7A-11 Racecourse Road, 5-9 Faunce Street & Young Street, West Gosford

Noise and Vibration Impact Assessment

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E-LAB Consulting

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Document QA and Revisions

ISSUE	DATE	COMMENTS	ENGINEER	REVIEWER
1	14/12/2022	Draft Issue	Artie Rattananikom	Brandon Notaras
2	16/12/2022	For Development Application	Artie Rattananikom	Brandon Notaras
3				
4				

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Authorised by:

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Acoustics & Vibration

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1 EXECUTIVE SUMMARY

This noise and vibration report has been prepared by E-LAB Consulting to accompany a Development Application (DA) for the proposal at 7A-11 Racecourse Road, 5-9 Faunce Street & Young Street, West Gosford. The proposal will involve construction of a bus depot that will comprise of an at-grade carpark, three storey administration building, workshop, hardstand for bus parking and associated facilities.

This report concludes that the proposal is acceptable and supportable subject to the implementation of the mitigation measures outlined below.

- Typical mitigation measures for mechanical plant and equipment are outlined in Section 7.1, to be refined and finalised during the design development stage once equipment selections and detailed designs have progressed further.
- Mitigation measures to address operational noise impacts are outlined in Section 7.2, including constructions for acoustic screens and awnings, and management controls.
- Reasonable and feasible construction noise and vibration mitigation measures in-line with the recommendations of the ICNG and AS2436 are outlined in Section 9.

Following implementation of the above mitigation measures, the proposal is appropriate from a noise and vibration perspective.

2 INTRODUCTION

This Noise and Vibration Impact Assessment has been prepared to accompany a Development Application (DA) for the development to be located at 7A-11 Racecourse Road, 5-9 Faunce Street & Young Street, West Gosford. The proposal includes construction of a bus depot that will comprise of an at-grade carpark, three storey administration building, workshop, hardstand for bus parking and associated facilities.

In summary, this assessment shall address the following key acoustics considerations:

- Noise generated by vehicles movements (buses, cars and other moving equipment) within hardstand and carparking areas on the project site, and from general operation of the site (workshops, vehicle servicing/checks and washing)
- Noise impacts of additional traffic on surrounding local roads generated by the proposed development; and
- Noise emissions from mechanical plant associated with the development to surrounding noise-sensitive receivers.

The acoustic, noise and vibration legislation, standards and guidelines applicable to the proposal include:

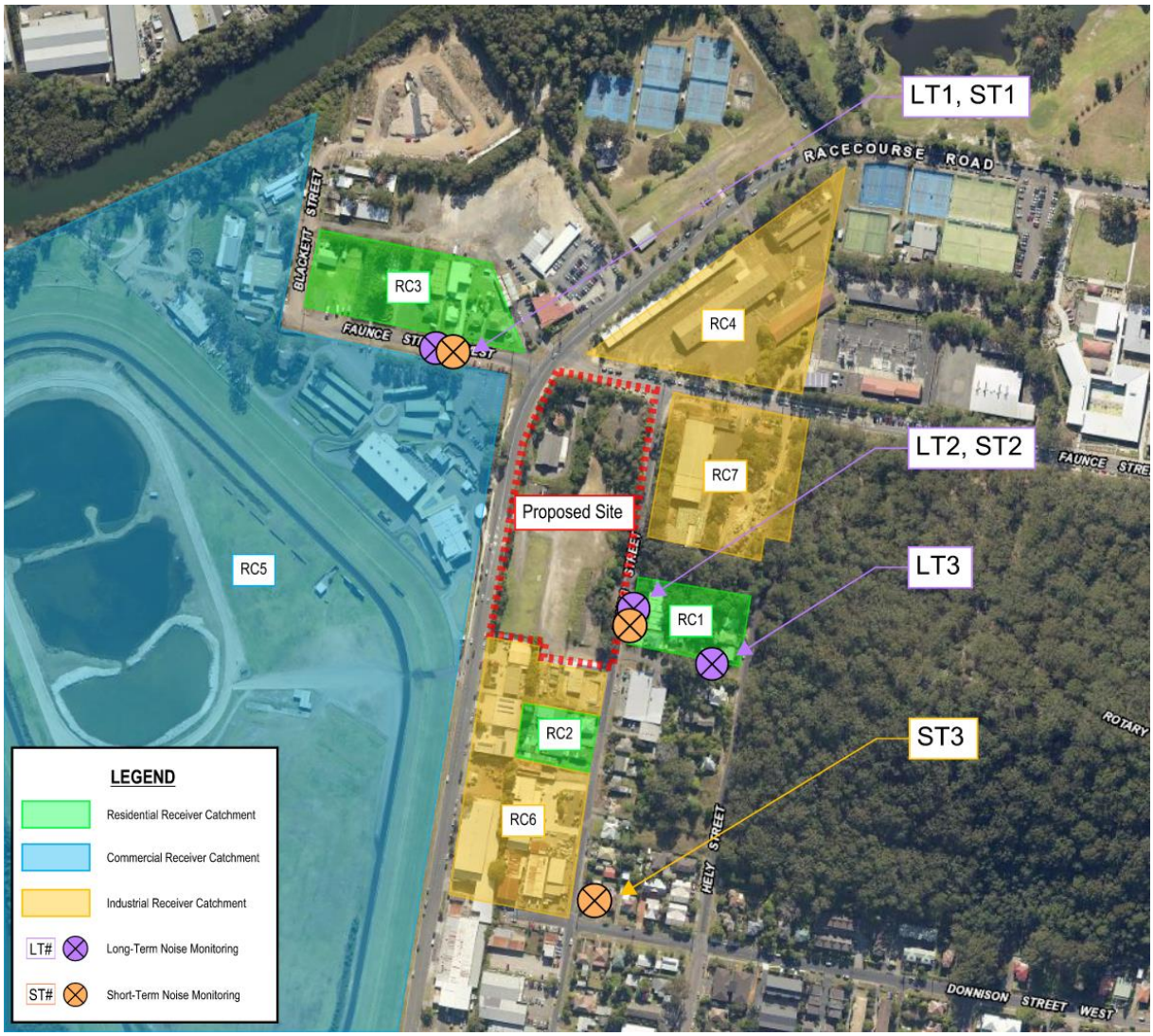
- Central Coast Council *Development Control Plan* 2022 (**DCP**)
- NSW EPA *Road Noise Policy* 2011 (**RNP**)
- NSW EPA *Noise Policy for Industry* 2017 (**NPfI**); and
- NSW EPA Interim Construction Noise Guideline 2009 (**ICNG**).

3 PROJECT OVERVIEW

3.1 SITE DESCRIPTION

The location of the proposal, noise monitoring and measurement positions are shown in Figure 1. Figure 1 also presents a summary of the worst affected noise-sensitive receivers which have been delineated into receiver catchments (RCs).

Figure 1: Acoustic site plan identifying the surrounding noise-sensitive receivers and relevant noise monitoring locations



3.2 SITE PROPOSAL

The proposed development is for a bus depot transport facility depot that will comprise of the following:

- An at-grade carpark with 113 car spaces and 4 disabled car spaces.
- A three-storey administration building for staff and visitors which include end of trip facilities, lunchroom, offices, meeting rooms and training rooms.
- External staff recreation area associated with the administration building.
- A 1.5 storey workshop for bus maintenance and repairs.
- Hardstand areas for stacked bus parking, to accommodate 97 bus bays.

- Facilities for bus wash, refuelling and storage areas.
- Site security including electric fencing around the site.

3.3 SITE ACOUSTIC CONSIDERATIONS

Upon reviewing the design documentation prepared for the Development Application, the acoustic elements to consider are:

- Noise generated by vehicles movements (buses, cars and other moving equipment) within hardstand and carparking areas on the project site, and from general operation of the site (internal workshops, vehicle servicing and repairs, vehicles checks and wash stations)
- Noise impacts of additional traffic on surrounding local roads generated by the proposed development; and
- Noise emissions from mechanical plant associated with the development to surrounding noise-sensitive receivers.

4 NOISE SURVEYS

4.1 INSTRUMENTATION

The equipment used for noise surveys is summarised below:

- 4 x Convergence Instruments Sound Level Meter Data Logger (NSRT_mk3 Type 1)
- Bruel and Kjaer Sound Level Meter/Analyzer Type 2250 (S/N: 3031115)
- Bruel and Kjaer Sound Calibrator Type 4231 (S/N: 3029638)

All equipment was calibrated prior to the measurement period, and no significant drift was observed following the measurement period. All equipment carries current traceable calibration certificates that can be provided upon request.

4.2 LONG-TERM NOISE MONITORING – TRAFFIC NOISE

Long-term noise monitoring has been conducted at the project site at locations LT1 to LT3 as labelled in Figure 1. The results of the traffic noise measurements are presented in Table 1.

The description of time of day is outlined within the NSW Planning Guidelines; SEPP (Transport and Infrastructure) and Development Near Rail Corridors and Busy Roads – Interim Guideline, and described as follows.

- Day – the period from 7:00am to 10:00pm
- Night – the period from 10:00pm – 7:00am

Table 1: Unattended traffic noise monitoring results

LOCATION	MEASURED TRAFFIC NOISE LEVELS – dB(A)$L_{AEQ,PERIOD}$	
	DAY (MEASURED)	NIGHT (MEASURED)
LT1	61	52
LT2	61	51
LT3	64	50

4.3 LONG-TERM NOISE MONITORING – BACKGROUND NOISE

Background noise levels and subsequent Rating Background Noise Levels (RBLs) have been established in accordance with the Noise Policy for Industry 2017 using the results of the noise monitoring.

We note the NPfI recognises that there are times of day when there is a clear change in the noise environment (such as early morning shoulder periods), where it may be unreasonable to expect operations to be assessed against the night-time project noise trigger levels as background noise levels steadily rise in early morning hours. Appendix A3 of the policy provides a method in deriving a shoulder period rating background noise level.

In light of the above, time periods used in this assessment have been determined in accordance with the NPfI and are summarized as follows:

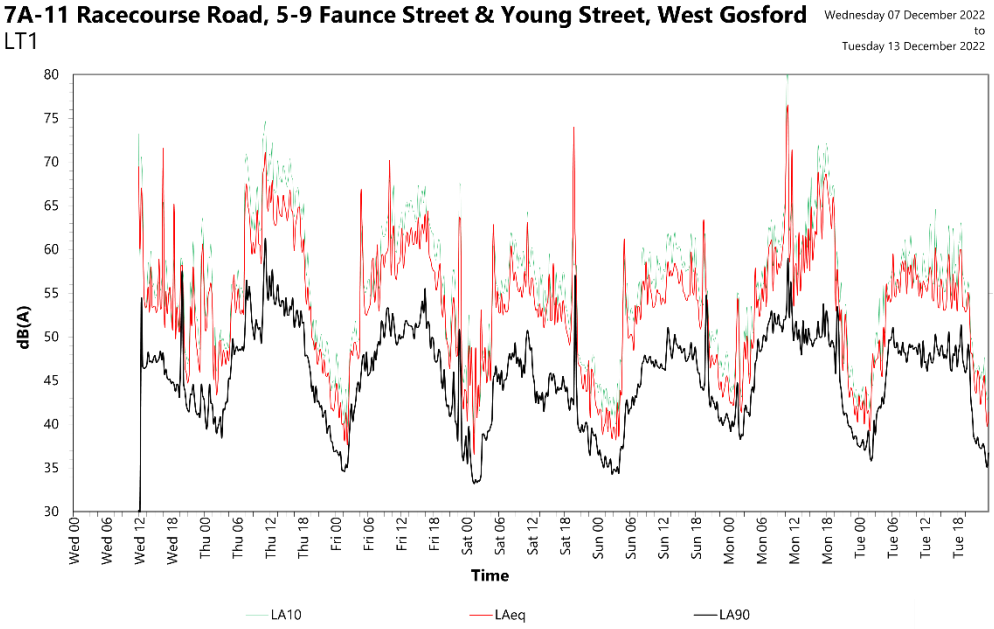
- Day – the period from 7:00am to 6:00pm Monday to Saturday, 8am to 6pm on Sundays and public holidays
- Evening – the period from 6:00pm to 10:00pm
- Night – the period from 10:00pm – 5:00am
- Morning shoulder – the period from 5:00am to 7:00am Monday to Saturday, 5am to 8:00am Sundays and public holidays.

Table 2 provides a summary of ambient noise levels in line with the periods listed above. Also refer to Figure 2 to Figure 4 for graphical noise monitoring data.

