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Resonate

Phillip Island Community Energy Storage System

Environmental Noise Assessment

M210558RP1 Revision C

Friday, 12 November 2021

Document Information

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Revision Table

Report revision	Date	Description	Author	Reviewer
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A	3 September 2021	Updated with new layout and additional inverter	Mingsan Boulter	Tom Evans
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Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
Background Level for the purposes of Part I (Commercial, industrial and trade premises)	The arithmetic average of the hourly L_{A90} levels that represents the background sounds in a noise sensitive area, in the absence of noise from any commercial, industrial or trade premises which appears to be intrusive at the point where the background level is measured, when measured according to Part I, Section A4 of the Noise Protocol.
Beaufort Wind Scale	The Beaufort Wind Scale is an empirical measure that relates wind speed to observed conditions (refer to Appendix C of Australian Standard AS 1055:2018 <i>Acoustics - Description and measurement of environmental noise</i>). According to AS 1055:2018 the Beaufort Wind Scale numbers 0 to 2 encompass wind speeds from 0 to 5.5 m/s.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of loudness.
Effective noise level	The level of noise emitted from the commercial, industrial or trade premises and adjusted if appropriate for duration, character and position as defined in Part I, Section B2 of the Noise Protocol.
Environment Protection Regulations (Victoria)	The objectives of these Regulations are to further the purposes of, and give effect to, the Environment Protection Act 2017.
Frequency (Hz)	The number of times a sound pressure wave oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
L_{A90}	A-weighted sound pressure level, measured using the Fast time-weighting, that is exceeded for 90% of the time interval considered. The L_{A90} metric is used to quantify the background noise level in an environment.
L_{Aeq}	The equivalent continuous A-weighted sound pressure level. It is the value of the A-weighted sound pressure level of a continuous steady sound that has the same acoustic energy as a given time-varying A-weighted sound pressure level when determined over the same measurement time interval. The L_{Aeq} metric is used to quantify the Effective Noise Level from a premises.
Noise Limit	The maximum effective noise level allowed in a noise sensitive area, as determined in accordance with the Noise Protocol.
Noise Protocol	Environmental Protection Authority 1826 <i>Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues</i> . The current version is published by EPA Victoria on its website.
Noise source	Premises or a place at which an activity is undertaken, or a machine or device is operated, resulting in the emission of noise
Unreasonable noise	Noise defined by the Environment Protection Regulations to exceed the noise limits established under the Noise Protocol.

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1 Introduction

TEC-C is proposing to develop the Phillip Island Community Energy Storage System (PICCESS). It is proposed that the PICCESS would be located on Gap Road in Cowes, approximately 300 m south of Wimbledon Heights.

Resonate has been engaged by TEC-C to conduct a planning stage environmental noise assessment from the site. To conduct the assessment, a three-dimensional digital noise model was developed based on provided noise, building and geographical data. Predicted noise levels were then assessed against relevant noise limits established at surrounding residential properties, and considering reasonably practicable noise mitigation measures.

This report presents the outcomes of the environmental noise assessment, including:

- applicable legislative requirements
- predicted noise levels from the proposed PICCESS
- reasonably practicable noise mitigation measures
- an assessment of compliance with the applicable legislative requirements.

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2 Site description

The proposed PICES site is located approximately 300m South of Wimbledon Heights. The Planning Scheme defines the land on which the site sits as a Farming Zone (FZ), with the nearest noise sensitive receivers being located within General Residential Zone (GRZ) and within the same Farming Zone (FZ).

Figure 1 shows an overview of the site including nearest noise sensitive receivers and planning zones. The noise sensitive receivers have been identified based on a review of aerial photography and zoning of the surrounding area.



Figure 1 Site overview

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3 Legislative requirements

3.1 General Environmental Duty

Section 25(1) of the *Environment Protection Act 2017* (the Act) sets forth the General Environmental Duty (GED), which states:

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.

PICISS has an obligation to understand the risks associated with noise and to take reasonably practicable steps to minimise those risks.

EPA Victoria has released a range of subordinate legislation and guidelines to support the Act. Compliance with these subordinate legislation and guidelines would be expected to assist in meeting the GED. It is noted that compliance with these subordinate legislation and guidelines would not remove the overarching requirements to implement reasonably practicable noise management measures on site to avoid or, if it cannot be avoided, mitigate environmental noise emissions. However, they provide a benchmark which can be used to assist in the determination as to whether further consideration of noise management measures should be undertaken.

