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**PROPOSED FULHAM SOLAR ENERGY FACILITY**

**CORNER MCLARENS ROAD AND HOPKINS ROAD FULHAM VICTORIA**



**Planning Permit Application Submission**

**Acoustic Report – Amended Report Including Response to RFI Items and Changed Equipment Selections**

**Prepared for:**

Solis Renewable Energy Pty Ltd

C/-

Ricardo Energy, Environment & Planning

Ref: 12716-1.1ng.docx
12 November 2021

## EXECUTIVE SUMMARY

Watson Moss Growcott Acoustics (WMG) has undertaken a noise emission assessment for the proposed Fulham Solar Energy Generation Facility at the corner of McLaren's Road and Hopkins Road Fulham, Victoria.

The purpose of the assessment has been to identify potential off-site noise emission from the proposed solar energy generation facility in terms of the Environment Protection Act 2017 as amended by the Environment Protection Amendment Act 2018 (The Act) and subordinate legislation, and to determine required noise control measures, if necessary, to achieve compliance with relevant noise limits applicable under the legislation at noise sensitive locations.

This report covers the following aspects:

- Determination of noise limits in accordance with the Noise Protocol, EPA Publication 1826.4
- Prediction of noise levels at potentially affected residential locations resulting from the proposed solar energy facility, using a three-dimensional noise modelling software package; and
- Consideration of predicted noise levels in terms of noise limits and other guidance under the Act.

Given that all noise sources can operate within the EPA-defined night period when the Noise Protocol noise limit is 36 dB(A), and allowance is being made for a tonal adjustment of +5 dB(A), the project noise target effectively becomes a modelled noise level of 31 dB(A) at houses in the vicinity of the subject site.

Noise emissions from all components of the proposal have been included in the modelling, including the batteries. Batteries per se do not emit noise, it is the equipment connected to the batteries that emits noise.

The findings of the noise assessment have concluded that in the absence of any noise control measures, there is potential for noise emissions associated with the proposed use to exceed the project noise target at noise sensitive residential receptors.

In consideration of the above, WMG has developed suitable noise control strategies for the proposed facility which are predicted to result in compliance with relevant criteria at all noise sensitive residential receptors.

The proposed noise control strategy is to:

- Where possible select equipment incorporating optional noise reduction kits, which allow the equipment to operate at full capacity while producing less noise than standard equipment. This is applicable to the inverters.
- Install noise barriers around the inverters.
- Enclose the converters, which do not have a low-noise option available, inside sound attenuated enclosures.

In addition to the above, it is recommended that as part of detailed design for the project, an acoustic consultant is engaged to undertake a final review of the proposal to ensure that compliance with relevant criteria is achieved at all noise sensitive residential receptors. This should take into account technological developments that may occur between the planning stage and detail design in this rapidly developing field and detailed noise data for the equipment selections.

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## 1. INTRODUCTION

The proposal comprises the construction and operation of a new solar energy facility at the corner of McLaren's Road and Hopkins Road Fulham, Victoria.

The land associated with the proposed use is currently vacant and is generally surrounded by farm zoned land including some scattered residential premises. The Fulham Correctional Facility is located adjacent to the north boundary of the subject site.

Equipment operating as part of the solar farm will generate noise emissions which have the potential to affect the acoustic amenity of noise sensitive residential receptors located in the vicinity of the subject site.

Therefore, Watson Moss Growcott Acoustics Pty Ltd (WMG) has been engaged to undertake a noise emission assessment for the proposal.

The purpose of the assessment has been to identify potential off-site noise emission from the proposed solar energy facility in terms of the Environment Protection Act 2017 as amended by the Environment Protection Amendment Act 2018 (The Act) and subordinate legislation, and to determine required noise control measures, if necessary, to achieve compliance with relevant noise limits applicable under the legislation at noise sensitive locations.
This report covers the following aspects:

- Determination of noise limits in accordance with EPA Publication 1826.4
- Prediction of noise levels at potentially affected residential locations resulting from the proposed solar energy facility, using a three-dimensional noise modelling software package; and
- Consideration of predicted noise levels in terms of noise limits and other guidance under the Act.

This report presents a summary of the assessment, including noise control strategies to achieve compliance with relevant criteria at noise sensitive receptors.

## 2. NOISE ASSESSMENT TERMINOLOGY

Noise assessment terminology used within this report is defined within Table 1 below.