Table 2: Unattended noise monitoring results

LOCATION	MEASURED EQUILAVENT CONTINUOUS NOISE LEVEL – L_{EQ} dB(A)				MEASURED RATING BACKGROUND NOISE LEVELS – L_{90} dB(A)			
	DAY	EVENING	NIGHT	MORNING SHOULDER	DAY	EVENING	NIGHT	MORNING SHOULDER
LT1	62	57	50	56	48	41	36	42
LT2	61	56	48	57	46	41	37	39
LT3	65	58	44	57	45	40	36	40

Figure 2: Long-term noise monitoring data graph (LT1)



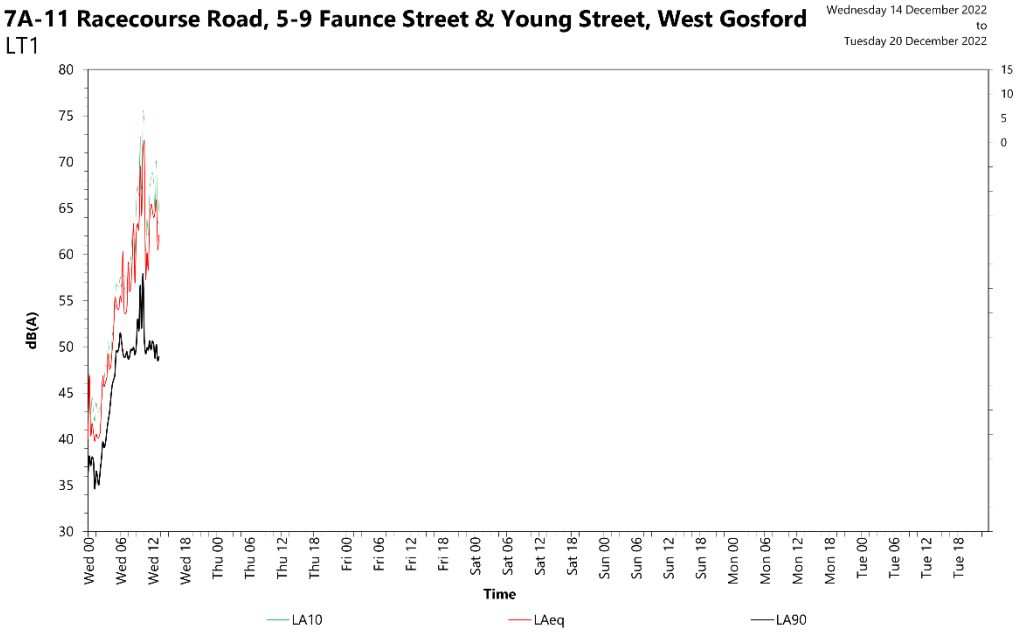


Figure 3: Long-term noise monitoring data graph (LT2)

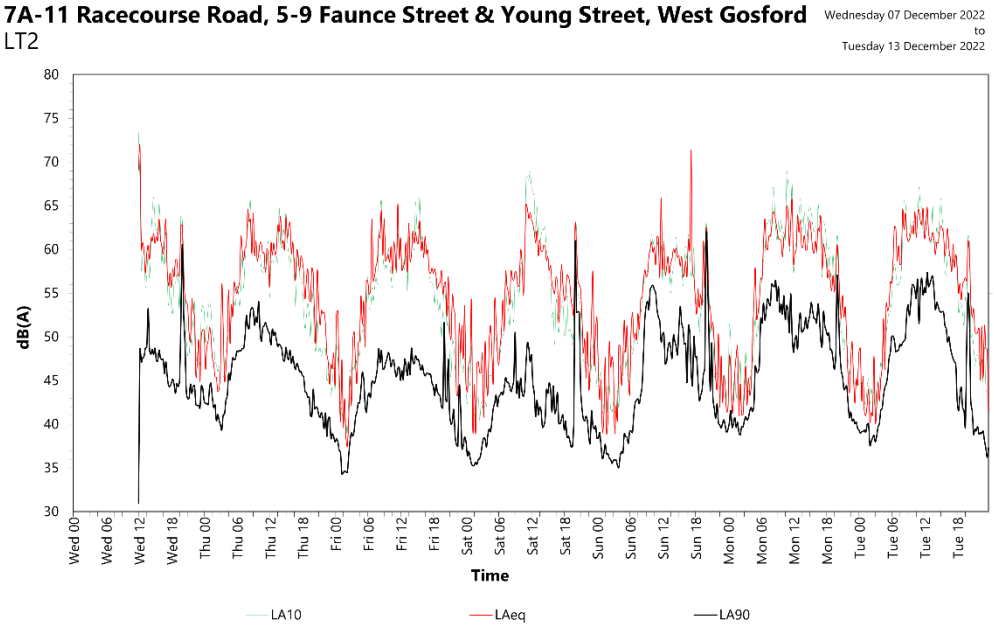
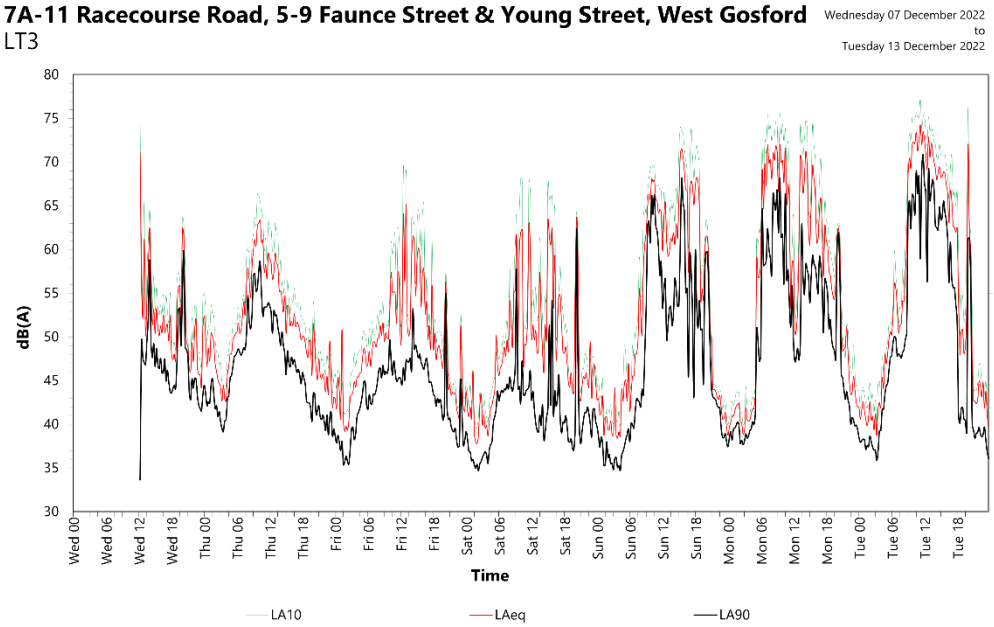


Figure 4: Long-term noise monitoring data graph (LT3)



4.4 SHORT-TERM (ATTENDED) NOISE MONITORING

4.4.1 Ambient Noise Levels

Short-term attended noise measurements have been conducted at the subject site to supplement long-term unattended noise monitoring, and to determine environmental noise characteristics. The results of attended noise measurement conducted at the locations indicated in Figure 1 is provided in Table 3.

Table 3: Short-term noise measurement summary – Ambient Noise

MEASUREMENT LOCATION	MEASUREMENT TIME	L_{Aeq} dB(A)	L_{A90} dB(A)	L_{A10} dB(A)	COMMENTS
ST1	Wednesday 7th December 2022, Thursday 20th October, 2022 1:30pm – 3:00pm	55	45	55	Intermittent noise from traffic (predominantly trucks) along Racecourse Road, horse stables and other commercial noise at development (The Entertainment Grounds) on the corner of Faunce Street West and Racecourse Road.
ST2		58	52	59	Predominantly noise from the natural environment (cicadas). Intermittent noise from traffic (cars and trucks) along Young Street and distant industrial noise.
ST3		54	43	57	Noise from the natural environment, intermittent traffic along Young and Donnison Street West, and distant industrial noise.

4.4.2 Operational Noise Levels

Short-term attended noise measurements have also been undertaken at an existing bus depot currently in use by the Operator.

Measurements were conducted to identify typical operational activities at the same type of development, and also the noise levels each activity will generate.

A summary of observed noise sources and resultant noise levels measured at the existing bus depot is provided in Table 3.

Table 4: Short-term noise measurement summary – Operational Noise

ACTIVITY/NOISE SOURCE	ASSOCIATED NOISE SOURCES	MEASURED NOISE LEVEL dB(A)		MEASUREMENT DISTANCE
		L_{AFMAX}	$L_{AEQ,T}$	
Bus Pre-Departure Checks	Bus Startup	84	81	3m
	Bus Idling and Air Brake	81	75	7m
	Horn Check	97	86	7m
Departure/Arrival of Buses	Bus Travelling at 10km/h	79	70	7m
	Bus Reversing and Reverse Beep/Alarm	90	79	7m
	Bus Horn before reversing	97	86	7m
	Bus Idling and Air Brake	81	75	7m
Workshop	Electric Impact Wrench	108	102	1m
	Bench Grinder	96	93	1m
	Welding Machine	92	88	1m
	Brake Tank Draining	77	76	7m
	Forklift Operation	76	73	2m
Panel Shop & Spray Booth	Disk Sander	100	102	1m
	Drop Saw	95	102	3m
	Orbital Sander	92	99	1m
	Hammering on Metal	106	100	1m
Steam Clean Bay	Diesel Pressure Washer	82	81	1m
	Pressure Washer Nozzle	87	86	1m
	Staple Gun	90	82	1m
External Bus Wash	External Washing Machine	88	64	5m

5 PROJECT NOISE AND VIBRATION CRITERIA

This section presents the regulatory requirements, and acoustic design criteria for the proposal.

5.1 CENTRAL COAST COUNCIL DEVELOPMENT CONTROL PLAN 2022

Chapter 2.9 (Industrial Development) Section 2.9.2.19 (Noise Generation) of the DCP provides the following requirements to minimise the impact of noise generated by industrial activity:

a. *Acoustic design principles are to be incorporated into the development design. In this regard, industrial noise shall be controlled so that it does not impact upon the amenity of the nearest residential dwelling.*

b. *Industrial development shall comply with the requirements of the Noise Policy for Industry produced by the EPA in 2017.*

c. *An Acoustic Report shall be submitted with the Development Application for any industrial development proposal located within 50 metres of a residential property boundary (other than a Manger's residence on an adjacent industrial site).*

5.2 EXTERNAL NOISE EMISSIONS

5.2.1 NSW EPA Noise Policy for Industry (NPI) 2017 – Industrial Noise

The NSW EPA's Noise Policy for Industry (NPI) 2017 has been implemented to assess the noise impacts of mechanical plant and equipment, as well as other industrial noise sources on the surrounding receiver catchments.

The NPI sets out a framework for the derivation of project noise trigger levels that are used to assess the potential impacts of noise from industry (and industrial noise sources) and indicate the noise level at which feasible and reasonable noise management measures should be considered.

This policy applies to noise sources from activities listed in Schedule 1 of the POEO Act and those regulated by the EPA. This includes noise sources from mechanical plant and equipment within the proposed redevelopment, as well as activities in the operation of the site generally for which this policy will be applied.

The project noise trigger level provides a benchmark for assessing a proposal, where if exceeded, indicates a potential noise impact on the community and so triggers a management response such as additional mitigation measures. The project noise trigger level is the lower (the more stringent) value of the project intrusiveness noise level and project amenity noise level determined in Sections 2.3 and 2.4 of the NPI, respectively.

Project Intrusiveness Noise Level

The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (in terms of L_{Aeq}) measured over a 15-minute period does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. The project intrusiveness noise level is only applicable to surrounding residential receivers.

To account for the temporal variation of background noise levels, the method outlined in Fact Sheet A of the NPI establishes a method in determining the Rating Background Noise Level (RBL) to be used in the assessment.

The intrusiveness noise level is determined as follows:

$L_{Aeq,15min}$ (Intrusiveness Criteria) = Rating Background Noise Level (RBL) + 5 dB(A)

Where the RBLs established in accordance with Fact Sheet A are lower than the values presented in Table 5 for each assessment period, the values presented in Table 5 shall be used for that particular assessment period. These result in the minimum intrusiveness noise levels provided in Table 5.

Table 5: Minimum assumed RBLs and project intrusiveness noise levels

TIME OF DAY	MINIMUM ASSUMED RBL - dB(A)	MINIMUM PROJECT INTRUSIVENESS NOISE LEVELS - $L_{Aeq,15min}$ dB(A)
Day	35	40
Evening	30	35
Night	30	35

Table 6 provides the project intrusiveness noise levels applicable to each of the surrounding residential noise-sensitive receivers based on the measured background noise levels provided in Table 2.

Table 6: Project intrusiveness noise level criteria for each residential receiver

RECEIVER	TIME OF DAY	MEASURED RBL - dB(A)	PROJECT INTRUSIVENESS NOISE LEVELS - $L_{Aeq,15min}$ dB(A)
RC1 & RC2 - Residential	Day	45	50
	Evening	40	45
	Night	36	41
	Morning Shoulder	40	45
RC3 - Residential	Day	48	53
	Evening	41	46
	Night	36	41
	Morning Shoulder	42	47

Project Amenity Noise Level

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project Amenity Noise Level = Recommended Amenity Noise Level (see Table 8) – 5 dB(A)

The following exceptions to the above method to derive the project amenity noise level apply:

- In areas with high traffic noise levels. Where the level of transport noise, road traffic noise in particular is high enough to make noise from an industrial source inaudible, the project amenity noise level shall be set at 15 dB(A) below the measured $L_{Aeq,period(traffic)}$ for the particular assessment period
- In proposed developments in major industrial clusters
- Where the resultant project amenity noise level is 10 dB(A) or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB(A) below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time
- Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development

Table 2.3 of the NPfI provides guidance on assigning residential receiver noise categories; being Rural, Suburban or Urban. The following descriptions have been replicated from the policy:

Table 7: Residential receiver category descriptions for Suburban and Urban residences

RECEIVER CATEGORY	TYPICAL EXISTING RBL'S	DESCRIPTION
Suburban	Daytime < 45dB(A) Evening < 40dB(A) Night < 35dB(A)	An area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban	Daytime > 45dB(A) Evening > 40dB(A) Night > 35dB(A)	An area with an acoustical environment that: ▪ Is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources ▪ Has through-traffic with characteristically heavy and continuous traffic flows during peak periods ▪ Is near commercial districts or industrial districts ▪ Has any combination of the above

In consideration of the above, we note the following based on long-term noise monitoring and on-site observations:

- Existing background noise levels at nearby residences are generally consistent with those associated with an Urban" residence.
- Existing land-use surrounding the site is predominantly industrial, or commercial.
- Ambient noise levels in the existing acoustical environment are governed by industrial noise sources and traffic, both located adjacent to the site and further in the distance.

On this basis, the receiver noise category most applicable to nearby residences is the Urban classification. The recommended amenity noise level, project amenity noise level, and converted project amenity noise level for comparison with the intrusiveness criteria (from time-of-day period to 15-minute) is provided for each surrounding receiver catchment in Table 8.

