ACCENT ENVIRONMENTAL

Appendix K:
Noise Impact Assessment

Peninsula Solar Farm

EIS Noise and Vibration Assessment

S210230RP1 Revision G

Friday, 26 August 2022

Resonate

Document Information

Project	Peninsula Solar Farm
Client	Accent Environmental Pty Ltd
Report title	EIS Noise and Vibration Assessment
Project Number	S210230

Revision Table

Report revision	Date	Description	Author	Reviewer
0	2 July 2021	Draft – first issue	Raymond Sim	-
A	16 August 2021	Draft – second issue	Raymond Sim	-
B	18 October 2021	Draft – third issue	Raymond Sim	Andrew Parker
C	28 October 2021	Final	Raymond Sim	Andrew Parker
D	9 December 2021	Final – update conclusion	Raymond Sim	Andrew Parker
E	1 February 2022	Final – updated battery storage capacity	Raymond Sim	Andrew Parker
F	15 March 2022	Final – update to name to solar farm	Raymond Sim	Andrew Parker
G	26 August 2022	Final – update project capacity	Raymond Sim	Andrew Parker

Glossary

EPA	Environment Protection Authority
EIS	Environmental Impact Statement
ICNG	Interim Construction Noise Guideline
NML	Noise Management Level
NPI	Noise Policy for Industry
NSW	New South Wales
OOHW	Out-of-Hours Work
PPV	Peak Particle Velocity
Project Area	Refers to the solar farm, switchyard and electrical transmission line
RBL	The RBL is the overall single figure background level representing each assessment period (day, evening and night) over the whole monitoring period (as opposed to over each 24-hour period used for the ABL). This is the level used for assessment purposes. It is the median value of: • All the day assessment background levels over the monitoring period for the day; • All the evening assessment background levels over the monitoring period for the evening; or • All the night assessment background levels over the monitoring period for the night.
RNP	Road Noise Policy
SPL	Sound Pressure Level
SWL	Sound Power Level
TfNSW	Transport for NSW
VC	Generic Vibration Criterion
VDV	Vibration Dose Values
VML	Vibration Management Level

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Table of Contents

1 Introduction

Resonate Consultants Pty Ltd (Resonate) has been engaged by Accent Environmental Pty Ltd (AE) on behalf of Edify Energy Pty Ltd (Edify) to prepare a noise and vibration impact assessment for the proposed Peninsula Solar Farm (the Project).

1.1 Scope and objectives

The purpose of this report is to provide a noise and vibration impact assessment for the Project that addresses the Secretaries Environmental Assessment Requirements for the EIS which includes:

> *Noise – including an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG), operational noise impacts in accordance with the NSW Noise Policy for Industry (2017), cumulative noise impacts (considering other developments in the area), and a draft noise management plan if the assessment shows construction noise is likely to exceed application criteria.*

The objectives of this study were to:

1) Establish noise level design goals (criteria) for environmental noise emissions at potentially noise affected sensitive receivers surrounding the Project site;
2) Determine all acoustically significant plant required for the construction and operation of the solar facility to predict noise at the nearest potentially affected noise sensitive receivers within the vicinity of the solar facility; and
3) From results of the noise predictions, assess noise levels from proposed construction and future operations relative to the noise criteria at the nearest potentially affected receivers.

Specific acoustic terminology is used within this report. An explanation of common terms is included in Appendix A.

1.2 Relevant guidelines

The noise and vibration guidelines for construction and operations are based on the publications managed by the New South Wales (NSW) Environment Protection Authority (EPA). The EPA guidelines applicable to this assessment include:

- Construction Noise – *Interim Construction Noise Guideline* (DECC 2009);
- Construction Road Traffic Noise – *Road Noise* Policy (DECCW 2011); and
- Operational Noise – *Noise Policy for Industry* (EPA 2017).

2 Project Description

2.1 The project

Edify is proposing to construct and operate a solar photovoltaic (PV) energy generation facility with an estimated capacity of up to 80 Megawatts (MW) and associated infrastructure, including grid connection and battery storage of up to 80 MW / 160 MWh (the Project). The proposed project site layouts are presented in Figures 1A to 1C.

The Project is a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011. As an SSD, an application for the Project is required to be submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979*. The NSW Minister for Planning (or the Minister's delegate) is the consent authority.

2.2 Locality

The Project is in the Forbes Shire Council Local Government Area (LGA) of central western New South Wales. The project site is to be located on Lot 441 DP1124885, Lot 442 DP1124885, Lot 9 DP752938 in Paytens Bridge, which is approximately 27 km south-east of Forbes.

There are no residential dwellings within the project site, the nearest dwelling is located approximately 340 m to the west of the western boundary. There are 14 existing receivers identified within 5 km of the site. Paytens Bridge Road runs east-west through the site, which connects onto Lachlan Valley Way approximately 9 km north of the project site.

The site location and nearest receivers are presented in Figure 2.

2.3 Noise sensitive receivers

The closest potentially impacted sensitive receivers identified in the vicinity of the Project area are listed in Table 1 and are shown in Figure 2.

Table 1 Nearest noise sensitive receivers

Receiver ID	Address	Receiver type	Coordinates (MGA 55), meter	
			Easting	Northing
R1	1065 Pineleigh Road, Mulyandry	Residential	614117.83	6286404.87
R2	2140 Paytens Bridge Road, Paytens Bridge	Residential	616018.37	6283517.09
R3	938 Borehams Road, Paytens Bridge	Residential	616639.01	6282151.17
R4	2547 Paytens Bridge Rd, Mulyandry	Residential	612436.45	6282993.81
R5	2014 Paytens Bridge Road, Paytens Bridge	Residential	617212.93	6283547.74
R6	725 Mulyandry Road, Mulyandry	Residential	615636.62	6289675.04
R7	920 Pineleigh Road, Mulyandry	Residential	610329.78	6285103.19
R8	550 Borehams Road, Paytens Bridge	Residential	615391.02	6279209.79
R9	2525 New Grenfell Road, Mulyandry	Residential	610940.93	6280621.17
R10	2125 New Grenfell Road, Mulyandry	Residential	609615.88	6284384.47
R11	2449 New Grenfell Road, Mulyandry	Residential	610343.37	6281054.69

Receiver ID	Address	Receiver type	Coordinates (MGA 55), meter	
			Easting	Northing
R12	63 Cairnhill Road, Paytens Bridge	Residential	619163.40	6288354.40
R13	1482 Paytens Bridge Road, Paytens Bridge	Residential	619843.49	6286397.67
R14	2310 New Grenfell Road, Mulyandry	Residential	609075.60	6282361.34

2.4 Hours of operation

It is proposed that the Peninsula Solar Farm will operate continuously 24 hours a day, 7 days a week, with the solar tracker motors only operating during daylight hours.

2.5 Construction hours

The construction period for the Project is expected to be 12 months. Construction is proposed to occur with the EPA's *Interim Construction Noise Guideline*'s 'standard hours' period. The 'standard hours' period is as follows:

- Monday – Friday: 7 am to 6 pm
- Saturday: 8 am to 1 pm

No work on Sundays and public holidays.

In general, no construction activities will occur over night, on Sundays or public holidays, however exceptions to these hours may be required on limited occasions, for example:

- The delivery of materials as requested by the NSW Police Force or other authorities for safety reasons and/or to minimise disruption to local traffic;
- Augmentation works to the substation, which may require a temporary power outage, such that the impact on power supplies to the local community is minimised; and
- Emergency work to avoid the loss of life, property and/or material harm to the environment.

The local council, surrounding landholders and other relevant authorities will be notified of any exceptions prior to the works being undertaken.

Peninsula Solar Farm FARM

Figure 1A Site Layout (Part 1)

Legend

- Power Station (6 interverts per station)
- Substation location
- Receivers
- The Project

N

0 250 500 750 m

Datum GDA 94, Projection MGA ZONE 55

PROJECT NUMBER	S210230
DRAWN BY	RS
DATE	26 August 2022
CLIENT	Accent Environmental

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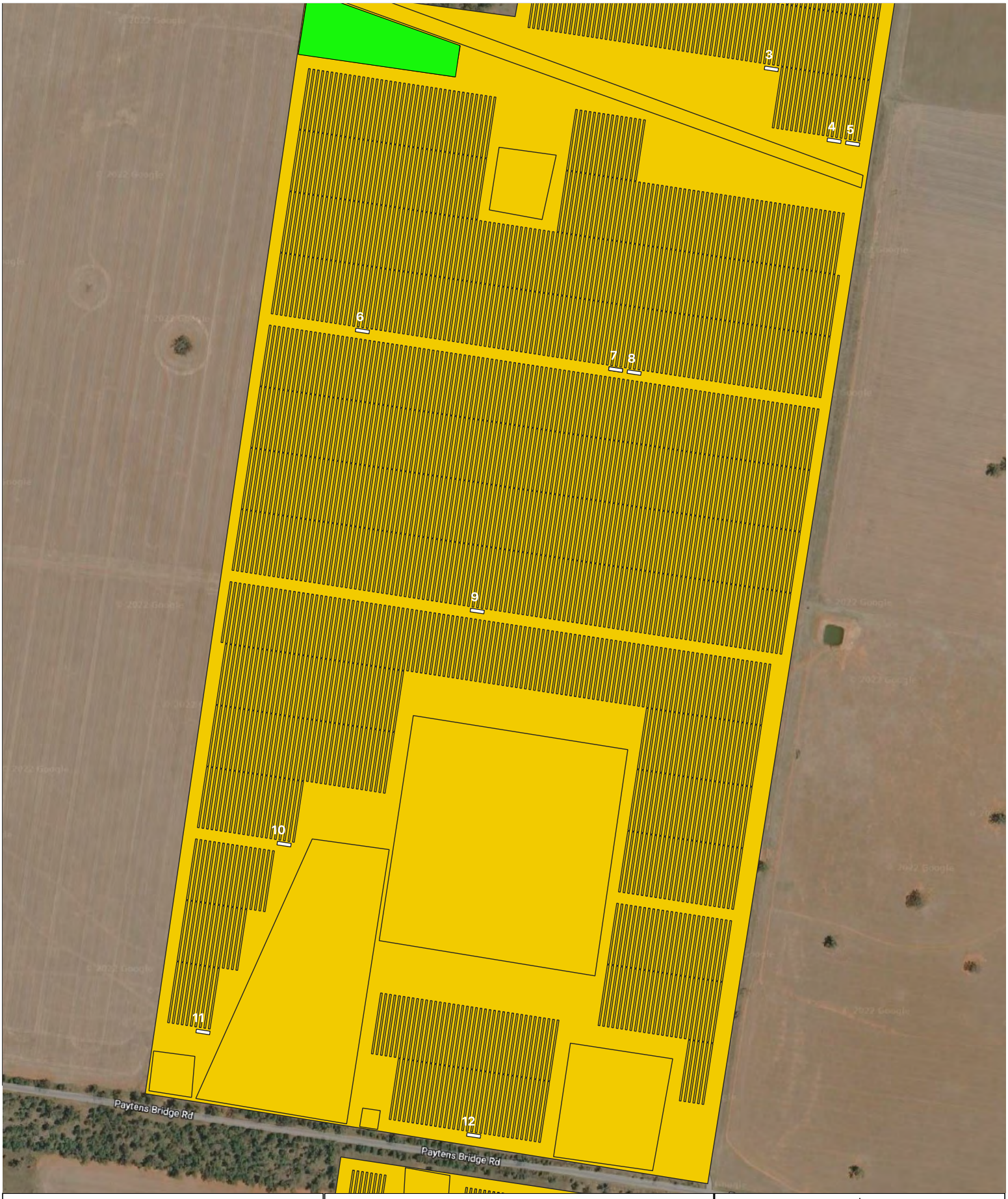


Peninsula Solar Farm FARM

Figure 1B Site Layout (Part 2)

Legend

- Power Station (6 interverts per station)
- Substation location
- Receivers
- The Project

