

The noise emission trigger levels for operational noise generated by the development are provided in Table 4-4.

Individual Project Amenity Noise Levels have been determined with consideration to the cumulative noise associated with the developments presented in Table 4-2.

Amenity criteria presented in Table 4-4 has been converted from a period level to 15-minute level by adding 3 dB, as per NPfI methodology.

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

NCA	Receiver Type	Period	ANL[1] $L_{Aeq,period}$	Measured RBL[2]	Criteria for New Sources	
					Intrusive $L_{Aeq,15min}$	Amenity[3,4] $L_{Aeq,15min}$
NCA01	Residential	Day	50	36	41	40
		Evening	45	33	38	35
		Night	40	28	35[7]	30
NCA02	Residential	Day	50	35	40	38
		Evening	45	34	39	33
		Night	40	32	37	28
	School Classroom	Noisiest 1-hour period when in use	35[6] internal	n/a	45 external	n/a
NCA03 (North)	Residential	Day	50	39	44	38
		Evening	45	39[5]	44	33
		Night	40	39[5]	44	28
NCA03 (South)	Residential	Day	50	39	44	40
		Evening	45	39[5]	44	35
		Night	40	39[5]	44	29
-	Industrial	When in use	70	n/a	70	n/a

Note 1: ANL = "Amenity 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: ANLs have been modified to account for approved and existing levels of industrial noise refer to Section 4.2.2.

Note 5: Project intrusiveness noise level for night-time and Evening should be no greater than the project intrusiveness noise level for day as per *NPfI* methodology.

Note 6: ANL for school classrooms is internal criteria. On the basis that external noise levels are typically 10 dB higher than internal noise levels when windows are open, an external ANL of 45 dBA has been adopted for school classrooms.

Note 7: Minimum project intrusiveness noise level applied as per *NPfI* methodology.

4.3 Sleep Disturbance

Guidance for assessing the potential for sleep disturbance impacts on nearby residences is provided in Section 2.5 of the *NPfI*, which states:

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_{Amax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

a detailed maximum noise level event assessment should be undertaken.

Based on the above, the night-time sleep disturbance screening noise levels for the residential areas in the vicinity of the development is presented Table 4-5.

Table 4-5 - Sleep Disturbance Criteria

NCA	Period	Measured RBL L_{A90} (15minute)	Relevant RBL[1] plus 5 / 15 dB	Sleep Disturbance Criteria	
				$L_{Aeq,15min}$	L_{AMAX}
NCA01	Night-time	30[1]	35 / 45	**40**	**52**
NCA02		36	41 / 51	**41**	
NCA03 (North)		33	38 / 48	**40**	
NCA03 (South)		33	38 / 48	**45**	

Note 1: Minimum RBL for 'Night-time' used for assessment.

Where the sleep disturbance screening noise level is predicted to be exceeded then a detailed maximum noise level event assessment should be undertaken. The detailed assessment should discuss the predicted level of the events, the exceedance of the screening level, existing maximum noise levels, and consider guidance from current literature regarding sleep disturbance, such as the *Road Noise Policy*.

5 OPERATIONAL NOISE ASSESSMENT

5.1 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, and design ground topography 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. No shielding provided by future buildings surrounding the site have been included in the model.

5.2 Modelled Sources

Noise sources including onsite vehicle movements, forklift operation and internal warehouse activity have been modelled throughout the development. As details of specific items and exact usage of warehouse facilities are not yet known, a conservative approach to modelling has been conducted.

The following noise level data for vehicle-related noise sources has been used for the assessment. These noise levels are taken from RWDI's internal database and external assessments of similar subject sites.

Table 5-1 Sound Power Reference Levels

Noise Source	Noise Characteristic	Sound Power Level SWL, dBA
Forklift operational on hardstand	Quasi-steady	89 L_{Aeq}
Light Vehicle movements onsite	Quasi-steady	90 L_{Aeq}
Heavy Vehicle[1], unloaded @ 10 km/h	Quasi-steady	106 L_{Aeq}
Heavy Vehicle[1], loaded @ 10 km/h	Quasi-steady	107 L_{Aeq}
Heavy Vehicle[1], reversing @ 5 km/h	Quasi-steady	111 L_{Aeq}
Truck Engine Starting	Instantaneous	100 L_{Amax}
Truck Airbrake Release	Instantaneous	120 L_{Amax}

Note 1: Heavy vehicle defined as any cargo vehicle with three or more axles with gross vehicle weight > 12,000 kg.

5.2.1 Forklifts

Forklift operations with a reference sound power level of 89 (SWL) have been modelled outside each warehouse to provide a worst-case prediction of noise impacts on the surrounding sensitive receivers.

