Murchs Corner BESS

Noise Assessment

EBARE Pty Ltd c/- Robert Luxmoore Pty Ltd

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SLR Project No.: 640.031998.00001

10 March 2026

Revision: 1.2

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.2	10 March 2026	JS	BF	BF
1.1	12 February 2026	JS	BF	BF
1.0	16 December 2025	JS	BF	BF

Basis of Report

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with EBARE Pty Ltd c/- Robert Luxmoore Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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1.0 Introduction

EBARE Pty Ltd is proposing to develop a 500 MW / 2000 MWh Battery Energy Storage System (BESS) on the 'Stony Point' property at 2977 Hamilton Highway, Darlington 3271, Victoria (the Project).

SLR Consulting Pty Ltd (SLR) has been engaged by Robert Luxmoore Pty Ltd on behalf of EBARE Pty Ltd to undertake a preliminary construction and operation noise impact assessment for the Project.

2.0 Project Area

The proposed site is on rural farmland approximately 4 km southwest of Darlington. The proposed site is located within the Moyne Shire Council local government area. The Stony Point property is an 1870 ha landholding. Within the property, 2 parcels have been selected to form 'the Site' (391 ha). Within the Site parcels, an Project Area has been defined (169 ha). The development area is to be confirmed and is expected to be between 15-25 ha. All land parcels are zoned as Farming Zone (FZ). **Figure 1** shows the project layout plan.

2.1 Noise Sensitive Receivers

There are 5 identified noise sensitive receivers within 3 km of the BESS site boundary, one of which is project-involved. All receivers are located within the Farming Zone (FZ) land use zone.

Table 1 summarizes the sensitive receivers and the distance to the boundary of the Project Site. The easting and northing coordinates reference to GDA2020 MGA Zone 54.

The proposed site and closest sensitive receivers are presented in **Figure 2**.

Table 1 Noise Sensitive Receivers

Receiver ID	Easting (m)	Northing (m)	Distance to Project Boundary (m)
R1	675050	5790833	1250
R2	675090	5790683	1170
R3	677820	5791922	2470
R4 (project-involved)	678211	5788729	2050
R5	674272	5786791	3270

