Appendix E. Noise assessment report

Energy from Waste

Noise Assessment Report

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19th September 2020

Prospect Hill International Pty Ltd

Energy from Waste

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Author:	Michel Baron
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Jacobs Group (Australia) Pty Limited
ABN 37 001 024 095
Floor 11, 452 Flinders Street
Melbourne VIC 3000
PO Box 312, Flinders Lane
Melbourne VIC 8009 Australia
T +61 3 8668 3000
F +61 3 8668 3001
www.jacobs.com

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Revision	Date	Description		Author	Checked	Reviewed	Approved
0	2/09/2020	Initial issue		M Baron	M Baron	K Munro	K Munro
1	19/09/2020	Re-issue following client review		M Baron	M Baron	K Munro	K Munro

Contents

Glossary of Acoustic Terms

<table>
<tr><th>Term</th><th>Definition</th></tr>
<tr><td>Decibel</td><td>Sound pressure levels are expressed in units of decibels - a logarithmic ratio between the measured sound pressure level and the reference pressure ($2x10^{-6}$ Pascal). Typical noise levels are presented below:
<table>
<tr><th>Sound Pressure Level dB(A)</th><th>Example</th></tr>
<tr><td>130</td><td>Threshold of pain</td></tr>
<tr><td>120</td><td>Jet aircraft take-off at 100 m</td></tr>
<tr><td>110</td><td>Power tool at 1 m</td></tr>
<tr><td>100</td><td>Nightclub</td></tr>
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<tr><td>80</td><td>Kerbside of busy street, excavator at 15 m</td></tr>
<tr><td>70</td><td>Loud radio (in typical domestic room)</td></tr>
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<tr><td>50</td><td>Domestic fan heater at 1 m</td></tr>
<tr><td>40</td><td>Living room</td></tr>
<tr><td>30</td><td>Theatre</td></tr>
<tr><td>20</td><td>Rural environment on still night</td></tr>
<tr><td>10</td><td>Sound insulated test chamber</td></tr>
<tr><td>0</td><td>Threshold of hearing</td></tr>
</table></td></tr>
<tr><td>dB(A)</td><td>The A-weighted sound pressure level in decibels, denoted dB(A) is the unit generally used for the measurement of environmental, transportation or industrial noise. The A-weighting scale approximates the sensitivity of the human ear and correlates well with subjective perception of sounds. An increase or decrease in sound level of approximately 10 dB corresponds respectively to a subjective doubling or halving in loudness. A change in sound level of 3dB is considered just noticeable.</td></tr>
<tr><td>L_{eq}</td><td>The equivalent continuous sound pressure level is the steady level that would, over a given period, deliver the same sound energy as the actual time-varying sound over the same period. Hence, fluctuating levels can be described in terms of a single figure level. The A- weighted equivalent continuous sound level is denoted $L_{Aeq.}$</td></tr>
<tr><td>Sound power Level (SWL)</td><td>The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in dB(A).</td></tr>
<tr><td>Sound Pressure Level (SPL)</td><td>The level of noise, usually expressed as SPL in dB(A), as measured by a standard sound level meter with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.</td></tr>
<tr><td>Frequency</td><td>The rate of repetition of a sound wave. The unit of frequency is the Hertz (Hz), defined as one cycle per second. Human hearing ranges approximately from 20 Hz to 20,000 Hz. For design purposes, the octave bands between 63 Hz to 8 kHz are generally used. The most commonly used frequency bands are octave bands. For more detailed analysis each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.</td></tr>
<tr><td>Noise Sensitive Areas / Receivers (NSAs)</td><td>(a) That part of the land within the apparent boundaries of any piece of land which is within a distance of 10 m outside the external walls of any of the following buildings; dwelling and residential building
(b) That part of the land within the apparent boundaries of any piece of land on which is situated any of the following buildings which is within a distance of 10m outside the external walls of any dormitory, ward or bedroom of such buildings:
▪ Caretaker's house
▪ Hospital
▪ Hotel
▪ Institutional Home</td></tr>
</table>

Term	Definition
	▪ Motel ▪ Reformative Institution ▪ Tourist Establishment Work Release Hostel

Executive Summary

Project Description

Jacobs Group (Australia) Pty Ltd (Jacobs) has been engaged by Prospect Hill International Pty Ltd (Prospect Hill) to provide a noise impact assessment for an Energy from Waste (EfW) Project (the Project), near Lara in Victoria. The proposed project will use moving grate boiler technology, with a steam boiler and steam turbine to recover energy combusted from Municipal Solid Waste, along with Commercial and Industrial waste.

Regulations and Guidelines

Noise emitted from all commercial, industrial and trade premises within Metropolitan Melbourne must currently comply with the State Environment Protection Policy (Control of Noise from Commerce Industry and Trade) No. N-1 (SEPP N-1) at Noise Sensitive Areas (NSAs).

The nearest sensitive receivers along Minyip Rd and Gibbons Rd are located outside of both the SEPP N-1's area of application as well as outside the major urban areas of Lara and Geelong. Therefore, for these areas, the *Noise from Industry in Regional Victoria* (NIRV, Publication 1411, October 2011) is the applicable policy.

Methodology

NIRV Effective Recommended Maximum Noise Levels (RMNLs) were determined using the NIRV derivation procedure.

Noise levels at sensitive receivers were modelled using the acoustic software SoundPLAN (version 8.0) and in accordance with NIRV. This is an environmental noise modelling software package which has implemented the CONCAWE noise propagation model.

Results

The assessment determined that during neutral and weather conditions, all receivers were compliant with the Effective RNMLs. The highest noise level predicted at a receiver was 43 dB(A) at180 Minyip Rd during adverse conditions. This is 1 dB(A) below the most stringent Effective RMNL, the night RMNL (44 dB(A)).

Management

No management or mitigation is required to comply with the Effective RMNLs. However, options to further reduce have been provided if the client would like to further reduce noise levels.

Conclusion

The noise impact assessment for Prospect Hill Energy from Waste has been completed. It was determined that during both neutral and adverse meteorological conditions, noise levels at all receivers would be compliant with the Effective RMNLs.

1. Introduction

1.1 Project description

Jacobs Group (Australia) Pty Ltd (Jacobs) has been engaged by Prospect Hill International Pty Ltd (Prospect Hill) to provide a noise impact assessment for an Energy from Waste (EfW) Project (the Project), near Lara in Victoria.

The Project proposes to use conventional moving grate boiler technology, with a steam boiler and steam turbine to recover energy by combusting non-hazardous Municipal Solid Waste (MSW) supplemented with Commercial Industrial (C&I) waste. The main components of the project are:

- Site roads and weighbridges
- Waste reception and tipping hall (where waste is delivered)
- Waste bunker (for waste storage and mixing)
- Furnaces for combustion of residual waste
- Energy recovery boiler/steam generators
- Flue gas treatment
- Continuous emissions monitoring system
- Transformers and HV electrical equipment
- Steam condenser and cooling tower
- Plant control system and control room
- EfW plant buildings and structures
- Bottom Ash treatment and storage hall
- Wastewater discharge holding pond and stormwater detention pond

The site layout is shown in Appendix A. An acoustic glossary with technical definitions is provided at the beginning of the report.

1.2 Project Location

The proposed site for the Project is 164-200 McManus Road, Lara, Victoria. The site is surrounded by a mix of large-scale industrial land uses, other undeveloped sites, and some residential land uses. Surrounding industrial land uses predominantly include the management of hazardous materials, including an Elgas fuel storage site and Viva fuel refinery to the site's south-west. Land uses to the east of the site include the Accensi agricultural chemical plant and a waste storage facility, previously managed by Central Recyclers.

Directly north of the site is a quarry surrounded by unused farmland. To the northwest of the site, in a rural residential zone, are several small properties. The site is located 1.5 km southwest of the southern parts of the small township of Lara, and 1.75 km north of the northernmost urban parts of Corio in northern Geelong

The nearest Noise Sensitive Areas (NSAs) to the site are a number of receivers along Minyip Road and Gibbons Road to the north-west of the site, with 180 Minyip Road the closest individual noise sensitive receiver located 0.3 km away (Figure A.5 of Appendix A).

Figure A.2 of Appendix A shows the various planning zones surrounding the EfW development site and identifies the closest residences, those along Minyip Road, within a Rural Living Zone (RLZ).

Jacobs current understanding is that these locations are also representative of presently-known potential future NSAs.

1.3 Purpose of Assessment

The purpose of this noise impact assessment is to:

- Provide an assessment of noise emissions to determine compliance with EPA agreed noise limits
- Provide findings for input to an EPA Works Approval application
- Provide recommendations where noise mitigation measures should be considered/implemented (if required)

It is important to note that the Project is currently in the early design phase and there are a number of design parameters that have yet to be fully developed. The next phase of the Project involves the detailed design and subsequently the appointment of an EPC contractor and the finalisation of the design prior to construction of the Project (should the project proceed).

