

**HASTINGS GENERATION PROJECT  
ENVIRONMENTAL NOISE IMPACT  
ASSESSMENT**

**ESSO**

Rpt01-AU00659-Rev1-26.Nov.2021

## DOCUMENT CONTROL & REVIEW INFORMATION

**Customer:** Esso  
Customer Contact: Barbara Lucas

Wood Contact: Samuel Turner  
Wood Office: Melbourne  
Wood Job No: AU00659

**Wood Document No: Rpt01-AU00659-Rev1-26.Nov.2021**

Rev	Date	Description	Prepared	Reviewed	Approved	
					Proj Manager	Customer
A	05 Nov 21	Issued for Review	S Turner	S Lloyd	S Turner	
0	12 Nov 21	Issued for Use	S Turner	S Lloyd	S Turner	
1	24 Nov 21	Updated with vendor data	S Lloyd	S Turner	S Turner	

Item	Page	Section	Comments

\* Use after Rev. 0

## **Disclaimer**

*This Report has been prepared for Esso by Wood, based on assumptions as identified throughout the text and upon information and data supplied by others.*

*The Report is to be read in the context of the methodology, procedures and techniques used, Wood's assumptions, and the circumstances and constraints under which the Report was written. The Report is to be read as a whole, and sections or parts thereof should therefore not be read or relied upon out of context.*

*Wood has, in preparing the Report, followed methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgment and reasonable care. However, no warranty should be implied as to the accuracy of estimates or other values and all estimates and other values are only valid as at the date of the Report and will vary thereafter.*

*Parts of the Report have been prepared or arranged by Esso or third party contributors, as detailed in the document. While the contents of those parts have been generally reviewed by Wood for inclusion into the Report, they have not been fully audited or sought to be verified by Wood. Wood is not in a position to, and does not, verify the accuracy or completeness of, or adopt as its own, the information and data supplied by others and disclaims all liability, damages or loss with respect to such information and data.*

*In respect of all parts of the Report, whether or not prepared by Wood no express or implied representation or warranty is made by Wood or by any person acting for and/or on behalf of Wood to any third party that the contents of the Report are verified, accurate, suitably qualified, reasonable or free from errors, omissions or other defects of any kind or nature. Third parties who rely upon the Report do so at their own risk and Wood disclaims all liability, damages or loss with respect to such reliance.*

*Wood disclaims any liability, damage and loss to Esso and to third parties in respect of the publication, reference, quoting or distribution of the Report or any of its contents to and reliance thereon by any third party.*

*This disclaimer must accompany every copy of this Report, which is an integral document and must be read in its entirety.*

## EXECUTIVE SUMMARY

Esso are seeking to obtain regulatory planning approval for the Hastings Generation Project (The Project). The Hastings Generation Project is to be located at an ExxonMobil owned site adjoining the existing Long Island Point (LIP) facility. The project consists of the use of ethane from LIP to generate power through the installation of three Solar Titan 130 power generation packages producing approximately 40MW of electricity. The power generated will be fed into the existing electricity transmission network via the Tyabb Terminal Station.

This report presents an assessment of potential noise emissions from The Project against Victoria's EPA Noise Limit and Assessment Protocol (Noise Protocol).

Noise levels due to the operation of the facility were predicted at four nearby Noise Sensitive Receivers (NSRs). NSR for the purposes of this report are used to denote *noise sensitive area* as defined in the *Environment Protection Regulations 2021*.

Determination of background noise levels through attended monitoring and zoning levels has been undertaken at four NSRs surrounding the project site to determine the project noise limits. For the purposes of this project only night-time noise limits have been considered as night-time noise limits are the most stringent and the facility is anticipated to operate under steady-state conditions throughout daytime, evening and night-time periods. The attended monitoring results are shown in Table A-1-1 below.

**Table A-1-1 Receiver Project Noise Limits**

Receiver	Background Noise Level, dB(A)	Night-time zoning Level, dB(A)	Night-time noise limit, dB(A)
NSR 1	37 <sup>1</sup>	55	<b>49</b>
NSR 2	35	41	<b>41</b>
NSR 3	37	42	<b>42</b>
NSR 4	37 <sup>1</sup>	43	<b>43</b>

A number of major equipment items associated with the Project have been identified as significant noise emission sources (Section 2.2). Noise emission sources data for this equipment has been supplied by the vendor. Noise modelling has been undertaken to predict noise emissions and propagation associated with the Project at these receivers, and hence to determine the *effective noise level*.

Based on noise characteristics of the proposed equipment it is expected that noise emissions from The Project are unlikely to exhibit tonal or other noise characteristics that may invoke

<sup>1</sup> Due to the presence of significant intrusive noise from an industrial premises at this location. Background measurements undertaken at a background equivalent location (NSR3) have been used for NSR1 in determining project noise limits.

adjustments to predicted noise levels at noise sensitive receivers. Therefore, no adjustments have been made to the predicted levels.

Noise level predictions assume adverse weather conditions for sound propagation towards the noise sensitive receivers and that all items of plant are operational continuously. The modelled results are shown in Table A-1-2.