Figure 1 Proposed BESS Site Layout

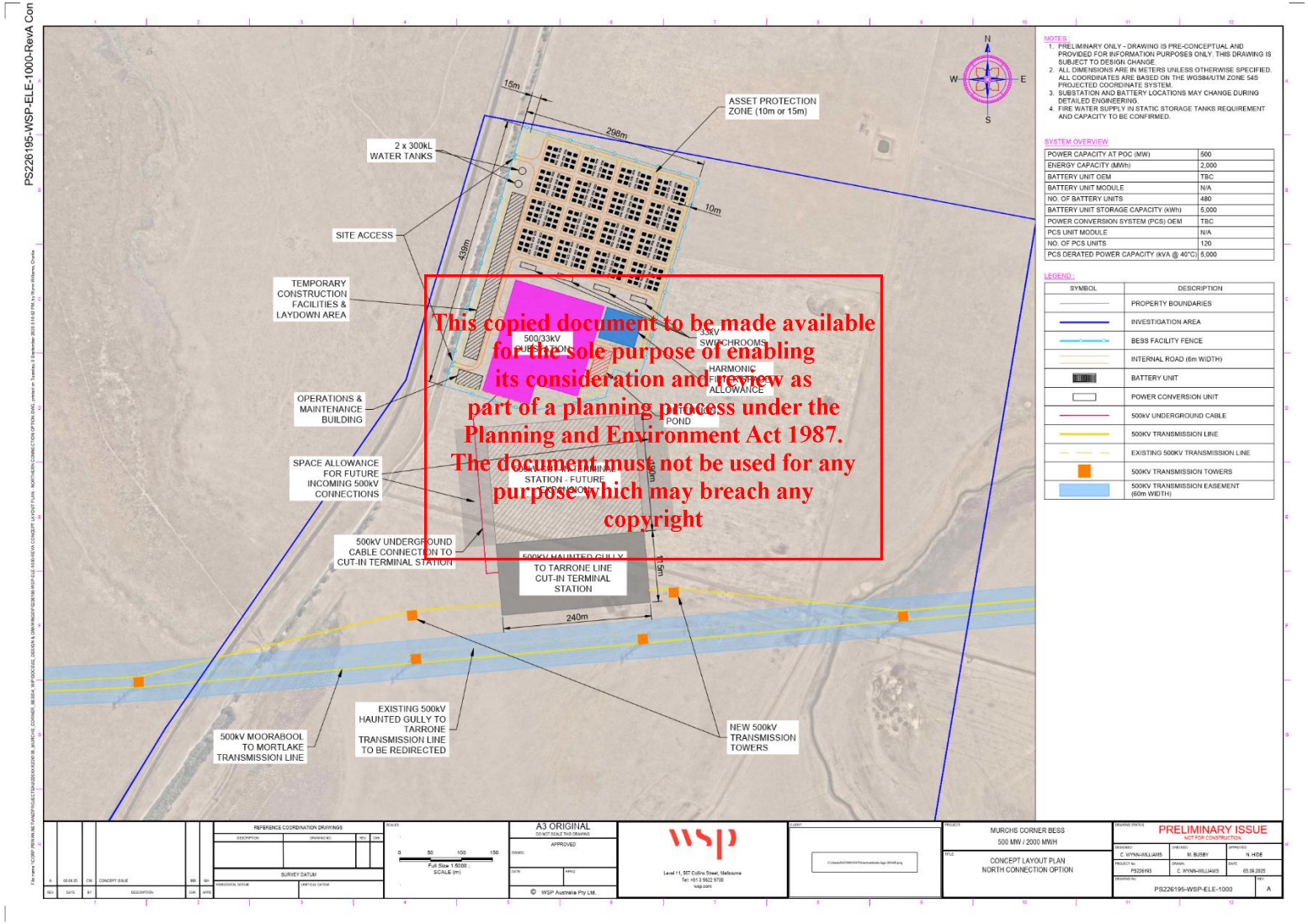
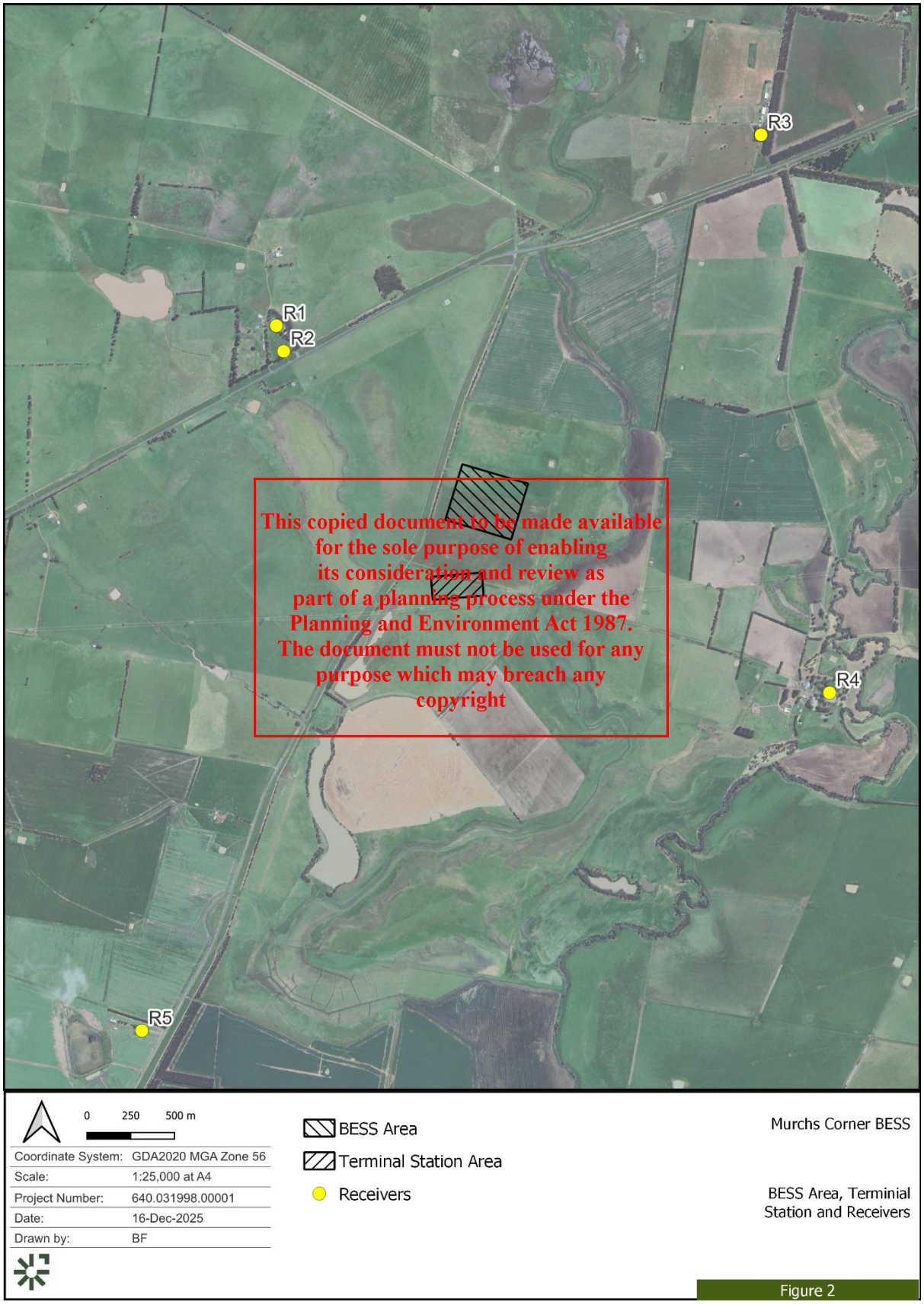


