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WAREHOUSE DEVELOPMENT

24-28 CAIRNS STREET, LOGANHOLME



NOISE IMPACT ASSESSMENT

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1.0 INTRODUCTION

Zedz Consultants Pty Ltd are proposing to construct a warehouse building at 24-28 Cairns Street, Loganholme. The site locality is shown on Figure 1 and is described as Lot 31 on RP88336.

Palmer Acoustics (Australia) Pty Ltd has been commissioned by Zedz Consultants Pty Ltd to complete a noise impact assessment in response to the Logan City Council (LCC).

The report addresses warehouse activities (loading bay and warehouse noise) from the proposed development.

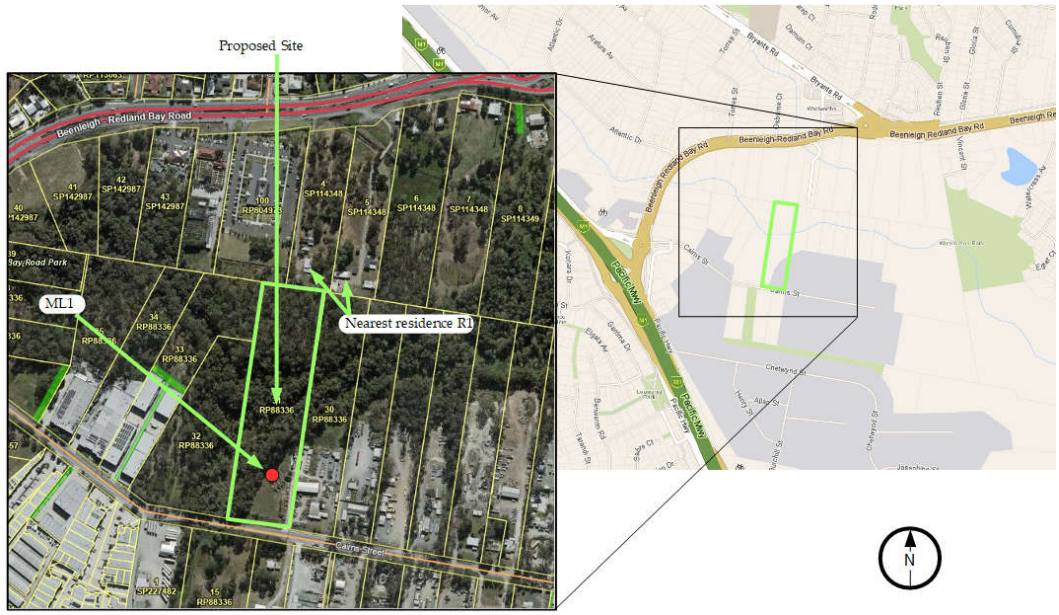


Figure 1: Locality

1.1 Existing site and surroundings

The subject site is currently vacant land with approx 25% of the land free of trees. The site is located 400m east of the Pacific Highway. There are industrial operations (Mixed Use Zone, industry and Environmental Management precincts) to east and south of the site. On the western property boundary is bushland (Environmental Management and Conservation Zone). On the northern boundary are bounded by place of workship and residential zone.

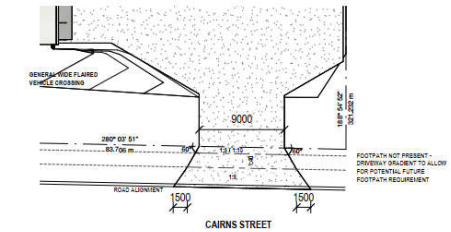
The subject site is located within the Environmental Management and Conservation Zone under the LCC Planning Scheme 2015.

1.2 Proposed development

The proposal is to construct a warehouse building including loading/unloading area and warehouse noise activities. The operation hours of the development are between 6am to 7pm.

The proposed site layout and location of the building are presented in Figure 2, below.





Site Plan - Driveway

Site Plan - Aerial Overview

Figure 2: Proposed site layout

2.0 EQUIPMENT AND PROCEDURES

2.1 Measurement Procedures

Noise levels were measured over a 6-day period commencing Wednesday 31 January 2024. An environmental noise logger was located on the middle of the site, with the microphone 1.3m above the ground height. The measurement location is shown as ML1 on Figure 1 and is indicated in Figure 3. The loggers were set to record 15 minute statistics over the logging period. The weather during the logging period was predominately fine. The night time data was affected by insect noise. The environmental record is presented in Figure 4, below. Where individual events are identified as atypical, they have been removed from the calculations as indicated.