**Table A-1-2 Effective Noise Levels**

Receiver	Address	Noise limit, dB(A)	Effective noise level, dB(A)
NSR 1	11 Cemetery Rd, Hastings VIC 3915	49	46
NSR 2	65 Skinner St, Hastings VIC 3915	41	34
NSR 3	2 Hodgins Rd, Hastings VIC 3915	42	34
NSR 4	15A Lyall St, Hastings VIC 3915	43	31

The modelled noise levels fall below the most stringent (night-time) noise limits at all noise sensitive receivers identified in the assessment.

To ensure that effective noise levels from the proposed facility comply with the project noise limits at noise sensitive areas, it is recommended that a series of noise control measures are incorporated into the Solar equipment packages. These noise control measures are listed in Section 7.

The project has advised that major construction activities involving mobile equipment and loud hand tools will be limited to the normal working hours. It is recommended that The Project follow the guidance outlined in Section 4.3 of EPA's Publication 1834 to minimise noise and vibration risk as far as reasonably practicable.

Night construction works are not anticipated to involve the use of significant mobile or fixed plant noise sources, and the additional power and lighting will be powered by existing power sources, eliminating the need for portable generators. Therefore, it is anticipated that The Project will meet the EPA's guidelines for noise levels for construction works undertaken outside the normal working hours.

# TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
<b>2</b>	<b>DESCRIPTION OF SITE &amp; OPERATIONS .....</b>	<b>2</b>
2.1	Site Locality.....	2
2.1.1	Noise Sensitive Receivers .....	2
2.2	Operational Activities .....	3
<b>3</b>	<b>CONSTRUCTION NOISE.....</b>	<b>5</b>
<b>4</b>	<b>PROJECT NOISE LIMITS .....</b>	<b>7</b>
4.1	Zoning Levels.....	8
4.2	Background Noise Levels.....	9
4.2.1	Methodology.....	9
4.2.2	Measurement Equipment.....	9
4.2.3	Noise Level Descriptors.....	10
4.2.4	Monitoring Locations.....	10
4.2.5	Results.....	10
4.3	Project Noise limits.....	11
<b>5</b>	<b>NOISE MODELLING METHODOLOGY .....</b>	<b>13</b>
5.1	Noise Model.....	13
5.2	Noise Modelling Scenarios.....	13
5.2.1	Operational Scenarios.....	13
5.3	Meteorological Conditions.....	14
5.4	Ground Topography, Buildings and Barriers .....	15
5.5	Noise Source Emission Data .....	15
<b>6</b>	<b>NOISE ASSESSMENT .....</b>	<b>17</b>
<b>7</b>	<b>DISCUSSION .....</b>	<b>18</b>
<b>8</b>	<b>CONCLUSION.....</b>	<b>19</b>
8.1	Construction Noise.....	19
8.2	Project Noise.....	19
<b>APPENDIX A</b>	<b>ATTENDED NOISE MONITORING DATA.....</b>	<b>A-1</b>
<b>APPENDIX B</b>	<b>SOURCE SOUND POWER LEVELS .....</b>	<b>B-3</b>
<b>APPENDIX C</b>	<b>PREDICTED NOISE CONTOURS .....</b>	<b>C-4</b>

# 1 INTRODUCTION

Esso are seeking to obtain regulatory planning approval for the Hastings Generation Project (The Project). The Hastings Generation Project is to be located at an ExxonMobil owned site adjoining the existing Long Island Point (LIP) facility. The project consists of the use of ethane from LIP to generate power through the installation of power generation packages producing approximately 40MW of electricity. The power generated will be fed into the existing electricity transmission network via the Tyabb Terminal Station. The three components of the project can be summarised as:

- Installation of new piping to transfer ethane from LIP to the adjoining, Esso owned project site;
- Installation of three Solar Titan 130 generators, each with a capacity of 13.5MW producing approximately 40MW of electricity, on the project site that tie-in to the new ethane pipeline; and
- Installing a high voltage electricity line from the generators that links into the existing transmission network powerline on Bayview Road.

The Project is planning to start construction in 2Q 2022 and is anticipated to continue for 6 months. It is anticipated that the facility will remain in operation for 11 years (2023 – 2033).

Noise from The Project has the potential to impact *noise sensitive areas* (hereby referred to as NSRs/noise sensitive receivers) surrounding the proposed operations. Noise impacts at four of the closest noise sensitive receivers have been assessed based on noise modelling and background noise monitoring of The Project.

This report presents an assessment of whether the project could comply with the noise limits (Project Noise Limits) imposed under the Victorian *Noise Limit and Assessment Protocol (Noise Protocol)* at the closest noise sensitive receivers.

## 2 DESCRIPTION OF SITE & OPERATIONS

### 2.1 Site Locality

The Hastings Generation Project will be constructed at a site adjoining the northern end of ExxonMobil's Long Island Point (LIP) facility. The proposed facility is to be located in an existing industrial area approximately 2km west of the town of Hastings. Figure 2-1 displays the proposed project area in relation to the existing LIP facility.



**Figure 2-1: Aerial Imagery of Site Locality**

#### 2.1.1 Noise Sensitive Receivers

A noise sensitive area has several definitions as per the Victorian Environmental Protection Regulations 2021<sup>3</sup>.

For the purposes of this assessment, four noise sensitive receivers (NSRs) nearby the proposed facility have been identified. These receivers have all been identified as private residences. The residential addresses of these receivers are outlined in Table 2-1.

