



Operational Noise Emission Assessment Proposed Solar Farm 910 Princes Highway, Bairnsdale, VIC

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Client:
Bison Energy
C/o- Habitat Planning

19 October 2023



Sydney Head Office
Suite 2
174 Willoughby Rd
St Leonards NSW 2065
T: 02 9908 1270

Melbourne Office
Suite 11
70 Racecourse Rd
Nth Melbourne VIC 3051
T: 03 7015 5112

ABN: 36 105 797 715
PO Box 270
Neutral Bay NSW 2089
E: info@acousticdynamics.com.au
W: www.acousticdynamics.com.au



Client	Bison Energy
C/o	Habitat Planning
Contact	Ms Shannon O'Brien
Address	409 Kiewa St ALBURY NSW 2640
Phone	02 6021 0662
Email	shannon@habitatplanning.com.au

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NOISE

Noise is produced through rapid variations in air pressure at audible frequencies (20 Hz – 20 kHz). Most noise sources vary with time. The measurement of a variable noise source requires the ability to describe the sound over a particular duration of time. A series of industry standard statistical descriptors have been developed to describe variable noise, as outlined in **Section 2** below.

NOISE DESCRIPTORS

L_{eq} – The sound pressure level averaged over the measurement period. It can be considered as the equivalent continuous steady-state sound pressure level, which would have the same total acoustic energy as the real fluctuating noise over the same time period.

L_{Aeq(15min)} – The A-weighted average equivalent sound level over a 15-minute period.

L_{A90} – The A-weighted noise level that has been exceeded for 90% of the measurement duration. This descriptor is used to describe the background noise level.

RBL – Rating Background Level. The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24hr period used for assessment background level). This is the level used for assessment purposes.

dB – Decibels. The fundamental unit of sound level is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell. Probably the most common usage of the Decibel in reference to sound loudness is dB sound pressure level (SPL), referenced to the nominal threshold of human hearing. For sound in air and other gases, dB(SPL) is relative to 20 micropascals (μPa) = 2×10^{-5} Pa, the quietest sound a human can hear.

A-WEIGHTING

"A-weighting" refers to a prescribed amplitude versus frequency curve used to "weight" noise measurements in order to represent the frequency response of the human ear. Simply, the human ear is less sensitive to noise at some frequencies and more sensitive to noise at other frequencies. The A-weighting is a method to present a measurement or calculation result with a number representing how humans subjectively hear different frequencies at different levels.

NOISE CHARACTER, NOISE LEVEL AND ANNOYANCE

The perception of a given sound to be deemed annoying or acceptable is greatly influenced by the character of the sound and how it contrasts with the character of the background noise. A noise source may be measured to have only a marginal difference to the background noise level but may be perceived as annoying due to the character of the noise.

Acoustic Dynamics' analysis of noise considers both the noise level and sound character in the assessment of annoyance and impact on amenity.

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1 INTRODUCTION

1.1 EXECUTIVE SUMMARY

Acoustic Dynamics is engaged by **Habitat Planning** on behalf of **Bison Energy** to conduct an assessment of operational noise emission associated with the proposed solar farm and battery energy storage system (BESS) located at 910 Princes Highway, Bairnsdale, Victoria.

This document provides an assessment of noise emission resulting from various noise sources associated with the operation of the proposed solar farm at the potentially most affected sensitive receiver locations.

This assessment is prepared in accordance with the various acoustic requirements of:

- (a) East Gippsland Shire Council;
- (b) Environment Protection Authority (EPA) Victoria; and
- (c) Australian Standards.

Note. This report has been updated to address a request for information relating to additional sensitive receiver locations and the cumulative impacts associated with adjacent operations (Bairnsdale Power Station and Parkside Timber Mill).

1.2 DESCRIPTION OF PROPOSAL

The subject proposal is for a solar farm to be located at 910 Princes Highway, Bairnsdale, Victoria. The site is zoned Farming Zone (FZ1).

The boundaries of the site are shared with other FZ-zoned lots, with residences located on some of these lots. The closest sensitive receivers are located at:

- [R₁]: 175 Bairnsdale-Dargo Road;
- [R₂]: 135 Bairnsdale-Dargo Road;
- [R₃]: 125 Bairnsdale-Dargo Road
- [R₄]: 107 Bairnsdale-Dargo Road;
- [R₅]: 870 Princes Highway;
- [R₆]: 21 Merry Street;
- [R₇]: 25 Bengworden Road; and
- [R₈]: 20 Bengworden Road.

