

Application for Environmental Authority Supplementary Information

Supporting document submission by Clean Energy Fuels Australia Marketing Pty Ltd (CEFA)

Preparation Date: June 2026

Submission in response to: *DETSI Information Request Notice on Form ESR/2016/3447 (30-Apr-2026)*

DETSI Reference: *A-EA-NEW-101041729*

Tenure: *PFL35*

Registered Suitable Operator No.: *101041691*

Centurion Liquefied Natural Gas Facility

Contents

1.0	SUMMARY.....	3
1.1	DOCUMENT SUMMARY.....	3
1.2	COMPANY DETAILS	3
2.0	INTRODUCTION	4
2.1	INTRODUCTION	4
2.2	PURPOSE	4
2.3	SCOPE	4
2.4	ENVIRONMENTALLY RELEVANT ACTIVITIES (ERAs)	5
2.4.1	DETSI information request & response	5
2.4.2	Environmentally Relevant Activities (ERAs) (CORRECTED)	6
3.0	THE FACILITY – CENTURION LNG FACILITY DETAILS.....	7
3.1	AIR EMISSIONS.....	7
3.1.1	DETSI information request & response	7
3.2	GREENHOUSE GAS EMISSIONS	15
3.2.1	DETSI information request & response	15
3.3	OTHER AMENDMENTS.....	18
3.3.1	Civil Works Phasing.....	18
3.3.2	CEFA Registered Office Address	18
4.0	ENVIRONMENTAL IMPACT ASSESSMENT (UPDATED)	19
4.1	AIR QUALITY.....	19
4.1.1	Air Quality - Environmental Values	19
4.1.2	Air Quality – Hazards	19
4.1.3	Air Quality – Potential Environmental Impacts, Controls, & Residual Risks.....	20
4.2	NOISE	20
4.2.1	Noise – Environmental Values.....	20
4.2.2	Noise – Hazards	21
4.2.3	Noise – Potential Environmental Impacts, Controls, & Residual Risks.....	22

List of Figures

<i>Figure 1 – Centurion LNG – Site Emissions Map</i>	<i>14</i>
--	-----------

List of Tables

<i>Table 1 – Prescribed ERAs – Centurion LNG Facility (Corrected).....</i>	<i>6</i>
<i>Table 2 – Air & Noise – emissions sources (summary from EA Application)</i>	<i>10</i>
<i>Table 3 – Air & Noise – emissions sources (updated and additional)</i>	<i>11</i>
<i>Table 4 – Air Quality – potential environmental impacts, controls, & residual risks</i>	<i>20</i>
<i>Table 5 – Noise – proposed limits for sensitive receptors</i>	<i>21</i>
<i>Table 6 – Noise – key emissions sources.....</i>	<i>21</i>
<i>Table 7 – Noise – potential environmental impacts, controls, & residual risks.....</i>	<i>23</i>

1.0 SUMMARY

1.1 DOCUMENT SUMMARY

Prepared By	Clean Energy Fuels Australia Marketing Pty Ltd (CEFA)
Prepared For	Department of the Environment, Tourism, Science & Innovation (DETSI)
Nature of contents	© CEFA 2026. Contains content that is Commercial in Confidence and that remains the intellectual property of CEFA. Approved for use & distribution by DETSI. Use for any purpose other than environmental assessment and approval prohibited.
Revision	Final for Submission - V1.0
CEFA Company Contact	Gary Ireson Director email: gireson@cefa.com.au mobile: +61 400 844 692
Technical Contact	Christopher Doig Principal Environmental Manager South Queensland Environmental Expertise & Services Pty Ltd email: christopher.doig@sq-ees.com mobile: +61 427 298 954

1.2 COMPANY DETAILS

Project Proponent	Clean Energy Fuels Australia Marketing Pty Ltd (CEFA)
Company registered	16/12/2020
State registered in	Western Australia
Business structure	<i>Company</i>
Company Numbers	ACN 667 339 406 ABN 96 667 339 406
Registered Office	Clean Energy Fuels Australia Marketing Pty Ltd Level 21, 1 Spring Street, Perth, Western Australia, 6000 T (08) 9212 6700
Directors	Gary Ireson Basilio Lenzo
Online	www.cefa.com.au
Registered Suitable Operator (Qld)	101041691

2.0 INTRODUCTION

2.1 INTRODUCTION

Clean Energy Fuels Australia Marketing Pty Ltd (CEFA) submitted an *Environmental Authority (EA) Application*, for:

- Construction, installation, operation and eventual decommissioning, of
- The proposed **CENTURION LNG FACILITY** (the facility), at the
- Centurion Coal Mine at Goonyella, Queensland, on ML6949 and specifically PFL35, to
- The Department of the Environment, Tourism, Science & Innovation (DETSI), on
- 1 March 2026 with application number **A-EA-NEW-101041729**.

The completed EA application form (ESR/2015/1757) and supporting document was received by DETSI and deemed a properly made application. DETSI progressed their review and issued an *Information Request Notice (form ESR/2016/3447)* on 30-Apr-2026, presented in **Appendix A**.

2.2 PURPOSE

This document has been prepared as a comprehensive response to clarifications and additional information requested by DETSI. Where applicable it includes updates to project specifications. This document does not seek to replicate information presented in the original application that is not the subject of the information request notice or necessary updates.

The original *EA Application* including the document “*Application for Environmental Authority, Supporting Document*” (CEFA Jan-2026) should be read in conjunction with this supplementary information. Where this supplementary information document provides new information, correction or update to previously submitted information, the supplementary information takes precedence and supersedes the older content.

The purpose of this document is to ensure that DETSI has sufficient information, with the original *EA Application*, to support the application for a site-specific EA to facilitate the construction and operation of the proposed facility in compliance with the Queensland *Environmental Protection Act (1994)*. Through this document, CEFA aims to demonstrate:

- That potential environmental impacts related to site development, gas processing, and chemical storage activities have been identified, assessed, and controlled,
- That all risks of harm to environmental values are managed **so far as reasonably practicable**.

2.3 SCOPE

The scope of this supplementary information is limited to issues raised by DETSI, including:

- Environmentally relevant activities,
- Air emissions and impacts,
- Greenhouse gas (GHG) emissions, and

noise emissions and impacts (triggered by the addition of new power generation equipment).

2.4 ENVIRONMENTALLY RELEVANT ACTIVITIES (ERAS)

2.4.1 DETSI information request & response

DETSI identified a small number of discrepancies with the **Environmentally Relevant Activities (ERAs)** included in the application. Extract from the DETSI RFI is as follows:

DETSI Information Request

Applicability of the proposed ERA 8

- The application states: "The primary site activity is LNG production and storage, classified as a petroleum activity under Schedule 3 of the Environmental Protection Regulation 2019. Associated activities include ERA 8, Chemical Storage, for the storage of dangerous goods Class 2.1 flammable gas (LNG), with a maximum on-site storage capacity of 150 tonnes."
- However, the DETSI assessment does not support the requirement for this ERA. Please see below the outlined reasons:
 - The application indicates that the proposed facility will store up to 150 tonnes of liquefied natural gas (LNG).
 - LNG, which is classified as a Class 2.1 dangerous good (flammable gas), does not meet the thresholds for ERA 8(1) or ERA 8(2), as these thresholds only apply to dangerous goods classified as Class 1, Class 2 Division 2.3, or Class 6 Division 6.1.
 - LNG is not a combustible liquid, so the ERA 8(3) threshold does not apply.
 - LNG is stored as a cryogenic liquid but is fundamentally a liquefied gas. Therefore, the ERA 8(4) threshold is relevant "Storing 200 tonnes or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)."
 - However, given the proposed storage amount of 150 tonnes is below the 200-tonne threshold, this threshold is also not triggered.

Requested information

VIII. Please confirm whether proposed ERA 8 is required.

CEFA Response

VIII. **Required ERAs:** Proposed Ancillary ERA 8 is required. The project meets the criteria for ERA 8(1) as fully defined in the *Environmental Protection Regulation (2019)* Schedule 2 ERA 8 sub-section 1 (d)(i) (and 3 (4)).

The proposed storage was originally erroneously stated as <150 tonnes (amount carried through from a previous iteration of the project description). CEFA sought to rectify this error through correspondence to DETSI on 3-Mar-2026. Clarification to the high level project description is as follows:

- The gas will be pre-compressed, filtered, dehydrated, purified, and liquefied in the modular micro-LNG plant using cryogenic processes, to produce **70 tonnes per day** of Liquefied Natural Gas (LNG). Produced LNG will be stored on site in **3 x 365,000 litre / 150 tonne** above ground storage tanks. (2 tanks will be installed prior to commissioning, the third tank will be added when gas supply increases).
- A clarified / corrected version of *EA Application* Section 2.4 is presented below as Section **2.4.1 Environmentally Relevant Activities (ERAs) (CORRECTED)**. Storage capacities in tonnes are also mentioned (but are not critical to assessment) in the *EA Application* sub-sections 6.2.5 and 6.3.2. The correction below should be considered applicable also for the noted sections.

2.4.2 Environmentally Relevant Activities (ERAs) (CORRECTED)

The **CENTURION LNG FACILITY** will operate under the tenure of a PFL (PFL35), as defined under the *Petroleum and Gas (Production and Safety) Act 2004*. This EA application identifies the ERAs associated with the proposed facility, as outlined in **Schedule 2** and **3** of the *Environmental Protection Regulation 2019*.