Six (6) forklifts have been distributed around the site at one per hardstand. It is unlikely all forklifts would operate during the same 15-minutes during the night-time period; however, this represents a worst-case scenario.

5.2.2 Internal Warehouse Activity

Noise emissions associated with internal warehouse activity with a total reverberant sound pressure level of 75 dBA ($L_{Aeq,15min}$) have been modelled inside each warehouse (with roller doors open) to assess potential noise impacts to nearby receivers.

Noise impacts have the potential to disturb (especially during night-time period) if breakout noise emissions are inadequately managed at the site.

5.2.3 Onsite Vehicle Movements

Estimated onsite vehicle movements were provided by the client based on the *RMS Guide to Traffic Generating Developments* with reference to traffic report *Mamre Road Precinct – Road Network Assessment Traffic Modelling and Options Assessment* (Ason Group, 2021); which includes a of review estimated traffic projections for proposed developments in the Mamre Road Precinct (MRP).

In the report conducted by Ason Group, predicted traffic generation was surveyed across six development sites, supplemented with additional data taken from the updated RMS *Guide to Traffic Generating Developments* and TfNSW case studies (GHD, 2019).

Based on the above, the following outlines the peak 15-minute period traffic volumes for light and heavy vehicles movements onsite, during the Daytime, Evening and Night time periods. The vehicle movements have been modelled to reflect realistic operations, with heavy vehicles accessing hardstand areas and light vehicles utilising carparking facilities. The assessment includes all five warehouses and office spaces as proposed in the Project.

Table 5-2 - Onsite Vehicle Movements

	Assessment Period[1]	Light Vehicles per 15min	Heavy Vehicles per 15min
All Warehouses (1-5)	Day	10	11
	Eve	22	5
	Night	17	3

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

Vehicle routes have been distributed across the site proportionally with the following light and heavy vehicle movements per warehouse presented below in Table 5-3. Note rounding errors may result in slightly different total.

Table 5-3 Onsite Vehicle Movements per Warehouse

	Assessment Period[1]	Light Vehicles per 15min	Heavy Vehicles per 15min
Warehouse 1	Day	2	1
	Eve	3	1
	Night	2	1
Warehouse 2	Day	1	2
	Eve	3	1
	Night	3	-
Warehouse 3	Day	2	3
	Eve	5	1
	Night	4	1
Warehouse 4	Day	3	3
	Eve	6	1
	Night	5	1
Warehouse 5	Day	2	2
	Eve	4	1
	Night	3	-

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

It is assumed trucks would arrive to each warehouse travelling at approximately 25 km/h and then manoeuvre on the hardstand areas speeds 5 – 10 km/h. Heavy vehicles will reverse for a duration of 30 seconds per vehicle at each warehouse loading bay. Sound power levels have been applied as per Table 5-1 accounting for reversing alarms, engine starts, airbrake releases and heavy vehicle movements onsite.

Light vehicle movements have been modelled at 40 km/h when accessing the carparking areas.

5.3 Predicted Operational Noise Levels

The predicted operational noise levels are summarised in Table 5-4.

Table 5-4 - Predicted Operational Noise Levels

Receiver Location	Time of Day	Predicted Noise Level[1] $L_{Aeq,15min}$	Intrusive Criteria $L_{Aeq,15min}$	'Future' Predicted Noise Level[2] $L_{Aeq,15min}$	Cumulative Amenity Criteria $L_{Aeq,15min}$	Exceedance
NCA01	Day	26	41	16	40	-
	Evening	26	38	16	35	-
	Night	23	35	13	30	-
NCA02	Day	26	40	16	38	-
	Evening	27	39	17	33	-
	Night	23	37	13	28	-
Educational[3]	When in use	20	45 external	10	-	-
NCA03 - North	Day	19	44	< 10	38	-
	Evening	18	44	< 10	33	-
	Night	16	44	< 10	28	-
NCA03 - South	Day	21	44	11	40	-
	Evening	20	44	10	35	-
	Night	17	44	< 10	29	-
Industrial[4]	When in use	54	70	-	-	-

Note 1: Receiver with highest level within each NCA reported.
Note 2: Predicted Noise Level minus 10 dB to account for acoustic shielding provided by future development surround site
Note 3: Educational receiver located within NCA02.
Note 4: Results represent future industrial receivers located at subject site boundary.

The above assessment indicates that predicted noise from the proposal complies with the Project Trigger Levels at all receivers during all time periods.

5.4 Sleep Disturbance

As the warehouses operate 24 hours per day, noise emissions during the night time period require an assessment for potential sleep disturbance at the nearest noise sensitive receivers. A summary of the LAmax sound power levels of typical activities that may occur at the facility with the potential to cause sleep disturbance is presented in Table 5-5.