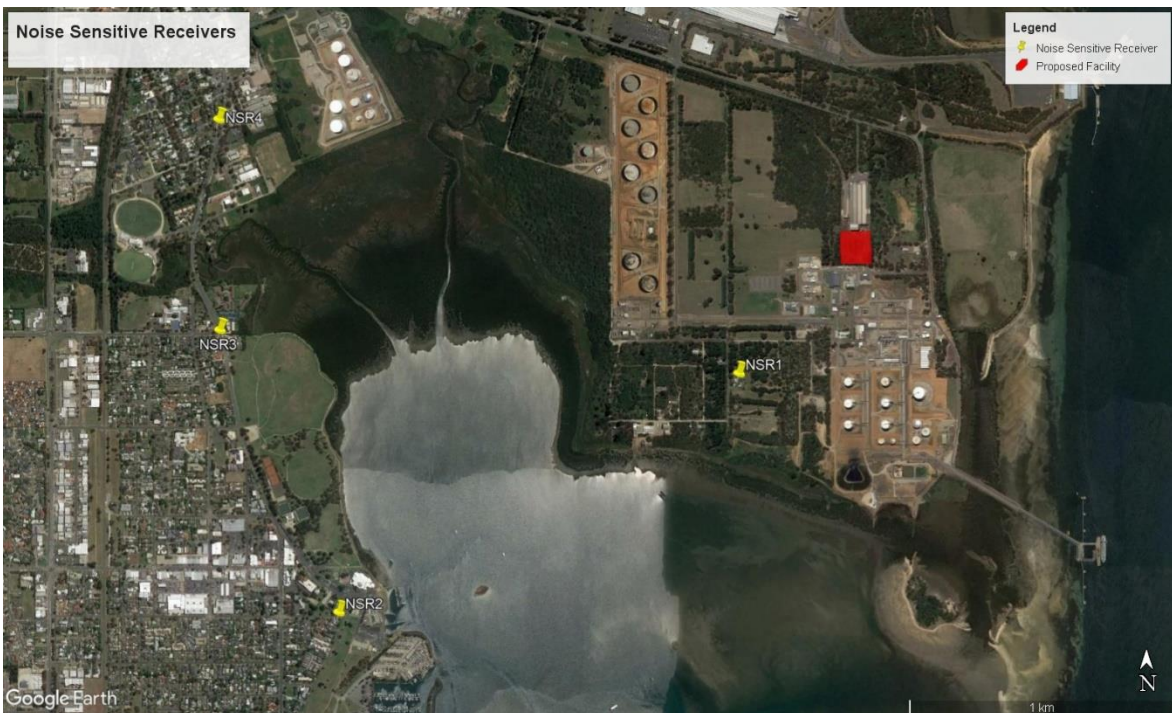
<sup>3</sup> Victorian Environmental Protection Regulations 2021, Part 1.2 – Interpretation and introductory matters, Pages 21-23



**Table 2-1 Residential address' of Assessed Noise Sensitive Receivers**

Noise Sensitive Receiver	Address
NSR 1	11 Cemetery Rd, Hastings VIC 3915
NSR 2	65 Skinner St, Hastings VIC 3915
NSR 3	2 Hodgins Rd, Hastings VIC 3915
NSR 4	15A Lyall St, Hastings VIC 3915

Figure 2-2 shows an overview of these receivers (yellow) with reference to the proposed project area (red)



**Figure 2-2: Location of Project Area and Noise Sensitive Receivers**

## 2.2 Operational Activities

It is anticipated that the proposed facility will comprise of the following (noise generating) equipment:

- 3 x Solar Titan 130 Gas Turbine Generator packages, consisting of the following:
  - Enclosed compressor package including baseframe
  - Turbine air system
  - Enclosure ventilation

- Turbine exhaust system
  - Lube oil cooler
- 3 x Fuel gas skid
- 2 x Instrument air package
- 2 x Transformers
- 1 x Water purification pump

---

## 3 CONSTRUCTION NOISE

Victoria does not have regulatory limits for noise from construction works. Instead, EPA Victoria provides guidance to help operators reduce noise impacts from construction works through EPA Victoria's *Civil construction, building and demolition guide, Publication 1834, 2020* (replaces EPA Publication 480 and Publication 1254).

The EPA's Publication 1834 states:

*Under the general environmental duty, anyone who is engaging in an activity that poses risk of harm to human health and the environment, from pollution or waste, must manage that risk. You need to do this by **eliminating or reducing your specific risks as far as reasonably practicable**. You can do this by putting appropriate controls in place.*

*Key aspects to consider when you are planning include:*

- *Identifying people and sensitive environments (sensitive receivers) that could be affected by your activities*
- *Carrying out appropriate engagement as early as possible*
- *Avoiding the generation of noise and vibration*
- *Facilitating construction during normal working hours, where possible (See Table 3-1)*
- *Reducing noise and vibration by using the most appropriate equipment and work practices for your activities*
- *Choosing alternative equipment or methods that generate less noise or vibration*
- *Maintaining equipment and vehicles according to manufacturer's instructions*
- *Attenuating noise by obstructing the path between noise source and receiver*
- *Mitigating offsite noise with measures such as respite offers and acoustic treatment*
- *Considering alternatives if noise and vibration cannot be reduced through avoidance, reduction or attenuation.*

The EPA's Publication 1834 provides recommended working hours for construction sites of major infrastructure works, including the development of power facilities, and guidelines for noise levels for works undertaken outside normal working hours. The recommendations given in Section 4.4 of Publication 1834 are summarised in Table 3-1 below.