3.2 Environment Protection Regulations

The EPA Victoria Environment Protection Regulations are subordinate legislation that support the Act. Under the Environment Protection Regulations, the assessment of noise from commercial, industrial and trade premises at noise sensitive areas must be carried out in accordance with EPA Victoria Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol), both in terms of establishing noise limits as noise sensitive areas and in terms of the measurement of noise from the subject premises.

Noise sensitive areas are defined in the Environment Protection Regulations as:

- The area within 10 m of the external walls of dwellings (including residential care facilities but excluding caretaker’s houses), residential buildings and noise sensitive residential uses.
- The area within 10 m outside the external walls of any dormitories, wards, bedrooms and living rooms of caretaker’s houses, hospitals, hotels, motels, residential hotels specialist disability accommodation, corrective institutions, tourist establishments, retirement villages and residential villages.
- The area within 10 m outside the external walls of classrooms or other rooms in which learning occurs at childcare centres, kindergartens, primary schools and secondary schools.
- Within the boundary of tourist establishments, campgrounds and caravan parks that are located in rural areas.

The Environment Protection Regulations also define Day, Evening and Night periods for the assessment of noise, reproduced in Table 1.

Table 1 Applicable time periods

Time period	Details
Day	Monday to Saturday, 7 am to 6 pm
Evening	Monday to Saturday, 6 pm to 10 pm Sundays and public holidays, 7 am to 10 pm
Night	10 pm to 7 am any day

The Environment Protection Regulations define:

- Unreasonable noise as noise from commercial, industrial and time periods that exceeds the applicable noise limits from the Noise Protocol.
- Aggravated noise as noise commercial, industrial and time periods that exceeds:
 - 75 dB $L_{Aeq,30m}$ or the Noise Protocol noise limit by more than 15 dB during the day
 - 70 dB $L_{Aeq,30m}$ or the Noise Protocol noise limit by more than 15 dB during the evening
 - 65 dB $L_{Aeq,30m}$ or the Noise Protocol noise limit by more than 15 dB during the night.

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4 Noise limits

Under the Environment Protection Regulations, the assessment of noise from commercial, industrial and trade premises at noise sensitive areas must be carried out in accordance with the Noise Protocol, both in terms of establishing noise limits as noise sensitive areas (NSAs) and in terms of the measurement of noise from the subject premises. The Noise Protocol defines two assessment methods for urban area and rural area, respectively.

The PICESS site and surrounds sit outside the major urban boundary and therefore the rural area method in Noise Protocol has been referenced for the assessments in this report. The rural area method provides the methods to set noise limits for industry in regional Victoria. The method sets out noise limits based on:

- the land-use zoning of both the source and receiver
- the time of day i.e., different criteria apply at different times of the day.

In areas where an existing noise source exists, known as background relevant areas, the method also allows for consideration of existing background noise levels, which may act to increase the Noise Protocol noise limits. As a conservative approach, this assessment is based on the noise limits determined from land zoning alone and has assumed that the area around the PICESS is not a background relevant area.

The PICESS site is classed as a Utility Installation, as defined in the planning scheme. As such, Section 2.6 of the Noise Protocol states:

- *If the utility is located in a Farming Zone, Rural Activity Zone or Green Wedge Zone and the distance adjustment is 0dB, and unless a background level assessment is conducted in accordance with clauses 21 to 23, then:*
 - *The distance-adjusted level for each period is-*
 - *Day – 45 dB(A)*
 - *Evening – 39 dB(A)*
 - *Night – 34 dB(A)*

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The applicable noise limits are summarised in Table 2 with further details provided in Appendix A of this report.

Table 2 Applicable noise limits at nearby residential properties

Receiver (planning zone)	Noise limits as dB L _{Aeq,30min} for Noise Protocol time period		
	Day	Evening	Night
8 Ventnor Beach Road (GRZ)	45	39	34
32 Ventnor Beach Road (GRZ)	45	39	34
53 Ventnor Beach Road (FZ)	45	39	34
103 Ventnor Beach Road (FZ)	45	39	34
111 Ventnor Beach Road (FZ)	45	39	34
135 Gap Road (FZ)	45	39	34
2102 Philip Island Road (FZ)	45	39	34
1950 B420 (FZ)	45	39	34

It has been assumed that the PICESS will operate 24 hours per day. Therefore, noise emissions from the will need to comply with the most stringent night time noise limit of 34 dB L_{Aeq,30min}.