The ERAs detailed below in **Table 1** were determined using online DETSI forms and tools and were confirmed in consultation with DETSI (Energy & Extractive Resources, Environmental Services & Regulation) through pre-lodgement meetings undertaken on 14-Jan-2025 and 15-Jan-2026.

The primary site activity is LNG production and storage, categorised as a petroleum activity under **Schedule 3** of the *Environmental Protection Regulation 2019*. Associated activities include **Schedule 2 ERA 8, Chemical Storage: Storing 200 tonnes or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)**, with on-site storage capacity up to 3 x 365,000L (150 tonnes each) pressurised storage vessels. This application addresses both production and storage components of the relevant ERAs. Aggregate environmental scores for each ERA have been calculated and added below.

Table 1 – Prescribed ERAs – Centurion LNG Facility (Corrected)

EP Reg Schedule	Prescribed ERA	Threshold	Aggregate Environmental Score (AES)	Relevance to Project
Sch 3	ERA 8: A petroleum activity	Includes 1 or more activities mentioned in Schedule 2.	126	The facility is a petroleum activity, involving the processing and storage of gas sourced from coal seams.
Sch 2	ERA 8: Chemical Storage	1 (d)(i)&3(4) Storing 200 tonnes or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3	31	The facility includes storage infrastructure for up to 450 tonnes of LNG (300t at start up increasing to 450t when supply of ICSG ramps up).
Sch 2	ERA 9: Hydrocarbon gas refining	1(c) Refining coal seam gas	64	The facility will process incidental coal seam gas (ICSG) from an operating mine.

Note: Changes outlined below indicate addition of gas fired power generation to the facility to meet a load of up to 2.8MW. Allowing for the proposed generation, the site will not meet the 10MW threshold for ERA14: Electricity Generation.

The proposed facility is a small-scale, modular plant, which will solely process incidental coal seam waste gas that is a waste from adjacent mining process that would otherwise be flared. The facility footprint, emissions, and waste are relatively small. The net environmental impact is accordingly minor. With respect to greenhouse gas emissions, the facility provides an overall net benefit, by capturing and processing waste gas (that would have otherwise been flared), and distributing it as a fuel source potentially displacing more carbon intensive fuels such as diesel. Whilst the facility will process incidental coal seam waste gas (ICSWG), this is not a typical CSG field activity. The facility will not extract coal seam gas (which will be delivered to the site by pipeline). The facility will not extract, store, or treat groundwater to produce or process gas. The operation will convert existing waste gas from an operating coal mine into LNG for beneficial use.

3.0 THE FACILITY – CENTURION LNG FACILITY DETAILS

3.1 AIR EMISSIONS

3.1.1 DETSI information request & response

DETSI raised a number of questions with respect to Air Emissions included in the *EA Application*. Extract from the DETSI RFI is as follows:

DETSI Information Request

Air Emissions

The application provides an AQA that addresses flare as the main source of air contaminants; However:

- The proposal includes additional sources of emissions (e.g., MR compressor, amine scrubber, etc.) that were not explicitly addressed in the AQA. Additionally, the application contains conflicting statements regarding the inclusion of gas fired generators as part of the proposal.*
- The provided information on flare design parameters is not complete, particularly regarding smoke generation. It is noted that section 7.2 of the AQA states “For non-smoking flares operating under normal conditions, particulate matter emissions (PM10 and PM2.5) are considered negligible due to the clean-burning nature of LNG and have therefore not been assessed”. However, it’s not confirmed whether the flare will be designed to be smokeless.*
- The submitted Project Basis of Design document suggests the potential for refrigerant gases to be directed to the flare along with nitrogen during purging activities. This is indicated by the statement: “Cryosys will design and supply a flare system with a capacity of at least 125% of the anticipated requirements for the Mt. Magnet including but not limited to LNG Plant, storage tanks and loading skids. The flare and flame arrestor shall be designed to function and capture the entire LNG plant facility. The flow of gas to the flare will be metered. The flare shall function normally in the event of a general power outage”. It must be noted that directing refrigerant or nitrogen to a flare designed for methane combustion can lead to incomplete combustion, smoking, and release of particulates, largely soot or fine carbon particles.*

Requested information

I. Please clarify whether the proposed facility includes gas-fired generators. If gas-fired generators are part of the proposal, the details on their specifications, expected emissions, and how they would impact the air quality assessment (AQA) must be provided.

II. Please provide additional information on the design parameters of the flare system, specifically:

- a) Will the flare be designed to be smokeless under all operating scenarios including start-up, shutdown, commissioning, and upset scenarios.*
- b) If there are scenarios where smoke or significant flame visibility is expected, provide details on those scenarios and how these will be managed to minimise environmental and aesthetic impacts.*
- c) Confirm whether refrigerant gases or nitrogen will be directed to the flare during purging activities and how this will be managed to ensure complete combustion.*

CEFA Response

CEFA engaged consultants South Queensland Environmental Expertise & Services Pty Ltd (SQEES) to support preparation of the *EA Application*. SQEES sub-consulted Trinity Consultants to complete the **Air Quality Assessment**. DETSI’s information request refers to design features, operational processes, and air quality assessment outputs. Responses to DETSI requested information are as follows:

- I. **Gas fired electricity generators included:** The proposed facility will now include gas-fired generators. This is a change from the original *EA Application*, and is explained as follows:
- a. CEFA has confirmed through detailed gas supply agreement negotiation with Peabody - Centurion Coal Mining Pty Ltd that the grid electricity able to be supplied to the site is limited to an extent previously not recognised. CEFA operations will accordingly commence with a mixture of energy:
 - i. from the grid supplied via Centurion Mining (1.8MW load), and
 - ii. on-site gas powered generation (~0.94MW load).

This represents an acceleration of the gas powered generation option that was 'identified' as a potential future upgrade in Section 6.2.12 of the *EA Application* but was initially excluded from the *EA Application*. This option is now necessarily included in the proposal.

Note: CEFA has completed preliminary assessment of suitable gas generators that are available on the market. The Rolls Royce MTU 16V4000 GS is presented as the selected model for this supplementary information and associated air and noise assessments. Equipment selection and procurement is ongoing. Final equipment decisions will be based on environmental and commercial considerations. Should equipment that is a different make or model to the nominated and assessed units be selected, CEFA will ensure that the selected equipment is 'in general accordance with' that which has been outlined and reported within this document (i.e., selected equipment will meet or improve upon the reported specifications, efficiency, air quality and noise emissions and outcomes. All subsequent references to 'gas generators' in this document refer to the Rolls Royce MTU 16V4000 GS (with the understanding that this remains a working model subject to detailed selection and procurement processes).

When gas supply from Centurion Mining ramps up (nominally 1-2 years from start-up), a second on-site gas generator will be commissioned to replace some or all of the supply of electricity purchased from the grid.

Each gas generator has a capacity of 2MW. Nominally an additional generator could be added to meet an estimated load requirement of ~2.8MW. It is noted that until such time as the project is operational, estimates of gas supply and load requirements remain indicative. For the purposes of air and noise assessment, 2 gas generators each running at 60% capacity (or ~1.2MW) has been used as a 'reasonable case estimate' (this represents a high level of conservatism for the first 1 - 2 years of operation, and a 'reasonable case' for future years). Operational updates (gas supply, load, generator % capacity used etc.) can be communicated to DETSI over the first years of operation as required.

In addition to the above on-site power generation will include diesel generator(s) for 'black starts' (i.e., when the plant has gone completely down and residual gas pressure is inadequate to support re-start of gas generators). Black starts are required periodically but diesel generators are only required for very brief periods (nominally 10 minutes per event), as once equipment is running gas generators may be restarted.

As gas-fired generators are now included in the proposed development, the details of their specifications, expected emissions, and impacts on air quality assessment are included in this supplementary information document. Original equipment manufacturers specifications for the currently selected equipment are presented in **APPENDIX E**. Trinity Consultants were also engaged to revise the Air Quality Assessment completed for the site with the addition of the new equipment and accounting for the specifications and locations of the new equipment (and any other changes to the plant necessary to accommodate the new equipment). Given

the addition of new equipment, Trinity were also engaged to revise the Noise Impact Assessment for the site.

Operational air and noise emissions sources as outlined in Section 6.2.10 of the *EA Application* remain predominantly unchanged. Emissions tables have been updated to include the new power generation equipment and to fill potential gaps indicated by questions raised by DETSI and other questions raised by greenhouse gas and air quality specialists.

Air and noise point sources are shown on the 'Site Emissions Map' in **Figure 1**. Air and noise emissions by point source are summarised below in **Table 2** (air and noise emissions source data as presented in the *EA Application*), and **Table 3** (updated and refined data used for **Supplementary Air and Noise Assessment(s)**). Air and Noise Assessment Reports are presented in **APPENDIX C & APPENDIX D**. Additional original equipment manufacturer specifications are presented in **APPENDIX E**.