**Table 3-1 Construction Noise Working Hours**

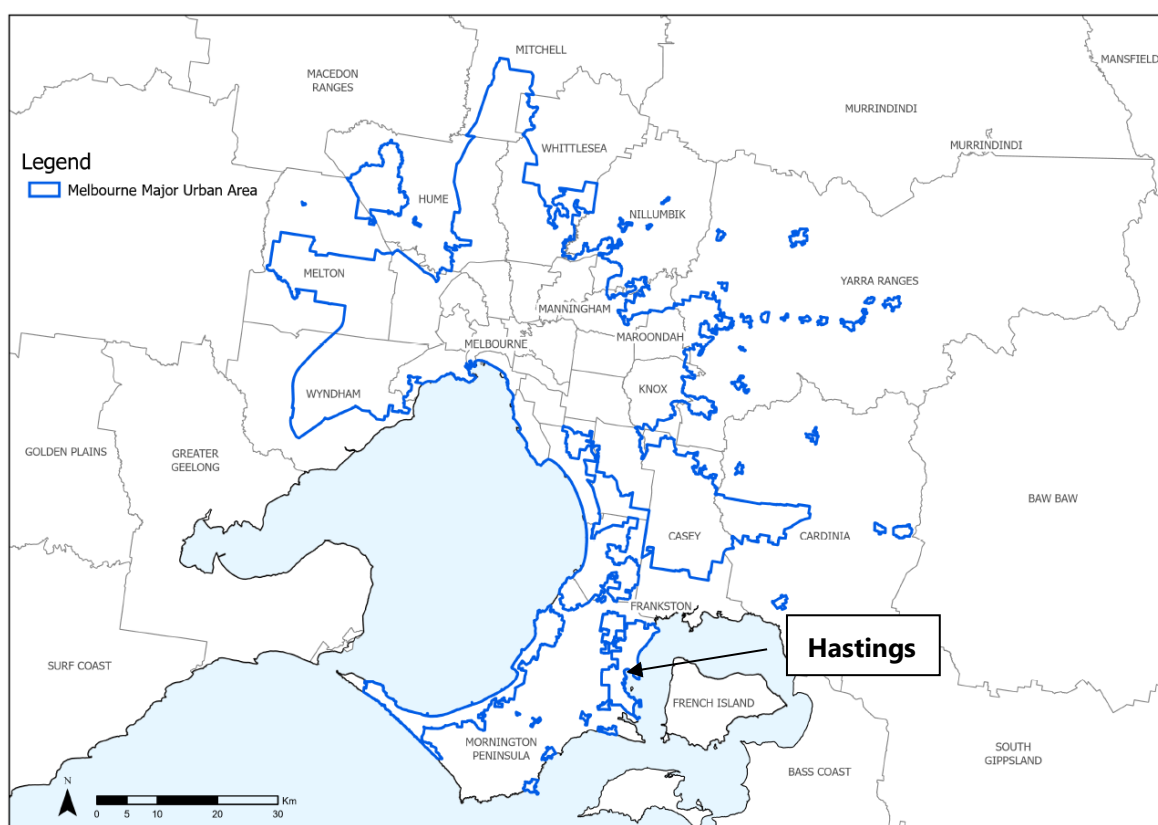
Period	Working Hours	Description
Normal Working Hours	<ul style="list-style-type: none"> <li>0700 – 1800, Monday – Friday; and</li> <li>0700 – 1330 Saturday</li> </ul>	No noise level guidelines apply
Weekend / Evening	<ul style="list-style-type: none"> <li>1800 – 2200, Monday – Saturday;</li> <li>1300 – 2200, Saturday; and</li> <li>0700 – 2200, Public Holidays</li> </ul>	<p>Construction noise levels should not exceed the background LA90 level by:</p> <ul style="list-style-type: none"> <li>10dBA or more for up to 18 months after project commencement;</li> <li>5dBA or more, after 18 months after project commencement</li> </ul>
Night	<ul style="list-style-type: none"> <li>2200 – 0700, Monday – Sunday, (inc. Public Holidays)</li> </ul>	Noise is to be inaudible within a habitable room of any residential premises

The project has advised Wood that major construction activities involving mobile equipment and loud hand tools will be limited to normal working hours. Night construction works may be undertaken, however they will be limited to activities such as cable laying activities which are not anticipated to involve the use of significant mobile or fixed plant noise sources. Additionally, it is anticipated that additional lighting and power may be required but will be powered by existing power sources, eliminating the need for portable generators.

## 4 PROJECT NOISE LIMITS

Noise emissions from commercial, industrial, trade premises and entertainment venues in Victoria are regulated under the *Noise Limit and Assessment Protocol (Noise Protocol)*<sup>4</sup>. The Noise Protocol specifies the procedure for determining noise limits at noise sensitive areas near a proposed facility or activity.

The proposed Esso Power Generation facility is located in Hastings, Mornington Peninsular and within the Melbourne major urban area, as shown in Figure 4-1. Therefore, noise limits have been determined using the Urban Area Method as defined by The Noise Protocol Part 1, Section A, Subsection 1.



