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Project: **BENDIGO BESS**

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Report No.: **Rp 001 R01 20260028**

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SUMMARY

This report comprises an environmental noise assessment of the proposed Bendigo battery energy storage system (BESS) project.

It includes a summary of the relevant policy requirements as set out in the *Environment Protection Act 2017*, the existing noise levels in the area and predicted noise levels due to the proposed project.

A candidate project design which utilises reasonable equipment selection assumptions and noise mitigation measures has been assessed and predicted noise levels are indicated to comply with relevant noise limits.

This report sets out:

- Maximum noise levels for all noise generating equipment, including batteries, transformers and inverters based on documented performance outcomes for candidate equipment
- Indicative noise barrier layouts

It is expected that alterations or refinements to the candidate project design may be available during design development. To verify the acceptability of a revised project design, an updated environmental noise assessment should be prepared prior to construction.

This assessment has considered the potential for future cumulative noise due to existing commercial, industry and trade premises, as well as undeveloped adjacent lots. A balanced approach has been applied where the comparative size of the project lot has been considered along with speculative uses of the remaining lots in the subdivision.

An allowance for a tonality adjustment has been made on the basis that it would be just perceptible and not prominent within noise sensitive areas. This conclusion has been drawn from comparison of the predicted project noise levels and the existing ambient noise levels in the area. This should continue to be reviewed during design development, especially if equipment selections are revised.

The general environmental duty (GED) applies under the EP Act to reduce the risk of harm from noise so far as reasonably practicable. During detailed design, all opportunities for noise controls, including those discussed in this report, should be considered.

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APPENDIX B PLANNING MAP

APPENDIX C LEGISLATION

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1.0 INTRODUCTION

Pacific Blue Australia Developments Pty Ltd (Pacific Blue) is proposing to develop a grid-scale battery energy storage system (BESS) at 20 Hattam Street, Golden Square, Bendigo (the project).

Marshall Day Acoustics (Australia) Pty Ltd (MDA) has been engaged by Cogency Australia on behalf of Pacific Blue to undertake an environmental noise assessment of the proposed project. The results of this assessment are provided in this report.

A glossary of acoustic terminology used throughout this report is provided in Appendix A.

2.0 PROJECT OVERVIEW

2.1 Project description

The Project is a grid-scale BESS proposed to have a storage capacity of 201 MW / 866 MWh.

For noise assessment purposes, the following equipment list has been considered:

- 1 high voltage (HV) transformer (250 MVA)
- 8 small transformers (750 kVA)
- 168 battery units
- 56 inverter modules which each include:
 - 1 inverter
 - 1 medium voltage (MV) transformer (4.6 MVA)

The current project layout is shown in Figure 1.

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Figure 1: Project layout dated 19 May 2026



2.2 Project location and receivers

The project site is immediately bounded by:

- Vacant, undeveloped industrial-zoned lots to the north
- Existing industrial uses to the west, south, and north-east
- A public park and recreation area to the east

The existing industrial uses include the Bendigo Terminal Station (BETS) and assorted warehouse-type premises.

Further afield, the site is surrounded by residential uses on all sides. The distance from the site boundary to the nearest residential properties are approximately:

- 130 m to the north
- 330 m to the east
- 760 m to the south
- 300 m to the west

A planning map is provided in Appendix B.

The project location is zoned IN1Z (Industrial 1 Zone). It is bounded by IN1Z and SUZ12 (Special Use Zone 12) for the Bendigo Terminal Station. GRZ (General Residential Zone), PPRZ (Public Park and Recreation Zone), IN3Z (Industrial 3 Zone) characterise the majority of the surrounding area.

A section of land to the north of the project site (Public Use Zone 7) which we understand constitutes the Golden Oak Reserve. Council has considered buildings within this area (and potential future buildings) to be residential in nature.

For the purpose of this assessment, 6 residential premises have been selected from the surrounding area as receivers. The receivers represent discrete locations within the 'noise sensitive areas' that surround the site. Further information regarding noise sensitive areas is provided in Appendix C4.

The selected receivers have been selected to broadly represent the nearest or expected worst-affected receivers in each direction. They are summarised in Table 1.

Table 1: Assessment receivers

Receiver	Orientation from site	Description
13 Hattam St	North	Single-storey residential dwelling
15 Hattam St	North	Currently vacant land within PUZ7 zone. <i>Assumed to likely be residential use in future.</i>
3 Hattam St	North-west	Single-storey residential dwelling
37 McLachlan St	West	Double-storey residential dwelling
108 MacDougall Rd	East	Single-storey residential dwelling
31 Ham St	South	Single-storey residential dwelling

A map showing the subdivision of the industrial lots, a planning map, and an aerial map of the project site and surrounds, including the identified receivers are presented as Figure 2.

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Figure 2: Project location and assessment receivers



3.0 LEGISLATION AND GUIDELINES

3.1.1 Victorian policy overview

In Victoria, environmental noise is regulated by several different requirements, including various legislation, local laws, and Victoria's planning system.

The environmental noise assessment requirements for commercial, industrial and trade premises (CIT premises) are defined by several Victorian government documents, comprising:

- the *Environment Protection Act 2017* (EP Act)
- the *Environment Protection Regulations 2021* (EP Regulations)
- the *Environment Reference Standard* published 25 May 2021, and as amended by Environment Reference Standard No. S158 Gazette 29 March 2022 (ERS)
- EPA Publication 1826.5 Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues, published September 2025 (Noise Protocol).

The requirements and guidance of these documents is summarised below. Additional details and extracts from these documents are provided in Appendix C.

3.1.2 Environment Protection Act 2017

The *Environment Protection Act 2017* (EP Act) provides the overarching legislated protection of the environment in Victoria and establishes mandatory requirements for the control of environmental noise. The following key obligations apply under the EP Act:

- A person who is engaging in an activity that may give rise to risks of harm to human health or the environment has a general environmental duty (GED) to minimise the risk of harm, so far as reasonably practicable.
- A person must not, from a place or premises that are not residential premises, emit unreasonable noise or permit unreasonable noise to be emitted.

The risk of harm under the EP Act includes both health and amenity related noise impacts. The EP Act defines environmental noise as unreasonable if it is:

- prescribed to be unreasonable from an assessment against mandatory noise limits, or
- assessed to be unreasonable according to the following factors defined in the EP Act:
 - noise volume, intensity or duration
 - noise character
 - the time, place and other circumstances in which the noise is emitted
 - how often the noise is emitted.

3.1.3 Environment Protection Regulations 2021

The *Environment Protection Regulations 2021* (EP Regulations) give effect to the EP Act by establishing prescriptive requirements for a range of environmental considerations including noise. The noise requirements are defined according to the type of noise-generating activity under consideration. The EP Regulations also define the types of noise sensitive areas where these requirements apply and the hours of different assessment time periods (i.e. day, evening and night).

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The EP Regulations specify that the prediction, measurement, analysis and assessment of operational industry noise within a noise sensitive area must be conducted in accordance with the EPA Noise Protocol. Noise from industry is prescribed by the EP Regulations to be unreasonable for the purposes of the EP Act if it exceeds the noise limit determined in accordance with the Noise Protocol.

3.1.4 EPA Publication 1826.5 (Noise Protocol)

The Noise Protocol defines a procedure for setting noise limits that apply to the operation of industry premises and entertainment venues in Victoria. Compliance with the noise limits is mandatory. The EPA Noise Protocol defines noise limits that are used to assess whether a noise is prescribed to be unreasonable in accordance with the EP Regulations and the EP Act.