It is during the detailed design phase where detailed acoustic design is conducted and noise mitigation measures are incorporated into the design. This process is iterative and will involve risk and hazard identification (e.g. risk and HAZOP/HAZID workshops) to quantify and manage risks, such as adherence to statutory noise limits. Experience has shown that typical noise mitigation measures can reduce the noise contribution of a plant by up to 10 dB(A) and can be incorporated in to the plant design. If the noise contribution of the subject plant is above 10 dB(A), more detailed engineering for noise mitigation is normally required to reduce noise impacts.

2. Relevant Regulations and Guidelines

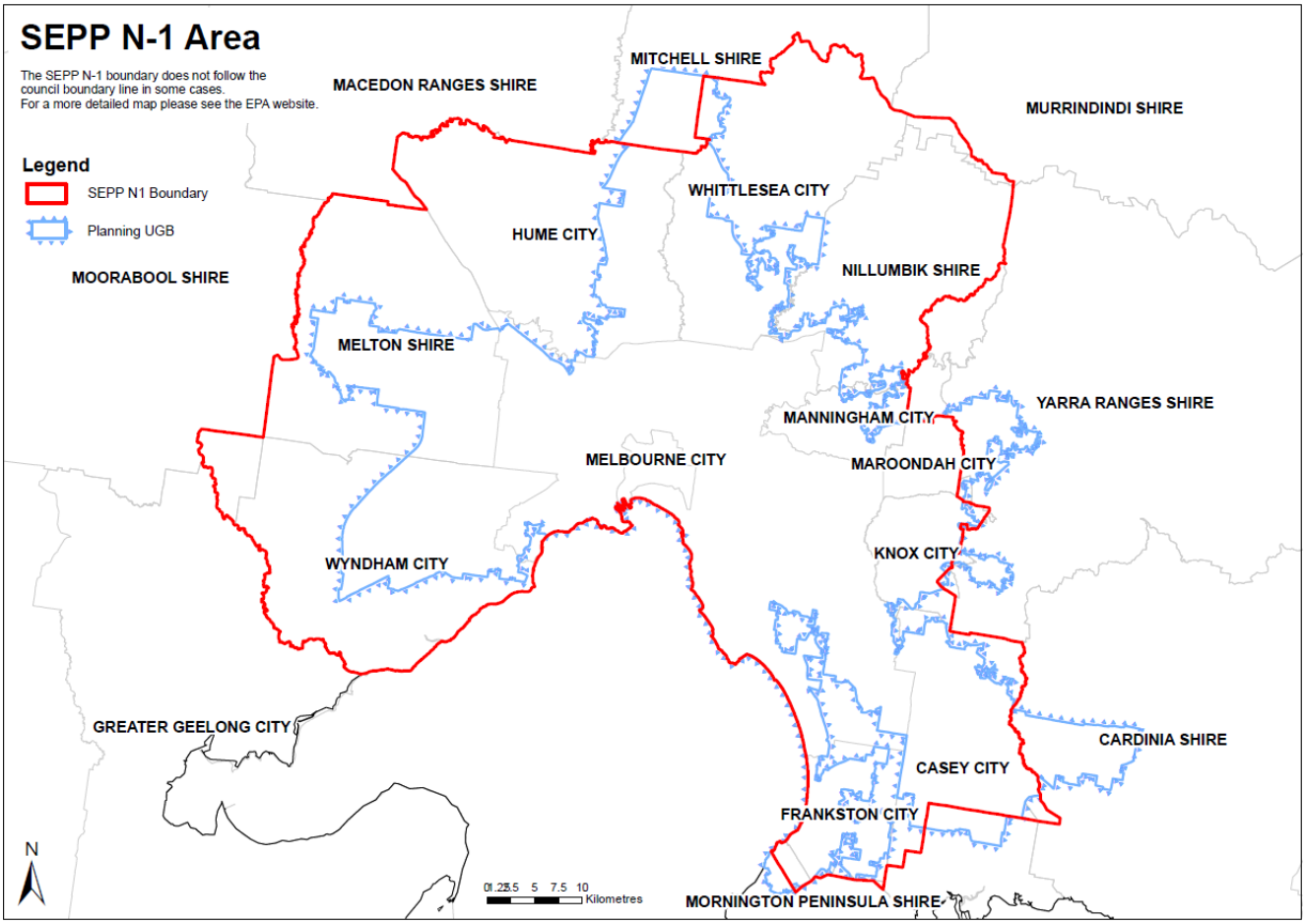
Noise emitted from all commercial, industrial and trade premises within Metropolitan Melbourne must currently comply with the State Environment Protection Policy (Control of Noise from Commerce Industry and Trade) No. N-1 (SEPP N-1) at Noise Sensitive Areas (NSAs).

The proposed site and the nearest noise sensitive residences are based in regional Victoria outside of SEPP N-1's area of application (Figure 2.1) and outside the major urban areas (population centres) of Lara and Geelong and, therefore, *Noise from Industry in Regional Victoria* (NIRV, Publication 1411, October 2011) is applicable to this Project. NIRV sets out procedures for setting levels for industry noise emissions with the recommended maximum noise levels (RMNLs) the maximum allowable.

The purpose of both SEPP N-1 and NIRV is to protect people from commercial, industrial or trade noise that may affect NSAs, with consideration to existing land use.

Note: the current regulatory framework for industrial noise in Victoria is in a state of transition, with the 'Noise Protocol' (Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues, Publication no. 1826, Release date 10 March 2020) set to supersede SEPP-N1 (State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N–1, Publication no. 1412, Release date 28 October 2011) in the calendar year 2021. A draft version of the Noise Protocol is publicly available. The assessment methodology outlined in this draft Noise Protocol aligns with the assessment methodology of SEPP N-1 and therefore the methodology of the assessment outlined in this report. The draft version of Noise Protocol indicates the bringing together of several previously distinct Victorian noise policies and guidelines (SEPP N-1, SEPP N-2 and NIRV) under one umbrella-document which will be applicable statutorily not only in Metropolitan Melbourne but the entire State of Victoria.

Figure 2.1: SEPP N-1 area



Methodology

2.1 Applicable Guideline

The proposed Project site and the NSAs are located outside of the SEPP N-1 area of application and *Noise from Industry in Regional Victoria (NIRV, Publication 1411, October 2011)* is applicable.

The nearest noise sensitive residences to the proposed site are outside of Melbourne's Urban Growth Boundary and the Urban Centre Boundary of an urban centre with a population greater than 7000.

In circumstances where both the noise emitter and noise receiver are outside these boundaries the procedures of NIRV are adopted for setting Recommended Maximum Noise Levels (RMNLs) at the nearest NSAs.

2.2 Recommended Maximum Noise Levels (RMNLs)

NIRV outlines a procedure for setting Recommended Maximum Noise Levels (RMNLs) for a site at the nearest noise-sensitive receiver. RMNLs are set for different periods of the day. The periods are defined as follows

Day Period: 07:00 to 18:00 hours

Evening Period: 18:00 to 22:00 hours

Night Period: 22:00 to 07:00 hours

(Note that 13:00 hours to 22:00 hours on Saturday and 07:00 hours to 22:00 hours on Sundays and public holidays are defined as the Evening Period)

RMNLs at the NSAs were determined following the procedures of NIRV stated above and based on the following:

- The Project site is to be located outside of the existing SEPP N-1, Urban Growth and Urban Centre Boundaries;

The Project site is to be located in the planning zone 'IN2Z – Industrial 2 Zone; (Refer to Figure A.2 of Appendix A for Planning Zoning of the Project site and surrounding area.

- All surrounding receivers are to be located outside of the existing SEPP N-1, Urban Growth and Urban Centre Boundaries;
- All surrounding receivers assessed in this report are to be located in the planning zone 'RLZ – Rural Living Zone'.

The NIRV derivation procedure used to derive RMNLs for each time period involve the following:

RMNLs are noise levels that should not be exceeded at NSAs. The NIRV RMNLs at the NSAs are determined by adopting the methodology in Part 3 of NIRV and are based on the following:

1) Determination of the 'Zone Levels' based upon the land-use zones for both the generating zone (where the noise emitter is located) and the receiving zone (Noise Sensitive Area). Refer to Table 1 in the NIRV publication.
2) Determination of the 'Distance-adjusted Levels' based upon the distance between the zone where the noise emitter is located and the location of the noise receiver (the Noise Sensitive Area).
3) A 'Base Noise Level Check', comparing the 'Distance-adjusted Levels' with the following 'Base Noise Levels' for each period of the day (adopting the greater of each comparison):
    - Day: 45 dB(A)
    - Evening: 37 dB(A)

- Night: 32 dB(A).