5 Operational noise assessment

5.1 Noise modelling

Modelling of PICES has been based on supplied drawings (Drawing Number: J2739-CI-0001-01, Revision: F, Dated 11/11/2021). Figure 2 presents the proposed PICES layout.

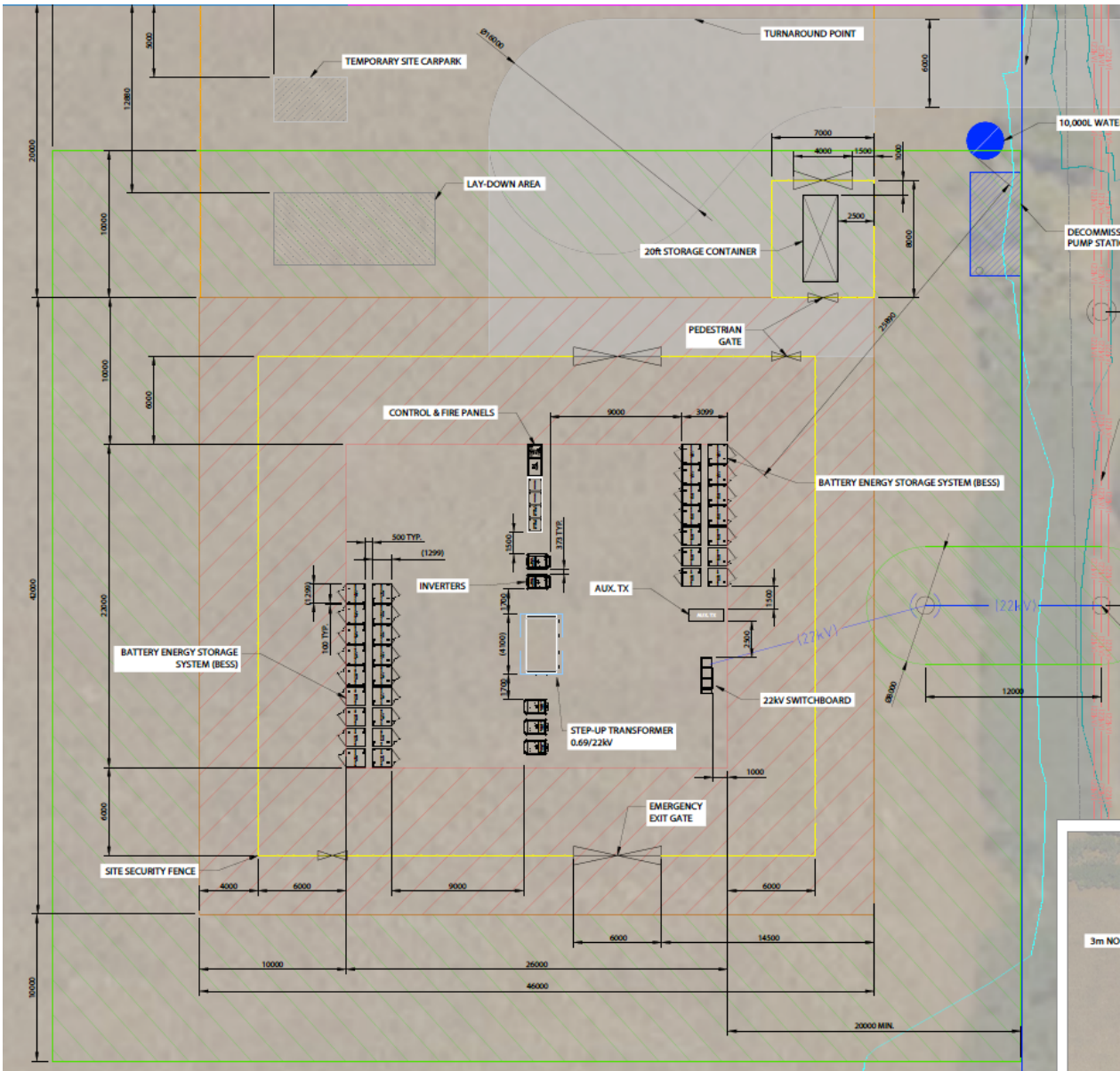


Figure 2 PICES site layout

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Noise emissions from the PICES have been modelled in SoundPLAN Environmental Software v8.2, using the ISO 9613-2 methodology¹. The model takes into consideration:

- attenuation of noise source due to distance
- barrier effects from buildings, topography and the like
- air absorption
- ground effects – the ground immediately around the site has been assumed to be reflective, with the ground outside of the immediate site assumed to be 50% absorptive, typical of rural areas
- meteorological conditions, with the ISO 9613-2 methodology provides a prediction representative of conditions where the receiver is downwind of the source in a light breeze or under a moderate ground-based temperature inversion.