*Table 1: Noise Assessment Terminology*

| Terminology | Definition |
|---|---|
| dB(A) | Decibels recorded on a sound level meter, which has had its frequency response modified electronically to an international standard, to quantify the average human loudness response to sounds of different character |
| $L_{eq}$ | The equivalent continuous level that would have the same total acoustic energy over the measurement period as the actual varying noise level under consideration. It is the noise measure defined by the EPA as the measure of the noise to use in assessing compliance with noise limits. |

| Terminology | Definition |
|---|---|
| Sound Power Level (Lw) | The sound power level of a noise source is amount of energy in the form of sound emitted from the source. Therefore, sound power level does not vary with distance from the source or with a different acoustic environment. Lw = Lp + 10 $\log_{10}$ A dB, re: 1pW, ($10^{-12}$ Watts) where A is the measurement surface area ($m^2$) in a free field. |
| Sound Pressure Level (Lp) | The level of sound measured on a sound level meter and expressed in decibels (dB). Where LP = 10 log10 $(P_a/P_o)^2$ dB (or 20 log10 (Pa/ Po) dB) where $P_a$ is the rms sound pressure in Pascal and $P_o$ is a reference sound pressure conventionally chosen is 20 µPa (20 x $10^{-6}$ Pa) for airborne sound. Lp varies with distance from a noise source. |

## 3. SUBJECT SITE AND SURROUNDING ENVIRONMENT

The site under consideration is located within land zoned FZ at the corner of McLarens Road and Hopkins Road, Fulham. All noise sensitive areas in the vicinity of the subject site are also zoned FZ, with the exception of residential components of the Fulham Correctional Centre north of the subject site, which are zoned SUZ2.

The aerial photo shown below in Figure 1 identifies the subject site under consideration and the noise sensitive receptors considered relevant for this assessment.