4) A 'Background Level Check' comparing measured levels (if a background survey is applicable) with resultant noise levels from the 'Base Noise Level Check', adopting the following procedure for each period:
   - Day - the greater of:
     - the distance-adjusted level or base noise level
     - the day background level plus 8 dB.
   - Evening - the greater of:
     - the distance-adjusted level or base noise level
     - the evening background level plus 5 dB.
   - Night - the greater of:
     - the distance-adjusted level or base noise level
     - the night background level plus 5 dB.
5) An assessment of 'High Traffic-Noise Areas' (if applicable) and comparison of the levels determined from 'Step 4' with the following reference values:
   - Day: 55 dB(A)
   - Evening: 50 dB(A)
   - Night: 45 dB(A).

The resulting recommended maximum noise levels are shown in Table 2.1.

Table 2.1: Recommended Maximum Noise Levels

Noise Sensitive Area	Recommended Maximum Noise Levels (dBA)		
	Day	Evening	Night
Closest residences on Minyip Road	60	54	49

2.3 Noise Allowance for Other Industry

Based on previous assessments conducted by Jacobs which have involved consultation with and have been approved by the EPA, Jacobs have adopted an assessment methodology of an adjustment of - 5 dB [1] is applied to the RMNLs provided in Table 3.1 to account for other Industrial sites in the area surrounding the Project site. The adjusted RMNLs (Effective RMNLs) are shown in Table 2.2.

Table 2.2: Effective Recommended Maximum Noise Levels

Noise Sensitive Area	Recommended Maximum Noise Levels (dBA)		
	Day	Evening	Night
Closest residences on Minyip Road	55	49	44

2.4 Noise Levels associated with the Project

A key element of determining potential noise impacts is to identify the noise sources of the project. There are different items of plant and equipment that will have different noise profiles. Identifying these sources leads to the application of mitigation measures to minimise potential impacts on surrounding land users.

[1] A 5-dB reduction from the relevant noise criteria (i.e NIRV RMNLs) equates and accounts for three industrial facilities (based on 10 x log10(N) where N is the total number of contributing industrial facilities.

The main noise sources associated with the proposed site have been identified by Jacobs. The overall source noise levels were provided by Prospect Hill. Further published material on similar EfW plants and industry recognised data sources were used for source noise octave-data. The source noise levels are provided in Section 5.1.

2.5 Acoustic Model for EfW

Acoustic modelling enables predictive assessment of projects so that potential acoustic impacts on surrounding land users can be determined and mitigated through the design process. An acoustic model has been developed for the Project using the acoustic software SoundPLAN (version 8.0) and in accordance with NIRV. This is an environmental noise modelling software package which has implemented the CONCAWE noise propagation model[2]. The CONCAWE methodology considers noise attenuation by:

- Geometrical spreading
- Atmospheric absorption
- Ground effects
- Meteorological conditions
- Barriers

The model inputs for SoundPLAN include:

- Topography
- Building structures
- Noise sources associated with proposed plant
- Receivers
- Ground absorption
- Air absorption

The noise levels have been predicted at the NSAs for day, evening and night periods for the following meteorological conditions:

- Neutral
- Adverse

[2] CONCAWE, The Propagation of Noise from Petrochemical Complexes to Neighbouring Communities, CJ Manning 1981

3. Recommended Maximum Noise Levels

RMNLs for all residential properties within the nearest NSA (Minyip and Gibbons Road) to the Project have been derived using the methodology outlined in NIRV. The surrounding NSAs and the noise-sensitive receivers within the nearest NSA are presented in Figure A.4 and Figure A.5 in Appendix A.

The RMNLs of the nearest NSA are presented in Table 3.1 along with the factors of consideration in the derivation, such as zoning of each receiver, the zoning levels and influencing factor.

Table 3.1 Recommended Maximum Noise Levels (RMNLs)

Receiver Name	Address	Zoning	Day Zoning Level dB(A)	Evening Zoning Level dB(A)	Night Zoning Level dB(A)	Influence Factor	Day RMNL dB(A)	Evening RMNL dB(A)	Night RMNL dB(A)
R01	40 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R02	45 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R03	50 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R04	55 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R05	60 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R06	65 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R07	70 Gibbons Rd	RLZ	60	54	49	0.57	60	54	49
R08	70 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R09	75 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R10	80 Gibbons Rd	RLZ	60	54	49	0.57	60	54	49
R11	80 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R12	85 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R13	90 Gibbons Rd	RLZ	60	54	49	0.57	60	54	49
R14	90 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R15	95 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R16	99 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R17	100 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R18	110 Gibbons Rd	RLZ	60	54	49	0.57	60	54	49
R19	110 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R20	115 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R21	160 Minyip Rd	RLZ	60	54	49	0.57	60	54	49
R22	180 Minyip Rd	RLZ	60	54	49	0.57	60	54	49

In areas that have potential for future industrial development, it is useful to account for the potential increase of industrial noise sources and the effect of potential background noise level 'creep' in the local setting. Based on discussions with EPA, an additional -5 dB(A) (i.e. a 5 dB(A) decrease/reduction) has been applied to each RMNL to account for the cumulative noise impact that could be caused by potential multiple industrial operations in the

area. These effective RMNLs for the day, evening and night periods are presented in Table 3.2 Table 3.2 Effective Recommended Maximum Noise Levels (Effective RMNL)

Receiver Name	Address	Day RMNL dB(A)	Evening RMNL dB(A)	Night RMNL dB(A)	Noise Character Adjustment dB(A)	Effective Day RMNL dB(A)	Effective Evening RMNL	Effective Night RMNL dB(A)
R01	40 Minyip Rd	60	54	49	-5	55	49	44
R02	45 Minyip Rd	60	54	49	-5	55	49	44
R03	50 Minyip Rd	60	54	49	-5	55	49	44
R04	55 Minyip Rd	60	54	49	-5	55	49	44
R05	60 Minyip Rd	60	54	49	-5	55	49	44
R06	65 Minyip Rd	60	54	49	-5	55	49	44
R07	70 Gibbons Rd	60	54	49	-5	55	49	44
R08	70 Minyip Rd	60	54	49	-5	55	49	44
R09	75 Minyip Rd	60	54	49	-5	55	49	44
R10	80 Gibbons Rd	60	54	49	-5	55	49	44
R11	80 Minyip Rd	60	54	49	-5	55	49	44
R12	85 Minyip Rd	60	54	49	-5	55	49	44
R13	90 Gibbons Rd	60	54	49	-5	55	49	44
R14	90 Minyip Rd	60	54	49	-5	55	49	44
R15	95 Minyip Rd	60	54	49	-5	55	49	44
R16	99 Minyip Rd	60	54	49	-5	55	49	44
R17	100 Minyip Rd	60	54	49	-5	55	49	44
R18	110 Gibbons Rd	60	54	49	-5	55	49	44
R19	110 Minyip Rd	60	54	49	-5	55	49	44
R20	115 Minyip Rd	60	54	49	-5	55	49	44
R21	160 Minyip Rd	60	54	49	-5	55	49	44
R22	180 Minyip Rd	60	54	49	-5	55	49	44

There are a few residential areas around the Project site:

- Minyip Rd and Gibbons Rd: Located a minimum of 300m northwest of the project. Receivers are predominately sparsely spaced rural residencies.
- Canterbury Rd South: Located approximately 1km north of the project. Receivers are low density residential, forming the southern extent of the main township of Lara.
- Bacchus Marsh Rd: Located approximately 1.35km west of the project. Receivers are predominately sparsely spaced rural residencies adjacent to a moderate volume traffic road.

- South of the Freeway: Located approximately 1.65km south of the project. Receivers are low density residential, forming the northern extent of the main township of Corio.

This assessment focuses on Minyip Rd and Gibbons Rd. These were the focus of the assessment due to the proximity of these receivers relative to the other NSAs and the sensitivity of these areas to noise (as they are located in a sparsely populated, rural location). As such, if the project noise levels comply with the Effective RMNLs at Minyip Rd and Gibbons Rd, the project would be compliant at all other NSAs. Refer to Figure A.4 and A.5 of Appendix A.

Table 3.3 Common noise sources and their typical sound levels, sourced from *WorkSafe Victoria Guide for assessing and fixing noise problems at work*

Effect on people's hearing	Typical sound levels in dB	Sound Source
Significant Damage	140	Jet Engine, Gun Shot (Pain Threshold) (Peak Noise Exposure Standard in Victoria)
	130	Rivet Hammer
Damaging	120	Angle Grinding
	110	Chain Saw
	100	Sheet-Metal Workshop
	90	Lawn Mowing (93 dB), Welding (91 dB)
	85	Front End Loader (Exposure Standard in Victoria for Average Eight Hours)
Safe	80	Heavy Traffic/ Lathe
	70	Loud Conversation
	60	Normal Conversation
	50	Low Conversation
	40	Quiet Radio Music
	30	Whispering
	20	Quiet Urban Room
	10	Rustling Leaves
	0	Hearing Threshold

4. Acoustic Modelling

An acoustic model for the Project was developed from vendor source noise data from Prospect Hill's technology supplier and source noise levels sourced from published material on similar EfW plants in the UK (Ferrybridge[3]) and Australia (Eastern Creek[4], Dandenong South[5]). Specific modelling details are provided below.