Table 8: Project amenity noise level criteria for each receiver catchment

RECEIVER TYPE	TIME OF DAY	RECOMMENDED AMENITY NOISE LEVEL - $L_{Aeq,period}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,period}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,15min}$ dB(A)
Residential – Urban	Day	60	55	58
	Evening	50	45	48
	Night	45	40	43
Commercial Premises	When in use	65	60	63
Industrial Premises	When in use	70	65	68

Sleep Disturbance and Maximum Noise Level Assessment

Where the proposed redevelopment night-time noise levels generated at a residential location exceed either:

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

a detailed maximum noise level event assessment should be undertaken.

Corrections for Annoying Noise Characteristics – Noise Policy for Industry Fact Sheet C

Fact Sheet C contained within the Noise Policy for Industry outlines the correction factors to be applied to the source noise level at the receiver before comparison with the project noise trigger levels established within this report, to account for the additional annoyance caused by these modifying factors.

The modifying factor corrections should be applied having regard to:

- The contribution noise level from the premises when assessed/measured at a receiver location, and
- The nature of the noise source and its characteristics (as set out in Fact Sheet C)

Table C1 within Fact Sheet C sets out the corrections to be applied for any assessment in-line with the NPI. The corrections specified for tonal, intermittent and low-frequency noise are to be added to be added to the measured or predicted levels at the receiver before comparison with the project noise trigger levels. The adjustments for duration are to be applied to the criterion.

Project Noise Trigger Levels

Table 9 presents the project intrusiveness and project amenity noise levels for each period, and each receiver catchment, as well as the resultant project noise trigger levels (PNTLs) that shall be applied for any assessment of impacts of mechanical plant and equipment noise on the surrounding receiver catchments.

Table 9: Project noise trigger levels (PNTL) to be applied to each surrounding receiver type

RECEIVER TYPE	TIME OF DAY	PROJECT INTRUSIVENESS NOISE LEVEL - $L_{Aeq,15min}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,15min}$ dB(A)	SLEEP DISTURBANCE NOISE LEVEL - dB(A)	PROJECT NOISE TRIGGER LEVEL - $L_{Aeq,15min}$ dB(A)
RC1 & RC2 – Residential (Urban)	Day	50	58	-	50
	Evening	45	48	-	45
	Night	41	43	41dB(A)L_{eq} and 52dB(A)L_{max}	41dB(A)L_{eq} and 52dB(A)L_{max}
	Morning Shoulder	45	43	44dB(A)L_{eq} and 52dB(A)L_{max}	43dB(A)L_{eq} and 52dB(A)L_{max}
RC3 – Residential (Urban)	Day	53	58	-	53
	Evening	46	48	-	46
	Night	41	43	41dB(A)L_{eq} and 52dB(A)L_{max}	41dB(A)L_{eq} and 52dB(A)L_{max}
	Morning Shoulder	47	43	47dB(A)L_{eq} and 52dB(A)L_{max}	43dB(A)L_{eq} and 52dB(A)L_{max}

RECEIVER TYPE	TIME OF DAY	PROJECT INTRUSIVENESS NOISE LEVEL - $L_{Aeq,15min}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,15min}$ dB(A)	SLEEP DISTURBANCE NOISE LEVEL - dB(A)	PROJECT NOISE TRIGGER LEVEL - $L_{Aeq,15min}$ dB(A)
RC5 – Commercial Premises	When in use	-	63	-	63
RC4, RC6 & RC7 – Industrial Premises	When in use	-	68	-	68

5.3 TRAFFIC NOISE GENERATION

Road traffic noise impact is assessed in accordance with the NSW Road Noise Policy (RNP). The criterion (Table 3 – Road Traffic Noise Assessment Criteria for Residential Land Uses) divides land use developments into different categories and lists the respective criteria for each case. The category that is relevant to the proposed use of the site is shown below in Table 10.

Table 10: NSW RNP – Traffic Noise Assessment Criteria

ROAD CATEGORY	TYPE OF PROJECT/LAND USE	ASSESSMENT CRITERIA – dB(A)	
		DAY (7AM – 10PM)	NIGHT (10PM – 7AM)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	$L_{Aeq, (15\ hour)}$ 55	$L_{Aeq, (15\ hour)}$ 50
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads	$L_{Aeq, (15\ hour)}$ 60	$L_{Aeq, (15\ hour)}$ 55
	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments		
Local Roads	4. Existing residences affected by noise from new local road corridors	$L_{Aeq, (1\ hour)}$ 55	$L_{Aeq, (1\ hour)}$ 50
	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		

In the event that the traffic noise at the site is already in excess of the criteria noted above, the NSW RNP states that the primary objective is to reduce the existing level through feasible and reasonable measures to meet the criteria above.

If this is not achievable, Section 3.4.1 of the RNP states that for existing residences affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise should be limited to 2 dB above that of the corresponding 'no build option'.

Also, the inherent quality of noise from vehicles on public roads arriving to and departing from the site would be indistinguishable from other traffic noise on public roads.

5.4 CONSTRUCTION NOISE CRITERIA

The noise criteria outlined within the Interim Construction Noise Guideline (ICNG) 2009 has been adopted for the assessment of noise emissions from the construction of the proposal.

5.4.1 Airborne Noise – Residential Receiver Catchments

The airborne noise criteria for surrounding residential receiver catchments (RC1 – RC3) has been extracted from Table 2 of the ICNG and is presented in Table 11 below.

Table 11: NSW ICNG construction noise criteria for surrounding residential receiver catchments

TIME OF DAY	MANAGEMENT LEVEL $L_{Aeq,15min}$ [1]	HOW TO APPLY
Recommended Standard Hours: Monday – Friday 7am – 6pm Saturday 8am – 1pm No work on Sundays or public holidays	Noise Affected RBL + 10dB	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 residences 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 in, taking into account: – Times identified by the community when they are less sensitive to noise (such as before and after school, for works near schools, or mid-morning or mid-afternoon for works near residences) – If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Recommended Standard Hours	Noise Affected RBL + 5dB	▪ 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.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

5.4.2 Airborne Noise – Other Sensitive Land Uses

Section 4.1.3 Table 3 of the ICNG provides guidance in establishing noise management levels for construction noise impacts at other sensitive land uses. Noise management levels applicable to noise sensitive receivers surrounding the site have been summarised in Table 12.

Table 12: ICNG noise management levels for other sensitive land uses

RECEIVER CATCHMENT	LAND USE	MANAGEMENT LEVEL, $L_{Aeq(15min)}$ (APPLIES WHEN PROPERTIES ARE BEING USED)
RC5	Commercial	70 (External)
RC4, RC6 & RC7	Industrial	75 (External)

5.4.3 Ground-borne Noise – Residential Receiver Catchments

Ground-borne noise is noise generated by vibration transmitted through the ground into a structure, such as an excavator with a hydraulic hammer attachment, or impact/bore piling. The following ground-borne noise levels for residences have been extracted from Section 4.2 of the ICNG and indicate when management actions should be implemented.

- Evening (6pm to 10pm) – Internal Noise Level: $L_{Aeq,15min}$ 40 dB(A)
- Night-time (10pm to 7am) – Internal Noise Level: $L_{Aeq,15min}$ 35 dB(A)

An assessment of ground-borne noise to these levels is only required when the ground-borne noise levels are higher than airborne noise levels, and for surrounding residential receiver catchments. The ground-borne noise levels are for evening and night-time periods only. The levels shall be assessed at the centre of the most affected habitable room.

5.5 CONSTRUCTION VIBRATION CRITERIA

5.5.1 Human Comfort – Continuous and Impulsive Vibration Criteria

Where occupants can detect vibration in buildings, this may potentially impact on their quality of life or working efficiency. The level of vibration that affects the amenity of occupants within a building is lower than that associated with building damage. The NSW DEC have prepared a guideline, *"Assessing vibration: a technical guideline"*, which presents preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques.

Acceptable values of human exposure to continuous and impulsive vibration are dependent on the time of day and the activity taking place in the occupied space. Guidance on preferred values for continuous and impulsive vibration acceleration is provided in Table 13.

Table 13: Preferred and maximum weighted RMS values for continuous and impulsive vibration acceleration (m/s^2) 1-80 Hz

LOCATION	ASSESSMENT PERIOD[1]	PREFERRED VALUES		MAXIMUM VALUES	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration					
Critical[2]	Day- or night time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night time	0.020	0.014	0.040	0.028
Workshops	Day- or night time	0.04	0.029	0.080	0.058
Impulsive vibration					
Critical[2]	Day- or night time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night time	0.64	0.46	1.28	0.92
Workshops	Day- or night time	0.64	0.46	1.28	0.92

Note 1: Daytime is 7:00am to 10:00pm and night time is 10:00pm to 7:00am

Note 2: Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472–1992.

5.5.2 Human Comfort – Intermittent Vibration Criteria

Intermittent vibration is vibration which is perceived in separately identifiable repeated bursts. Its onset can be sudden, or there might be a gradual onset and termination bounding a more sustained event. The vibration dose value (VDV) defines a relationship that yields a consistent assessment of intermittent vibration and correlates well with subjective human response.

Acceptable values of vibration dose have been extracted from Table 2.4 of the guideline and are presented in Table 14.

Table 14: Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

LOCATION	DAYTIME		NIGHT-TIME	
	PREFERRED VALUE	MAXIMUM VALUE	PREFERRED VALUE	MAXIMUM VALUE
Critical	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

5.5.3 Cosmetic Damage

Structural vibration thresholds are set to minimize the risk of cosmetic surface cracks and lie below the levels that have the potential to cause damage to the main structure. Table 15 presents guide values for building vibration, based on the vibration thresholds above which cosmetic damage has been demonstrated outlined within BS7385-Part 2:1993. These values are evaluated to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as 95% probability of no effect.

Table 15: Transient vibration guide values for cosmetic damage – BS 7385-2:1993

TYPE OF BUILDING	PEAK PARTICLE VELOCITY IN FREQUENCY RANGE OF PREDOMINANT PULSE (PPV)	
	4 HZ TO 15 HZ	15 HZ AND ABOVE
Reinforced or framed structures Industrial or light commercial type buildings	50mm/s	N/A
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s	20mm/s (50mm/s at 40Hz and above)

5.5.4 Structural Damage

Structural damage criteria are established within DIN4150-Part 3 “Structural vibration in buildings – Effects on structures”. Table 16 indicates the vibration limits presented in DIN4150-Part 3, where upon exceeding these thresholds lies the risk in inducing structural damage.

Table 16: Guideline value of vibration velocity, vi, for evaluating the effects of short-term vibration – DIN4150-3

LINE	TYPE OF STRUCTURE	VIBRATION VELOCITY, VI, IN MM/S			
		FOUNDATION			PLANE OF FLOOR OF UPPERMOST FULL STOREY
		AT A FREQUENCY OF			
		LESS THAN 10HZ	10 TO 50HZ	50 TO 100HZ*	ALL FREQUENCIES
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8
*For frequencies above 100Hz, at least the values specified in this column shall be applied					

6 NOISE AND VIBRATION IMPACT ASSESSMENT

6.1 NOISE EMISSION ASSESSMENT

6.1.1 Mechanical Plant and Equipment Noise Impact Assessment

Mechanical plant and equipment servicing the proposed site are expected to be limited to roof-mounted exhaust fans and outdoor air-conditioning condensers. At this stage of the proposed development, mechanical plant and equipment selections have not been made. During the design development stage of the project, the mitigation measures outlined in Section 7.1 should be considered when preparing the mechanical services to design to ensure compliance with the external noise emissions criteria established in Section 5.2.

Notwithstanding, an assessment of noise from mechanical plant and equipment has been undertaken in Section 6.1.2 which considers up to 8 exhaust fans located on the roof of the workshop approximately 2m from the western building edge, and evenly spaced north to south.

It is expected that noise from AC condensers will be insignificant relative to other noise sources on the project site. Noise from these sources are to be reviewed at design development once equipment selections and siting is determined.

6.1.2 Operational Noise Assessment

An assessment of noise generated by operational activities associated with the bus depot has been conducted to calculate the noise impacts on surrounding noise sensitive receivers. Operational noise sources have been determined based on observations and measurements detailed in Section 4.4.2 obtained from an existing bus depot currently in use by the Operator. These sources include:

- Early morning bus pre-departure checks
- Bus movements in hardstand areas, and passenger vehicle movements and car parking
- Activities within the workshop, spray booth and panel shop, and internal bus steam clean bay; and
- External bus washing station.

A breakdown of typical activities, equipment, and vehicle schedules associated with the operation is presented in Table 17.

Table 17: Proposed operation schedule

ACTIVITY/NOISE SOURCE	HOURS OF USE
Bus Pre-Departure Checks	All Days: Starting at 5:00am and finishing by 6:00pm
Departure of Buses	All Days: 5:00am to 6:00pm
Arrival of Buses	All Days: 8:00am to 1:00am
Workshop	Monday: 4:30am to 12:00am Remaining: 5:00am to 12:00am
Panel Shop & Spray Booth	All Days: 6:00am to 6:00pm
Steam Clean Bay	All Days: 5:00am to 12:00pm
External Bus Wash	Weekdays: 4:30am to 6:30am Weekends: 4:30am to 11:30am

ACTIVITY/NOISE SOURCE	HOURS OF USE
Passenger Vehicle Movements	All Days: 24 hours per day
Mechanical Plant and Equipment	Same hours as workshop, spray booth and panel shop, and steam clean bay

A summary of specific noise sources, sound power levels (SWLs) and duration of operation within a typical 15-minute assessment period is provided in Table 18. These SWLs have been derived from attended noise measurements detailed in Section 4.4.2.

For internal spaces such as the workshop, panel shop and spray booth, and steam clean bay, the assessment has considered the noisiest typical sources within the space based on on-site observations and attended noise measurements.