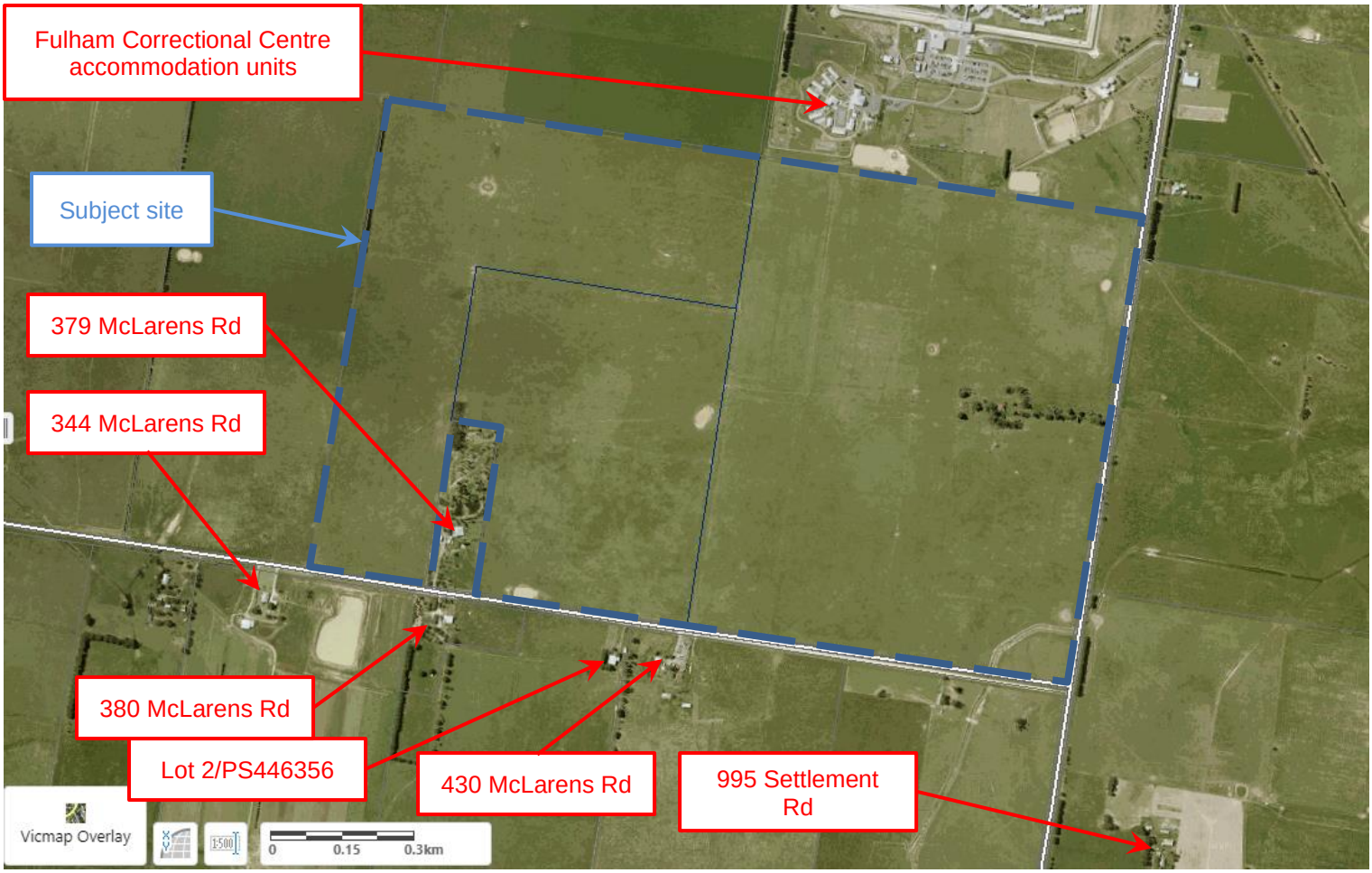


*Figure 1: Aerial photo indicating subject site and noise sensitive areas*

## 4. PROPOSED FACILITY

The proposed facility is to include over 200,000 photovoltaic solar panels, which do not emit noise of any potential significance. The solar panels will include small motors which will enable the panels to rotate throughout the day period to maximise efficiency. The motors will emit negligible noise relative to the other sources discussed below.

The facility will include other electrical infrastructure in the form of inverters, converters and transformers located within the boundaries of the subject site land, which do emit noise of potential significance. It is these sources that need to be considered in relation to noise emission beyond the boundaries of the site.

The solar panels will only be generating electricity during daylight hours, but the facility is to include battery storage and components of the facility will operate 24 hours per day, 7 days per week. Therefore, consideration of noise emission during the EPA-defined night period is required.

The components of the proposed facility with the potential to emit noise beyond the site boundaries are:

- 23 inverter stations, each comprising two inverters and a transformer. The noise contribution of the transformer that forms part of each inverter station is included in the sound power level for the inverter station. That is, the nominated sound power level for the inverter stations is the combined total for all components that comprise each inverter station.
- 23 clusters of 8 converters associated with inverter stations.
- Four clusters of 5 converters at the south east corner of the site.
- One main substation transformer unit at the Transformer Yard.
- Air conditioning installed at the Substation.
- Air conditioning installed at the Switching Station Control Room.
- Air conditioning installed at each of the Amenities and Office Buildings

Figure 2 below provides the site plan for the proposal.