5.2 Noise sources

The noise-generating equipment proposed for site are summarised below alongside the sound pressure level information supplied by TEC-C:

- 32 x CATL BESS Battery packs – 66 dB L_{Aeq} at 1 m per pack
- 5x PS1000 Inverters – 75 dB L_{Aeq} at 5 m per inverter
- 1x 5.5mVa Transformer – 59 dB L_{Aeq} at 1 m.

The specification for the battery pack was determined based on a noise test report from GRGTest, reference H202012234046-01 and dated 29 December 2020. The highest level measured at 1 m at any location around the battery pack was used for the basis of the assessment.

Based on the sound pressure level specifications and the size of the equipment, Sound Power Levels have been determined as presented in Table 3. Spectral data for similar equipment available to Resonate has been used to define the sound power levels in octave bands adjusted to match the overall sound pressure level specification received for the equipment.

Table 3 Estimated Sound Power Level for each equipment

Equipment	Sound Power Level in dB at Octave Band Centre Frequency (Hz)							Sound Power Level, dB L _{WA}
	125	250	500	1000	2000	4000	8000	
CATL BESS Battery Pack	79	73	80	79	75	72	70	83
PS1000 Inverters	89	94	87	84	86	94	84	97
5.5mVa Transformer	87	85	79	70	62	53	60	81

It is noted that selections may change during detailed design. It is recommended that the selection of equipment for PICES consider noise emissions from that equipment. Where manufacturer data exceeds the overall levels specified in Table 3, an additional noise assessment would be necessary to ensure compliance with the Noise Protocol noise limits can be maintained.

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¹ ISO Standard 9613-2 (1996) *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method for calculation (ISO 9613)*

5.3 Character adjustments

According to Noise Protocol, a measured or predicted noise level needs to be adjusted for noise characteristics to derive the effective noise level for the assessment.

Potential noise character adjustments are discussed below.

- **Duration adjustment (potential reduction):** When the noise emission is not audible over the whole of a continuous 30 minute period, then a duration adjustment based upon the total amount of time for which the noise is audible over that continuous 30 minute period shall be determined in accordance with Schedule 3.3 of Noise Protocol.
- **Impulsive adjustment (potential increase):** When the noise emission is impulsive in character, then any impulse noise emission event shall be considered to be audible for 10 seconds after the occurrence of the event for the purposes of determining the duration adjustment in accordance with Schedule 3.4 of Noise Protocol.
- **Intermittency adjustment (potential increase):** When the noise emission is intermittent or variable and the noise emission, when measured by a sound level meter set to F time-weighting and A frequency weighting, increases in level rapidly on at least two occasions during a 30 minute period and maintains the level for at least a one-minute duration, then an adjustment determined shall be made in accordance with Schedule 3.4 of Noise Protocol.
- **Tonal adjustment (potential increase):** When the noise is tonal in character then an adjustment shall be made as follows:
 - When the tonal character of the noise is just detectable then tonal adjustment of +2 dB.
 - When the tonal character of the noise is prominent then tonal adjustment of +5 dB.

In accordance with Schedule 2 of Noise Protocol, the effective noise level is then derived by applying any determined character adjustments to the measured or predicted L_{Aeq} noise level for assessment against the noise limits.

Based on previous experience, noise from the equipment proposed for the BESS is expected to remain steady across a 30-minute period and therefore no duration, impulsive or intermittency adjustments have been applied. Noise from the transformer may require application of a tonal penalty if it were clearly audible at the noise sensitive locations to account for typical transformer hum. However, as the transformer sound power level is significantly lower than that of the other sources at the site, no tonal adjustment has been applied.