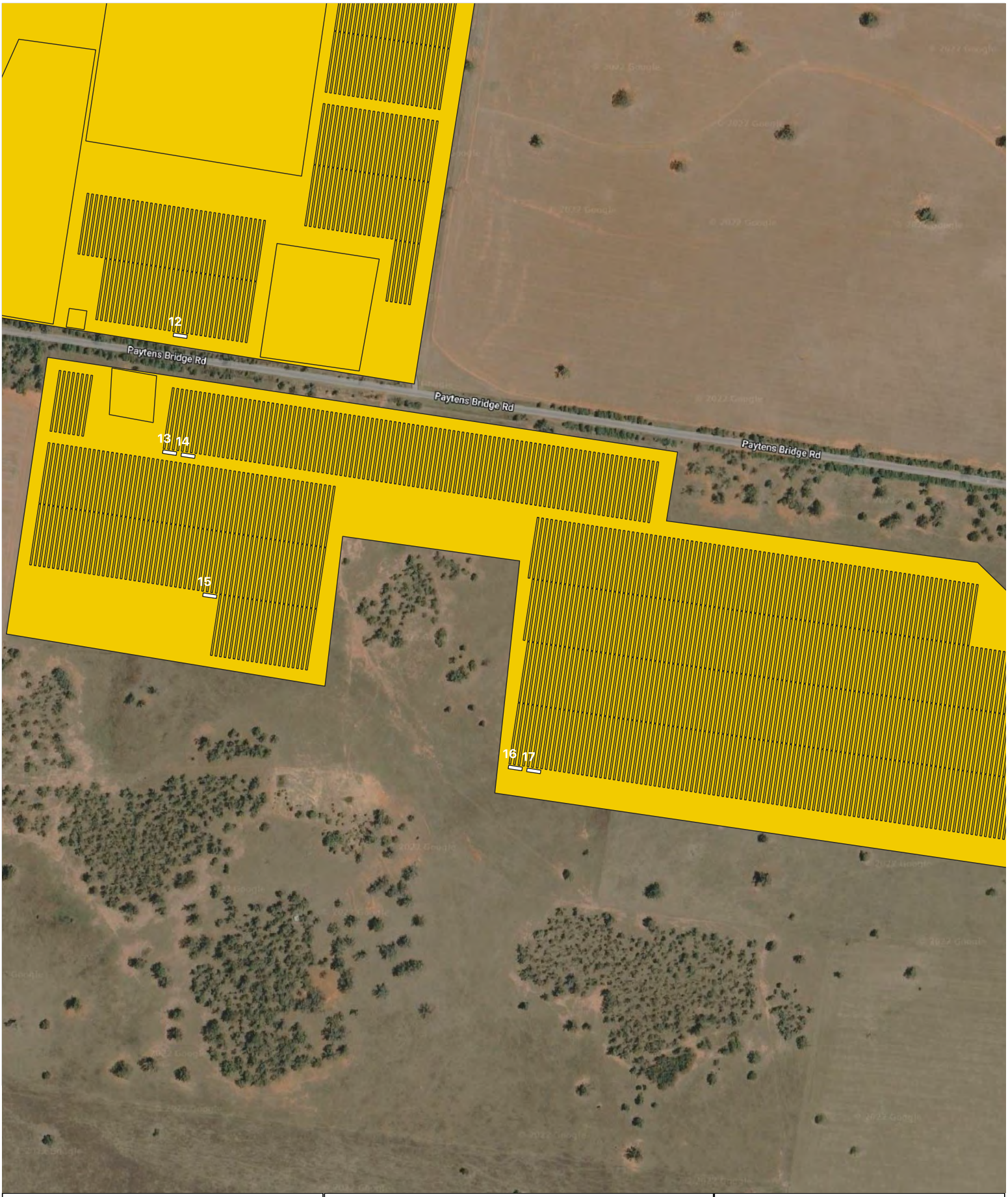
N

0 250 500 750 m

Datum GDA 94, Projection MGA ZONE 55

PROJECT NUMBER	S210230
DRAWN BY	RS
DATE	26 August 2022
CLIENT	Accent Environmental

Resonate



Peninsula Solar Farm FARM

Figure 1C Site Layout (Part 3)

Legend

- Power Station (6 interverts per station)
- Substation location
- Receivers
- The Project

N

0 250 500 750 m

Datum GDA 94, Projection MGA ZONE 55

PROJECT NUMBER	S210230
DRAWN BY	RS
DATE	26 August 2022
CLIENT	Accent Environmental

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Peninsula Solar Farm

FIGURE 2
Project Site Location and Nearest Receivers

Date: 2 August 2021
Client: Accent Environmental Pty Ltd
Prepared by: RS

N

Datum GDA 94, Projection MGA ZONE 55

0 1 2 km

Legend

- Receivers
- The Project

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3 Noise and Vibration Policies, Guidelines and Standards

The construction and operational assessments presented in this report have been conducted with due regard to and in general accordance with the following policy, guidelines and standards.

3.1 Secretary's Environmental Assessment Requirements (SEARs)

The Project SEARs require an Environmental Impact Statement to be prepared which addresses the following requirements in relation to noise:

- An assessment of the construction noise impacts of the development in accordance with the *Interim Construction Noise Guideline* and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria
- An assessment of the operational noise impacts in accordance with the *NSW Noise Policy for Industry*
- An assessment of the cumulative noise impacts (considering other operations in the area)

3.2 NSW Interim Construction Noise Guideline

The NSW Department of Environment and Climate Change – *Interim Construction Noise Guideline* (ICNG), presents an accepted method by which construction noise impacts may be assessed for a range of receptor types for works completed in NSW. It provides a set of recommended standard hours of construction, as reproduced below:

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

The ICNG encourages works to occur within the recommended standard hours of construction unless justification is provided. It focuses on minimising construction noise impacts, rather than only on achieving numeric noise levels, and recognises that some noise from construction sites is inevitable.

The ICNG encourages organisations involved with construction, maintenance or upgrading works (e.g. large scale contractors or Government agencies) to develop their best-practice techniques for managing construction noise and vibration, and implementing feasible and reasonable mitigation measures.

In this case, the ICNG is the suitable guideline document to quantitatively assess potential noise emissions and impacts associated with project construction. The ICNG assessment methodology has been adopted to develop project-specific construction noise management levels (refer Section 4.1), assess potential impacts (refer Section 5) and recommend any necessary mitigation, management measures or provisions for monitoring (refer Section 5).

Table 2 details the construction noise management levels guidance for residential noise sensitive receptors developed in accordance with ICNG. Construction noise management levels for other sensitive receivers are detailed in Table 3.

Table 2 Construction Airborne Noise Management Levels for Residential Receivers

Time of Day	Noise Management Level, $L_{Aeq,\ 15\ minute}$ – dB(A)[1]	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or Public Holidays	Noise affected Rating Background Level (RBL) + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{eq,\ 15\ minute}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be a strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected Rating Background Level (RBL) + 5 dB(A)	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

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

Table 3 Construction Airborne Noise Management Levels for Other Sensitive Receivers

Land use	Where objective applies	Noise Management Level, $L_{Aeq, 15\ minute}$ – dB(A)[1]
Commercial premises	External noise level	70
Industrial premises	External noise level	75

(1) Noise management level applies when receiver is in use only.

(2) Where some nearby receivers may operate as both commercial/industrial and residential land uses, the more stringent NML should be applied. For this project, the residential NMLs are more stringent.

3.3 Noise Policy for Industry

Responsibility for the control of noise emissions in NSW is typically vested in Local Government and the NSW Environment Protection Authority (EPA). The *NSW Noise Policy for Industry* (NPI) and relevant application notes provide a framework and methodology for deriving limit conditions for project consent and environment protection licence conditions.

The NPI is designed for large and complex industrial sources and outlines processes designed to strike a feasible and reasonable balance between the operations of industrial activities and the protection of the community from noise levels that are intrusive or unpleasant.

The NPI measurement and evaluation methodology to quantify existing ambient and background noise levels has been adopted for this assessment, with the baseline values utilised to derive construction noise criteria. The NPI assessment terminology is outlined in more detail in Appendix A of this report.

3.3.1 Assessment of prevailing weather conditions

The NPI 'Fact Sheet D: Accounting for noise-enhancing weather conditions' states:

> Two options are available to a proponent to consider meteorological effects:
>
> 1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F-class temperature inversions with wind speeds up to 2 m/s at night.
>
> Or
>
> 2. Determine the significance of noise enhancing conditions.

Noise emissions from the proposed development have been assessed in accordance with NPI Option 1 using 'noise enhancing' meteorological conditions. This ensures a conservative assessment and where compliance under 'worst-case' conditions are predicted then compliance during other scenarios is expected.

3.3.2 NPI minimum RBLs

In lieu of noise survey data, the NPI minimum recommended RBLs have been adopted for the purpose of this assessment and are presented in Table 4 below. The RBLs are considered representative of typical rural environments with few surrounding noise sources.

Table 4 Minimum RBLs in accordance with the NPI

Minimum Rating Background Noise Level – dB(A)		
Daytime (0700 am – 1800 pm)	**Evening (1800 pm – 2200 pm)**	**Night-time (2200 pm – 0700 am)**
35	30	30

3.3.3 Potential sleep disturbance issues

As stated in the NPI the potential for sleep disturbance from maximum noise level events generated by premises during the night-time period needs to be considered. The term “sleep disturbance” is considered to be both awakenings and disturbance to sleep stages.

To evaluate potential sleep disturbance or awakening issues associated with the construction of the Project the NPI screening method has been adapted as follows. There is limited potential for sleep disturbance or awakening issues to occur, where:

- The predicted project night-time noise level ($L_{eq,\ 15\ minute}$ in dB(A)) at any residential receptor remains below 40 dB(A) (or the prevailing night-time background noise level plus 5 dB(A)), whichever is the greater.
- The predicted project night-time noise level (L_{max} in dB(A)) at any residential receptor remains below 52 dB(A) (or the prevailing night-time background noise level plus 15 dB(A)), whichever is the greater.

These screening method features have been adopted for likely maximum noise level events from construction vehicles associated with the Project.

3.4 NSW Road Noise Policy

The *NSW Road Noise Policy* (RNP) outlines the range of measures needed to minimise road traffic noise and its impacts. It is intended for use by acoustics specialists as well as:

- Road project proponents.
- Determining authorities and regulators involved in the approval and construction of road projects and land use developments that generate additional traffic on existing roads.
- City and transport planners and policymakers dealing with issues such as route corridors, heavy vehicle transport and building codes.

The RNP aims to identify the strategies that address the issue of road traffic noise from existing roads, new road projects, road redevelopment projects and new traffic-generating developments. In this case, the RNP is considered the suitable document to qualitatively assess potential noise emissions and impacts associated with construction traffic using public roads.

The RNP target noise criteria vary based on road type and are dependent on the development being assessed. The criteria values from the RNP were considered in the assessment of potential construction noise impacts. They are used to provide guidance on potential short-term and temporary impacts associated with heavy vehicle haulage and/or other like vehicles that may be required as part of the construction.

3.5 Vibration guidelines and standards

The effects of vibration on buildings can be divided into three main categories: human comfort (annoyance), building damage (cosmetic/structural) and sensitive equipment (scientific/medical). An overview of the applicable standards and guidelines is provided below.

- **Human Comfort (annoyance)**: The NSW Vibration Guideline provides guidance for assessing human exposure (comfort or annoyance issues) to vibration. The publication is based on British Standard (BS 6472–1992) – Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz), dated 1992.

- **Cosmetic and Structural Damage**: There is currently no Australian policy or guideline for assessing the potential for building damage (cosmetic and structural) from vibration. The British Standard BS 7385 Part 2-1993 'Evaluation and measurement for vibration in buildings Part 2' has been considered for project works where applicable. BS 7385 provides safe limit guideline values, below which vibration is considered insufficient to cause structural or cosmetic damage to buildings. If a heritage building or structure is found to be structurally unsound a more conservative standard has been adopted i.e. German Standard DIN4150 Part 3-1999 (DIN4150-3) – Structural Vibration - Effects of Vibration on Structures, dated 1999. DIN4150-3 presents a set of safe limit values below which cosmetic or structural damage is unlikely to occur.

  The NSW Vibration Guideline, BS7385 and DIN 4150-3 criteria vary based on vibration type, receptor type and are dependent on the component frequency of the vibration event. The criteria values from the NSW Vibration Guideline, BS7385 and DIN 4150-3 were considered in the assessment of potential impacts but are not reproduced here.

- **Sensitive Scientific and Medical Equipment**: Some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent objectives than those applicable to human comfort.

  Where manufacturer's data for the identified vibration sensitive scientific and/or medical instruments are not available, generic vibration criterion (VC) curves will be adopted as vibration goals.

  However, as there is no sensitive scientific and medical equipment housed in nearby buildings, the assessment of vibration impacts on sensitive scientific and medical equipment is not relevant and will not be conducted in this study.

Given the distance between the proposed works and the nearest residential noise sensitive receiver, the potential vibration impacts during construction are more concerned with the impact on Human Comfort.

4 Project Specific Noise and Vibration Criteria

4.1 Construction noise and vibration

4.1.1 Construction noise management levels

The project-specific construction “Noise Management Levels” (NML), for works within and outside the recommended standard hours for construction, are presented in Table 5 below.

These NMLs have been established with due regard to the requirements of the ICNG for all identified residential (dwelling) and other sensitive (non-residential) receptors. NML for all periods are provided for completeness despite construction works limited to the recommended standard hours for construction presented in the ICNG.

For residential (dwelling) receptors the NML are based on the RBL values presented in Section 3.3.2.

Table 5 Project Specific Construction Noise Management Levels (NML)

Receiver Type	Construction Noise Management Levels, $L_{eq,\ 15\ minute}$, dB(A)				High Noise Affected, $L_{eq,\ 15\ minute}$, dB(A)
	Standard Hours	Out-of-Hours			
	Day	Day	Evening	Night	
Residential	45	40	35	35	75
Industrial	75	75	75	75	-

Construction activities would only be carried out during daytime period. Therefore, construction noise impacts will only be assessed against the daytime NMLs.

4.1.2 Construction vibration management levels

Impacts from vibration can be considered both in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage). Of these considerations, the human comfort limits are the most stringent. Therefore, for occupied buildings, if compliance with human comfort limits are achieved, it will follow that compliance will be achieved with the building damage objectives.

Human Comfort

The NSW Vibration Guideline provides guidance for assessing human exposure to vibration. These documents are based on *British Standard (BS 6472–1992) – Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz) dated 1992*. The vibration dose values recommended in BS 6472-1992 for which various levels of adverse comment from occupants may be expected are presented in Table 6.