**Figure 4-1: Location of Hastings within the Melbourne Major Urban Area**

The following operational time periods (day, evening and night) as outlined in Table 4-1 are defined in the Noise Protocol.

<sup>4</sup> *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues*, EPA Publication 1826.4 Part 1A

**Table 4-1 Operating time periods**

Period	Details
Day	0700—1800, Monday - Saturday (excluding public holidays)
Evening	1800—2200, Monday - Saturday
	0700—2200, Sunday and public holidays
Night	2200—0700

For the purposes of this project only night-time noise limits have been considered in the assessment as these limits are the most stringent. The facility is anticipated to operate under steady-state conditions throughout daytime, evening and night-time periods.

The noise limits set by the Noise Protocol are influenced by the zoning of land uses surrounding a noise sensitive receiver and the existing background noise level.

#### 4.1 Zoning Levels

In accordance with the Noise Protocol, the zoning level<sup>5</sup> is determined by applying two concentric circles of diameters of 140 m and 400 m, reproduced to scale, with the centre of the circles placed at the centre of each identified sensitive receiver. From each of these circles the area of each zoning types was determined and from this the zoning levels were calculated.

The night-time zoning levels for each noise sensitive receiver are summarised in Table 4-2.

**Table 4-2 Influencing Factor and Zoning Levels**

Noise Sensitive Receiver	Land Zoning for NSR		Influencing Factor	Zoning Levels, dB(A)
	140 m diameter	400 m diameter		Night time period
NSR1	SUZ1	SUZ1 PCRZ PUZ5	0.93	55
NSR2	PPRZ PUZ3 RDZ2 GRZ1	PPRZ PUZ3 RDZ2 GRZ1 PUZ6	0.09	41
NSR3	GRZ1 C1Z	GRZ1 C1Z	0.19	42

<sup>5</sup> Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues, EPA Publication 1826.4 Part 1A, Section 1.1 Zoning Level

Noise Sensitive Receiver	Land Zoning for NSR		Influencing Factor	Zoning Levels, dB(A)
	140 m diameter	400 m diameter		Night time period
	RDZ2 PUZ2	RDZ2 PUZ2 PPRZ		
NSR4	GRZ1 RDZ2 IN3Z	GRZ1 RDZ2 IN3Z	0.25	43

## 4.2 Background Noise Levels

### 4.2.1 Methodology

Attended background noise monitoring was undertaken on the night of 11<sup>th</sup> October 2021 at the noise sensitive receivers listed in Table 2-1. The attended monitoring and analysis was conducted in accordance with the short background method<sup>6</sup> detailed in The Noise Protocol.

### 4.2.2 Measurement Equipment

A Brüel & Kjaer Sound Level Meter (SLM) was used to undertake the attended noise monitoring. The meter is designed to meet the requirements for Type 1 instruments as specified in AS IEC 61672.1-2004 and for 1/3 octave band filters as specified in AS/NZS 4476:1997 *Acoustics—Octave-band and fractional-octave-band filters*.

The SLM was field calibrated prior to starting measurements and on completion of measurements using a Brüel and Kjaer Type 4231 reference sound source. A list of equipment used is given in Table 4-3 below.

**Table 4-3 Noise Monitoring Equipment**

Equipment Type	Serial Number
Sound Level Meter, Brüel & Kjaer Type 2270	3000342
Reference Sound Source, Brüel & Kjaer Type 4231	2253111

<sup>6</sup> *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues*, EPA Publication 1826.4 Part 1A, Section 4. Assess background level to set noise limits for the urban area method or the rural area method

### 4.2.3 Noise Level Descriptors

The noise parameters outlined in Table 4-4 were measured throughout the logging period. The noise parameters were logged over at least two intervals of 10 minutes over the (night-time) period.

**Table 4-4 Noise Level Descriptors**

Parameter	Definition
L <sub>AF 1</sub>	A sound level, determined as an L <sub>A Slow</sub> value, exceeded for 1% of the time period over which the level is determined.
L <sub>AF 10</sub>	A sound level, determined as an L <sub>A Slow</sub> value, exceeded for 10% of the time period over which the level is determined.
L <sub>AF 90</sub>	A sound level, determined as an L <sub>A Slow</sub> value, exceeded for 90% of the time period over which the level is determined (commonly referred to as the background noise level if a measurement of ambient noise is made before the proposal is in operation).
L <sub>A eq</sub>	The equivalent continuous sound level that has the same energy as the fluctuating sound under consideration over the time period which the level is determined.

### 4.2.4 Monitoring Locations

Attended monitoring background measurements were undertaken at locations representative of the NSRs identified in Table 2-1. The measurement location at each of the corresponding NSR (in degrees, minutes, seconds) are listed in Table 4-5 below.

**Table 4-5 Attended Monitoring Locations**

NSR	Latitude	Longitude
NSR 1	38°18'8.1"S	145°12'47.3"E
NSR 2	38°18'33.3"S	145°11'47.3"E
NSR 3	38°18'57.9"S	145°11'23.8"E
NSR 4	38°17'34.8"S	145°11'26.8"E

### 4.2.5 Results

The measured background noise levels for each receiver are presented in Table 4-6.

Detailed results for the attended noise monitoring undertaken are presented in APPENDIX A.