The noise limits apply at a 'noise sensitive area', which is defined by the EP Regulations as being *within 10 metres of the outside of the external walls* of buildings including dwellings, hotels, and schools. In rural areas, noise sensitive areas also include land within the boundary of campgrounds, caravan parks and certain types of tourist establishments. In this report, noise sensitive areas are referred to as receivers.

The procedures for setting noise limits are defined separately for urban and rural areas. However, in both cases, the noise limits are defined by considering the land zoning in the area and the noise environment of the receiver. Separate noise limits are defined for the day, evening and night periods.

3.1.5 Environment Reference Standard

The *Environment Reference Standard* (ERS) was introduced under the EP Act and sets out environmental and human health outcomes that are sought to be achieved and maintained in Victoria. The outcomes are described by the ERS in terms of a collection of environmental values, indicators and objectives.

The ERS is mentioned here for information and completeness only and the ERS has had no further consideration in this assessment. Direct regulation takes precedence over the ERS, and all aspects of noise generated on the Project are regulated under the EP Regulations.

3.1.6 Related Victorian guidelines

To support the application and use of the above legislation and guidance, a range of Victorian EPA publications provide additional advice on matters of interpretation and technical assessment requirements. These publications include:

- EPA Publication 1992 *Guide to the Environment Reference Standard*, dated June 2021
- EPA Publication 1996 *Noise guideline – assessing low frequency noise*, dated May 2025
- EPA Publication 1997 *Technical guide: Measuring and analysing industry noise and music noise*, dated May 2025.

The EPA also provides online guidelines relating to noise, including:

- commerce, industry and trade noise guidelines¹
- noise advice for businesses²
- unreasonable noise guidelines³.

Broader relevant industry guidance is also provided in:

¹ See EPA commerce, industry and trade noise guidelines through this [weblink](#)

² See EPA noise advice for business through this [weblink](#)

³ See EPA unreasonable noise guidelines through this [weblink](#)

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- EPA Publication 1695.1 *Assessing and controlling risk for business*, dated 1 March 2019
- EPA Publication 1856 *Reasonably practicable*, dated September 2020.

3.2 Town planning

3.2.1 Planning scheme

The *Greater Bendigo planning scheme clause 13.05 'Noise'* includes general requirements to 'minimise the impact on human health from noise exposure'.⁴ It lists 'building siting and design (including orientation and internal layout), urban design and land use separation techniques' as noise mitigation measures but does not prescribe objective requirements.

Broadly, the intent of the clause aligns with the legislated GED described in Section 3.2

The policy documents summarised in Section 3.2 are stated to be considered 'as relevant' to the clause.

Additional documents listed in the clause relate to noise from rail infrastructure and are not relevant to this assessment.

Overall, the clause does not impose any mandatory or specific requirements additional to those outlined by state legislation.

3.2.2 Golden Square Structure Plan

The Project site is located within the area covered by the *Golden Square Structure Plan* (Structure Plan) that was adopted by the Greater Bendigo City Council on 24 January 2022.

Specifically, the site is located within 'Precinct 19' that is characterised in the plan as the main industrial precinct of Golden Square.

The plan states that the area is suitable for 'supporting further smaller scale/lower intensity industrial development'. It also notes the importance of minimising 'the conflict between industrial uses and residential development within this area'.

Rezoning portions of the GRZ (General Residential Zone) to the north-east and south of the Project site is identified as an actionable measure, however this has not yet been carried out.

The scale of the proposed Project may not align fully with the stated goals of 'smaller scale/lower intensity industrial development'. However, the Structure Plan does not impose any mandatory or specific requirements additional to those outlined by state legislation.

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⁴ <https://planning-schemes.app.planning.vic.gov.au/Greater%20Bendigo/ordinance>

4.0 ASSESSMENT OVERVIEW

As discussed in the previous section, the overarching noise requirements for the project are defined by the EP Act.

The cornerstone of the EP Act is the GED, which requires that the risk of harm due to noise be minimised so far as reasonably practicable. Residual noise impacts are then assessed as to whether they could constitute unreasonable noise under the EP Act.

Unreasonable noise is addressed by considering the requirements of the EP Regulations and the Noise Protocol.

The overarching approach to the assessment of noise for the Project is described in Table 2.

Table 2: Assessment method

Step	General method
Consider hazards and assess risk	Preliminary noise modelling was used to identify specific hazards which could contribute to the risk of harm. This was based on documented noise data for the nominated equipment items.
Reduce risk so far as reasonably practicable	In consultation with the Project team, controls were investigated which could reduce the risk of harm, and it was determined whether they were reasonably practicable. These included noise control kits, operational contextualisation (for example during the night period) and noise walls. Noise control measures were informed by iterative noise modelling to determine whether they afforded a material reduction in noise level.
Assess residual noise impacts	Measures that were deemed reasonably practicable and feasible for consideration at this stage were incorporated into the assessment. Noise levels were predicted with measures in place to determine residual noise impacts and inform the residual risk of harm due to noise.
Check controls	GED obligations are ongoing over the life of the Project. Consideration will be required during design development and after construction.

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5.0 EXISTING NOISE ENVIRONMENT

A noise survey was carried out on Tuesday 17 September 2024 and Wednesday 18 September 2024 to evaluate existing noise conditions at the identified receivers.

The timing of the survey coincided with initial feasibility studies carried out by the proponent.

Short term attended noise measurements were carried out in a sample of locations which were selected in order to provide a representative overview of the noise environment.

The survey included measurements during the day, evening and night periods defined in the EP Regulations. Day, evening and night period timeframes are described in Section 6.0.

The measured background noise levels used for deriving mandatory noise limits are summarised in Table 3. Where more than one measurement was taken at a location within a given time period, the level provided represents the arithmetic average of those measurements.

The measurement locations are shown in Figure 3.

Further information regarding the noise survey is provided in Appendix D.

Table 3: Measured background noise levels, dB L_{A90}

Location	Relevant receiver	Day	Evening	Night
1	13/15 Hattam St	52	47	32
2A	3 Hattam St	-	50	33
2B	3 Hattam St	56	-	-
3	108 MacDougall Rd	-	39	32
4	37 McLachlan St	-	42	31
5	31 Ham St	-	42	31

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Figure 3: Noise measurement locations



6.0 OPERATIONAL NOISE LIMITS

Mandatory noise limits are defined separately for the day, evening and night period.

As defined in the EP Regulations, the limits apply externally, up to 10m from the exterior walls of a dwelling, but within the property boundary.

The environmental noise limits derived for the receivers, based on the current land zoning and the measured background noise levels, are summarised in Table 4.

The limits are expressed in terms of the effective noise level (dB ENL) which is defined as the 30-minute worst-case equivalent (dB L_{Aeq}) noise level, adjusted to account for noise character if required.

Table 4: Summary of environmental noise limits, dB ENL

	Location 1	Location 2A/2B	Location 3	Location 4	Location 5
Period	13/15 Hattam St	3 Hattam St	108 MacDougall Rd	37 McLachlan St	31 Ham St
Day	62	62	51	55	52
Evening	55	53	45	49	46
Night	44	42	40	41	39

Since the noise limits depend on the land zoning, changes to zones in the vicinity of the site and/or receivers may change the noise limits.

Detailed information regarding the derivation of noise limits is provided in Appendix E.