Table 6 Human Comfort

Location	Assessment Period	Preferred Values		Maximum Values	
		z axis	x and y axes	z axis	x and y axes
Continuous Vibration (m/s^2)					
Critical Areas	Daytime or Night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Daytime or Night-time	0.020	0.014	0.040	0.028
Workshops	Daytime or Night-time	0.040	0.029	0.080	0.058
Impulsive Vibration (m/s^2)					
Critical Areas	Daytime or Night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Daytime or Night-time	0.64	0.46	1.28	0.92
Workshops	Daytime or Night-time	0.64	0.46	1.28	0.92
Intermittent Vibration (m/s$^{1.75}$)					
Critical Areas	Daytime or Night-time	0.10		0.20	
Residences	Daytime	0.20		0.40	
	Night-time	0.13		0.26	
Offices, schools, educational institutions and places of worship	Daytime or Night-time	0.40		0.80	
Workshops	Daytime or Night-time	0.80		1.60	

(1) Daytime is 7am-10pm and Night-time is 10pm-7am.

(2) For continuous and impulsive vibration, the preferred and maximum values are weighted acceleration values (Wg for z-axis and Wd for x and y-axis)

(3) For intermittent vibration, the preferred and maximum values are Vibration Dose Values (VDVs), based on the weighted acceleration values

Building Damage

German Standard DIN 4150-3-1999 Structural Vibration – Part 3 Effects of vibration on structures provides methods for evaluating the effects of vibration on structures in the absence of an Australian Standard.

The recommended limits (guide values) from DIN 4150 for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented in Table 7.

Table 7 Guideline Vibration Values for Short Term Vibration on Structures (mm/s)

Type of Building	Guideline values for velocity (mm/s)			
	1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	Vibration at horizontal plane of highest floor at all frequencies
Commercial and Industrial Building	20	20-40	40-50	40
Dwellings and buildings of similar occupancy or design	5	5-15	15-20	15
Structures that, because of their particular sensitivity to vibration cannot be classified under lines 1 and 2 and are of great intrinsic value	3	3-8	8-10	8

4.2 Operational noise

The *Noise Policy for Industry* (NPI) was released in 2017 and sets out the NSW Environment Protection Authority's (EPA) requirements for the assessment and management of noise from industry in NSW.

4.2.1 Trigger levels

The NPI describes 'trigger levels' which indicate the noise level at which feasible and reasonable noise management measures should be considered. Two forms of noise criteria are provided – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses.

- The intrusiveness of an industrial noise source is generally considered acceptable if the L_{Aeq} noise level of the source, measured over a period of 15 minutes, does not exceed the background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended amenity levels specified in the NPI for that particular land use.

For this assessment, the area surrounding the proposal is considered to be 'rural'.

4.2.2 Project specific noise criteria

The criteria for industrial noise generated by the facility are provided in Table 8. The Project Noise Trigger Level (PNTL) is the lowest value of the intrusiveness or amenity noise level for each period and are shown below in bold.

Table 8 NPI noise criteria (rural amenity area)

Receiver	Period	Noise level – dB(A)			
		Recommended amenity noise level L_{eq}	Assumed background noise level	Project noise trigger level $L_{eq(15minute)}$	
			RBL[1]	Intrusiveness	Amenity[2],[3]
Residential	Daytime	50	35[4]	**40**	53
	Evening	45	30[4]	**35**	48
	Night-time	40	30[4]	**35**	43
Industrial	When in use	70	n/a	n/a	**73**

(1) RBL = Rating Background Level

(2) The recommended amenity noise level has been used as the Project amenity noise level as there are no other industries present or likely to be introduced

(3) The Project amenity noise level has been converted to a 15-minute level by 3 dB

(4) The minimum RBL as per the NPI has been adopted

4.2.3 Annoying noise characteristics corrections

Sources of industrial noise can cause greater annoyance where they contain certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content. The NPI provides the following modifying factors, shown in Table 9, which are to be applied to the predicted receiver noise levels.

Table 9 NPI modifying factor corrections

Factor	Assessment / measurement	When to apply	Correction[1]
Tonal noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (ISO1996.2-2007 – Annex D).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz	5 dB[2]

Factor	Assessment / measurement	When to apply	Correction(1)
Low-frequency noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10– 160 Hz	Measure / assess source contribution C and A weighted $L_{eq,t}$ levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: • where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period • where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2 dB(A) positive adjustment applies for the daytime period.	2 or 5 dB(2)
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level	The source noise heard at the receiver varies by more than 5 dB and the intermittent nature of the noise is clearly audible.	5 dB

(1) Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.

(2) Where a source emits tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

(3) Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.

4.2.4 Sleep disturbance criteria

As the construction works will only be undertaken during the day period there will be no sleep disturbance or night time noise impacts as a result of these works.

Similarly, during normal operation of the solar farm there will be minimal noise impacts during the night period as the associated infrastructure will be under minimum / no load. That said, for a more conservative assessment only operational noise of the inverters and transformers, and maintenance activities from the solar farm will be assessed against the sleep disturbance and night time noise criteria. Noise from the tracker motors will not be assessed to the sleep disturbance and night time noise criteria.

In accordance with the NPI, the sleep disturbance noise criteria for assessing the Project are presented in Table 10 below.

Table 10 Sleep disturbance Noise Criteria

Receiver Type	$L_{eq,\ 15minute}$ dB(A)	L_{max} dB(A)
Residential receivers	40	52

4.3 Road traffic noise

The RNP provides guidance, criteria and procedures for assessing noise impacts from existing, new and redeveloped roads and traffic generating developments. The assessment of road traffic noise impacts on public roads is assessed under the RNP.

Road traffic generated by the operation of the Project will not generate additional traffic on existing surrounding public roads, and as such, there will be no increase to the existing road traffic. Hence, road traffic noise impact due to operational noise will not be assessed in this study.

The construction of the Project will generate additional traffic on surrounding public roads, such as construction worker car movements and delivery and construction vehicle movements. Once construction is complete, project traffic is expected to return to levels similar to the current situation.

The RNP details a number of noise assessment criteria for various road categories and land uses. Road access to the facility will be via Paytens Bridge Road from Lachlan Valley Way which is a NSW state highway. Paytens Bridge Road would be classified as a local road and Lachlan Valley Way would be classified as a freeway.

The Application Notes for the RNP state that;

> *'for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.*'

If road traffic noise during the Project construction is within 2 dB(A) of current levels then the objectives of the RNP are met and no specific mitigation measures are required. Where the Project road traffic noise levels exceed 2 dB(A) of current levels than the consideration should be given to the actual noise levels associated with construction traffic and whether or not these levels comply with the RNP criteria as presented in Table 11.

Table 11 RNP Residential Road Traffic Noise Criteria

Road Category	Type of Project/Land Use	Assessment Criteria(1) – dB(A)	
		Day 7am to 10pm	Night 10pm to 7am
Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)
Local roads	Existing residences affected by additional	$L_{Aeq,1hr}$ 55 (external)	$L_{Aeq,1hr}$ 50 (external)

(1) The assessment criteria for external noise levels apply at 1 metre from the facade of any affected residential receiver

5 Construction Noise and Vibration Assessment

This section details the assessment of the construction noise and vibration impacts from the Project. Construction noise impacts predicted at nearest residential receivers have been assessed against the adopted ICNG noise management levels. Road traffic noise from the construction of the Project have been assessed against the RNP noise criteria.

5.1 Construction noise

5.1.1 Construction stages

To assess the potential noise and vibration impacts during construction, a number of scenarios comprising typical plant and equipment have been developed based on Resonate's past project experiences. These are summarised in Table 11.

It is understood that all construction works are proposed to be carried out during standard daytime periods (7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm on Saturdays).

Table 12 Construction stages and equipment sound power levels

Stage	Scenario	Equipment	No. of plant per 15-minute period	Individual equipment maximum L_{eq} sound power level – dB(A)
1	Site preparation, clearing & demolition	Excavator	2	107
		Bulldozer 28 tonne	1	107
		Chainsaw	2	117(1),(2)
		Tree mulcher	1	115
		Light vehicle	2	94
		Dump truck	1	106
2	Establish site compound, access roads & delivery of materials	Hand tools	2	94
		Excavator	2	107
		Light vehicle	3	94
		Delivery trucks / semi-trailers	3	100(2)
		Bulldozer 28 tonne	1	107
		DPU / plate compactor	2	103
		Grader	1	107
		Roller 18 tonne	1	102
		Asphalt paver & tipper lorry	1	108
		Bobcat	1	104
		Telehandler	2	105

Stage	Scenario	Equipment	No. of plant per 15-minute period	Individual equipment maximum L_{eq} sound power level – dB(A)
		Mobile crane	1	106
3	Installation of foundation for substation and BESS(s)	Piling rig	1	114(1),(2)
		Bobcat	1	104
		Crane	2	106
		Excavator	2	107
		Concrete vibrating needle	2	103
		Concrete agitator truck (discharging)	1	103
		Concrete agitator (low to mid revs)	1	107
4	Installation of underground cabling	Vermeer trencher	2	105
		Cable laying trailer & tractor	2	103
		Loader	2	110
5	Assembly of panel frames, mounts & transformer units	Telehandler	2	105
		Generator	2	99
		Compressor	1	93
		Hand tools	2	94
		Ratchet gun	4	94
		Mobile crane	1	106
6	Site rehabilitation / removal of temporary construction facility	Light vehicle	2	98
		Excavator	2	106
		Bulldozer 28 tonne	1	107
		Loader	1	110
		Dump truck	2	106
		Semi-trailer	1	104

(1) Denotes “annoying” item of equipment as defined in the ICNG (i.e. contains characteristics such as impulsiveness, tonality etc.), and as such includes a +5 dB penalty adjustment to predictions.

(2) Overall SWL assumes a maximum duration of 7.5 minutes operation in any 15 minute period.

5.1.2 Construction noise assessment methodology

Prediction of construction noise impacts from the Project has been undertaken through the use of the SoundPLAN noise propagation modelling software (version 8.2).

The most significant factors in determining the level of noise received from construction activities are the receiver’s distance from the Project site, shielding, ground absorption and source heights. The parameters used and values adopted in the noise modelling are presented in Table 13 below.

Table 13 Construction noise modelling parameters

Parameter	Input data
Receivers	• Receivers provided by project team in shapefile format and imported into SoundPLAN • Receivers have been modelled as point receivers • Height of receivers modelled as 1.5 m
Terrain	1 metre ground contours from Geoscience Australia.
Ground surface / absorption	The agricultural land surrounding the site has been conservatively modelled with a ground cover factor of 0.5 representative of 'mixed' ground.
Source heights	Construction plant and equipment heights are modelled to be 2 m above ground
Sources	All equipment has been modelled as point sources and all equipment have been modelled to operate simultaneously.
SoundPLAN module	ISO 9613 algorithm industrial module
Met condition	Neutral meteorological condition has been modelled as construction activities will only be conducted during standard daytime period.

5.1.3 Predicted construction noise levels

Appendix B presents the predicted noise levels associated with each stage of works along with a comparison with the relevant construction noise management level (refer Table 5). The assessment is limited to the identified receivers within an approximate 5 km radius from the Project site boundaries (refer to Figure 2). Predicted noise levels have been based on continuous operation of the noise sources identified for each construction stage. Predictions are therefore considered to represent the highest potential noise impacts. The predicted noise levels presented in Appendix B would typically be short-term, lasting for the duration of the construction period when works are conducted in the vicinity of each receiver.

The results presented in Appendix B indicate that construction activities would not exceed the construction noise management levels at most surrounding residential receivers except receiver R1. The predicted noise levels also indicate that no surrounding residences would be highly noise affected by the construction activities.

The worst case predicted construction noise level is 46 dB(A) at receiver R1 (refer to Figure 2) during Stage 1 "Site preparation, clearing & demolition" activities. The predicted 46 dB(A) level at receiver R1 exceeds the standard hours NML by 1 dB(A). This is the only predicted exceedance. The predicted noise impacts from Stage 1 construction activities have been assessed to achieve compliance with the NMLs at all other receivers. Stages 2 to 6 construction activities noise have been predicted to be well within the NMLs at all receivers.

Based on the assessed minor exceedance of potential construction activities at receiver R1, noise management and mitigation measures are provided in Section 5.4.

5.2 Construction road traffic noise

The proposed construction traffic is anticipated to travel along Paytens Bridge Road before accessing Lachlan Valley Way.

As a worst case scenario, Table 14 indicates the existing and proposed construction traffic for these roads during their applicable periods appropriate to each classification of road. The Transport for NSW's (TfNSW) Road Traffic Noise Estimator has been used to undertake construction road traffic noise predictions. Screenshots of the calculation predictions are shown in Appendix C.

Table 14 Construction road traffic noise predictions

Road name	Road type	Daytime criteria dB(A)	Period	Existing traffic volume (daytime 7 am to 10 pm)		Construction traffic volume (daytime 7 am to 10 pm)		Predicted noise level – dB(A)	
				Light	Heavy	Light	Heavy	Existing	Future
Paytens Bridge Road	Local Road	55	1 hour	29(1)	5(1)	3(1)	1(1)	49	49
Lachlan Valley Way	Arterial Road	60	15 hour	833(2)	136(2)	29(1)	10(1)	52	52

(1) Traffic volume derived from project's Traffic Impact Assessment report prepared by Impact Traffic Engineering.