**Table 4-6 Measured Background Noise Levels**

NSR	Address	Measured Background Noise Level, LAF 90	Observations
NSR1	11 Cemetery Rd, Hastings VIC 3915	42.6	Constant industrial noise from Esso LIP facility.
NSR2	65 Skinner St, Hastings VIC 3915	35.4	Distant fluctuations of industrial noise from industrial facilities. When faint, fan sound from nearby recreation centre can be heard.
NSR3	2 Hodgins Rd, Hastings VIC 3915	37.3	Faint industrial noise from Esso facility. Fairly constant noise from traffic.
NSR4	15A Lyall St, Hastings VIC 3915	- (note 1)	Constant industrial noise likely from United Plant facility.

**Note 1:** Background noise measurements were not undertaken at this location due to the presence of intrusive noise from an industrial premises. However, observations were recorded.

### 4.3 Project Noise limits

The background noise levels were compared to the night-time zoning levels and a determination on whether the background noise level, relative to the zoning level, is neutral, low or high was made in accordance with Clause 4<sup>7</sup> of the Noise Protocol. Where background noise is dominated by intrusive noise from a commercial, industrial, or trade premises, background noise measurements undertaken at an equivalent location have been used in accordance with Clauses 40 & 42<sup>8</sup> of the Noise Protocol. Table 4-7 details the background noise level assessment and outlines the project noise limits which were determined in accordance with Clauses 5 or 6<sup>9</sup> of the Noise Protocol

<sup>7</sup> *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues*, EPA Publication 1826.4 Part 1A, Section 1. Noise limits – urban area method, Clause 4

<sup>8</sup> *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues*, EPA Publication 1826.4 Part 1A, Section 4. Assess background level to set noise limits for the urban area method or the rural area method, Clause 40 & 42.

<sup>9</sup> *Noise Limit and Assessment Protocol for the Control of Noise from Commercial, Industrial and Trade Premises and Entertainment Venues*, EPA Publication 1826.4 Part 1A, Section 1. Noise limits – urban area method, Clause 5 / Clause 6

**Table 4-7 Background Noise Level Assessment & Project Noise Limits**

Receiver	Background Noise Level, dB(A)	Night time zoning Level, dB(A)	Background Noise Level Assessment	Comment	Project Night time noise limit, dB(A)
NSR 1	37 <sup>10</sup>	55	Low	Project noise limit is ½ (zoning level + background level) + 3 dB	<b>49</b>
NSR 2	35	41	Neutral	Project noise Limit based is zoning Level	<b>41</b>
NSR 3	37	42	Neutral	Project noise Limit based is zoning Level	<b>42</b>
NSR 4	37 <sup>11</sup>	43	Neutral	Project noise Limit based is zoning Level	<b>43</b>

<sup>10</sup> Due to the presence of significant intrusive noise from an industrial premises at this location. Background measurements undertaken at a background equivalent location (NSR3) have been used for NSR1 in determining project noise limits.

<sup>11</sup> Due to the presence of significant intrusive noise from an industrial premises at this location. Background measurements undertaken at a background equivalent location (NSR3) have been used to determine project noise limits.

## 5 NOISE MODELLING METHODOLOGY

### 5.1 Noise Model

A noise propagation model has been developed using the SoundPlan 8.2 program developed by SoundPLAN LLC. This program calculates sound pressure levels at nominated receiver locations or produces noise contours over a defined area of interest around the noise sources. SoundPlan can be used to model different types of noise, such as industrial noise, traffic noise and aircraft noise, and it is professionally recognised in Australia and internationally. The inputs required in SoundPlan are noise source data, ground topographical data, meteorological data and receiver locations.

SoundPlan provides a range of prediction algorithms that can be selected by the user. The CONCAWE prediction algorithms were selected for this assessment<sup>12,13</sup>. The acoustic model has been used to generate a noise contour for the area surrounding the Project and predict noise levels at the nearby noise sensitive (residential) locations.

The acoustic model does not include noise emissions from any source other than the proposed operations from The Project. Therefore, noise emissions from other neighbouring industrial sources, road traffic, aircraft noise, animals, domestic sources, etc are excluded from the modelling.

### 5.2 Noise Modelling Scenarios

#### 5.2.1 Operational Scenarios

For the purposes of this project only one operating scenario (night-time) of the proposed Hastings Generation Project has been considered as night-time noise limits are the most stringent and the facility is anticipated to operate under steady-state conditions throughout daytime, evening and night-time periods.

Table 5-1 outlines the equipment and respective quantity used for this modelling scenario.

---

<sup>12</sup> CONCAWE (Conservation of Clean Air and Water in Europe) was established in 1963 by a group of oil companies to carry out research on environmental issues relevant to the oil industry.

<sup>13</sup> The propagation of noise from petroleum and petrochemical complexes to neighbouring communities, CONCAWE Report 4/81, 1981

**Table 5-1 Quantity of Operational Equipment for Modelled Scenario**

Equipment	No. of units
Solar Titan 130 Power Generator Package, including: <ul style="list-style-type: none"> <li>Enclosure;</li> <li>Enclosure ventilation</li> <li>Turbine air inlet system,</li> <li>Combustion outlet system.</li> </ul>	3
Lube Oil Cooler	3
Fuel Gas Skid	3
Instrument Air Compressor (2 x units at 100% standby / duty)	1
Water Purification Pumps	1
Transformers	2

### 5.3 Meteorological Conditions

The CONCAWE prediction algorithm includes consideration of the effect on noise propagation of defined meteorological conditions. The following variables are included that will affect the predicted noise level: temperature; Pasquill stability (temperature inversion); relative humidity; wind speed; and wind direction.