A schematic layout of the modelled Project, showing the arrangement of all noise sources, is presented in Figure A.1 of Appendix A.

4.1 Operation Details

Quantities, periods of operation and associated operational assumptions for each item of equipment are presented in Table 4.1. Equipment included in each modelling-scenario is assumed to operate continuously and simultaneously over a 24-hour period.

Table 4.1: Operational details for the Project

No	Equipment	Location	Height (m)	Quantity
1	Stack	Stack	80	1
2	Mechanical induced draft cooling towers	Cooling towers	15	4
3	ID fan	Flue gas cleaning hall	7	1
4	Lime blowers	Flue gas cleaning hall	2	1
5	Air compressor	Compressor house	2	1
6	Truck	Tipping hall	7	1
7	Transformer	Switchyard	5	1
8	Furnace wall cooling fan	Boiler room	13.5	1
9	Primary fan	Boiler room	3	1
10	Secondary fan	Boiler room	17.5	1
11	Activated blowers	Flue gas cleaning hall	2	1
12	Pumps	Steam turbine hall and pump house	2	2
13	Turbine	Steam turbine hall	8.5	1

4.2 Modelling Details

The octave band sound power levels for significant sources at the site used in the acoustic model are provided in Table 4.2. The source noise information detailed in Table 4.2 was supplied from Prospect Hill's technology supplier and source noise levels sourced from published material on similar EfW plants in the UK (Ferrybridge[6]) and Australia (Eastern Creek[7], Dandenong South[8])

[3] *Ferrybridge, Multi-fuel 2 Preliminary Environmental Information Report* by URS (October 2013, Ref: Pa-D1)
[4] *Energy from Waste Facility, Eastern Creek (SSD 6236) – Noise Impact Assessment* by Pacific Environment (31 October 2016, Job ID. 21292C)
[5] *Proposed Waste to Energy Facility, 70 Ordish Road, Dandenong South – Consideration of Noise Emissions Associated with Proposed Facility by WMG (20th May 2019, Ref: 12219-1.2jg)*
[6] *Ferrybridge, Multi-fuel 2 Preliminary Environmental Information Report* by URS (October 2013, Ref: Pa-D1)
[7] *Energy from Waste Facility, Eastern Creek (SSD 6236) – Noise Impact Assessment* by Pacific Environment (31 October 2016, Job ID. 21292C)
[8] *Proposed Waste to Energy Facility, 70 Ordish Road, Dandenong South – Consideration of Noise Emissions Associated with Proposed Facility by WMG (20th May 2019, Ref: 12219-1.2jg)*

Table 4.2: Sound power levels of EfW noise sources

No	Equipment	Sound power level, dB(A) Octave band frequency (Hz)								Overall sound power level, dB(A)
		63	125	250	500	1k	2k	4k	8k	
1	Stack	84	86	85	75	59	58	57	62	90
2	Mechanical induced draft cooling towers	92	90	89	88	80	78	76	76	88
3	ID fan	63	71	84	90	90	88	81	82	95
4	Lime blowers	55	76	84	84	84	81	79	72	90
5	Air compressor	86	85	83	83	85	89	88	84	95
6	Truck	69	77	81	84	84	83	80	74	90
7	Transformer	47	59	61	67	64	60	55	46	70
8	Furnace wall cooling fan	83	88	88	85	85	83	80	80	90
9	Primary fan	73	81	94	100	100	98	91	92	105
10	Secondary fan	73	81	94	100	100	98	91	92	105
11	Activated blowers	55	76	84	84	84	81	79	72	90
12	Pumps	88	93	93	90	90	88	85	85	95
13	Turbine	77	77	77	82	85	89	89	89	95

Building breakout calculations have been performed assuming those internal sound pressure levels for the steam turbine hall, flue gas cleaning hall, tipping hall, waste bunker, pump house, demineralisation (demin) water plant and compressor house, boiler room and feed water/raw water (FW/RW) pump room. The octave band internal sound pressure levels for these buildings in the acoustic model are provided in Table 4.3.

Table 4.3: Internal sound pressure levels for Project buildings

Building	Sound power level, dB(A) Octave band frequency (Hz)								Overall sound power level, dB(A)
	63	125	250	500	1k	2k	4k	8k	
Steam turbine hall	78	83	83	81	81	82	80	80	90
Flue gas cleaning hall	54	70	79	82	82	79	75	73	87
Tipping hall	59	67	71	74	74	73	70	64	80
Pump house, demin water plant and compressor house	76	75	73	73	75	79	78	74	85
Boiler room	74	79	88	93	93	91	84	85	98
FW/RW pump room	88	93	93	90	90	88	85	85	95

Assumptions with regards to modelling of the Project are:

- The steam turbine hall, flue gas cleaning hall, tipping hall and boiler room are assumed to be constructed with steel, with a thickness of 20cm. The pump house, demin water plant and compressor house, as well as the FW/RW pump room are assumed to be constructed with a concrete wall with a thickness of 20cm
- Wet-cooling tower units are assumed to be area sources on top of the cooling towers
- All equipment is assumed to operate continuously and simultaneously for day, evening and night scenarios.

4.3 Meteorological Conditions

Noise levels from the operation of the Project have been predicted at the NSA (Minyip and Gibbons Road), during day, evening and night periods. The predictions were made for two sets of meteorological conditions:

- Scenario 1: Neutral meteorological conditions
- Scenario 2: Adverse meteorological conditions

The details of the meteorological conditions are provided in Table 4.4:

Table 4.4: Meteorological conditions

Meteorological Condition	Wind Speed* (m/s)	Temperature (°C)	Humidity (%)	Pasquil Stability Category (from CONCAWE)
Neutral	0	20	70	Neutral (D)
Adverse	3	15	50	Worst Case (F)

*The wind direction resulting in the highest noise level at the Noise Sensitive Areas was used in determining the impact.

4.4 Noise Modelling Scenarios

All predictive operational noise scenarios modelled are outlined below.

- Predicted sound pressure levels for neutral meteorological conditions for day, evening and night
- Predicted sound pressure levels for adverse meteorological conditions for day, evening and night

Predictive noise levels for the 'neutral' and the worst-case 'adverse' scenario are represented as a series of noise contours labelled Figure A.6 and Figure A.7 within Appendix A.

5. Predicted Noise Levels

The predicted noise levels due to the Project are provided in Table 5.1. They represent the Projects contribution to the overall noise level experienced at the representative noise sensitive areas.

Table 5.1: Predicted noise levels

Location	Address	Predicted sound pressure level (dB)	
		Neutral Meteorological Conditions	Adverse Meteorological Conditions
R01	40 Minyip Rd	29	31
R02	45 Minyip Rd	32	34
R03	50 Minyip Rd	31	32
R04	55 Minyip Rd	33	34
R05	60 Minyip Rd	33	35
R06	65 Minyip Rd	36	37
R07	70 Gibbons Rd	31	33
R08	70 Minyip Rd	27	28
R09	75 Minyip Rd	35	36
R10	80 Gibbons Rd	31	33.
R11	80 Minyip Rd	35	36
R12	85 Minyip Rd	36	38
R13	90 Gibbons Rd	33	35
R14	90 Minyip Rd	35	36
R15	95 Minyip Rd	39	40
R16	99 Minyip Rd	38	39
R17	100 Minyip Rd	36	37
R18	110 Gibbons Rd	34	36
R19	110 Minyip Rd	37	38
R20	115 Minyip Rd	40	41
R21	160 Minyip Rd	40	41
R22	180 Minyip Rd	42	43

6. Assessment

The predicted noise levels at the nearest NSAs (for day, evening and night-time periods) and their compliance with Effective RMNLs are provided below in Table 6.1 for the neutral meteorological conditions and

Table 6.2 for adverse meteorological conditions.

