

## Appendix F – Noise and vibration assessment



Renew Estate Pty Ltd  
Bomen solar farm EIS  
Noise impact assessment

February 2018

# Executive summary

GHD Pty Ltd has been engaged by Renew Estate Pty Ltd to conduct a noise impact assessment for the proposed Bomen Solar Farm (the proposal).

This assessment is based on the available information at this stage of the design. The exact location and layout of operational noise sources within the proposal site are yet to be specified and assumptions made in this report have been outlined within Section 5.

The potential noise and vibration impacts associated with the proposal have been assessed with consideration of the following documents:

- *Interim Construction Noise Guideline* (ICNG) (DECC 2009)
- *NSW Road Noise Policy* (RNP) (DECCW 2011)
- *NSW Noise Policy for Industry* (NPI) (EPA 2017)

The results of the construction noise impact assessment indicate that the construction of the proposal is predicted to exceed the construction noise management levels at two (2) residential receiver locations and one (1) commercial receiver location. Noise mitigation measures have been provided to reduce construction noise levels to these receivers. No adverse vibration impacts are anticipated at any sensitive receivers during construction of the proposal.

It is typical for construction projects to exceed the construction noise and vibration management levels. Any impacts due to construction works are temporary in nature and would not represent a permanent impact on the community and surrounding environment. The predicted noise and vibration levels are generally conservative and would only be experienced for limited periods during construction. Impacts may be reduced through the introduction of feasible and reasonable mitigation measures which have been recommended within this report.

The results of the operational noise impact assessment indicate that the operation of the proposal will comply with the relevant operational noise emission criteria and is not predicted to adversely impact the acoustic amenity of the surrounding sensitive receivers.

The results of the traffic noise assessment indicate that the construction and operation of the proposal will comply with the requirements of the Road Noise Policy.

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# Glossary

Term	Description
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Decibel expressed with the frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at low and high frequencies.
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
EPA	Environment Protection Authority
ICNG	<i>Interim Construction Noise Guideline</i> (DECC, 2009).
NPI	<i>Noise Policy for Industry</i> (EPA, 2017).
L <sub>A90</sub> (period)	The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise e.g. L <sub>A90</sub> (15 min).
L <sub>Aeq</sub> (period)	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
L <sub>Amax</sub> (period)	The maximum sound pressure level over a specified period of time.
Mitigation	Reduction in severity.
Noise sensitive receiver	An area or place potentially affected by noise which includes: <ul style="list-style-type: none"> <li>• a residential dwelling.</li> <li>• an educational institution, library, childcare centre or kindergarten.</li> <li>• a hospital, surgery or other medical institution.</li> <li>• an active (e.g. sports field, golf course) or passive (e.g. national park) recreational area.</li> <li>• commercial or industrial premises</li> <li>• a place of worship.</li> </ul>
Rating Background Level	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period. This is the level used for assessment purposes.
RNP	<i>Road Noise Policy</i> (DECCW, 2011).
Tonality	Noise containing a prominent frequency or frequencies characterised by definite pitch.

# 1. Introduction

## 1.1 Overview

Renew Estate Pty Ltd (Renew Estate) proposes to construct, operate and potentially decommission a 120 megawatt (MW) solar farm and associated infrastructure approximately 9 kilometres north-east of Wagga Wagga ('the proposal').

Renew Estate has engaged GHD Pty Ltd (GHD) to prepare an Environmental Impact Statement (EIS) for the proposal. The EIS identifies and assesses the environmental issues associated with the proposed solar farm.

The EIS supports an application for development consent from the Minister for Planning under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The EIS has been prepared to fulfil the required of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and Section 79C of the EP&A Act.

This noise assessment has been prepared in support of the EIS. It considers construction and operational noise impacts associated with the proposal, including road traffic noise.

## 1.2 Description of the proposal

The proposal involves constructing, operating and eventually decommissioning a 120 megawatt (MWac) solar farm to the north-east of Wagga Wagga, NSW. Subject to final detailed design the primary project components will consist of:

- about 400,000 photovoltaic solar modules (modules)
- about 4,500 trackers comprising single-axis tracking framing systems mounted on steel piles (structures)
- up to 44 containerised power conversion stations containing electrical switchgear, inverters and medium voltage transformers
- new on-site electrical switchyard and substation (substation)
- connection into the National Electricity Market (NEM) via about 3.5 km of 132 kV transmission line between the proposed on-site substation and the existing TransGrid Wagga North Substation. The transmission line may be overhead or underground, or a combination of both, subject to detailed design. For the purpose of assessment in this EIS, it is assumed the entire transmission line would be overhead, as this would have greater environmental impacts than underground construction
- battery storage system
- control building including office, SCADA systems, operation and maintenance facilities, spare parts and staff amenities serviced by septic systems and rainwater tanks
- car park
- internal DC and AC cabling for electrical reticulation
- minor upgrade of the unsealed section of Trahairs Road, east of Byrnes Road, for site access (to be maintained as a single lane unsealed road)
- internal all-weather access tracks
- internal fire trail and bushfire asset protection zones
- security fencing around the solar farm

- vegetation screening – plantings along the site boundaries where required
- meteorological stations
- subdivision of the following lots to allow the purchase of the required land for the proposal site as shown in the plans of proposed subdivision:
  - Lot 11 DP 1130519
  - Lot 2 DP 590756
  - Lot 174 DP 751405
  - Lot 108 DP 751405.

Construction of the proposal is anticipated to take between nine (9) and twelve (12) months to complete.

The operational lifetime of the solar farm is 30 years, at which time the site will either continue to operate subject to further approval and agreements or be decommissioned. Decommissioning will return the Site to the predevelopment condition.

### 1.3 Secretary's Environmental Assessment Requirements and agency requirements

The Secretary's Environmental Assessment Requirements (SEARs), and agency requirements that relate to noise and are addressed in this report are summarised in Table 1-1.

Table 1-1 Secretary's Environmental Assessment Requirements and agency requirements

Assessment requirements	Where addressed in report
Assessment of construction, upgrading and decommissioning noise impacts of the development in accordance with the <i>Interim Construction Noise Guideline</i> (ICNG)	Section 3 (criteria) Section 4 (construction impact assessment)
Assessment of operational noise impacts in accordance with the <i>NSW Noise Policy for Industry</i> (NPI) and <i>NSW Road Noise Policy</i> (RNP)	Section 3 (criteria) Section 5 (operation impact assessment)
Description of measures (as part of a draft noise management plan) that would be implemented to mitigate any impacts if the assessment shows construction, upgrading or decommissioning noise is likely to exceed applicable criteria.	Section 6
Agency requirements	
NSW EPA	
Identify potential impacts and mitigation strategies to be incorporated during operation to minimise noise and comply with NSW policies and legislation on noise control.	Section 3 (criteria) Section 4 (construction impact assessment) Section 5 (operational impact assessment) Section 6 (mitigation)

### 1.4 Scope and structure of the report

#### 1.4.1 Scope of report

This report assesses the potential noise impacts of the proposal. The assessment has been undertaken to address the SEARs and other agency requirements detailed in Section 1.3.

#### 1.4.2 Structure of report

- **Chapter 1 – Introduction** – This chapter introduces the proposal

- **Chapter 2 – Existing environment** – This chapter describes the proposal location, existing noise environment and sensitive receivers in the proposal area
- **Chapter 3 – Noise criteria** – This chapter identifies the criteria for assessment
- **Chapter 4 – Construction noise impact assessment** – This chapter examines the potential noise impacts associated with construction of the proposal
- **Chapter 5 – Operational noise impact assessment** – This chapter examines the potential noise impacts associated with operation of the proposal
- **Chapter 6 – Noise mitigation** – This chapter identifies mitigation measures relating to noise
- **Chapter 7 – Conclusions** – This chapter summarises the assessment conclusions
- **Chapter 8 – References** – This chapter provides a reference list

## 1.5 Limitations

*This report: has been prepared by GHD for Renew Estate Pty Ltd and may only be used and relied on by Renew Estate Pty Ltd for the purpose agreed between GHD and the Renew Estate Pty Ltd as set out in section 1.1 of this report.*

*GHD otherwise disclaims responsibility to any person other than Renew Estate Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.*

*GHD has prepared this report on the basis of information provided by Renew Estate Pty Ltd and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.*

*The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.*

## 2. Existing environment

### 2.1 Proposal location and existing environment

The proposal site is approximately seven kilometres north-east of the Wagga Wagga central business district and to the east of Olympic Highway and Byrnes Road.

The proposal site is within the Wagga Wagga local government area. The proposal is located within the following *Wagga Wagga Local Environment Plan 2010* zones:

- zone IN1 General Industrial (the northern and southern solar farm development areas, Trahairs Road and part of the transmission line)
- zone RU1 Primary Production (part of the transmission line)
- zone RE1 Public Recreation (part of the transmission line).

The location of the site, the transmission line corridor and the surrounding planning zones is shown on Figure 1.

### 2.2 Sensitive receivers

Noise sensitive receivers are defined based on the type of occupancy and the activities performed in the land use. Sensitive noise receivers could include residences, educational institutes, hospitals, place of worship, recreational areas and commercial/industrial premises.

Fourteen (14) isolated residential receivers have been identified as being potentially impacted by construction and/or operational noise associated with the proposal and are homesteads on agricultural properties. The results of the noise assessment for these receivers are considered applicable for other nearby residences that have not been included in the assessment. Thirty-two (32) residential receivers have been identified as being potentially impacted by construction/operational road noise traffic associated with the proposal. In addition, six (6) industrial receivers have been identified within the study area of the proposal. These sensitive receivers are tabulated in Table 2-1 and Table 2-2 and are shown on Figure 1 and Figure 2.

Table 2-1 Identified noise sensitive receivers – construction and operational

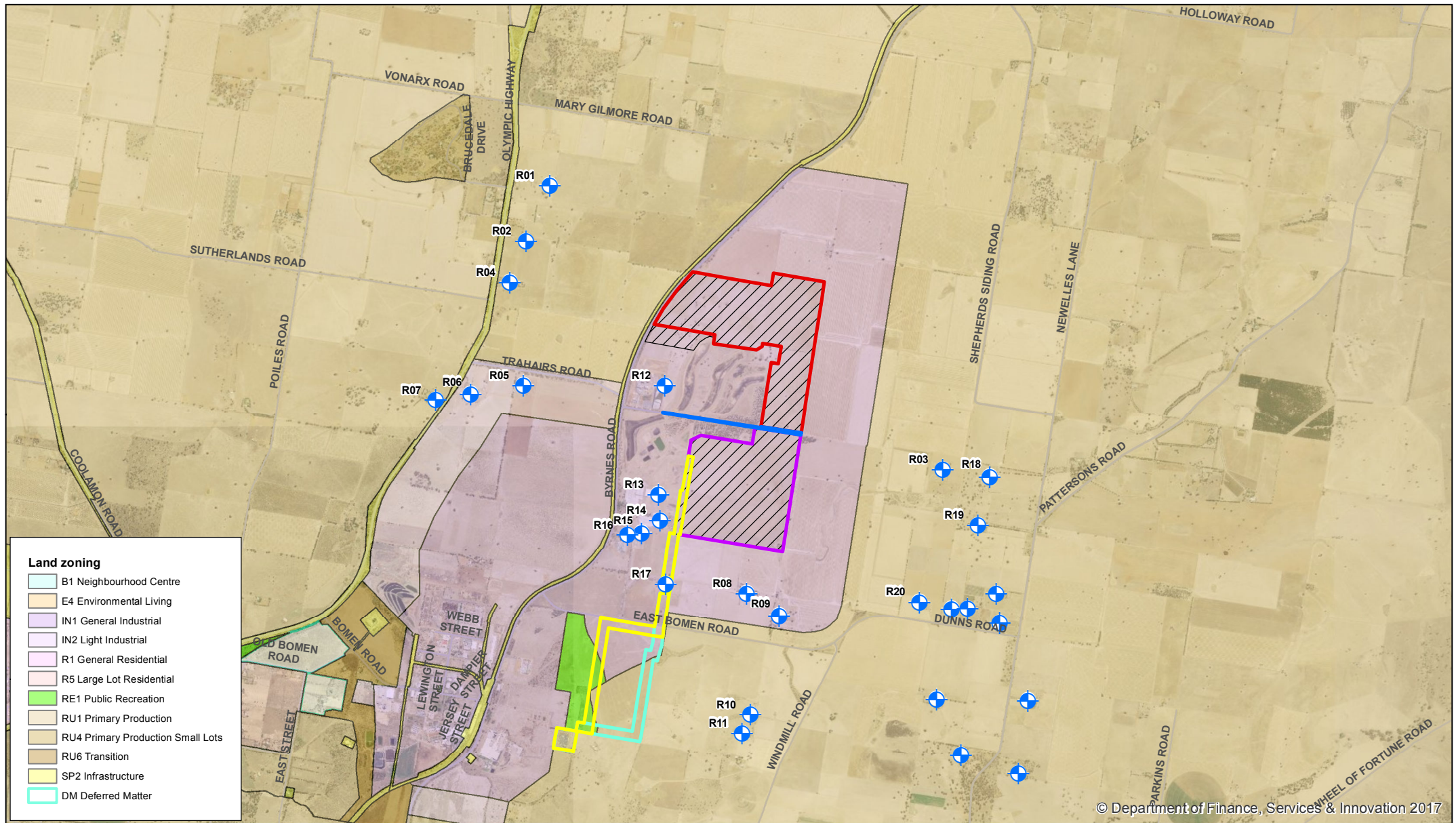
Rec. ID	Receiver Type	Planning zone	Direction from main proposal site	Distance to nearest solar farm boundary (metres)
R1	Residential	RU1 – Primary Production	North-west	1,654
R2	Residential	RU1 – Primary Production	West	1,530
R3	Residential	RU1 – Primary Production	East	1,400
R4	Residential	RU1 – Primary Production	West	1,800
R5	Residential	IN2 – Light Industrial	West	1,465
R6	Residential	IN2 – Light Industrial	West	1,820
R7	Residential	RU1 – Primary Production	West	2,155
R8	Residential	IN1 – General Industrial	South	469
R9	Residential	IN1 – General Industrial	South	640
R10	Residential	RU1 – Primary Production	South	1,670
R11	Residential	RU1 – Primary Production	South	1,850
R12	Industrial	IN1 – General Industrial	West	360
R13	Industrial	IN1 – General Industrial	West	244
R14	Industrial	IN1 – General Industrial	West	200
R15	Industrial	IN1 – General Industrial	West	360