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Compliance at the assessed sensitive receiver locations ensures compliance at all other receivers located further away.

The proposed solar farm is shown in the Location Map, Aerial Image and Drawings presented within **Appendix A**. The various noise sources and operations associated with the proposal are expected to include:

- Mechanical plant and equipment; and
- Vehicle movements.

1.3 SCOPE

Acoustic Dynamics has been engaged to provide an acoustic assessment suitable for submission to the relevant authorities.

The scope of the assessment is to include the following:

- Review local council planning instruments, state guidelines, federal legislation and standards relevant to noise emission at the subject site;
- Determine noise limits for the assessment of operational noise impacts;
- Perform relevant calculations and noise modelling associated with the operations of the development to determine noise emission at nearby sensitive receiver locations; and
- Provide recommendations for design measures to be incorporated to achieve compliance with the relevant noise limits and reduce potential noise impacts at nearby receiver locations.

2 ASSESSMENT CRITERIA AND STANDARDS

Acoustic Dynamics has conducted a review of the local council, state government and federal legislation that is applicable to noise emission assessment from the subject site. The relevant sections of the legislation are presented below. The most stringent criteria which have been used in this assessment of the subject development are summarised below.

2.1 PLANNING SCHEME – CLAUSE 13.05

Acoustic Dynamics advises that Clause 13.05 of the planning scheme includes the following relevant noise assessment policy:

“13.05 NOISE

13.05-1S Noise management

Objective

To satisfy the management of noise effects on sensitive land uses.

Strategy

Ensure that development is not prejudiced and community amenity and human health is not adversely impacted by noise emissions.

Minimise the impact on human health from noise exposure to occupants of sensitive land uses (residential use, child care centre, school, education centre, residential aged care centre or hospital) near the transport system and other noise emission sources through suitable building siting and design (including orientation and internal layout), urban design and land use separation techniques as appropriate to the land use functions and character of the area.

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Policy guidelines

Consider as relevant:

- *The noise requirements in accordance with the Environment Protection Regulations under the Environment Protection Act 2017.*

Policy guidelines

Consider as relevant

- *Environment Protection Regulations under the Environment Protection Act 2017*
- *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues (Publication 1826.2, Environment Protection Authority, March 2021)*
- *Environment Reference Standard (Gazette No. S 245, 26 May 2021)*
- *Passenger Rail Infrastructure Noise Policy (Victorian Government, 2013)*
- *VicTrack Rail Development Interface Guidelines (VicTrack, 2019)*

2.2 ENVIRONMENT PROTECTION AUTHORITY VICTORIA

2.2.1 ENVIRONMENT PROTECTION ACT 2017

From 1 July 2021, new environment protection legislation – the *Environment Protection Act 2017* (incorporating amendments as at 1 July 2021), provides a legislative framework for the assessment and control of noise impacts.

Part 3.2 of the Act provides the following detail regarding the environmental noise obligations of all Victorians:

“25 General environmental duty

- 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.”*

Part 7.6 of the Act provides the following detail regarding the control of unreasonable and aggravated noise:

“Part 7.6—Control of unreasonable and aggravated noise

166 Unreasonable noise

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.*

Section 3 of the Act provides a definition of unreasonable noise:

“unreasonable noise means noise that—

- a) *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; or*
- b) *is prescribed to be unreasonable noise;”*

2.2.2 ENVIRONMENT PROTECTION REGULATION 2021

Part 5.3 of the *Environment Protection Regulations (2021)* provides the following detail regarding the assessment of commercial and industrial noise impacts:

“113 Prediction, measurement, assessment and analysis of noise must be in accordance with Noise Protocol

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.”

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2.2.3 INDUSTRIAL NOISE LIMITS

In Victoria, industry compliance with noise limits is regulated by the *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol, EPA Publication 1826.4) and is mandatory under the Environment Protection Act 2017 and Environment Protection Regulations 2021.

The Noise Protocol sets noise limits which are determined based on the purpose of the local land zones at a given noise generation and receiver area and are used to exemplify the reasonable amenity expectations for the area.