II. **Design parameters and operations:** Additional information on the design parameters and operation of the flare system is provided as follows:

- a. The proposed flare is designed to have a 98% conversion / destruction efficiency and has capacity for 100% of production (not 125% as indicated). As such the flare may not be 100% 'smokeless' under all operating scenarios, but smoke, and the scenarios when smoke may be generated are very limited.
- b. Under normal flare operations the flare will burn natural gas from coal seam gas wells that are used to clear gas for the safety of future mining operations and that will supply the plant, or LNG product diverted to the flare or residual in the system at the time of a shutdown. The source gas will be relatively pure methane, and the flare will be predominantly free from smoke. Flame and convection currents associated with emitted thermal energy may be evident during flare operation. The flare flame will be most significant when the plant is stopped, and product is diverted to the flare.
 - i. Plant stoppages are undesirable and operators will work to avoid unnecessary stoppages and minimise the impact and duration of any stoppages that do occur.
 - ii. In terms of the aesthetic impacts of flare emissions, the flare will be located in an industrial facility, on a mine site, in a remote location that is distant (minimum ~ 4.3km) from all known sensitive receptors.
 - iii. In terms of the environmental impacts of flare emissions (including contaminants) these were considered in the original Air Quality Assessment and the Air Quality Assessment revised for this supplementary submission (noting that initial assessment included the flare, and revisions are predominantly associated with added gas generators).
- c. Refrigerant gases and nitrogen would only be directed to the flare under specific circumstances. Additional information is as follows.
 - i. The MR compressor would only release MR components to the flare if there was a malfunction such as a seal failure. If the plant is stopped for any reason, the flow of natural gas would be directed to the flare to ensure the coal seam wells continue to flow. Under these circumstances MR product would be held in the system.

- ii. Refrigerant would not be sent to the flare except in the event of a significant operational excursion that causes a relief valve to operate. It should be noted that refrigerant typically comprises mixed light hydrocarbon products that are fully combustible and clean burning.
- iii. Refrigerant would not normally be purged except in preparation for major works on, or internal inspections of, the refrigerant system (nominally ≤once per 3 years) and be a fully controlled / permitted activity.
- iv. Where the plant is stopped for a prolonged period, the refrigerant will be held (parked) in storage vessels. During operations, refrigerants remain in a closed loop, and top-ups are not normally required.
- v. Nitrogen purging will only be required after a major shutdown, where a section of the plant has been opened and air has been allowed in (e.g., pressure vessel internal inspection). Purging equipment prior to return to service will occur rarely (nominally ≤once per 3 years) and be a fully controlled / permitted activity.

Table 2 – Air & Noise – emissions sources (summary from EA Application)

Source of emission or discharge	Emission or discharge type	Volume and frequency	Location on annotated site layout (EA Application Fig-26)
Regen Gas Compressor - Gas Conditioning Cube	Noise	Continuous 72dBA @1M	9
Regen Gas Cooler - Gas Conditioning Cube	Noise	Continuous 87dBA @1M	9
MR Evacuation Compressor - Refrigeration Cube	Noise	Continuous 78dBA @1M	9
MR Compressor - Compressor Cube	Noise Air	Continuous 94dBA @1M 0.9 SCFM N ₂ 1.8 SCFM MR	8
MR Compressor Lube Oil Cooler - Compressor Cube	Noise	Continuous 88dBA @1M	8
MR Compressor Inter Cooler - Cooler Cube	Noise	Continuous 88dBA @1M	8
MR Compressor After Cooler - Cooler Cube	Noise	Continuous 88dBA @1M	8
Nitrogen Package - Instrument Air/Nitrogen Building	Noise	Intermittent 68dBA @1M	7
RO Unit - RO Building	Noise	Intermittent 65dBA @1M	6
Inlet Filter skid	Noise	77 dBA @1M	5
Pre-compression skid Compressor	Noise	108 dBA @1M	4
Pre compression skid cooler	Noise	95 dBA @1M	3
Pre compression skid Motor	Noise	85 dBA @1M	2
Flare 0.3m diameter ~15m elevation	Noise Air	Rare 95dBA @1M 2.25 SCFM N ₂	1
Road Train	Noise	110 dBA @1M	Site internal roadway

Table 3 – Air & Noise – emissions sources (updated and additional)

Description	Location of Emission Point (on Supp Fig-1)	Acoustic Emission @ 1m (dBA)	Source Surface Area LxWxH (m)	Emission Stream Composition	Emission Stream Rate	Emission Height	Remarks
Flare	01	95 dB at base (6m height)		N2	2.25 SCFM	8.0m	Emergency use only
Inlet compressor, inter & after coolers	02	84 (64 @ 15m)	4.8x3.7x1.3	nil			
Inlet compressor - JGK	03		5.0*3.6*1.2	CH4	0.11 tpd	6.5m	Refer noise Data
Inlet compressor oil cooler	04	88	1.0x1.0x0.2	nil			
Amine still column	10	0		1% CO2 in gas supply	0.7 tpd	11.1m	
Reflux condenser / amine cooler	11	87	3.4x1.3x1.2	nil			
Amine circulation pumps	12	82	0.6x0.6x0.5	nil			
Regen gas cooler	13	87	1.3x1.0x1.0	nil			
Regen gas compressor	14	72	0.4x0.3x0.3	nil			
MR inter cooler	21	88	2.4x3.0x0.9	nil			
MR after cooler	22	88	2.4x8.0x0.9	nil			
MR evacuation compressor	23	78	1.2x0.6x0.3	nil			Only when stopping the plant for extended periods.
MR compressor	24	94	3.8x2.0x1.2	N2, Mixed Refrigerant	0.9 SCFM for N2 1.8 SCFM for MR	3.4m	
MR compressor oil cooler	25	88	1.3x0.3x0.7	nil			
Cold box	26	0		N2	3 SFCM	11.4m	
Instrument air and nitrogen package	31	68	12x2.4x2.9	O ₂	3.3 SCFM	1.0m	
RO plant	32	65	6x2.4x2.9	nil			
PCR building A/C 1	33	63	1.4x1.4x1.6	nil			
PCR building A/C 2	34	63	1.4x1.4x1.6	nil			

Description	Location of Emission Point (on Supp Fig-1)	Acoustic Emission @ 1m (dBA)	Source Surface Area LxWxH (m)	Emission Stream Composition	Emission Stream Rate	Emission Height	Remarks
HV switch room A/C 1	35	63	1.0x1.0x1.3	nil			
HV switch room A/C 2	36	63	1.0x1.0x1.3	nil			
Office A/C 1	37	50	1.2x0.3x0.8	nil			
Office A/C 2	38	50	1.2x0.3x0.8	nil			
Load out pump 1	41	80	0.8x0.4x0.4	nil			1 hr per day. Seal-less pumps
Load out pump 2	42	80	0.8x0.4x0.4	nil			1 hr per day. Seal-less pumps
Power generation MTU1	51	80 dB @ 10m	11.6x3.5x4.1	nil			
Power generation MTU1 cooler	52	87	6.4x2.5x1.6	nil			
Power generation MTU1 exhaust	53	63 Hz = 113.9 dB 125 Hz = 119.8 dB 250 Hz = 111.9 dB 500 Hz = 104.5 dB				9.5m	
Power generation MTU2	54	80 dB @ 10m	11.6x3.5x4.1	nil			Only run if grid supply is disconnected
Power generation MTU2 cooler	55	87	6.4x2.5x1.6	nil			Only run if grid supply is disconnected
Power generation MTU2 exhaust	56	63 Hz = 113.9 dB 125 Hz = 119.8 dB 250 Hz = 111.9 dB 500 Hz = 104.5 dB				9.5m	Only run if grid supply is disconnected
Power generation Diesel 1	57	83	6.0x2.5x2.9	nil			For black start only (short duration / irregular)
Power generation diesel 1 exhaust	58	incl above				4.0m	For black start only
Amine regeneration package	N/A	0		NONE			Electric reboiler
Regen gas heater	N/A	0		NONE			Electric regen gas heater
Amine drain sump	N/A	0		NONE			
Amine storage tank	N/A	0		NONE			
Gas filter coalescer	N/A	0		NONE			

Description	Location of Emission Point (on Supp Fig-1)	Acoustic Emission @ 1m (dBA)	Source Surface Area LxWxH (m)	Emission Stream Composition	Emission Stream Rate	Emission Height	Remarks
Regen gas scrubber	N/A	0		NONE			
Dry gas dust filter	N/A	0		NONE			
Mole sieve dryer	N/A	0		NONE			
MR dryer	N/A	0		NONE			
MR dust filter	N/A	0		NONE			
MR scrubber	N/A	0		NONE			Closed circuit
MR accumulator	N/A	0		NONE			
Ethylene storage	N/A	0		NONE			Closed circuit
Propane storage	N/A	0		NONE			Closed circuit
I-pentane drum	N/A	0		NONE			Closed circuit
MR compressor suction scrubber	N/A	0		NONE			Closed circuit
MR compressor inter-stage scrubber	N/A	0		NONE			Closed circuit
Treated water storage tank	N/A	0		NONE			
Slop tank	N/A	0		oil			Waste oil collected for 3rd party disposal
LNG storage	N/A	0		NONE			BOG returned to plant inlet
Amine contactor	N/A	0		NONE			Closed circuit
Fuel gas scrubber	N/A	0		NONE			



CLEAN ENERGY
FUELS AUSTRALIA

239 PLANET STREET
WELSHPOOL WA 6106, Australia
Phone: +61(0) 8 9212 6700. www.cefa.com.au

3.2 GREENHOUSE GAS EMISSIONS

3.2.1 DETSI information request & response

DETSI identified a number of discrepancies with the Greenhouse Gas narrative and details presented in the *EA Application*. The discrepancies are acknowledged and, as outlined below are now replaced by updated greenhouse gas (GHG) assumptions and calculations for Scope 1, 2 & 3 emissions. Extract from the DETSI RFI is as follows:

DETSI Information Request

Greenhouse Gas (GHG) Emissions

- *The application states that total annual Scope 1 emissions are estimated as 615.3 t CO₂-e, primarily attributed to vented waste process gas, flaring, and onsite electricity generation (gas-fired generator set), however the basis for these estimates is unclear, as no calculation methodology or input data has been provided. Additionally, several potentially material Scope 1 emission sources appear to be omitted or not accurately quantified, including fugitive emissions (e.g. valves, flanges, compressor seals), venting from process equipment, boil off gas (BOG) losses, and emissions associated with LPG storage and handling (including tanker loading).*
- *The Scope 2 emissions are based on an estimated electricity consumption of 650 MWh/year for a 2.5 MW processing facility, however the emissions factor applied does not align with the National Greenhouse Accounts Factors, which specifies a Queensland grid emissions factor of approximately 0.67 kg CO₂-e/kWh rather than 0.549 kg CO₂-e/kWh being used.*
- *Scope 2 emissions reported in Section 6.6 are not consistent with those presented in Table 22.*
- *The estimated electricity consumption of 650 MWh/year for a 2.5 MW processing facility appears to be significantly underestimated without further justification provided.*
- *Scope 3 emissions are presented in Table 22; however, no methodology, no activity data, and no emission factors have been provided. Importantly, the end-use combustion of LNG, which is typically the dominant Scope 3 emission source, has not been clearly quantified or included.*

Requested information

III. Please provide detailed activity data, emission factors, and calculation methodologies for total annual Scope 1 emission sources, including:

- a) Vented waste process gas,*
- b) Flaring, and*
- c) Onsite electricity generation (gas-fired generator set).*

Additionally, please confirm whether the following potentially material Scope 1 emission sources have been considered, and if so, please provide the associated data and methodologies:

- d) Fugitive emissions (e.g. valves, flanges, compressor seals),*
- e) Venting from process equipment,*
- f) Boil-off gas (BOG) losses, and*
- g) Emissions associated with LNG storage and handling (including tanker loading).;*

IV. Please provide supporting calculations and assumptions for the estimated electricity consumption of 650 MWh/year for a 2.5 MW processing facility, including operational hours and energy efficiency measures.

V. Please clarify the inconsistency between the Scope 2 emissions reported in Section 6.6 and those presented in Table 22.

VI. Please provide revised Scope 2 emissions calculations using the Queensland grid emissions factor of approximately 0.67 kg CO₂-e/kWh, as specified in the National Greenhouse Accounts Factors.

VII. Please provide detailed activity data, emission factors and calculation methodologies for Scope 3 emissions sources, including the end-use combustion of LNG.

CEFA Response

CEFA Engaged Clear Carbon Pty Ltd to quantify and calculate greenhouse gas emissions for the Centurion LNG Project *EA Application*. Clear Carbon's results were transcribed to Table 22 of the EA Application. Table 22 of the EA application comprised the 'headline numbers' from Clear Carbon's calculation spreadsheet which included all assumptions, calculations, and working. CEFA provided the headline numbers and omitted the supporting data and worked calculations. In isolation, where there were discrepancies between the narrative of *EA Application* Section 6.6 and Table 22, the tabulated data should take precedence over the narrative. Given that updates to the project have been triggered independently and in response to DETSI's queries, CEFA re-engaged Clear Carbon to support response to DETSI queries and provide updated GHG calculations. Whilst the narrative presented in Section 6.6 of the *EA Application* remains conceptually correct, new data presented below and in **APPENDIX B** take precedence over previously presented data. Responses to DETSI requested information are as follows:

- III. **Activity data, calculations and methodology:** Detailed activity data, emission factors, calculation methodologies, notations, comments and estimates for Annualised Scope 1 emissions (including from vented waste process gas, flaring, onsite electricity generation, fugitive emissions, venting from process equipment, boil-off gas losses, and LNG storage and handling) are presented on the Clear Carbon Greenhouse Gas Calculation Spreadsheet presented as **Appendix B**. The Excel workbook is presented in entirety in Excel Workbook format to allow deeper interrogation of original and additional activity data, conversion and emissions factors used, and GHG calculations used and results derived. The appended workbook is presented as version V5 and supersedes the narrative AND data table presented in the *EA Application* (and shall represent the 'single source of truth' on Centurion LNG Project GHG Emissions). The following should be noted:
- a. **Fugitive emissions:** were omitted from calculations in the original EA application as they were sincerely thought to be negligible. CEFA sought advice from the original equipment manufacturers of the equipment. Fugitive emissions have now been included in the GHG calculations presented in **APPENDIX B**. The piston driven reciprocating compressor was identified as the most significant source of fugitive CO₂ equivalent emissions, as they are released as vented methane (CH₄). The associated fugitive emissions are inherent to the equipment selection and design, and can occur as CH₄ passes the pistons, to the crank case, to the oil tank, which is vented to atmosphere. CEFA will pursue improvement of this fugitive emission stream but acknowledge that design and operational rectification of this emission will be complex (due to pressure differential between the compressor oil tank and process streams, including those that would provide access to flaring instead of venting (better) or capture and recycling of the gas back into the LNG stream (best case)). The following considerations have also been incorporated as assumptions into GHG calculations:
 - i. Valve and pump seals and gaskets do not normally leak.
 - ii. Tanker connections are "dry break", only operate when residual LNG in the coupling has vaporised. These releases may result in 2 x 100ml (42g) vapour releases per day.

- iii. Process equipment venting during inspections or maintenance is possible.
- iv. Boil off gas (BOG) is returned to the plant inlet and accordingly is not lost.
- v. LPG (MR mix) is delivered in cylinders. Losses are minimal and occur at connection / disconnection with releases being similar to that associated with connection of a gas bottle to a barbecue).

IV. **Electricity consumption:** Supporting calculations and assumptions for estimated electricity consumption (including assumptions associated with operational hours and energy efficiency measures) are presented on the Clear Carbon Greenhouse Gas Calculation Spreadsheet presented as **APPENDIX B**. The following should be noted:

- a. CEFA has confirmed through negotiation with Peabody - Centurion Coal Mining Pty Ltd that the grid electricity able to be supplied to the site is limited to an extent previously not recognised. CEFA operations will accordingly commence with a mixture of energy:
 - i. from the grid supplied via Centurion Mining, and
 - ii. on-site gas powered generation.

This represents an acceleration of the gas powered generation option that was 'identified' as a potential future upgrade in Section 6.2.12 of the *EA Application* but was initially excluded from the *EA Application*. This option is now necessarily included in the application and has been included in the revised Clear Carbon Greenhouse Gas Calculation Spreadsheet and Air Quality Assessment by Trinity Consultants.

In the GHG calculations presented in **APPENDIX B**, Clear Carbon have allowed for:

- iii. Scope 1 Emissions from on-site gas-fired electricity generation upon commissioning using 1 x ~1MW (0.94MW) provided by gas generator, and
- iv. Scope 2 Emissions from 1.8MW continuous purchased electricity.

When gas supply from Centurion Mining ramps up, a second on-site gas generator will be commissioned to replace the supply of electricity purchased from the grid. In terms of GHG emissions this change will represent:

- v. a change from Scope 2 to Scope 1 emissions for this component, and
- vi. a net improvement in GHG emissions due to the move away from grid power which includes emissions intensive energy from coal fired power to less emissions intensive gas fired power.

V. **Data inconsistency:** Scope 2 emissions presented in Table 22 of the *EA Application* would take precedence over those reported in the narrative of Section 6.6 of the *EA Application*. Both Section 6.6 and Table 22 of the *EA Application* are now superseded by the Clear Carbon GHG Calculation Spreadsheet (i.e., single source of truth) presented as **APPENDIX B**.

VI. **Emissions Factors:** Revised Scope 2 emissions calculations using the Queensland grid emissions factor of approximately 0.67 kg CO₂-e/kWh, as specified in the National Greenhouse Accounts Factors are included in the Clear Carbon GHG Calculations presented as **APPENDIX B**.

- VII. Detailed activity data, emission factors and calculation methodologies for Scope 3 emissions sources, including the end-use combustion of LNG are included in the Clear Carbon GHG Calculations presented as **APPENDIX B**.

3.3 OTHER AMENDMENTS

3.3.1 Civil Works Phasing

It was reported in the *EA Application* that the land owner, Peabody (Centurion Coal Mining Pty Ltd) had cleared, levelled and surfaced the site of the proposed facility under their own existing approvals in preparation for hand over to CEFA. It was also reported that Peabody would progress with the installation of stormwater management infrastructure etc. around the site. Handover has been delayed for commercial reasons. Given the significance of the Greenhouse Gas Abatement Program, that includes CEFA's *CENTURION LNG PROJECT* Peabody will continue to progress early civil works on site prior to handover. All works progressed by Peabody will be under and in compliance with their existing environmental authority and associated approval conditions.