Table 6.1 Predicted noise levels and compliance with Effective RMNLs under neutral meteorological conditions

Location	Address	Effective RMNLs dB(A)			Predicted Noise Level dB(A)	Compliance with Effective RMNLs?			Exceedance of Effective RMNLs dB(A)		
		Day	Evening	Night		Day	Evening	Night	Day	Evening	Night
R01	40 Minyip Rd	55	49	44	29	YES	YES	YES	-	-	-
R02	45 Minyip Rd	55	49	44	32	YES	YES	YES	-	-	-
R03	50 Minyip Rd	55	49	44	31	YES	YES	YES	-	-	-
R04	55 Minyip Rd	55	49	44	33	YES	YES	YES	-	-	-
R05	60 Minyip Rd	55	49	44	33	YES	YES	YES	-	-	-
R06	65 Minyip Rd	55	49	44	36	YES	YES	YES	-	-	-
R07	70 Gibbons Rd	55	49	44	31	YES	YES	YES	-	-	-
R08	70 Minyip Rd	55	49	44	27	YES	YES	YES	-	-	-
R09	75 Minyip Rd	55	49	44	35	YES	YES	YES	-	-	-
R10	80 Gibbons Rd	55	49	44	31	YES	YES	YES	-	-	-
R11	80 Minyip Rd	55	49	44	35	YES	YES	YES	-	-	-
R12	85 Minyip Rd	55	49	44	36	YES	YES	YES	-	-	-
R13	90 Gibbons Rd	55	49	44	33	YES	YES	YES	-	-	-
R14	90 Minyip Rd	55	49	44	35	YES	YES	YES	-	-	-
R15	95 Minyip Rd	55	49	44	39	YES	YES	YES	-	-	-

Location	Address	Effective RMNLs dB(A)			Predicted Noise Level dB(A)	Compliance with Effective RMNLs?			Exceedance of Effective RMNLs dB(A)		
		Day	Evening	Night		Day	Evening	Night	Day	Evening	Night
R16	99 Minyip Rd	55	49	44	38	YES	YES	YES	-	-	-
R17	100 Minyip Rd	55	49	44	36	YES	YES	YES	-	-	-
R18	110 Gibbons Rd	55	49	44	34	YES	YES	YES	-	-	-
R19	110 Minyip Rd	55	49	44	37	YES	YES	YES	-	-	-
R20	115 Minyip Rd	55	49	44	40	YES	YES	YES	-	-	-
R21	160 Minyip Rd	55	49	44	40	YES	YES	YES	-	-	-
R22	180 Minyip Rd	55	49	44	42	YES	YES	YES	-	-	-

Table 6.2 Predicted noise levels and compliance with Effective RMNLs under adverse meteorological conditions

Location	Address	Effective RMNLs dB(A)			Predicted Noise Level dB(A)	Compliance with Effective RMNLs?			Exceedance of Effective RMNLs dB(A)		
		Day	Evening	Night		Day	Evening	Night	Day	Evening	Night
R01	40 Minyip Rd	55	49	44	31	YES	YES	YES	-	-	-
R02	45 Minyip Rd	55	49	44	34	YES	YES	YES	-	-	-
R03	50 Minyip Rd	55	49	44	32	YES	YES	YES	-	-	-
R04	55 Minyip Rd	55	49	44	34	YES	YES	YES	-	-	-
R05	60 Minyip Rd	55	49	44	35	YES	YES	YES	-	-	-
R06	65 Minyip Rd	55	49	44	37	YES	YES	YES	-	-	-
R07	70 Gibbons Rd	55	49	44	33	YES	YES	YES	-	-	-
R08	70 Minyip Rd	55	49	44	28	YES	YES	YES	-	-	-

Location	Address	Effective RMNLs dB(A)			Predicted Noise Level dB(A)	Compliance with Effective RMNLs?			Exceedance of Effective RMNLs dB(A)		
		Day	Evening	Night		Day	Evening	Night	Day	Evening	Night
R09	75 Minyip Rd	55	49	44	36	YES	YES	YES	-	-	-
R10	80 Gibbons Rd	55	49	44	33.	YES	YES	YES	-	-	-
R11	80 Minyip Rd	55	49	44	36	YES	YES	YES	-	-	-
R12	85 Minyip Rd	55	49	44	38	YES	YES	YES	-	-	-
R13	90 Gibbons Rd	55	49	44	35	YES	YES	YES	-	-	-
R14	90 Minyip Rd	55	49	44	36	YES	YES	YES	-	-	-
R15	95 Minyip Rd	55	49	44	40	YES	YES	YES	-	-	-
R16	99 Minyip Rd	55	49	44	39	YES	YES	YES	-	-	-
R17	100 Minyip Rd	55	49	44	37	YES	YES	YES	-	-	-
R18	110 Gibbons Rd	55	49	44	36	YES	YES	YES	-	-	-
R19	110 Minyip Rd	55	49	44	38	YES	YES	YES	-	-	-
R20	115 Minyip Rd	55	49	44	41	YES	YES	YES	-	-	-
R21	160 Minyip Rd	55	49	44	41	YES	YES	YES	-	-	-
R22	180 Minyip Rd	55	49	44	43	YES	YES	YES	-	-	-

7. Discussion

An assessment of the potential noise impacts of the Project has been conducted, in accordance with EPA requirements (i.e NIRV). Recommended MNL and Effective RMNLs were determined for the nearest NSA. An acoustics modelling and predictive assessment was conducted

Noise levels attributed to the Project at the nearest NS have been predicted for all NIRV time periods (day, evening, night) and for both neutral and adverse meteorological conditions. The predicted noise levels at each noise-sensitive receiver (of the nearest NSA) have been compared against the Effective RMNLs to determine the potential noise impacts as a result of the Project. Table 6.1 and Table 6.2 detail the compliance with the RMNLs at the NSAs due to the modelled-operation of the Project.

It was predicted that with plant components configured to noise levels equal or inferior to those detailed in **Section 2.4**, under both a neutral and adverse (i.e. worst case, noise enhancing) meteorological conditions, no nearby receivers would be subjected to noise levels in exceedance of any Effective RMNLs during any time period.

Under adverse meteorological conditions, the nearest receiver to the project, 180 Minyip Road would experience the highest predicted noise level, of 43 dB(A). This level remains 1 dB(A) below the night Effective RMNL (44 dB(A)), the most sensitive Effective RMNL the project is held to.

The noise levels for the plant and equipment used in this assessment are based on standard equipment with standard noise mitigation. As the Project is in the early design phase, if desired, more specific noise mitigation measures can be incorporated in to the plant's design during the detailed design phase, in order to reduce the noise levels further – recommendations to achieve this are outlined in the following section.

8. Recommendations/Mitigation

The project currently complies with all Effective RMNLs during all time periods. However, mitigation measures to reduce noise levels further could be adopted.

Typical mitigation strategies that may be applied to achieve an additional noise reduction include:

- Selection of quiet plant and equipment (low noise / non-tonal options)
- 'Line of sight' with noise sensitive areas reduced as far as practicably possible
- Application of acoustic attenuation in the form of noise 'barrier' walls or enclosure. The 'barrier' is to have a mass per unit area in the order of 15 kg/m2 and be contiguous without any gaps
- Application of acoustic insulating constructions for building door and walls
- The use of attenuators on extract systems

It is important to note that the Project is currently in the early design phase and there are a number of design parameters that have yet to be fully developed. The next phase of the Project involves detailed design. It is during the detailed design phase where acoustic design is conducted, and noise mitigation measures are incorporated into the design. This process is iterative and will involve risk and hazard identification (e.g. risk and HAZOP/HAZID workshops) to quantify and manage risks, such as adherence to statutory noise limits. Experience has shown that typical noise mitigation measures can reduce the noise contribution of a plant by up to 10 dB(A) and can be incorporated in to the plant design. If the noise contribution of the subject plant is above 10 dB(A), more detailed engineering for noise mitigation is normally required to reduce noise impacts.

Once the design is further developed to include mitigation, further modelling of the noise levels should be undertaken to assess compliance with agreed Effective RMNLs.

9. Conclusion

Noise levels for the Prospect Hill Energy from Waste facility have been predicted. It was predicted that under both neutral and adverse meteorological conditions, no sensitive receivers would be subject to noise levels in exceedance of any Effective RMNLs. The nearest receiver is predicted to experience noise levels of 43 dB(A), 1 dB(A) below the night Effective RMNL.

Standard and design level mitigation measures have been advised if the client wishes to further decrease the noise levels of the project, though no mitigation is required to comply with the Effective RMNLs.