Rec. ID	Receiver Type	Planning zone	Direction from main proposal site	Distance to nearest solar farm boundary (metres)
R16	Industrial	IN1 – General Industrial	West	470
R17	Commercial	IN1 – General Industrial	South	494
R18	Residential	RU1 – Primary Production	East	1,885
R19	Residential	RU1 – Primary Production	East	1,825
R20	Residential	RU1 – Primary Production	South-east	1,413

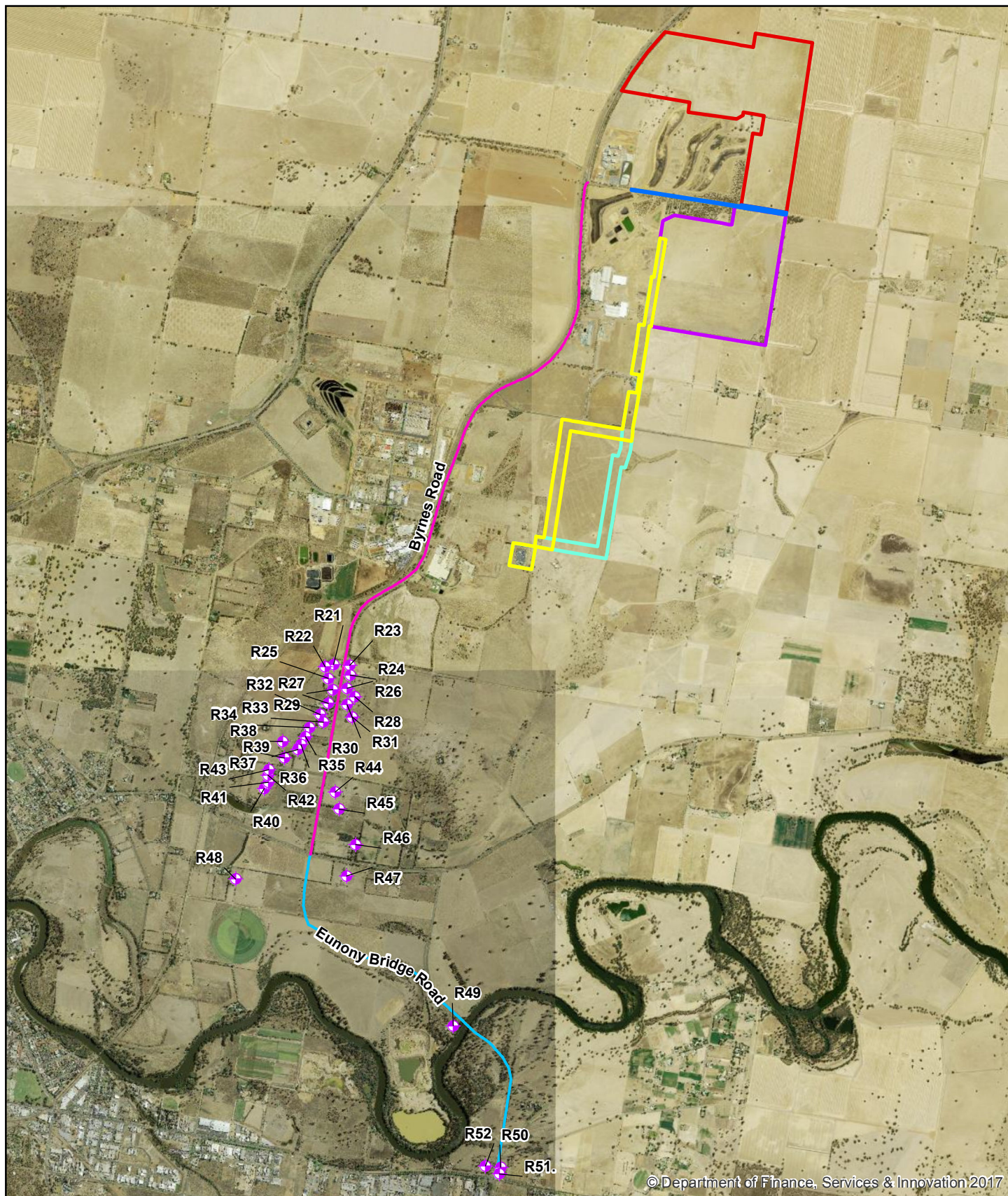
Table 2-2 Identified noise sensitive receivers – residences adjacent to Byrnes Road/ Eunony Bridge Road

Receiver ID	Residential address	Nearest road associated with the proposal	Distance from nearest residence façade to road edge
R21	171 Byrnes Road	Byrnes Road	84
R22	169 Byrnes Road	Byrnes Road	140
R23	168 Byrnes Road	Byrnes Road	45
R24	162 Byrnes Road	Byrnes Road	54
R25	155 Byrnes Road	Byrnes Road	94
R26	150 Byrnes Road	Byrnes Road	47
R27	145 Byrnes Road	Byrnes Road	35
R28	136 Byrnes Road	Byrnes Road	122
R29	135 Byrnes Road	Byrnes Road	63
R30	128 Byrnes Road	Byrnes Road	75
R31	126 Byrnes Road	Byrnes Road	129
R32	121 Byrnes Road	Byrnes Road	119
R33	117 Byrnes Road	Byrnes Road	75
R34	103-115 Byrnes Road	Byrnes Road	187
R35	97-101 Byrnes Road	Byrnes Road	204
R36	95 Byrnes Road	Byrnes Road	237
R37	87 Byrnes Road	Byrnes Road	350
R38	85 Byrnes Road	Byrnes Road	382
R39	83 Byrnes Road	Byrnes Road	255
R40	80 Byrnes Road	Byrnes Road	473
R41	78 Byrnes Road	Byrnes Road	442
R42	76 Byrnes Road	Byrnes Road	440
R43	74 Byrnes Road	Byrnes Road	440
R44	58 Byrnes Road	Byrnes Road	105
R45	44 Byrnes Road	Byrnes Road	161
R46	233 Oura Road	Byrnes Road	350
R47	226 Oura Road	Eunony Bridge Road	311
R48	73 Mingara Street	Eunony Bridge Road	596
R49	175 Eunony Bridge Road	Eunony Bridge Road	67
R50	8 Eunony Bridge Road	Eunony Bridge Road	29
R51	4 Eunony Bridge Road	Eunony Bridge Road	29
R52	Cnr. Sturt Highway & Eunony Bridge Road	Eunony Bridge Road	62





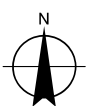




#### LEGEND

-  Noise Sensitive Receivers (road noise)
-  Final proposed Northern Development Area
-  Final proposed Southern Development Area
-  Transmission Line Option 1
-  Transmission Line Option 2
-  Trahairs Rd Corridor
-  Byrnes Road
-  Eunony Bridge Road

Paper Size A4  
0 165 330 660 990 1,320  
Metres  
Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 55



Renew Estate Pty Ltd  
Boman Solar Farm EIS

Job Number	23-16243
Revision	A
Date	15 Feb 2018

Site location, roads and noise  
sensitive receivers (road noise)

Figure 2

## 3. Noise criteria

### 3.1 Construction noise criteria

The *Interim Construction Noise Guideline* (DECC 2009) is used to assess noise impacts associated with construction works. The guideline recommends standard hours for construction activities as Monday to Friday: 7 am to 6 pm, Saturday: 8 am to 1 pm and no work on Sundays or public holidays.

The *Interim Construction Noise Guideline* acknowledges that the following activities have justification to be undertaken outside the recommended standard construction hours assuming all reasonable and feasible mitigation measures are implemented to minimise the impacts to surrounding sensitive land uses:

- The delivery of oversized plant or structures that police or other authorities require special arrangements to transport along public roads.
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm.
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard construction hours.
- Works which maintain noise levels at receivers to below the noise management levels outside of the recommended standard construction hours.

Table 3-1 details the *Interim Construction Noise Guideline* (DECC 2009) construction noise management levels at residential receivers in the study area. For industrial noise receivers within the study area, the noise management level is 75 dBA and for commercial noise receivers within the study area, the noise management level is 70 dBA.



Table 3-1 Construction noise management levels at residences

Time of day	Management level L <sub>Aeq</sub> (15min)	How to apply
<b>Recommended standard hours:</b> <ul style="list-style-type: none"> <li>Monday to Friday 7 am to 6 pm</li> <li>Saturday 8 am to 1 pm</li> <li>No work on Sundays or public holidays</li> </ul>	<b>45 dBA<sup>1</sup></b>  Noise affected  Rating background level + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. <ul style="list-style-type: none"> <li>Where the predicted or measured L<sub>Aeq</sub>(15min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>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.</li> </ul>
	<b>75 dBA</b>  Highly noise affected	The highly noise affected level represents the point above which there may be 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: <ul style="list-style-type: none"> <li>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)</li> <li>If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</li> </ul>
<b>OOHW1 - Outside recommended standard hours – weekends</b> (Saturdays 1 pm to 6 pm, Sundays 8 am to 6 pm)	<b>40 dBA<sup>1</sup></b>  Noise affected  Rating background level + 5 dBA	<ul style="list-style-type: none"> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> <li>Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.</li> </ul>
<b>OOHW2 - Outside recommended standard hours – evenings/nights</b> (Sunday to Thursday 6 pm to 7 am, Fridays and Saturdays 6 pm to 8 am)	<b>35 dBA<sup>1</sup></b>  Noise affected  Rating background level + 5 dBA	<ul style="list-style-type: none"> <li>A strong justification would typically be required for works outside the recommended standard hours.</li> <li>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.</li> </ul> <p>Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.</p>

Note 1: Based on the minimum rating background level (RBL) of 35 dBA for the day period and 30 dBA for the night period as per the Noise Policy for Industry (NPI).

### 3.2 Project noise trigger levels

The Noise Policy for Industry (NPI) provides guidance on the assessment of operational noise impacts. The guideline includes both intrusiveness and project amenity noise levels that are designed to protect receivers from noise significantly louder than the background level, and to limit the total noise level from industry near a receiver.

The NPI project noise trigger levels provide an objective for assessing a proposal and are not mandatory limits required by legislation. The project noise trigger levels assist the regulatory authorities to establish licensing conditions. Where project noise trigger levels are predicted to be exceeded, feasible and reasonable noise mitigation strategies should be considered. In circumstances where noise criteria cannot be achieved, residual noise impacts are used to assess noise impacts and manage noise from the site in negotiation between the regulatory authority and community. The regulatory authority then sets statutory compliance levels that reflect the achievable and agreed noise limits from the development.

The intrusiveness noise level controls the relative audibility of operational noise compared to the background level at residential receivers. The amenity noise level limit the total level of extraneous noise for all receiver types. Both levels are calculated and the lower of the two in each time period is set as the project noise trigger level. The intrusiveness noise level is assessed over a 15 minute period however the amenity noise level is assessed over the day, evening or night time period. For the purposes of assessment to standardise the approach the NPI recommends that the  $L_{Aeq(15min)} = L_{Aeq(period)} + 3 \text{ dBA}$  unless an alternative approach can be justified.

#### 3.2.1 Intrusiveness noise level

The intrusiveness noise level is determined by a 5 dB addition to the measured or adopted background noise level with a minimum intrusiveness noise level of 35 dBA for the evening and night period and 40 dBA for the day period. The NPI recommends that the intrusiveness noise level for the evening and day period should not exceed the daytime period. The intrusiveness noise levels are only applicable to residential receivers.

#### 3.2.2 Project amenity noise level

The recommended amenity noise level applies to all industrial noise in the area which when combined should remain below the recommended amenity noise level. The recommended amenity noise level represents the total industrial noise at a receiver location and a Project Amenity Noise Level is set at 5 dBA below the recommended amenity noise level.

Residential receiver areas are characterised into 'urban', 'suburban', 'rural' or other categories based on land uses and the existing level of noise from industry and road traffic. With consideration to the NPI 'noise amenity area' classification, the residential receivers identified for this assessment should be classified as 'Rural Residential' and all other nearby industrial sites are classified as 'Industrial premises'.