3.3.2 CEFA Registered Office Address

Subsequent to submission of the EA Application, Clean Energy Fuels Australia Marketing Pty Ltd have changed their official office location, as registered with the Australian Securities & Investment Commission. CEFA have moved their Western Australian office operations to the following new / registered address:

- Level 21, 1 Spring Street,
Perth, Western Australia, 6000

4.0 ENVIRONMENTAL IMPACT ASSESSMENT (UPDATED)

4.1 AIR QUALITY

4.1.1 Air Quality - Environmental Values

The facility is located in an industrial and rural area within Petroleum Facility Licence PFL35 and mining lease ML 6949. Trinity Consultants were engaged to complete initial Air Quality Assessment for the project, and the revision prepared for this supplementary submission. Trinity Consultants' revised report is presented in **APPENDIX C**. The key environmental values of air in the region are established in the *Environmental Protection Air Policy (EPP Air)* and detailed in the Trinity Consultants report (2026). Modelling was completed and revised to assess impacts at identified sensitive receptors to address added power generation equipment. The nearest sensitive receptor was identified as Denham Homestead located approximately 4.3 kilometres west of the proposed site, with other receptors further away from the site.

At a high level environmental values for air in the project area include:

- **Human Health:** Maintaining acceptable air quality levels is critical for protecting workers at the facility and any nearby residents.
- **Ecosystem Health:** Local vegetation and wildlife may be sensitive to changes in air quality, particularly dust and industrial emissions.
- **Amenity:** Dust and airborne particulates can reduce visibility, and affect the visual amenity of the region, possibly interfering with nearby industrial, mining, and agricultural operations.

4.1.2 Air Quality – Hazards

The construction and operation of facility will result in air emissions that could affect local air quality. The following key points were extracted from the air impact assessment report (*Trinity Consultants 2026*):

- The main air emission sources during operation include electricity generation using on site gas generator(s), and intermittent flaring events associated with start-up, shutdown, commissioning, and upset conditions. The site will initially be powered using a mixture of grid power and gas generation, with full gas generation after supply ramps up (nominally 1-2 years). Air emissions will also include fugitive emissions of methane (CH₄) that are addressed above under greenhouse gas emissions.
- Construction emissions are limited to minor fugitive dust and vehicle exhaust during plant installation and minimal earthworks.
- The key pollutants considered included nitrogen dioxide, carbon monoxide, and volatile organic compounds associated with the proposed generators and flare, with particulate matter and sulfur dioxide deemed negligible.

4.1.3 Air Quality – Potential Environmental Impacts, Controls, & Residual Risks

The facility has the potential to impact local air quality through the release of identified potential contaminants during construction and operations. The following key conclusions were extracted from the supplementary air impact assessment report (*Trinity Consultants 2026*):

- **Impact to sensitive receptors:** Air dispersion modelling predicts compliance with all relevant ambient air quality objectives for nitrogen dioxide, carbon monoxide, and volatile organic compounds at the nearest sensitive receptor, even under conservative assumptions such as multiple gas generator units, continuous flare operation, full conversion of NO_x to NO₂ and elevated background levels. Overall, the low predicted concentrations demonstrate that the project is suitably located and designed with respect to minimising air quality impacts.

These impact outcomes are the result of, the location of, and features inherent to the design of the facility. Additional and effective preventative and mitigative control measures will work to minimise risks so far as reasonably practicable. Environmental aspects, potential impacts, and proposed controls are summarised in **Table 4**, below.

Table 4 – Air Quality – potential environmental impacts, controls, & residual risks

Environmental Aspect	Potential Impact	Controls	Residual risk (after control)
Air quality	Deteriorated air quality at sensitive receptors during operations	Inherent in design: the site is located in an existing mining and industrial area remote from sensitive receptors. Nearest sensitive receptor is >4km from site. Gas powered generation will be undertaken with new equipment that meets current technology standards. Process systems are fully contained. Dry break couplings are used for all LNG vehicle connections. With the exception of some fugitive emissions, process emissions will only occur intermittently under upset conditions. Preventative: Operation of the plant in accordance with original equipment manufacturers specifications, operational procedures and <i>Environmental Management Plan (EMP)</i>. Use of fuel-efficient equipment, regular maintenance of machinery, reducing idle times when loading LNG trucks. Operation of the plant to avoid stoppages, and to avoid events that trigger flaring, and to minimise the duration of events when they do occur. Storage and handling of chemicals in accordance with the ADG Code. Dust suppression if required (e.g., water sprays), limiting vehicle speeds, using dust barriers if required. Mitigative: Response plans.	Low
Air quality	Deteriorated air quality at sensitive receptors during construction	Inherent in design: Modular construction method limits the duration and impact associated with construction. Preventative: <i>Environmental Management Plan (EMP)</i> controls applied to access and work locations, times, and durations. Dust suppression (e.g., water sprays). Vehicle speed limits enforced, using dust barriers. Mitigative: Response plans.	Low

4.2 NOISE

4.2.1 Noise – Environmental Values

The facility is located in an industrial and rural area on Petroleum Facility Licence PFL35 and within mining lease ML 6949. Trinity Consultants were engaged to complete initial noise assessment for the project and to revise that assessment for this supplementary. Trinity Consultants' revised report is presented in **APPENDIX D**. The key environmental values relating to noise in the region are established in the *Environmental Protection Noise Policy (EPP Noise)* and include acoustic quality objectives that are detailed in the Trinity Consultants report (2026). Modelling was completed and revised to assess impacts at identified sensitive receptors. The nearest sensitive receptors were identified as:

- (R1) Lapunyah Homestead – 8.8 km south-west,
- (R2) Denham Homestead – 4.3 km west,
- (R5) Burton Down Homestead – 11.3 km east.

with other receptors located further away from the site. The key acoustic environmental values are associated with wellbeing and amenity at the sensitive receptor and are established as proposed noise limits for sensitive receptors as shown in **Table 5** below.

Table 5 – Noise – proposed limits for sensitive receptors

Location	Lapunyah	Denham Park	Burton Downs
Period	Noise Limit, LAeq	Noise Limit, LAeq	Noise Limit, LAeq
Day (7am to 6pm)	35	35	35
Evening (6pm to 10pm)	35	35	35
Night (10pm to 6am)	31	28	27

4.2.2 Noise – Hazards

The construction and operation of the facility will generate various noise emissions, which could impact the surrounding acoustic environment. Emissions may include:

- **Construction noise:** Noise will be generated from activities such as earthworks, machinery operation, and vehicular movement including heavy machinery (e.g., cranes) during construction.
- **Operational Noise:** Noise from equipment such as compressors, pumps, and generators. Continuous noise sources may arise from gas powered generators, gas processing equipment and transportation vehicles.
- **Traffic Noise:** Increased vehicular traffic to and from the site, particularly during construction, will result in elevated noise levels along access roads and in the vicinity of the facility area.

Key operational noise sources and associated continuous and intermittent emissions are as outlined below in **Table 6**. Refer to **Figure 1** above for locations of each component.

Table 6 – Noise – key emissions sources

Source of emission or discharge	Emission volume
Power Generation MTU1	80 dB @ 10m
Power Generation MTU1 cooler	87
Power Generation MTU1 exhaust	63 Hz = 113.9 dB 125 Hz = 119.8 dB 250 Hz = 111.9 dB 500 Hz = 104.5 dB
Power Generation MTU2	80 dB @ 10m
Power Generation MTU2 cooler	87
Power Generation MTU2 exhaust	63 Hz = 113.9 dB 125 Hz = 119.8 dB 250 Hz = 111.9 dB 500 Hz = 104.5 dB
Power Generation DIESEL 1	83

Source of emission or discharge	Emission volume
Power Generation DIESEL 1 exhaust	incl above
Regen gas compressor - gas conditioning cube	Continuous / 72dBA @1M
Regen gas cooler - gas conditioning cube	Continuous / 87dBA @1M
MR evacuation compressor - refrigeration cube	Continuous / 78dBA @1M
MR compressor - compressor cube	Continuous / 94dBA @1M
MR compressor lube oil cooler - compressor cube	Continuous / 88dBA @1M
MR compressor inter cooler - cooler cube	Continuous / 88dBA @1M
MR compressor after cooler - cooler cube	Continuous / 88dBA @1M
Nitrogen package - instrument air/nitrogen building	Intermittent / 68dBA @1M
RO unit - RO building	Intermittent / 65dBA @1M
Inlet filter skid	Continuous / 77 dBA @1M
Pre-compression skid compressor	Continuous / 108 dBA @1M
Pre compression skid cooler	Continuous / 95 dBA @1M
Pre compression skid Motor	Continuous / 85 dBA @1M
Flare (0.3m diameter ~15m elevation)	Rare (est 7 x p.a.) / 95dBA @1M
Road Train	Intermittent (4 moves p.d.) 110 dBA @1M

4.2.3 Noise – Potential Environmental Impacts, Controls, & Residual Risks

The facility has the potential to impact local noise environment through noise emissions during construction and operations. The following key conclusions were drawn by *Trinity Consultants* 2026:

- Impact to sensitive receptors:** The key noise sources are continuous in nature and include generators, compressors, pumps (the gas flare stack is an intermittent source). Operational noise impact was assessed through computational noise modelling. Compliance with the noise criteria was predicted for day and evening at all nearest sensitive receptors. Initial modelling without mitigation indicated potential exceedances during the night period at receptors R2 and R3. Application of a 10dB noise reduction at the source (achievable through mitigations such as acoustic enclosures and exhaust silencers (or equivalent)) results in predicted full compliance with all applicable noise criteria for day, evening, and night periods at all sensitive receptors.
- Impact to sensitive receptors:** The potential for noise impacts during other operational phases (e.g. startup, shutdown) and during construction were expected to be no greater than those predicted for normal operations. Ultimately, the nearest sensitive receptors are separated by a large distance, resulting in very low noise levels at these receptors.
- Impact to sensitive receptors:** Overall, the assessment demonstrated that the Project is suitably located and designed with respect to minimising noise impacts.