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7.0 NOISE PREDICTION METHOD

Operational noise levels associated with the Project are predicted using:

- noise emission data for the battery units, inverters, and transformers
- a 3D digital model of the Project and the surrounding environment, using proprietary noise modelling software SoundPLANnoise v9.1
- implementation of the environmental sound propagation method specified in International Standard ISO 9613-2: 2024 Acoustics — *Attenuation of sound during propagation outdoors - Part 2: Engineering method for the prediction of sound pressure levels outdoors* (ISO 9613-2)

The implementation of ISO 9613-2 within proprietary noise modelling software enables multiple sound transmission paths, including reflected and screened paths, to be accounted for in the calculated noise levels. ISO 9613-2 was designed to assume conditions that favour the propagation of noise from meteorological effects, described as a slight wind (1 to 5 m/s) blowing from source to receiver, or a well-developed moderate ground-based temperature inversion.

A digital terrain map with a cell size of 1 m has been sourced from the public national portal, Elevation Information System (ELVIS) for areas outside the project area, and from terrain information provided by Pacific Blue for the future project site area.

All equipment items are modelled as omnidirectional point sources of noise with associated octave and third-octave band sound power level noise emissions. Further details regarding equipment noise levels are provided in Section 8.1.

The ground factor, G , representing the ground attenuation as a result of sound reflected by the ground surface interfering with the sound propagating directly from source to receiver is variable throughout the model being:

- $G = 0.0$ i.e. hard ground, within the project boundary
- $G = 1.0$ i.e. soft ground outside the project boundary to represent surrounding existing landscape between the project and receivers.

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8.0 ASSESSMENT OF PROJECT NOISE LEVELS

8.1 Candidate equipment sound levels

Sound power levels for individual equipment items, as used in the noise model, are detailed in Table 5. Data is provided as un-weighted (linear) octave band sound power level spectra and A-weighted overall sound power level.

For inverters and batteries, 2 operating conditions have been selected to represent anticipated operation during the night and the day or evening periods. These operating conditions have been considered in conjunction with Pacific Blue with regard to the anticipated actual operation of the equipment and the cooling required based on the ambient temperature as reported by the equipment manufacturer. They do not represent manual operational controls.

The transformers have been assumed to have a reduced max sound power level in accordance with Annex ZA of AS 60076-10:2023.⁵

The candidate data for batteries is as follows:

- EVE Mr Giant with proprietary attenuator operating at 70% fan speed with 45 °C ambient temperature during day/evening
- EVE Mr Giant with proprietary attenuator operating at 70% fan speed with 35 °C ambient temperature during night.

The candidate data for inverters is as follows:

- SMA SCS 4600 UP-S with proprietary noise reduction kit operating at 100 % apparent power during day/evening
- SMA SCS 4600 UP-S with proprietary noise reduction kit operating at 80 % apparent power during night.

Table 5: Sound power levels for Project equipment items, dB L_w re 10⁻¹² W^{a]}

Item	Octave band centre frequency, Hz									
	31.5	63	125	250	500	1k	2k	4k	8k	A
Battery – day/eve	80	78	90	78	70	68	62	58	56	76
Battery – night	81	84	90	74	69	65	61	57	56	75
Inverter – day/eve	83	86	81	77	76	72	74	79	80	85
Inverter – night	81	85	78	74	73	69	72	79	75	83
HV transformer	-	89	99	96	91	81	73	69	-	92
Small transformers	-	53	64	60	55	45	38	33	-	56

a All values rounded to the nearest whole decibel.

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⁵ Standards Australia, *Australian Standard AS 60076-10:2023 Part 10: Determination of sound levels (IEC 60076-10:2016 (ED. 2.0) MOD)* (AS 60076-10:2023)

8.2 Tonality

Noise associated with the operation of BESS infrastructure can be tonal in nature.

Section 3.4 of the noise protocol provides a mechanism by which the characteristics of a noise source, such as tonality, may attract the application of a modifying factor adjustment if deemed to meet the prescribed criteria. The Noise Protocol states that:

The following adjustments apply –

- a. when the tonal character of the noise is just detectable then $A_{tone} = +2$ dB;*
- b. when the tonal character of the noise is prominent then $A_{tone} = +5$ dB.*

The prominence of tonality in noise sensitive areas depends on the tonality of the noise source, the effect of propagation to the noise sensitive area and the level of ambient noise.

For the project, the tonal characteristic of equipment items such as transformers and inverters can be relatively prominent at source. However, the level of ambient noise compared to the predicted project noise level within the noise sensitive areas has been reviewed and tonality is not anticipated to be prominent within the noise sensitive areas.

A +2 dB adjustment has been applied for tonality.

Additional tonality sensitivity analyses is provided in Appendix F.

8.3 Cumulative noise

The mandatory noise limits apply to the cumulative noise from all CIT (commercial, industrial and trade) premises at a given receiver.

Based on the site survey undertaken and detailed in Appendix D, there is limited evidence to suggest that cumulative noise from other sites is a significantly constraining factor on the project.

The BTS (Bendigo Terminal Station) was observed to be the only audible CIT premises during the site survey during the night. Noise from the station was only audible at Location 6 in the vicinity of 37 McLachlan Street (refer Appendix D).

At the time of the survey, the total measured level was 10 dB below the limit at 37 McLachlan Street. Sensitivity analysis of the overall measured noise level indicated that the steady-state noise (L_{Aeq}) from the substation itself was more than 10 dB below the limit, however it is not possible to derive the exact level.

Significant uncertainty exists regarding the potential for cumulative noise from the other vacant commercial lots within the subdivision. There is no information available at this time that describes the future nature of these lots.

The noise protocol does not outline a set pathway for considering noise for this type of situation.

An 'equal sharing' principal is often used in the first instance to determine the allowable contributions from individual premises (including future undeveloped commercial land). However, EPA Publication 1997 – *Technical guide – measuring and analysing industry noise and music noise* notes the following considerations relevant to this assessment:

The equal sharing principal may be too simplistic in complex situations... for example:

- >> *There is a large diversity in the size or nature of the industries affecting noise sensitive areas,*
- >> *The distance from each individual premises to the noise sensitive area varies greatly, or*
- >> *The practicability of noise control varies greatly between the different premises.*

Of the above factors, there is potential for a large diversity in the size or nature of the industries affecting noise sensitive areas, and the practicability of noise control could vary greatly between the different premises.

The following additional factors have been considered with respect to establishing cumulative noise targets:

- The project occupies approximately half of the subdivision and 2-way equal sharing on an area basis equates to - 3 dB.
- The project incorporates all reasonably practicable noise mitigation measures, including noise barriers where relevant and the quietest practicable equipment.
- Other than noise barriers and equipment selection, limited other noise mitigation measures are available.
- The night period is the most sensitive period for the project. Prospective tenants at other lots such as warehouses may not require significant night period operations.
- Prospective tenants such as warehouses may be able to effectively mitigate prominent noise sources using enclosure.

On this basis, a factor of -3 dB has been allocated to the project noise limit to allow for potential cumulative noise.

8.4 Preliminary noise barriers

Preliminary noise barrier designs have been developed with the project team through iterative noise modelling. The barrier requirements respond to the noise profiles of the candidate equipment. As such, changes to the candidate site design, such as equipment reselections, may have an impact on the barrier requirements. This should be reviewed during detailed design.

Noise barriers should be constructed of a material with a surface density of at least 15 kg/m². They should be free of holes and gaps. Materials such as timber, precast concrete, proprietary modular panels and others can be used, provided they meet the density requirement.