To establish the operational noise limits at the subject site, limits were derived as per the prescribed methodology in accordance with the Noise Protocol (“2. *Noise limits – Rural area method*”). Acoustic Dynamics advises that the noise generating property and all nearby receiving properties are within the Farming Zone (FZ) with no intervening zones.

Following the general procedures outlined in the EPA’s Noise Protocol, a summary of relevant noise limits is presented in **Table 2.1** below.

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Table 2.1 Summary of Determined Noise Limits for Nearest Sensitive Receivers

Location	Assessment Period	Day of the Week	Noise Limit [dB(A)]
Nearest Residential Receiver(s)	Day	Mon to Sat (except public holidays): 7am - 6pm	$L_{eq(30minute)} \leq 46$
	Evening	Mon to Sat: 6pm to 10pm	$L_{eq(30minute)} \leq 41$
		Sun and public holidays: 7am to 10pm	
	Night	10pm to 7am	$L_{eq(30minute)} \leq 36$

The Noise Protocol states that the measured or predicted noise level associated with the operation of mechanical plant associated with the subject development shall be presented as an L_{Aeq} noise level. Where required, the emitted noise level is to be corrected for noise character, tonality and duration and is to be presented as the effective noise level (L_{eff}).

2.3 SLEEP DISTURBANCE OBJECTIVE

Acoustic Dynamics advises that sleep disturbance is a complex issue, and the potential for sleep disturbance to occur depends on both the level of noise at a residential receiver, and the number of events that occur. In lieu of applicable Victorian legislation or guidelines, the NSW Environmental Protection Agency's document "Noise Guide for Local Government" can be used as guidance in Victoria although it is not a mandatory policy.

The NSW EPA has investigated overseas and Australian research on sleep disturbance. The assessment of noise for sleep disturbance relies on the application of a screening that indicates the potential for this to occur. The EPA's *Noise Guide for Local Government (NGLG) 2013* provides the following guidance for such a screening test:

"Currently, there is no definitive guideline to indicate a noise level that causes sleep disturbance and more research is needed to better define this relationship. Where likely disturbance to sleep is being assessed, a screening test can be applied that indicates the potential for this to occur. For example, this could be where the subject noise exceeds the background noise level by more than 15 dB(A). The most appropriate descriptors for a source relating to sleep disturbance would be $L_{A1(1\text{ minute})}$ (the level exceeded for 1% of the specified time period of 1 minute) or L_{Amax} (the maximum level during the specified time period) with measurement outside the bedroom window."

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In addition to the above, the EPA has previously published the following additional information relating to findings of significant research carried out for sleep disturbance:

“Maximum internal noise levels below 50-55 dBA are unlikely to cause awakening reactions... One or more noise events per night, with maximum internal noise levels of 65-70 dBA, are not likely to affect health and wellbeing significantly.”

In accordance with the guidelines detailed above, the following sleep disturbance objective has been applied for this project:

$$L_{Amax} \leq 55 \text{ dB}$$

3 ASSESSMENT METHODOLOGY

Acoustic modelling was undertaken using noise modelling software (*CadnaA Version 2023*) to predict operational noise levels generated by the development.

CadnaA calculates environmental noise propagation according to the applicable international and ISO standards, including the ISO 9613 algorithm.

Within our calculations and acoustic modelling, noise emission contributions from the development have been considered taking the following factors into account:

- Airborne noise losses due to distance and ground topography;
- Losses due to direction and diffraction;
- Increases due to reflections; and
- Acoustic shielding.

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3.1 MODELLING ASSUMPTIONS

The following assumptions were made regarding the noise model configuration:

1. The noise-generating mechanical systems are to be non-enclosed and situated towards the centre of the site, as indicated in the site plans;
2. The site and mechanical plant will operate 24 hours a day; and
3. Vehicle access will consist of one staff vehicle visiting the site once a week.

3.2 NOISE SOURCES AND OPERATIONS

Acoustic Dynamics has established and assessed the following noise sources and operations associated with the development.

The noise data presented in **Table 3.1** has been established based on information provided by the proponent, short-term measurements, or referenced from our database of nearfield measurements at similar developments.