### 3.3 Summary of project noise trigger levels

For residential receivers, the project noise trigger levels are provided in Table 3-2. The project noise trigger levels reflect the most stringent noise level requirements derived from the intrusiveness and project amenity noise levels. Daytime and evening time project noise trigger levels should be achieved, as the solar farm will operate during these time periods. Project noise trigger levels at the sensitive receivers have been determined based on the minimum background noise level thresholds, as no background noise monitoring has been undertaken.

Table 3-2 – Project noise trigger levels – residential noise receivers, dBA

Criteria $L_{Aeq}(15min)$	Residential Receivers		
	Day	Evening	Night
Intrusiveness noise level	40	35	35
Project amenity noise level (rural)	48	43	38
Project noise trigger levels	40	35	35

Notes:

- The NPI defines Day as 7 am to 6 pm Monday to Friday and 8 am to 6 pm Saturday, Sunday and Public Holidays, Evening 6 pm to 10 pm and Night as the remaining periods.
- In accordance with the NPI, the minimum assumed Rating Background Level (RBL) during the daytime is 35 dBA and 30 dBA for the evening and night periods (no background noise monitoring was undertaken as part of this assessment).
- Noise from the site is to be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary, to determine compliance with the project noise trigger levels, except where otherwise specified below.

For industrial receivers, the project noise trigger levels are provided in Table 3-3 below.

Table 3-3 – Project noise trigger levels – commercial and industrial receivers

Receiver	Time of day	$L_{Aeq}$ , dBA
Commercial premises	When in use	65
Industrial premises	When in use	70

### 3.3.1 Hours of operation

It is understood that the operations of at the solar farm site will be limited to the hours presented in Table 3-4.

Table 3-4 Operating hours

Activity	Day of week	Time	Quietest assessment period
Trackers/ modules	7 days a week	Daylight hours	Night
Substation/power station/battery storage system		24 hours	Night
Operational and maintenance activities		24 hours (predominantly during daylight hours unless in an emergency)	Night

### 3.3.2 Meteorological conditions

Noise propagation can be enhanced by particular wind conditions and temperature inversions. The NPI states:

*“Where inversion conditions are predicted for at least 30% (or approximately 2 nights per week) of the total night time in winter, then inversion effects are considered to be significant and should be taken into account in the noise assessment.*

*Wind effects need to be assessed where wind is a feature of the area. Wind is considered to be a feature where source-to-receiver wind speeds (at 10 m height) of 3 m/s or below occur for 30 per cent of the time or more in any assessment period (day, evening, night) in any season.”*

Meteorological modelling has not been undertaken, however temperature inversions are likely to be a significant feature of the area. To simulate worst case meteorological conditions for noise propagation, a Concawe F-Class meteorological conditions with calm wind has been included in the noise predictions during the night and Concawe D-class meteorological conditions during the day period.

Predictions are carried out assuming an average temperature of 10°C and average humidity of 70%.

### 3.3.3 Modifying factor adjustments

The NPI requires that modifying factor adjustments are applied if the noise sources contain tonal, intermittent or low frequency characteristics, which have the potential to increase annoyance. The modifying factor adjustments are detailed in Table 3-4.

Table 3-5 NPI modifying factor adjustments

Factor	Assessment/ measurement	When to apply	Correction <sup>1,2</sup>
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: <ul style="list-style-type: none"> <li>5 dB or more if the centre frequency of the band containing the tone is above 400 Hz</li> <li>8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive</li> <li>15 dB or more if the centre frequency of the band containing the tone is below 160 Hz.</li> </ul>	5 dBA <sup>2</sup>
Low frequency noise	Measurement of C-weighted and A-weighted level	Measure/assess C and A weighted $L_{eq,T}$ levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more and: <ul style="list-style-type: none"> <li>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 dBA positive adjustment to measured/predicted A-weighted levels for the evening/night period</li> <li>Where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dBA and cannot be mitigated, a 5 dBA positive adjustment to measured/predicted A-weighted noise levels applies for the evening/night period and a dBA positive adjustment for the daytime period.</li> </ul>	5 dBA <sup>2</sup>
Intermittent noise	Subjectively assessed	When the night-time noise level drops to that of the background noise level with a noticeable change in noise level of at least 5 dBA.	5 dBA
Impulsive noise	A-weighted fast response and impulse response	If the difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2 dB.	Apply the difference in measured noise levels as the correction up to a maximum of 5 dBA

Note 1: Where two or more modifying factors are present the maximum correction is limited to 10 dBA.

Factor	Assessment/ measurement	When to apply	Correction <sup>1,2</sup>
--------	----------------------------	---------------	---------------------------

Note 2: Where a source emits a tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low frequency range.

### 3.3.4 Sleep disturbance

The EPA (2013) *Noise Guide for Local Government* (NGLG) provides guidelines for assessing sleep disturbance from short-term noise events. To assess potential disturbance during night-time hours (6:00 am to 7:00 am), Section 2.4.5 of the NGLG recommends that  $L_{A1,1min}$  levels outside a bedroom window should not exceed the background level by more than 15 dBA.

Table 3-6 below summarises the background noise level at the nearby residential receivers and the sleep disturbance criterion.

Table 3-6 Sleep disturbance criteria,  $L_{A1(1min)}$  dBA

Receiver Type	Night-time shoulder $L_{A90}$ Background Noise Level	Criterion $L_{A1(1min)}$
Nearby Residential Receivers	30	45

## 3.4 Road traffic noise criteria

The *Road Noise Policy* (RNP) (DECCW, 2011) provides traffic noise criteria for residential receivers in the vicinity of existing roads, shown in Table 3-7. The criteria is applied to operational and construction traffic on public roads to identify potential road traffic impacts and the requirement for reasonable and feasible mitigation measures.

The RNP application notes 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 increases from the development are within 2 dBA of current levels then the objectives of the RNP are met and no specific mitigation measures are required.

Table 3-7 Road traffic noise criteria,  $L_{Aeq(period)}$  dBA

Type of Development	Day 7 am to 10 pm	Night 10 pm to 7 am
Existing residence affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	60 $L_{eq(15hr)}$	55 $L_{eq(9hr)}$

The Roads and Maritime Services' *Noise Criteria Guideline* (2015) defines sub-arterial, collector and local roads as shown in Table 3-8. Based on these definitions, Byrnes Road and Eunony Bridge Road have been classified as sub-arterial roads which are assessed under the sub-arterial road criteria as outlined in Table 3-7.



Table 3-8 Roads and Maritime road classification criteria

Road	Definition
<b>Sub-arterial</b>	<p>Connects arterials to regions of development and carry traffic from one part of a region to another.</p> <p>Provide connection between arterial roads and local roads. May support arterial roads during peak periods.</p> <p>A road that collects local traffic leaving a locality and connects to another local road, sub-arterial or arterial.</p> <p>Note not all networks are large enough to have both sub-arterial and collector roads</p>
<b>Collector</b>	<p>Connects the sub-arterial roads to the local road system in developed areas.</p> <p>May support sub-arterial roads during peak periods.</p> <p>May have been designed as local streets but can serve major traffic-generating developments or support non-local traffic.</p> <p>Note not all networks are large enough to have both collector and sub-arterial roads.</p> <p>The Road Noise Policy does not provide separate noise criteria for collector roads. Roads and Maritime applies sub-arterial noise criteria to collector roads and still considers collector roads and sub-arterial roads to be different functional classes.</p>
<b>Local</b>	<p>Provide vehicular access to abutting property and surrounding streets. They are the subdivisional roads within a particular developed area.</p>

## 4. Construction noise impact assessment

### 4.1 Construction methodology

Construction of the proposal is expected to commence in 2018 and would take approximately nine to twelve months to complete. The main construction activities would include:

- Site establishment and preparation including:
  - Minor upgrade of the unsealed section of Trahairs Road (road grading work to a width of four metres)
  - Constructing internal access roads
  - Installing perimeter fencing
  - Removing existing internal fence lines (if required)
  - Establishing construction compound and laydown areas
  - Installing environmental controls
- Installing the steel post foundation system for the trackers (driven piling)
- Installing the trackers on the steel posts
- Installing the solar modules on the trackers
- Constructing the power conversion stations
- Constructing the substation and switchyard
- Constructing the transmission line between the substation and the TransGrid Wagga Wagga North substation
- Constructing the control building
- Installing the battery storage system
- Installing underground cabling (trenching) and connecting communications equipment
- Installing ancillary facilities and infrastructure
- Landscaping works
- Removing temporary construction facilities and rehabilitation of disturbed areas.

The majority of construction works would be during standard construction working hours, with out-of-standard-hours works on Saturdays (between 1 pm and 6 pm), Sundays (between 8 am and 6 pm) and nights (6 pm to 7 am). Construction works during non-standard hours will not include piling works and transmission line works.

Out-of-standard hours works on Saturdays and Sundays include all the construction activities above except for piling works and the construction of the transmission line. Out-of-standard hours works on weekday and weekend evenings and nights include all the construction activities above (limited to the central work area) except for piling works and the construction of the transmission line. Should piling or transmission line works outside these hours be required, notification to nearby residents would occur outlining the timing, duration and nature of the works and potential noise levels.

## 4.2 Construction noise

### 4.2.1 Construction noise sources

Equipment used during construction would include earth-moving equipment for civil works, diesel generators, trucks and cranes with similar noise outputs to farm machinery such as tractors. Pile driving for the solar panel foundations would be undertaken using a machine which screws or hammers poles into the ground, similar to that used for driving farm fence poles into the ground. The typical construction equipment likely to be the main noise sources are shown in Table 4-1 with the corresponding noise level. The typical construction activities associated with the proposal with the relevant construction equipment and hours of construction are presented in Table 4-2. The locations of Trahairs Road, the northern and southern farm development areas, the transmission line corridor and the central area of the solar farm is presented in Figure 3 below.

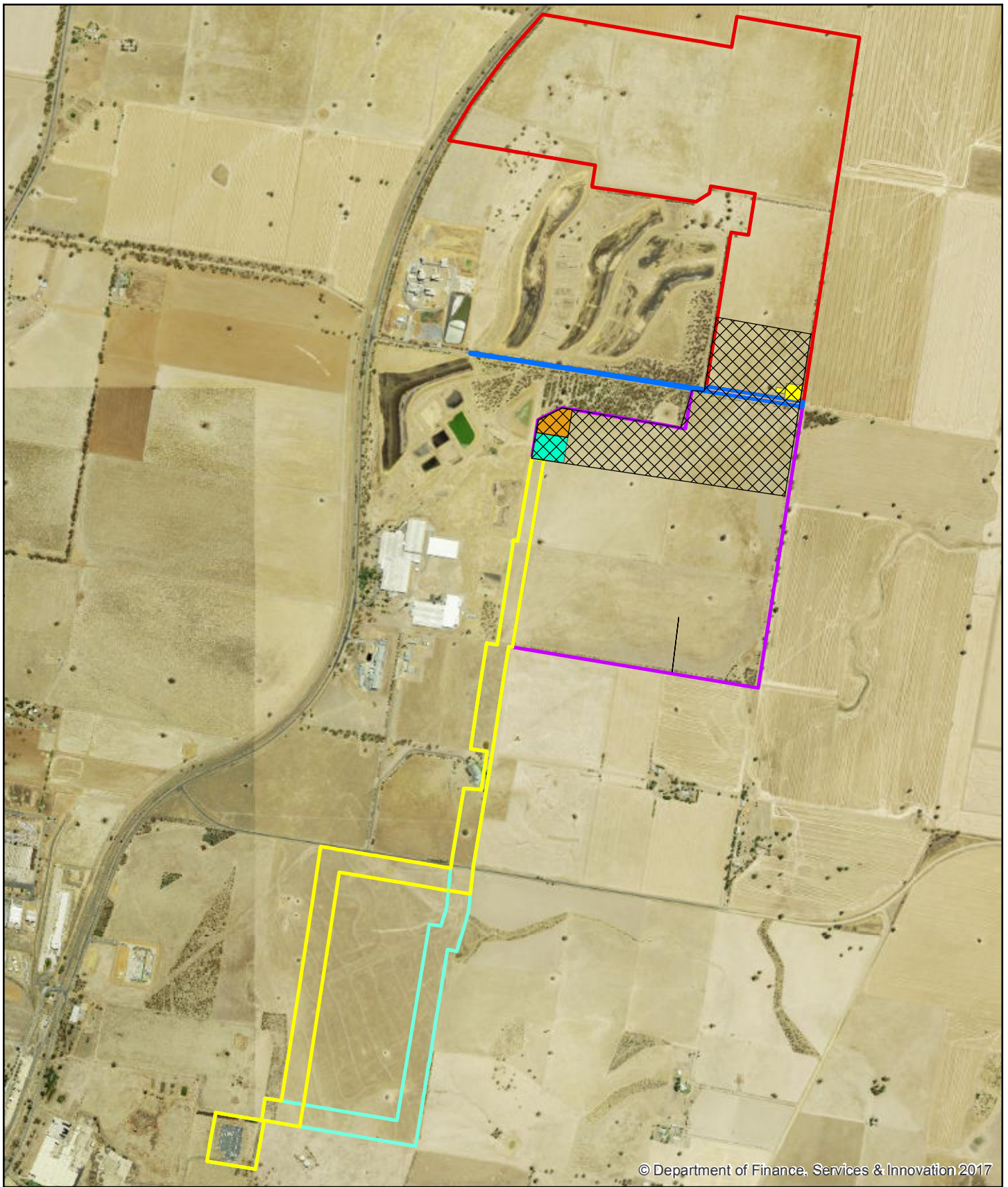
Noise levels of construction equipment have been obtained from Australian Standard, AS 2436 – 2010 *“Guide to Noise Control on Construction, Maintenance and Demolition Sites”*, the Department for Environment Food and Rural Affairs (DEFRA) *“Noise Database for Construction Sites”* 2005 and the RMS *“Construction Noise Guideline”* 2016.

