

Barnawartha Solar Farm

Noise Impact Assessment

Prepared for: MPower Projects Pty Limited

Project No: MEL2629
Date: 26 July 2021
Revision: 01



Project:	Barnawartha Solar Farm
Location:	1377 Plunketts Rd Barnawartha VIC 3688
Prepared by:	ADP Consulting Pty Ltd Level 3, 8 Spring Street Sydney NSW 2000
Project No:	MEL2629
Revision:	01
Date:	26 July 2021

Rev	Date	Comment	Author	Signature	Technical Review	Signature	Authorisation & QA	Signature
00	04.05.2021	DRAFT for review	JMa		TC		TC	
01	26.07.2021	Final Issue	JMa		TC		TC	

Project Team	
Client / Principal	MPower Projects Pty Limited



Contents

1. Introduction	3
1.1 Document purpose.....	3
1.2 Referenced drawings, codes and standards	3
1.3 Project summary	3
2. Noise emission criteria – EPA Noise Protocol	5
3. Noise assessment and recommendations.....	6
3.1 Plant and equipment noise levels.....	6
3.2 Noise assessment.....	6
4. Conclusion	8

Appendices

Appendix A Glossary of acoustic terms	9
---------------------------------------------	---

Tables

Table 1 Noise emission criteria summary for the local residences and nature reserve	5
Table 2 Plant and equipment sound power levels.....	6
Table 3 Noise emission levels at closest sensitive receivers	7

1. Introduction

1.1 Document purpose

ADP Consulting Pty Ltd has been retained by MPower Pty. Limited to undertake a noise impact assessment for the proposed Plunkett road, Barnawartha solar farm project.

This report is prepared to provide acoustic design advice for documentation by others and addresses the impact on nearby sensitive receivers from the operation of the proposed development. These impacts include noise emission from equipment associated with the proposed solar farm at Barnawartha and namely the photovoltaic inverters.

It is understood that this document may be submitted to the Department of Environment, Land, Water and Planning to satisfy requirements of a noise impact assessment for developments outside the Melbourne Metropolitan areas using the methodology presented in the EPA's Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues.

1.2 Referenced drawings, codes and standards

The following drawings, guidelines, standards and regulatory requirements and other project-specific information have been referenced in preparing this report:

- > Mpower's Site Layout Drawing (JM2010018-B01-01[B]), dated 14 July 2021 (site plan)
- > EPA Victoria's Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues, Publication 1826.4 dated 4 May 2021 (EPA Noise Protocol)

1.3 Project summary

ADP Consulting understand that the proposed Plunkett road, Barnawartha solar farm is comprised of:

- > 11,664 Longi solar panel modules
- > 208 NEXTrackers with 2 strings each (being a total of 432 strings with 27 panels each)
- > 1 Sungrow turnkey station (SG4950HV-MV) housing the 2 inverter units servicing the strings

Based upon information received from Mpower we have determined the following about the solar farm's operation:

- > the photovoltaic inverters will begin operation from sunrise, which is approximately at 6am daily. The trackers may operate at night or evening in order to return to position
- > Each photovoltaic inverter will have some tonal noise

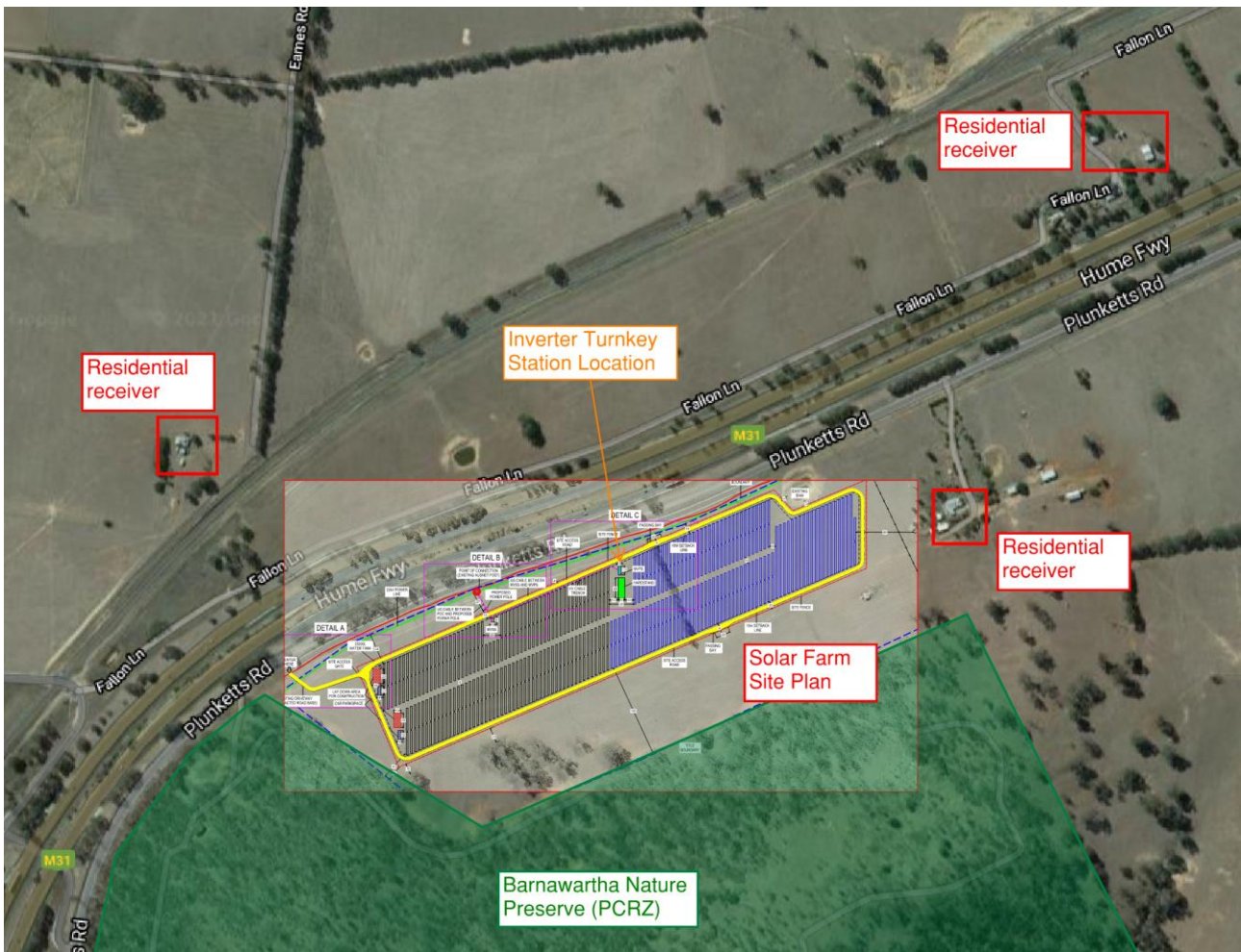
Based on our site investigations we have identified the following noise sensitive receivers:

- > Residence adjacent to Earnes Road located approximately 340 metres northwest of the proposed development
- > 26 Fallon Lane residence located approximately 400 metres northeast of the proposed development
- > Residence on Plunketts road located approximately 50 metres east of the proposed development
- > Barnawartha Nature preserve located approximately 50 metres to the south of the development

The proposed development and affected residential receivers are located in zones characterised as Farming FZ. The Barnawartha nature preserve is classified as a public conservation and resource zone (PCRZ).

Figure 1 provides a site map of the proposed development, the location of the inverters and the nearby receivers.

Figure 1 Site plan (source: Google Maps)



2. Noise emission criteria – EPA Noise Protocol

Noise emission restrictions apply to the operation of the proposed development. These must be planned, designed and installed to include suitable sound attenuation, and other necessary acoustic treatments. This report provides an approach that needs to be incorporated in the proposed development to meet the noise emission requirements of EPA Noise Protocol.

Part 1 Section A2 of the EPA Noise Protocol provides a methodology to determine the noise emission criteria in rural areas for commercial, industrial and trade premises. The criteria apply at sensitive receivers and are derived based on the characterisation of the Generating Zone as Farming FZ and the Receiving Zones as Farming FZ and Public Conservation and Resource Zone PCRZ, as per Annex B of the EPA Noise Protocol.

Table 1 summarises the noise emission criteria presented in the EPA Noise Protocol guidelines for the local residences and the Barnawartha nature preserve.

Table 1 Noise emission criteria summary for the local residences and nature reserve

Day of operation	Time of operation	Noise Limit, dB(A) Residences	Noise Limit, dB(A) Nature Preserve
Monday to Friday	Day (7am to 6pm)	46	45
	Evening (6pm to 10pm)	41	40
	Night (10pm to 7am)	36	35
Saturday	Day (7am to 1pm)	46	45
	Evening (1pm to 10pm)	41	40
	Night (10pm to 7am)	36	35
Sunday	Evening (7am to 6pm)	41	40
	Night (10pm to 7am)	36	35

It should be noted that the cumulative noise emission from the operations of the proposed development is to meet the specific noise criteria in Table 1, also factoring any penalties for undesirable noise characteristics such as tonality.

3. Noise assessment and recommendations

3.1 Plant and equipment noise levels

Table 2 presents the major plant and equipment sound power levels to be used in the development, as provided by the MPower. We should note that these sound power levels are assumed to be maximum and that any alternative plant is not to exceed these levels.

Table 2 Plant and equipment sound power levels

Equipment in use	Sound Pressure Level at 1m, dB(A)
SG4950HV-MV Turnkey station housing 2 Sungrow inverters contained inside	81
NEXTracker Motor	44

We should also note that photovoltaic inverters typically generate noise which can be characterised as a hum and are likely to be tonal in nature. We have used the methodology presented in EPA Noise Protocol to quantify the level of tonality penalties to be applied for this development.

3.2 Noise assessment

We understand that the proposed development will require 2 solar inverters housed in a turnkey station and 208 trackers. In this assessment, the following was considered:

- > Maximum sound pressure levels of plant and equipment scheduled in Section 3.1.
- > Proposed hours of operation, scheduled in Section 1.3.
- > Noise emission penalties applied for the tonal characteristics of the photovoltaic inverters.