Table 5-5 - Sleep Disturbance – L_{Amax} Sound Power Levels

Noise Source	L_{Amax} SWL (dBA)	Source Height
Truck Movement in Truck Parking Area	108	2 m
Airbrake in Truck Parking Area	120	2 m
Reversing Alarm	110	1 m
Roller Door	94	4 m
Forklift loading / unloading	100	2 m

The predicted night-time L_{Amax} noise levels at the nearest receivers to the development are presented in Table 5-6.

Table 5-6 - Summary of Predicted Sleep Disturbance Noise Levels

Receiver Location	L_{AFmax} Noise Level (dBA)		
	Criteria	Predicted	Exceedance
NCA01	52	51	-
NCA02		49	-
NCA03 (North)		42	-
NCA03 (South)		45	-

The above assessment indicates that predicted night-time L_{AFmax} noise levels from the proposal complies with the night-time sleep disturbance goals at all receivers.

6 ROAD TRAFFIC NOISE

This section of the report considers the potential impacts from additional traffic on the surrounding local road network.

The surrounding road network servicing the proposed development is located within the Mamre Road Precinct (MRP). Consideration of offsite road traffic noise is outside the scope of this assessment, as outcomes of the MRP Development Control Plan and several other key planning policies and strategies will determine the potential for traffic noise impacts at sensitive receiver locations,

6.1 NSW Road Noise Policy (2011)

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

Table 3 of the *RNP* is reproduced in Table 6-1 and presents the relevant criteria for road use within the Project in line 3.

Section 3.4 of the *RNP* describes the methodology used to assess noise impacts that may result from off-site operational road traffic. An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2 dB with the addition of the traffic from the development at nearby residential and other sensitive receivers. The results of this screening test are presented in Section 6.2.

Table 6-1 - 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)

6.2 Off-site Traffic Movement

Estimates of projected traffic volumes associated with the development have been provided by the client and are produced below for reference.

While light and heavy vehicle movements within the GPT site are classified as part of the operational site noise, once they leave site and onto public roads, they are assessed under the NSW Road Noise Policy (RNP).

The existing annual average daily traffic volume for Mamre Road is approximately 20,000 vehicles per day as per RMS report '*Mamre Road upgrade*', dated 2017. In accordance with the RTA Guide to Traffic Generating Developments, the proposed warehouse development is predicted to produce an additional 4407 vehicle movements per day, consisting of 3243 light vehicles and 1164 commercial vehicles (trucks).

Based on the estimated vehicle volume data, the predicted increase in daytime $L_{Aeq,15hr}$ for receivers near Mamre Road is calculated to be less than 1 dB. Noise impacts due to traffic generation associated with the proposed development is therefore expected to be negligible.

7 CONSTRUCTION NOISE & VIBRATION IMPACT ASSESSMENT

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.

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

Table 7-1 - Interim Construction Noise Guideline Criteria

Time of Day	NML	How to Apply
Recommended Standard Hours **Monday to Friday** **7am to 6pm** **Saturday** **8am to 1pm** **No work on Sundays or Public Holidays**	Noise Affected RBL+10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly Noise Affected 75 dBA	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 dBA	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 dBA above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the *ICNG*.

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
- Classrooms at schools and other educational institutions: internal $L_{Aeq,15min}$ 45dBA

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

Table 7-2 - 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]	Day OOH	Evening OOH[2]	Night OOH[3]	
NCA01	46	41	38	35	75
NCA02	45	40	39	37	
NCA03 (North/South)	49	44	34	34	
Industrial		75 external			-
Educational		45 internal			-

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 Construction Noise & Vibration Guideline (RMS, 2016)

Minimum working distances for typical vibration intensive construction equipment are provided in the Roads and Maritime Services *Construction Noise and Vibration Guideline* (CNVG).

The minimum working distances presented in are for both cosmetic damage (from BS 7358) and human comfort (from the NSW EPA Vibration Guideline) and are based on empirical data which suggests that where works are outside the minimum distances impacts are not considered likely.

Table 7-3 - Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating / Description	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Vibratory Roller	< 50 kN (Typically 1-2t)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4t)	6 m	20 m
	< 200 kN (Typically 4-6t)	12 m	40 m
	< 300 kN (Typically 7-13t)	15 m	100 m
	> 300 kN (Typically 13-18t)	20 m	100 m
	> 300 kN (Typically > 18t)	25 m	100 m
Small Hydraulic Hammer	300 kg – 5 to 12t excavator	2m	7 m
Medium Hydraulic Hammer	900 kg - 12 to 18t excavator	7 m	23 m
Large Hydraulic Hammer	1600 kg - 18 to 34t excavator	22 m	73 m
Vibratory Pile Driver	Sheet Piles	2 m to 20 m	20 to 100 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

7.3 Proposed Construction Activities

7.3.1 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 Warehouse 1&3 and supporting road network. The construction noise and vibration assessment has considered the following construction activities:

Stage 1 *(Warehouse 1&3)*

- Site Clearing and Enabling Works
- Excavation and construction of retaining walls.
- Building construction

Stage 1 *(Roadworks)*

- Site Clearing and Enabling Works
- Construction of internal north-south road network
- Carpark construction

7.3.2 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.