Table 18: Sound power levels and operation durations of typical site activities

ACTIVITY/NOISE SOURCE	ASSOCIATED NOISE SOURCES	SOUND POWER LEVEL $L_{Aeq,period}$ - dB(A)	TYPICAL DURATION OF ACTIVITIY WITHIN A 15-MINUTE PERIOD
Bus Pre-Departure Checks	Bus Startup	102	1 second
	Bus Idling and Air Brake	97	2 minutes and 8 minutes (See Note 2)
	Horn Check	93	1 second
Departure/Arrival of Buses	Bus Travelling at 10km/h	96	N/A
	Bus Reversing and Reverse Beep/Alarm	103	N/A
	Bus Horn before reversing	93	1 second
Workshop	Electric Impact Wrench	110	2 minutes
	Bench Grinder	101	2 minutes
	Welding Machine	96	2 minutes
	Brake Tank Draining	101	30 seconds
	Forklift[1]	90	15 minutes
Panel Shop & Spray Booth	Disk Sander	100	15 minutes
	Drop Saw	110	1 minute
	Orbital Sander	97	15 minutes
	Hammering on Metal	108	1 minute
Steam Clean Bay	Diesel Pressure Washer	89	15 minutes
	Pressure Washer Nozzle	94	10 minutes
	Staple Gun	90	1 minute

ACTIVITY/NOISE SOURCE	ASSOCIATED NOISE SOURCES	SOUND POWER LEVEL $L_{Aeq,period}$ - dB(A)	TYPICAL DURATION OF ACTIVITIY WITHIN A 15-MINUTE PERIOD
External Bus Wash	External Washing Machine	86	15 minutes
Passenger Vehicle Movements	Vehicle Travelling at 10km/h	84	N/A
Mechanical Plant and Equipment	Roof mounted exhaust fans	80	15 minutes

Note 1: Assumed only in use when roller doors are open. Refer to mitigation measures in Section 7.
Note 2: Prior to departure and during the pre-departure checks, approximately 50% of the buses have sufficient air pressure from the previous day and only require a maximum of 2 minutes (usually 1 minute but maximum of 2minutes) for the oil pressure to build up to operational requirements. The other 50% of buses may not have sufficient air pressure and take approximately 5 to 8 minutes (maximum of 8 minutes used for this assessment) to build up prior to departure. The potential for 8 minute pre-departure checks has been spread randomly across the idling locations within our model.

E-LAB Consulting have been advised by the Operator of the following peak hour bus and car vehicle movements:

Table 19: Peak hour vehicle movements

TIME OF DAY	PEAK HOUR VEHICLE MOVEMENTS[1]	
	BUSES	CARS
5:00am to 7:00am	16	14
7:00am to 6:00pm	34	31
6:00pm to 10:00pm	12	11
10:00pm to 1:00am[2]	10	10

Note 1: Assumed that vehicle movements are evenly distributed in a typical 15 minute assessment period.
Note 2: No data was available for this period. This assessment assumes a conservative level of vehicle movements during this period relative to other times.

Based on the summary of typical activities in Table 17, reasonable worst-case 15-minute assessment scenarios have been determined for the bus depot facility during the assessment periods outlined in Section 5.2.1.

Table 20: Proposed operation schedule

TIME OF DAY	OPERATING NOISE SOURCES / ACTIVITIES
Scenario 1 - Prior to 5:00am	Workshop
	External Bus Wash
	Mechanical Plant and Equipment
	Passenger Vehicle Movements
Scenario 2 - 5:00am to 7:00am	Bus Pre-Departure Checks
	Departure of Buses
	Workshop

TIME OF DAY	OPERATING NOISE SOURCES / ACTIVITIES
	Panel Shop & Spray Booth
	Steam Clean Bay
	External Bus Wash
	Passenger Vehicle Movements
	Mechanical Plant and Equipment
Scenario 3 - 7:00am to 6:00pm	Bus Pre-Departure Checks
	Departure/Arrival of Buses
	Workshop
	Panel Shop & Spray Booth
	External Bus Wash
	Passenger Vehicle Movements
	Mechanical Plant and Equipment
Scenario 4 - 6:00pm to 10:00pm	Arrival of Buses
	Workshop
	Passenger Vehicle Movements
	Mechanical Plant and Equipment
Scenario 5 - 10:00pm-2:00am	Arrival of Buses
	Workshop
	Passenger Vehicle Movements
	Mechanical Plant and Equipment

3D acoustic modelling for operational noise emissions levels was conducted using the software SoundPlan (Version 8.2). The acoustic modelling was undertaken considering no specific meteorological characteristics such as dominant wind direction and speed or temperature therefore it was considered under neutral conditions.

Noise generated by the activities during a 15-minute period have been predicted to an assessment level of 1.5m above ground level in-line with the NSW EPA NPfI and are summarised in Table 21. The resultant operational noise contours from SoundPlan modelling are presented in Appendix A.

Table 21: Predicted operational noise levels

SCENARIO	RECEIVER CATCHMENT	PREDICTED NOISE LEVEL $L_{Aeq,15Min}$ – dB(A)	PROJECT TRIGGER NOISE LEVEL	COMPLIES
Scenario 1	RC1 – Residential (Urban)	40	41dB(A)L_{eq} and 52dB(A)L_{max}	Yes
	RC2– Residential (Urban)	< 35	41dB(A)L_{eq} and 52dB(A)L_{max}	Yes
	RC3– Residential (Urban)	< 35	41dB(A)L_{eq} and 52dB(A)L_{max}	Yes
	RC4 – Industrial	36	68	Yes
	RC5 – Commercial	42	63	Yes
	RC6 – Industrial	48	68	Yes
	RC7 – Industrial	40	68	Yes
Scenario 2	RC1 – Residential (Urban)	42	43dB(A)L_{eq} and 52dB(A)L_{max}	Yes
	RC2– Residential (Urban)	36	43dB(A)L_{eq} and 52dB(A)L_{max}	Yes
	RC3– Residential (Urban)	42	43dB(A)L_{eq} and 52dB(A)L_{max}	Yes
	RC4 – Industrial	42	68	Yes
	RC5 – Commercial	56	63	Yes
	RC6 – Industrial	50	68	Yes
	RC7 – Industrial	44	68	Yes
Scenario 3	RC1 – Residential (Urban)	48	50	Yes
	RC2– Residential (Urban)	38	50	Yes
	RC3– Residential (Urban)	48	53	Yes
	RC4 – Industrial	48	68	Yes
	RC5 – Commercial	62	63	Yes
	RC6 – Industrial	54	68	Yes
	RC7 – Industrial	46	68	Yes

SCENARIO	RECEIVER CATCHMENT	PREDICTED NOISE LEVEL $L_{Aeq,15Min}$ – dB(A)	PROJECT TRIGGER NOISE LEVEL	COMPLIES
Scenario 4	RC1 – Residential (Urban)	42	45	Yes
	RC2– Residential (Urban)	< 35	45	Yes
	RC3– Residential (Urban)	45	46	Yes
	RC4 – Industrial	42	68	Yes
	RC5 – Commercial	54	63	Yes
	RC6 – Industrial	50	68	Yes
	RC7 – Industrial	40	68	Yes
Scenario 5	RC1 – Residential (Urban)	40	41dB(A)L_{eq} and 52dB(A)L_{max}	Yes
	RC2– Residential (Urban)	< 35	41dB(A)L_{eq} and 52dB(A)L_{max}	Yes
	RC3– Residential (Urban)	40	41dB(A)L_{eq} and 52dB(A)L_{max}	Yes
	RC4 – Industrial	38	68	Yes
	RC5 – Commercial	50	63	Yes
	RC6 – Industrial	46	68	Yes
	RC7 – Industrial	40	68	Yes

6.1.3 Traffic Noise Generation

The assessment of traffic noise generation as a result of the project site development has been based on the peak hour vehicle movements summarised in Table 19.

The proposed bus depot is only accessible via Racecourse Road. On this basis, Racecourse Road is expected to generate the largest increase in additional peak hourly traffic.

Predicted façade noise levels have been assessed at this worst-case road section and to the nearest façade of the residential receivers closest to this road section, being RC3 on Faunce Street and RC1 on Young Street. Predicted façade noise levels are summarized below in Table 22, which have been modelled based on attended measurements of peak hourly noise levels along Racecourse Road and Young Street (see Section 4), and forecasted peak hourly trips. Noise corrections (such as distance and façade reflections) have been factored into the façade noise level prediction where applicable.

Table 22: Existing and predicted traffic noise levels at RC3 – Faunce Street

DESCRIPTION	NOISE METRIC	7AM-6PM PEAK HOUR
Measured existing peak hourly noise levels	$L_{Aeq,1hour}$	56.7 dB(A)
Measured sound exposure level of light vehicle pass-by	L_{AE}	Bus: 76 dB(A) Car: 62 dB(A)
Number of additional vehicle trips	N/A	Bus: 5[1] Car: 31
Predicted façade noise level +2.5 dB(A) façade correction, from additional vehicles	dB(A)$L_{Aeq,1hour}$	Bus: 42.9 Car: 40.5
Predicted cumulative façade noise level	dB(A)$L_{Aeq,1hour}$	59.7
Predicted increase in traffic noise	dB(A)	0.1

Note 1: It is expected that the majority of bus trips generated by the project site will travel south when departing the depot, and north when arriving at the depot. A conservative estimate of 5 trips has been assessed for buses directed north towards Faunce Street.

As shown in Table 22, the predicted increase in traffic noise due to the development will not exceed 2dB(A) which is within the limits given in the Road Noise Policy criteria (as shown in Section 5.3). For this reason, the traffic generated by the proposed development is considered to not have an adverse impact on surrounding noise-sensitive receivers.

The above calculation has also been undertaken for the remaining periods and vehicle counts listed in Table 19. Predicted increase in traffic noise levels at these times will not exceed a 2dB(A).

7 RECOMMENDED NOISE MITIGATION MEASURES

7.1 MECHANICAL PLANT AND EQUIPMENT NOISE IMPACT ASSESSMENT

7.1.1 Rooftop Exhaust Fans

Mitigation measures for rooftop exhaust fans include the installation of a minimum length of 2m acoustically lined duct on the workshop side to address noise breakout through any openings in the roof.

7.1.2 All Other Mechanical Plant and Equipment

Further mitigation measures for the mechanical plant should be considered during the design development stage to ensure compliance with the outlined criteria at the nearest sensitive receiver catchments. These mitigation measures could include where possible and practicable, but not limited to the following:

- Positioning mechanical plant away from nearby receivers;
- Acoustic attenuators fitted to duct work;
- Screening around mechanical plant; and
- Acoustic insulation within duct work.

It should be noted that the noise reduction requirements will likely be refined and reduced once the mechanical plant and equipment selections and designs have been progressed further during the detailed design. The mitigation measures proposed at this stage of the planning process are conservative in nature.

7.2 OPERATIONAL NOISE ASSESSMENT

Mitigation measures for operational noise impacts include the following:

7.2.1 Bus Parking Areas on Eastern Boundary – Solid Awning

A solid, horizontal awning is recommended to the bus parking along the eastern boundary, between the workshop building and on-grade passenger vehicle carpark. The awning shall be acoustically sealed to the retaining wall to the East to avoid any flanking transmission paths. The construction of the awning shall achieve an acoustic rating of no less than Rw 28.

The awning is to be constructed with a solid wall along the southern edge starting at floor level and sealed to the underside of the awning. The awning is to also be closed off along the eastern edge.

The extent of the awning and solid wall noted above is detailed in Appendix C.

7.2.2 Site Perimeter – Acoustic Screens

Solid, vertical acoustic screens are recommend along the eastern edge of the on-grade passenger vehicle carpark (1.8m high), and along the north-western corner of the site (2.8m high). Existing or proposed retaining walls can be used to make up the lower portion of the screen, provided the following is achieved:

- Minimum fence height and extent as per markup in Appendix C.
- Vertical screen material density to be minimum 18 kg/m^2.

7.2.3 Workshop Spaces – Roller Doors

Roller doors to the workshop, panel shop and spray booth, and bus wash bays shall have an acoustic rating of no less than Rw 22.

7.2.4 Plan of Management Recommendations

The following operational management procedures have been incorporated within the operator's plan of management to minimise noise impacts generated by the site:

- Roller doors to the workshop, panel shop and spray booth and bus wash bay shall be closed when these spaces are in use before 7am or after 10pm.
- Buses parked adjacent to the driveway shall commence pre-departure checks and depart the site after 7am and return by 10pm. Refer to the specific location of these parking spaces marked in Appendix C.
- Buses leaving and departing the site should generally be dispersed across the hardstand areas to distribute noise emissions to surrounding noise-sensitive receivers to the North and East. Where possible, early morning bus activities should be undertaken beneath the solid awning, though this is not a strict requirement.
- Buses shall depart within two minutes from reaching the air and oil pressure requirements to satisfy the operator's pre-departure checks.

8 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

8.1 CONSTRUCTION PROGRAMME

A breakdown of the indicative stages proposed for the works associated with the proposal are as follows:

- Demolition of existing structures and tree removal (Demolition)
- Bulk earthworks to level and terrace the site (Civil Works)
- Construction and landscaping including earthworks, retaining walls, drainage and essential services (Construction)

The proposed hours of construction are expected to be in-line with the recommended standard hours in Section 2.2 of the ICNG, being:

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

In the event works are proposed to be conducted outside of those listed above, they are to be assessed and approved in a future Construction Noise and Vibration Management Plan.

8.2 EXPECTED CONSTRUCTION EQUIPMENT

The indicative noise sources likely to be associated with the works listed in the previous section of this report are summarised in Table 23. The equipment sound power levels (SWL) have been extracted from AS2436:2010 "Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites" and from onsite measurements of similar equipment.