(2) Traffic volume extracted from Hilltops Freight and Transport Study prepared by PSA Consulting Australia, document reference 0864, dated 3 May 2019

From the traffic noise predictions in Table 14 above, the proposed construction traffic along Paytens Bridge Road during the worst case 1-hour traffic flows and Lachlan Valley Way during the 15-hour daytime period would not increase the existing traffic noise levels by more than 2 dB at the nearest residential buildings.

Based on the above, construction road traffic noise associated with the Project are unlikely to have an adverse impact on surrounding receivers.

5.3 Construction vibration

No vibration intensive activities are proposed to occur near any receiver. Hence, no impacts are expected to occur given the significant distance to the nearest receiver building, which is more than 300 m from the site boundary.

The Roads and Maritime Services' *Construction Noise and Vibration Guideline* provides guidance for safe working distances for vibration-intensive activities. Vibration levels for typical construction activities have been published along with the safe working distances for cosmetic damage and human comfort.

Table 15 presents the recommended safe working distances for vibratory roller and jackhammer that may be used the construction of the project.

Table 15 – Recommended safe working distances for vibration intensive plant

Plant Item	Rating/Description	Safe Working Distance – Cosmetic Damage(1)	Safe Working Distance – Human Comfort
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m

(1) Based on residential structures.

The minimum working distances are indicative and will vary depending on the particular item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions. Vibration monitoring is recommended to confirm the minimum working distances at specific sites and once plant selection has been confirmed.

5.4 Construction noise management and mitigation measures

Without mitigation, noise levels from Stage 1 construction activities have been predicted to marginally exceed the noise management level nominated in the guidelines at receiver R1.

This section details pre-construction and construction phase management and mitigation measures designed to reduce and control potential noise levels to where feasible to achieve the adopted noise management levels at nearest receivers. The measures recommended have been developed applying the predicted impacts, adjacent receivers and land use and duration of works. The management measures have been informed from guidance provided in the ICNG which promotes principles of best management practice and community notification of likely noise impacts.

It will be important for the contractor to undertake all reasonable and feasible measures to reduce noise impacts and minimise impact potential through programming works to minimise duration and liaise with affected landowners and local communities throughout the construction program. All Contractors commissioned by the client to undertaken construction works associated with the Project are recommended to adhere to all noise management and mitigation measures recommended.

Construction works should adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions. The principles and proactive noise management measures presented in Table 16 are to be considered for implementation.

Table 16 Recommended construction noise management and mitigation measures

Construction phase	Recommended measure
Planning	Construction works are to be undertaken during the ICNG standard daytime construction hours (i.e. 7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm on Saturdays)
	Where possible, consider the application of alternative, low-impact construction techniques. For example, Ripping or cutting/sawing and grinding instead of rock hammering, or vacuum excavation instead of small scale earthworks
	A Construction Noise and Vibration Management Plan (CNVMP) should be developed to manage noise and vibration issues during construction.
Easement layout	Easement entry and exit points will be located as far as possible from sensitive receivers, taking into account the importance of safe access.
	Trucks will not queue up outside residential properties. No trucks will arrive on site or be permitted to queue near sensitive receivers prior to the 7:00 am start time unless required by road safety considerations.
	Training will be provided to all project personnel, including relevant sub-contractors on noise and vibration requirements from this plan through inductions, toolboxes and targeted awareness training.
	All relevant staff and sub-contractors will be informed of areas and work practises where potential noise impacts have been identified.
Training	Keep horn signals between drivers to a minimum.
	Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.
	Truck drivers will limit compression braking as far as practicable.
Contractor management	Switch off plant (e.g. vehicles and generators) when not in use.
Noise source mitigation	Dampen or line metal trays as necessary.
	Shut down or throttle down machinery when not in operation.
	Avoid simultaneous operation of noisy plant within discernible range of a sensitive receiver
	Ensure equipment is operated in the correct manner including replacement of engine covers, repair of defective silencing equipment, tightening of rattling components, repair of leakages in compressed air lines and shutting down equipment not in use.
	Direct noise sources such as vent outlets, generators, etc. will be located and orientated away from the residences
	Plant will be fitted with noise control devices, where practicable, including acoustic lining of engine bays and air intake / discharge silencers
	Ensure that all doors/hatches are shut during operation of plant and equipment.
	Check hatches/enclosures regularly to ensure that seals are in good working order and doors close properly against seals.
	Avoid dropping materials from height.

Construction phase	Recommended measure
	Use residential-grade mufflers on plant.
	Use dampened bits on impulsive tools such as jackhammers to avoid 'ringing' noise.
	Ensure truck movements are kept to a minimum, i.e. that trucks are fully loaded on each trip.
	Use temporary screening around immobile plant. Acoustic screens may be constructed from either a layer of 10 kg/m^2 loaded vinyl acoustic curtain (product name Wavebar from Pyrotek Noise Control) or minimum 9 mm thick plywood hoarding. Gaps at joints of the acoustic screen are to be sealed by overlapping the loaded vinyl or plywood, or with silicon mastic on the plywood hoarding.
Community consultation	Provide at least five and not more than 14 days' notice to affected receivers prior to starting works.
	Provide signage detailing who is undertaking the works and a 24-hour contact number.
	Where there are complaints about noise from an identified work activity, review and implement, where feasible and reasonable, action additional control measures.
	Consult with adjacent utility owners regarding the minimal risk of vibration impacts associated with the proposal.
	In consultation with the community, preference may be given to avoiding cumulative impacts by avoiding the con-current completion of phases of construction. Alternatively, impacted receivers may prefer a shorter works duration where this requires con-current completion of construction phases.

6 Operational Noise and Vibration Assessment

This section details the assessment of the operational noise and vibration impacts from the Project. Operational noise impacts predicted at nearest residential receivers have been assessed against the adopted NPI noise criteria.

6.1 Solar farm site operational noise

6.1.1 Solar farm site operations

The main noise sources associated with the operation of the solar farm consists of the following:

- Power stations – There are 17 power stations within the site and each station would have a bank of 6 inverters. Therefore, there would be a total 102 inverters on the site. Edify Energy has provided sound data from a leading solar and battery inverter supplier, which currently has one of the loudest equipment in the market. The sound data provided was used in this assessment and is considered to be a conservative approach.
- Tracker motors.
- Main transformer located in substation.
- Maintenance activities: A limited number of up to 10 staff members will be on site to operate and maintain the solar plant equipment. Maintenance activities are expected to involve low noise generating manual hand tools, be infrequent and be conducted on an as-needs basis during daytime hours.

The L_{Aeq} sound power levels of plant and equipment from the proposed operations are given in Table 17 below.

Table 17 Operational equipment sound power levels

Equipment	Number of equipment	Sound power level Leq – dB(A) (Individual equipment)
Power station (number of inverters)	17 (102)(1)	95(2)
Solar tracker panel motor	6,250	78
Transformer in substation	1	100
Maintenance activities, includes trucks travelling along the access road within the site	-	103(3)

(1) There are 17 power stations located within the solar farm site, and each power station will have a bank of 6 inverters.

(2) This is the sound power level of each inverter. This sound power level is similar to a Tesla Megapack.

(3) This is the L_{Amax} level of a truck passby.

During the evening and night-time periods the tracker panel motors will not be operating and there will be no maintenance activities. Hence, for the evening and night-time operational assessments, only the power stations and transformer would be assessed against the NPI evening and night-time noise criteria. The noise emissions from power stations and transformers are continuous and do not emit peak noise levels for an instant or very short time period. Therefore, the operational noise from the Project will only be assessed against the sleep disturbance L_{Aeq} criterion and not the L_{Amax} criterion.

Noise from the tracker motors and transformer can be tonal in nature. Therefore, a 5 dB penalty would be applied to the predicted noise levels at the receivers to account for tonality of the inverters, tracker motors and transformers in accordance with Table C.1 of the NPI.

6.1.2 Methodology

In order to determine the potential acoustical impact of the Project, a computer model incorporating all significant noise sources; the closest potentially affected residential properties, and the intervening terrain has been prepared.

The computer model was prepared using the SoundPLAN noise propagation modelling software (Version 8.2) Industrial Module which allows the use of various internationally recognised noise prediction algorithms. The CONCAWE algorithm, which is suitable for the assessment of large industrial plants, has been selected for this assessment which enables meteorological influences to be assessed over large distances.

The parameters used and values adopted in the noise modelling are presented in Table 18 below.

Table 18 Operational noise modelling parameters

Parameter	Input data
Receivers	• Receivers provided by project team in shapefile format and imported into SoundPLAN • Receivers have been modelled as point receivers • Height of receivers modelled as 1.5 m
Terrain	1 m ground contours from Geoscience Australia.
Ground surface / absorption	The agricultural land surrounding the site has been conservatively modelled with a ground cover factor of 0.5 representative of 'mixed' ground.
Sources	• Noise emission sources associated with the Project as detailed in Table 17. • All noise emitting equipment has been modelled to operate simultaneously. • All equipment has been modelled as point sources at a height of 2.5 m.
SoundPLAN module	CONCAWE industrial module
Meteorological condition	Neutral meteorological conditions for all periods. • Pasquill category D • No wind • 70% relative humidity • 20°C temperature • 1013 mbar air pressure
	Adverse meteorological conditions for daytime and evening periods. • Pasquill category D • 3 m/s • 70% relative humidity • 20°C temperature • 1013 mbar air pressure
	Adverse (temperature inversion) meteorological conditions for night-time period. • Pasquill category F • 2 m/s • 70% relative humidity • 10°C temperature • 1013 mbar air pressure
Time correction	As the solar tracker motor will only operate to track the sun over the period of a day, the operational noise assessment assumes the tracker motor will operate no more than 1-minute out of every 15-minute. A time correction for this has been applied in the noise model. All other equipment will operate for the full 15-minute period.

6.1.3 Predicted operational noise levels

The predicted operational noise levels for the day, evening and night-time periods are presented in Appendix D and the operational noise contours are presented in Appendix E.

The highest predicted operational noise levels during neutral weather condition are:

- 35 dB(A) during the daytime period at receiver R1; and
- 32 dB(A) during the evening/night-time periods also at receiver R1.

The highest predicted operational noise levels during adverse weather conditions are:

- 40 dB(A) during the daytime period at receiver R1; and
- 39 dB(A) during the evening/night-time periods also at receiver R1.

6.1.4 Discussion

The predicted daytime, evening and night-time noise levels show that the operation of the Project during neutral weather condition are expected to comply with the NPI noise criteria at all surrounding receivers.

During adverse weather conditions the daytime operational noise have been predicted to achieve compliance with the daytime noise criteria at all surrounding receivers. Evening/night-time operations during temperature inversion condition have been to predicted to comply with the evening/night-time criteria at receivers R2 to R14 but exceed the criteria at receiver R1. The exceedance of the evening/night-time criteria at receiver R1 has been predicted to be 4 dB(A).

The night-time operational noise levels have been predicted to comply with the sleep disturbance L_{Aeq} criterion at all surrounding residential receivers during neutral weather and temperature inversion conditions.

Based on the assessed exceedance of the operational noise during night-time adverse weather conditions mitigation options have been developed for the Project and are presented in Section 6.4.

6.2 Operational road traffic noise

The Project is expected to introduce two additional car movements per day associated with the general operation of the facility. The additional traffic associated with the Project is not predicted to exceed the RNP based criteria at the nearest receivers along Paytens Bridge Road and Lachlan Valley Way.

Table 19 indicates the existing and proposed operational traffic for these roads during their applicable periods appropriate to each classification of road. The TfNSW's Road Traffic Noise Estimator has been used to undertake operational road traffic noise predictions. Screenshots of the calculation predictions are shown in Appendix H.

Table 19 Operational road traffic noise predictions

Road name	Road type	Daytime criteria dB(A)	Period	Existing traffic volume (daytime 7 am to 10 pm)		Operational traffic volume (daytime 7 am to 10 pm)		Predicted noise level – dB(A)	
				Light	Heavy	Light	Heavy	Existing	Future
Paytens Bridge Road	Local Road	55	1 hour	29(1)	5(1)	1(1)	-(1)	49	49
Lachlan Valley Way	Arterial Road	60	15 hour	833(2)	136(2)	2(1)	-(1)	52	52

(1) Traffic volume derived from project's Traffic Impact Assessment report prepared by Impact Traffic Engineering.

(2) Traffic volume extracted from Hilltops Freight and Transport Study prepared by PSA Consulting Australia, document reference 0864, dated 3 May 2019

From the traffic noise predictions in Table 19, the proposed operational road traffic along Paytens Bridge Road during the worst case 1-hour traffic flows and Lachlan Valley Way during the 15-hour daytime period would not increase the existing traffic noise levels by more than 2 dB at the nearest residential buildings.

Based on the above, operational road traffic noise associated with the Project are unlikely to have an adverse impact on surrounding receivers.

6.3 Operational vibration

No vibration intensive plant/equipment or activities are proposed to occur during standard operation onsite, therefore no vibration impacts are anticipated.