7.4 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 proposed design. 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 7-4. 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 into L_{Aeq} noise levels for assessment against the NMLs.

Table 7-4 - 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 ***(Warehouse 1&3)***	Site Establishment and Clearing	Chainsaw	5	1	108	**114**	118
		Dozer	15	2	110		
		Dump Truck (15 t)	15	1	98		
	Excavation	Dozer (D10)	15	2	115	**122**	123
		Dump Truck (15 t)	15	3	103		
		Excavator (40 t)	15	3	109		
		Piling Rig	1.5	1	116		
		Vibratory Roller (10-12 t)	15	1	109		
	Building Construction	Concrete Truck / Agitator	7.5	2	106	**114**	118
		Concrete Pump	15	1	106		
		Truck (12-15 tonne)	15	1	103		

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 ***(Roadworks)***	Site Establishment and Clearing	Chainsaw	5	1	108	**111**	118
		Dozer	15	1	110		
		Dump Truck (15 t)	15	1	98		
		Concrete Truck	15	1	106		
	Construction of Internal Road	Scraper	15	2	108	**118**	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	3	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.

7.5 Predicted Construction Noise Impacts

Noise impacts have been quantitatively assessed of construction activities for the NCAs and future industrial buildings surrounding the site, the. The activities considered are described in Table 7-4.

The typical $L_{Aeq,15min}$ noise levels at the surrounding NCAs and future industrial developments (to be located at site boundary) are provided in Table 7-5. Each of the construction activities are representative of the 'noisiest' construction periods allowing for the simultaneous operation of noise intensive construction plant in close proximity.

Table 7-5 - Predicted Construction Noise Impacts

Works	Stage	NCA	Noise Level – $L_{Aeq,15min}$ dBA					
			Noise Management Levels (NMLs)				Worst-case Predicted	Exceedance during Standard Hours
			Day Standard	Day OOH	Eve OOH	Night OOH		
Stage 1 ***(Warehouse 1&3)***	Site Establishment and Clearing	NCA01	46	41	38	35	30	-
		NCA02	45	40	39	37	36	-
		NCA03	49	44	34	34	26	-
		Industrial	75				50	-
	Bulk Excavation and Retaining Walls	NCA01	46	41	38	35	35	-
		NCA02	45	40	39	37	41	-
		NCA03	49	44	34	34	31	-
		Industrial	75				55	-
	Building Construction	NCA01	46	41	38	35	30	-
		NCA02	45	40	39	37	37	-
		NCA03	49	44	34	34	27	-
		Industrial	75				49	-
Stage 1 ***(Internal Road)***	Site Establishment and Clearing	NCA01	46	41	38	35	31	-
		NCA02	45	40	39	37	36	-
		NCA03	49	44	34	34	26	-
		Industrial	75				57	-
	Road Construction	NCA01	46	41	38	35	39	-
		NCA02	45	40	39	37	44	-
		NCA03	49	44	34	34	34	-
		Industrial	75				65	-

During standard construction hours, no exceedances of the NMLs are predicted at any residential receivers. 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}.

Industrial receivers to be located in the adjoining lots will not be subjected to noise impacts greater than the external Construction Noise Management Level of 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.

7.6 Predicted Construction Vibration Impacts

Vibration intensive items of plant proposed for use during the construction of the development includes rock breaking , vibratory rollers and pilling activity. These items of equipment are proposed to be used primarily during enabling works, earth works and construction of the road network.

Commercial developments surrounding the site may be operational at the time of construction. Site specific vibration mitigation measures should be utilised where works requiring the use of vibration intensive items of plant are proposed within the minimum working distances outlined in Table 7-3.

8 CONCLUSION

RWDI was engaged by the GPT Group to conduct a noise and vibration assessment for the proposed warehouse estate located on Lots 59-60 in DP 259135, Kemps Creek. Construction and operational noise and vibration, including traffic noise, has been quantitatively assessed in accordance with relevant Environment Protection Authority guidelines.

Based on the results of the investigation, the application for the masterplan is predicted to be acoustically satisfactory for both construction during 'standard hours' (Section 7) and 24-hour operations (Section 5).