Table 23: Indicative construction equipment and respective noise levels

STAGES	EQUIPMENT	SWL – dB(A)	ACOUSTICAL USAGE FACTOR (%)	USAGE IN 15-MINUTE PERIOD (MINUTES)	TIME CORRECTED SWL – dB(A) $L_{Aeq,15min}$
Demolition	Excavator breaker[1]	120	40	6	116
	Bobcat	107	70	10.5	105
	Dump truck	108	40	6	104
	General truck	107	40	6	103
	Powered hand tool	102	50	7.5	99
Civil Works	Excavator breaker	115	70	10.5	113
	Excavator with bucket	105	70	10.5	103
	Bobcat	107	70	10.5	105
	Dump truck	108	40	6	104
	General truck	107	40	6	103

STAGES	EQUIPMENT	SWL – dB(A)	ACOUSTICAL USAGE FACTOR (%)	USAGE IN 15-MINUTE PERIOD (MINUTES)	TIME CORRECTED SWL – dB(A) $L_{Aeq,15min}$
Construction	Mobile Crane	110	100	15	110
	General Truck	107	40	6	103
	Concrete Pump Truck	107	100	15	107
	Powered Hand Tools	102	50	7.5	99
	Bobcat/ Forklift	107	50	7.5	104

Note 1: Adjusted by a 5dB(A) penalty where noise sources are considered particularly annoying (typically such as saw cutting and hammering).

8.3 NOISE MODELLING AND ASSUMPTIONS

To assess the noise impact from the site during the various construction stages, a noise model was prepared using commercial software SoundPLAN v8.2, which is a comprehensive software package for conducting three-dimensional complex noise propagation modelling. Using the software, a 3D model of the site and its surroundings was constructed including the nearby buildings, and the construction plant and equipment were positioned as noise sources. Within the model, the effects of the environment (built and natural) on propagation of sound were considered to reliably estimate the resulting noise effects on the surrounding noise sensitive receivers.

The noise model represents the 'reasonable' worst case periods of construction activities, meaning that all the equipment of each stage is operating simultaneously during a 15-minute observation period.

The assumptions that were made within the assessment include the following:

- The predicted noise levels represent the worst-case scenario for each receiver
- The mitigation measures outlined in Section 9 are implemented
- Neutral weather conditions

8.4 PREDICTED NOISE LEVELS

Noise levels have been assessed to the construction noise management levels established in Section 5.4. The noise contour maps produced by the three-dimensional noise propagation modelling are provided in Appendix B for indicative works. Predicted noise levels for demolition works have been presented in Table 24, civil works in Table 25, and construction in Table 26.

Table 24: Predicted noise levels – Demolition Works

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL RANGE dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL EXCEEDANCE dB	COMPLIES WITH HIGHLY NOISE AFFECTED LEVEL (YES/NO)
RC1 - Residential	61-63	55	6-8	Yes
RC2 - Residential	< 55	55	0	Yes
RC3 - Residential	65-67	58	7-9	Yes
RC4 – Industrial Premises	69-71	75	0	N/A
RC5 – Commercial Premises	65-71	70	0-1	N/A
RC6 – Industrial Premises	63-65	75	0	N/A
RC7 – Industrial Premises	65-67	75	0	N/A

Table 25: Predicted noise levels – Civil Works

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL RANGE dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL EXCEEDANCE dB	COMPLIES WITH HIGHLY NOISE AFFECTED LEVEL (YES/NO)
RC1 - Residential	61-73	55	6-18	Yes
RC2 - Residential	55-61	55	0-6	Yes
RC3 - Residential	57-69	58	1-11	Yes
RC4 – Industrial Premises	57-73	75	0	N/A
RC5 – Commercial Premises	61-73	70	0-3	N/A
RC6 – Industrial Premises	59-81	75	0-6	N/A
RC7 – Industrial Premises	61-75	75	0	N/A

Table 26: Predicted noise levels – Construction

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL RANGE dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL EXCEEDANCE dB	COMPLIES WITH HIGHLY NOISE AFFECTED LEVEL (YES/NO)
RC1 - Residential	61-63	55	6-8	Yes
RC2 - Residential	< 55	55	0	Yes
RC3 - Residential	59-61	58	1-3	Yes
RC4 – Industrial Premises	63-65	75	0	N/A
RC5 – Commercial Premises	61-65	70	0	N/A
RC6 – Industrial Premises	63-65	75	0	N/A
RC7 – Industrial Premises	61-63	75	0	N/A

9 CONSTRUCTION NOISE AND VIBRATION MITIGATION MEASURES

9.1 PROJECT SPECIFIC RECOMMENDATIONS

Project specific recommendations and required mitigation methods have been listed below. For general noise and vibration mitigation and management measures, refer to Section 9.2.

9.1.1 Noise

Noise impacts from construction activities will be greatest during demolition and civil works when heavy equipment such as excavator mounted hammering are located close to the site boundary.

To minimise construction noise emissions at the worst affected noise-sensitive receivers, a 2.1m high A-class hoarding is recommended to the eastern boundary, which has also been incorporated into the construction noise assessment presented in Section 8.4. A solid hoarding of this height will reasonably reduce noise levels at the lower levels of surrounding receivers and at the 1.5m assessment height within the ICNG. Hoarding with a higher height, or to other parts of the site perimeter can be explored but may not be practical or feasible for the sole purpose of reducing construction noise levels from within the site. Refer to Appendix B for the location extent of the recommended 2.1m hoarding.

Where possible, stationary plant (such as concrete trucks, diesel generator, vehicle hardstand areas) should be located centrally within the site or towards the south-western corner of the project site, adjacent to commercial and industrial receivers, to maximise their distance to noise sensitive residential receivers.

Limitations on hours of use for noise intensive activities will be investigated and developed in a future Construction Noise and Vibration Management Plan where required to be submitted to obtain a Construction Certificate.

As much as possible, equipment such as trucks and concrete pumps should be switched off when not in use.

9.1.2 Vibration

The highest vibration inducing activities for the site are expected to be from rock breaking during civil works. At the start of breaking, attended vibration measurements should be conducted at the nearest residential receivers to determine if there is an exceedance of the vibration limits set out in Section 5.5.

Upon any exceedances in vibration levels, reasonable and feasible measures should be considered to lessen any effects, such as alternative methods or equipment for excavation to achieve the vibration levels required.

Limitations on hours of use for vibration intensive activities will be investigated and developed in a future Construction Noise and Vibration Management Plan where required to be submitted to obtain a Construction Certificate.

9.2 GENERAL ACOUSTIC RECOMMENDATIONS FOR CONSTRUCTION

According to AS 2436 – 2010 “Guide to noise and vibration control on construction, demolition and maintenance sites” the following techniques could be applied to minimize the spread of noise and vibrations to the potential receivers.

9.2.1 Noise

If a process that generates significant noise levels cannot be avoided, the amount of noise reaching the receiver should be minimized. Two ways of achieving this are to either increase the distance between the noise source and the receiver or to introduce noise reduction measures such as screens.

Physical methods to reduce the transmission of noise between the site works and residences, or other sensitive land uses, are generally suited to works where there is longer-term exposure to the noise. Practices that will reduce noise from the site include:

- Increasing the distance between noise sources and sensitive receivers;
- Reducing the line-of-sight noise transmission to residences or other sensitive land uses using temporary barriers (stockpiles, shipping containers and demountable offices can be effective barriers); and
- Constructing barriers that are part of the project design early in the project to introduce the mitigation of site noise.

Screening

On sites where distance is limited, the screening of noise may be beneficial, and this should be taken into account when planning the method of construction.

If structures such as stores, site offices and other temporary buildings are situated between the noisiest part of the site and the nearest dwellings, some of the noise emission from the site can be reduced. If these buildings are occupied, sound insulation measures may be necessary to protect workers inside the buildings.

Storage of building materials or the placement of shipping containers between the noise source and any noise-sensitive area may also provide useful screening and the same is true of partially completed or demolished buildings. A noisy, stationary plant can be placed in a basement, the shell of which has been completed, provided reverberant noise can be controlled.

Where such noise barriers are not practical, a worthwhile reduction in noise can be obtained by siting the plant behind and as close as possible to mounds of earth, which may effectively screen any noise-sensitive areas from the plant. These can often be designed into the construction schedule or site arrangement for future landscaping.

In many cases it is not be practical to screen earthmoving operations effectively, but it may be possible to partially shield a construction plant or to build-in at the early stages protective features required to screen traffic noise. Where earth noise barriers are not practical due to lack of space, consideration should be given to the possibility of constructing temporary screens from wood or any equivalent material in surface density.

If the works are predominately within nominally closed structures, careful consideration should be given to reducing noise breakout at any openings.

On-Site Diesel Generators

If possible, an appropriate silencer on the muffler and acoustic screen around the engine bay to attenuate the noise from it may be considered.

Reversing and warning alarms

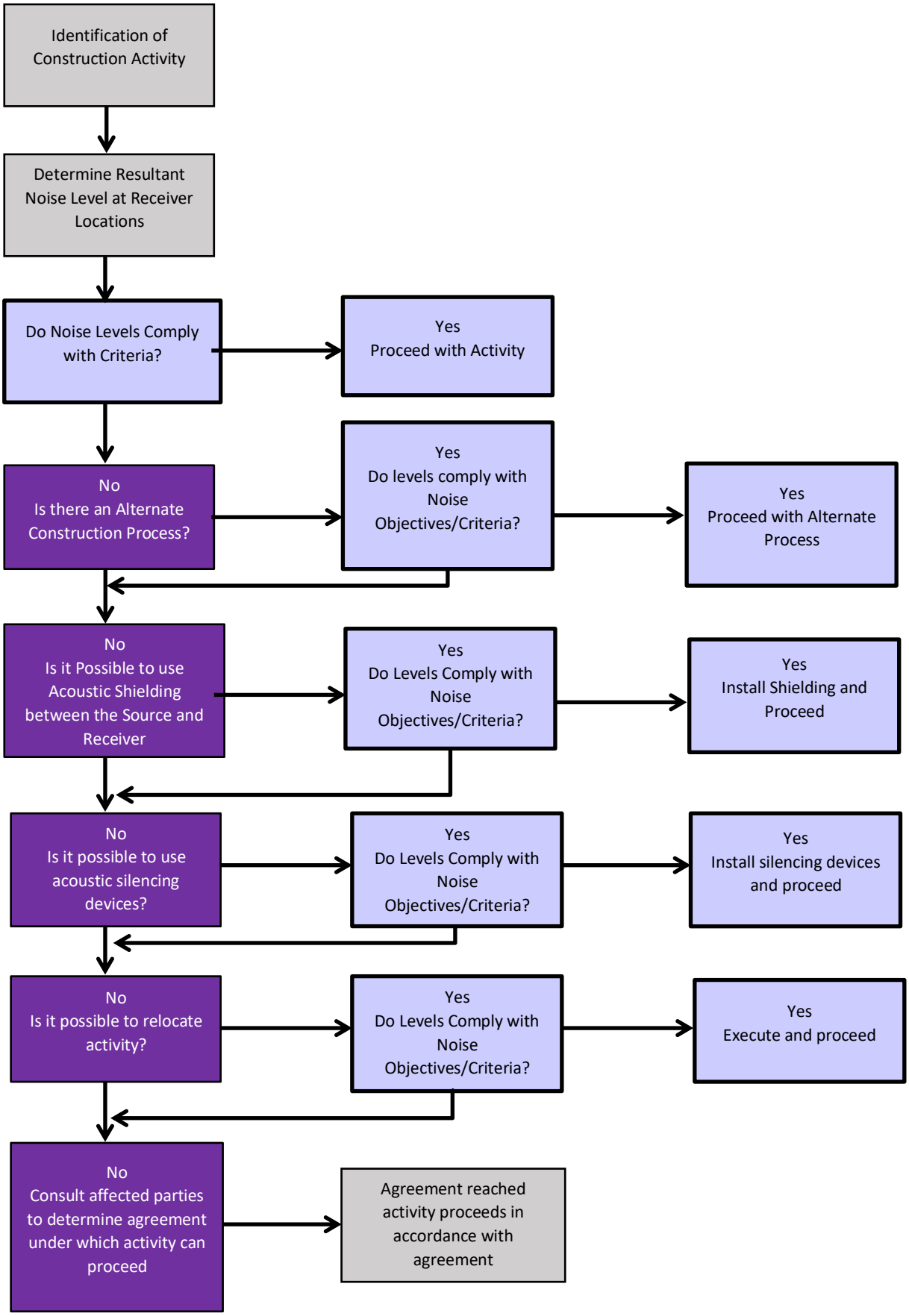
Community complaints often involve the intrusive noise of alarms commonly used to provide a safe system of work for vehicles operating on a site. Beeper reversing alarm noise is generally tonal and may cause annoyance at significant distances from the work site.

There are alternative warning alarms capable of providing a safe system of work that are equal to or better than the traditional 'beeper', while also reducing environmental noise impacts. The following alternatives should be considered for use on construction sites as appropriate:

- Broadband audible alarms incorporating a wide range of sound frequencies (as opposed to the tonal frequency 'beep') are less intrusive when heard in the neighbourhood;
- Variable-level alarms reduce the emitted noise levels by detecting the background noise level and adjusting the alarm level accordingly;
- Non-audible warning systems (e.g. flashing lights, reversing cameras) may also be employed, providing safety considerations, are not compromised;
- Proximity alarms that use sensors to determine the distance from objects, such as people or structures, and generate an audible alarm in cabin for the driver; and
- Spotters or observers.

The above methods should be combined, where appropriate.

Figure 5: Noise mitigation management flow chart



9.2.2 Vibration

Vibration can be more difficult to control than noise, and there are few generalizations that can be made about its control. It should be kept in mind that vibration may cause disturbance by causing structures to vibrate and radiate noise in addition to perceptible movement.

During the demolition works and the erection of new structures, some vibrations (transmitted through the structure from the demolition sites) are not expected to be significant or noticeable.

General principles of seeking minimal vibration at receiving structures should be followed in the first instance. Predictions of vibration levels likely to occur at sensitive receivers are recommended when they are relatively close, depending on the magnitude of the source of the vibration or the distance associated. Relatively simple prediction methods are available in textbooks, codes of practice and standards, however, it is preferable to assess site transmission and propagation characteristics between source and receiver locations through measurements.