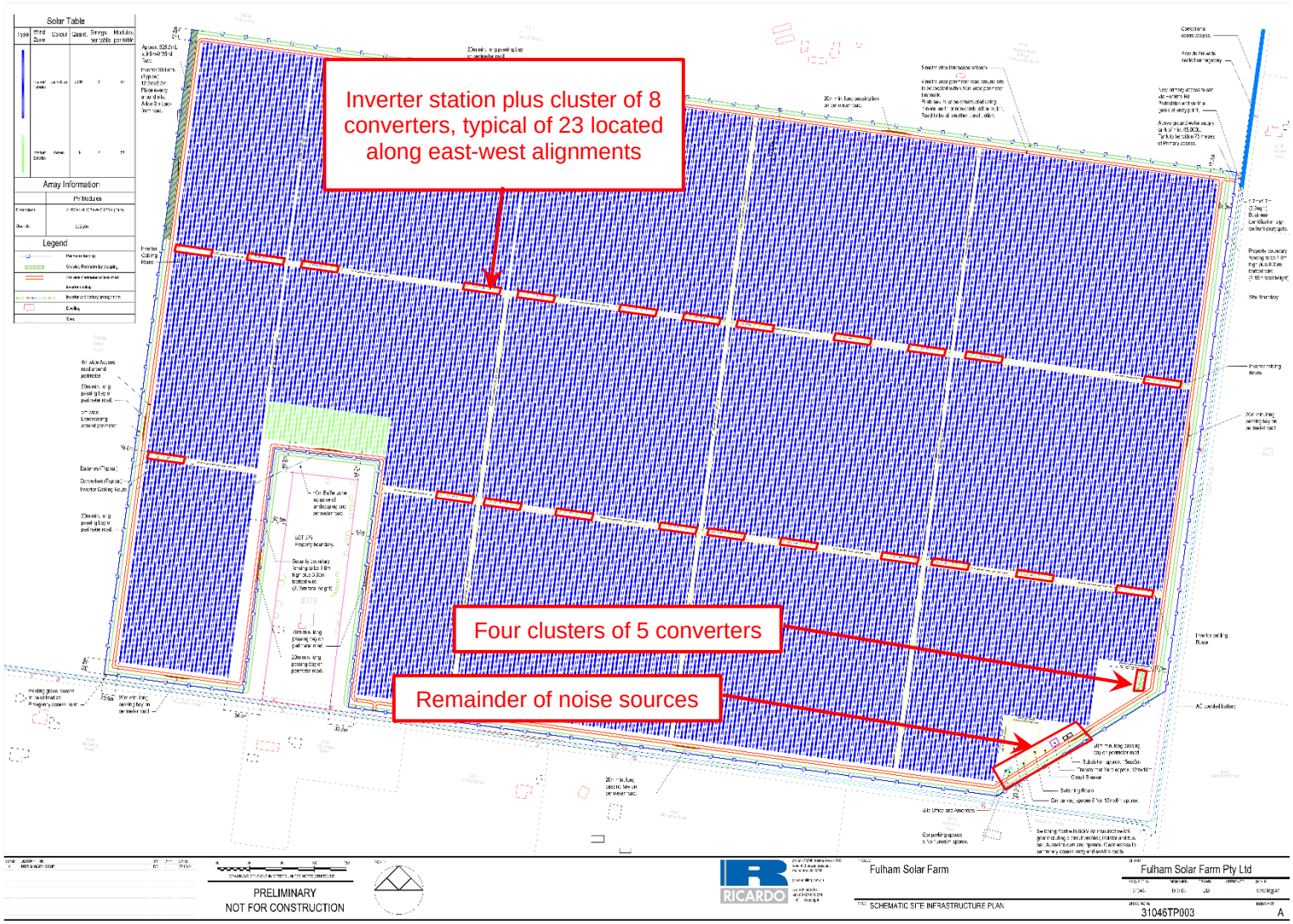


Figure 2: Schematic site infrastructure plan

Table 2 below provides a summary of the different equipment types and the associated sound power levels adopted as the basis for this assessment.

Noise emissions from all components of the proposal have been included in the modelling, including the batteries. Batteries per se do not emit noise, it is the equipment connected to the batteries that emits noise, as set out in the table below.



*Table 2: Summary of Noise Sources*

| Noise Source | Description | Adopted Sound Power Level, dB(A) |
|---|---|---|
| Inverter Stations | Each of 23 inverter stations, each comprising two inverters and one transformer. Inverter stations to be SC 4400 UP, including optional noise reduction kit allowing operation at full capacity with reduced noise emission. | 90.8 – combined total level for each inverter station including the transformer |
| Main substation transformer | | 96 |
| Converters | Total of 204 converters, configured as 23 clusters of 8 and 4 clusters of 5. Model SMA DC-DC CONVERTER. | 93 for each converter |
| Outdoor air conditioning units at the Substation Switching Room | 2 off, each Mitsubishi MSY-GN80VF 69 dB(A) sound power level per unit | Total 72 |
| Outdoor air conditioning units at the Switching Station Control Room | 2 off, each Mitsubishi MSY-GN80VF 69 dB(A) sound power level per unit | Total 72 |
| Outdoor air conditioning units at the Amenities Building | 1 off, Mitsubishi MSY-GN80VF 69 dB(A) sound power level per unit | 69 |
| Outdoor air conditioning units at the Office Building | 1 off, Mitsubishi MSY-GN80VF 69 dB(A) sound power level per unit | 69 |

The sound power and sound pressure level information provided by the client has been documented as an overall dB(A) figure. For the noise emission modelling, WMG has adopted sound power level spectrum data associated with the relevant noise sources from previous investigations involving similar equipment types.

From previous experience, it is expected that each of the relevant electrical infrastructure noise sources is likely to include a tonal character, except for the outdoor air conditioning units.

The tonal character associated with the noise sources will require consideration when assessing noise impacts at residential receptors, as discussed in section 5.1 below.

## 5. NOISE EMISSION ASSESSMENT CRITERIA

Noise emissions within the State of Victoria are governed by the legislative framework contained within the Environment Protection Act 2017 as amended by the Environment Protection Amendment Act 2018 (the Act) and subordinate legislation.

The approach within the Act focuses on prevention of pollution impacts rather than managing the impacts after they have occurred and is based on a person or entity's General Environmental Duty (GED) for the protection of human health and the environment from pollution, waste and emissions, including noise.

The GED is explained within Part 3.2 of the Environment Protection Amendment Act 2018 and stipulates that 'a person who is engaging in an activity that may give rise to risks of harm to human health or the environment from pollution or waste must minimise those risks, so far as reasonably practicable'.