Appendix A. Site-related Figures

Figure A.1: Site Location Figure

Prospect Hill Energy from Waste | PROSPECT HILL INTERNATIONAL

Legend

- Population Centres
- Rail Station
- Railway
- Major Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- LGA Boundary
- Project location
- Major Urban Area
- ABS Urban Centres
- Noise Sensitive Area

N

IS1305100
GDA 1994 MGA Zone 55

0 0.5 1
Kilometres

DATA SOURCES
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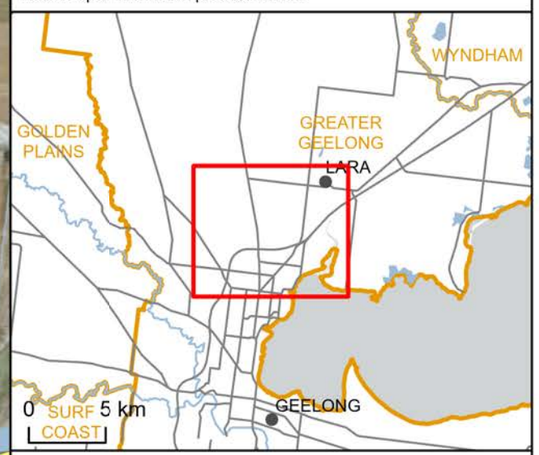

Jacobs

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Figure A.2: Planning Zones Figure

Prospect Hill Energy from Waste | PROSPECT HILL INTERNATIONAL

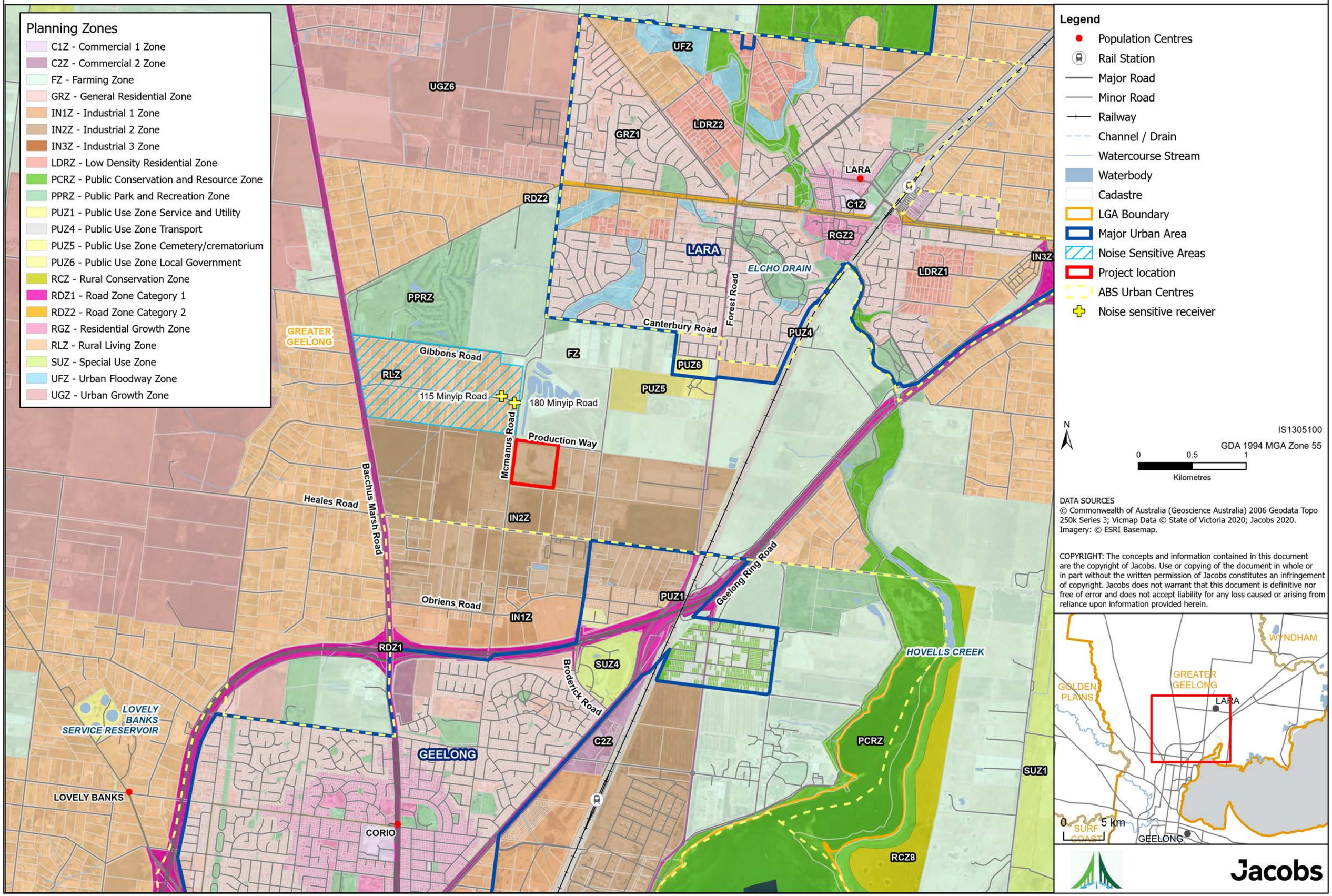

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Figure A.3: Proposed Layout

Prospect Hill Energy from Waste | PROSPECT HILL INTERNATIONAL

NOTE 7
NOTE 2
NOTE 6
NOTE 3
NOTE 5
NOTE 4
PRODUCTION WAY
McMANUS ROAD
STORMWATER DETENTION POND
FW/RW TANK
FW/RW TANK
FW/RW PUMP ROOM
FW HARDSTAND
GAS METERING ASSEMBLY
WASTE WATER DISCHARGE HOLDING POND
GATE
GATE HOUSE
GATE
WEIGHBRIDGE
WEIGHBRIDGE
COOLING TOWERS EXPANSION
COOLING TOWERS
TIPPING HALL
WASTE BUNKER
EXPANSION ZONE
PUMP HOUSE, DEMIN WATER PLANT AND COMPRESSOR HOUSE
STEAM TURBINE HALL
BOILER ROOM
ASH TRANSFER
PUMP HOUSE EXPANSION
EXPANSION ZONE
FLUE GAS CLEANING HALL
SILO
SILO FUTURE
Stack
DIESEL GENSET
HV SWITCHROOM
STORAGE BUILDING/ WORKSHOP
BOTTOM ASH PRE-TREATMENT STORAGE
BOTTOM ASH PROCESS HALL
BOTTOM ASH LONG TERM STORAGE
SWITCHYARD
ENTRANCE LOBBY OFFICES
GATE
9
7.5
12.9
38.39
58.2
15

Legend

- Boundary Line
- Fence Line
- Easement - Potable Water and Sewer
- Easement - Gas
- Easement - Stormwater

N

IS1305100
GDA 1994 MGA Zone 55

0 50 100
Meters

DATA SOURCES
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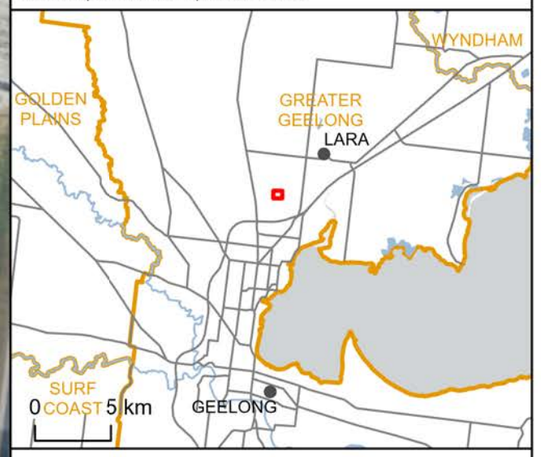

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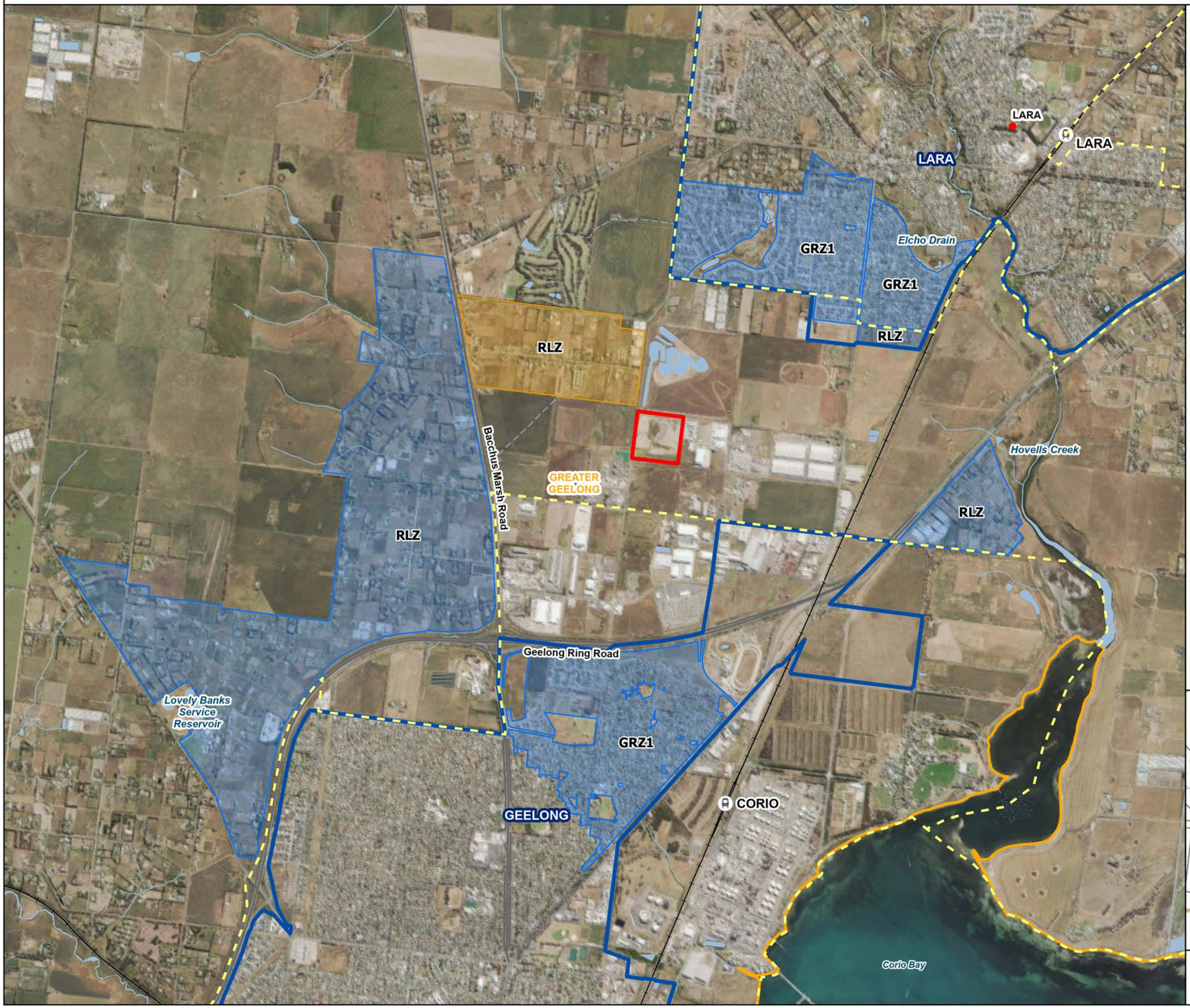
Figure A.4: Noise Sensitive Areas