The risk of harm to noise environmental values is low due to the location of, and features inherent in, the design of the facility. Additional and effective preventative and mitigative control measures will work to minimise impacts so far as reasonably practicable. Environmental aspects, potential impacts, and proposed controls are summarised in **Table 7**, below.

Table 7 – Noise – potential environmental impacts, controls, & residual risks

Environmental Aspect	Potential Impact	Controls	Residual risk (after control)
Construction Noise	Noise impacts at sensitive receptors during construction	Inherent in design: Site is located in an existing mining and industrial area remote from sensitive receptors. Nearest sensitive receptor is >4km from site. Modular Process systems limit the duration of the construction phase. Preventative: <i>Environmental Management Plan (EMP)</i> construction hours limited to daytime, well maintained, low-noise machinery used, white noise reversing alarms etc. Mitigative: Response plans.	Low
Operational Noise	Noise impacts at sensitive receptors during operations	Inherent in design: the site is located in an existing mining and industrial area remote from sensitive receptors. Nearest sensitive receptor is >4km from site. Modular process systems incorporate acoustic enclosures. Gas generator 10dB reduction at source (e.g., using mitigations such as acoustic enclosures / exhaust silencers). Preventative: Operations (i.e., physical works beyond continuous equipment operation scheduled for daytime (after hours operations possible but limited). Mitigative: Response plans.	Low
Traffic Noise	Noise impacts at sensitive receptors due to traffic	Inherent in design: The site is located in an existing mining and industrial area remote from sensitive receptors. Nearest sensitive receptor is >4km from site. Vehicle movement during construction and operations will be on existing HV/DG routes. Preventative: Speed limits enforced on access roads. Truck movement timing limited. Vehicle filling operations scheduled for daytime (after hours operations possible but limited). Mitigative: Response plans.	Low
Wildlife Disturbance	Noise impacts to sensitive fauna in nearby regional ecosystems	Inherent in design: Site is located on a disturbed site in an existing mining and industrial area on existing mining roads. Process modules incorporate acoustic enclosures. Site footprint limited to 190m x 190m. Site fenced prior to commencement of construction works avoids encroachment into sensitive communities. Preventative: <i>EMP</i>. Operations scheduled for daytime. Mitigative: Response plans.	Low

APPENDIX A. – DETSI INFORMATION REQUEST NOTICE

Notice

Environmental Protection Act 1994

Information request

This information request is issued by the administering authority under section 140 of the Environmental Protection Act 1994 to request further information needed to assess an application for a site-specific environmental authority.

Clean Energy Fuels Australia Marketing Pty Ltd
Level 21, 1 Spring St
PERTH WA 6000

ATTN: Guy Bowden

gbowden@cefa.com.au

Reference: A-EA-NEW-101041729 || PFL35

Further information is required to assess an application for environmental authority

1 Application details

The application for a site-specific environmental authority was received by the administering authority on 2 March 2026.

The application reference number is: A-EA-NEW-101041729

Land description: PFL35

2 Information request

The administering authority has considered the abovementioned application and is writing to inform you that further information is required to assess the application (an information request).

The information requested is provided below:

Air Emissions

The application provides an AQA that addresses flare as the main source of air contaminants; However:

- The proposal includes additional sources of emissions (e.g., MR compressor, amine scrubber, etc.) that were not explicitly addressed in the AQA. Additionally, the application contains conflicting statements regarding the inclusion of gas fired generators as part of the proposal.
- The provided information on flare design parameters is not complete, particularly regarding smoke generation. It is noted that section 7.2 of the AQA states “*For non-smoking flares operating under normal conditions, particulate matter emissions (PM10 and PM2.5) are considered negligible due to the clean-burning nature of LNG and have therefore not been assessed*”. However, it’s not confirmed whether the flare will be designed to be smokeless.

- The submitted Project Basis of Design document suggests the potential for refrigerant gases to be directed to the flare along with nitrogen during purging activities. This is indicated by the statement: *“Cryosys will design and supply a flare system with a capacity of at least 125% of the anticipated requirements for the Mt. Magnet including but not limited to LNG Plant, storage tanks and loading skids. The flare and flame arrestor shall be designed to function and capture the entire LNG plant facility. The flow of gas to the flare will be metered. The flare shall function normally in the event of a general power outage”*. It must be noted that directing refrigerant or nitrogen to a flare designed for methane combustion can lead to incomplete combustion, smoking, and release of particulates, largely soot or fine carbon particles.

Requested information

- I. Please clarify whether the proposed facility includes gas-fired generators. If gas-fired generators are part of the proposal, the details on their specifications, expected emissions, and how they would impact the air quality assessment (AQA) must be provided.
- II. Please provide additional information on the design parameters of the flare system, specifically:
 - a) Will the flare be designed to be smokeless under all operating scenarios including start-up, shutdown, commissioning, and upset scenarios.
 - b) If there are scenarios where smoke or significant flame visibility is expected, provide details on those scenarios and how these will be managed to minimise environmental and aesthetic impacts.
 - c) Confirm whether refrigerant gases or nitrogen will be directed to the flare during purging activities and how this will be managed to ensure complete combustion.

Greenhouse Gas (GHG) Emissions

- The application states that total annual Scope 1 emissions are estimated as 615.3 t CO₂-e, primarily attributed to vented waste process gas, flaring, and onsite electricity generation (gas-fired generator set), however the basis for these estimates is unclear, as no calculation methodology or input data has been provided. Additionally, several potentially material Scope 1 emission sources appear to be omitted or not accurately quantified, including fugitive emissions (e.g. valves, flanges, compressor seals), venting from process equipment, boil of gas (BOG) losses, and emissions associated with LPG storage and handling (including tanker loading).
- The Scope 2 emissions are based on an estimated electricity consumption of 650 MWh/year for a 2.5 MW processing facility, however the emissions factor applied does not align with the National Greenhouse Accounts Factors, which specifies a Queensland grid emissions factor of approximately 0.67 kg CO₂-e/kWh rather than 0.549 kg CO₂-e/kWh being used.
- Scope 2 emissions reported in Section 6.6 are not consistent with those presented in Table 22.
- The estimated electricity consumption of 650 MWh/year for a 2.5 MW processing facility appears to be significantly underestimated without further justification provided.

- Scope 3 emissions are presented in Table 22; however no methodology, no activity data, and no emission factors have been provided. Importantly, the end-use combustion of LNG, which is typically the dominant Scope 3 emission source, has not been clearly quantified or included.

Requested information

III. Please provide detailed activity data, emission factors, and calculation methodologies for total annual Scope 1 emission sources, including:

- a) Vented waste process gas,
- b) Flaring, and
- c) Onsite electricity generation (gas-fired generator set).

Additionally, please confirm whether the following potentially material Scope 1 emission sources have been considered, and if so, please provide the associated data and methodologies:

- d) Fugitive emissions (e.g. valves, flanges, compressor seals),
- e) Venting from process equipment,
- f) Boil-off gas (BOG) losses, and
- g) Emissions associated with LNG storage and handling (including tanker loading).;

IV. Please provide supporting calculations and assumptions for the estimated electricity consumption of 650 MWh/year for a 2.5 MW processing facility, including operational hours and energy efficiency measures.

V. Please clarify the inconsistency between the Scope 2 emissions reported in Section 6.6 and those presented in Table 22.

VI. Please provide revised Scope 2 emissions calculations using the Queensland grid emissions factor of approximately 0.67 kg CO₂-e/kWh, as specified in the National Greenhouse Accounts Factors.

VII. Please provide detailed activity data, emission factors and calculation methodologies for Scope 3 emissions sources, including the end-use combustion of LNG.

Applicability of the proposed ERA 8

- The application states: *"The primary site activity is LNG production and storage, classified as a petroleum activity under Schedule 3 of the Environmental Protection Regulation 2019. Associated activities include ERA 8, Chemical Storage, for the storage of dangerous goods Class 2.1 flammable gas (LNG), with a maximum on-site storage capacity of 150 tonnes."*
- However, the DETSI assessment does not support the requirement for this ERA. Please see below the outlined reasons:
 - The application indicates that the proposed facility will store up to 150 tonnes of liquefied natural gas (LNG).
 - LNG, which is classified as a Class 2.1 dangerous good (flammable gas), does not meet the thresholds for ERA 8(1) or ERA 8(2), as these thresholds only apply to dangerous goods classified as Class 1, Class 2 Division 2.3, or Class 6 Division 6.1.

- LNG is not a combustible liquid, so the ERA 8(3) threshold does not apply.
- LNG is stored as a cryogenic liquid but is fundamentally a liquefied gas. Therefore, the ERA 8(4) threshold is relevant "*Storing 200 tonnes or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d).*"
- However, given the proposed storage amount of 150 tonnes is below the 200-tonne threshold, this threshold is also not triggered.

Requested information

VIII. Please confirm whether proposed ERA 8 is required.

Actions

The abovementioned application will lapse unless you respond by giving the administering authority -

- (a) all of the information requested; or
- (b) part of the information requested together with a written notice asking the authority to proceed with the assessment of the application; or
- (c) a written notice –
 - i. stating that you do not intend to supply any of the information requested; and
 - ii. asking the administering authority to proceed with the assessment of the application.