Table 4-1 Construction equipment sound power levels, dBA

Equipment	Sound power level (typical)	Source
Diesel generator	99	AS 2436
Chainsaw	114	RMS CNVG
Tree clearing and mulching equipment	116	RMS CNVG
Mobile crane	104	AS 2436
Pile drilling rig	126	AS 2436
Powered hand tools	102	AS 2436
Trucks	117	AS 2436
Forklifts	106	AS 2436
Electric forklift	98	DEFRA
Grader	110	AS 2436
Roller	108	AS 2436
Excavator	107	AS 2436
Water trucks	107	AS 2436
Underground bore equipment	112	DEFRA
Cable winch	96	DEFRA
Bored piling rig	111	AS 2436
Delivery Trucks	107	AS 2436

To simulate the worst-case scenario, the two loudest items of mechanical plant have been modelled as point source to calculate the activity sound power level. As the project extent is very large, this is considered conservative as it is likely that there will be greater distances between the items of mechanical plant during construction.

It should be noted that the assessed construction works areas for the northern and southern development areas extend beyond the final proposed boundaries of these areas. The final proposed northern and southern development areas have decreased in size since the initial computer noise modelling of the assessed construction work area. The difference in modelled noise levels at sensitive receivers between the assessed areas and the final proposed areas would likely be negligible. If any change, noise levels would be likely to decrease.

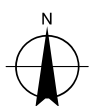


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#### LEGEND

- |  |  |   |                            |   |                               |
|--|--|---|----------------------------|---|-------------------------------|
|  | Central work area                        |  | Transmission Line Option 1 |  | Battery Storage               |
|  | Final proposed Northern Development Area |  | Transmission Line Option 2 |  | Substation                    |
|  | Final proposed Southern Development Area |  | Trahairs Rd Corridor       |  | Control Building/Carpark Area |

Paper Size A4  
0 75 150 300 450 600  
Metres  
Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 55



Renew Estate Pty Ltd  
Boman Solar Farm EIS

Job Number	23-16243
Revision	A
Date	23 Feb 2018

Construction noise areas

Figure 3

G:\23\16243\GIS\Maps\Deliverables\Noise\23\_16243\_Figure\_3.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com.au W www.ghd.com.au

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Table 4-2 Construction scenarios associated with the proposal

CS	Scenario	Construction area location	Construction hours	Construction equipment		activity sound power level
S1	Site establishment/ Trahairs Road upgrade/ vegetation clearing/ civil earthworks	Trahairs Road and northern and southern solar farm development areas	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	Grader	Water truck	112 dBA
				Dozer	Hand tools	
				Dump truck	Chainsaws	
				Roller	Tree clearing and mulching equipment	
S2	Installing steel post foundations	Northern and southern solar farm development areas	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	Impact pile driver	Crane	121 dBA
				Hand tools	-	
S3	Construction of hardstand areas, solar arrays, substation, control building, power stations, battery storage area	Northern and southern solar farm development areas	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	Generator	Bobcat	111 dBA
				Forklifts	Hand tools	
				Crane	Trenching machines	
				Concrete truck/pump	Semi-trailers	
				Grader	Delivery trucks	
S4	Construction of overhead transmission lines	Transmission line corridor (option 1 and option 2)	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	Excavator	Bored piling rig	112 dBA
				Crane	Winch	
S5	Construction of underground transmission cables	Transmission line corridor (option 1 and option 2)	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	Under bore equipment	Excavator	117 dBA
				Cable drums/winch	Water cart/dump truck	
S6	Out of hours work - (Saturdays and Sundays) (OOHW1) including all activities above except piling works and construction of the transmission line	Northern and southern solar farm development areas	Outside of standard construction hours (Saturdays 1 pm to 6 pm and Sundays 8 am to 6 pm)	Generator	Concrete truck	111 dBA
				Forklifts	Grader/dozer	
				Crane	Hand tools	

CS	Scenario	Construction area location	Construction hours	Construction equipment	activity sound power level
S7	Out of hours work (evenings/nights) (OOHW2) including all activities above except piling works and construction of the transmission line	Northern and southern solar farm development areas	Outside of standard construction hours (Sunday to Thursday 6 pm to 7 am, Fridays and Saturdays 6 pm to 8 am)	Generator and crane (central work area only, shown in Figure 3)	111 dBA (central area) 103 dBA (trackers and modules)
				Concrete truck (central work area only, shown in Figure 3)	
				Grader and dozer (central work area only, shown in Figure 3)	
				Electric forklift (all areas, except within 250 m of the southern solar farm boundary, installing trackers and modules)	
				Hand tools (all areas, except within 250 m of the southern solar farm boundary, installing trackers and modules)	
Note: 1) The activity sound power level is calculated from the logarithmic sum of the two loudest construction equipment items to simulate the worst-case scenario.					

#### 4.2.2 Construction assessment methodology

The noise emissions from construction activities have been assessed at the surrounding sensitive receivers. A quantitative assessment has been undertaken with consideration to the ICNG.

For each construction activity, the potential noise impacts on the surrounding sensitive receivers have been predicted. Noise modelling was undertaken using SoundPLAN version 7.4 which calculates environmental noise propagation according to *ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors*. The following assumptions and calculation parameters were used in the noise model:

- Land was modelled assuming a mixture of hard and soft ground with a ground absorption coefficient of 0.75. This has been considered representative of the grassy, agricultural land surrounding the site
- The noise model was used to predict noise levels during a typical worst case 15 minute period of operation where all equipment is operating at full power
- Meteorological conditions was based on Concawe D-class during the day and Concawe F-class during the night to simulate worst-case meteorological conditions for noise propagation
- Atmospheric absorption was based on an average temperature of 10 °C and an average humidity of 70%

#### 4.2.3 Predicted construction noise levels

A summary of the predicted noise levels of each construction scenario (CS) is provided in Table 4-3, along with the relevant noise management level (NML). The predicted noise levels for residential receivers are provided as a range as the project extent is over 2.5 kilometres (north to south) and will significantly vary depending on the distance of the construction equipment to the sensitive receiver. The range is calculated from the closest point from the receiver to the nearest and furthest point of the relevant construction equipment. The predicted noise levels for commercial/industrial receivers is a maximum noise level from the shortest distance from the receiver to the relevant construction equipment.

All exceedances of the noise management levels and the highly noise affected criteria at sensitive receivers are presented in Table 4-4.

Table 4-3 Predicted construction noise levels at surrounding receivers, dBA

CS	Construction Hours	Receiver ID	Receiver Type	NML	Predicted noise level, $L_{Aeq(15min)}$	Exceedances
S1	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	R1	Residential	45	20 to 23	No
		R2	Residential	45	23 to 25	No
		R3	Residential	45	32 to 35	No
		R4	Residential	45	23 to 26	No
		R5	Residential	45	27 to 31	No
		R6	Residential	45	24 to 27	No
		R7	Residential	45	22 to 25	No
		R8	Residential	45	32 to 36	No
		R9	Residential	45	31 to 34	No
		R10	Residential	45	24 to 26	No
		R11	Residential	45	9 to 11	No
		R12	Industrial	75	46	No
		R13	Industrial	75	48	No
		R14	Industrial	75	44	No
		R15	Industrial	75	40	No
		R16	Industrial	75	39	No
		R17	Commercial	70	35	No
		R18	Residential	45	26 to 30	No
		R19	Residential	45	26 to 30	No
		R20	Residential	45	26 to 31	No
S2	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	R1	Residential	45	26 to 35	No
		R2	Residential	45	27 to 36	No
		R3	Residential	45	31 to 39	No
		R4	Residential	45	28 to 36	No
		R5	Residential	45	30 to 38	No
		R6	Residential	45	27 to 33	No
		R7	Residential	45	25 to 31	No
		R8	Residential	45	38 to 55	10 dB
		R9	Residential	45	35 to 49	4 dB
		R10	Residential	45	27 to 36	No
		R11	Residential	45	28 to 36	No
		R12	Industrial	75	54	No
		R13	Industrial	75	63	No
		R14	Industrial	75	65	No
		R15	Industrial	75	56	No
		R16	Industrial	75	51	No
		R17	Commercial	70	52	No
		R18	Residential	45	25 to 33	No
		R19	Residential	45	27 to 33	No
		R20	Residential	45	28 to 37	No



CS	Construction Hours	Receiver ID	Receiver Type	NML	Predicted noise level, $L_{Aeq}(15min)$	Exceedances
S3	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	R1	Residential	45	16 to 25	No
		R2	Residential	45	17 to 26	No
		R3	Residential	45	21 to 29	No
		R4	Residential	45	18 to 26	No
		R5	Residential	45	20 to 28	No
		R6	Residential	45	17 to 23	No
		R7	Residential	45	15 to 21	No
		R8	Residential	45	28 to 45	No
		R9	Residential	45	25 to 39	No
		R10	Residential	45	17 to 26	No
		R11	Residential	45	18 to 26	No
		R12	Industrial	75	44	No
		R13	Industrial	75	53	No
		R14	Industrial	75	55	No
		R15	Industrial	75	46	No
		R16	Industrial	75	41	No
		R17	Commercial	70	42	No
		R18	Residential	45	15 to 23	No
		R19	Residential	45	17 to 23	No
		R20	Residential	45	18 to 27	No
S4 (1)	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	R1	Residential	45	12 to 16	No
		R2	Residential	45	14 to 18	No
		R3	Residential	45	17 to 21	No
		R4	Residential	45	18 to 19	No
		R5	Residential	45	19 to 25	No
		R6	Residential	45	17 to 21	No
		R7	Residential	45	15 to 19	No
		R8	Residential	45	27 to 37	No
		R9	Residential	45	25 to 32	No
		R10	Residential	45	25 to 31	No
		R11	Residential	45	5 to 12	No
		R12	Industrial	75	37	No
		R13	Industrial	75	53	No
		R14	Industrial	75	56	No
		R15	Industrial	75	50	No
		R16	Industrial	75	44	No
		R17	Commercial	70	71	1 dB
		R18	Residential	45	12 to 17	No
		R19	Residential	45	13 to 17	No
		R20	Residential	45	16 to 20	No

CS	Construction Hours	Receiver ID	Receiver Type	NML	Predicted noise level, $L_{Aeq}(15min)$	Exceedances
S4 (2)	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	R1	Residential	45	12 to 16	No
		R2	Residential	45	14 to 18	No
		R3	Residential	45	17 to 21	No
		R4	Residential	45	18 to 19	No
		R5	Residential	45	19 to 25	No
		R6	Residential	45	17 to 21	No
		R7	Residential	45	15 to 19	No
		R8	Residential	45	27 to 37	No
		R9	Residential	45	25 to 32	No
		R10	Residential	45	27 to 33	No
		R11	Residential	45	7 to 14	No
		R12	Industrial	75	37	No
		R13	Industrial	75	54	No
		R14	Industrial	75	56	No
		R15	Industrial	75	49	No
		R16	Industrial	75	44	No
		R17	Commercial	70	72	2 dB
		R18	Residential	45	12 to 17	No
		R19	Residential	45	13 to 17	No
		R20	Residential	45	16 to 20	No
S5	Standard (Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm)	R1	Residential	45	22 to 31	No
		R2	Residential	45	23 to 32	No
		R3	Residential	45	27 to 35	No
		R4	Residential	45	24 to 32	No
		R5	Residential	45	26 to 34	No
		R6	Residential	45	23 to 29	No
		R7	Residential	45	21 to 27	No
		R8	Residential	45	34 to 51	6 dB
		R9	Residential	45	31 to 45	No
		R10	Residential	45	23 to 32	No
		R11	Residential	45	24 to 32	No
		R12	Industrial	75	50	No
		R13	Industrial	75	59	No
		R14	Industrial	75	61	No
		R15	Industrial	75	52	No
		R16	Industrial	75	47	No
		R17	Commercial	70	48	No
		R18	Residential	45	21 to 29	No
		R19	Residential	45	23 to 29	No
		R20	Residential	45	24 to 33	No