Figure 3: ML1 Logger location

Additional night time attended measurements were conducted between 11:30pm on 6 February still 12:30am 7 February 2024. Noise measurements were conducted near the front boundary and at the nearest residence south of Beenleigh Redland Bay Road. The background result is presented in Figure 5, below.

2.2 Instrumentation

The following instruments were used to measure the ambient noise levels:

<u>31 Jan 2024 logging</u>

- BSWA Noise Logger #1 (serial number 560527)
- B & K 4230 Calibrator #2 (serial number 1638750)

<u>6 Feb 2024 midnight measurements</u>

- NTi XL2 Sound level meter (serial number A2A-08208-E0)
- B & K 4231 Calibrator (serial number 2095146)

The sound level measuring equipment was field calibrated before and after each measurement session and was found to be within 0.2dB of the reference signal. The noise logger, sound level meter and calibrator used in this assessment have a current calibration certificate from a certified NATA calibration laboratory.

3.0 AMBIENT NOISE LEVELS

The average ambient noise levels measured at ML1 are presented in Table 1. The noise sources present during the survey included:

- Road traffic noise from Pacific Highway;
- Hand tools from adjacent industries during day period and
- insect noise (affecting the night time result).

Table 1: Measured Ambient Noise Levels ML1

Time	Measured Noise Levels[1] dB(A)[2]				
	L_{Amax}[3]	L_{A01}[4]	L_{A10}[5]	L_{Aeq}[6]	L_{A90}[7]
Day: 7 am to 6 pm	64	55	50	48	41
Evening: 6 pm to 10 pm	57	52	49	47	41
Night: 10 pm to 7 am	57	52	49	48	43 (32)*

* Note: 43dB(A) is affected by insect noise, apply the measured background without the insect of 32dB(A) on the following page.