Guidance for measures available for the mitigation of vibration transmitted can be sought in more detailed standards, such as BS 5228-2 or policy documents, such as the NSW DEC *Assessing Vibration: A technical guideline*. These measures should be considered when developing a future Construction Noise and Vibration Management Plan prior to obtaining a Construction Certificate. Identifying the strategy best suited to the control of vibration follows a similar approach to that of noise: avoidance, control at the source, control along the propagation path, control at the receiver, or a combination of these. It is noted that vibration sources can include stationary plants (pumps and compressors), portable plants (jackhammers and pavement vibrators), mobile plants and pile-drivers amongst others. Unusual ground conditions, such as a high water-table, can also cause a difference to expected or predicted results, especially when considering the noise propagated from piling.

9.2.3 Community Consultation to be Undertaken

The contractor shall directly contact adjacent noise sensitive receivers and provide them with the following information:

- The contact details for a nominated representative in order to make noise / vibration complaints.
- Explain the timeframe for the construction works and the proposed activities, i.e. the proposed start / stop dates of work and a description of the noise producing equipment that will be used.
- Notify the noise sensitive receivers and Council in a timely manner should there be any need for an extension to the proposed arrangements.
- Provide them with a copy of this report as may be approved.
- Council should be notified of the nature and details of any complaints received (time, complainant etc.) and what remedial action has taken place, if any.
- Where noise is demonstrated as being compliant with criteria, this should not limit the proponent in undertaking further additional reasonable and feasible steps to reduce noise emissions.

9.2.4 Complaint Handling Procedures and Community Liaison

To assist in the management of noise and vibration complaints various procedures are to be followed. These include, but are not limited to:

- Clearly visible signage identifying any key personnel along with their contact details to be erected along the perimeter of the building site including:
  - A 24-hour contact name, phone number and email address provided for the resident to address any complaint. The signage will declare; “For any enquiry, complaint or emergency relating to this site at any time please contact…”
- The contact details for a nominated representative in order to make noise / vibration complaints.
- Explain the timeframe for the construction works and the proposed activities, i.e. the proposed start / stop dates of work and a description of the noise producing equipment that will be used.
- Notify the noise sensitive receivers and Council in a timely manner should there be any need for an extension to the proposed arrangements.
- Provide them with a copy of this report as approved by Council.
- Where noise is demonstrated as being compliant with criteria, this should not limit the proponent in undertaking further additional reasonable and feasible steps to reduce noise emissions.
- Give complaints a fair hearing.
- Have a documented complaints process, including an escalation procedure so that if a complaint is not satisfied there is a clear path to follow.
- Call back as soon as possible to keep people informed of action to be taken to address noise problems. Call back at night time only if requested by the complainant to avoid further disturbance.
- Implement all feasible and reasonable measures to address the source of the complaint.
- A register is to be kept by the contractor to keep a record of complaints and detail any information associated with them. The contents of the register will include:
  - The name and the address of the complainant
  - Time and date of the complaint
  - The nature of the complaint (Noise/Vibration)
  - Subsequent details
  - Remedial action undertaken

The contents of the register will be maintained and updated with any new complaint without delay. The complaints will be reported to both Council and the Contractor. The investigation of the complaint and any remedial actions will be performed by the builder and/or client representative.

In the event of noisy works scheduled, the builder will notify residents minimum 48 hours in advance.

9.3 NOISE & VIBRATION MONITORING STRATEGY

General Methodology

Noise and vibration levels should be monitored from time to time to ensure that noise and vibration generated as a result of construction activities is appropriate.

Monitoring may be in the form of regular checks by the builder or indirectly by an acoustic consultant engaged by the builder and in response to any noise or vibration complaints. Where noise and vibration criteria are being exceeded or in response to valid complaints, noise and / or vibration monitoring should be undertaken. This would be performed inside the premises of the affected property and on site adjacent to the affected receivers.

Monitoring is to be undertaken by an experienced noise and vibration monitoring professional or an acoustic consultant. The results of any noise or vibration monitoring are to be provided to the relevant party or person in a timely manner allowing the builder to address the issue and respond to the complaints.

Noise and vibration monitoring can take two forms:

- Short term monitoring; and
- Long-term monitoring

Short-term monitoring

Short-term monitoring consists of attended monitoring when critical stages of the construction are occurring. This normally provides real-time assistance and guidance to the subcontractor on site letting them know when the noise and vibration criteria are exceeded allowing the selection of alternative method on construction or equipment selection in order to minimise noise and vibration impacts.

Long-term monitoring

Similarly, long-term monitoring uses noise and vibration loggers providing real-time alerts to the builder / site manager when the noise and vibration criteria are exceeded.

Typically, the noise and vibration loggers stay on site for a period of several months for the critical construction stages of the project. Sometimes the period of construction noise and vibration monitoring is dictated by the local authorities through the DA conditions.

Both methodologies are complementary and normally used simultaneously providing a significant of amount of data via the long-term monitoring but also providing information on the sources of noise and vibration generating exceedances via the short-term or attended monitoring.

9.3.1 Noise & Vibration Monitoring Program

Noise and vibration monitoring programme shall be developed in a future Construction Noise and Vibration Management Plan as part of the submission for a Construction Certificate. This way, the noise and vibration monitoring strategy will be tailored specifically for the methods of construction used once the design has developed.

10 CONCLUSION

This Noise and Vibration Impact Assessment has been prepared in support of a Development Application (DA) made to the NSW Department of Planning and Environment for the proposed bus depot to be located at 7A-11 Racecourse Road, 5-9 Faunce Street and Young Street, West Gosford.

The following noise and vibration assessments were conducted as part of this noise and vibration impact assessment:

- Noise generated by vehicles movements (buses, cars and other moving equipment) within hardstand and carparking areas on the project site, and from general operation of the site (workshops, vehicle servicing/checks and washing)
- Noise impacts of additional traffic on surrounding local roads generated by the proposed development; and
- Noise emissions from mechanical plant associated with the development to surrounding noise-sensitive receivers.

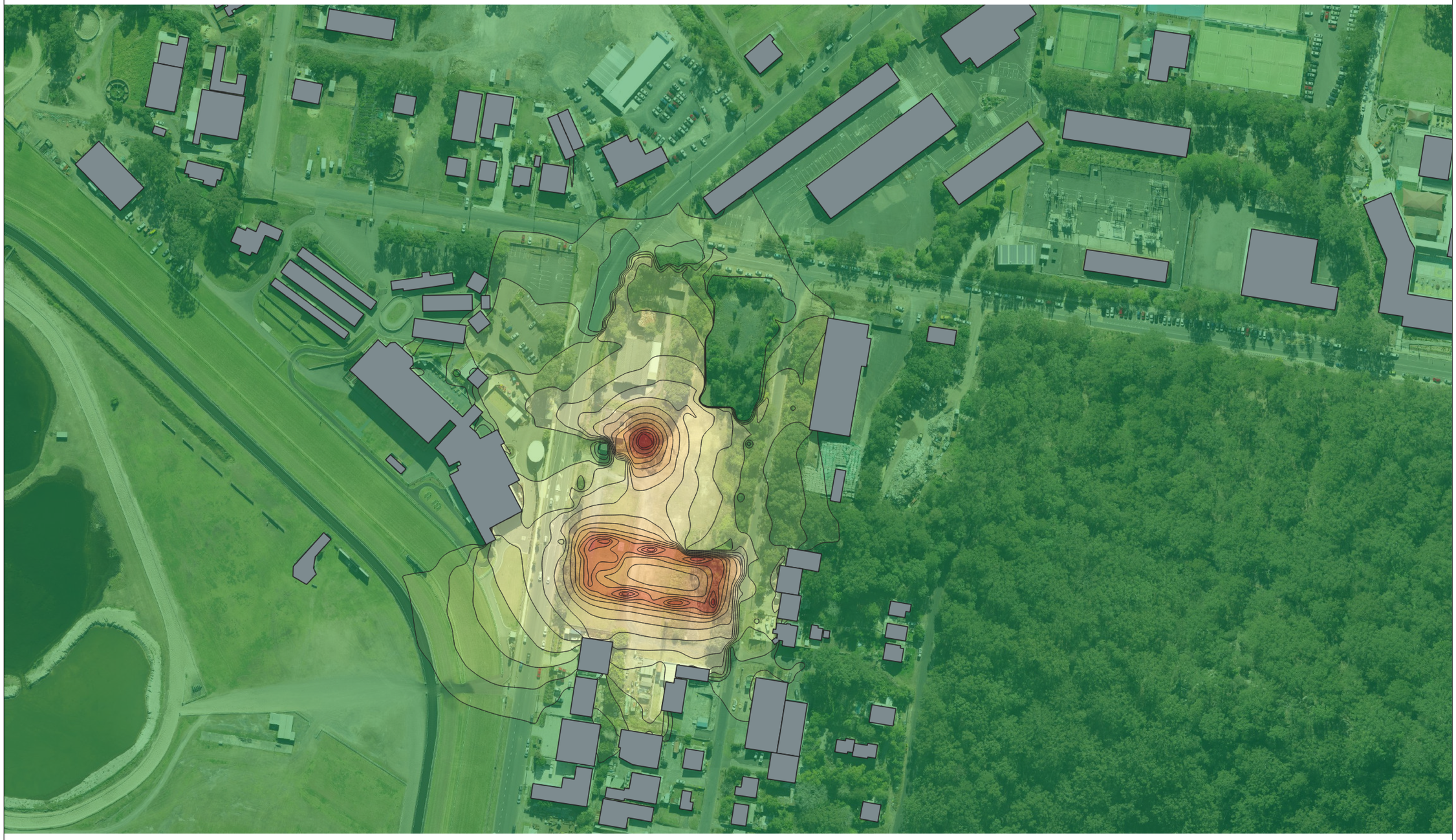
The acoustic, noise and vibration legislation, standards and guidelines applicable to the proposal include:

- Central Coast Council *Development Control Plan* 2022 (DCP)
- NSW EPA *Road Noise Policy* 2011 (RNP)
- NSW EPA *Noise Policy for Industry* 2017 (NPfI); and
- NSW EPA Interim Construction Noise Guideline 2009 (ICNG).

Having given regard to the analysis conducted within this report, it is the finding of this noise and vibration impact assessment that the proposal is compliant with the relevant noise and vibration criteria controls for this type of development, and it is expected to comply with the applicable regulations with regards to noise and vibration, particularly those listed above, subject to the mitigation measures outlined within Section 7 of this report.

In conclusion, the Development Application for the proposed redevelopment of the subject site is supportable from a noise and vibration perspective.

Appendix A **Operational Noise Contours**



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 35
- 35-37
- 37-39
- 39-41
- 41-43
- 43-45
- 45-47
- 47-49
- 49-51
- 51-53
- 53-55
- 55-57
- 57-59
- 59-61
- 61-63
- > 63

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

ARCHITECT
dem

CLIENT
Waluya Pty Ltd Gosford Transport

SCALE
NTS

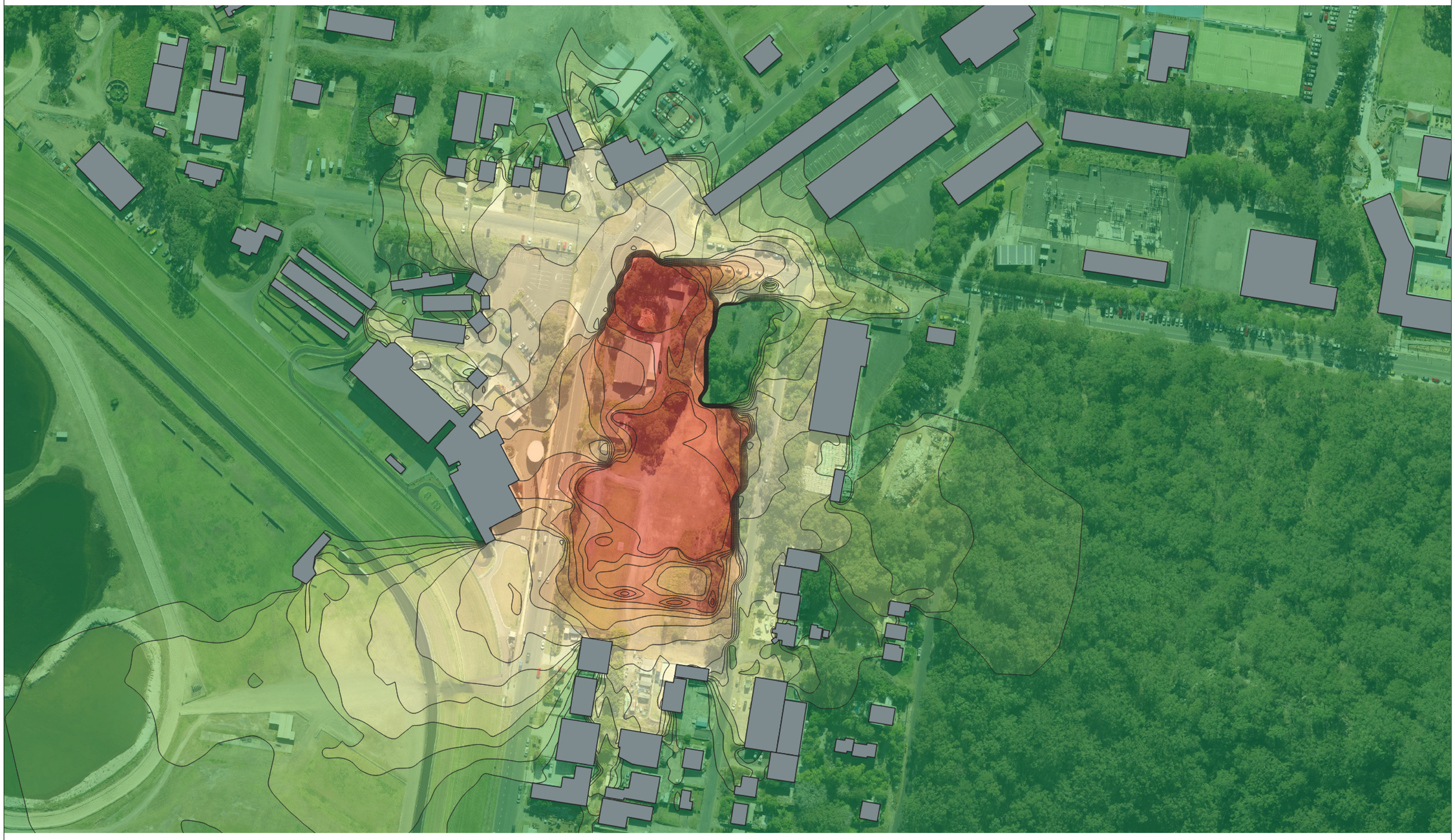
STATUS
FOR INFORMATION

DRAWING
OPERATIONAL NOISE CONTOURS - SCENARIO 1 (PRIOR TO 5AM)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-100-01-01