6.4 Recommended operational noise mitigation measures

Based on the predicted exceedance of the evening/night-time operational noise at receiver R1, the following noise mitigation measures are recommended to be implemented to ensure that the Project operates in a noise compliant manner:

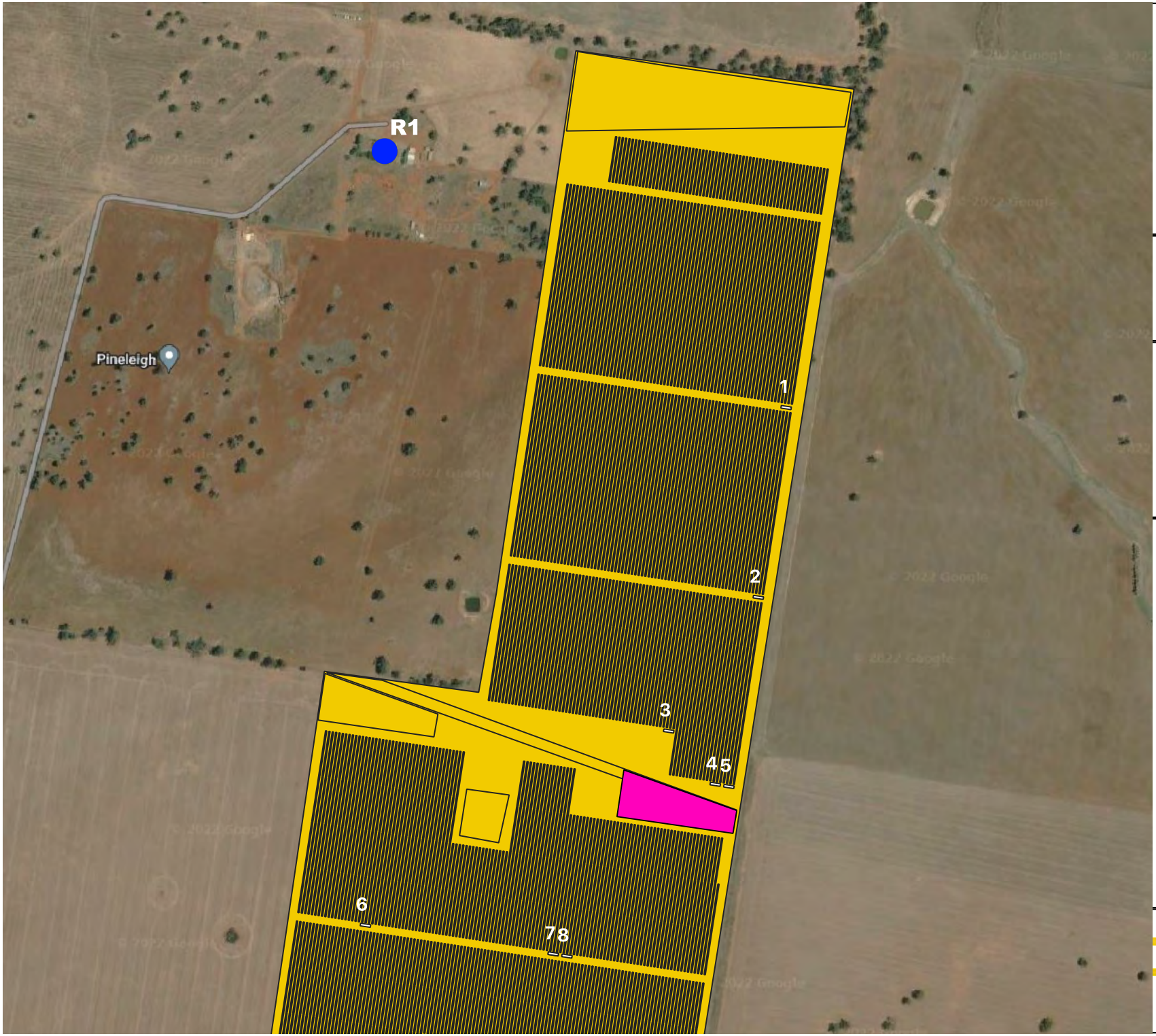
- Relocate the substation from the western boundary to the eastern boundary of the site as shown in Figure 3.
- Power stations (inverters) should not be located within 840 m from receiver R1 and within 1.1 km from receiver R2.

6.5 Predicted operational noise levels with noise mitigation measures

The operational noise of the Project with the above recommended noise mitigation measures implemented have been predicted and are presented in Appendix F. Only operational noise levels during adverse weather conditions have been predicted as exceedances of the noise criteria only occur during adverse weather conditions.

From the predicted noise levels presented in Appendix F, the operational noise of the Project with the implementation of the recommended noise mitigation measures will comply with the NPI noise criteria at all surrounding residential receivers.

Predicted operational noise contours of the Project with the implementation of the recommended noise mitigation measures are presented in Appendix G.



Peninsula Solar Farm

Figure 3
Recommended new substation location

Date: 26 August 2022
Client: Accent Environmental Pty Ltd
Prepared by: RS

N

Datum GDA 94, Projection MGA ZONE 55

0 250 500 m

Legend

- Proposed new substation location
- Power Station
- Receivers
- The Project

Resonate

7 Conclusion

This report presents the results of the assessment of the potential noise impacts associated with the Project. This assessment has been carried out in accordance with NSW regulatory requirements identified in the SEARs issued for the development.

7.1 Construction noise and vibration

The construction noise and vibration assessment was undertaken using plant and equipment representative of the likely methodologies used to construct solar farm. The assessment identifies the following regarding the Project's construction activities:

- construction activities would not exceed the construction noise management levels at most surrounding residential receivers except receiver R1.
- the exceedance at receiver R1 is marginal, i.e. 1 dB exceedance, and is only impacted by Stage 1 construction activities.
- predicted noise levels indicate that no surrounding residences would be highly noise affected by the construction activities.
- due to the marginal exceedance at receiver R1, construction noise management and mitigation measures have been recommended in this report and should be considered for implementation.
- no vibration impacts are expected to occur given the significant distance to the nearest receiver building, which is more than 300 m from the site boundary.
- construction road traffic noise has been assessed to comply with the RNP base noise criteria and is not expected to increase from the exiting road traffic noise levels by more than 2 dB.

7.2 Operational noise

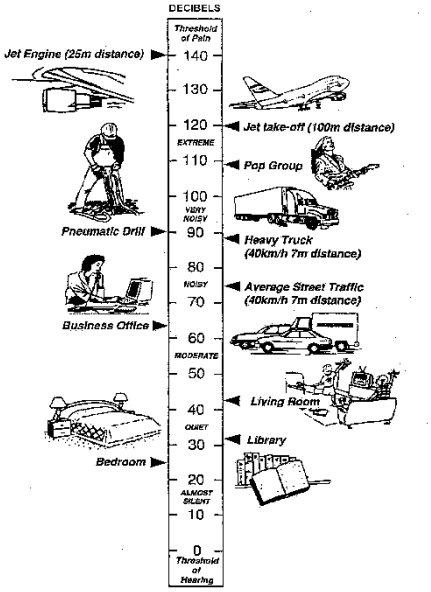
An operational noise and vibration assessment associated with the Project was conducted. The assessment identifies the following regarding the Project's operational noise and vibration:

- the predicted noise levels show that the operation of the Project during neutral weather condition are expected to comply with the NPI noise criteria at all surrounding receivers.
- during daytime adverse weather condition, the operational noise levels have been predicted to comply with the daytime noise criteria at all receivers.
- during evening/night-time adverse weather condition, the operational noise levels have been predicted to comply with the evening/night-time noise criteria at most receivers except receiver R1.
- due to the predicted evening/night-time operational noise exceedance at receiver R1, operational noise mitigation measures have been developed and recommended in this report.
- operational noise mitigation measures would consist of:
  - relocate the substation from the western boundary to the eastern boundary of the site as shown in Figure 3.
  - Power stations (inverters) should not be located within 840 m from receiver R1 and within 1.1 km from receiver R2.
- no vibration intensive plant/equipment or activities are proposed to occur during standard operation onsite, therefore no vibration impacts are anticipated.
- additional traffic associated with the Project is likely to have negligible impacts on the existing road traffic noise levels.

Appendix A – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: • character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) • character of the environment (e.g. very quiet suburban, suburban, urban, near industry) • miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) • human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
dB(A)	dB(A) denotes a single number sound pressure level that includes a frequency weighting ("A-weighting") to reflect the subjective loudness of the sound level. The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A).
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: • Noise mitigation benefits (amount of noise reduction provided, number of people protected). • Cost of mitigation (cost of mitigation versus benefit provided). • Community views (aesthetic impacts and community wishes). • Noise levels for affected land uses (existing and future levels, and changes in noise levels).

Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10th percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

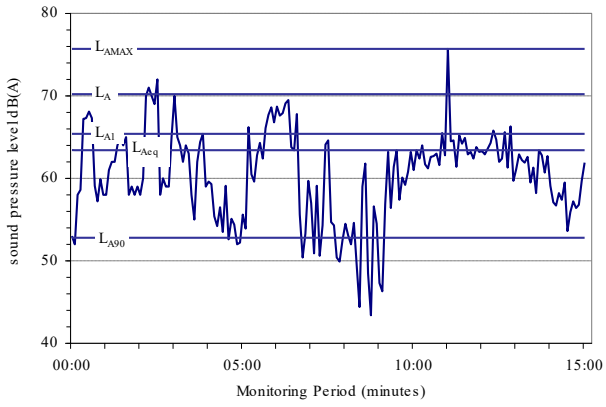
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptors:

- L_{Amax}: Maximum recorded noise level.

- L_{A1}: The noise level exceeded for 1% of the 15 minute interval.
- L_{A10}: Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.
- L_{Aeq}: Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.
- L_{A90}: Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

Threshold	The lowest sound pressure level that produces a detectable response (in an instrument/person).
Tonality	Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

Appendix B – Predicted Construction Noise Levels

Receiver ID	Predicted L_{eq} – dB(A)	Standard hours			"Highly Noise Affected"		
		NML – dB(A)	Exceedance – dB(A)	Compliance Yes / No	NML – dB(A)	Exceedance – dB(A)	Compliance Yes / No
Stage 1 - Site preparation, clearing & demolition							
1	46	45	1	No	75	-	Yes
2	42	45	-	Yes	75	-	Yes
3	35	45	-	Yes	75	-	Yes
4	37	45	-	Yes	75	-	Yes
5	35	45	-	Yes	75	-	Yes
6	26	45	-	Yes	75	-	Yes
7	29	45	-	Yes	75	-	Yes
8	24	45	-	Yes	75	-	Yes
9	24	45	-	Yes	75	-	Yes
10	25	45	-	Yes	75	-	Yes
11	22	45	-	Yes	75	-	Yes
12	18	45	-	Yes	75	-	Yes
13	16	45	-	Yes	75	-	Yes
14	12	45	-	Yes	75	-	Yes
Stage 2 - Establish site compound, access roads & delivery of materials							
1	41	45	-	Yes	75	-	Yes
2	37	45	-	Yes	75	-	Yes
3	30	45	-	Yes	75	-	Yes
4	32	45	-	Yes	75	-	Yes
5	30	45	-	Yes	75	-	Yes
6	21	45	-	Yes	75	-	Yes
7	24	45	-	Yes	75	-	Yes
8	19	45	-	Yes	75	-	Yes
9	19	45	-	Yes	75	-	Yes
10	20	45	-	Yes	75	-	Yes
11	17	45	-	Yes	75	-	Yes
12	13	45	-	Yes	75	-	Yes

Receiver ID	Predicted L_{eq} – dB(A)	Standard hours			"Highly Noise Affected"		
		NML – dB(A)	Exceedance – dB(A)	Compliance Yes / No	NML – dB(A)	Exceedance – dB(A)	Compliance Yes / No
13	11	45	-	Yes	75	-	Yes
14	7	45	-	Yes	75	-	Yes
Stage 3 - Installation of foundation							
1	42	45	-	Yes	75	-	Yes
2	38	45	-	Yes	75	-	Yes
3	31	45	-	Yes	75	-	Yes
4	33	45	-	Yes	75	-	Yes
5	31	45	-	Yes	75	-	Yes
6	22	45	-	Yes	75	-	Yes
7	25	45	-	Yes	75	-	Yes
8	20	45	-	Yes	75	-	Yes
9	20	45	-	Yes	75	-	Yes
10	21	45	-	Yes	75	-	Yes
11	18	45	-	Yes	75	-	Yes
12	14	45	-	Yes	75	-	Yes
13	12	45	-	Yes	75	-	Yes
14	8	45	-	Yes	75	-	Yes
Stage 4 - Installation of underground cabling							
1	39	45	-	Yes	75	-	Yes
2	35	45	-	Yes	75	-	Yes
3	28	45	-	Yes	75	-	Yes
4	30	45	-	Yes	75	-	Yes
5	28	45	-	Yes	75	-	Yes
6	19	45	-	Yes	75	-	Yes
7	22	45	-	Yes	75	-	Yes
8	17	45	-	Yes	75	-	Yes
9	17	45	-	Yes	75	-	Yes
10	18	45	-	Yes	75	-	Yes
11	15	45	-	Yes	75	-	Yes
12	11	45	-	Yes	75	-	Yes
13	9	45	-	Yes	75	-	Yes