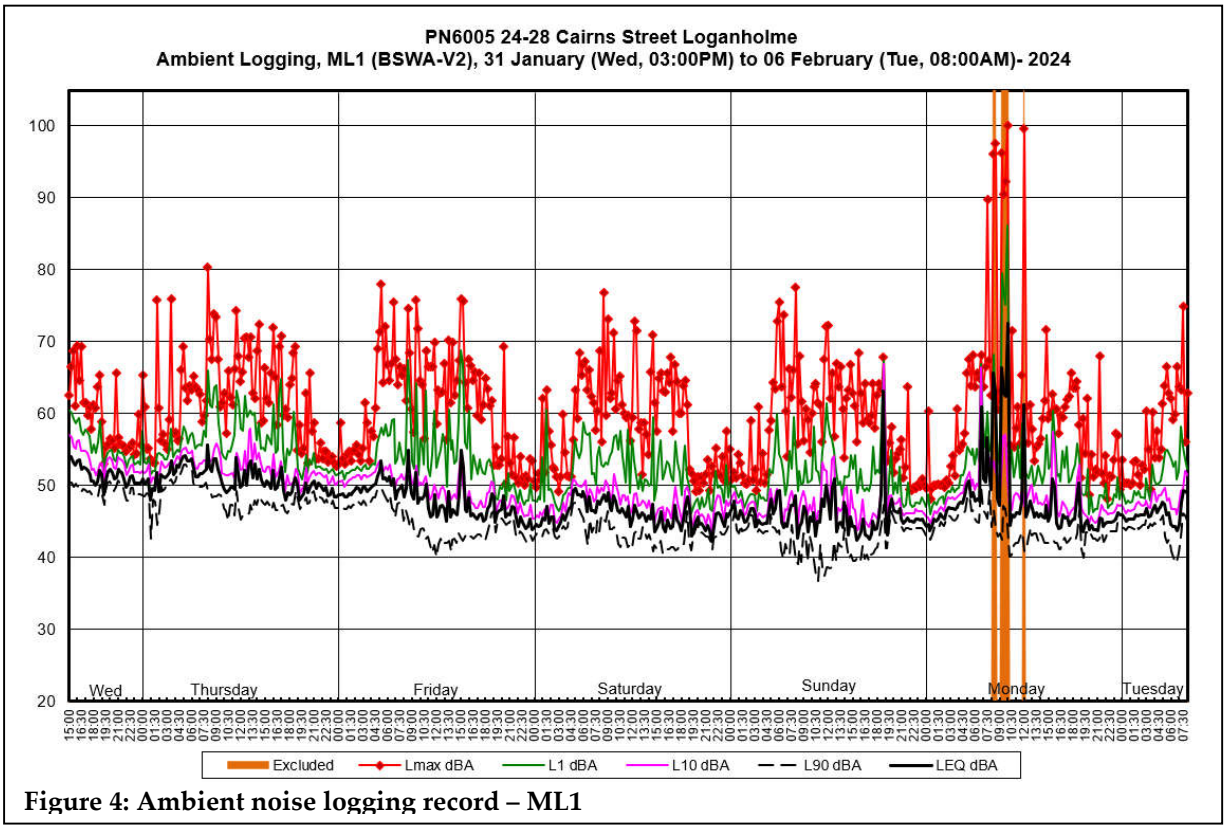


Figure 4: Ambient noise logging record – ML1

[1] *Average noise levels throughout the period, with the exception of L_{A90} which is the average below the median noise levels for the period.*
[2] *dB(A) decibels, A-weighted*
[3] *L_{Amax} refers to the maximum a-weighted sound pressure level occurring during the sampling period*
[4] L_{A01} *for a specified time interval, means the A-weighted sound pressure level that is equalled for 1% of the interval*
[5] L_{A10} *for a specified time interval, means the A-weighted sound pressure level that is equalled or exceeded for 10% of the interval*
[6] L_{Aeq} *for a specified time interval, means the time average A-weighted sound pressure level, within the meaning given by AS1055.1 for the interval*
[7] *L_{A90} refers to the noise level exceeded 90% of the time period, commonly referred to as the background noise level*

During the noise measurements, insect were the dominant noise at 43dB(A)L_{90} @ 4kHz. Further background calculation was conducted by removing the insect noise from the attended on-site measurements. The calculated background level is 29dB(A) L_{90}. The measured background level without the insect noise at Beenleigh Redland Bay Road is 32dB(A) L_{90}.

We propose to apply the measured night time background of **32dB(A) L_{90}** at the residence instead of the background from insects.