Figure 2 BESS Area and Noise Sensitive Receiver Location



3.0 Victorian Regulations – Project Criteria

3.1 General Environmental Duty

The general environmental duty (GED) is at the centre of the Environment Protection Act 2017 (EP Act), and it applies to all Victorians. GED states that 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.

Under the 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:

- 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
- a change to the condition of the environment to make it offensive to the senses of human beings; or
- anything prescribed to be harm for the purposes of the Act or the regulations; and
- Should consider potential cumulative effect of harm arising from an activity combined with harm arising from other activities or factors.

To determine what is (or was at a particular time) reasonably practicable in relation to the minimisation of risks of harm to human health and the environment, regard must be had to the following matters:

- the likelihood of those risks eventuating,
- the degree of harm that would result if those risks eventuated,
- what the person concerned knows, or ought reasonably to know, about the harm or risks of harm and any ways of eliminating or reducing those risks,
- the availability and suitability of ways to eliminate or reduce those risks,
- the cost of eliminating or reducing those risks.

In the assessment of noise impacts with reference to GED, consideration must first be given to eliminating risks so far as reasonably practicable, and then to reducing those risks so far as reasonably practicable.

3.2 Noise Criteria

Certain types of noise within Victoria are regulated. The following sections provide an overview of how regulated noise is assessed in Victoria.

3.2.1 EP Act 2017

The EP Act prescribes that a person must not, from a place or premises that are not residential premises—

- emit an unreasonable noise; or
- permit an unreasonable noise to be emitted

Unreasonable noise means noise that—

- is unreasonable having regard to the following—
  - its volume, intensity, or duration

  - its character
  - the time, place, and other circumstances in which it is emitted
  - how often it is emitted
  - any prescribed factors, or
- is prescribed to be unreasonable noise

For the purposes of the above definition, 'frequency spectrum' is a prescribed factor.

The EP Act prescribes that, noise emitted from commercial, industrial and trade premises is prescribed to be aggravated noise if:

- in the case of noise emitted during the day period, the effective noise level exceeds the lower of the following:
  - 75 dBA
  - the noise limit plus 15 dB, and
- in the case of noise emitted during the evening period, the effective noise level exceeds the lower of the following:
  - 70 dBA
  - the noise limit plus 15 dB, and
- in the case of noise emitted during the night period, the effective noise level exceeds the lower of the following—
  - 65 dBA
  - the noise limit plus 15 dB.

3.2.2 EP Regulations and Noise Protocol 2021

The Environmental Protection Regulations 2021 (EP Regulations) support the EP Act by providing clarity and further detail for duty holders on how to fulfil their obligations. Regulations are used to deal with matters in detail and may contain their own penalties for breaches.

In Victoria, noise emissions from commercial, industrial and trade premises are not permitted to be unreasonable or aggravated, and are subject to the provisions of the Regulations, and the *"Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues"*, EPA Publication 1826.5 September 2025 (the Noise Protocol).