Receiver ID	Predicted L_{eq} – dB(A)	Standard hours			"Highly Noise Affected"		
		NML – dB(A)	Exceedance – dB(A)	Compliance Yes / No	NML – dB(A)	Exceedance – dB(A)	Compliance Yes / No
14	5	45	-	Yes	75	-	Yes
Stage 5 - Assembly of panel frames, mounts & transformer units							
1	35	45	-	Yes	75	-	Yes
2	31	45	-	Yes	75	-	Yes
3	24	45	-	Yes	75	-	Yes
4	26	45	-	Yes	75	-	Yes
5	24	45	-	Yes	75	-	Yes
6	15	45	-	Yes	75	-	Yes
7	18	45	-	Yes	75	-	Yes
8	13	45	-	Yes	75	-	Yes
9	13	45	-	Yes	75	-	Yes
10	14	45	-	Yes	75	-	Yes
11	11	45	-	Yes	75	-	Yes
12	7	45	-	Yes	75	-	Yes
13	5	45	-	Yes	75	-	Yes
14	1	45	-	Yes	75	-	Yes
Stage 6 - Site rehabilitation / removal of temporary construction facility							
1	39	45	-	Yes	75	-	Yes
2	35	45	-	Yes	75	-	Yes
3	28	45	-	Yes	75	-	Yes
4	30	45	-	Yes	75	-	Yes
5	28	45	-	Yes	75	-	Yes
6	19	45	-	Yes	75	-	Yes
7	22	45	-	Yes	75	-	Yes
8	17	45	-	Yes	75	-	Yes
9	17	45	-	Yes	75	-	Yes
10	18	45	-	Yes	75	-	Yes
11	15	45	-	Yes	75	-	Yes
12	11	45	-	Yes	75	-	Yes
13	9	45	-	Yes	75	-	Yes
14	5	45	-	Yes	75	-	Yes

Appendix C – Construction Road Traffic Noise Calculations

Paytens Bridge Road Calculation

Transport Roads & Maritime Services

Road Traffic Noise Estimator

Please input information into yellow cells	
Please pick from drop-down list in orange cells	

Ground type	Undeveloped green fields (rural areas with isolated dwellings)	
Road surface	DGA	
Road type	Local road	Note that a road is new if a road's functional class changes during construction. For example, rerouting traffic from an arterial road temporarily to a collector road changes the functional class of the collector road for the duration of the temporary reroute.
	Day	Night
Noise criteria (residences)	55	50
Existing speed	100	100
Speed during construction	100	100

	Day (7am to 10pm)		Night (10pm to 7am)		Worst Case 1-hour Day		Worst Case 1-hour Night	
Existing traffic	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Direction (1)					15	3	1	1
Direction (2)					14	2	1	1
Additional traffic								
Direction (1)					2	1	0	0
Direction (2)					1	0	0	0

	Day	Night
Change in noise levels (dBA)	0.6	0.0
Mitigation level (dBA)	55	50
Is the change in noise level greater than 2.0 dBA?	No	No
Require consideration of additional mitigation measures?	No	No
Mitigation distance (m)		

To assess noise impacts from construction traffic or a temporary reroute due to a road closure or both an initial screening test should be undertaken by evaluating whether noise levels will increase by more than 2dB(A). Where increases are 2dBA or less then no further assessment is required. Where noise levels increase by more than 2dBA (2.1dBA) and noise levels exceed the controlling criterion then the receiver qualifies for consideration of noise mitigation under the Noise Mitigation Guideline. [note: the assessment methodology is similar to minor works so in any instance the only trigger for noise mitigation under the NMG shall be due to noise level increase]

Mitigation Measures
Management of construction related traffic or traffic reroutes noise should as a minimum include the following controls:
- Scheduling and routing of vehicle movements
- Speed of vehicles
- Driver behaviour and avoidance of the use of engine compression brakes
- Ensuring vehicles are adequately silenced before allowing them to access the site

Where noise impacts are greater than one year then consideration should be given to the following measures where feasible and reasonable:
- temporary noise barriers
- at-receiver noise mitigation

Feasible and reasonable considerations should also include:
- time of day of the noise increase and exceedance of criteria
- time of use of affected receivers
- how many decibels the noise levels are to increase
- how long the mitigation will provide benefit to the receiver during the project

Calculating noise level at the receiver

Distance to receiver (m)		
Direction (1)	70	
Direction (2)	70	
	Day	Night
Predicted noise levels (dBA) @ 1m from the façade	49.4	44.2

Note:
(1) Noise reports present noise levels rounded to the nearest integer and differences between two noise levels rounded to a single decimal place.
(2) noise barriers more than 3 metres high, if designed using Roads and Maritime guidelines, would generally provide an insertion loss of around 5 dB(A) at the most affected residence.
(3) noise barriers more than 5 metres high, if designed using Roads and Maritime guidelines, would generally provide an insertion loss of around 10 dB(A) at the most affected residence.

Lachlan Valley Way

Transport Roads & Maritime Services

Road Traffic Noise Estimator

Please input information into yellow cells
Please pick from drop-down list in orange cells

Ground type	Undeveloped green fields (Rural areas with isolated dwellings)
Road surface	OGA
Road type	Freeway/arterial/sub-arterial road

Note that a road is new if a road's functional class changes during construction. For example, rerouting traffic from an arterial road temporarily to a collector road changes the functional class of the collector road for the duration of the temporary reroute.

	Day	Night
Noise criteria (residences)	60	55
Existing speed	100	100
Speed during construction	100	100

	Day (7am to 10pm)		Night (10pm to 7am)		Worst Case 1-hour Day		Worst Case 1-hour Night	
Existing traffic	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Direction (1)	417	68	1	1				
Direction (2)	416	68	1	1				
Additional traffic								
Direction (1)	15	5	0	0				
Direction (2)	14	5	0	0				

	Day	Night
Change in noise levels (dBA)	0.2	0.0
Mitigation level (dBA)	60	55
Is the change in noise level greater than 2.0 dBA?	No	No
Require consideration of additional mitigation measures?	No	No
Mitigation distance (m)		

To assess noise impacts from construction traffic or a temporary reroute due to a road closure or both an initial screening test should be undertaken by evaluating whether noise levels will increase by more than 2dB(A). Where increases are 2dBA or less then no further assessment is required. Where noise levels increase by more than 2dBA (2.1dBA) and noise levels exceed the controlling criterion then the receiver qualifies for consideration of noise mitigation under the Noise Mitigation Guideline. [note: the assessment methodology is similar to minor works so in any instance the only trigger for noise mitigation under the NMG shall be due to noise level increase]

Mitigation Measures
Management of construction related traffic or traffic reroutes noise should as a minimum include the following controls:
- Scheduling and routing of vehicle movements
- Speed of vehicles
- Driver behaviour and avoidance of the use of engine compression brakes
- Ensuring vehicles are adequately silenced before allowing them to access the site

Where noise impacts are greater than one year then consideration should be given to the following measures where feasible and reasonable:
- temporary noise barriers
- at-receiver noise mitigation

Feasible and reasonable considerations should also include:
- time of day of the noise increase and exceedance of criteria
- time of use of affected receivers
- how many decibels the noise levels are to increase
- how long the mitigation will provide benefit to the receiver during the project

Calculating noise level at the receiver

Distance to receiver (m)	
Direction (1)	70
Direction (2)	70

	Day	Night
Predicted noise levels (dBA) @ 1m from the façade	51.7	34.7

Note:
(1) Noise reports present noise levels rounded to the nearest integer and differences between two noise levels rounded to a single decimal place.
(2) noise barriers more than 3 metres high, if designed using Roads and Maritime guidelines, would generally provide an insertion loss of around 5 dB(A) at the most affected residence.
(3) noise barriers more than 5 metres high, if designed using Roads and Maritime guidelines, would generally provide an insertion loss of around 10 dB(A) at the most affected residence.

Appendix D – Predicted Operational Noise Levels

Operation during neutral weather condition

Receiver ID	Daytime period				Evening and Night-time periods			
	Predicted dB(A) [1]	Criteria dB(A)	Exceedance dB(A)	Compliance? (Yes / No)	Predicted dB(A)	Criteria dB(A)	Exceedance dB(A)	Compliance? (Yes / No)
1	34	40	-	Yes	31	35	-	Yes
2	30	40	-	Yes	28	35	-	Yes
3	20	40	-	Yes	<20	35	-	Yes
4	25	40	-	Yes	24	35	-	Yes
5	21	40	-	Yes	20	35	-	Yes
6	<20	40	-	Yes	<20	35	-	Yes
7	<20	40	-	Yes	<20	35	-	Yes
8	<20	40	-	Yes	<20	35	-	Yes
9	<20	40	-	Yes	<20	35	-	Yes
10	<20	40	-	Yes	<20	35	-	Yes
11	<20	40	-	Yes	<20	35	-	Yes
12	<20	40	-	Yes	<20	35	-	Yes
13	<20	40	-	Yes	<20	35	-	Yes
14	<20	40	-	Yes	<20	35	-	Yes

(1) Predicted noise levels include a +5 dB penalty to account for tonal noise characteristics from the Project.

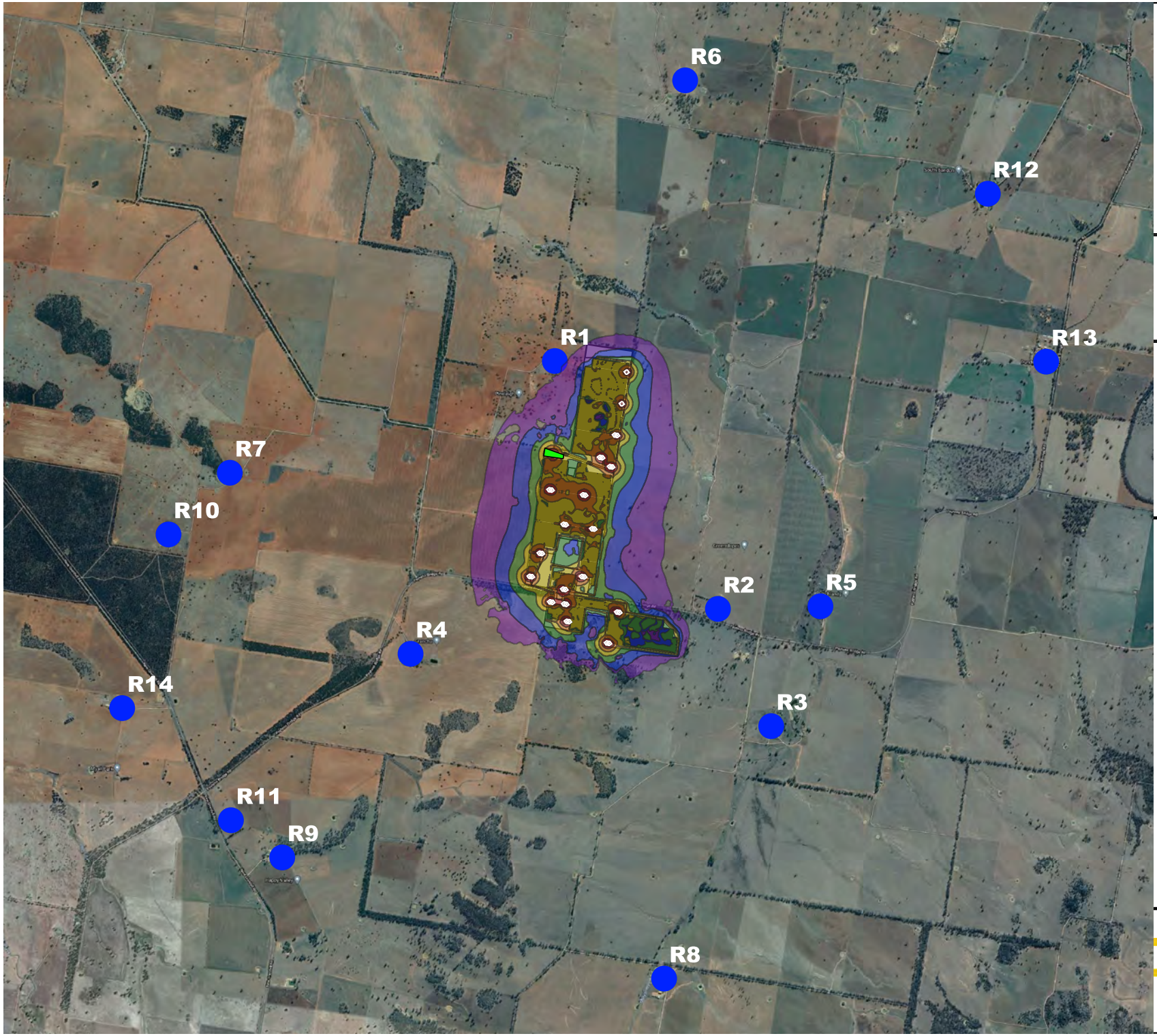
Operation during adverse weather condition

Receiver ID	Daytime period				Evening and Night-time periods			
	Predicted dB(A) [1]	Criteria dB(A)	Exceedance dB(A)	Compliance? (Yes / No)	Predicted dB(A)	Criteria dB(A)	Exceedance dB(A)	Compliance? (Yes / No)
1	39	40	-	Yes	37	35	2	No
2	35	40	-	Yes	34	35	-	Yes
3	27	40	-	Yes	25	35	-	Yes
4	31	40	-	Yes	31	35	-	Yes
5	28	40	-	Yes	27	35	-	Yes
6	<20	40	-	Yes	<20	35	-	Yes
7	22	40	-	Yes	22	35	-	Yes
8	<20	40	-	Yes	<20	35	-	Yes
9	<20	40	-	Yes	<20	35	-	Yes
10	<20	40	-	Yes	<20	35	-	Yes

Receiver ID	Daytime period				Evening and Night-time periods			
	Predicted dB(A) [1]	Criteria dB(A)	Exceedance dB(A)	Compliance? (Yes / No)	Predicted dB(A)	Criteria dB(A)	Exceedance dB(A)	Compliance? (Yes / No)
11	<20	40	-	Yes	<20	35	-	Yes
12	<20	40	-	Yes	<20	35	-	Yes
13	<20	40	-	Yes	<20	35	-	Yes
14	<20	40	-	Yes	<20	35	-	Yes

(1) Predicted noise levels include a +5 dB penalty to account for tonal noise characteristics from the Project.