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 35
- 35-37
- 37-39
- 39-41
- 41-43
- 43-45
- 45-47
- 47-49
- 49-51
- 51-53
- 53-55
- 55-57
- 57-59
- 59-61
- 61-63
- > 63

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

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STATUS
FOR INFORMATION

DRAWING
OPERATIONAL NOISE CONTOURS - SCENARIO 2 (5AM TO 7AM)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER	REVISION
AC-DWG-100-02-01	001

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 35
- 35-37
- 37-39
- 39-41
- 41-43
- 43-45
- 45-47
- 47-49
- 49-51
- 51-53
- 53-55
- 55-57
- 57-59
- 59-61
- 61-63
- > 63

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

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SCALE
NTS

STATUS
FOR INFORMATION

DRAWING
OPERATIONAL NOISE CONTOURS - SCENARIO 3 (7AM-6PM)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-100-03-01

REVISION
001

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 35
- 35-37
- 37-39
- 39-41
- 41-43
- 43-45
- 45-47
- 47-49
- 49-51
- 51-53
- 53-55
- 55-57
- 57-59
- 59-61
- 61-63
- > 63

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

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P00476

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Waluya Pty Ltd Gosford Transport

SCALE
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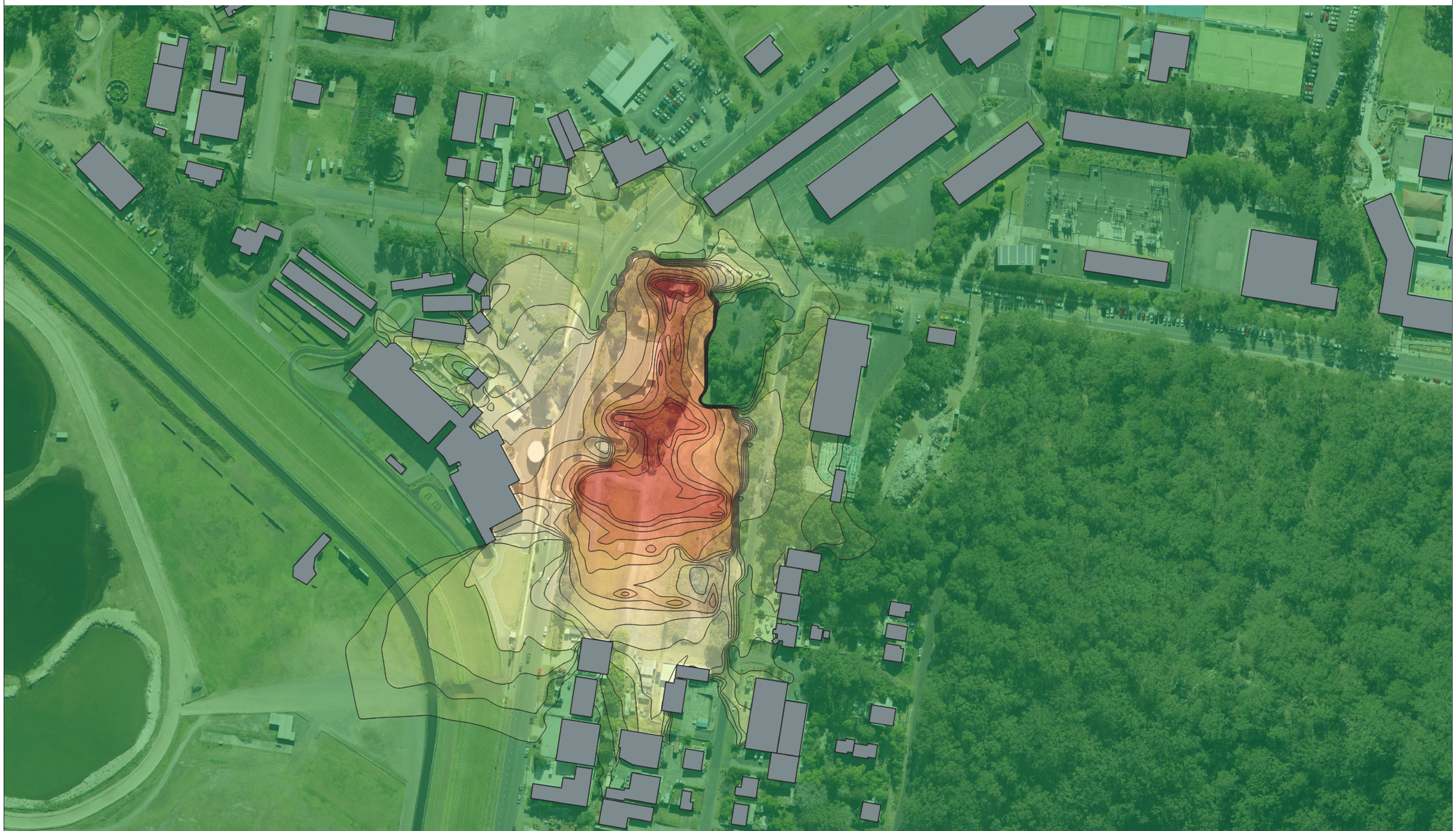
STATUS
FOR INFORMATION

DRAWING
OPERATIONAL NOISE CONTOURS - SCENARIO 4 (6PM-10PM)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-100-04-01

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 35
- 35-37
- 37-39
- 39-41
- 41-43
- 43-45
- 45-47
- 47-49
- 49-51
- 51-53
- 53-55
- 55-57
- 57-59
- 59-61
- 61-63
- > 63

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

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Waluya Pty Ltd Gosford Transport

SCALE
NTS

STATUS
FOR INFORMATION

DRAWING
OPERATIONAL NOISE CONTOURS - SCENARIO 5 (10PM-2AM)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-100-05-01

REVISION
001

Appendix B **Construction Noise Contours**

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 55
- 55-57
- 57-59
- 59-61
- 61-63
- 63-65
- 65-67
- 67-69
- 69-71
- 71-73
- 73-75
- > 75

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

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CLIENT
Waluya Pty Ltd Gosford Transport

SCALE
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STATUS
FOR INFORMATION

DRAWING
CONSTRUCTION NOISE CONTOURS - DEMOLITION

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-200-01-01

REVISION
001

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 55
- 55-57
- 57-59
- 59-61
- 61-63
- 63-65
- 65-67
- 67-69
- 69-71
- 71-73
- 73-75
- > 75

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

ARCHITECT
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CLIENT
Waluya Pty Ltd Gosford Transport

SCALE
NTS

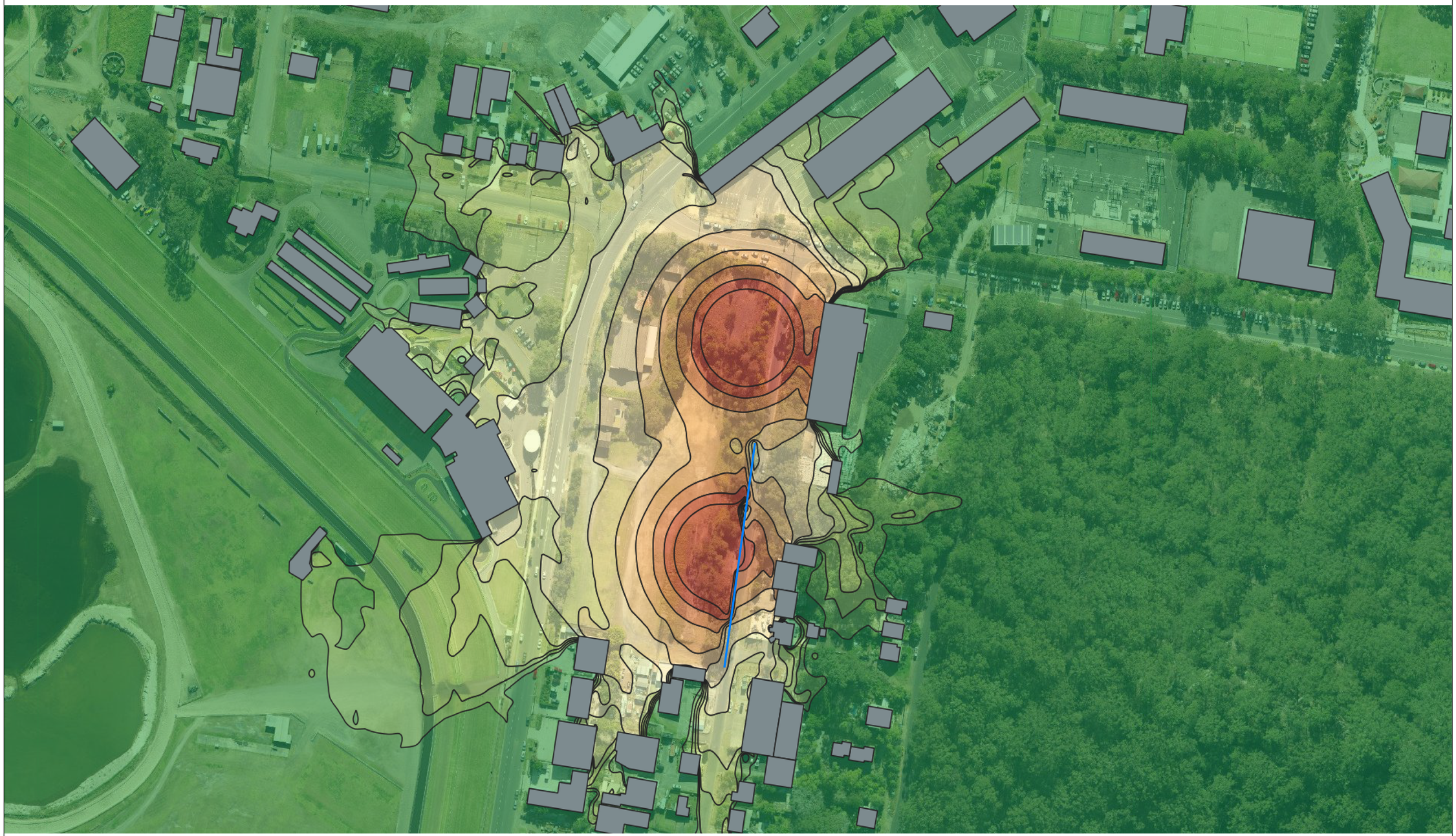
STATUS
FOR INFORMATION

DRAWING
CONSTRUCTION NOISE CONTOURS - CIVIL WORKS (EAST)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-200-02-01

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 55
- 55-57
- 57-59
- 59-61
- 61-63
- 63-65
- 65-67
- 67-69
- 69-71
- 71-73
- 73-75
- > 75

NOTES

- 2.1m High Construction Hoarding

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

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Waluya Pty Ltd Gosford Transport

SCALE
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STATUS
FOR INFORMATION

DRAWING
CONSTRUCTION NOISE CONTOURS - CIVIL WORKS (EAST, TREATED)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-200-03-01

REVISION
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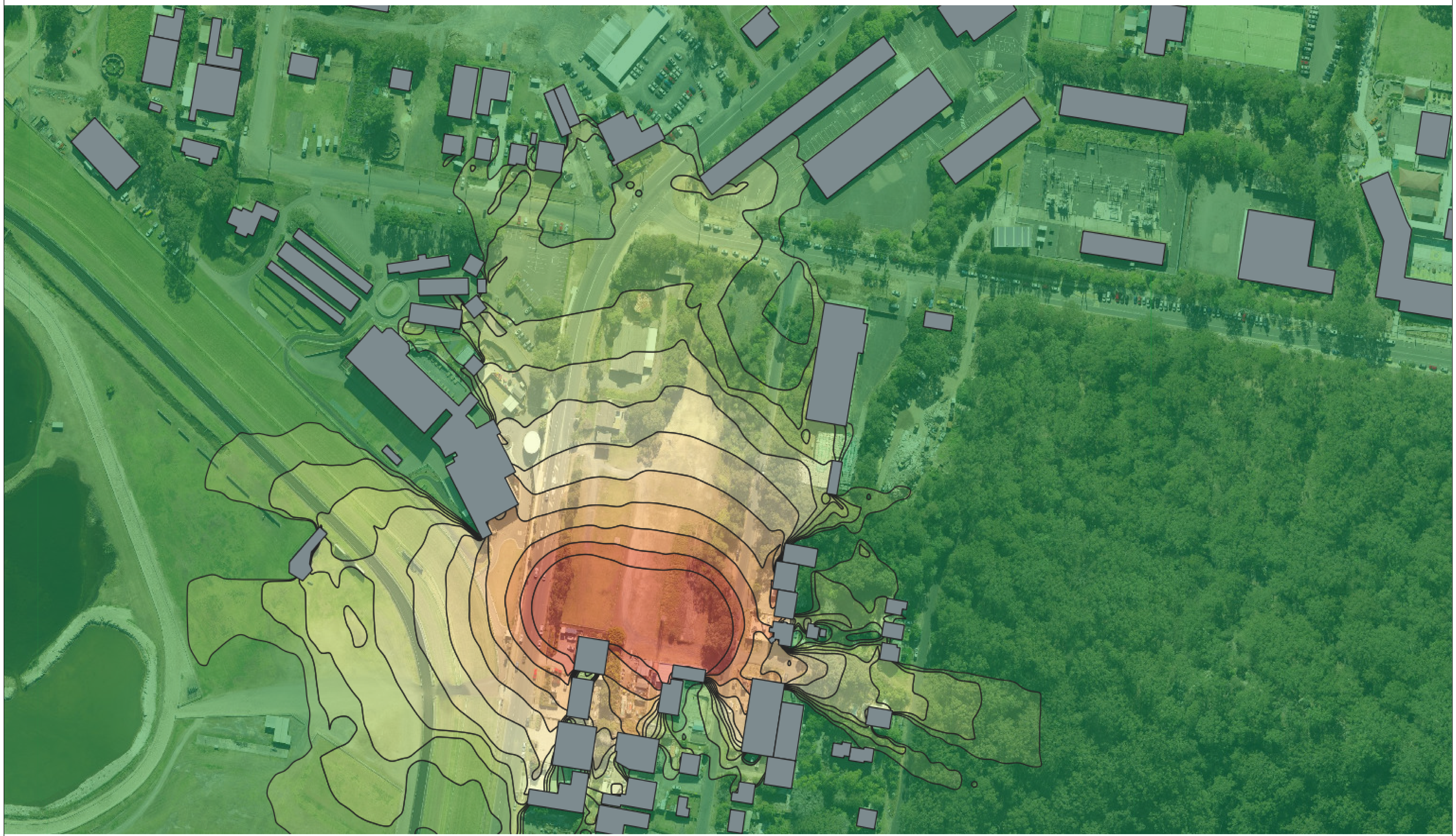