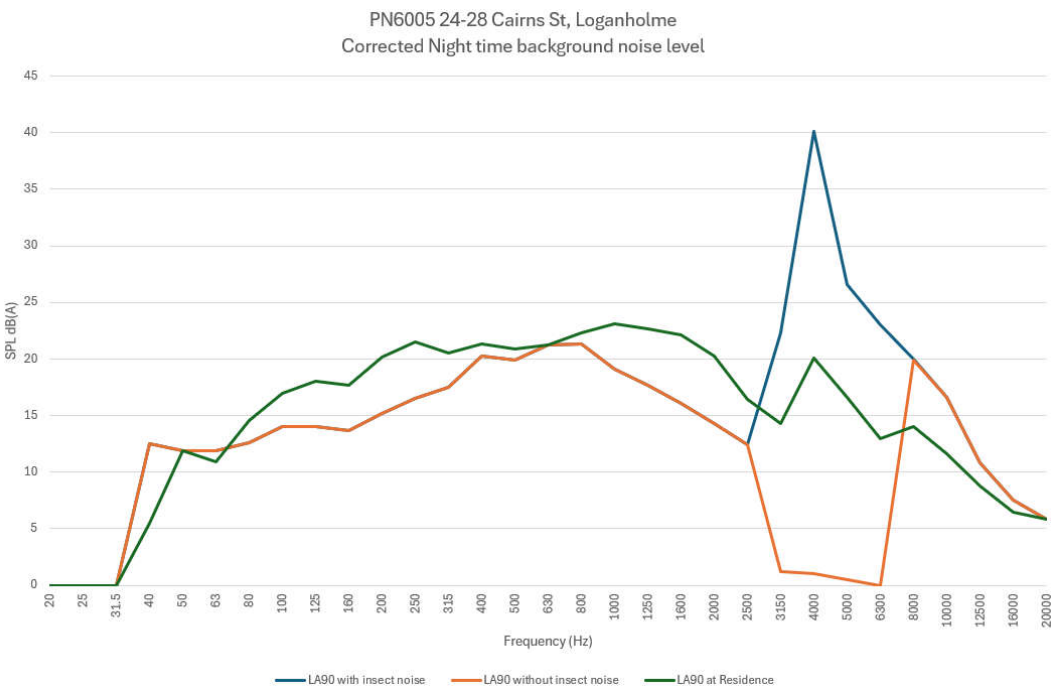


Figure 5: Night time noise level – without insect noise

4.0 NOISE EMISSIONS

The following section addresses the noise from the Warehouse, loading and car park activities onto the adjacent houses.

4.1 Council emission standards

The noise limiting criteria for the development are defined in the LCC Planning Scheme background plus criteria as per SC6.2.3 Planning Scheme Policy 3-Environmental Management, Section 3.2.1 (1), Table 3.2.1.1 and Table 3.2.1.2, presented as Table 2 and Table 3.

Table 2: Noise emission standards for the protection of residential amenity

Noise level at the boundary of premises			
Noise Type	**Time Period**	**Noise emission level**	**Derived Noise Limit $L_{Aeq,\ adj,T}$ dB(A)**
Non-steady sound	Day 7am-6pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5dB(A)	41+5=46
	Evening 6pm-10pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5dB(A)	41+5=46
	Night 10pm-7am	$L_{Aeq,adj,T} \leq L_{A90}$ plus 0dB(A) and $L_{Amax} \leq$ 60dB(A)	32+0=32
Continuous noise	Anytime	$L_{A90,T}$ plus 0dB(A)	Day – 41dB(A); Evening – 41dB(A); and Night – 32dB(A)

Table 3: Noise emission standards for the protection of general amenity

Noise level at the boundary of premises				
Noise Type	**Time Period**	**Monday to Saturday**	**Sunday and public holiday**	**Derived Noise Limit $L_{Aeq,\ adj,T}$ dB(A)**
Non-steady sound	Day 7am-6pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 10dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5dB(A)	41+10=51
	Evening 6pm-10pm	$L_{Aeq,adj,T} \leq L_{A90}$ plus 10dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5dB(A)	41+10=51
	Night 10pm-7am	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5dB(A) and $L_{Amax} \leq$ 80dB(A)	$L_{Aeq,adj,T} \leq L_{A90}$ plus 5dB(A) and $L_{Amax} \leq$ 80dB(A)	32+5=36
Continuous noise	Anytime	$L_{A90,T}$ plus 5dB(A)	$L_{A90,T}$ plus 5dB(A)	Day – 46dB(A); Evening – 46dB(A); and Night – 36dB(A)

The background noise level between 6am-7am (throughout the noise logging periods) is higher than the day time background. The daytime period will include 6am starts for non-steady sound.

4.2 Noise emission from Mechanical Plant

The design for any mechanical services have not yet been completed and plant selections and locations are unknown. Therefore, we are only able to recommend design limits for the control of mechanical plant noise emissions at the nearest noise sensitive receptor. These are presented as the "continuous noise" limits in Table 2 and Table 3.

To comply with the above noise limits, there are a number of engineering solutions available. Low noise levels are achieved by the engineered selection and application of:

- Low sound power level equipment
- Silencers
- Acoustic enclosures
- Noise barriers
- Vibration isolation systems

The application of such principles and treatments, along with providing maximum separation distances between noise sources and sensitive areas will ensure that noise from plant and equipment complies with limits.

4.3 Noise emission from Warehouse

Intermittent and fluctuating noise at the adjacent residences is likely to include the following sources:

- Noise from loading/unloading;
- Noise from inside the warehouse.

Measurements of typical vehicle manoeuvring and loading/unloading noise for a warehouse have been conducted by this office and are presented in Table 4.

Table 4: Typical maximum measured noise levels from vehicle manoeuvres

Source	Noise Level @ 10m dB(A) L_{AMax}
Truck passby	72 dB(A)
Broadband/smart reverse beepers	75 dB(A) + 5dB*
Truck loading/unloading	71 dB(A)
Forklift loading/ passby	67 dB(A)

* Impulsive adjustments

- Warehouse activities to northern residences (worse case situations):

  The closest edge of the loading area (refer to Figure 6) is approximately 270m and 230m from the shed 2 northern wall to the residential boundary on the north. The warehouse building shields all activities to the northern property.