Prospect Hill Energy from Waste | PROSPECT HILL INTERNATIONAL



Legend

- Population Centres
- Rail Station
- Railway
- Major Road
- Channel / Drain
- Watercourse Stream
- Waterbody
- Wetland Swamp
- LGA Boundary
- Project location
- Major Urban Area
- ABS Urban Centres
- Closest Noise Sensitive Area
- Other Noise Sensitive Areas

N

IS1305100
GDA 1994 MGA Zone 55

0 0.5 1
Kilometres

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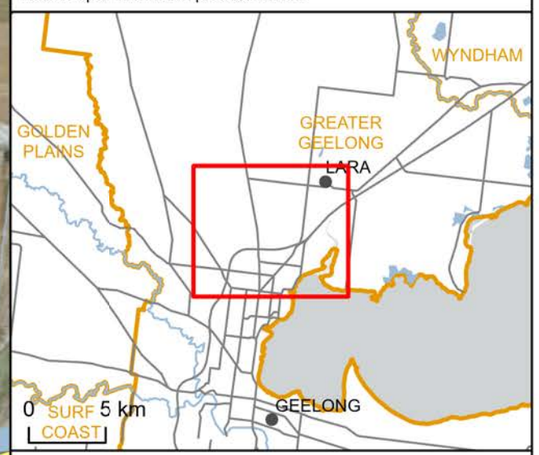

Jacobs

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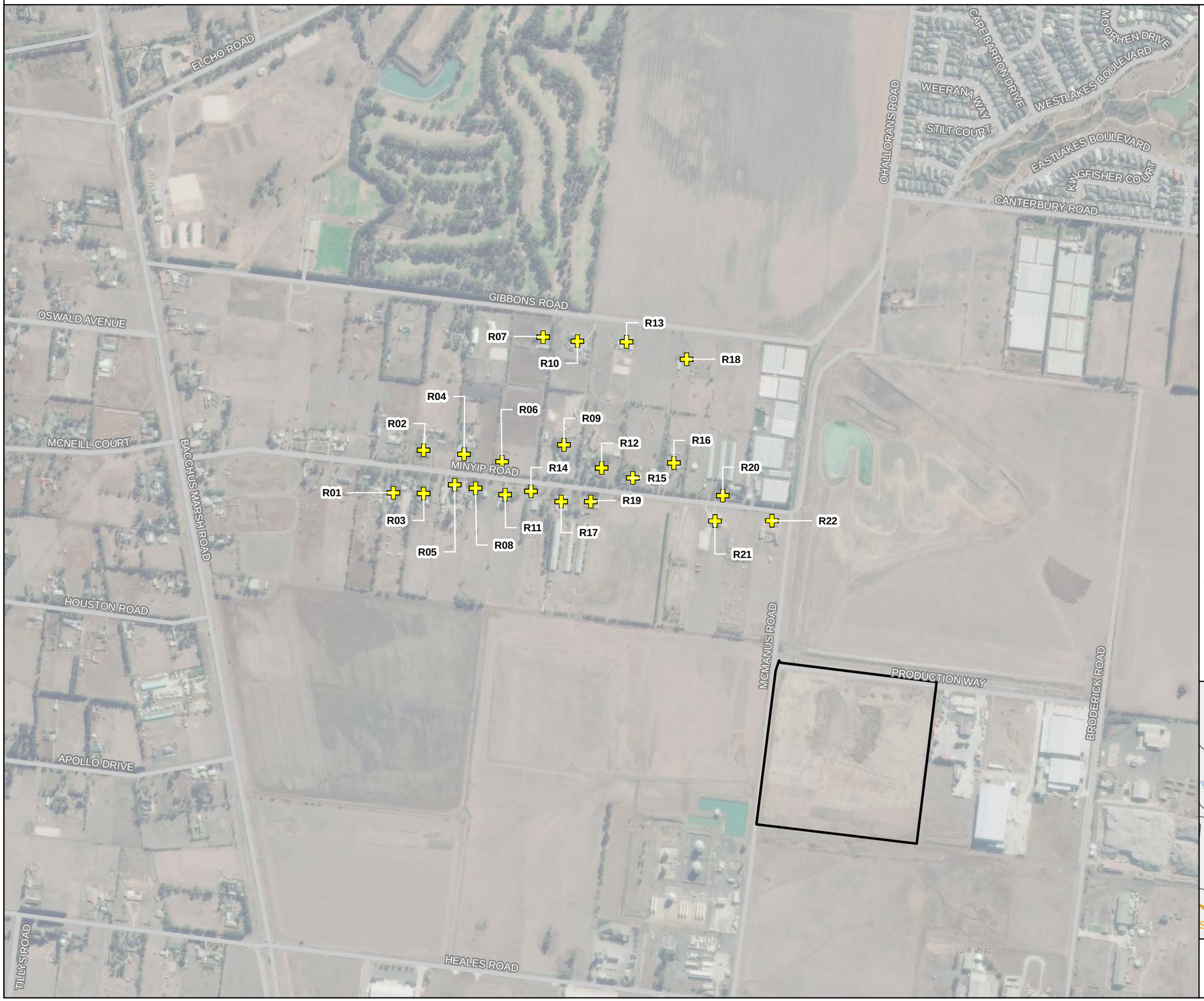
Figure A.5: Nearest Noise Sensitive Receivers (Minyip Road)