Determining what is deemed 'reasonably practicable' is explained within EPA Publication 1856 and relates to the implementation of controls that are proportionate to the potential risk. It relates to the potential for harm to occur, the potential impacts on the environment, and considers what controls are available to reduce the risk, and their associated costs.

Under the Act it is the responsibility of the operator to understand and assess the risks which their operations may pose on human health or the environment and once understood, to implement proportionate controls to mitigate or minimise the risk of harm.

The definition of harm within the Act introduces the concept of what is deemed 'unreasonable' generally, and in particular 'unreasonable noise'. The Regulations under the Act essentially define unreasonable noise as noise that exceeds the noise limit that applies under the Noise Protocol (EPA Publication 1826.4) at the time the noise is emitted.

Methodologies, specific criteria, and guidance regarding unreasonable noise emissions are included within the following Regulations and guideline documentation referred to within the Act and provided by the Environment Protection Authority (EPA):

- Environment Protection Regulations 2021 (The Regulations).
- EPA Publication 1826.4 '*Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*' (Noise Protocol).
- Environmental Reference Standard (ERS).
- EPA Publication 1996 *Noise Guideline – assessing low frequency noise*.
- EPA Publication 1856 *Reasonably practicable*.

With the above considered, whilst evaluating risks and implementing reasonably practicable measures are considered as a necessity to comply with the GED, the basis for any noise emission assessment will be ensuring that noise emissions are not deemed 'unreasonable', discussed further below.

### 5.1 Environment Protection Regulations And Noise Protocol

Implementation of the general concepts within the Act rely on The Regulations. The objectives of The Regulations are to further the purposes of and give effect to the Act by imposing obligations in relation to environmental protection through providing a basis for addressing potential emissions.

The Regulations further define the concepts of 'unreasonable' and 'aggravated' noise and introduce the Noise Protocol as a tool for quantitatively addressing noise emissions from commercial premises within 'noise sensitive areas' including residential and accommodation type premises as well as childcare, kindergarten, primary school and secondary school facilities.

Within the Regulations, a person who conducts a prediction, measurement, assessment, or analysis of noise within a noise sensitive area for the purpose of the Act or the Regulations must conduct the relevant works in accordance with the Noise Protocol.

The main focus of the noise assessment has therefore been consideration of noise emission in terms of noise limits determined in accordance with the Noise Protocol.



#### 5.1.1 General methodologies

The subject site land and the sensitive receptors surrounding the subject site are not located within a 'major urban area' and will therefore be defined as a 'rural area'.

In accordance with the Noise Protocol, noise limits for site operations will be determined as set out in Part I, A2 of the Noise Protocol document referenced as the 'rural area method'. Using the 'rural area method', relevant 'zoning levels' for noise emission from the subject site are determined based on the source and receiver zonings and the methodologies described in Clauses 29-32 of the Noise Protocol.

The calculated 'zoning levels' vary depending on the time of the day, evening, or night with the highest during the day period and the lowest during the night periods.

The relevant day, evening, and night assessment periods are shown in Table 2 below.

*Table 3: Details of EPA Assessment Periods*

| EPA Assessment Period | Relevant Days | Relevant Time Periods |
|---|---|---|
| Day | Monday to Saturday | 7:00am to 6:00pm |
| Evening | Monday to Saturday | 6:00pm to 10:00pm |
| | Sunday, Public Holidays | 7:00am to 10:00pm |
| Night | All Days | 10:00pm to 7:00am |

Where the site is located within a background relevant area, typically near a major highway or the coast where there are non-typical sources of background noise, further derivation of noise limits applicable for commercial, industrial and trade noise emissions are based on

measurement of the existing ambient background noise level at nearby relevant sensitive receptors in accordance with Clauses 21-23 of the Noise Protocol.

If the background noise level plus 8 during the day or 5 during the evening or night exceeds the zone level, then noise limits for site operations are based on the following:

- The day background noise level plus 8dB.
- The evening background noise level plus 5dB
- The night background noise level plus 5dB.

For the night period, the noise criterion is limited to 55 dB(A) as a maximum applicable value.

The subject site and relevant noise sensitive areas are not located in a background relevant area, so the noise limits are only based on zoning considerations.

### 5.1.2 Determination of Relevant Noise Limits

The Planning Scheme zoning map indicates that the subject site is zoned FZ and all relevant receivers are zoned FZ and FUZ2.

For this combination of generating zone and receiving zone, the Noise Protocol Zone Levels are 46, 41 and 36 dB(A) for the day, evening and night periods respectively.