The Noise Protocol presents the methodology for determining the noise limit (maximum allowable level of noise emitted from a premise) when measured in a noise sensitive area. Noise sensitive areas are defined in the Regulations as that part of the land within the boundary of a parcel of land that is within 10 m of the outside of the external walls of a place where people generally sleep (homes, dormitories, hotels, hospitals, correctional facilities etc.), schools (including childcare centres) and tourist establishments in rural areas (campgrounds, caravan parks, etc.).

Table 2 presents the assessment periods prescribed by the Regulations.

Table 2 Definitions of Day, Evening and Night (Environmental Protection Regulations 2021)

Period	Day	Time
Day	Monday to Saturday (except public holidays)	7:00 am – 6:00 pm
Evening	Monday to Saturday Sunday and public holidays	6:00 pm – 10:00 pm 7:00 am – 10:00 pm
Night	Monday to Sunday	10:00 pm – 7:00 am

Rural Method – Noise Limits

With regard to the Murchs Corner BESS site, all noise sensitive receivers are located outside of the Major Urban Area, therefore the determination of noise criteria follows the Rural Method.

The Noise Protocol noise limits for receivers in a rural environment normally takes into consideration the influence of zoning map categories (and changes in zoning categories), the distance between the zoning boundary and receiver (where different zones apply) as well as the background noise. However, there is a special consideration that applies for utilities.

Noise Limits in Rural Areas for Utilities

Section 2.6 of the Protocol defines the method for determining noise limits in rural areas for utilities, which include electricity infrastructure, which is an appropriate classification for the BESS facility.

Paragraph (31) states that if the utility is located in a Farming Zone (FZ) and the distance adjustment is 0 dB (receiver is also in FZ), then the distance-adjusted level for each period is:

- Day: 45 dBA
- Evening: 39 dBA
- Night: 34 dBA

Since all sensitive receivers and the proposed site are located in a Farming Zone (FZ), the above levels are therefore the noise limits applicable for this project.

3.2.3 Cumulative Noise Impacts

Regulation 119 of the EP Regulations states that the noise contributions from all commercial industrial and trade premises must not exceed the noise limit for a noise sensitive area. Therefore noise from all commercial and industrial operations are required to cumulatively comply with the identified noise limits.

Guidance is provided in the EPA 2021 Publication 1997 June 2021 *Technical Guide – Measuring and analysing Industry noise and music noise.* The guidance provided in Section 3.3.1 is as follows:

Proposed new industry or extension of existing premises in rural areas

In rural areas, new industry plant or operations should be designed so that their emissions are less than the noise limits. Circumstances for which the equal sharing principle applies for new industry developments include:

- *Where there is existing industry impacting on noise sensitive areas*
- *Sites where there are multiple small commercial, industrial or trade premises.*

The contribution of the proposed development should then be abated to meet, for each period of the day, a level set below the relevant noise limit by 10 x log(10) decibels, where N is the total number of existing and likely contribution industrial plant installations.

It is noted that no nearby industries have been identified, therefore no adjustment to noise limit is required.

3.2.4 Low Frequency Noise Guidelines

EPA Publication 1996 "Noise guidelines: Assessing low frequency noise" (LFNG) provides guidance for acoustic consultants and other qualified professionals who assess low frequency noise (10Hz – 160Hz).

Frequency spectrum is a prescribed factor under the EP Act and subordinate legislation. The assessment of frequency spectrum applies to noise from commercial, industrial and trade premises only.

Low frequency noise emitted from commercial, industrial and trade premises should be assessed by comparing its frequency spectrum to the relevant threshold levels. Specifically, Z-frequency weighted (unweighted or linear) measurements in one-third octave bands from 10 Hz to 160 Hz are compared with low frequency threshold levels.

The threshold levels are not set limits. Rather, they are levels that indicate a potential risk of problematic low frequency noise. The disturbance from low frequency noise depends on the:

- noise level,
- characteristics that can increase annoyance with the noise, for example, tonality, frequency modulation,
- baseline noise levels in the absence of the noise of concern.

Table 3 details the outdoor low frequency noise threshold levels, which would apply for levels measured outdoors and based on the assumed façade noise reductions given in Downey and Parnell (2017).