A response to the information requested must be provided by 30 October 2026 (the information response period). If you wish to extend the information response period, a request to extend the period must be made at least 10 business days before the last day of the information response period.

The response to this information request or a request to extend the information response period can be submitted to the administering authority by email to EnergyandExtractive@des.qld.gov.au.

If the information provided in response to this information request is still not adequate for the administering authority to make a decision, your application may be refused as a result of section 176 of the *Environmental Protection Act 1994*, where the administering authority must have regard to any response given for an information request.

3 Human rights

A human rights assessment was carried out in relation to this decision and it was determined that no human rights are engaged by the decision.

Notice

Information request

Should you have any questions about the notice, please contact Senior Environmental Officer, Mandy Greyling using the details provided below.



Signature

Helena Braye

Department of the Environment, Tourism, Science and Innovation

Delegate of the administering authority

Environmental Protection Act 1994

30 April 2026

Date

Enquiries:

Energy and Extractive Resources

GPO Box 2454, Brisbane QLD 4001

Phone: 07 3330 5715

Email: EnergyandExtractive@detsi.qld.gov.au

APPENDIX B. – GREENHOUSE GAS ASSESSMENT (Clear Carbon)

Activity Description	Qty	Daily hours	Daily km	Days on site	Fuel /Energy / Materials	Unit	Scope 1 (t CO2-e)	Scope 2 (t CO2-e)	Scope 3 (t CO2-e)	Assumptions
Construction Materials										Operated by a Subcontractor
Concrete 260 m3	260					m3			91	260 m3 of 40MPa structural concrete. Factor: 0.35 tCO2-e/m3 (Source: ISCA Materials Calculator v2 / Green Star).
2 Steel Tanks, 120 t	240					t			480	2x 120t LNG Storage Tanks (240t total). Factor: 2.0 tCO2-e/t (Source: WorldSteel Association Global Average for Plate Steel).
Compressor (60t), Pipework (60t)	120					t			240	60t Compressor Skid + 60t Stainless Pipework (120t total). Factor: 2.0 tCO2-e/t (Source: Engineering Estimate based on steel weight).
Construction Equipment										Operated by a Subcontractor
Detailed earthworks	1	8		14	1.7	kL			5.7	Diesel. 1x 20t Excavator (e.g. CAT 320D). Medium Load Factor (15 L/hr) per CAT Performance Handbook Ed 49. Duration: 14 days @ 8hrs/day.
Civils – mini excavator	1	4		14	0.8	kL			2.8	Diesel. 1x 5t Mini Excavator. Conservative estimate 15 L/hr (High Load). Duration: 14 days @ 4hrs/day.
150 tonne crane - 4 visits. Drive from Moranbah to site. On site 6 hours then de-mob	1	6	130	4	1.0	kL			3.5	Diesel. Liebherr LTM 1150-6.1. Operation: 30 L/hr (Heavy Lift). Mobilisation: 130km return @ 0.6 L/km (Source: Liebherr Technical Data). 4 visits.
Franna	1	4	130	10	1.4	kL			4.7	Diesel. 25t Franna (Terex). Operation: 15 L/hr (Pick & Carry). Mobilisation: 130km return @ 0.6 L/km. 10 days.
Vehicles (Light) - to and from Moranbah	3		130	90	4.2	kL			14.2	Diesel. 3x Toyota Landcruiser 70 Series. Fuel cons: 12L/100km (Source: Green Vehicle Guide). Daily commute Moranbah-Site (130km). Scope 1 (Company Fleet).
Telehandler	1	3		90	4.1	kL			13.7	Diesel. Manitou MT-X. Loading duty cycle: 3 hrs/day @ 15 L/hr (Source: OEM Spec).
Transport of Modules										Operated by a Subcontractor
12 x 40' modules on double trailers (6 x trucks)	6		1000	4.5	3.6	kL			12.2	Diesel. 6x Prime Movers (B-Double equivalent). Payload: 2 modules/truck. Distance: 1000km (Brisbane-Site). Fuel: 0.6 L/km (Source: GreenTruck / AusRoads).
Seafreight of 2 x 365kl tanks from China to Makay	240		8300	1	1992000.0	t.km			29.9	HFO. 2x 120t Tanks (240t). Route: Nantong (China) to Mackay. Distance: 8300km. Factor: 0.015 kgCO2/t.km (Source: DEFRA/IMO for General Cargo).
Road freight tanks to site - 2 x semi's + 8 x escort vehicles	1		260	1	0.6	kL			1.9	Diesel. Convoy for Over-Dimensional Load. 2x Prime Movers (Pull/Push) @ 0.6 L/km + 8x Escort Vehicles @ 0.12 L/km. Distance: 260km.
Seafreight compressor Canada to Makay	30		12000	1	360000.0	t.km			5.4	HFO. 30t Compressor Skid. Route: Vancouver (Canada) to Mackay. Distance: 12,000km. Factor: 0.015 kgCO2/t.km.
Road freight compressor Makay to site (1 x semi, 4 x escorts)	1		260	1	0.3	kL			0.9	Diesel. Convoy. 1x Prime Mover @ 0.6 L/km + 4x Escorts @ 0.12 L/km. Distance: 260km.
Other equipment 6 x 40' containers Brisbane to site.	6		1200	1	4.3	kL			14.6	Diesel. 6x Semi-Trailers (General Freight). Distance: 1200km (Brisbane/Gladstone supply base). Fuel: 0.6 L/km.
Site Construction Generation										Operated by CEFA
22 kVa generator for office & ablutions	1	12		90	10.8	kL	29.3		7.2	Diesel. 22kVa Diesel Generator. Load: 50% (approx 10kW). Burn Rate: 10 L/hr. Operation: 12 hrs/day (Office/Ablutions). Scope 1.
11 kVa generator for Site power tools	1	4		90	3.6	kL	9.8		2.4	Diesel. 11kVa Portable Generator. Load: Variable. Burn Rate: 10 L/hr (conservative). Operation: 4 hrs/day (Power tools). Scope 1.
Commissioning										Operated by CEFA
Commissioning Gas Venting (CH4) - 365m3 x 2 tanks x 4 cycles to 100 kPa = 2 tonnes	2				2.2	t	61.6			Source: Natural Gas. Direct Venting. Volume: 2 tonnes CH4. GWP: 28 (IPCC AR5). Source: Engineering Commissioning Plan.
Other purging 200kg	0.2				0.2	t	5.6			Source: Natural Gas. Minor purging allowance. Est: 200kg CH4. GWP: 28.
Flare (Comm)	4	4			725.3	GJ	37.4			Natural Gas. Commissioning Flaring. 4 events x 4 hours. Flow: 20 tpd. Combustion Efficiency: 98% (Assumed 100% for CO2 calc).
Operations										Operated by CEFA Scope 1, 2, 3
Flaring /upsets (pa) at 70 tpd flow rate	2	8			2538.7	GJ	130.8			Natural Gas. Operational Upset Allowance. 2 events/yr x 8 hrs. Flow: 70 tpd (Max design flow). Scope 1.
Deliveries (upstream transport)	2		900	365	394.2	kL			1331.4	Diesel. Consumables/Spares delivery. 2x Trucks/day. Route: Mackay-Site return (900km). Scope 3 (Cat 4).
Rolleston Power generation: 100kVa gas set.	1	8		365	2803.2	GJ	144.4		24.7	Natural Gas. 100kVa Gas Generator. Load: 80kW. Thermal Eff: 30%. Fuel: Natural Gas. Scope 1.
Site vehicles	3		130	365	17.1	kL	46.3		11.4	Diesel. 3x Toyota Landcruisers. Daily site inspection + commute (130km). Scope 1.
Site power requirements - 2.8MW x 24 x 365 = 24,528 MWHr pa	24528				24528.0	MWh		16433.8	2207.5	Grid Import. Load: 2.8MW Continuous. annual: 24,528 MWh. Factors: NGA 2025 QLD Grid (Scope 2+3).
Venting (upsets, maintenance etc)	5				5.2	t	145.6			Natural Gas. Operational Maintenance Venting. Est: 100kg/week = 5.2 tpa. GWP: 28. Scope 1.
Decommissioning										Scope 3 (Contractor)
Site Generation (22 kVa)	1	12		14	1.7	kL	4.6		1.1	Diesel. 22kVa Generator. Decommissioning phase power. 10 L/hr. Scope 1 (CEFA operated).
Civils – Loader	1	4		7	0.4	kL			1.4	Diesel. 1x Front End Loader. Site rehab works. 15 L/hr. Scope 3.
150 tonne crane - 4 visits. Drive from Moranbah to site. On site 6 hours then de-mob	1	6	130	2	0.5	kL			1.7	Diesel. 150t Crane. Module removal. 30 L/hr + Mob. Scope 3.
Franna	1	4	130	4	0.6	kL			1.9	Diesel. 25t Franna. Light lifting. 15 L/hr. Scope 3.
Vehicles - to and from Moranbah	2		130	14	0.4	kL			1.5	Diesel
Telehandler	1	6		14	1.3	kL			4.3	Diesel. Waste loading. 15 L/hr. Scope 3.
Transport to Brisbane?? Double A train semi's	12		1200	1	8.6	kL			29.2	Diesel. Return freight of modules. 12x Trucks x 1200km. Scope 3.
TOTAL							615.3	16433.8	4546.1	

The information requested below is intended to support Clear Carbon’s estimation of Scope 1, Scope 2 and relevant Scope 3 greenhouse gas emissions for the proposed LNG facility, including confirmation of reporting boundaries, engineering assumptions, calculation methodologies, and