Appendix E – Predicted Operational Noise Contours



Peninsula Solar Power Station

Operational Noise Contours
Daytime
Neutral Weather Condition

Date: 11 October 2021
Client: Accent Environmental Pty Ltd
Prepared by: RS

N

Datum GDA 94, Projection MGA ZONE 55

0 1 2 km

Legend

- Power Station
- Substation location

Noise Contours dB(A)

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65

- Receivers
- The Project

Resonate

Peninsula Solar Power Station

Operational Noise Contours Evening/Night-time Neutral Weather Condition

Date: 11 October 2021
Client: Accent Environmental Pty Ltd
Prepared by: RS

N

Datum GDA 94, Projection MGA ZONE 55

0 1 2 km

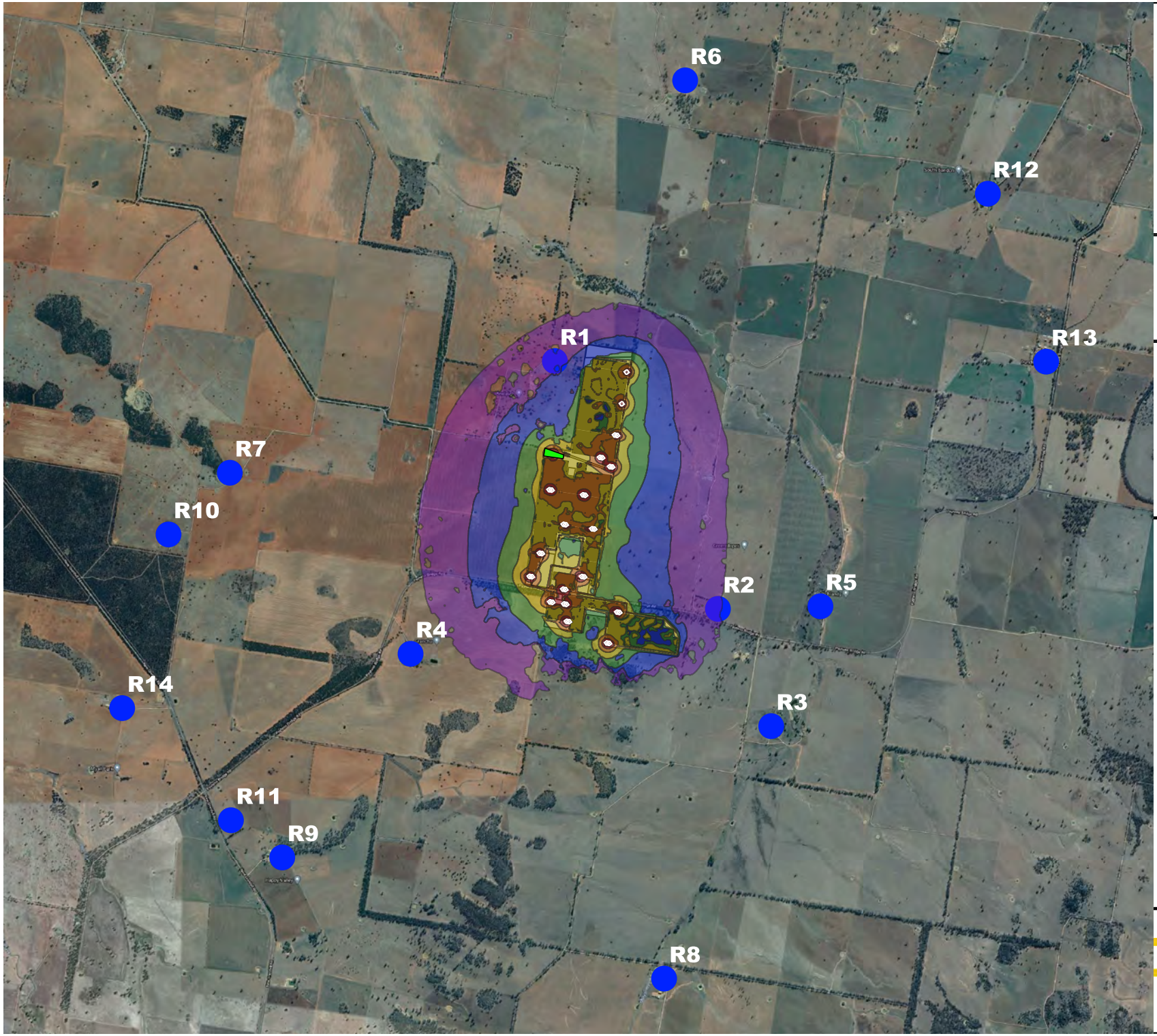
Legend

- Power Station
- Substation location

Noise Contours dB(A)

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- Receivers
- The Project

Resonate



Peninsula Solar Power Station

Operational Noise Contours
Daytime
Adverse Wind Weather Condition

Date: 11 October 2021
Client: Accent Environmental Pty Ltd
Prepared by: RS

N

Datum GDA 94, Projection MGA ZONE 55

0 1 2 km

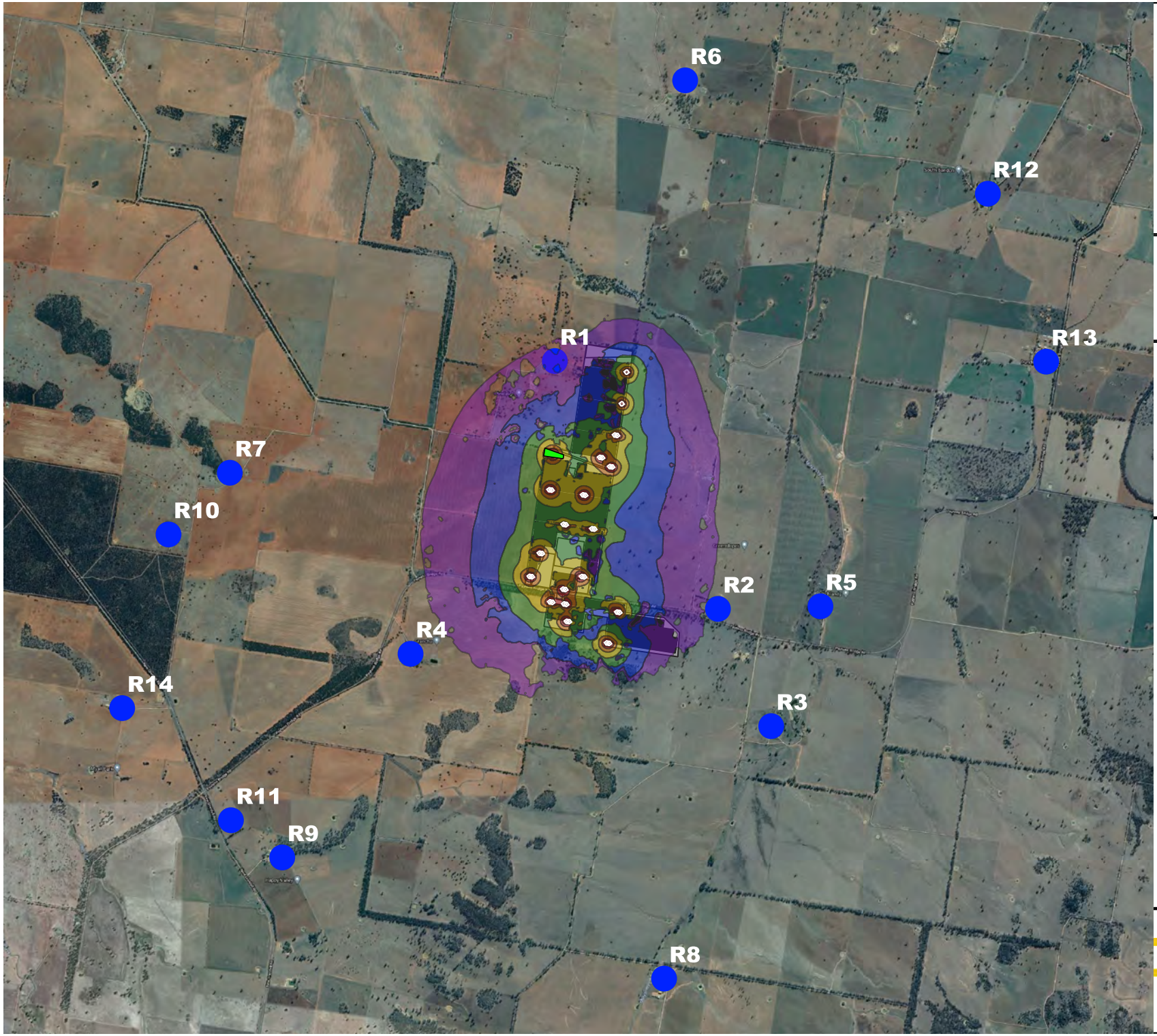
Legend

- Power Station
- Substation location

Noise Contours dB(A)

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- Receivers
- The Project

Resonate



Peninsula Solar Power Station

Operational Noise Contours Evening/Night-time Temperature Inversion Weather Condition

Date: 11 October 2021
Client: Accent Environmental Pty Ltd
Prepared by: RS

N

Datum GDA 94, Projection MGA ZONE 55

0 1 2 km

Legend

- Power Station
- Substation location

Noise Contours dB(A)

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- Receivers
- The Project

Resonate

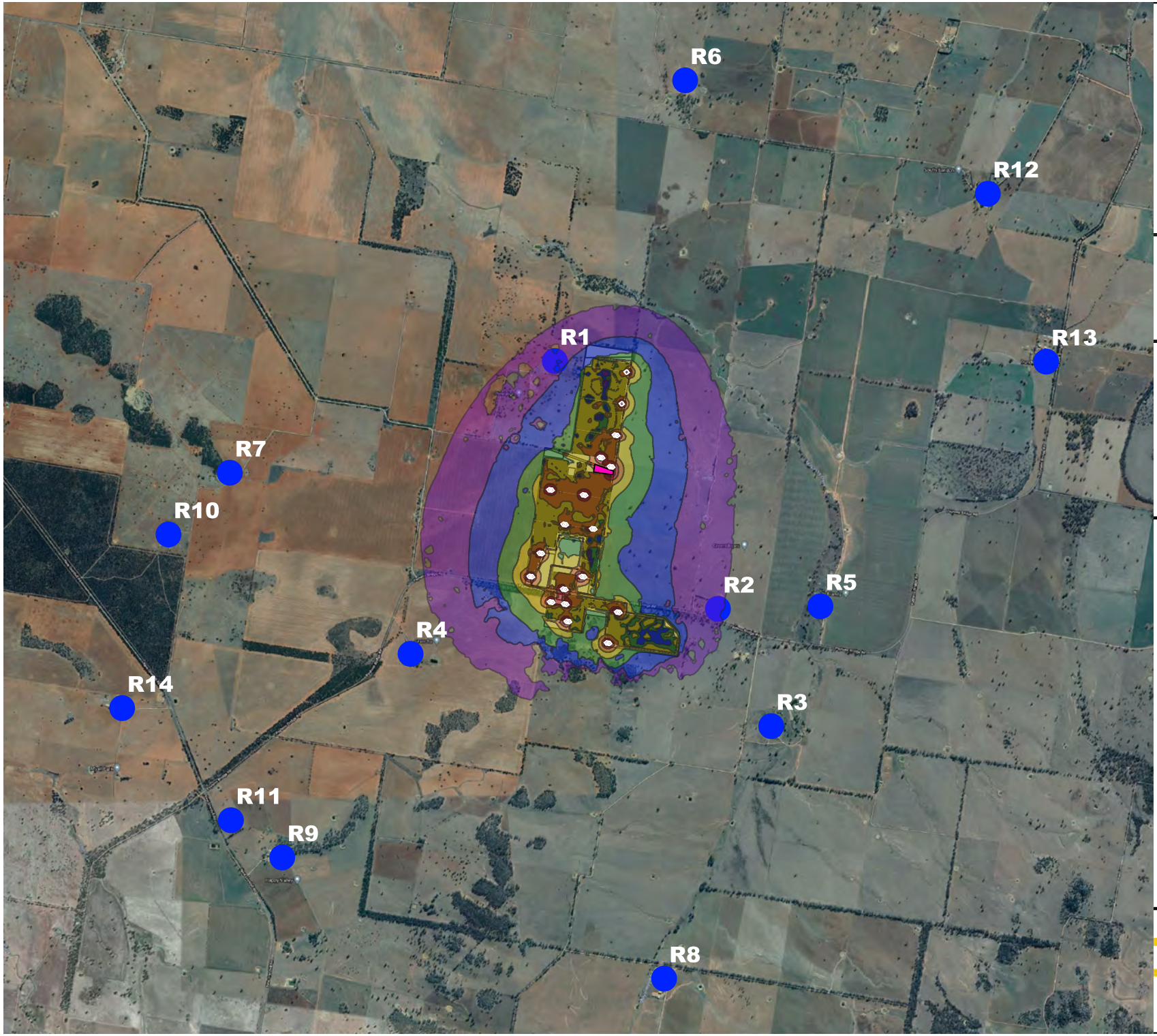
Appendix F – Predicted Operational Noise Levels with Noise Mitigation Measures Implemented