Figure 6: Noise source locations northern residential boundary

- Warehouse activities to eastern boundary:

  The centre of the loading area is approximately 35m to the closest adjacent office building to the east (adjacent industrial site). The warehouse building is 5m away from the eastern boundary, the warehouse building is 35m to the adjacent office building. Refer to Figure 7.

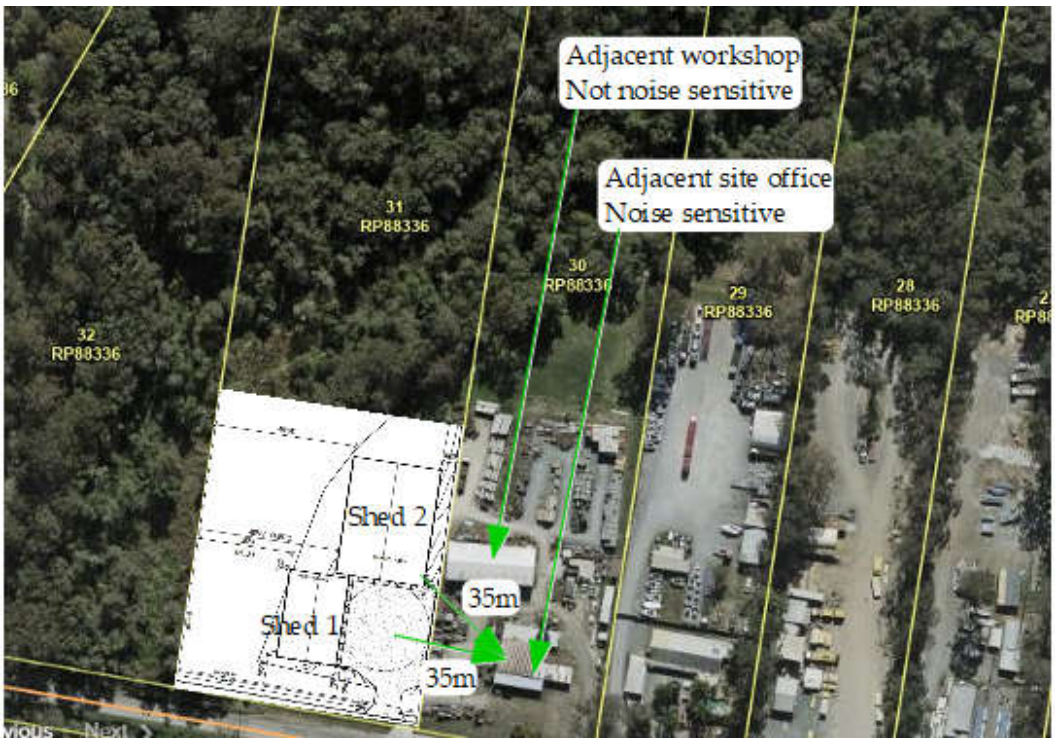


Figure 7: Noise source location east boundary – adjacent office building

4.4 Assessment of Residential amenities

This section considers truck loading and unloading noise from the proposed loading area to the adjacent residences (north).

The distance between the loading area and the nearest residential boundary to the north is approximately 270m. The loading activities of the Warehouse operate between 6am to 7pm.

Where emission criteria are expressed as Leq values and noise emissions are not continuous, the number and duration of events must be estimated. Predicted noise emissions from loading /unloading at the designated loading area are presented in Table 5. The assumed number and duration of events has been added to the table.

Table 5: Typical maximum noise levels as measured from typical truck loading activities

Source	Noise Level @ 10m	Duration (seconds) / Number of events		
		Day	Evening	Night
Truck passby	72 dB L_{Amax}	30/10	30/5	30/2
Truck loading/unloading	71 dB L_{Amax}	60/15	60/15	60/2
Forklift loading/ passby (outside area)	67 dB L_{Amax}	60/30	60/30	60/5
Broadband/smart reverse beepers	80 dB $L_{Amax, adj}$	10/10	10/5	10/1

(i) Loading Area Noise Northern residence

Table 6 presents the predicted noise impacts from the proposed loading area. The northern property boundary is approximately 270m from edge of the loading area. The presented calculation is based on distance attenuation of 6 dB per doubling of distance and shed shielding.