Table 3 Outdoor Low Frequency Noise Threshold Levels

Outdoor 1/3 Octave Low Frequency Noise Threshold Levels													
Freq, Hz	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
Leq, dB	92	89	86	77	69	61	54	50	50	48	48	46	44

It is noted that since the BESS equipment has yet to be selected, the assessment of low frequency will be done at a later stage once equipment information becomes available.

3.3 Construction Noise Criteria

The *Civil construction, building and demolition guide* (EPA Publication 1834 November 2020) adopts a primary mechanism of reducing noise and vibration impacts through limiting the times of operation of noisy equipment, vehicles and operations. Whilst EPA Publication 1834 November 2020 does not establish objective noise goals or limits for works conducted during Normal Working Hours, it states that construction noise should be minimised as far as possible in any situation and that a noise impact assessment may be used to inform the risk assessment process for construction works and to inform plans for the management of noise generated during construction.

Table 4 presents the EPA construction noise guidelines.

Table 4 EPA Publication 1834 November 2020 Construction Noise Guidelines

Time of day	Construction noise guidelines
Normal working hours: 7 am – 6 pm Monday to Friday 7 am – 1 pm Saturday	Minimise as far as possible in any situation
Weekend/evening work hours: 6 pm – 10 pm Monday to Friday 1 pm – 10 pm Saturday 7 am – 10 pm Sunday and Public Holidays	Noise level at any residential premises not to exceed background noise (L_{90}) by: • 10 dBA or more for up to 18 months • 5 dBA or more after 18 months
Night period: 10 pm – 7 am Monday to Sunday	Noise inaudible within a habitable room of any residential premises

EPA Publication 1834 November 2020 details that whilst projects should aim to constrain works to normal working hours, where necessary, works or activities outside normal working hours may occur for:

- **Low-noise impact works** – these are inherently quiet or unobtrusive, for example, manual painting, internal fitouts, and cabling. Low-noise works do not have intrusive characteristics such as impulsive noise or tonal movement alarms.
- **Managed-impact works** – works where the noise emissions are managed through actions specified in a noise and vibration management plan (may be part of a broader environmental management plan), to minimise impacts on sensitive receivers. Managed-impact works do not have intrusive characteristics such as impulsive noise or tonal movement alarms.
- **Unavoidable works** – are works which pose an unacceptable risk to life or property or a major traffic hazard and can be justified. Includes an activity which has commenced but cannot be stopped. A project would need to demonstrate that planned unavoidable works cannot be reasonably moved to normal work hours. This requires additional consideration of potential noise and vibration generating activities and controls to minimise noise and vibration. These can be recorded within the noise and vibration management plan (may be part of a broader environmental management plan).

It is anticipated that most construction activities related to the Project will be able to be completed during EPA normal working hours, with the exception of unavoidable works (if required) and low-noise impact works.

4.0 Noise Assessment

A 3D noise model was constructed within the modelling software SoundPLAN 8.2 to predict noise levels at the nearby sensitive receivers.

Noise modelling was conducted using the algorithms of ISO 9613-2[1] , which predicts the A-weighted sound pressure levels under meteorological conditions favourable to propagation from sources of known sound power levels. This enhanced propagation is equivalent to downwind propagation or a moderate ground-based temperature inversion. The model also includes attenuation due to air absorption, ground attenuation and shielding.

4.1 General Modelling Assumptions

The following general assumptions are made based on best-practice modelling methods to suit the project:

- A reflection-order of three (3).
- Source height were set according to the source item.
- Receivers are in the acoustic free field, 1.5 m above ground level.
- All equipment is assumed to be in operation for the entire 30 minute assessment period.
- Ground topography was sourced from publicly available 5 meters digital elevation data from VIC Government.
- Ground absorption is modelled by a single number parameter between 0 (hard – reflective) and 1 (soft – absorptive). The BESS substation and BESS infrastructure were modelled as hard ground, all other ground surfaces were modelled with a ground absorption parameter of 0.6, which is suitable for rural farmland.

4.2 Construction Noise Assessment

The following standard construction hours are proposed for the Project:

- Monday to Friday - 7 am to 6 pm.
- Saturday – 7 am to 1 pm.
- Sunday and Public Holidays - No works to be undertaken.

No works are proposed to be undertaken outside of the standard construction hours.

4.2.1 Construction Activities

Representative scenarios have been developed to assess the likely impact from the various construction phases of the proposal. These scenarios are shown in **Table 5**.