Table 3.1 Associated Noise Sources and Operations

Source	Quantity	Sound Pressure Level @ 1m [dB(A)]
Mechanical Equipment		
Hithium Container Battery Energy Storage System (or equivalent)	72	75
SCS 3600 UP(-US) Inverter and SCMVP4600 Switch/Transformer	18	81
Vehicle Movements		
Car pass-by	1	78

3.3 ADJACENT OPERATIONS

Noise emission from the adjacent commercial/industrial operations (i.e. Bairnsdale Power Station and Parkside Timber Mill) has been considered within this assessment. Regulation 119 of the Environment Protection Regulations provides the following relevant information:

“119 Cumulative noise part of a planning process under the Planning and Environment Act 1987.

- 1) *If 2 or more commercial, industrial and trade premises (whether existing or proposed) emit, or are likely to emit, noise that contributes to the effective noise level, a person in management or control of one or more of those premises must take all reasonable steps to ensure that the contribution from each of the premises, when combined, does not exceed the noise limit for the noise sensitive area.*
- 2) *(For the purposes of subregulation (1), what constitutes a reasonable step must be determined in accordance with the Noise Protocol.”*

3.3.1 PARKSIDE TIMBER MILL

Based on a review of Google business information, the timber mill operates weekdays, between 8:00am and 4:00pm. We assume that the timber mill does not exceed the daytime noise limit, and as such, given that noise from the solar farm is predicted to be more than 10 dB lower than the daytime noise limit, the cumulative noise contribution from the two sites is not expected to increase existing noise levels, or exceed the daytime noise limit.

3.3.2 BAIRNSDALE POWER STATION

Acoustic Dynamics has been provided with the following information from Bison Energy in relation to the future usage of the Bairnsdale power station:

“Historically, the Alinta owned gas peaker has been fired up to support the East Gippsland grid majority in school holidays etc when an influx of holiday makers travel from Melbourne to the Lakes Entrance area and also a little at 2am in deep winter periods to support a large amount of residential electric hot water tanks/ systems to start heating up before peoples morning uses (showers, washing etc).

So literally the population (either increase in demand or hot water load demand) causes a massive increase on the grid and creates a supply shortage therefore triggering a 'demand response' requirement by Ausnet, which means the grid needs a boost (to date from the gas peaker).

Though due to the cost of gas and social responsibility by Ausnet/ AEMO they've redacted the 'services agreement' with Alinta to supply for demand/grid response as we committed to supporting and developing an equivalent output sized demand response BESS to take this role.

What this means is now Ausnet will call on the Bairnsdale BESS to take this role and the gas peaker won't be turning on, nor can it anyway as the grid will be at max capacity. So whether the gas peaker wants to turn on or the battery wants to ramp up they can't do it at the same time due to very limited capacity in that part of the East Gippsland Ausnet network. It's literally one or the other, it's physically not possible to have both running at the same time.”

In relation to cumulative acoustic impacts from the solar farm and the power station, this means there will not be any, as either the power station, or the BESS will respond to peak grid demand, however the operation will be non-concurrent.

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3.4 RECEIVERS

The cumulative noise impact has been assessed to the potentially most affected point at the adjacent sensitive receiver properties and presented in **Table 3.2** below.

Table 3.2 Nearest Sensitive Receiver Locations

Receiver	Location	Direction
R ₁	175 Bairnsdale-Dargo Road	North
R ₂	135 Bairnsdale-Dargo Road	North
R ₃	125 Bairnsdale-Dargo Road	North east
R ₄	107 Bairnsdale-Dargo Road	North east
R ₅	870 Princes Highway	East
R ₆	21 Merry Street	South east
R ₇	25 Bengworden Road	South
R ₈	20 Bengworden Road	West

Acoustic Dynamics advises that by achieving compliance with the nearest sensitive receiver locations, compliance will also be achieved at all other sensitive receiver locations further away.

4 OPERATIONAL NOISE EMISSION ASSESSMENT

The calculated maximum noise emission levels at the nearest receiver locations against the relevant noise limits are presented below. It is advised that by achieving compliance with the nearest sensitive receiver locations, compliance will also be achieved at all other receiver locations.

The assessment location for **external noise emission** is defined as the most affected point on or within any sensitive receiver property boundary. Examples of this location may be:

- 1.5m above ground level;
- On a balcony at 1.5m above floor level; and
- Outside a window on the ground or higher floors, at a height of 300mm below the head of the window.