Table 6: Predicted loading/unloading noise impacts (without noise barrier) – north

Source	Distance & shielding Attenuation	Energy Averaging D/E/N	Noise Level dB(A) at northern residence boundary	Complies With Noise Limits 42/42/32dB(A)
			L_{Aeq} D/E/N	
Truck passby	-29 dB 10m to 270m & -15dB	-11/-14/-18 dB	18/15/11 dB(A)	Yes
Truck loading/unloading	29 dB 10m to 270m & -15dB	-6/-6/-15 dB	21/21/13 dB(A)	Yes
Forklift loading/ passby (outside area)	29 dB 10m to 270m & -15dB	-3/-3/-11 dB	20/20/12 dB(A)	Yes
Broadband/smart reverse beepers	29 dB 10m to 270m & -15dB	-16/-19/-26 dB	21/18/11 dB(A)	Yes
SUM			26/25/18 dB(A)	Yes

Table 6 indicates that the predicted accumulative loading area noise emissions complies with LCC day and night time limits at the northern boundary (6am-7pm operation). Therefore, no acoustic treatment be required.

(ii) Loading and unloading noise within the proposed Warehouses

The proposed warehouse buildings (Shed 1 and Shed 2) will be constructed with metal framing and metal sheeting on the outside. The metal shed structure is calculated to have acoustic insulation performance of Rw21 and an insertion loss of 15 + 6 = 21 dB owing to the transition from reverberant to free field radiation. The roller doors opening of the Shed 1 is on the east façade and the Shed 2 in on the southern façade. These openings are facing away from the northern residence. The northern façade of the Shed 2 is closer to residence than Shed 1.

The proposed warehouse building is 230m to the northern residential boundaries. The presented calculation is based on distance attenuation of area source:

Shed 2:

- Northern wall (30m x 5m from 10m to 230m) is -27 dB
- Roof to Northern (40m x 30m from 10m to 230m) is -26dB and

Table 7: Predicted warehouse noise impacts – Wall

Source	Allow for reverberant noise inside Warehouse	Attenuation through façade and distance	Energy Averaging D/E/N	Noise Level dB(A) at residence boundary L_{Aeq}	Complies With Noise Limits 46/46/32dB(A)
To Northern Residential Boundary					
Truck loading/ unloading	+10dB	-21 dB & -27dB (10m to 230m)	-6/-6/-15 dB	27/27/18 dB(A)	Yes
Forklift – loading / passby	+10dB	-21 dB & -27dB (10m to 230m)	-3/-3/-11 dB	26/26/18 dB(A)	Yes

For the calculation in Table 8 noise breakout from the roof, there is -3dB correction for directivity.

Table 8: Predicted warehouse noise impacts – Roof/Ceiling

Source	Allow for reverberant noise inside Warehouse	Attenuation through façade & distance & directivity	Energy Averaging D/E/N	Noise Level dB(A) at residence boundary L_{Aeq}	Complies With Noise Limits 46/46/32dB(A)
To Northern Residential Boundary					
Truck loading/ unloading	+10dB	-21 dB & -26dB (10m to 230m) & -3dB	-6/-6/-15 dB	25/25/16 dB(A)	Yes
Forklift – loading / passby	+10dB	-21 dB & -26dB (10m to 230m) & -3dB	-3/-3/-11 dB	24/24/16 dB(A)	Yes

Table 9 presents the sum from the predicted level in Table 7 and Table 8.

Table 9: Predicted Warehouse noise impacts – Noise sum at north boundary

Source	Wall	Ceiling	Sum	Complies With Noise Limits 46/46/32dB(A)
To Northern Residential Boundary				
Truck loading/ unloading	27/27/18 dB(A)	25/25/16 dB(A)	29/29/20 dB(A)	Yes
Forklift – loading / passby	26/26/18 dB(A)	24/24/16 dB(A)	28/28/20 dB(A)	Yes

Table 9 indicates that the predicted noise emissions from the Warehouse (Shed 2) comply with the Council day and night time limits at the northern residential boundary (6am-7pm operation).