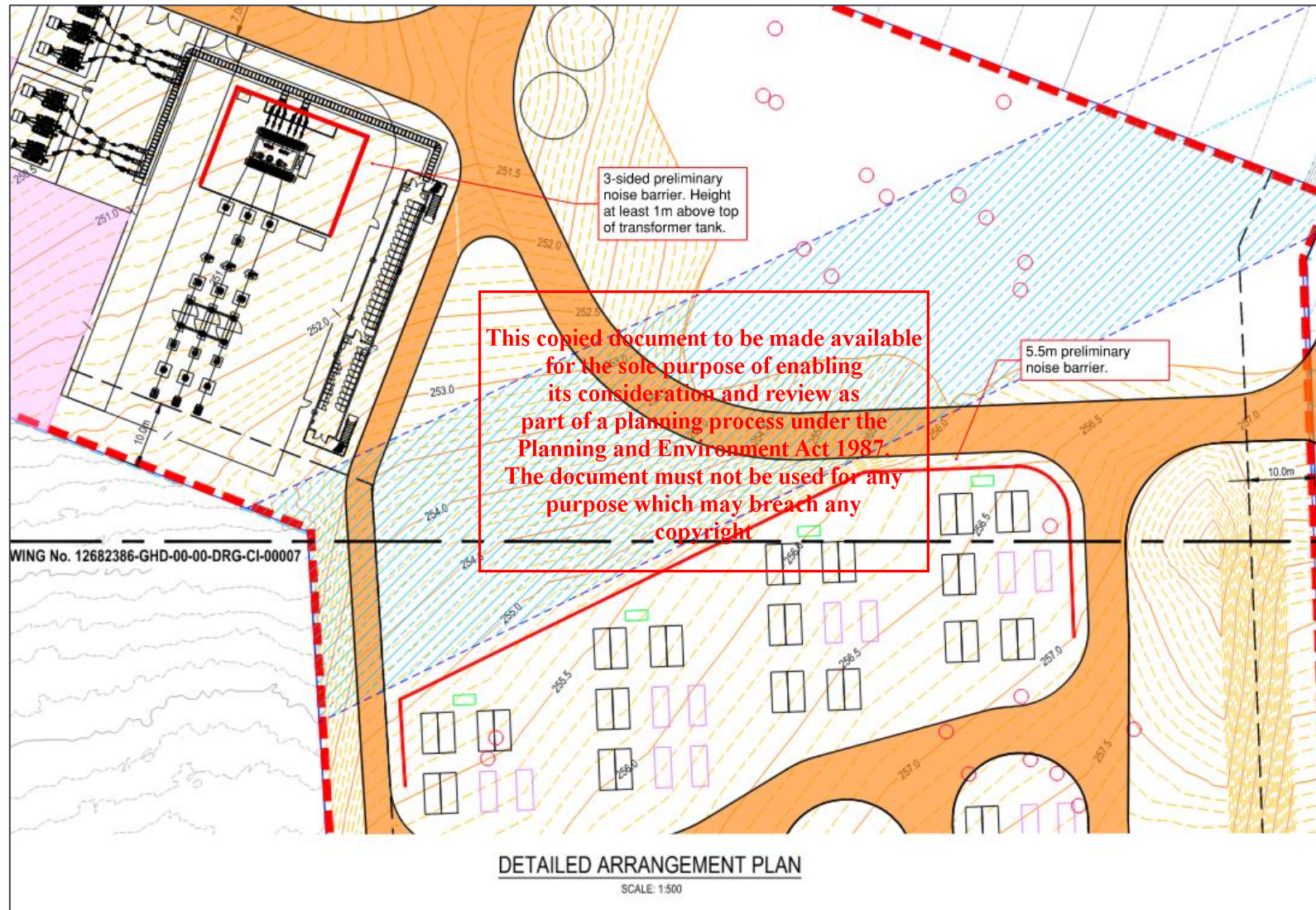
The preliminary noise barriers are shown in Figure 4. They are subject to review during detailed design stages.

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Figure 4: Preliminary noise barriers – subject to detailed design



8.5 Predicted noise levels

The predicted levels in Table 7 include the effect of the preliminary noise barrier shown in the Project layout.

Table 6 provides a summary of the associated predicted noise levels and a comparison with the night period noise targets. The targets are based on the noise limits, with consideration of cumulative noise as discussed in Section 8.3. The smallest margin is 1 dB.

Table 6: Predicted noise levels for the Project, dB

Receiver	Project noise level, L_{Aeq}	$A_{tone}^{[a]}$	Assessable noise level, ENL	Noise target (Night), ENL	Compliance?
13/15 Hattam St	36	+2	38	41	Yes
3 Hattam St	34	+2	36	39	Yes
31 Ham St	26	+2	28	36	Yes
37 McLachlan St	35	+2	37	38	Yes
108 MacDougall Rd	30	+2	32	37	Yes

a Refer Section 8.2 and Appendix F.

Table 7 provides a summary of the associated predicted noise levels and a comparison with the evening period noise targets. The smallest margin is 8 dB.

Table 7: Predicted noise levels for the Project, dB

Receiver	Project noise level, L_{Aeq}	A_{tone}	Assessable noise level, ENL	Noise target (Eve), ENL	Compliance?
13/15 Hattam St	37	+2	39	52	Yes
3 Hattam St	35	+2	37	50	Yes
31 Ham St	27	+2	29	43	Yes
37 McLachlan St	36	+2	38	46	Yes
108 MacDougall Rd	31	+2	33	42	Yes

Table 8 provides a summary of the associated predicted noise levels and a comparison with the day period noise targets. The smallest margin is 14 dB.

Table 8: Predicted noise levels for the Project, dB

Receiver	Project noise level, L_{Aeq}	A_{tone}	Assessable noise level, ENL	Noise target (Day), ENL	Compliance?
13/15 Hattam St	37	+2	39	59	Yes
3 Hattam St	35	+2	37	59	Yes
31 Ham St	27	+2	29	49	Yes
37 McLachlan St	36	+2	38	52	Yes
108 MacDougall Rd	31	+2	33	48	Yes

The predicted noise level indicate compliance across all time targets.

8.6 Environment Reference Standard

The Environment Reference Standard (ERS) is a relevant consideration for natural areas located in the vicinity of the site.

The ERS is not applicable where mandatory Noise Protocol noise limits apply.

8.6.1 Identified natural areas

Natural areas are a land-use category for which the ERS details desired outcomes in terms of noise level to be achieved or maintained in Victoria. The ERS defines natural areas as national parks, state parks, state forests, nature conservation reserves and wildlife reserves.

The key identified natural area in the vicinity of the Project is the public park and recreation zone (PPRZ) abutting the site to the east. It is unconfirmed whether this area would represent a 'natural area' with respect to the definitions above, however we have treated it as such for the purposes of this assessment.

8.6.2 Guidance on noise in natural areas

Clause 7 of the ERS sets out the environmental values for the ambient sound environment that are to be achieved or maintained in Victoria.

The environmental value relevant to natural areas and the indicator to support this value is contained in Table 9.

Table 9: Environmental values of the ambient sound environment

Environmental value	Description of environmental value
Human tranquillity and enjoyment outdoors in natural areas	An ambient sound environment that allows for the appreciation and enjoyment of the environment for its natural condition and the restorative benefits of tranquil soundscapes in natural areas.

The ERS does not provide quantitative indicators or objectives to assess human tranquillity and enjoyment outdoors in natural areas. Instead, a qualitative objective is provided:

A sound quality that is conducive to human tranquillity and enjoyment having regard to the ambient natural soundscape.

8.6.3 Comparison of existing and predicted noise levels in natural areas

Noise from the Project is expected to be clearly audible within the adjacent PPRZ. The noise level and audibility would vary depending on the proximity to the Project, and also depending on the level of road traffic noise at the time.