Noise emissions have been predicted under adverse weather conditions favourable for noise propagation from the facility to the nearest residences, in accordance with this requirement.

These noise model inputs are summarized in Table 5-2 below.

**Table 5-2 Meteorological Model Inputs for Adverse Conditions**

Input	Adverse Conditions
Wind Speed (m/s)	3
Wind Direction	Source to Receiver
Pasquill-Gifford stability class (Atmospheric Stability)	F
Humidity (%)	50
Temperature (degrees Celsius)	15
Air Pressure (mbar)	1013.3

## 5.4 Ground Topography, Buildings and Barriers

Topographical information for the acoustic model has been imported from Google Earth. A moderately absorptive (ground factor 0.6) ground is assumed for forest, farmland surrounding the facility and a relatively reflective (ground factor 0.3) is assumed for the facility and other nearby industrial premises, and water surrounding the facility is assumed to be fully reflective (ground factor 0.0)

The model also includes the acoustic barrier effects and reflections associated with buildings within the locality.

## 5.5 Noise Source Emission Data

Sound power levels for the modelled equipment items are shown in Table 5-3.

Equipment sound power levels for the Titan 130 Package and associated equipment were provided by the nominated vendor (Solar). The noise emissions (sound power levels) associated with this Solar equipment assume incorporation of the following noise reduction treatments in the package:

- Acoustic blanket on engine air inlet silencer and flex duct;
- Acoustic blanket on engine exhaust expansion joint;
- Cladding on web of skid beam;
- Additional enclosure door seals; and
- Acoustic blanket on ventilation inlet elbow and fans.

The performance of these noise control treatments, and effective reduction in emissions of the standard Solar Titan 130 package has been estimated by Solar based on design/materials data, and not based upon direct measurement of performance.

Where vendor sound pressure level or sound power level data was not available (additional equipment items), Wood has used library data of similar equipment measured at existing compression or power generation facilities.

Octave-band noise source sound power levels for the equipment in the noise model are listed in APPENDIX C.

For the purposes of this assessment, it has been assumed that all items of plant are continuously operating.

**Table 5-3 Noise Source (Sound Power) Levels for Operational Equipment for Modelled Scenario**

Equipment	No. of units	Sound Power Level, L <sub>w</sub> , dB(A)
Solar Titan 130		
• Enclosure (+ventilation)	3	107
• Turbine air inlet system		97
• Combustion exhaust stack		103
Lube Oil Cooler	3	98
Fuel Gas Skid	3	96
Instrument Air Package	1	95
Water Purification Pump	1	92
Transformer	2	90

## 6 NOISE ASSESSMENT

The noise levels that would be generated at the noise sensitive receivers by operation of the Hastings Generation Project were modelled under the adverse weather conditions set out in Section 5.3. The predicted noise levels are presented in Table 6-1 below.

**Table 6-1 Predicted Noise Levels**

Receiver	Address	Predicted noise level, dB(A)
NSR1	11 Cemetery Rd, Hastings VIC 3915	46.4
NSR2	65 Skinner St, Hastings VIC 3915	33.8
NSR3	2 Hodgins Rd, Hastings VIC 3915	34.3
NSR4	15A Lyall St, Hastings VIC 3915	31.4

A noise contour for the modelled scenario is presented in APPENDIX C.

Based on noise characteristics from the proposed equipment it is expected that noise emissions from The Project are unlikely to exhibit tonal or other noise characteristics that may invoke adjustments to predicted noise levels at noise sensitive receivers. Therefore, no adjustments have been made to the predicted levels to obtain the *effective noise levels* (Table 6-2), which form the basis of the assessment.

**Table 6-3 Effective Noise Levels**

Receiver	Address	Noise limit, dB(A)	Effective noise level, dB(A)
NSR1	11 Cemetery Rd, Hastings VIC 3915	49	46
NSR2	65 Skinner St, Hastings VIC 3915	41	34
NSR3	2 Hodgins Rd, Hastings VIC 3915	42	34
NSR4	15A Lyall St, Hastings VIC 3915	43	31

## 7 DISCUSSION

The assessment results presented in Table 7-1 indicate that noise emissions (*effective noise levels*) due to the operation of The Project would fall below the noise limits at all noise sensitive receivers identified in the assessment, and are thus compliant with the relevant regulations.

Based on noise characteristics from the proposed equipment it is expected that noise emissions from The Project are unlikely to exhibit tonal or other noise characteristics that may invoke adjustments to predicted noise levels at noise sensitive receivers. Therefore, no adjustments have been made to the predicted levels.

The predictive noise modelling undertaken for the assessment incorporates the following noise attenuation measures within the Solar Titan 130 equipment packages:

- Acoustic blanket on engine air inlet silencer and flex duct;
- Acoustic blanket on engine exhaust expansion joint;
- Cladding on web of skid beam;
- Additional enclosure door seals; and
- Acoustic blanket on ventilation inlet elbow and fans.

It is recommended that to ensure compliance with the noise limits once operating, these noise control measures are clearly specified in the Project procurement and design details, and their inclusion verified for the as-built plant.