The noise limits must be met within a 'noise sensitive area', which for this site will be within the boundary of any of the nearby sensitive receptors, and within 10 metres of the outside of the external walls of the dwelling.

### 5.1.3 Noise Protocol Assessment Adjustments

When considering noise impacts on residential receptors, the Noise Protocol methodology includes relevant adjustment factors which account for the potential for the noise source to impact on the acoustic amenity of the noise sensitive receptor. The relevant adjustments include:

- Tonal Adjustment
- Impulsive adjustment.
- Intermittency adjustment.
- Reflection Adjustment.
- Duration Adjustment.

Clarification regarding each of the adjustments is shown below in Table 4.

***Table 4: Noise Protocol Assessment Adjustments***

| Relevant Adjustment | Description |
|---|---|
| Tonal Adjustment | When the noise is tonal in character than an adjustment shall be made as follows:<br>▪ When the tonal character of the noise is just detectable then + 2 dB(A).<br>▪ When the tonal character of the noise is prominent then + 5 dB(A). |
| Impulsive Adjustment | When the noise is impulsive in character then an adjustment shall be made as follows:<br>▪ When the impulsive character of the noise is just detectable then + 2 dB(A).<br>▪ When the impulsive character of the noise is prominent then + 5 dB(A). |
| Intermittency Adjustment | An intermittency adjustment applies when the noise increases in level rapidly by at least 5 dB, on at least two occasions during a 30-minute period and maintains the higher level for at least one minute duration. The relevant intermittency adjustments applicable include:<br>▪ When the level increase is >10 dB during the day period, then apply an adjustment of +3 dB(A).<br>▪ When the level increase is 5-10 dB during the night period, then apply an adjustment of +3 dB(A).<br>▪ When the level increase is >10 dB during the night period, then apply an adjustment of +5 dB(A). |
| Reflection Adjustment | When the measurement point is located outdoors and the microphone is located from 1 to 2 metres from an acoustically reflecting surface, an adjustment of -2.5 dB shall be made. |
| Duration Adjustment | If noise emissions from the commercial, industrial or trade premises investigated do not occur over the whole continuous 30-minute period, the duration adjustment applies. This is the only one of the adjustments that is negative, reducing the effective level compared with the 'raw' measured level. |

The above adjustments are applied to the measured / predicted values at residential receptors to determine the 'effective' noise level impacting on the residential receptor.

The proposed solar farm site will include inverter and transformer units which typically include a tonal character.

In accordance with the above methodology, where noise sources included a tonal character, the following adjustments will be made to noise levels impacting on residential receptors:

- When the tonal character is 'just detectable' then the tonal adjustment will be +2dB(A).
- When the tonal character is 'prominent' then the tonal adjustment will be +5dB(A).

Allowance has been made in this assessment for 'prominent' tonality.

### 5.2 Project Noise Target

Given that all noise sources can operate within the 'night' period when the noise limit is 36 dB(A) and allowance is being made for a tonal adjustment of +5 dB(A), the project noise target effectively becomes a modelled noise level of 31 dB(A) at houses in the vicinity of the subject site.

### 5.3 Environment Reference Standard

The ERS provides environmental values which have been developed to reflect the ambient soundscape associated with different land use settings, from highly urbanised areas to natural environments.

Through consideration of land zoning types, and varying assessment periods for the day and night, it is understood that the ERS intends to provide consideration of noise levels which may impact on:

- Sleep during the night.
- Domestic and recreational activities.
- Normal conversation.
- Child learning and development.
- Human tranquillity and enjoyment outdoors in natural areas.
- Musical entertainment.



Whilst being included within The Act, the ERS is not a compliance standard and clearly states that 'the objectives for each land use category are typical ambient sound level values and are neither noise limits nor noise design criteria'.

It's understood that the primary function of the ERS is to provide an environmental assessment benchmark to assist 'decision makers' with evaluating noise emissions within areas not captured within The Regulations and Noise Protocol.

The assessment has considered noise emissions from the site at existing residential receptors as well as within currently vacant farm zone land which may be developed for residential use at a later stage.

Given the proximity of the noise sensitive residential receptors to the site, and the fact that the focus of the noise emission assessment is based on the Noise Protocol, it is understood that consideration of the ERS will not impact on the findings of the assessment and has therefore not been considered further.

### 5.4 EPA Noise Guideline – Assessing Low Frequency Noise

As defined within The Act, a person must not, from a place or premises that are not residential premises emit an unreasonable noise or permit an unreasonable noise to be emitted.

Within the Regulations, unreasonable noise is based on exceedances determined in accordance with the Noise Protocol, however, the Regulations also include consideration of the sound frequency spectrum associated with a noise emission.