Although the ERS environmental value does not reference any specific criteria, the intrusiveness of the noise within the reserve can be estimated by comparing predicted noise levels associated with the Project against the measured existing noise level in the area, which is currently dominated by noise from traffic on surrounding roads.

Measurement Location 7 (refer Section 5.0) is broadly representative of the most affected region within the PPRZ. Locations further south within the PPRZ would be expected to experience lower Project related noise levels than at Location 7. Generally, noise levels during the day and evening periods have been considered as it is not anticipated that the PPRZ would be used during this night period.

Project related predicted levels at Location 7 are presented in Table 10.

Table 10: Predicted noise level within reserve (Location 7), dB L_{Aeq}

	Day	Evening
<i>Existing noise level</i>	49	49
Predicted noise level	43	43

The predicted noise levels indicate project noise levels are lower than existing noise levels at this location, depending on whether noise barriers are included.

As such, the project is not anticipated to result in any significant impact to the environmental values for natural areas. Given the area may not fully represent the ERS definition for natural areas, no further assessment is considered to be required.

8.7 Discussion

Overall, the assessment indicates that the project candidate design can comply with the relevant noise limits.

Key items of uncertainty include the allowance for cumulative noise due to future nearby premises, and the nominated tonality penalty. This assessment has considered these items based on the information available at this time, and they must continue to be reviewed during design development, in conjunction with all reasonably practicable noise mitigation measures.

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APPENDIX A GLOSSARY OF TERMINOLOGY

Term	Definition
A-weighting	A set of frequency-dependent sound level adjustments that are used to better represent how humans hear sounds. Humans are less sensitive to low and very high frequency sounds. Sound levels using an “A” frequency weighting are expressed as dB L _A .
Background sound	The sound that is continuously present in a room or outdoor location. Often expressed as the A-weighted sound level exceeded for 90 % of a given time period i.e. L _{A90} .
dB	Decibel. The unit of sound level.
Frequency	Sound occurs over a range of frequencies, extending from the very low (e.g. thunder) to the very high (e.g. mosquito buzz). Measured in units of Hertz (Hz). Humans typically hear sounds between 20 Hz and 20 kHz. High frequency acuity naturally reduces with age most adults can hear up to 15 kHz.
Hertz (Hz)	The unit of frequency, named after Gustav Hertz (1887-1975). One hertz is one pressure cycle of sound per second. One thousand hertz – 1000 cycles per second – is a kilohertz (kHz).
L _{Aeq}	The equivalent continuous A-weighted sound level. Commonly referred to as the average sound level and is measured in dB.
L _w	Sound Power Level. The calculated level of total sound power radiated by a sound source. Usually A-weighted i.e. L _{WA} .
Octave band	The interval between one frequency and its double. Sound is divided into octave bands for analysis. The typical octave band centre frequencies are 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, and 4 kHz.

The basic quantities used within this document to describe noise adopt the conventions outlined in ISO 1996-1:2016 *Acoustics - Description measurement and assessment of environmental noise – Basic quantities and assessment procedures*.

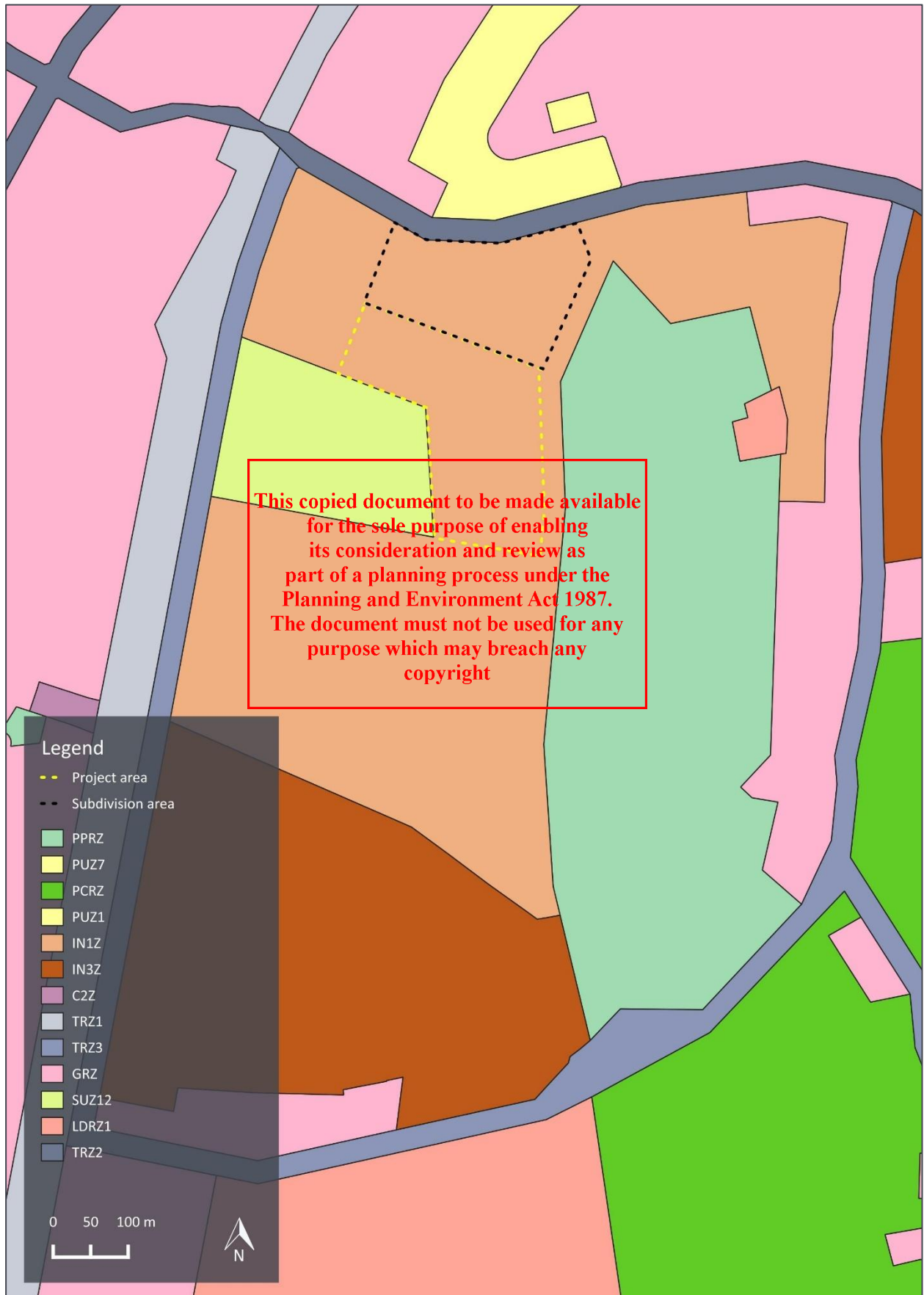
Accordingly, all frequency weighted sound pressure levels are expressed as decibels (dB) in this report. For example, sound pressure levels measured using an “A” frequency weighting are expressed as dB L_A. Alternative ways of expressing A-weighted decibels such as dBA or dB(A) are therefore not used within this report, unless included in a direct quote of external documentation.

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APPENDIX B PLANNING MAP

Figure 5: Planning map



APPENDIX C LEGISLATION

C1 Environment Protection Act 2017

The following key concepts and definitions are reproduced from the *Environment Protection Act 2017* (EP Act).

General environmental duty (Section 25(1)):

A person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable.