4.5 Assessment of General amenities

(i) Loading Area Noise Eastern industry land

This section considers truck loading/ unloading noise from the proposed loading area to the adjacent site office building.

The distance between the centre of loading area and adjacent industrial site office to the east is approximately 35m. The loading activities of the Warehouse operate between 6am to 7pm.

Where emission criteria are expressed as Leq values and noise emissions are not continuous, the number and duration of events must be estimated. Predicted noise emissions from loading /unloading at the designated loading area are presented in Table 5 above.

Table 10 presents the predicted noise impacts from the proposed loading area. The adjacent Warehouse to the east has an open façade workshop shed, on-ground storage area, site office. The site office is considered noise senstive receiver for general amenities. The presented calculation is based on distance attenuation of 6 dB per doubling of distance. The General Amenity noise limits were applied to the eastern site office building.

Table 10: Predicted loading/unloading noise impacts (without noise barrier) – east

Source	Distance Attenuation	Energy Averaging D/E/N	Noise Level dB(A) at Eastern boundary	Complies With Noise Limits 51/51/36dB(A)
			L_{Aeq} D/E/N	
Truck passby	-11 dB 10m to 35m	-11/-14/-18 dB	50/47/43 dB(A)	Yes/Yes/No
Broadband/smart reverse beepers	-11 dB 10m to 35m	-16/-19/-26 dB	54/51/44 dB(A)	No/Yes/No
Truck loading/unloading	-11 dB 10m to 35m	-6/-6/-15 dB	54/54/45 dB(A)	No
Forklift loading/ passby (outside area)	-11 dB 10m to 35m	-3/-3/-11 dB	53/53/45 dB(A)	No

Table 10 indicates that the predicted loading area noise emissions exceeds Council day and night time limits. Therefore, a 2.1m high acoustic barrier will be required on the eastern property boundary (Refer to Figure 8). The barrier is to be constructed of material with surface mass greater than 12.5kg/m^2 with no gaps or holes. Table 11 presented the calculation with noise attenuation of 2.1m high acoustic barrier. The receiver is 1.5m above the ground at the eastern property boundary.

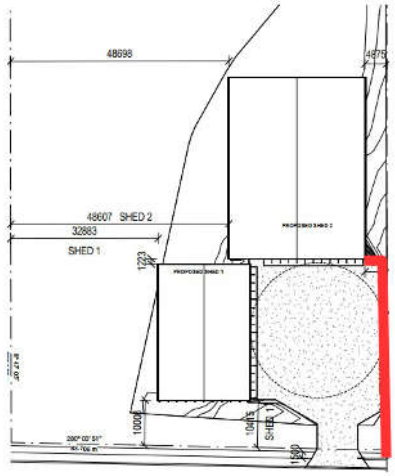


Figure 8: Noise barrier locations for eastern boundary – Overall site

Table 11: Predicted loading/unloading noise impacts (with 2.1m high acoustic barrier) – east

Source	Distance & barrier Attenuation	Energy Averaging D/E/N	Noise Level dB(A) at Northern boundary L_{Aeq} D/E/N	Complies With Noise Limits 51/51/36dB(A)
Truck passby	-11 dB 10m to 35m & -10dB	-11/-14/-18 dB	41/38/34 dB(A)	Yes
Broadband/smart reverse beepers	-11 dB 10m to 35m & -10dB	-16/-19/-26 dB	44/41/34 dB(A)	Yes
Truck loading/unloading	-11 dB 10m to 35m & -10dB	-6/-6/-15 dB	44/44/36 dB(A)	Yes
Forklift loading/ passby (outside area)	-11 dB 10m to 35m & -10dB	-3/-3/-11 dB	44/44/36 dB(A)	Yes

Table 11 indicates that the predicted noise (loading area) emissions comply with the Council day and night time limits at the eastern boundary. Therefore the loading activity should be limited to 6am to 7pm operation.

(ii) Loading and unloading noise inside the Warehouse –East boundary

To meet the day and night time limits, the eastern adjacent site office. The warehouse opening (roller doors) is to limited to 15 m². The overall performance, of the Shed 2 southern façade, reduced from -21dB to -8dB.