4.1 EXTERNAL NOISE EMISSION

The calculated maximum **external** noise emission levels at the nearest receiver locations are presented against the relevant noise emission criteria in **Table 4.1** below.

The calculated maximum noise levels include the benefit of the recommendations as detailed in **Section 6**.

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Table 4.1 Calculated Maximum External Noise Emission Levels at Sensitive Receiver Locations

Receiver	Relevant Assessment Period	Noise Source	Calculated Maximum $L_{Aeq(30min)}$ External Noise Level [dB]	$L_{Aeq(30min)}$ Noise Limit [dB]	Complies?
R ₁ 175 Bairnsdale-Dargo Rd	Night ¹ (10pm to 7am)	Solar Farm	28	36	Yes
R ₂ 135 Bairnsdale-Dargo Rd	Night ¹ (10pm to 7am)	Solar Farm	29	36	Yes
R ₂ 125 Bairnsdale-Dargo Rd	Night ¹ (10pm to 7am)	Solar Farm	28	36	Yes
R ₄ 107 Bairnsdale-Dargo Rd	Night ¹ (10pm to 7am)	Solar Farm	27	36	Yes
R ₅ 870 Princes Hwy	Night ¹ (10pm to 7am)	Solar Farm	31	36	Yes
R ₆ 21 Merry St	Night ¹ (10pm to 7am)	Solar Farm	30	36	Yes

Receiver	Relevant Assessment Period	Noise Source	Calculated Maximum $L_{Aeq(30min)}$ External Noise Level [dB]	$L_{Aeq(30min)}$ Noise Limit [dB]	Complies?
R ₇ 25 Bengworden Rd	Night ¹ (10pm to 7am)	Solar Farm	33	36	Yes
R ₈ 20 Bengworden Rd	Night ¹ (10pm to 7am)	Solar Farm	29	36	Yes

Note: 1) Compliance with the night-time limit will ensure compliance with the less stringent day time and evening periods.

Acoustic Dynamics advises the calculated **external** noise emission levels are conservatively based on **maximum capacity** operations at the development during the night time period. Acoustic Dynamics advises that such a scenario is unlikely to occur and noise levels are likely to be below those calculated for the majority of the time.

4.2 SLEEP DISTURBANCE

Acoustic Dynamics advises that there are no significant impact noise events associated with the use of the site, thereby achieving compliance with the L_{Amax} objective. Furthermore, Acoustic Dynamics advises that the noise levels provided above achieve compliance with the $L_{Aeq(30min)}$ requirement. The site is therefore predicted to comply with the sleep disturbance objective.

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5 DISCUSSION

The calculated noise emission levels associated with the operations of the proposed development indicate the following:

1. Noise emission resulting from the use and operations of the proposed development is **predicted to comply** with the relevant noise limits when assessed at the nearest sensitive receivers;
2. Cumulative noise impacts associated with the concurrent operation of the Parkside Timber Mill and the solar farm is **predicted to comply** with the relevant noise limits when assessed at the nearest sensitive receivers
3. There is **low risk** of acoustic disturbance to the nearest sensitive residential receivers;
4. To ensure the assessment is conducted in a conservative manner, noise emission has been assessed as a **worst-case** scenario (i.e. all noise generating activities and noise sources occurring simultaneously and at maximum capacity);
5. Generally, noise emission associated with the operation of the facility is **predicted to be lower** than the calculations presented.

6 RECOMMENDATIONS

Acoustic Dynamics advises that the predicted maximum noise emission associated with the operation of the proposed mechanical plant is predicted to **comply** following implementation of the following recommendations.