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 55
- 55-57
- 57-59
- 59-61
- 61-63
- 63-65
- 65-67
- 67-69
- 69-71
- 71-73
- 73-75
- > 75

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

ARCHITECT
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CLIENT
Waluya Pty Ltd Gosford Transport

SCALE
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STATUS
FOR INFORMATION

DRAWING
CONSTRUCTION NOISE CONTOURS - CIVIL WORKS (SOUTH)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
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REVISION
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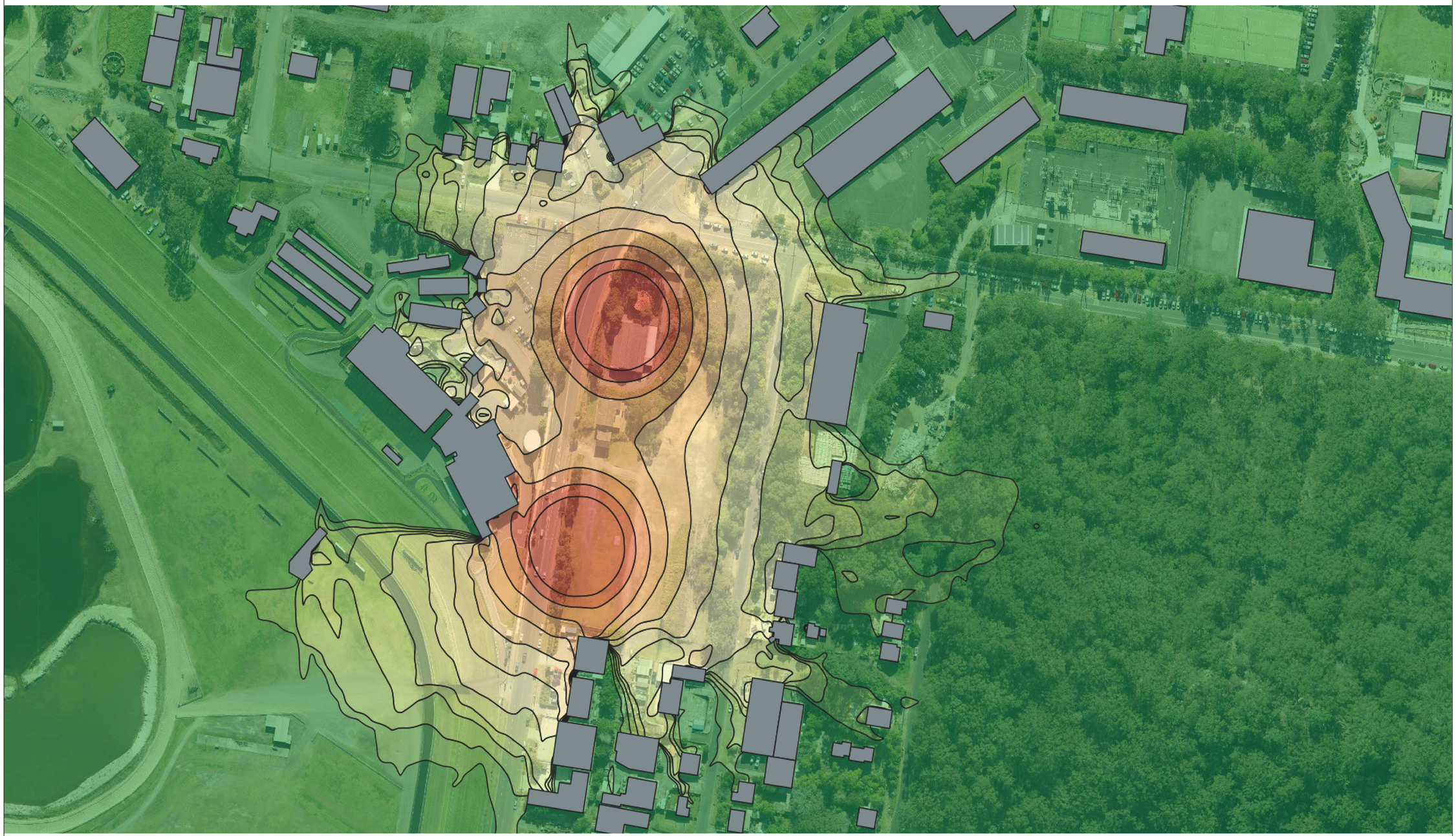

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 55
- 55-57
- 57-59
- 59-61
- 61-63
- 63-65
- 65-67
- 67-69
- 69-71
- 71-73
- 73-75
- > 75

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

ARCHITECT
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CLIENT
Waluya Pty Ltd Gosford Transport

SCALE
NTS

STATUS
FOR INFORMATION

DRAWING
CONSTRUCTION NOISE CONTOURS - CIVIL WORKS (WEST)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-200-05-01

REVISION
001

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 55
- 55-57
- 57-59
- 59-61
- 61-63
- 63-65
- 65-67
- 67-69
- 69-71
- 71-73
- 73-75
- > 75

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

ARCHITECT
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Waluya Pty Ltd Gosford Transport

SCALE
NTS

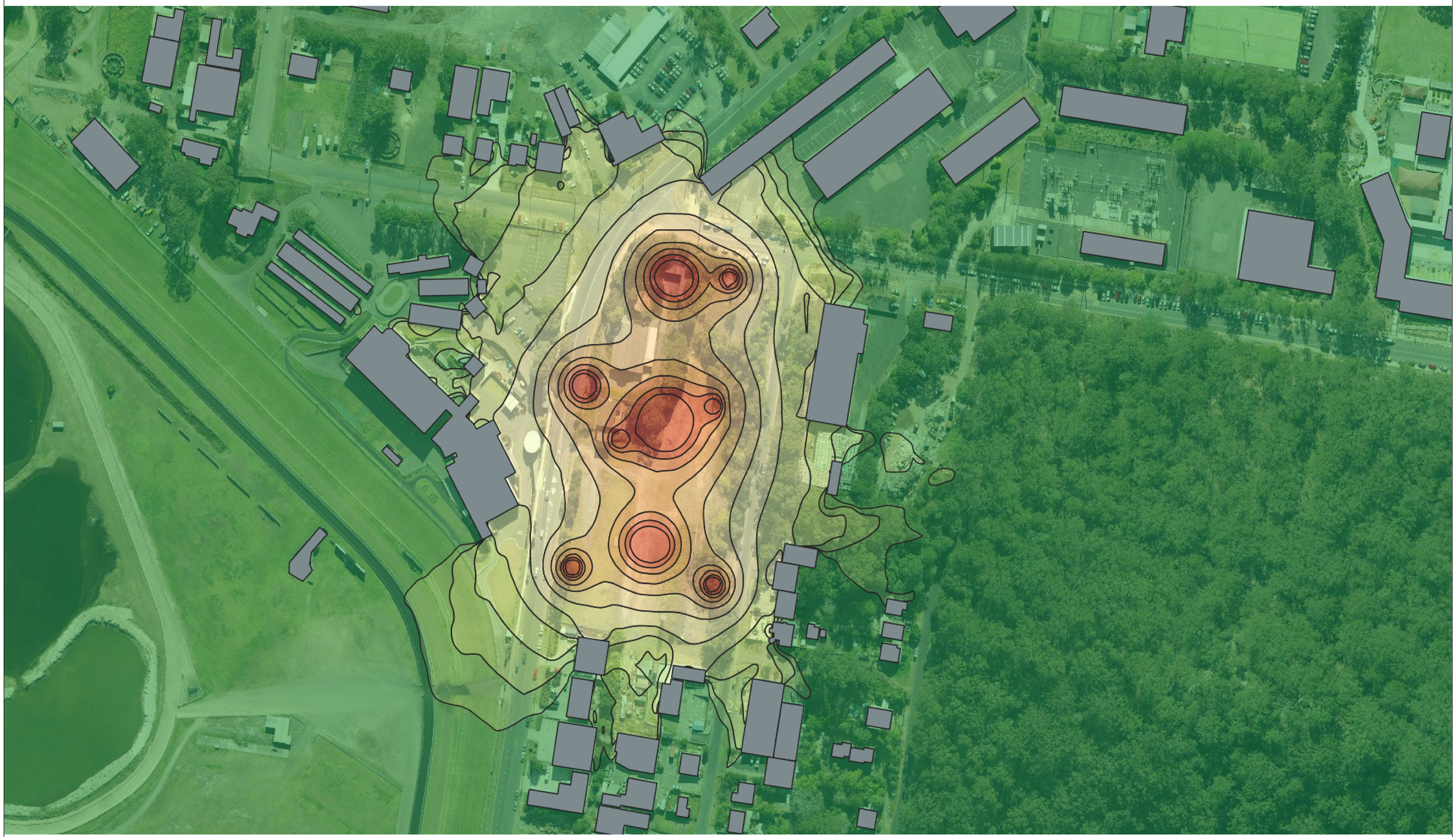
STATUS
FOR INFORMATION

DRAWING
CONSTRUCTION NOISE CONTOURS - CIVIL WORKS (NORTH)

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-200-06-01

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

Predicted Noise Level - dB(A)$L_{eq(15min)}$

- < 55
- 55-57
- 57-59
- 59-61
- 61-63
- 63-65
- 65-67
- 67-69
- 69-71
- 71-73
- 73-75
- > 75

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

ARCHITECT
dem

CLIENT
Waluya Pty Ltd Gosford Transport

SCALE
NTS

STATUS
FOR INFORMATION

DRAWING
CONSTRUCTION NOISE CONTOURS - CONSTRUCTION

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-200-07-01

REVISION
001

Appendix C **Operational Noise Mitigation Measures**

Solid horizontal screen/awning/concrete slab over bus parking, 6m above ground level.

Solid wall from ground level, sealed to the underside of the awning.

1.8m High Acoustic Screen

2.8m High Acoustic Screen

Have these buses leave after 7am and return to park in these spots by at least 10pm

YOUNG STREET

RACECOURSE ROAD

FAUNCE STREET WEST

ERINA STREET WEST

BM SSM 119125
RL 16,482 (AHD)

LANDSCAPE BUFFER

10m SETBACK LINE

BUS PARKING
7 BUSES

BUS PARKING
10 BUSES

BUS PARKING
10 BUSES

BUS PARKING
10 BUSES

BUS PARKING
10 BUSES

BUS MANOEUVRING AREA

2 BUSES

BUS DRIVEWAY
CONCRETE HARD STAND

12.5 BUS TURNING CIRCLE

BUS PARKING
21 BUSES

BUS PARKING
12 BUSES

BUS PARKING
6 BUSES

BUS PARKING
6 BUSES

ON-GRADE CARPARK
119 CARS

VACANT FOR TENDER DEPOT

OFFICE / WORKSPACE / STORAGE

SPRAY BOOTH AND PANEL

CHASSIS WASH

4 PITS

2 BAYS

TYRE & PARTS STORE

WATER TANK

BUS WASH PLANT

BUS WASH POINT

DIESEL FUEL TANK & ADBlue® TANK

BUS WASH BAY SHOWN DOTTED

LAND BOWSERS STAND ALONE

OPEN PLAN OFFICE SPACE

EX RL 7,00

EX RL 5,50

EX RL 4,20

TELSTRA

BLOCK WALL

S P 1 1 8 9 7

5
D P 3 0 5 6 5

3
MATILDA PICTURE FRAMING' BRICK BUILDING

B
D P 3 3 9 7 0 7

BRICK BUILDING
RIDGE RL 17,3
(APPROX.)

RENDERED BRICK BUILDING
RIDGE RL 15,3
(APPROX.)

B
D P 3 3 9 7 0 7

METAL BUILDING

RENDERED FACTORY
RIDGE RL 8,7
(APPROX.)

8
D P 8 0 1 2 6 1

9
D P 8 0 1 2

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	16/12/2022	For Information

LEGEND

NOTES

PROJECT
7A-11 Racecourse Road, 5-9 Faunce Street & Young Street

PROJECT NO.
P00476

ARCHITECT
dem

CLIENT
Waluya Pty Ltd Gosford Transport

SCALE
NTS

STATUS
FOR INFORMATION

DRAWING
ACOUSTIC MITIGATION MEASURES

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-300-01-01

REVISION
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