CS	Construction Hours	Receiver ID	Receiver Type	NML	Predicted noise level, $L_{Aeq}(15min)$	Exceedances
S6	OOHW1 - Outside of standard construction hours (1 pm to 6 pm on Saturday and 8 am to 6 pm on Sundays)	R1	Residential	40	16 to 25	No
		R2	Residential	40	17 to 26	No
		R3	Residential	40	21 to 29	No
		R4	Residential	40	18 to 26	No
		R5	Residential	40	20 to 28	No
		R6	Residential	40	17 to 23	No
		R7	Residential	40	15 to 21	No
		R8	Residential	40	28 to 45	5 dB
		R9	Residential	40	25 to 39	No
		R10	Residential	40	17 to 26	No
		R11	Residential	40	18 to 26	No
		R12	Industrial	75	44	No
		R13	Industrial	75	53	No
		R14	Industrial	75	55	No
		R15	Industrial	75	46	No
		R16	Industrial	75	41	No
		R17	Commercial	70	42	No
		R18	Residential	40	15 to 23	No
		R19	Residential	40	17 to 23	No
		R20	Residential	40	18 to 27	No
S7	OOHW2- Outside of standard construction hours (Sunday to Thursday 6 pm to 7 am, Fridays and Saturdays 6 pm to 8 am)	R1	Residential	35	13 to 22	No
		R2	Residential	35	15 to 24	No
		R3	Residential	35	15 to 23	No
		R4	Residential	35	16 to 25	No
		R5	Residential	35	20 to 29	No
		R6	Residential	35	19 to 26	No
		R7	Residential	35	18 to 24	No
		R8	Residential	35	21 to 39	4 dB
		R9	Residential	35	20 to 34	No
		R10	Residential	35	16 to 24	No
		R11	Residential	35	16 to 24	No
		R12	Industrial	70	43	No
		R13	Industrial	70	46	No
		R14	Industrial	70	49	No
		R15	Industrial	70	41	No
		R16	Industrial	70	37	No
		R17	Commercial	70	37	No
		R18	Residential	35	20 to 28	No
		R19	Residential	35	22 to 28	No
		R20	Residential	35	20 to 29	No

Table 4-4 Exceedances of noise management levels

Construction Scenario	Exceedance NML, dB	Exceedances - Highly Noise Affected, 75 dBA
S1	None	None
S2	R8 – 10 dB	None
	R9 – 4 dB	
S3	None	None
S4 (option 1)	R17 – 1 dB	None
S4 (option 2)	R17 – 2 dB	None
S5	R8 – 6 dB	None
S6	R8 – 5 dB	None
S7	R8 – 4 dB	None

The worst case noise levels are predicted to exceed the noise affected construction noise management levels at the residential receivers R8 and R9 and the commercial receiver R17. The highest exceedances occur when impact piling works (construction scenario S2) are occurring at the proposal boundary closest to the residential receiver at R8. Exceedances of the noise management level at R8 also occur during construction scenarios S5, S6 and S7. These exceedances are expected to be short term in duration and would reduce as the plant and equipment moved further away from the sensitive receiver.

The noise levels are predicted to marginally exceed the noise affected construction noise management levels at the commercial receiver R17 during the construction of the overhead transmission lines (S4 option 1 and S4 option 2). This exceedance is expected to be short term in duration and would reduce as the plant and equipment moved further away from the sensitive receiver. Furthermore, it is likely that the transmission line would be underground rather than overhead at areas closest to R17, however a worst case overhead line scenario has been assessed.

Option 1 is predicted to cause marginally less construction noise impact on sensitive receivers, when compared to option 2.

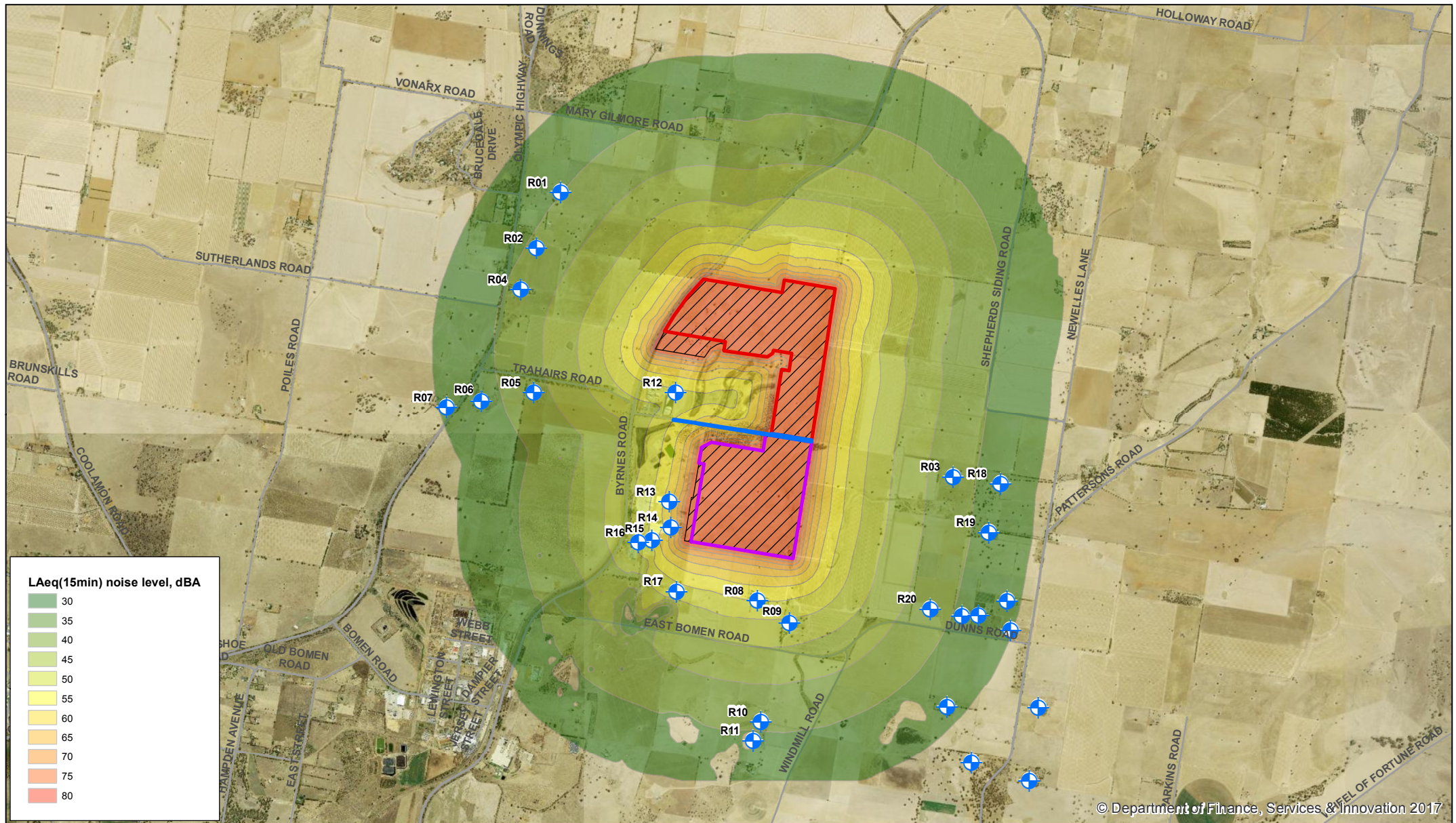
It is recommended that the noise mitigation measures detailed in Section 6 be considered, where feasible and reasonable, to reduce noise impacts.

Construction noise contours for the noisiest scenarios S2, S4 (option 1 and option 2) during standard construction hours are provided in Figure 4, Figure 5 and Figure 6 below. Construction noise contours for night-time works are provided in Figure 7 below.

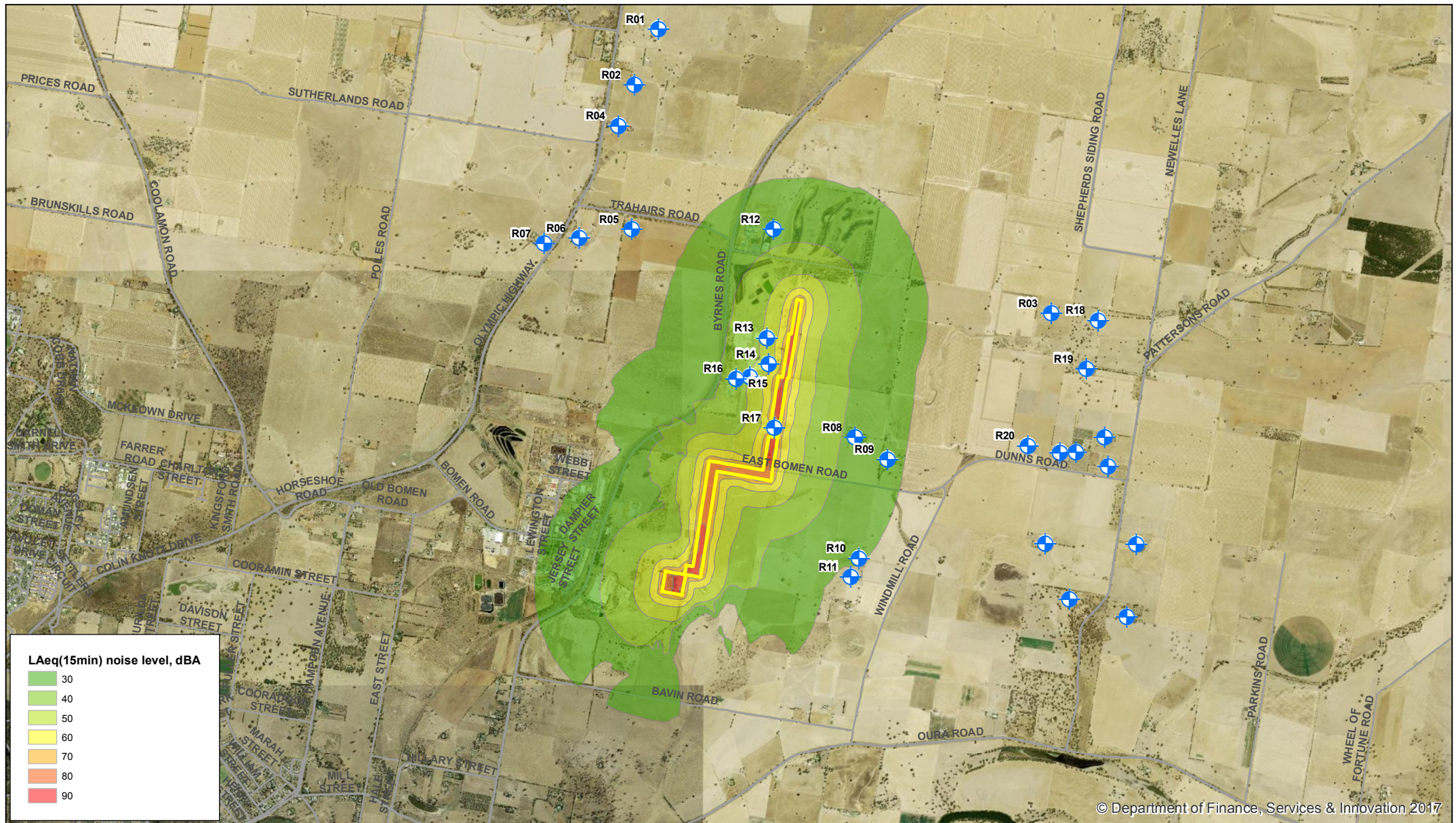
### 4.3 Sleep disturbance impacts

The noisiest event that could occur during the night-time period and have the potential to cause sleep disturbance at nearby residences is likely to be the use of hand tools during the construction of the solar arrays. Based on a predicted maximum sound power level of 102 dBA for the use of hand tools, the maximum  $L_{A1(1min)}$  noise levels due to construction works during the night-time period is predicted to be 37 dBA at R8 (received through an open window at all the nearest residential dwellings) and is below the sleep disturbance criterion of 45 dBA . As such, no sleep disturbance impacts are anticipated on the nearby residents during night-time construction works.

















## 4.4 Construction compound

A temporary construction compound would be established on site and would include a site office and amenities. This building would be a prefabricated structure which can be brought to site on the back of a truck and removed from site when required.

Noise impacts from establishing and operating the construction compound are not anticipated due to the large distances between the compound and sensitive receivers (refer to Table 2-1).

## 4.5 Construction traffic noise impacts

### 4.5.1 Overview of applicable roads

Construction of the proposal would generate approximately 30 heavy vehicle movements per day period (15 movements each way) and about 340 light vehicle movements (170 movements each way) per day period during the peak construction period. During non-peak periods, approximately 120 light vehicle movements and an average of 6 heavy vehicle movements per day are anticipated. Movements would occur mainly during the daytime period, with access to the site occurring from Trahairs Road via Byrnes Road, Eunony Bridge Road and Sturt Highway. During the night period (10 pm to 7 am), a maximum of 20 heavy vehicle movements and 50 light vehicle movements are anticipated.

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.” This is also considered to be applicable for construction noise therefore if road traffic noise increases from construction is within 2 dBA of current levels then the objectives of the RNP are achieved.

There are no residential receivers along Trahairs Road and the nearest residential receiver is over a kilometre from Trahairs Road. As the noise levels from construction traffic along Trahairs Road will be negligible at the nearest residential receivers, the assessment of road traffic noise along Trahairs road has not been included within this assessment and should not be deemed necessary.

A significant increase in traffic volumes would be needed to increase road traffic noise by 2 dBA (a doubling in traffic corresponds to an approximate 3 dBA increase) on Sturt Highway. The additional traffic generated from construction activities would not be significant when compared to the daily existing vehicle numbers on Sturt Highway. As such, assessment of road traffic noise on the Sturt Highway is not deemed necessary and has not been included in this assessment.