To provide some basis for addressing low frequency noise emissions and determining whether the noise emission is deemed 'unreasonable', the EPA released Publication 1996 *Noise Guideline – assessing low frequency noise*.

The guideline document provides 'threshold levels for assessing low frequency noise' which are not set limits, but levels that indicate a potential risk of problematic low frequency noise. The threshold levels for indoor and outdoor measurements are included within Table 5 below.

*Table 5: Indoor and outdoor measurement one-third octave band noise level thresholds*

| Measurement Location | One-third octave band noise levels Hz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 12.5 | 16 | 20 | 25 | 31.5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 |
| Indoor noise dB $L_{eq}$ | 92 | 87 | 83 | 74 | 64 | 56 | 49 | 43 | 42 | 40 | 38 | 36 | 34 |
| Outdoor noise dB $L_{eq}$ | 92 | 89 | 86 | 77 | 69 | 61 | 54 | 50 | 50 | 48 | 48 | 46 | 44 |

## 6. PREDICTED NOISE LEVELS AND APPROPRIATE NOISE CONTROL STRATEGIES

### 6.1 NOISE PREDICTION METHODOLOGY

Modelling of operational noise emissions associated with the proposal has been conducted using DataKustik CadnaA 2020 environmental noise modelling software.

Relevant information regarding site elevations, site buildings and the surrounding environment has been provided by the client and sourced from online databases including 'ELVIS' - Elevation and Depth - Foundation Spatial Data and VicMaps.

The model has been developed and configured with sufficient detail for appropriate noise emission calculations to be undertaken.

The modelling software implements the calculation procedures defined within International Standard *ISO 9613-2: 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613).

The ISO 9613-2 method aims to determine the average sound level under meteorological conditions favourable to propagation, that is, moderately downwind propagation or propagation under a well-developed, but moderate, ground-based temperature inversion, such as can occur at night.

Environment Protection Authority assessment methodology indicates that residual noise levels at noise sensitive receivers should be considered when weather conditions assist propagation of noise emissions in the direction of the receivers. This condition is implemented by the noise modelling software.

The noise modelling has allowed for the effects of light breezes from the noise sources to the residential locations enhancing sound propagation. For much of the time, the resultant noise levels would be lower than predicted on this basis.

Through implementation of ISO 9613-2 within CadnaA 2020, the noise emission modelling considers the following attenuation measures:

- Geometrical spreading.

- Atmospheric absorption.
- Ground attenuation.
- Meteorological effects.
- Source/Receiver height effects.
- Attenuation due to the surrounding environment including existing buildings/structures.

### 6.2 Noise Modelling Input Parameters

Advice has been received that all sources will operate during daylight hours.

Given that daylight begins prior to 0700 hours for much of the year, operation of all noise sources must be allowed for during all EPA-defined periods, including the 'night' period.

*Table 6: Summary of Adopted Operating Parameters*

| Assessment Period | Noise Source Description |
|---|---|
| Day | All sources operating |
| Evening | |
| Night | |



### 6.3 Noise Prediction Results and Identified Noise Control Strategies

Initial noise modelling identified that resultant off-site noise levels would exceed the project noise target with 'standard' noise levels in the absence of noise control measures.

Iterative noise modelling and consultation with the project team has been undertaken to develop a set of strategies to achieve compliance with the effective noise target of 31 dB(A).

The noise control strategies developed are:

- selection of inverter stations that include a noise reduction kit. This kit enables operation at full electrical capacity while emitting reduced noise emission compared with the standard equipment configuration.
- 4 m high noise barriers around the inverter stations
- Placement of the converters inside acoustically lined enclosures.

With these incorporated into the noise model, the following results were obtained.

*Table 7: Noise modelling results*

| Residential location | Modelled noise level, dB(A) $L_{eq}$ |
|---|---|
| 379 McLarens Rd | 31 |
| 430 McLarens Rd | 31 |
| Fulham Correctional Centre Res 4 | 30 |
| Parcel 2 Lot PS446356 McLarens Rd | 30 |

| Residential location | Modelled noise level, dB(A) $L_{eq}$ |
|---|---|
| Fulham Correctional Centre Res 5 | 30 |
| Fulham Correctional Centre Res 3 | 30 |
| Fulham Correctional Centre Res 6 | 30 |
| Fulham Correctional Centre Recreation Shed | 30 |
| Fulham Correctional Centre Res 2 | 30 |
| Fulham Correctional Centre Res 7 | 30 |
| 380 McLarens Rd | 28 |
| 139 Hopkins Rd | 28 |
| 344 McLarens Rd | 26 |
| 995 Settlement Rd | 26 |
| 1038 Settlement Rd | 21 |
| 922 Settlement Rd | 21 |



The noise modelling results have therefore demonstrated compliance with the project noise target at all relevant noise sensitive areas.