The sound power levels for the construction equipment used in each scenario are presented in **Appendix A**.

[1] ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*

Table 5 Construction Scenarios and Equipment

Scenario	Works Activity	Equipment
W.01	Earthworks	Dozer, excavator, front end loader, vibratory roller, dump truck, water truck, rockbreaker
W.02	Construction of pads and hardstands	Concrete pump, concrete truck/agitator, concrete vibrator
W.03	Equipment installation	Elevated working platform, flatbed truck, hand tools, mobile crane

4.3 Operational Noise Assessment

4.3.1 Noise Sources

All equipment items are assumed to be in operation for the entirety of a 30-minute assessment period. Noise emissions of the BESS equipment are typically dominated by cooling noise sources, which can be variable depending on the percentage of maximum power (charge/discharge) and the subsequent temperatures, both ambient and that being generated by the equipment.

Sound power levels (SWL) and quantities of noise producing equipment are shown in **Table 6**. The sound power levels shown are typical levels for unsilenced batteries and inverters[2] and assumes the infrastructure is operating at full capacity (100%), including the cooling fans. Silencing treatment may achieve sound power reductions of the order of 5 dB, depending on the products developed by the particular original equipment manufacturer (OEM).

Table 6 Equipment Sound Power Levels – BESS & HV Transformer

Qty	Item	Sound Power Level (SWL), per unit $L_{eq\ 15\ min}$, dBA
480	Battery Container	85
120	Inverter[2]	92
1	High Voltage Transformer	96[1]

Notes:

1: Based on AS 60076.10:2009 standard maximum (140 MVA rating).

2: The inverter item includes a medium voltage transformer and switch box on a skid. The medium voltage transformers are expected to have a sound power level of the order of 67 dBA. Since the transformer is ~25 dBA quieter than the inverter, its noise contribution is negligible.

[2] The sound power levels presented here are based on noise measurements of currently available equipment:

- Batteries: Wartsila Quantum 2 series
- Inverter: SMA 4xxx series MV Power Stations

Note that the original equipment manufacturer (OEM) has not been finalised. The above combination of OEMs is one such solution.

4.3.2 Noise Characteristics

The Noise Protocol contains provisions for adjustments for undesirable noise characteristics such as tonality, impulsiveness and intermittency. If one or more of these characteristics are present at the receiver, then an adjustment is applied to the overall level.

The following outlines the noise characteristics and discusses whether the adjustments are relevant to this assessment.

Tonality

Individual BESS noise sources may contain tonal characteristics when measured close to the source. In this preliminary assessment, it is assumed that the BESS equipment will not incur tonal adjustments at any receiver.

Impulsiveness

The impulsiveness characteristic refers to a dominant sudden pressure peak, or series of peaks, or a single burst with multiple pressure peaks whose amplitude decays with time or a sequence of bursts. Noise due to cooling the BESS is not impulsive in nature.

Intermittency

Intermittency is present when the noise increases in level rapidly, and by at least 5 dB, on at least two occasions during a 30 minute period and maintains the higher level for at least one-minute.

The cooling fans are expected to cycle up and down as required to cool the batteries and power electronics. However the duty cycle period exceeds 30 minutes and is not considered intermittent. Therefore, no characteristic adjustments have been applied to the following results.

5.0 Assessment Results

5.1 Construction Noise Assessment

Table 7 presents the construction noise results for the modelled scenarios. It is anticipated that construction works would occur during the EPA normal working hours (day) only.

Table 7 Construction Assessment Results

Receiver	W.01 Earthworks	W.02 Construction of pads, hardstands & ramps	W.03 Equipment installation
R1	42	34	35
R2	43	35	36
R3	35	27	28
R4 (project-involved)	36	28	29
R5	30	22	23

Construction of the BESS facility may be audible from several receivers from time to time, however noise impacts are minimised due to the distance to receivers and works being temporary and conducted during EPA normal working hours (day period) only.

The Australian Standard AS2436-2010 *Guide to Noise Control on Construction, Maintenance and Demolition Sites* sets out numerous practical recommendations to assist in taking all reasonable and practicable measures to prevent or minimise noise impacts.