In view of the above, assessment of construction road traffic noise has only been completed for Byrnes Road and Eunony Bridge Road.

### 4.5.2 Road traffic noise modelling

A separate model was created using the noise intrusion modelling software CadnaA in order to determine the effects of the additional light and heavy vehicle movements on receivers along Byrnes Road and Eunony Bridge Road. Road traffic noise propagation was calculated according to the *Calculation of Road Traffic Noise* (CoRTN) 1998 standard. The following modelling assumptions were used as shown in Table 4-5.



Table 4-5 Road traffic modelling assumptions

Input	Assumptions
Traffic speeds	100 km/hour
Traffic volumes	Average traffic counts from weekdays and Sundays during 14-21 April 2015 were used as the base for calculations.
Existing Traffic – light vehicles	1768 during day period (118/hour) and 193 (21/hour) during the night period
Existing Traffic – heavy vehicles	250 during day period (17/hour) and 45 (5/hour) during the night period
Traffic growth - day	An additional 400 light vehicle movements per day (27/hour) and additional 30 heavy vehicle movements per day (2/hour) to existing counts (peak period)
Traffic growth - night	An additional 50 light vehicle movements per night period (6/hour) and additional 20 heavy vehicle movements per night period (2/hour) to existing counts (peak period)
Road gradient	Taken into account based on existing topography
Road surface correction	+0.0 dBA
Buildings	Buildings close to receivers were included in the model to account for reflection and wake effects
Receiver heights	1.5 metres above building ground level
Ground absorption	G = 0.75, where 0 is non-porous ground and 1 is porous ground such as that found in a rural setting comprising of mainly grass and vegetation
Ground topography	A digital terrain model with a 1 metre resolution has been used
Façade correction	+2.5 dBA to account for noise reflected from the façade (from Road Noise Policy – DECCW)
CoRTN factor (Adapted to Australian conditions through research undertaken by the Australian Road Research Board)	-1.7 dBA at the façade

The impact on traffic levels and resulting noise at sensitive receivers along Byrnes Road and Eunony Bridge was modelled using CadnaA as outlined above. The noise impact was assessed against the noise criteria for a sub-arterial road of 60 dBA  $L_{Aeq(15hr)}$  for the day period (7 am to 10 pm) and 55 dBA  $L_{Aeq(15hr)}$  for the night period (10 pm to 7 am). The resulting noise levels at sensitive receivers are shown in Table 4-6 and Table 4-7 below.

Noise emission maps for the predicted road traffic noise along Byrnes Road and Eunony Bridge Road are also provided in Figure 8 and Figure 9 below.

Table 4-6 Noise levels at sensitive receivers from vehicles along Byrnes Road and Eunony Bridge Road

Receiver	$L_{Aeq(1hr)}$ Noise levels from existing traffic	$L_{Aeq(1hr)}$ Noise levels from predicted traffic	Increase in noise level, dBA	Compliance
R21	53.3	54.0	0.7	Yes
R22	49.6	50.2	0.6	Yes
R23	57.6	58.2	0.6	Yes
R24	55.5	56.2	0.7	Yes
R25	51.5	52.2	0.7	Yes
R26	56.8	57.5	0.7	Yes
R27	57.9	58.6	0.7	Yes
R28	50.4	51.0	0.6	Yes

Receiver	L <sub>Aeq</sub> (1hr) Noise levels from existing traffic	L <sub>Aeq</sub> (1hr) Noise levels from predicted traffic	Increase in noise level, dBA	Compliance
R29	54.4	55.1	0.7	Yes
R30	53.4	54.1	0.7	Yes
R31	51.2	51.9	0.7	Yes
R32	50.6	51.3	0.7	Yes
R33	53.7	54.4	0.7	Yes
R34	48.6	49.3	0.7	Yes
R35	48.6	49.3	0.7	Yes
R36	47.6	48.3	0.7	Yes
R37	45.4	46.1	0.7	Yes
R38	46.0	46.7	0.7	Yes
R39	47.6	48.3	0.7	Yes
R40	45.6	46.3	0.7	Yes
R41	45.9	46.6	0.7	Yes
R42	45.5	46.2	0.7	Yes
R43	45.4	46.1	0.7	Yes
R44	52.2	52.9	0.7	Yes
R45	49.6	50.3	0.7	Yes
R46	44.5	45.1	0.6	Yes
R47	45.4	46.1	0.7	Yes
R48	41.2	41.9	0.7	Yes
R49	54.6	55.2	0.6	Yes
R50	60.7	61.4	0.7	Yes
R51	60.6	61.3	0.7	Yes
R52	53.8	54.5	0.7	Yes

Table 4-7 Noise levels at sensitive receivers from vehicles along Byrnes Road and Eunony Bridge Road

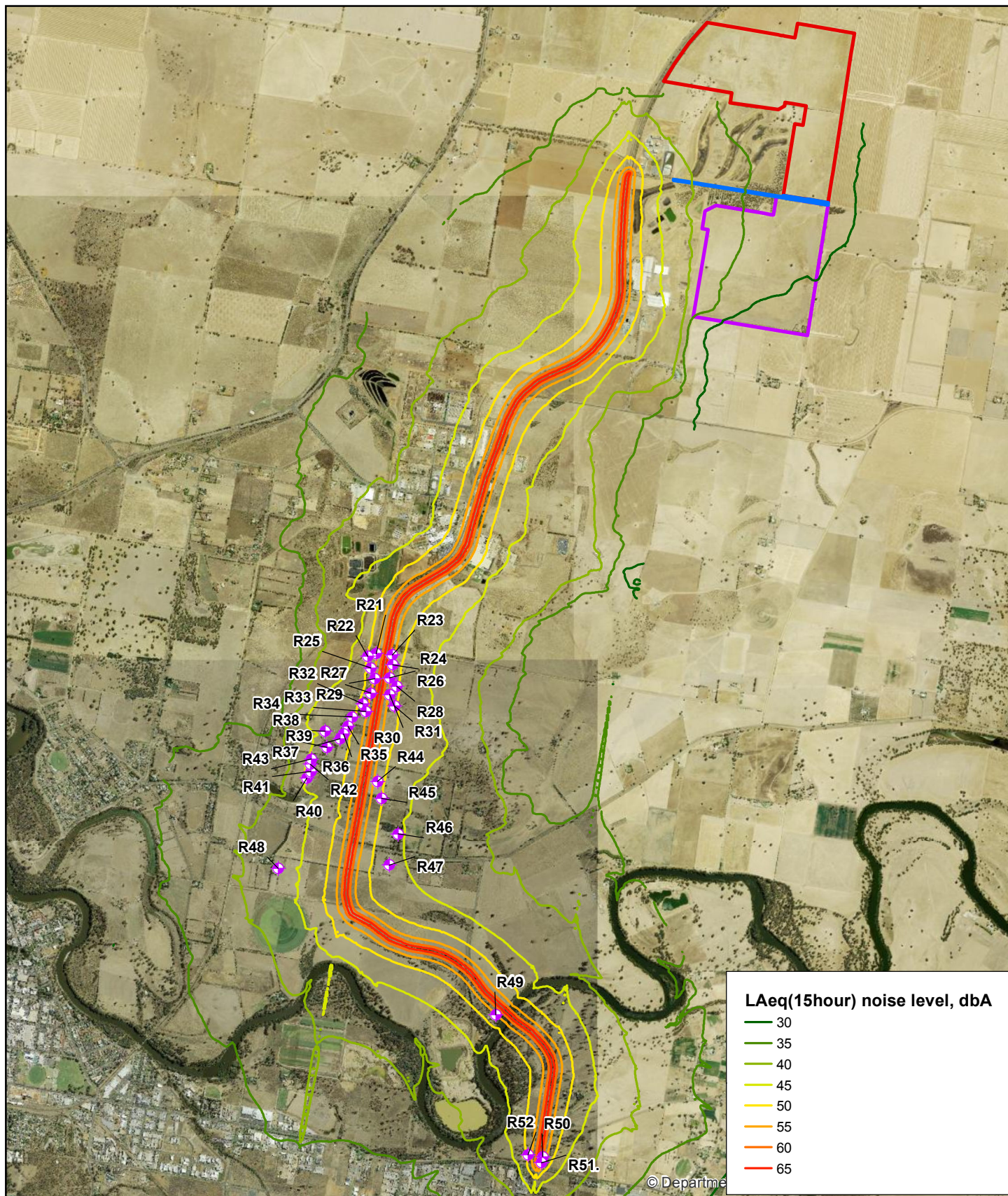
Receiver	L <sub>Aeq</sub> (1hr) Noise levels from existing traffic	L <sub>Aeq</sub> (1hr) Noise levels from predicted traffic	Increase in noise level, dBA	Compliance
R21	47.1	48.4	1.3	Yes
R22	43.3	44.6	1.3	Yes
R23	51.4	52.6	1.2	Yes
R24	49.4	50.6	1.2	Yes
R25	45.3	46.5	1.2	Yes
R26	50.6	51.9	1.3	Yes
R27	51.7	53.0	1.3	Yes
R28	44.2	45.4	1.2	Yes
R29	48.3	49.5	1.2	Yes
R30	47.2	48.5	1.3	Yes
R31	45.0	46.2	1.2	Yes
R32	44.4	45.7	1.3	Yes
R33	47.5	48.7	1.2	Yes
R34	42.4	43.7	1.3	Yes
R35	42.4	43.6	1.2	Yes
R36	41.4	42.6	1.2	Yes
R37	39.1	40.4	1.3	Yes
R38	39.7	41.0	1.3	Yes
R39	41.3	42.6	1.3	Yes

Receiver	L <sub>Aeq(1hr)</sub> Noise levels from existing traffic	L <sub>Aeq(1hr)</sub> Noise levels from predicted traffic	Increase in noise level, dBA	Compliance
R40	39.4	40.6	1.2	Yes
R41	39.6	40.9	1.3	Yes
R42	39.2	40.5	1.3	Yes
R43	39.1	40.4	1.3	Yes
R44	46.0	47.3	1.3	Yes
R45	43.4	44.7	1.3	Yes
R46	38.2	39.5	1.3	Yes
R47	39.2	40.5	1.3	Yes
R48	35.0	36.2	1.2	Yes
R49	48.3	49.6	1.3	Yes
R50	54.4	55.7	1.3	Yes
R51	54.3	55.6	1.3	Yes
R52	47.6	48.9	1.3	Yes

Noise levels due to the use of heavy vehicles associated with the proposal are greatest at residential receivers within 30 metres of Eunony Bridge Road, being R50 and R51. At these residences, the day time road noise level is predicted to slightly exceed L<sub>Aeq(15 hour)</sub> 60 dBA during peak construction periods. However, the increase in traffic noise levels during peak construction does not increase the existing road noise levels by more than 2 dBA at any residential receiver locations along Byrnes Road or Eunony Bridge Road. As such, the additional construction traffic along these roads complies with the Road Noise Policy criteria.

The road noise levels during peak construction periods are not predicted to exceed the night time road noise criteria of L<sub>Aeq(9 hour)</sub> 55 dBA at any residential receiver locations along Byrnes Road or Eunony Bridge Road.

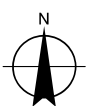




#### LEGEND

- Noise Sensitive Receivers (road noise)
- Final proposed Southern Development Area
- Final proposed Northern Development Area
- Trahairs Rd Corridor

Paper Size A4  
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Metres  
Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 55