1. The selected battery energy storage systems must not exceed sound power level **(SWL) 83 dB(A)**, or **75 dB(A) at 1 metre** (e.g. Hithium Container Battery Energy Storage System, or equivalent);
2. The selected inverters must not exceed sound power level **(SWL) 92 dB(A)**, or **83 dB(A) at 1 metre** (e.g. SCS 3600 UP(-US) Inverter and SCMVP4600 Switch/Transformer);
3. An acoustic barrier is required along the southern and south western perimeter of the plant, to a height of 4 metres and at a maximum distance of 10 metres from the plant;
4. The acoustic barrier should be constructed to the following specification:
 - i. Be constructed of a material with a minimum surface density of 15 kg/m², such as:
 - Hebel blockwork;
 - A double layer Colbond™ (Custom Blue Orb® or equivalent) barrier(s);
 - A minimum 9mm thick compressed fibre-cement sheeting on a timber or steel stud;
 - Masonry (brick or concrete) construction;
 - ii. Have no gaps between barrier panels and at the ground (gaps between panels can be adequately sealed using a flexible mastic sealant);
 - iii. Be lined internally (side facing mechanical plant) with a suitably weather resistant and durable outdoor acoustic absorption material (such as Stratocell Whisper or equivalent);
5. Where appropriate, materials used are to be certified by a locally recognised (qualified) and accepted professional for suitability (structural, wind loading, mechanical, or other) for the intended use; and
6. All mechanical equipment should be regularly maintained and serviced to maintain low mechanical noise emission levels.

7 CONCLUSION

Acoustic Dynamics has conducted an acoustic assessment of operational noise emission associated with the proposed solar farm located at Barnawartha North.

A review of the applicable local council, state government, federal legislation and international standards was conducted. Noise levels were assessed in accordance with the requirements of:

- (a) East Gippsland Shire Council; and
- (b) Environment Protection Authority Victoria.

The assessment predicted noise impacts at nearby sensitive receiver locations. Noise modelling was conducted using assumed **worst-case** operational scenarios in **Section 5**.

Acoustic Opinion

Further to our review of the relevant acoustic criteria and requirements, and our calculations, Acoustic Dynamics advises that the proposed development can be designed to comply with the relevant acoustic criteria of East Gippsland Shire Council, EPA Victoria.

It is our opinion that the acoustic risks associated with the proposal can be adequately controlled and the amenity of neighbouring properties and residents can be satisfactorily protected.

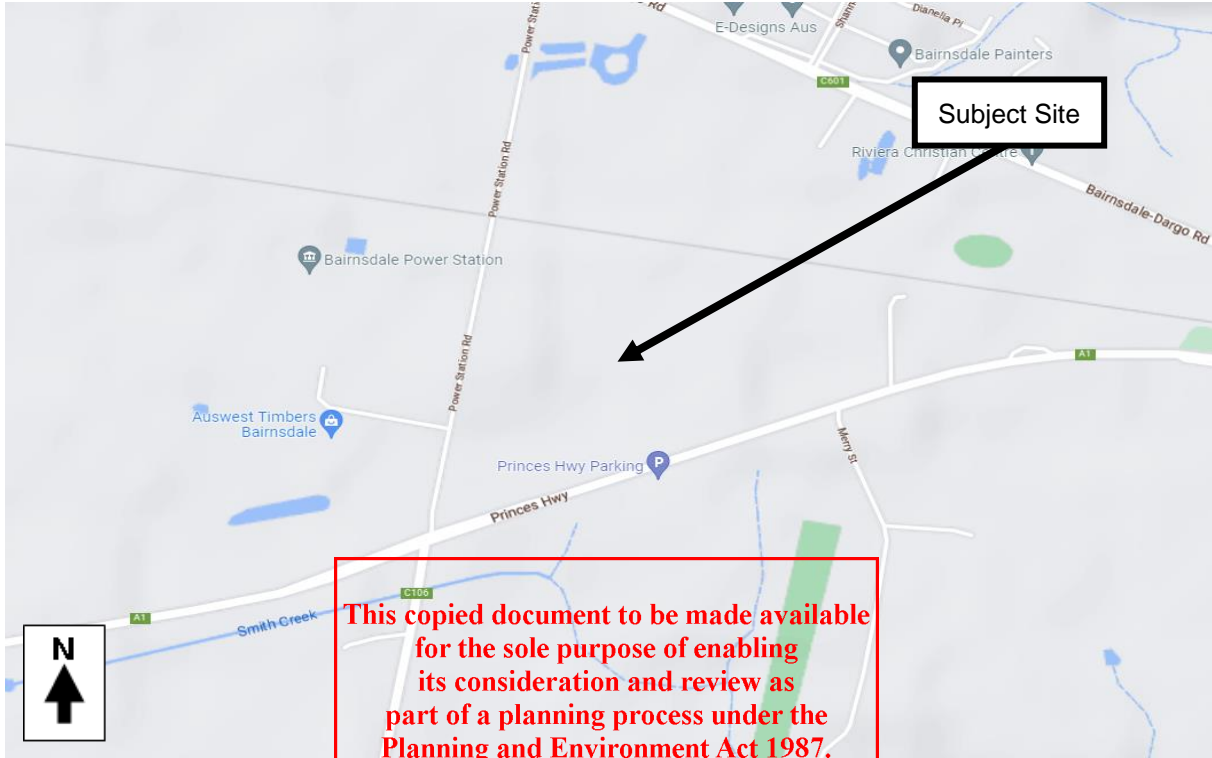
We trust that the above information meets with your present requirements and expectations. Please do not hesitate to contact us on 03 7015 5112 should you require more information.