The noise modelling results have indicated that low frequency noise will not exceed the low frequency noise threshold, but the source data is not fully defined in the low frequency range.



## 7. SUMMARY OF NOISE CONTROL STRATEGIES

The findings of the acoustic assessment have concluded that compliance with relevant EPA noise limits can be achieved through the implementation of suitable noise control strategies at the subject site.

Should other initiatives or provisions be incorporated within the development as the detailed design progresses which ensure that the relevant noise limits are met, the treatments herein may be amended at the approval of a qualified acoustic consultant.

### 7.1 Equipment Selections

The noise barriers and acoustic enclosures recommended to achieve compliance with the relevant noise limits are based on the equipment sound power levels set out in this report.

Should equipment with different sound power levels than set out within Table 2 be included in the proposal, then the nominated noise control would need to be reviewed by a suitably qualified acoustic consultant.

### 7.2 Noise Barriers

Noise barriers 4 m high are recommended around the main site transformer and the 23 inverter stations, with final extent to be determined during detail design.

The noise barriers are to be constructed of a solid material with a surface density of at least 15 kg/m$^2$, with no gaps at the base of the barrier or within the barrier. Access doors would need to

also be solid and fit neatly, but do not need to be sealed. The location and type of access is an aspect that would best be resolved at the detail design stage.

The noise barriers will need to be lined with weather resistant sound absorptive material nominally 100 mm thick, with sound absorption NRC 1.0.

### 7.3 Enclosures for Converters

All converters will need to be installed within full enclosures including roof. Based on the noise data available at the planning stage, the enclosures will need to be fully lined with sound absorptive material nominally 100 mm thick with sound absorption NRC 1.0.

The combined internal lining and cladding will need to achieve an overall sound reduction index of $R_w$ 32. It is expected that this would be achieved using 1.2 mm thick metal cladding or 9 mm fibre cement sheet in conjunction with the internal lining, but review will be required at the detail design stage.

The enclosures will also require a ventilation system to avoid the condensers overheating. The ventilation system will need to include acoustic attenuation consistent with the overall sound attenuation of the enclosures.



### 7.4 Consideration of Tonal Adjustment

The assessment has been based on the assumption of 'prominent' tonality in the absence of detailed frequency spectrum technical data for the electrical infrastructure.

If specific information available at the detailed design stage indicates that the equipment tonality is not 'prominent', then it may be possible to reduce the extent of the currently nominated noise barriers.



## 8. RECOMMENDED DRAFT PLANNING PERMIT CONDITIONS

### 8.1 Noise Criteria

Noise emission from the facility shall comply with noise limits determined in accordance with EPA publication 1826.4 '*Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*' (Noise Protocol), assessed at locations representative of residential premises in the vicinity of the facility. The noise limits are 46, 41 and 36 dB(A) for the EPA-defined 'day', 'evening' and 'night' periods.

### 8.2 Finalisation of Design

Finalisation of the design of noise attenuation measures shall include input from a qualified acoustic consultant, basing noise modelling on one-third octave band sound power level data provided by the equipment suppliers.

### 8.3 Monitoring of Resultant Operational Noise Levels

Within three months of commencement of operation of the facility, measurement of resultant noise levels arising from the facility shall be conducted by a qualified acoustic consultant at locations representative of residential premises in the vicinity of the facility.

The measured noise levels shall be compared with noise limits determined in accordance with EPA publication 1826.4. If this comparison shows exceedance of the Recommended Maximum Noise Levels, then ameliorative measures to achieve compliance shall be developed, implemented and re-assessed within another three months.

## 9. CONCLUSIONS

WMG has carried out a noise emission assessment for the proposed new solar energy generation facility at the corner of Hopkins and McLarens Roads, Fulham, Victoria.

The purpose of the assessment has been to consider any potential noise emissions associated with the proposed use which may impact on residential receptors located nearby to the subject site.

Noise emissions associated with the proposed use have been considered in accordance with methodologies set out in EPA publication 1826.4 '*Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues*'.

The assessment has concluded that compliance with relevant assessment criteria can be achieved by a combination of appropriate equipment selection, noise control barriers and full enclosures of the most significant noise sources.

The recommended noise control options have been set out in Section 7 of the report, with recommended draft Planning Permit Conditions in Section 8.

Neville Goddard

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