Noise control strategies to be considered are listed below:

- Ensure construction works to occur during normal working hours:
  - Weekdays: 7 am to 6 pm,
  - Saturday: 7 am to 1 pm.
- Incorporate clear signage at the site including relevant contact numbers for community enquiries.
- The lowest noise emitting plant and equipment that can economically and efficiently undertake the work should be selected where possible.
- Maintain regular maintenance of equipment to keep it in good working order and operating at the lowest feasible noise level.
- Use less intrusive broadband reversing beepers on mobile plant where possible.
- Equipment operators are to be made aware of noise impacts and techniques to minimise emissions through training/instruction, examples include:
  - Avoid dropping materials from height into bins, trucks and receptacles.
  - Operate mobile plant and power tools in a quiet, efficient manner where possible.
  - Switch plant off when not in use.
- Machines/tools found to produce excessing noise compared with industry best practice should be removed from service until repairs or modification can be made, or the machine/tool is replaced.
- Where possible avoid tonal reversing/movement alarms on machinery and replace with broadband (non-tonal) alarms or ambient noise-sensing alarms.
- Use dampened bits on impulsive tools (e.g. ratchet drivers) to avoid ‘ringing’ noise.

5.2 Operational Noise Assessment

The predicted noise levels at the identified representative sensitive receivers were assessed against the most stringent night-time criteria. The predicted noise levels presented in **Table 8** accounts for noise emissions from the BESS operations.

With the assumed equipment SWL modelled, the BESS operations demonstrate compliance with the most stringent night-time criteria at all assessed receivers.

Note that the preliminary assessment assumes no tonal penalty is applicable at any receiver.

The noise contour plot is shown in **Figure 3**.