Prospect Hill Energy from Waste | PROSPECT HILL INTERNATIONAL



Legend

- Site Area
- Noise Sensitive Receiver

N

IS309200

GDA 1994 MGA Zone 55

0 250 500

Metres

DATA SOURCES

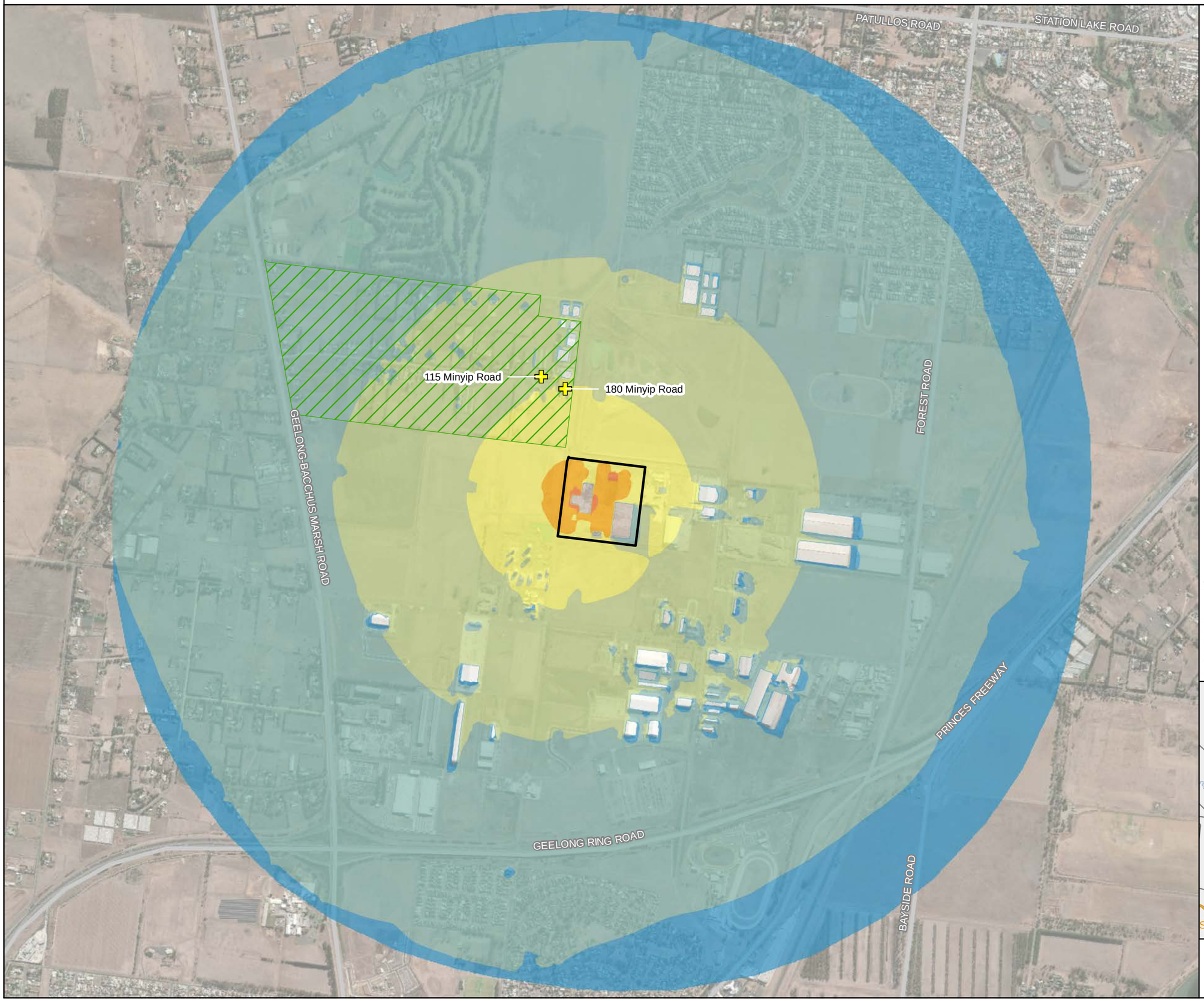
Jacobs

Document Path: J:\IE\Admin\03_Southern\Acoustics\04_Projects\2020\Industrial\2020-02-17_Prospect_Hill\Mapping\Directory\Templates\IS305100_FigA5_NearestNoiseSensitiveReceivers_r1v1.mxd

Date Published: 15 Sep 2020

Figure A.6: Noise Contour Plot - Neutral Meteorological Conditions

Prospect Hill Energy from Waste | PROSPECT HILL INTERNATIONAL



Legend

- Site Area
- Noise sensitive area
- Noise sensitive receiver

Noise contour, dB(A)

- 13 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70

Figure presents predicted noise levels at 2 metres above ground level, representative of the elevation of 180 Minyip Road.

N

IS309200

GDA 1994 MGA Zone 55

0 0.5 1

Kilometres

DATA SOURCES

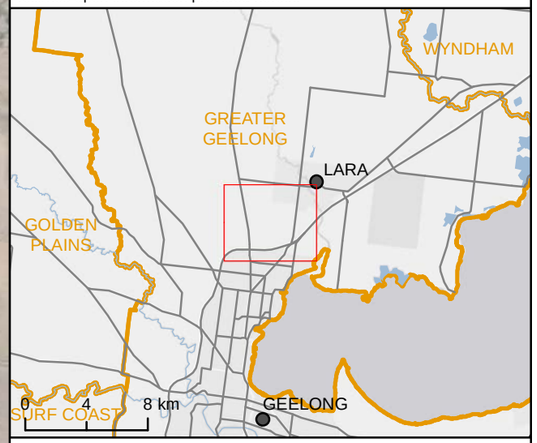


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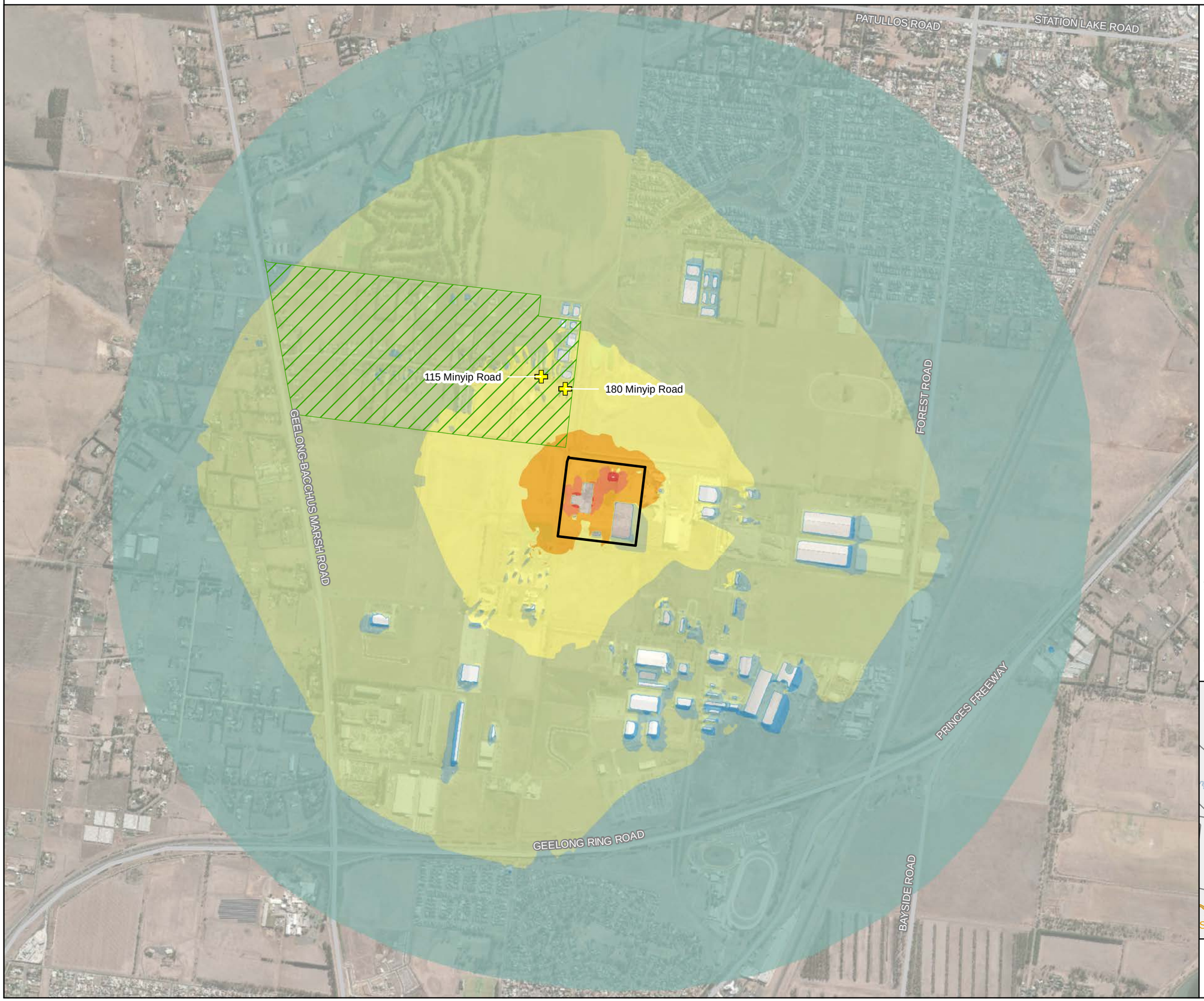
Figure A.7: Noise Contour Plot - Adverse Meteorological Conditions

Prospect Hill Energy from Waste | PROSPECT HILL INTERNATIONAL



Legend

- Site Area
- Noise sensitive area
- Noise sensitive receiver

Noise contour, dB(A)

- 13 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- >70

Figure presents predicted noise levels at 2 metres above ground level, representative of the elevation of 180 Minyip Road.

N

IS309200

GDA 1994 MGA Zone 55

0 0.5 1

Kilometres

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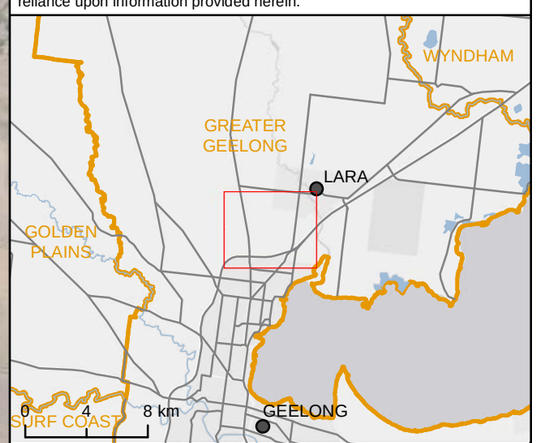

Jacobs