5.4 Predicted noise levels

For the assessment, two scenarios were assessed:

- Scenario 1: proposed site without any additional mitigation measures.
- Scenario 2: proposed site with an acoustic barrier located north of site.

For Scenario 2, the acoustic barrier would need to be installed in such a way that it breaks line of sight between the noise sources on the PICESSE site (battery packs and inverters) and the nearest sensitive receivers North and North-West of the site. Therefore, the barrier has been proposed to span 127 m along the northern boundary of the Battery Storage Facility. The barrier would be constructed in two sections, with the Eastern section of the barrier being 46 m in length and at least 3.5 m in height and the western section of the barrier being 81 m in length and a at least 3m in height. Construction of barrier would need to be solid (no air gaps) and be constructed from a material with a surface density of no less than 4 kg/m². Acoustically acceptable materials would include masonry, overlapped timber palings and Colorbond steel. Figure 3 presents the recommended location of noise wall.

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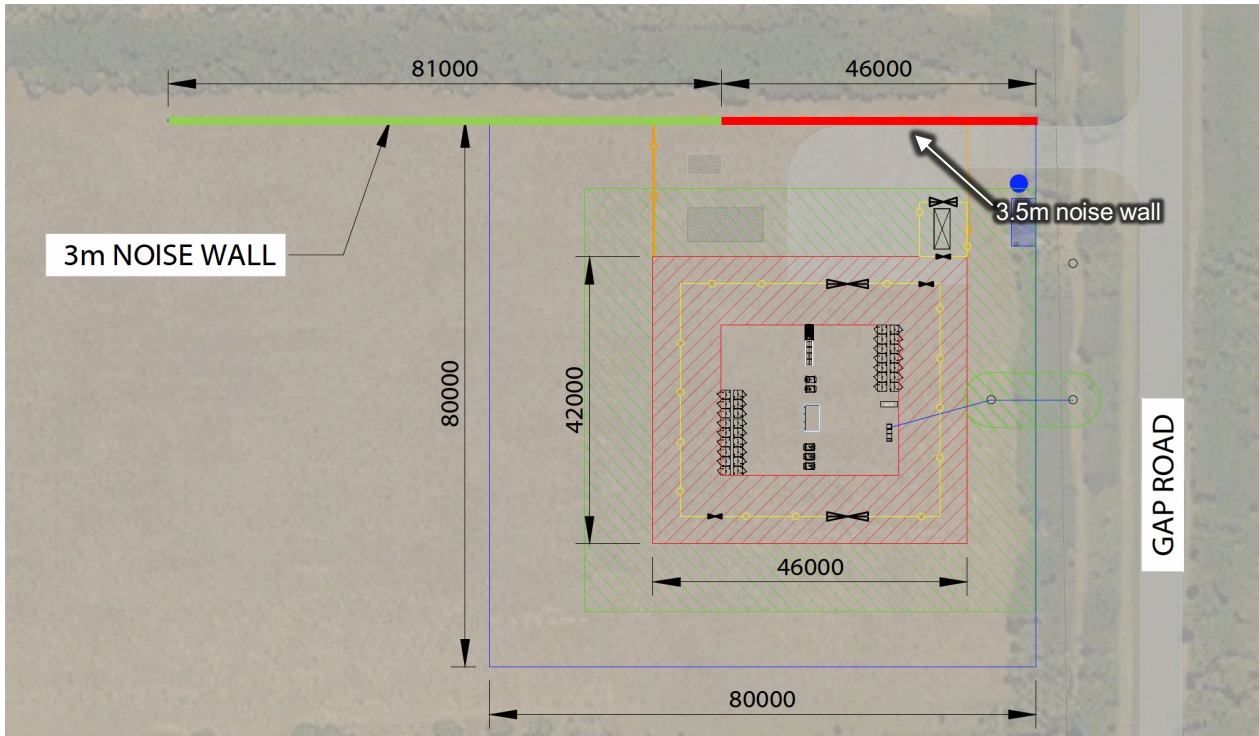


Figure 3 Site overview displaying location of acoustic barrier (green – 3m, red – 3.5m)

Table 4 presents the predicted noise levels from both scenarios, and compares the predicted noise levels to the applicable Noise Protocol night period limits for the identified nearest noise sensitive areas.