Renew Estate Pty Ltd  
Boman Solar Farm EIS

Job Number 23-16243  
Revision A  
Date 15 Feb 2018

Predicted LAeq(15hour)  
construction traffic noise levels (day) **Figure 8**

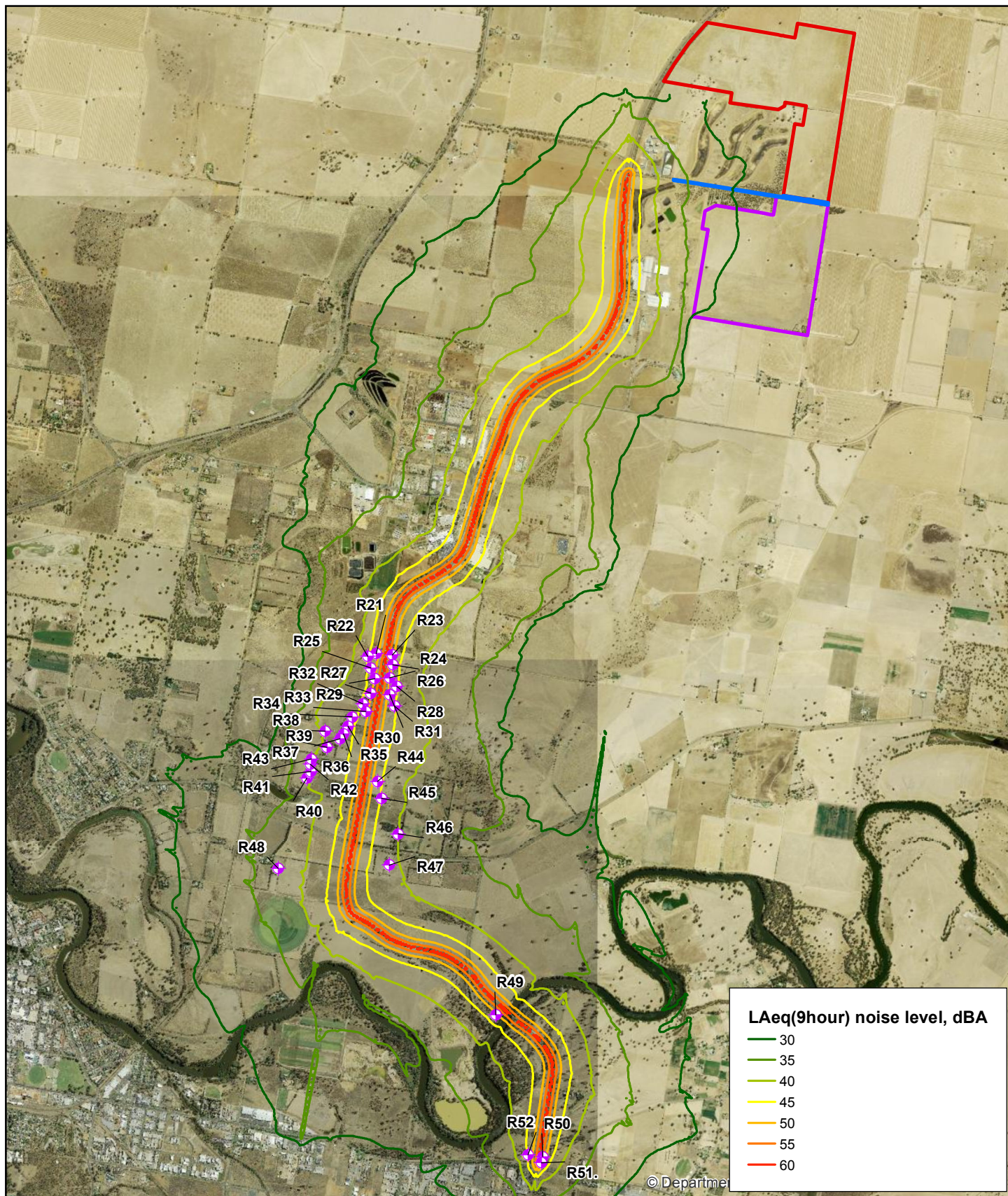
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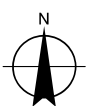




#### LEGEND

-  Noise Sensitive Receivers (road noise)
-  Final proposed Northern Development Area
-  Final proposed Southern Development Area
-  Trahairs Rd Corridor

Paper Size A4  
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Metres  
Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 55



Renew Estate Pty Ltd  
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Job Number 23-16243  
Revision A  
Date 15 Feb 2018

Predicted LAeq(9hour)  
construction traffic noise levels (night) **Figure 9**

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## 4.6 Vibration Impacts

Safe working buffer distances to comply with the human comfort, cosmetic damage and heritage structural damage criteria were sourced from the CNVG and are presented in Table 4-8 for the equipment relevant to the proposal.

Table 4-8 Vibration safe working buffer distances, m

Activity	Human comfort	Cosmetic damage	
		Heritage building/structure	Standard dwellings
Pile Boring	4 m	1 m	2 m
Vibratory roller (7-13 tonnes)	100 m	30 m	15 m
Vibratory roller (4-6 tonnes)	40 m	24 m	12 m
Vibratory roller (2-4 tonnes)	20 m	12 m	6 m
Vibratory roller (1-2 tonnes)	15 m	10 m	5 m

Pile boring will not be within 10 metres of any sensitive receiver structures during the construction of the overhead transmission lines. As such, no adverse vibration impacts to sensitive receivers are anticipated.

The nearest sensitive receiver would be more than 450 metres from any construction activities within the northern and southern solar farm development zones and as such, no rolling construction activities are predicted to cause adverse vibration impacts on nearby receivers.

Vibration safe working distances for impact piling are not provided in the CNVG, however, vibration levels from impact piling are generally negligible at distances greater than 100 metres. Given the nearest receiver would be more than 450 metres from any impact piling activities, vibration levels from pile driving are not anticipated to adversely impact receivers.

## 5. Operational noise impact assessment

### 5.1 Operational noise

#### 5.1.1 Noise generating equipment

At maximum operation, noise generating equipment and activities on the proposal site will include:

- Single-axis tracking systems (including approximately 4,500 trackers) on which the photovoltaic modules (solar array panels) are installed. The motors driving the trackers would be operational for less than 1 minute during a typical 15 minute period
- Forty-four (44) x 5.5 MVA power conversion stations (12 m x 5 m x 3.5 m) containing two (2) x 2.75 MVA SMA inverters and a single 5.5 MVA MV Siemens transformer. The containers are assumed to be constructed of steel and have 1.5 m<sup>2</sup> open area for ventilation
- A 132 kV substation, with one 120 MVA main transformer.
- Approximately 20 light vehicle movements to and from the carpark area per day

The tracking motors are to operate during the daylight hours and the substation and power stations are to operate on a 24-hour basis. To simulate the worst-case scenario, all noise sources have been assessed against the NPI amenity night criteria for rural residential receivers as the tracking motors may operate between 6 am and 7 am. It is uncertain when the nearby industrial sites to the proposed solar farm are in use, so it has been assumed that these sites operate on a 24-hour basis a worst-case scenario.

For the purposes of the noise assessment, the single-axis tracking panel case has been conservatively considered. The operational noise sources and associated sound power levels are summarised in Table 5.1 below.

Noise levels for the single-axis tracking panels and photovoltaic boxes were sourced from manufacturer data provided in Appendix A of the *Moree solar farm Operational noise prediction report* (Blackett Acoustics, 2014) for similar equipment. Noise levels for the 120 MVA and 5.5 MVA transformer were sourced from *AS 2374.6 (1994) – Power transformers Part 6: Determination of transformer and reactor sound levels*. Noise levels for the 2.75 MVA SMA inverters was provided as manufacturer data from SMA.

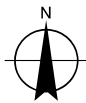
A layout of the modelled noise sources is provided in Figure 10 below. The layout of the power conversion stations and the tracking motors are an approximation. However, the exact location of the power stations will have a negligible effect on the predicted noise levels at sensitive receivers, as long as they are evenly spread throughout the northern and southern development areas.

It should be noted that the assessed areas for the operation of the northern and southern development areas extend beyond the final proposed boundaries of these areas. The final proposed northern and southern development areas have decreased in size since the initial computer noise modelling of the assessed operational work area. The difference in modelled noise levels at sensitive receivers between the assessed areas and the final proposed areas would likely be negligible. If any change, noise levels would be likely to decrease.



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Paper Size A4  
0 62.5125 250 375 500  
Metres  
Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 55



#### LEGEND

- Final proposed Northern Development Area
- Final proposed Southern Development Area
- Trahairs Rd Corridor
- Trackers
- Power stations
- Substation
- Carpark vehicle movements
- Control Building Carpark
- Area of assessment



Renew Estate Pty Ltd  
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Modelled noise sources within  
Boman Solar Farm

Job Number | 2316243  
Revision | A  
Date | 15 Feb 2018

Figure 10

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Table 5-1 Operational equipment sound power levels and sound transmission losses, dBA

Equipment	Number of units	Octave-band noise level (Frequency, Hz), dBA									Overall noise level, dBA	Source	Noise penalty	Adjusted sound power level $L_{Aeq,adj}$ dBA
		31.5	63	125	250	500	1k	2k	4k	8k				
Single-axis tracking panel motor	4,500	No octave-band data available (generic motor spectrum used)									SWL 78 (each)	Blackett Acoustic MSF report	None	78
SMA 2.75 MVA Inverter	88 (2 per power station)	51	62	69	81	76	80	82	90	79	SWL 92 (each)	SMA manufacturer data	+ 5 dBA (tonal)	97
Siemens 5.5 MVA Transformer	44 (1 per power station)	48	59	70	73	79	76	72	76	58	SWL 83 (each)	AS 2374.6 (Transformer noise – max)	+ 5 dBA (tonal)	85
Internal level of power station (SPL) (includes +5 dBA penalty)	-	50	60	64	77	74	80	84	95	83	95 (internal SPL)	GHD calculation	N/A	95
STL of 20 g steel with 1.5 m <sup>2</sup> louvres	-	2	5	8	12	15	16	16	16	16	( $R_w$ 16)	GHD calculation	N/A	-
Power station (includes +5 dBA penalty)	44	48	55	56	65	59	64	68	79	67	SWL 80	Internal level minus STL	N/A	80
Light vehicle within carpark	1 /15 min	32	63	72	75	78	83	83	79	73	SWL 88	GHD measured	None	88
120 MVA substation transformer	1	75	83	94	97	103	100	96	100	82	SWL 107	AS 2374.6 (Transformer noise – max)	+ 5 dBA (tonal)	112

Note: 1) Calculated assuming 12 m x 5 m x 3.5 m power station container constructed of corrugated steel



### 5.1.2 Modelling methodology

To assess compliance with the noise criteria, noise predictions were undertaken using CadnaA 2017 which calculates environmental noise propagation according to *ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors* and meteorological conditions according to CONCAWE algorithms. The following assumptions and calculation parameters were used in the noise model:

- Land was modelled assuming a mixture of hard and soft ground with a ground absorption coefficient of 0.75. This has been considered representative of the grassy, agricultural land surrounding the site
- The single-axis tracking panel motor sound power levels were corrected to an operational time of one minute during a 15 minute period. All other equipment was modelled as operating continuously over the 15 minute period
- Atmospheric absorption was based on an average temperature of 20 °C and an average humidity of 70%
- All noise sources presented in Table 5-1 are modelled at maximum capacity during the night period (6 am to 7 am) as a worst-case scenario
- All noise sources presented in Table 5-1 except for the tracking motors have also been modelled during the night period (10 pm to 7 am)
- Meteorological conditions was based on Concawe F-class during for the night period to simulate worst-case meteorological conditions for noise propagation

### 5.1.3 Modifying factor adjustments

Based on past noise measurements of transformers, there is the potential for the 5.5 MVA transformers, the 120 MVA transformer and the 2.75 MVA inverters to have tonal noise characteristics.

A conservative +5 dB tonality factor adjustment has been applied to the contributions from the photovoltaic boxes and the 120 MVA and 5.5 MVA transformers to the received noise levels, in accordance with the NPI.

### 5.1.4 Predicted operational noise levels

The predicted noise levels for site operations with and without the trackers operating are summarised in Table 5-2 and Table 5-3, respectively. Noise contour plots of the solar farm at maximum operation, with and without the tracking motors operating are shown in Figure 11 and Figure 12.

The noise levels are predicted to comply with the noise criteria during all assessment time periods. The noise predictions are considered conservative, as the predictions assume worst-case scenario meteorological conditions for noise propagation (Concawe F-Class) during the night period. Noise levels during the day time period and under calm conditions would generally be lower.

Table 5-2 Predicted noise levels at surrounding receivers (with trackers)

Receiver	Receiver Category	Assessment Period	Project trigger level	Predicted noise level, $L_{Aeq}(15min)$	Exceedances
R1	Rural residential	Night	35	24	No
R2	Rural residential	Night	35	25	No
R3	Rural residential	Night	35	32	No

R4	Rural residential	Night	35	24	No
R5	Rural residential	Night	35	24	No
R6	Rural residential	Night	35	21	No
R7	Rural residential	Night	35	20	No
R8	Rural residential	Night	35	35	No
R9	Rural residential	Night	35	33	No
R10	Rural residential	Night	35	26	No
R11	Rural residential	Night	35	19	No
R12	Industrial premises	When in use	70	40	No
R13	Industrial premises	When in use	70	42	No
R14	Industrial premises	When in use	70	40	No
R15	Industrial premises	When in use	70	34	No
R16	Industrial premises	When in use	70	32	No
R17	Commercial premises	When in use	65	36	No
R18	Rural residential	Night	35	29	No
R19	Rural residential	Night	35	27	No
R20	Rural residential	Night	35	30	No