As the photovoltaic inverters are likely to be tonal in nature, we have used the methodology presented in the EPA Noise Protocol for tonal noise. This resulted in a penalty adjustment of 2dB(A) being applied to the overall inverter and transformer noise levels due to tonal characteristics.

Given the proposed hours of operation, with photovoltaic inverters operating from 6am, the calculated noise levels were compared to the night time criteria scheduled in Section 2, which represents that which is most stringent.

Table 3 schedules the calculated noise levels at the nearby sensitive receivers and checks for compliance with the noise criteria outlined in Section 2.

Table 3 Noise emission levels at closest sensitive receivers

Receiver location	Time of day	Receiver noise levels, dB(A)	Criteria, dB(A)	Compliance
Earnes Road Residence to the Northwest of the development	Day	27	46	Yes
	Evening	27	41	Yes
	Night	27	36	Yes
26 Fallon Lane Residence	Day	23	46	Yes
	Evening	23	41	Yes
	Night	23	36	Yes
Plunketts Road Residence to the East of the development	Day	30	46	Yes
	Evening	30	41	Yes
	Night	30	36	Yes
Barnawartha Nature Preserve	Day	30	45	Yes
	Evening	30	40	Yes
	Night	30	35	Yes

Table 3 presents noise levels at the worst affected locations. We note that compliance at these locations would mean compliance with other nearby noise sensitive receivers.

4. Conclusion

Current regulations and standards associated with the development of the Solar Farm at Barnawartha have been reviewed and assessed in accordance with existing site constraints.

We have used distance sound attenuation formulas for the turnkey station and trackers in an unshielded (ie. no buildings, barriers, mounds or hills, etc) free field. We believe that this is the most conservative approach as there may be shielding between the station and any sensitive receiver has not been included.

Based on the assessment detailed in Section 3.2, ADP Consulting believe there are no site conditions, statutory or other requirements that would preclude this development from complying with the criteria defined in this report.

Appendix A

Glossary of acoustic terms

Air-borne sound

The sound emitted directly from a source into the surrounding air, such as speech, television or music.

Ambient sound

Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far. This is normally taken to be the L_{Aeq} value.

Background noise level

The average of the lowest levels of the noise levels measured in an affected area in the absence of noise from occupants and from unwanted external ambient noise sources. Usually the L_{A90} value represents the background noise level.

dB(A)

Unit of acoustic measurement weighted to approximate the sensitivity of human hearing to sound frequency.

Decibel scale

The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. Therefore, a 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. It is generally accepted that a 10 dB increase in the sound pressure level corresponds to a perceived doubling in loudness.

Examples of decibel levels of common sounds are as follows:

- > 0 dB(A) Threshold of human hearing
- > 30 dB(A) A quiet country park
- > 40 dB(A) Whisper in a library
- > 50 dB(A) Open office space
- > 70 dB(A) Inside a car on a freeway
- > 80 dB(A) Outboard motor
- > 90 dB(A) Heavy truck pass-by
- > 100 dB(A) Jackhammer / Subway train
- > 110 dB(A) Rock Concert
- > 115 dB(A) Limit of sound permitted in industry
- > 120 dB(A) 747 take off at 250 metres

Frequency

The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high-pitched sound and a low frequency to a low-pitched sound.

L_{90} , L_{10} , etc

A statistical measurement giving the sound pressure level which is exceeded for the given percentile of a measurement period (i.e. L_{90} is the level which is exceeded for 90 percent of a measurement period). L_{90} is commonly referred to as a basis for measuring the background sound level.

$L_{Aeq,T}$

The equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

L_{Amax}

The maximum sound pressure level measured over the measurement period.

 L_{Amin}

The minimum sound pressure level measured over the measurement period.

Day

Referred to as the period between 7am and 6pm for Monday to Saturday and 8am to 6pm for Sundays and Public Holidays.

Evening

Referred to as the period between 6pm and 10pm for Monday to Sunday and Public Holidays.

Night

Referred to as the period between 10pm and 7am for Monday to Saturday and 10pm to 8am for Sundays and Public Holidays.

Assessment background level (ABL)

The overall background noise level on each day, evening and night periods for each day of the noise monitoring.

Rating background level (RBL)

The overall background level on each day, evening and night periods for the entire length of noise monitoring.

Reverberation

The persistence, after emission by the source has stopped, of a sound field in an enclosure.

Sound isolation

A reference to the degree of acoustical separation between two spaces. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term 'sound isolation' does not specify any grade or performance quality and requires the units to be specified for any contractual condition.

Sound pressure level, L_p , dB of a sound

A measurement obtained directly obtained using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the R.M.S. sound pressure to the reference sound pressure of 20 micro Pascals.

Creating great environments with great people

Melbourne
Level 11, 60 Albert Road
South Melbourne VIC 3205
t. 03 9521 1195

Sydney
Level 3, 8 Spring Street
Sydney NSW 2000
t. 02 8203 5447

Brisbane
Ground Floor, 102 Adelaide Street
Brisbane QLD 4000
t. 07 3088 4022

adpconsulting.com.au