## 8 CONCLUSION

### 8.1 Construction Noise

The project has advised that major construction activities involving mobile equipment and loud hand tools will be limited to the normal working hours detailed in Table 3-1. For construction activities undertaken during normal working hours it is recommended that The Project follow the guidance outlined in Section 4.3 of EPA's Publication 1834 to minimise noise and vibration risk as far as reasonably practicable. Guidance in Section 4.3 of the EPA's Publication 1834 covers:

- Scheduling of works
- Community information and consultation
- Controlling noise at the source
- Limiting vibration and regenerated noise (jackhammers, rock breakers etc.)
- Noise reduction between noise source and receiver

Night construction works are not anticipated involve the use of significant mobile or fixed plant noise sources, and the additional power and lighting will be powered by existing power sources, eliminating the need for portable generators. Therefore, it is anticipated that The Project will meet the EPA's guidelines for noise levels for construction works undertaken outside the normal working hours.

### 8.2 Project Noise

Noise impacts at four of the closest noise sensitive receivers have been assessed based on noise modelling and background noise monitoring of The Project.

The modelling and analysis undertaken indicate compliance is met for all assessed noise sensitive receivers under adverse meteorological conditions, and therefore it is demonstrated that the Project can operate in compliance with the Victorian *Noise Limit and Assessment Protocol (Noise Protocol)*.

It is recommended that to ensure compliance with the noise limits once operating, the noise control measures for the Solar Titan 130 packages outlined in Section 7 are clearly specified in the Project procurement and design details, and their inclusion verified for the as-built plant.

## APPENDIX A ATTENDED NOISE MONITORING DATA

NSR	Start Time / Date	Elapsed Time	LAeq	LAF <sub>10</sub>	LAF <sub>90</sub>	Weather Observations	Noise Observations
NSR 1	11/10/2021 22:40:46	00:10:00	42.8	43.7	41.7	Calm, clear skies	Constant industrial noise from Esso LIP facility.
	11/10/2021 22:50:46	00:10:00	43.3	44.1	42.3		
	11/10/2021 23:00:46	00:10:00	43.4	44.2	42.5		
NSR 2	11/10/2021 23:30:37	00:10:00	37.9	40.5	34.2	Light breeze, E 1m/s, clear skies	Distant fluctuations of industrial noise from industrial facilities. When faint, fan sound from nearby recreation centre can be heard.
	11/10/2021 23:40:37	00:10:00	36.9	38.7	34.2		
	11/10/2021 23:51:27	00:10:00	40.3	41.1	34.0		
NSR 3	12/10/2021 0:13:53	00:10:00	43.5	44.9	36.7	Calm, clear skies	Faint industrial noise from Esso facility. Fairly constant noise from traffic.
	12/10/2021 0:23:53	00:10:00	40.8	42.4	37.1		
	12/10/2021 0:33:53	00:10:00	42.3	45.0	37.3		
NSR 1	12/10/2021 2:03:24	00:10:00	44.0	45.1	43.0	Calm, clear skies	Constant industrial noise from Esso LIP facility.
	12/10/2021 2:13:24	00:10:00	44.0	44.8	43.2		
	12/10/2021 2:23:24	00:10:00	43.9	44.9	42.9		
	12/10/2021 2:33:24	00:10:00	44.0	45.1	43.0		
NSR 2	12/10/2021 2:57:25	00:10:00	38.1	39.8	35.9	Light breeze, E 3m/s, clear skies	Distant fluctuations of industrial noise from industrial facilities.
	12/10/2021 3:07:25	00:10:00	38.4	39.9	36.3		

NSR	Start Time / Date	Elapsed Time	LAeq	LAF <sub>10</sub>	LAF <sub>90</sub>	Weather Observations	Noise Observations
	12/10/2021 3:17:25	00:10:00	38.5	40.0	36.4		
	12/10/2021 3:27:25	00:10:00	39.4	41.2	36.9		
NSR 3	12/10/2021 3:55:55	00:10:00	45.4	46.7	37.8	Light breeze, SE 1m/s, clear skies	Faint industrial noise from Esso facility. Fairly constant noise from traffic. Traffic more constant later in period.
	12/10/2021 4:05:55	00:10:00	43.6	43.4	37.4		
	12/10/2021 4:15:55	00:10:00	46.6	51.3	38.1		
	12/10/2021 4:25:55	00:10:00	43.6	47.8	36.9		

## APPENDIX B SOURCE SOUND POWER LEVELS

Source Name	Octave Band Sound Power Level, in dB									Lw dB(A)
	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	
Titan 130 GTG Package	119	117	114	109	103	99	96	98	94	<b>107</b>
Combustion Exhaust Stack Outlet	120	121	113	106	94	89	89	89	92	<b>103</b>
Turbine Air Inlet	105	110	109	103	86	70	54	64	61	<b>97</b>
Lube Oil Cooler	104	104	103	100	95	93	87	81	75	<b>98</b>
Instrument Air Package	86	96	91	89	90	83	90	87	83	<b>94.6</b>
Fuel Gas Skid Valve	72	72	72	72	77	82	87	92	92	<b>96.1</b>
Water Purification Pump	78	80	83	88	87	86	87	77	70	<b>91.5</b>
Transformer	77	86	91	90	90	84	79	74	67	<b>90.2</b>

# APPENDIX C PREDICTED NOISE CONTOURS