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APPENDIX A – LOCATION MAP, AERIAL IMAGE AND DRAWINGS

A.1 LOCATION MAP (COURTESY OF GOOGLE MAPS)

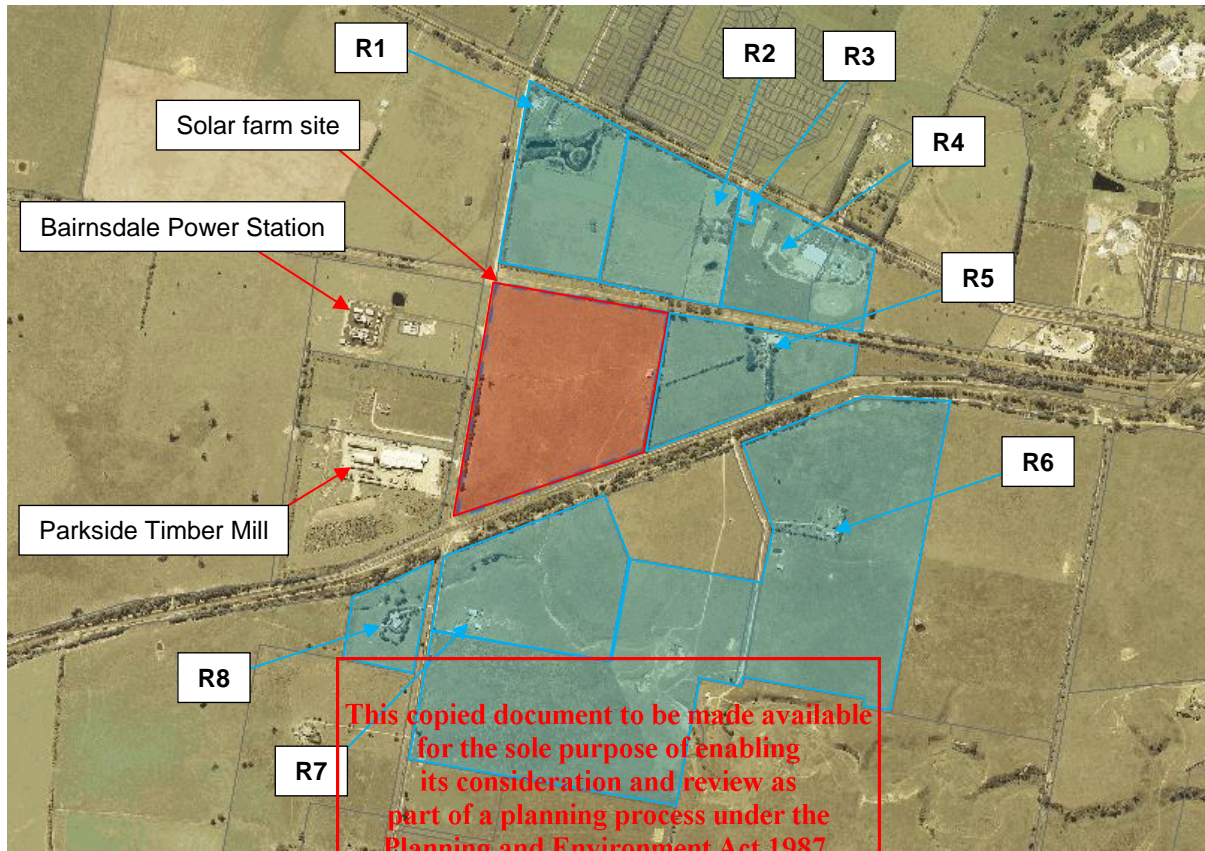


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A.2 AERIAL IMAGE (COURTESY OF GOOGLE MAPS)