Table 4 Predicted effective noise levels at residential properties

Receiver	Predicted noise level, dB L _{Aeq,30mins}		Night-time Noise Protocol limit, dB L _{Aeq,30mins}	Exceedance of noise limit, dB	
	Scenario 1	Scenario 2		Scenario 1	Scenario 2
8 Ventnor Beach Road	39	34	34	5	n/a (compliant)
32 Ventnor Beach Road	39	34	34	5	n/a (compliant)
53 Ventnor Beach Road	38	34	34	4	n/a (compliant)
103 Ventnor Beach Road	30	30	34	n/a (compliant)	n/a (compliant)
111 Ventnor Beach Road	28	28	34	n/a (compliant)	n/a (compliant)
135 Gap Road	33	33	34	n/a (compliant)	n/a (compliant)
2102 Philip Island Road	23	21	34	n/a (compliant)	n/a (compliant)
1950 B420	25	25	34	n/a (compliant)	n/a (compliant)

Table 4 demonstrates that the predicted noise levels comply with the applicable noise limits at most locations without any additional mitigation measures. However, exceedances of up to 5 dB are predicted for the nearest residential land uses on Ventnor Beach Road to the north of the site. With the proposed noise barrier for Scenario 2, the predicted noise levels are compliant with the night time noise limit at all locations.

The highest predicted night time noise level of 34 dB L_{Aeq} under Scenario 2 is equivalent to the night time noise objective for lower density residential areas, such as would be considered to apply to the township of Wimbledon Heights, that is set forth in the Victorian Environment Reference Standard (ERS). The ERS is not a compliance standard but provides an indication of acoustic objectives that reflect environmental values that the Victorian community wants to achieve and maintain. With the proposed noise barrier in Scenario 2, the noise levels are predicted to be below the ERS objectives and, therefore, consistent with the environmental values desired for the local environment.

5.5 Discussion

The assessment has shown that, with the current proposed equipment and a noise barrier, it is possible for predicted noise levels to achieve the Noise Protocol noise limits.

During detailed design of the facility, the requirement for the barrier will need to be reviewed to determine if it is required to achieve the applicable noise limits and reasonably practicable to construct. For example, the predicted noise levels would be capable of achieving the Noise Protocol noise limits without a noise barrier if the noise levels from the selected battery packs and inverters, which are the loudest items of equipment at the site, were approximately 5 dB lower than stated in Section 5.2.

The noise generated by site would be subject to commission testing upon completion.

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6 Conclusion

An environmental noise assessment has been conducted for the proposed PICESSE site has been conducted to assess compliance with relevant legislative requirements including the Environment Protection Act 2017 and the noise limits established in the Noise Protocol.

The assessment has concluded that, with the inclusion of reasonably practicable noise mitigation measures such as a barrier along the northern boundary of the site, noise emissions are predicted to comply with relevant legislative requirements.

It is noted that equipment selections and placement for the PICESSE site design may change during detailed design. It is recommended that any future design of the PICESSE site, including the selection of equipment, consider noise emissions, to ensure that compliance with the Noise Protocol noise limits is achieved. This would include an assessment of whether or not a noise barrier is required, noting that it may not be necessary if final equipment selections are quieter than assumed within this assessment.

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Appendix A—Noise limit derivation

The Noise Protocol provides the methods to set noise limits for industry in regional Victoria. The guidelines set out recommended noise levels based on:

- The land-use zoning of both the source and receiver.
- The time of day i.e., different limits apply at different times of the day.
- The background noise level (L_{A90}) in the noise sensitive area, for background-relevant areas only.

Noise Protocol time periods

The following time period classifications are defined by Noise Protocol:

Table A.1 Noise Protocol time period classifications

Time Period	Time
Day	7 am to 6 pm Weekdays to Saturdays
Evening	6 pm to 10 pm Weekdays to Saturdays 7 am to 10 pm Sundays and Public Holidays
Night	10 pm to 7 am Everyday

Zoning noise criteria

The zoning level is determined for each of the day, evening and night periods. The generating zone is the land-use zone in which the noise emitter is located. The receiving zone is the land-use zone in which the noise-sensitive area is located. The determined zoning levels for the land-use are as follows:

Table A.2 Zoning levels

Planning Zone	Zoning Levels, dB $L_{Aeq,30mins}$
Generating Zone: Farming Zone FZ Receiving Zone: Residential Growth Zone GRZ1	Day: 46
	Evening: 41
	Night: 36
Generating Zone: Farming Zone FZ Receiving Zone: Farming Zone FZ	Day: 46
	Evening: 41
	Night: 36