Harm (EP Act Section 4(1)):

In this Act, harm, in relation to human health or the environment, means an adverse effect on human health or the environment (of whatever degree or duration) and includes—

- (a) an adverse effect on the amenity of a place or premises that unreasonably interferes with or is likely to unreasonably interfere with enjoyment of the place or premises; or*
- (b) a change to the condition of the environment so as to make it offensive to the senses of human beings; or*
- (c) anything prescribed to be harm for the purposes of this Act or the regulations*

Minimising harm (EP Act Section 6(1)):

A duty imposed on a person under this Act to minimise, so far as reasonably practicable, risks of harm to human health and the environment requires the person—

- (a) to eliminate risks of harm to human health and the environment so far as reasonably practicable; and*
- (b) if it is not reasonably practicable to eliminate risks of harm to human health and the environment, to reduce those risks so far as reasonably practicable.*

Prohibition of unreasonable noise (EP Act Section 166).

A person must not, from a place or premises that are not residential premises—

- (a) emit an unreasonable noise; or*
- (b) permit an unreasonable noise to be emitted*

Unreasonable noise definition (EP Act Section 3):

unreasonable noise means—

- (a) noise that is unreasonable having regard to the following—*
 - (i) its volume, intensity or duration;*
 - (ii) its character;*
 - (iii) the time, place and other circumstances in which it is emitted;*
 - (iv) how often it is emitted;*
 - (v) any prescribed factors; and*
- (b) noise that is prescribed to be unreasonable noise; and*
- (c) does not include noise prescribed not to be unreasonable noise*

C2 Environmental Protection Regulations 2021

The *Environment Protection Act 2017* (EP Act) does not specify noise limit values or technical aspects of environmental noise but sets out legal requirements to comply with the described below. Clause 166 of the EP Act essentially places the onus of achieving compliance with noise limits on the commercial premises.

The *Environmental Protection Regulations 2021* (EP Regulations) are made under Section 465 of the EP Act and impose obligations in relation to environmental protection, including noise. The EP Regulations state that a person who conducts a prediction, measurement, assessment, or analysis of noise within a noise sensitive area must do so in accordance with the Noise Protocol. In particular, noise from CIT premises or entertainment venues or events is prescribed as unreasonable if it exceeds a noise limit or alternative criterion determined in accordance with the Noise Protocol.

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Key matters addressed in the EP Regulations include:

- definition of commercial, industrial and trade premises, which is essentially any premises that is not a residential premises, a road, or a railway. It is noted that noise from common building services equipment (such as shared condensing units and kitchen exhaust fans) is assessable
- definition of an indoor music entertainment venue
- definition of noise sensitive areas where the noise limits are assessed, which broadly include:
 - a residential building
 - temporary accommodation
 - hospital corrective institution
 - retirement or residential village
 - A room for learning in a childcare centre, kindergarten, or school
 - A tourist establishment, campground, or caravan park
- assessment time periods
- noise sources that must not be taken into account
- minimum noise limit values
- management of cumulative noise from multiple premises.

Part 5.3 of the EP Regulations specifically address noise. Table 11 presents a summary of the relevant Divisions and EP Regulations from this section.

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Table 11: Summary of Part 5.3 - Noise

Section	Description
Division 1, Regulation 113	States that <i>a person who conducts a prediction, measurement, assessment, or analysis of noise within a noise sensitive area for the purposes of the Act or these Regulations, must conduct the prediction, measurement, assessment, or analysis in accordance with the Noise Protocol.</i>
Division 3	Applies to noise from CIT premises
Regulation 116	Defines the day, evening and night period as follows: - Day: 0700 to 1800 hrs, Monday – Saturday - Evening: 1800 to 2200 hrs, Monday – Saturday 0700 to 2200 hrs, Sunday, and Public Holidays - Night: 2200 to 0700 hrs the next day, Monday – Sunday.
Regulation 117	In this Division, when the level of noise emitted from CIT premises is assessed, the following sources of noise that could be expected at the proposed facility must not be taken into account: - voices - construction or demolition activity on building sites - intruder, emergency or safety alarms or sirens - equipment used in relation to an emergency - non-commercial vehicles (except for maintenance activities) - wind turbines at wind energy facilities - lawnmowing - livestock
Regulation 118	Defines noise as being unreasonable if it exceeds the Noise Protocol limits or the alternative assessment criteria that apply at an alternative assessment location. Defines the lowest base noise limits as follows: Major urban area: Day: 45 dB ENL Evening: 40 dB ENL Night: 35 dB ENL Rural area: Day: 45 dB ENL Evening: 37 dB ENL Night: 32 dB ENL The noise limit for CIT premises for the night period must not exceed 55 dB ENL.
Regulation 119	If multiple existing or proposed premises emit noise that contributes to the effective noise level at a noise sensitive receiver, all reasonable steps must be taken by the premises' management to ensure the combined noise level does not exceed the noise limit.
Regulation 120	This regulation essentially identifies that tonal aspects of noise must be considered when considering unreasonable noise for Section 3(1)(a)(v) of the EP Act. The Noise Protocol provides a method of assessing tonal characteristics of noise from CIT premises, with additional guidance on low frequency noise available in EPA Publication 1996 <i>Noise guideline – assessing low frequency noise</i> .

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Section	Description
Regulation 121	Noise emitted from CIT premises is prescribed to be aggravated noise if it exceeds the noise limits by more than 15 dB, or the following if lower: 75 dB ENL during the day; 70 dB ENL during the evening; or 65 dB ENL during the night.

C3 Environment Reference Standard

The Environment Reference Standard (ERS) sets out environmental values for ambient sound that are sought to be achieved and maintained in Victoria and standards to support those values. The indicators and objectives within the standard provide a benchmark for comparing desired outcomes to the actual state of the environment and a basis for assessing actual and potential risks to the environmental values.

The environmental values of the ambient sound environment that are set out by the ERS are summarised in Table 12.

The ERS is not a compliance standard and the values listed within the ERS for different land uses are explicitly not noise limits nor design criteria.

Where applicable, direct regulation such as mandatory noise limits takes precedence over the ERS.

Table 12: ERS Environmental values

Environmental value	Description of environmental value
Sleep during the night	An ambient sound environment that supports sleep at night
Domestic and recreational activities	An ambient sound environment that supports educational and domestic activities in a residential setting
Normal conversation	An ambient sound environment that allows for a normal conversation indoors without the need to raise voices
Child learning and development	An ambient sound environment that supports cognitive development and learning in children
Human tranquillity and enjoyment outdoors in natural areas	An ambient sound environment that allows for the appreciation and enjoyment of the environment for its natural condition and the restorative benefits of tranquil soundscapes in natural areas
Musical entertainment	An ambient sound environment that recognises the community's demand for a wide range of musical entertainment

Of the listed environmental values, musical entertainment is not considered to be relevant to the Project.

The ERS provides 'indicators and objectives' which support the environmental values and which are dependent on the land zoning. For the most onerous night period, they are provided in terms of an average noise level from 2200 - 0600 hrs the next day.

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C4 Noise Protocol

EPA Publication 1826.5 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*, dated September 2025 (Noise Protocol) sets noise limits that apply to CIT premises and entertainment venues within Victoria. Compliance with the noise limits is mandatory under the EP Act.

The EP Act defines a 'commercial, industrial and trade premises as:

Any premises except the following –

- (a) residential premises (other than common plant under the control of an owners corporation);*
- (b) a street or road, including every carriageway, footpath, reservation and traffic island on any street or road;*
- (c) a railway track used by rolling stock in connection with the provision of a freight service or passenger service—*
 - (i) while travelling on a railway track or tramway track; or*
 - (ii) while entering or exiting a siding, yard, depot, or workshop;*
- (d) a railway track used by rolling stock in connection with the provision of a passenger service, while in a siding, yard, depot, or workshop and is—*
 - (i) powering up to commence to be used in connection with the provision of a passenger service; or*
 - (ii) shutting down after being used in connection with the provision of a passenger service;*
- (e) the premises situated at Lower Esplanade, St Kilda and known as "Luna Park" and being the whole of the land more particularly described in Certificate of Title Volume 1204 Folio 109;*

The EP Act defines an 'entertainment venue' as

Any premises or place where music is performed or played but does not include residential premises or a place of worship.