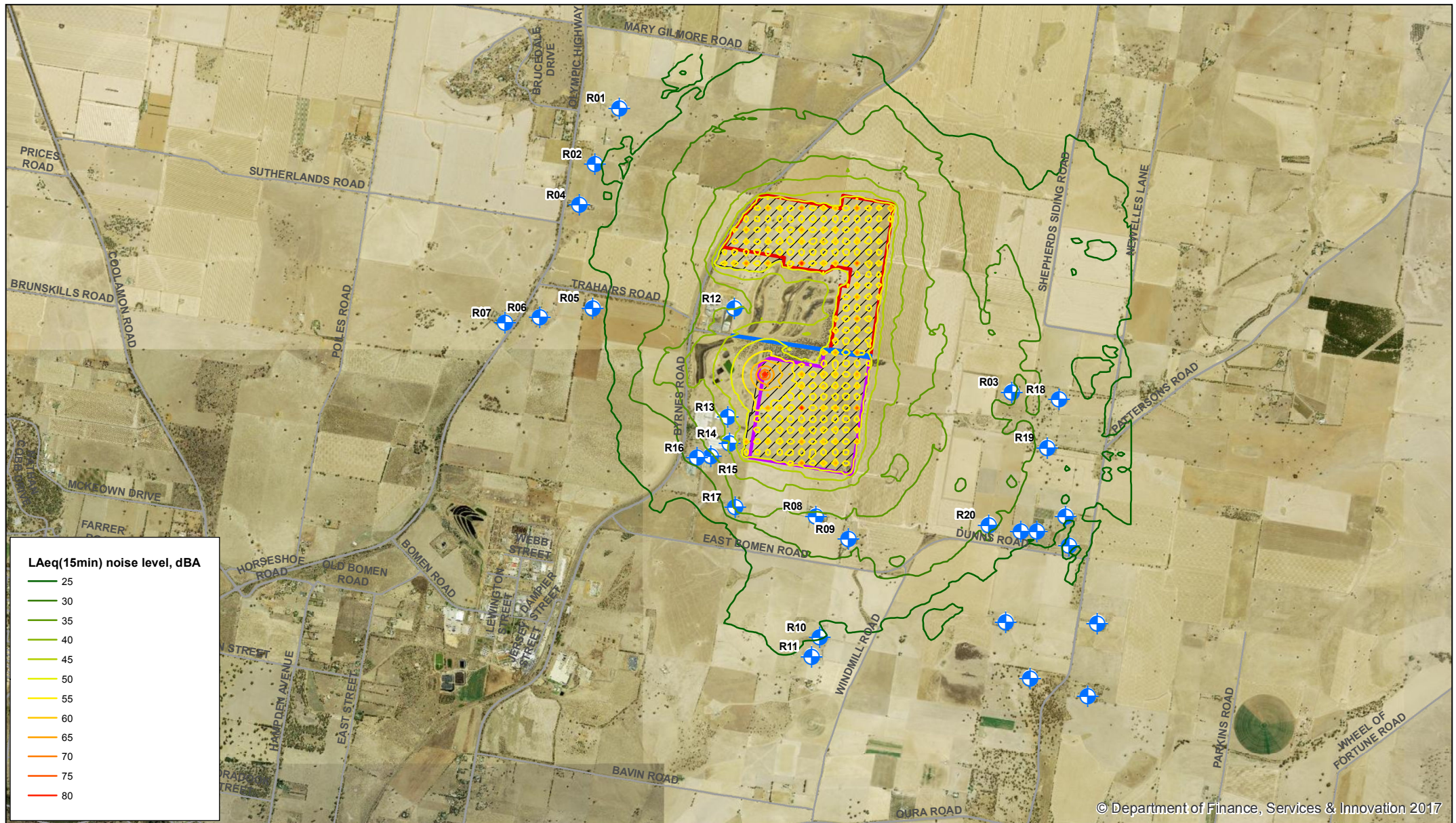
Table 5-3 Predicted noise levels at surrounding receivers (no trackers)

Receiver	Receiver Category	Assessment Period	Project trigger level	Predicted noise level, $L_{Aeq}(15min)$	Exceedances
R1	Rural residential	Night	35	14	No
R2	Rural residential	Night	35	13	No
R3	Rural residential	Night	35	26	No
R4	Rural residential	Night	35	14	No
R5	Rural residential	Night	35	18	No
R6	Rural residential	Night	35	14	No
R7	Rural residential	Night	35	12	No
R8	Rural residential	Night	35	22	No
R9	Rural residential	Night	35	21	No
R10	Rural residential	Night	35	14	No
R11	Rural residential	Night	35	10	No
R12	Industrial premises	When in use	70	36	No
R13	Industrial premises	When in use	70	39	No
R14	Industrial premises	When in use	70	35	No
R15	Industrial premises	When in use	70	31	No
R16	Industrial premises	When in use	70	28	No
R17	Commercial premises	When in use	65	27	No
R18	Rural residential	Night	35	24	No
R19	Rural residential	Night	35	20	No
R20	Rural residential	Night	35	21	No

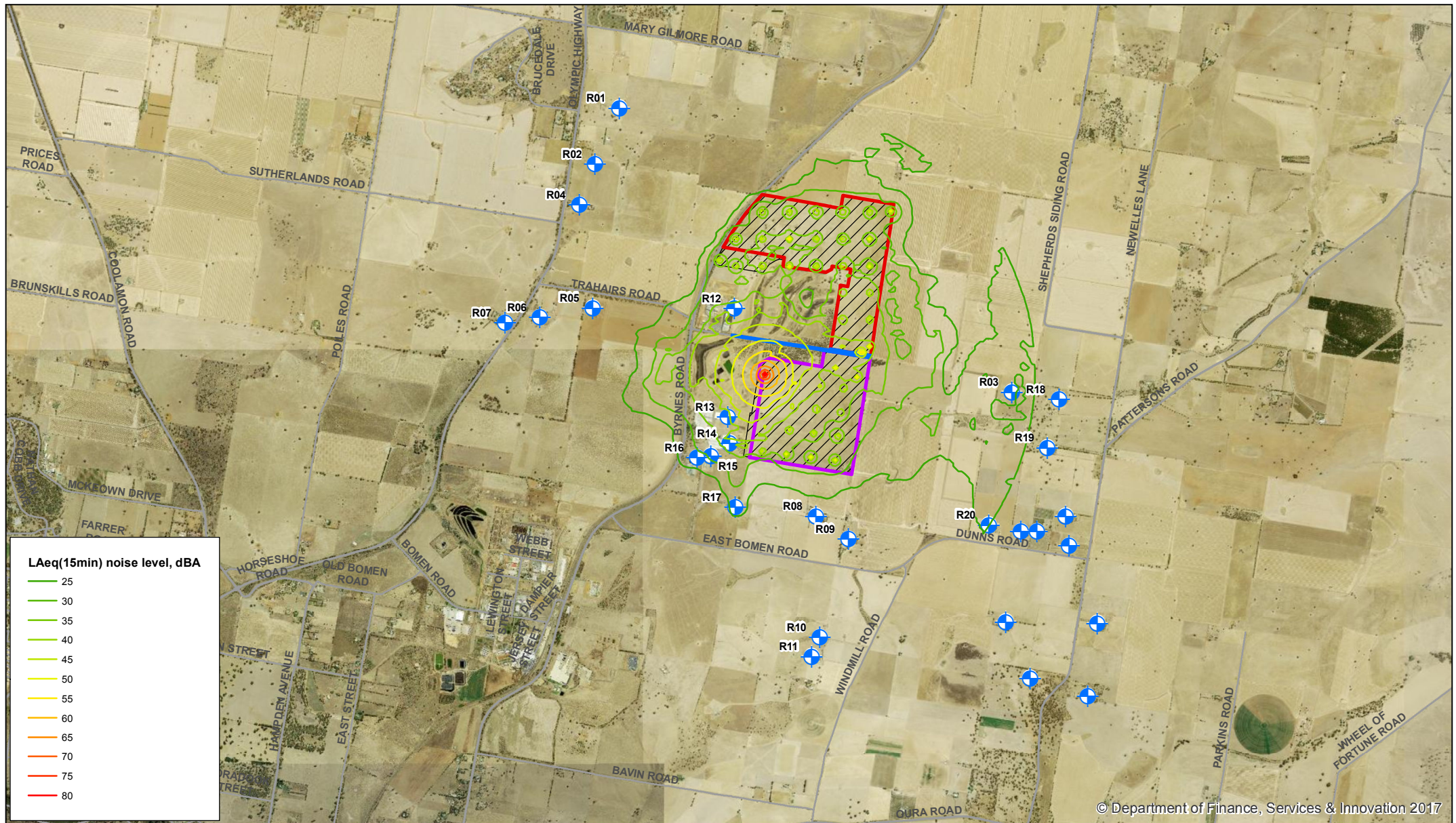
## 5.2 Operational road traffic noise

A maximum of 20 light vehicles movements are anticipated during the operation of the proposal per day. These additional vehicle numbers are not significant enough to cause an increase of +2 dBA to the existing road traffic noise levels along Byrnes Road and Eunony Bridge Road. The proposed vehicle movements are predicted to comply with the Road Noise Policy.









## 6. Noise mitigation

### 6.1 Construction noise

#### 6.1.1 Construction measures

A noise management plan would be prepared and implemented as part of the construction environmental management plan.

The noise modelling results indicate that the construction noise management levels may be potentially exceeded when work is undertaken at the proposal site boundary closest to the sensitive receivers to the south (R8 and R9) and during the construction of the overhead transmission lines at receiver R17. The following general noise mitigation measures are recommended to mitigate construction noise impacts:

- All engine covers should be kept closed while equipment is operating.
- As far as possible, heights from which materials are dropped, into or out of trucks, should be minimised.
- Machines found to produce excessive noise compared to industry best practice should be removed from the site or stood down until repairs or modifications can be made.
- To reduce the annoyance associated with reversing alarms, broadband reversing alarms (audible movement alarms) would be used for all site equipment. Satisfactory compliance with occupational health and safety requirements would need to be achieved and a safety risk assessment may need to be undertaken to determine that safety is not compromised. Refer to Appendix C of the ICNG (2009) for more information.

Further to the above, the following project-specific noise mitigation measures are recommended to mitigate construction noise impacts at nearby sensitive receivers:

- Piling works and works to construct the transmission line will not occur during evening/night periods.
- Apart from works involving installing trackers and modules, all works in evening/night periods will be limited to the central work area (see Figure 3).
- Works involving installing trackers and modules during evening/night periods will not occur in the area between the southern boundary of the solar farm and 250 metres north of the southern boundary. This provides a 700 metre buffer from the residential receiver at R8 and will reduce the noise level to within the noise management level of 35 dBA.
- During night-works, quiet forklifts (electric – sound power level <100 dBA) should be used for construction activities around the solar array areas.

Table 6-1 below presents noise control methods and expected noise reductions according to Australian Standard AS 2436 – 2010 *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*.

Table 6-1 Relative effectiveness of various forms of noise control, dBA

Noise control method	Typical noise reduction	Maximum noise reduction
Distance	Approximately 6 per doubling of distance	
Screening	5 to 10	15
Acoustic Enclosures	15 to 25	50
Engine Silencing	5 to 10	20



### 6.1.2 Work ethics

All site workers would be briefed on the potential for noise impacts on local residents and the requirement to implement practical and reasonable measures to minimise noise impacts during the course of their activities. This would include:

- avoiding the use of loud radios
- avoiding shouting and slamming doors
- where practical, machines would be operated at low speed or power and switched off when not being used rather than left idling for prolonged periods.
- keeping truck drivers informed of designated vehicle routes, parking locations and delivery hours
- minimising reversing
- avoiding dropping materials from height and avoiding metal to metal contact on material
- keeping engine covers closed while equipment is operating.

### 6.1.3 Community relations

Consultation and cooperation with the nearest sensitive receivers will assist in minimising uncertainty, misconceptions and adverse reactions to noise. The following community relation measures would be implemented:

- The construction contractor would establish contact with residents affected by construction noise and communicate the construction program and progress on a regular basis, particularly when noise generating activities are planned. Communication with the local community would be maintained throughout the construction period.
- The construction contractor would provide a community liaison phone number and permanent site contact so that noise complaints can be received and addressed in a timely manner.
- Upon receipt of a noise complaint, monitoring would be undertaken and reported as soon as possible. If exceedances are detected, the situation would be reviewed to identify means to attempt to reduce the impact to acceptable levels.

## 6.2 Selection of construction equipment

Once the selection of equipment has been finalised, a review should be undertaken to ensure that the noise levels do not exceed the assumed levels in this assessment.

Based on the information provided in this assessment, specific operational mitigation measures are not required.

## 7. Conclusion

This report was prepared to assess potential noise impacts associated with construction and operation of the Bomen solar farm, north-east of Wagga Wagga. Minimum background noise levels were adopted in accordance with the Noise Policy for Industry. Based on information provided by the client relating to construction and operation, computer noise modelling was undertaken to predict potential impacts on key sensitive receivers.

Some construction activities during recommended standard hours and during out-of-standard hours are predicted to exceed the noise affected construction noise management levels at nearby sensitive receivers. Recommended noise mitigation measures would be implemented where feasible and reasonable to reduce the noise impacts. No adverse vibration impacts are anticipated from the construction and operation of the proposal.

Operational noise from the proposal is predicted to comply with the NPI at the surrounding sensitive receivers during all times of the day.

Once the equipment selection for the solar farm is confirmed, a review should be undertaken to ensure that noise levels do not exceed the assumed levels in this assessment

The proposal would be acceptable from an acoustic perspective assuming the recommended mitigation measures are implemented.

## 8. References

*AS 2374.6 – Power transformers Part 6: Determination of transformer and reactor sound levels*, Australian Standards, 1994

*AS 2436 Guide to noise and vibration control on construction, demolition and maintenance sites*, Australian Standards, 2010

*BS 5228.2 Code of Practice for noise and vibration control on construction and open sites: Part 2 Vibration*, British Standards, 2009.

*Noise Policy for Industry*, EPA, 2017

*Interim Construction Noise Guideline*, Department of Environment and Climate Change, July 2009

*Construction Noise and Vibration Guideline*, RMS, 2016

*Moree solar farm Operational noise prediction report*, Blackett Acoustics, 2014

*Road Noise Policy*, DECCW, 2011

*Noise Guide for Local Government*, EPA, 2013



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#### Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	M.Velasco	C. Gordon	On file	R.Robinson	On file	08/02/2018

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