Distance adjustment

The zoning levels are then adjusted to account for the distance between the zone where the noise emitter is located and the location of the noise receiver:

- If the noise generator and receiver are covered by the same contiguous zone, the distance adjustment is 0.
- If the noise generator and receiver are not located in land use zones with the same zone code, subtract one decibel for every 100 metres of receiver distance.
- If the noise generator and receiver are located in land use zones that have the same zone code and there is an intervening zone that is not for a road or railway line, subtract one decibel for every 100 metres of receiver distance.
- If there is a zone for a road or a railway line that divides a noise-emitting zone, ignore the road or railway zone (that is, the zone should be treated as one contiguous zone for the receiver-distance adjustment).

- If a distance adjustment is required, the maximum subtraction is 9 dB.

As the nearest noise-sensitive land uses in the GRZ are located immediately adjacent to the zone boundary with the FZ, no distance adjustment has been applied.

Utility installations

The PICESSE site is classed as a Utility Installation, as defined in the planning scheme. As such, Section 2.6 of the Noise Protocol states:

- *If the utility is located in a Farming Zone, Rural Activity Zone or Green Wedge Zone and the distance adjustment is 0dB, and unless a background level assessment is conducted in accordance with clauses 21 to 23, then:*
 - *The distance-adjusted level for each period is-*
 - *Day – 45 dB(A)*
 - *Evening – 39 dB(A)*
 - *Night – 34 dB(A)*

Background noise levels

If applicable, background noise levels are then used to determine the noise criteria for the site. The Noise Protocol recommends that the following should be adopted for each period:

- Day – the greater of
 - the distance-adjusted level or base noise level
 - the day background level plus 8 dB
- Evening – the greater of
 - the distance-adjusted level or base noise level
 - the evening background level plus 5 dB
- Night
 - the greater of
 - the distance-adjusted level or base noise level
 - the night background level plus 5 dB
 - must not be greater than 55 dB $L_{Aeq,30mins}$.

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It has been assumed that the area around the PICESSE is not a background-relevant area to provide a conservative assessment.

Noise limits

The noise limits applicable to environmental noise emissions from the PICESSE to surrounding residential locations are presented in Table A.3.

Table A.3 Noise limits

Receiver (planning zone)	Noise limit summary	Noise limit for Noise Protocol time period as dB $L_{Aeq,30min}$		
		Day	Evening	Night
8 Ventnor Beach Road (GRZ1)	Zoning level	46	41	36
	Distance adjustment	0		
	Utility limit for source in FZ	45	39	34

Receiver (planning zone)	Noise limit summary	Noise limit for Noise Protocol time period as dB $L_{Aeq,30min}$		
		Day	Evening	Night
	Noise limit, $L_{Aeq,30min}$	45	39	34
32 Ventnor Beach Road (GRZ1)	Zoning level	46	41	36
	Distance adjustment	0		
	Utility limit for source in FZ	45	39	34
	Noise limit, $L_{Aeq,30min}$	45	39	34
53 Ventnor Beach Road (FZ)	Zoning level	46	41	36
	Distance adjustment	0		
	Utility limit for source in FZ	45	39	34
	Noise limit, $L_{Aeq,30min}$	45	39	34
103 Ventnor Beach Road (FZ)	Zoning level	46	41	36
	Distance adjustment	0		
	Utility limit for source in FZ	45	39	34
	Noise limit, $L_{Aeq,30min}$	45	39	34
111 Ventnor Beach Road (FZ)	Zoning level	46	41	36
	Distance adjustment	0		
	Utility limit for source in FZ	45	39	34
	Noise limit, $L_{Aeq,30min}$	45	39	34
135 Gap Road (FZ)	Zoning level	46	41	36
	Distance adjustment	0		
	Utility limit for source in FZ	45	39	34
	Noise limit, $L_{Aeq,30min}$	45	39	34
2102 Philip Island Road (FZ)	Zoning level	46	41	36
	Distance adjustment	0		
	Utility limit for source in FZ	45	39	34
	Noise limit, $L_{Aeq,30min}$	45	39	34
1950 B420 (FZ)	Zoning level	46	41	36
	Distance adjustment	0		
	Utility limit for source in FZ	45	39	34
	Noise limit, $L_{Aeq,30min}$	45	39	34

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