The proposed warehouse (shed 2 is the closest to adjacent industrial site office) is 35m eastern industrial office. The presented calculation is based on distance attenuation from an area source:

- Southern wall (30m x 5m from 10m to 35m) is -11dB
- Roof to east (40m x 30m from 10m to 35m) is -10dB.

Table 12 presents the predicted noise impact inside the Shed 2 warehouse.

Table 12: Predicted warehouse noise impacts – Wall and roof (without acoustic treatments)

Source	Allow for reverberant noise inside Warehouse	Attenuation through façade & distance & directivity & Barrier	Energy Averaging D/E/N	Noise Level dB(A) to east L_{Aeq}	Complies With Noise Limits 51/51/36dB(A)
Eastern façade to eastern Boundary					
Truck loading/ unloading	+10dB	-21 dB & -11dB (10m to 35m) & 0dB &0dB	-6/-6/-15 dB	43/43/34 dB(A)	Yes
Forklift – loading / passby	+10dB	-21 dB & -11dB (10m to 35m) & 0dB & 0dB	-3/-3/-11 dB	42/42/34 dB(A)	Yes
Southern façade (open roller door 15m²) to eastern Boundary					
Truck loading/ unloading	+10dB	-8dB & -11dB (10m to 35m) & -3dB &-5dB	-6/-6/-15 dB	48/48/39 dB(A)	Yes/Yes/No
Forklift – loading / passby	+10dB	-8dB & -11dB (10m to 35m) & -3dB &-5dB	-3/-3/-11 dB	47/47/39 dB(A)	Yes/Yes/No
Roof/ceiling façade to Eastern Boundary					
Truck loading/ unloading	+10dB	-21 dB & -10dB (10m to 35m) & -3dB & 0dB	-6/-6/-15 dB	41/41/32 dB(A)	Yes
Forklift – loading / passby	+10dB	-21 dB & -10dB (10m to 35m) & -3dB & 0dB	-3/-3/-11 dB	40/40/32 dB(A)	Yes

Source	Allow for reverberant noise inside Warehouse	Attenuation through façade & distance & directivity & Barrier	Energy Averaging D/E/N	Noise Level dB(A) to east L_{Aeq}	Complies With Noise Limits 51/51/36dB(A)
Sum of all façades					
Truck loading/ unloading				50/50/41 dB(A)	Yes/Yes/No
Forklift – loading / passby				49/49/41 dB(A)	Yes/Yes/No

Table 12 indicates that the predicted cumulative noise emissions comply with the Council day and evening time limits at the eastern industrial site office. Therefore the loading activities with open roller door (max 15m2 opening) be limited to 6am to 7pm operation.

The proposed loading noise inside the Warehouse (Shed 1) to the eastern boundary is further (in distance) than the Shed 2 building. The predicted cumulative noise (loading noise) emission will comply with the Council's day and evening time limits. No further acoustic treatments are required.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our assessment, we conclude:

- The background noise level between 6am-7am (throughout the noise logging period) is higher than the day time background. Therefore the daytime period below will include 6am starts for non-steady sound
- The loading area and driveway can comply with the Logan City Council – noise emission limits (Residential Amenity) at northern residences boundary. The loading activities be limited to 6am-7pm.
- The loading area and driveway can comply with the Logan City Council – noise emission limits (General Amenity) at eastern adjacent industry. A noise barrier is required on the eastern boundary.
- The loading noise from inside the Warehouse can comply with the Logan City Council noise limits at eastern adjacent industry. For Shed 2 open roller door is to be limited to max 15m^2 opening. Shed 1 is further away from the eastern adjacent industry and loading noise from inside the Warehouse will comply with noise limts.

To ensure compliance with the LCC noise requirements, the following is recommended:

- Loading/unloading activities be limited to 6am to 7pm.
- All forklifts and pick-up/delivery vehicles have installed broadband or smart reverse beepers.
- Thye installation of a noise barrier on the eastern property boundary (refer to Figure 8). Height to be 2.1m above loading area RL.
- Mechanical plant noise (continuous noise) emissions be controlled to the limits expressed in Table 2 and with appropriate noise screening.

Subject to the recommended acoustic treatments, it is the opinion of Palmer Acoustics (Australia) Pty Ltd that the proposed development will comply with the requirements of LCC's Plan Scheme 2015.

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