Based on the above the Project is considered to be a CIT premises.

The Noise Protocol prescribes the method and measurement procedure used to determine applicable noise limits and assessment of compliance.

The EP Act requires that proposed CIT premises be designed to comply with Noise Protocol noise limits and that premises have an ongoing obligation to meet the noise limits.

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A 'noise sensitive area' is defined in the EP Regulations as:

- (a) *that part of the land within the boundary of a parcel of land that is—*
- (i) *within 10 metres of the outside of the external walls of any of the following buildings—*
 - (A) *a dwelling (including a residential care facility but not including a caretaker's house);*
 - (B) *a residential building;*
 - (C) *a noise sensitive residential use; or*
 - (ii) *within 10 metres of the outside of the external walls of any dormitory, ward, bedroom or living room of one or more of the following buildings—*
 - (A) *a caretaker's house;*
 - (B) *a hospital;*
 - (C) *a hotel;*
 - (D) *a residential hotel;*
 - (E) *a motel;*
 - (F) *a specialist disability accommodation;*
 - (G) *a corrective institution;*
 - (H) *a tourist establishment;*
 - (I) *a retirement village;*
 - (J) *a residential village; or*
 - (iii) *within 10 metres of the outside of the external walls of a classroom or any room in which learning occurs in the following buildings (during their operating hours)—*
 - (A) *a childcare centre;*
 - (B) *a kindergarten;*
 - (C) *a primary school;*
 - (D) *a secondary school; or*

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- (b) *subject to paragraph (c), in the case of a rural area only, that part of the land within the boundary of—*
- (i) *a tourist establishment; or*
 - (ii) *a campground; or*
 - (iii) *a caravan park; or*
- (c) *despite paragraph (b), in the case of a rural area only, where an outdoor entertainment event or outdoor entertainment venue is being operated, that part of the land within the boundary of the following are not noise sensitive areas for the purposes of that event or venue—*
- (i) *a tourist establishment;*
 - (ii) *a campground;*
 - (iii) *a caravan park;*

The assessment of non-music noise from a subject site under the Noise Protocol is based on the calculation of a noise limit at a noise sensitive area, considering the background noise level and a zoning noise level derived from the land zoning types in the surrounding area.

Noise limit derivation is contingent on two separate methods:

- the rural method for NSAs outside an MUA
- the urban method for NSAs within a major urban area (MUA).

MUAs applicable in Victoria are set out in Table A.3 of the Noise Protocol.

Once a noise limit is established, the noise level $L_{Aeq, 30 \text{ min}}$ due to the CIT premises is measured or predicted. If necessary, the $L_{Aeq, 30 \text{ min}}$ noise level is adjusted for noise character and duration to give the effective noise level ENL, which also applies over a 30-minute assessment period. If the ENL exceeds the noise limit, then remedial action is required.

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APPENDIX D NOISE SURVEY

An attended noise survey was conducted between the evening of Tuesday 17 September 2024 through to the morning of Wednesday 18 September 2024.

The objective of the survey was to obtain an understanding of the existing noise environment at the noise sensitive areas surrounding the site, especially during the night period which is subject to the most onerous mandatory noise limits.

The location of each measurement position in relation to the project is shown in Section 5.0.

Noise measurements at all attended measurement positions were undertaken with 2 Brüel and Kjær Type 2250 Class 1 precision integrating sound level meters (S/N 3030015 and 3009588) mounted on tripods with the microphone located approximately 1.5 m above local ground level.

All noise measurement instrumentation was fitted with windshields and set to the “Fast (F)” response time. All equipment was calibration checked before and after the survey with no significant drift was observed.

A description of the measured noise levels and observations from each of the measurement locations are provided in the following sections.

The measured noise levels are presented in Table 13.

Table 13: Measurements summary

Location	Period	Time, hrs	Measured Level, dB		Duration, min	Description
			L _{Aeq}	L _{A90}		
1	Evening	1801	69	45	10	Local road traffic is the dominant noise source.
1	Evening	2035	67	45	10	Local road traffic is the dominant noise source.
1	Night	0123	58	33	10	Distant and local road traffic are main noise sources. Cars pass occasionally. Some insignificant wildlife noise (frogs/insects) in distance.
1	Night	0230	37	31	10	Distant and local road traffic are main noise sources. Cars pass occasionally. Some insignificant wildlife noise (frogs/insects) in distance.
1	Day	0924	68	52	10	Road traffic is the main noise source. Some intermittent contribution from wildlife (birds).
1	Day	0953	69	51	10	Road traffic is the main noise source. Some intermittent contribution from wildlife (birds).
2A	Evening	1800	67	54	10	Local road traffic is the only important noise source.
2A	Evening	2036	66	46	10	Local road traffic is the only important noise source.
2A	Night	0123	57	33	10	Distant and local road traffic are main noise sources. Cars pass occasionally. Some insignificant wildlife noise (frogs/insects) in distance.
2B	Day	0924	71	57	10	Local road traffic is the dominant noise source. Some wind gusts intermittently. A single train pass-by audible for 30 seconds in distance but does not affect the L _{A90} .
2B	Day	0955	69	54	10	Local road traffic is the dominant noise source. Some wind gusts intermittently.

Location	Period	Time, hrs	Measured level, dB		Duration, min	Description
			L _{Aeq}	L _{A90}		
3	Evening	1831	57	40	10	Local and distant road traffic is the dominant noise source. Some minor intermittent bird noise.
3	Evening	2053	47	38	10	Local and distant road traffic is the dominant noise source.
3	Night	0141	46	32	10	Distant road traffic is the dominant noise source. A distant train pass by is audible for approximately 1 minute but does not affect the measured L _{A90} .
4	Evening	2124	45	42	10	Local and distant road traffic is the dominant noise source.
4	Night	0216	41	31	3	Local and distant road traffic is the dominant noise source.
5	Evening	1849	61	43	10	Local and distant road traffic is the dominant noise source.
5	Evening	2108	59	41	10	Local and distant road traffic is the dominant noise source.
5	Night	0158	36	31	10	Distant road traffic is the dominant noise source.
6	Night	0222	37	31	1	Rear of 37 McLachlan Street. Steady-state hum from substation audible. Distant traffic also contributing to measured noise levels.
7	Evening	1819	49	44	5	Local and distant road traffic is the dominant noise source.
7	Day	0943	49	44	5	Local road traffic is the dominant noise source. Intermittent noise from birds and wind gusts. Some industrial noise audible at this location from premises to the north including tonal beepers and a few instances of impact noises.