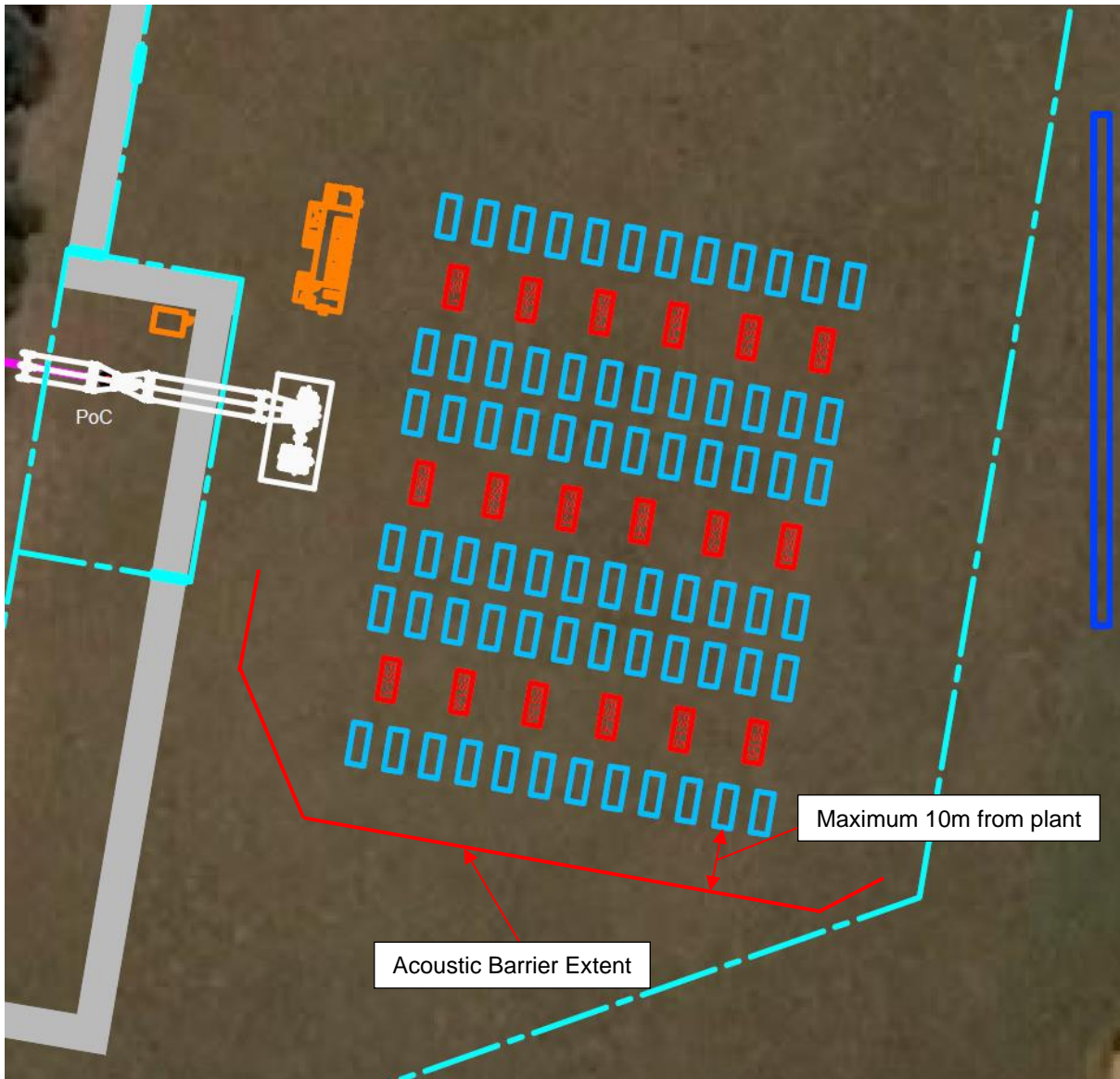
A.3 NEAREST SENSITIVE RECEIVERS



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A.4 DRAWINGS – SOLAR FARM





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