Figure 3 Operational Noise Contours

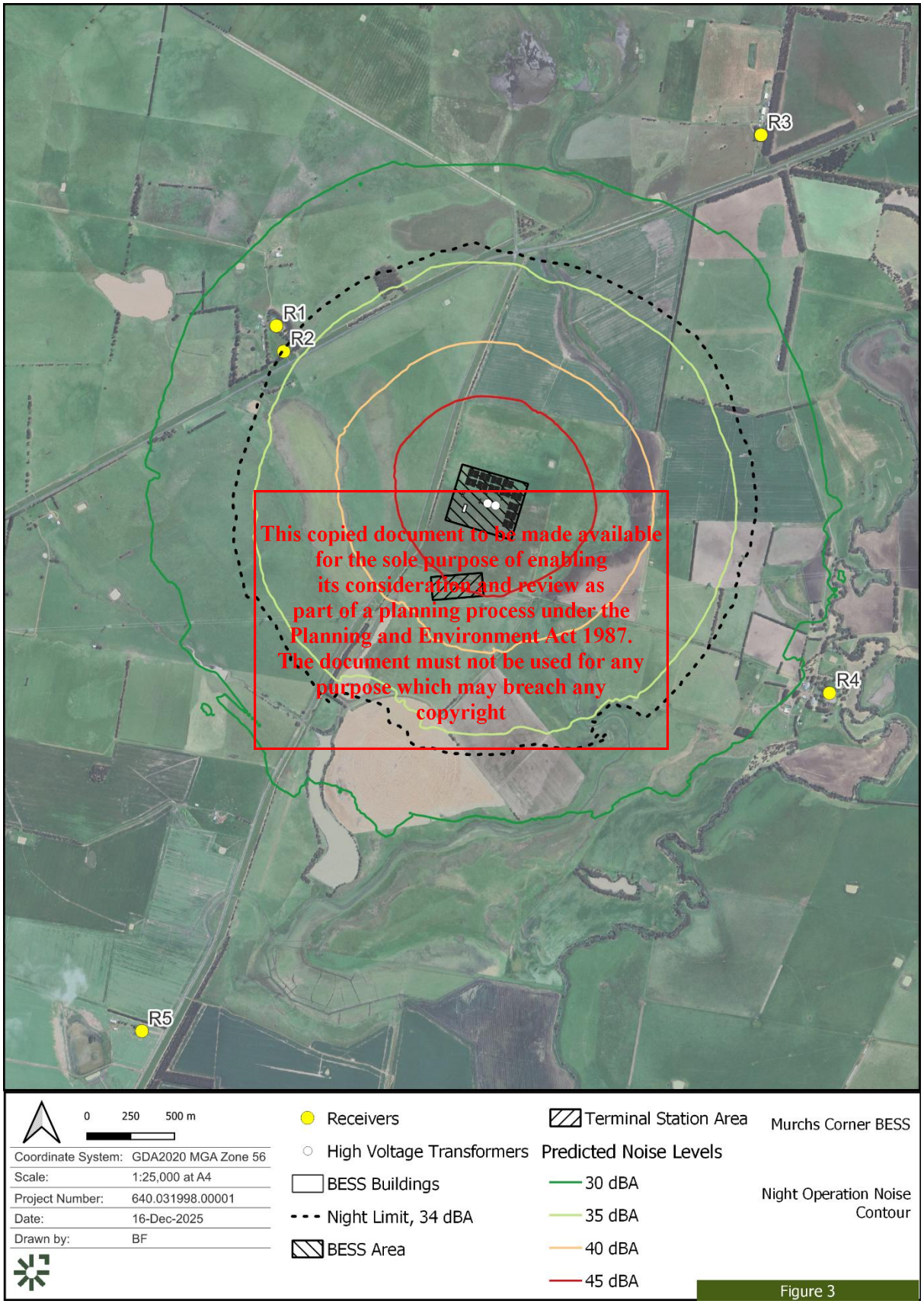


Table 8 Predicted Noise Levels from BESS Operations

Receiver	Predicted Noise Level, dBA	Night Noise Limit, dBA	Compliance Margin Night
R1	32	34	2
R2	34	34	0
R3	26	34	8
R4 (project-involved)	28	34	6
R5	20	34	14

6.0 Recommendations

To ensure the night-time noise criteria is achieved at locations R1 and R2, it is recommended that the Project source battery and inverter units with sound power levels of no more than 85 dBA and 92 dBA, respectively. This can be achieved through equipment selection, available silencing options or alternatively, the Project may reduce the night-time operational loads of the battery and inverter units to achieve these levels.

Moreover, the battery and inverter units need to be free from tonal characteristics. If tonality is predicted at a receiver, a minimum of 2 dB tonal adjustment will be applied to the predicted noise level. Given the compliance margin at R1 and R2 being 1 dB and 0 dB at night respectively, a 2 dB tonal penalty will result in marginal night time non-compliances. This can be controlled by the equipment selection and treatment options described above or the installation of a noise wall on the north western boundary of the BESS.

7.0 Conclusions

A preliminary construction and operation noise assessment was done for the Murchs Corner BESS. This report presents applicable noise criteria, assessment methodology and results in comparison with the noise limits as proscribed by the Noise Protocol.

Construction noise impacts are controlled by limiting works to day periods and a combination of training/equipment maintenance and community engagement.

Cumulative noise was considered and no adjustment to the noise limit was required as there are no other industry in the vicinity of the Project.

The Project is predicted to meet the relevant noise criteria and legislation at all times for all assessed receivers.

To ensure compliance with night-time noise limits, the Project should either select battery and inverter units with sound power levels of no more than 85 dBA and 92 dBA, respectively, or reduce their nighttime operational loads to meet these levels. The selected battery and inverter units should also not be tonal. The noise assessment will be updated based on the final design layout and equipment selection to demonstrate compliance prior to construction.

Appendix A Construction Noise Sources

Murchs Corner BESS

Noise Assessment

EBARE Pty Ltd c/- Robert Luxmoore Pty Ltd

SLR Project No.: 640.031998.00001

10 March 2026

SLR

Equipment	Total SWL	Chainsaw	Chipper	Concrete Pump	Concrete Truck	Concrete Vibrator	Crane - Mobile (100t)	Dozer	Elevated Working Platform	Excavator (20t)	Front End Loader	Hand Tools	Roller - Vibratory	Rockbreaker	Truck - Dump	Truck - Flatbed	Water Truck	Bored Piling Rig
Sound Power Level[1]		119	120	109	109	113	113	116	97	105	112	104	114	117	110	103	107	116
Estimated on-time in any 30 minutes		10	30	20	30	10	30	20	30	20	20	30	30	20	20	20	20	30
Scenario																		
W.01 Earthworks	121							X		X	X		X	X	X		X	
W.02 Construction of pads, hardstands & ramps	113			X	X	X												
W.03 Equipment installation	114						X		X			X				X		

Note 1: Sound power level data is taken from the DEFRA Noise Database, TfNSW *Construction and Vibration Guideline* and TfNSW *Construction Noise and Vibration Strategy*.

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