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Figure 6: Location 1 noise measurement



Figure 7: Location 2 noise measurement



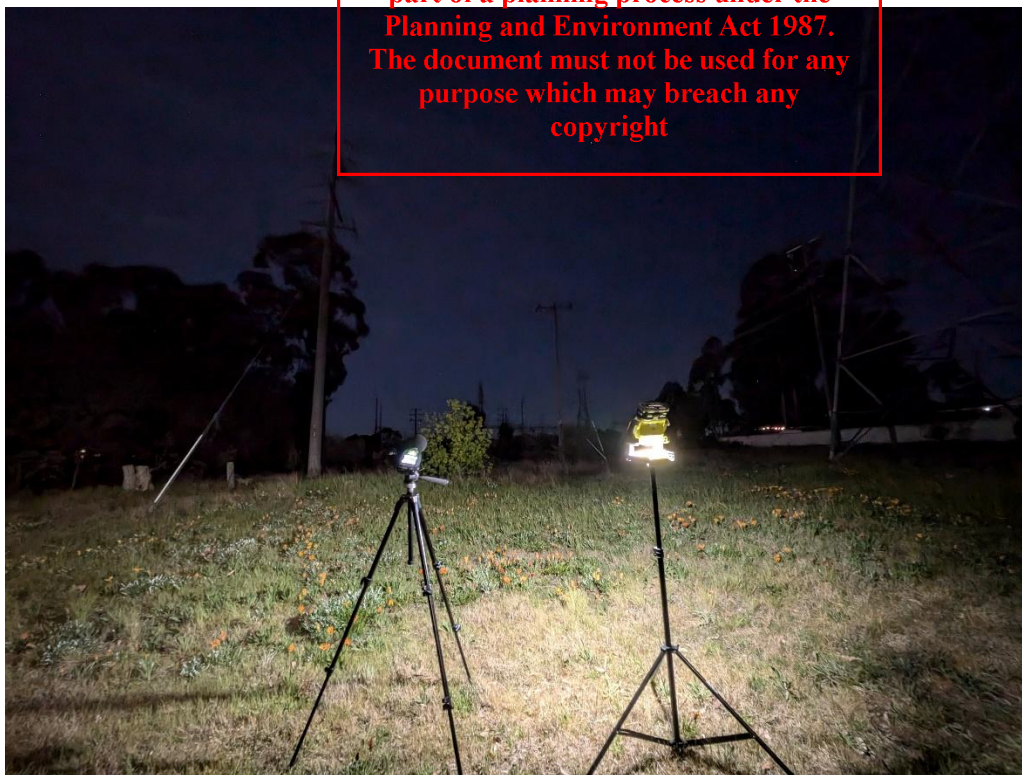
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Figure 8: Location 3 noise measurement



Figure 9: Location 4 noise measurement



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Figure 10: Location 5 noise measurement



Figure 11: Location 6 noise measurement



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Figure 12: Location 7 noise measurement



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APPENDIX E OPERATIONAL NOISE LIMIT DERIVATION

The determination of urban area noise limits according to the Noise Protocol is based on:

- the zoning levels, derived based on the zoning context of the assessment NSA
- the background noise levels at the receiver, excluding noise contributions from CIT premises.

The noise limits are calculated by considering planning scheme land 'zoning types' within a 70 m and 200 m radius of a receiver. The Noise Protocol categorises land zones as Type 1, 2 or 3.

Zone type designations consider the nature of the permitted land uses and are generally as follows:

- areas such as residential, rural, and open space are Type 1
- areas such as commercial, business, and light industry (including farming) are Type 2
- areas such as general industry and major roads are Type 3.

A prescribed formula is used to calculate a corresponding zoning level. Greater areas of Type 2 and Type 3 land within a 200 m radius of an NSA result in higher zoning levels than a site with respectively larger areas of Type 1 land.

Day, evening and night period timeframes are described in Table 11 of Appendix C2.

Table 14 to Table 18 provide a breakdown of the derivation of urban area noise limits for the receivers.

Table 14: 13/15 Hattam St – Location 1

Period	Measured background, dB LA90	Zoning level, dB	Background relative to zoning level	Noise limit, dB ENL
Day	52	62	High	62
Evening	47	55	Neutral	55
Night	32	50	Low	44

Table 15: 3 Hattam St – Location 2A/2B

Period	Measured background, dB LA90	Zoning level, dB	Background relative to zoning level	Noise limit, dB ENL
Day	56	57	Neutral	62
Evening	50	51	Neutral	53
Night	(32) ^[1]	46	Low	42

- 1 Although 33 dB LA90 was measured during a single measurement, 32 dB LA90 was adopted as the background noise level based on the measured noise level at measurement Location 1, which is based on an average of 2 measurements and is likely to be representative of this location also.

Table 16: 108 McDougall Rd – Location 3

Period	Measured background, dB LA90	Zoning level, dB	Background relative to zoning level	Noise limit, dB ENL
Day	Assumed neutral ^[1]	51	Neutral	51
Evening	39	45	Neutral	45
Night	32	40	Neutral	40

- 1 Background noise level assumed neutral for the purpose of setting noise limits at this stage.

Table 17: 37 McLachlan St – Location 4

Period	Measured background, dB L _{A90}	Zoning level, dB	Background relative to zoning level	Noise limit, dB ENL
Day	<i>Assumed neutral</i> ^[1]	55	Neutral	55
Evening	42	49	Neutral	49
Night	31	44	Low	41

1 Background noise level assumed neutral for the purpose of setting noise limits at this stage.

Table 18: 31 Ham St – Location 5

Period	Measured background, dB L _{A90}	Zoning level, dB	Background relative to zoning level	Noise limit, dB ENL
Day	<i>Assumed neutral</i> ^[1]	52	Neutral	52
Evening	42	46	Neutral	46
Night	31	41	Low	39

1 Background noise level assumed neutral for the purpose of setting noise limits at this stage.

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APPENDIX F TONALITY SENSITIVITY ANALYSIS

The ambient noise environment within noise sensitive areas varies based on many factors including the time of day. To assess the likelihood of prominent tonality within noise sensitive areas, the ambient noise during the evening night has been compared to the predicted project noise levels which consider all equipment operating.

Tonality is least likely to be prominent during the day due to the significantly higher ambient noise levels. Since the project predicted noise levels are not significantly different between evening and day periods, the day has been omitted from this assessment for brevity.

Measured noise levels described in Appendix D have been reproduced in Table 19 and compared to the project predicted levels for reference. The comparison cannot demonstrate inaudibility of tonality, however it indicates that tonality is unlikely to be prominent within the ambient noise environment at the noise sensitive areas. In some instances the predicted project noise levels are similar to the background noise levels (L_{A90}). This is only relevant between 01:00 – 03:00. However, it is unlikely that the project equipment will operate at the conservative modelled conditions during this period and therefore the predicted levels are likely to be lower during these times.

The overall noise levels present only an indication of tonality prominence. Additional checks were carried out by implementing the objective tonality assessment method provided by the noise protocol on the 1/3 octave band spectra that included both predicted project noise level and the measured ambient noise levels.

Overall, this sensitivity analysis should be reviewed during detailed design to confirm the applicable tonality penalty considering finalised equipment selection and layouts.

Table 19: Measurements summary

Location	Period	Time, hrs	Measured level, dB		Nearest receiver	Predicted project noise level, dB $L_{Aeq, 30 \text{ mins}}$ ^[a]
			Day	Night		
1	Evening	1801	69	49	13-15 Hattam	37
1	Evening	2035	67	45		37
1	Night	0123	58	33		36
1	Night	0230	37	31		36
2A	Evening	1800	67	54	3 Hattam	35
2A	Evening	2036	66	46		35
2A	Night	0123	57	33		34
3	Evening	1831	57	40	80-108 MacDougall	31
3	Evening	2053	47	38		31
3	Night	0141	46	32		30
4	Evening	2124	45	42	37 Maclachlan	36
4	Night	0216	41	31		35
5	Evening	1849	61	43	31 Ham	27
5	Evening	2108	59	41		27
5	Night	0158	36	31		26

a Absolute predicted equivalent noise level with all equipment operating.