Receiver ID	Daytime period				Evening and Night-time periods			
	Predicted dB(A)[1]	Criteria dB(A)	Exceedance dB(A)	Compliance? (Yes / No)	Predicted dB(A)	Criteria dB(A)	Exceedance dB(A)	Compliance? (Yes / No)
1	39	40	-	Yes	36	35	1	Yes(2)
2	36	40	-	Yes	34	35	-	Yes
3	27	40	-	Yes	26	35	-	Yes
4	31	40	-	Yes	31	35	-	Yes
5	28	40	-	Yes	28	35	-	Yes
6	<20	40	-	Yes	<20	35	-	Yes
7	21	40	-	Yes	21	35	-	Yes
8	<20	40	-	Yes	<20	35	-	Yes
9	<20	40	-	Yes	<20	35	-	Yes
10	<20	40	-	Yes	<20	35	-	Yes
11	<20	40	-	Yes	<20	35	-	Yes
12	<20	40	-	Yes	<20	35	-	Yes
13	<20	40	-	Yes	<20	35	-	Yes
14	<20	40	-	Yes	<20	35	-	Yes

(1) Predicted noise levels include a +5 dB penalty to account for tonal noise characteristics from the Project.

(2) Marginal exceedance of 1 dB acoustically insignificant as a 1 dB change in sound level is typically not perceptible by the average human ear. Therefore, this predicted level is considered to achieve compliance with the criteria.

Appendix G – Predicted Operational Noise Contours with Noise Mitigation Measures Implemented



Peninsula Solar Power Station

Operational Noise Contours
Daytime
Adverse Wind Weather Condition
With Noise Control Measures

Date: 26 October 2021
Client: Accent Environmental Pty Ltd
Prepared by: RS

N

Datum GDA 94, Projection MGA ZONE 55

0 1 2 km

Legend

Power Station

Proposed Alternate Substation Location

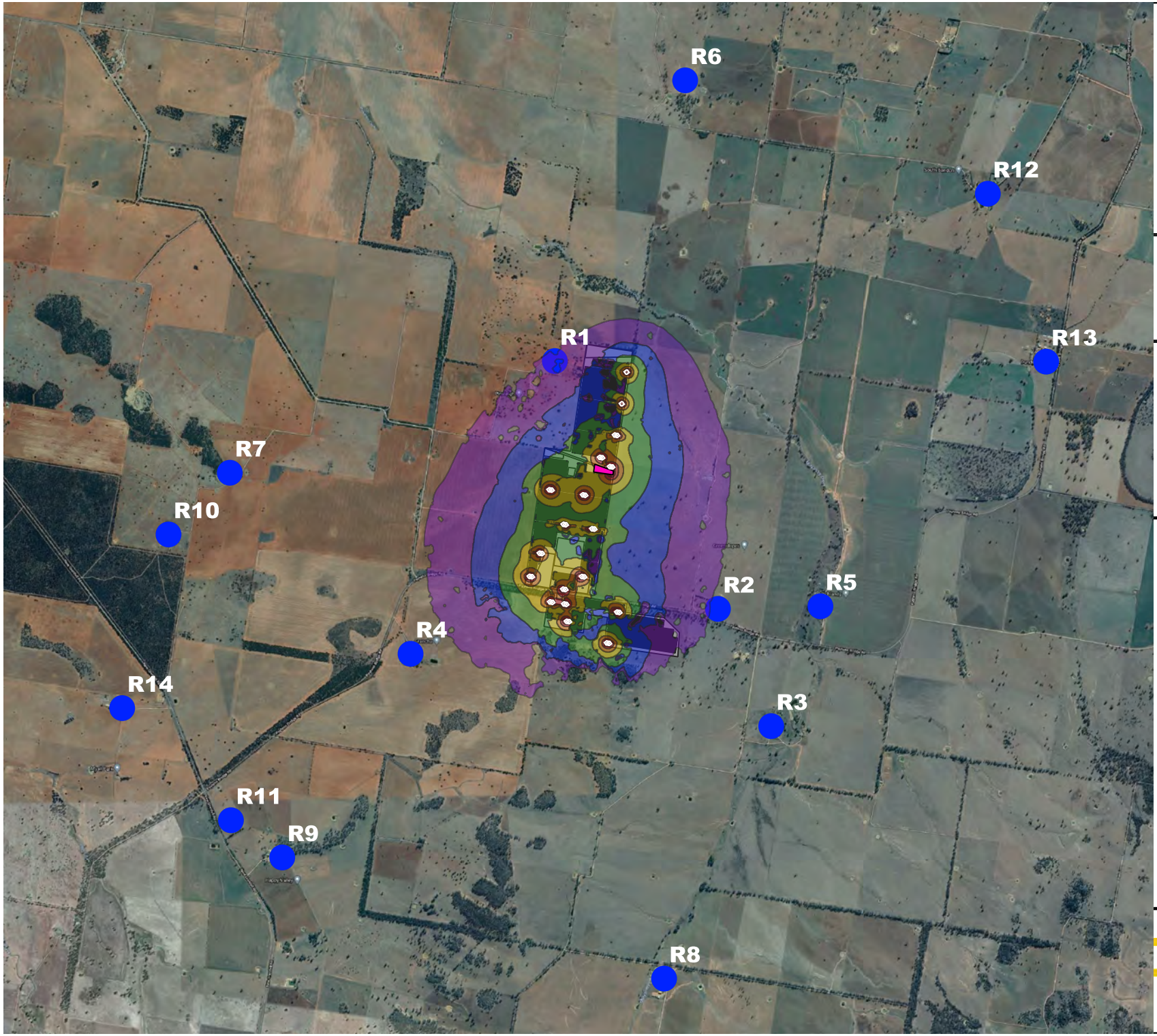
Noise Contours dB(A)

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65

Receivers

The Project

Resonate



Peninsula Solar Power Station

Operational Noise Contours Evening/Night-time Temperature Inversion Weather Condition With Noise Control Measures

Date: 26 October 2021
Client: Accent Environmental Pty Ltd
Prepared by: RS

N

Datum GDA 94, Projection MGA ZONE 55

0 1 2 km

Legend

Power Station

Proposed Alternate Substation Location

Noise Contours dB(A)

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65

Receivers

The Project

Resonate

Appendix H – Operational Road Traffic Noise Calculations

Paytens Bridge Road Calculation

Transport Roads & Maritime Services

Road Traffic Noise Estimator

Please input information into yellow cells
Please pick from drop-down list in orange cells

Ground type	Undeveloped green fields (rural areas with isolated dwellings)
Road surface	DGA
Road type	Local road

Note that a road is new if a road's functional class changes during construction. For example, rerouting traffic from an arterial road temporarily to a collector road changes the functional class of the collector road for the duration of the temporary reroute.

	Day	Night
Noise criteria (residences)	55	50
Existing speed	100	100
Speed during construction	100	100

	Day (7am to 10pm)		Night (10pm to 7am)		Worst Case 1-hour Day		Worst Case 1-hour Night	
Existing traffic	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Direction (1)					15	3	1	1
Direction (2)					14	2	1	1
Additional traffic								
Direction (1)					1	0	0	0
Direction (2)					0	0	0	0

	Day	Night
Change in noise levels (dBA)	0.1	0.0
Mitigation level (dBA)	55	50
Is the change in noise level greater than 2.0 dBA?	No	No
Require consideration of additional mitigation measures?	No	No
Mitigation distance (m)		

To assess noise impacts from construction traffic or a temporary reroute due to a road closure or both an initial screening test should be undertaken by evaluating whether noise levels will increase by more than 2dB(A). Where increases are 2dBA or less then no further assessment is required. Where noise levels increase by more than 2dBA (2.1dBA) and noise levels exceed the controlling criterion then the receiver qualifies for consideration of noise mitigation under the Noise Mitigation Guideline. [note: the assessment methodology is similar to minor works so in any instance the only trigger for noise mitigation under the NMG shall be due to noise level increase]

Mitigation Measures

Management of construction related traffic or traffic reroutes noise should as a minimum include the following controls:
- Scheduling and routing of vehicle movements
- Speed of vehicles
- Driver behaviour and avoidance of the use of engine compression brakes
- Ensuring vehicles are adequately silenced before allowing them to access the site

Where noise impacts are greater than one year then consideration should be given to the following measures where feasible and reasonable:
- temporary noise barriers
- at-receiver noise mitigation

Feasible and reasonable considerations should also include:
- time of day of the noise increase and exceedance of criteria
- time of use of affected receivers
- how many decibels the noise levels are to increase
- how long the mitigation will provide benefit to the receiver during the project

Calculating noise level at the receiver

Distance to receiver (m)	
Direction (1)	70
Direction (2)	70

	Day	Night
Predicted noise levels (dBA) @ 1m from the façade	48.9	44.2

Note:
(1) Noise reports present noise levels rounded to the nearest integer and differences between two noise levels rounded to a single decimal place.
(2) noise barriers more than 3 metres high, if designed using Roads and Maritime guidelines, would generally provide an insertion loss of around 5 dB(A) at the most affected residence.
(3) noise barriers more than 5 metres high, if designed using Roads and Maritime guidelines, would generally provide an insertion loss of around 10 dB(A) at the most affected residence.

Lachlan Valley Way

Transport Roads & Maritime Services

Road Traffic Noise Estimator

Please input information into yellow cells	
Please pick from drop-down list in orange cells	
Ground type	Undeveloped green fields (rural areas with isolated dwellings)
Road surface	DGA
Road type	Freeway/arterial/sub-arterial road

Note that a road is new if a road's functional class changes during construction. For example, rerouting traffic from an arterial road temporarily to a collector road changes the functional class of the collector road for the duration of the temporary reroute.

	Day	Night
Noise criteria (residences)	60	55
Existing speed	100	100
Speed during construction	100	100

	Day (7am to 10pm)		Night (10pm to 7am)		Worst Case 1-hour Day		Worst Case 1-hour Night	
Existing traffic	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Direction (1)	417	68	1	1				
Direction (2)	416	68	1	1				
Additional traffic								
Direction (1)	1	0	0	0				
Direction (2)	1	0	0	0				

	Day	Night
Change in noise levels (dBA)	0.0	0.0
Mitigation level (dBA)	60	55
Is the change in noise level greater than 2.0 dBA?	No	No
Require consideration of additional mitigation measures?	No	No
Mitigation distance (m)		

To assess noise impacts from construction traffic or a temporary reroute due to a road closure or both an initial screening test should be undertaken by evaluating whether noise levels will increase by more than 2dB(A). Where increases are 2dBA or less then no further assessment is required. Where noise levels increase by more than 2dBA (2.1dBA) and noise levels exceed the controlling criterion then the receiver qualifies for consideration of noise mitigation under the Noise Mitigation Guideline. [note: the assessment methodology is similar to minor works so in any instance the only trigger for noise mitigation under the NMG shall be due to noise level increase]

Mitigation Measures

Management of construction related traffic or traffic reroutes noise should as a minimum include the following controls:
- Scheduling and routing of vehicle movements
- Speed of vehicles
- Driver behaviour and avoidance of the use of engine compression brakes
- Ensuring vehicles are adequately silenced before allowing them to access the site

Where noise impacts are greater than one year then consideration should be given to the following measures where feasible and reasonable:
- temporary noise barriers
- at-receiver noise mitigation

Feasible and reasonable considerations should also include:
- time of day of the noise increase and exceedance of criteria
- time of use of affected receivers
- how many decibels the noise levels are to increase
- how long the mitigation will provide benefit to the receiver during the project

Calculating noise level at the receiver

Distance to receiver (m)	
Direction (1)	70
Direction (2)	70

	Day	Night
Predicted noise levels (dBA) @ 1m from the façade	51.5	34.7

Note:
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(2) noise barriers more than 3 metres high, if designed using Roads and Maritime guidelines, would generally provide an insertion loss of around 5 dB(A) at the most affected residence.
(3) noise barriers more than 5 metres high, if designed using Roads and Maritime guidelines, would generally provide an insertion loss of around 10 dB(A) at the most affected residence.