Ref	Emission Source	Information Required from CEFA	Parameter / Input Required	Quantity	Units	Existing Activity Data Assumptions (Feb 2026) / Notes	Purpose
III.a	Scope 1 – Process venting	Annual vented methane quantity	Annual vented CH ₄ quantity	t CH ₄ /year		Op. maintenance venting allowance estimated at 100kgCH ₄ /week = 5.2tCH ₄ /y	Scope 1 venting emissions
		Venting frequency and duration	Vent events / vent duration	events/year or hrs/year		Not separately defined	Methodology support
		Venting source/process description	Vent source description	N/A		Workbook references “upsets, maintenance etc”	Scope completeness
		Calculation basis used for venting estimate	Engineering basis / methodology	N/A		Current calculation uses methane mass basis	Audit traceability
		Gas composition where venting estimated from gas volume	CH ₄ concentration	% mol		95% methane, 5% Nitrogen based on gas supply samples and removal of CO2, water and oxygen.	CO ₂ -e conversion
III.b	Scope 1 – Flaring	Operational upset flare flow rate	Flare gas flow rate	t/day or GJ/hr		Operational upset allowance assumes 70 tpd maximum design flare flow	Scope 1 flare emissions
		Annual flare operating duration	Annual flare duration	hrs/year		5 days/year × 24 hrs = 350 tonnes/year (maintenance & trips)	Scope 1 flare emissions
		Flare destruction efficiency	Destruction efficiency	%		98% combustion efficiency assumption based on flare data sheet.	Scope 1 flare emissions
		Flare gas composition or confirmation of natural gas basis	CH ₄ concentration / gas basis	% mol or N/A		Not provided	CO ₂ -e conversion
		Onsite gas generation inclusion within current reporting boundary	Included in current scope?	Yes/No		Section 6.6 references future expansion	Boundary confirmation
III.c	Scope 1 – Gas-fired generation	Installed generator capacity	Generator capacity	MW or kVA		2 x 2MW gas generators (MTU 16V4000)	Scope 1 combustion
		Expected operating profile	Operating hours	hrs/year		1.2MW (one engine), 24 hrs/day, 360 days/year	Fuel estimation
		Annual natural gas consumption	Annual gas consumption	GJ/year		Estimated at 2,803.2 GJ/year	Scope 1 combustion
		Fugitive emission source applicability	Fugitive source applicability	Yes/No		Yes	Scope completeness
		Indicative valves/flanges inventory	Valves / flanges inventory	count		Primarily from inlet compressor and MR compressor - Refer emmissions spreadsheet.	Scope 1 fugitive emissions
III.d	Scope 1 – Fugitive emissions	Indicative seals/pumps inventory	Seals / pumps inventory	count		Not provided	Scope 1 fugitive emissions
		Piping/connectors subject to fugitive losses	Piping / connectors inventory	count and/or m		Not provided	Scope 1 fugitive emissions
		Fugitive estimation methodology	Fugitive methodology / assumptions	N/A		Not provided	Methodology support
		Process vent sources	Process vent inventory	N/A		No separate process vent inventory identified - Refer emissions spreadsheet.	Scope completeness
		Annual CO ₂ vented from process systems	CO ₂ vent quantity	t CO ₂ /year		CO2 is 1% of gas supply which is all removed and vented. 70*365*.01 = 255 tpa.	Scope 1 process emissions
III.f	Scope 1 – LNG storage / BOG	BOG generation applicability	BOG applicability	Yes/No		not applicable. All BOG is returned to the inlet of the plant including excess BOG from customer sites.	Scope completeness
		BOG generation rate	BOG generation rate	% loss or kg/day		Not provided	BOG emissions estimate
		LNG storage duration	Storage residence time	days		Not provided	BOG estimation
		BOG management pathway	Recovery/recompression/flare/vent pathway	N/A		Not provided	Net BOG emissions
		Source applicability	Applicability	Yes/No		Not Applicable. Dry break couplings are used. Any LNG in the pipework returns to the tank or BOG system.	Scope completeness
III.g	Scope 1 – LNG loading	Annual LNG loading frequency	Tanker loading frequency	loads/year		Not provided	Loading emissions
		Annual LNG throughput	LNG throughput	t/year		Not provided	Loading emissions
		LNG transfer/loading losses	Transfer loss rate	%		Not provided	Loading emissions
		LNG loading loss management pathway	Vented/flared/recovered/recompressed pathway	N/A		Not provided	Determines Scope 1 treatment
		Expected continuous electrical demand	Continuous electrical load	MW		Continuous operational demand assumed at 1.9 MW, 360 days pa.	Scope 2 emissions
IV	Scope 2 – Grid electricity	Annual electricity consumption	Annual electricity consumption	MWh/year		Calculated as 24,528 MWh/year based on continuous load	Scope 2 emissions
		Operating profile	Operating hours	hrs/year		Implied continuous operation (24 × 360) 5 days down time pa.	Electricity reconciliation
		Utilisation/load factor	Load factor / utilisation	%		Not separately provided	Electricity reconciliation
		Expected annual LNG production	LNG production	t/year		70 tonnes per day, 360 days pa.	Scope 3 downstream combustion
		LNG energy content	LNG energy content	GJ/t LNG		50.4	Scope 3 combustion
VII	Scope 3 – Downstream LNG use	LNG transport mode	Transport mode	N/A		Transported in double A road trains, 30 tonnes per truck, approx 2 trucks per day.	Scope 3 transport
		Downstream transport distance	Transport distance	km		880km round trip per truck.	Scope 3 transport
		Expected downstream LNG application	End-use profile	N/A		Initially, 100% of the gas gas is supplied to pipeline operators who supply gas to customers throughout the east coast of Australia. The intention is to transition up to 80% of the fuel to displace diesel for power generation throughout rural Queensland.	Scope 3 downstream use

Parameter / conversion	Value	Units	Source	Use in workbook
Production and power generation operating days	360.00	days/year	Operating assumption changed to 360 days pa	Annualisation of production, grid electricity & operating plant emissions
Hours per day	24.00	hours/day	24 hours per day	Operating hours calculation
Weeks in 360 days	51.43	weeks/360 days	51.43 weeks in 360 days	Operational flare emissions
Methane density at 1atm (101.325kPa aprox) at 0C	0.72	kg/m3	https://www.engineeringtoolbox.com/methane-density-specific-weight-temperature-pressure-d_2020.html?utm_s	Scope 1 commissioning venting
Commissioning methane (CH4) venting	2.09	t CH4	365m3 × 2 tanks × 4 cycles to 100 kPa	Scope 1 commissioning venting
Commissioning flare gas energy	13.33	t flare gas/year	4 events × 4 hours × 20 tpd basis	Scope 1 commissioning flare
Maintenance and trip days directed to flare	5.00	days/year	5 days pa for maintenance and trips would direct all gas to flare	Scope 1 operational flare emissions
1kWh	0.0036	GJ	https://www.iea.org/data-and-statistics/data-tools/unit-converter?utm	Scope 1 operational flare emissions
Operational upset flare flow rate	70.00	t gas/day	III.b: operational upset allowance assumes 70 tpd maximum design flare flow	Scope 1 operational flare emissions
Methane concentration in gas	0.95	fraction	III.a: 95% methane, 5% nitrogen	Flaring and venting gas composition
Flare destruction / combustion efficiency	0.98	fraction	III.b: 98% combustion efficiency	Operational flare split into combusted CH4 and CH4 slip
Operational maintenance venting allowance	5.14	t CH4/year	III.a: 100 kg CH4/week = 5.14 t CH4/year	Scope 1 operational process venting
Inlet compressor CH4 stream	0.11	t CH4/day	Table 1, INLET COMPRESSOR - JGK, waste stream composition CH4, rate 0.11 tpd	Scope 1 fugitive/process methane stream
Amine still CO2 vent	0.70	t CO2/day	Table 1, AMINE STILL COLUMN, waste stream 1% CO2 in gas supply, rate 0.7 tpd	Scope 1 process CO2 vent
Gas-fired generation fuel use	1,000.00	kW	2 x 2MW gas generators (MTU 16V4000) 1MW (one engine), 24 hrs/day, 360 days/year	Scope 1 onsite gas-fired generation and Scope 3 upstream fuel
Gas-fired generation fuel use	8,640.00	hours/year	1MW (one engine), 24 hrs/day, 360 days/year	Scope 1 onsite gas-fired generation and Scope 3 upstream fuel
Gas-fired generation fuel use	977.00	kW	MTU datasheet	Scope 1 onsite gas-fired generation and Scope 3 upstream fuel
Gas-fired generation fuel use	2,381.00	kW fuel input	MTU datasheet	Scope 1 onsite gas-fired generation and Scope 3 upstream fuel
Gas-fired generation fuel use	1,466.00	kW	MTU datasheet	Scope 1 onsite gas-fired generation and Scope 3 upstream fuel
Gas-fired generation fuel use	3,418.00	kW fuel input	MTU datasheet	Scope 1 onsite gas-fired generation and Scope 3 upstream fuel
Gas-fired generation fuel use	2,429.78	kW fuel input	MTU datasheet =, extrapolations for 1000kW (1MW)	Scope 1 onsite gas-fired generation and Scope 3 upstream fuel
Site vehicle diesel	16.85	kL/year	3x Toyota Landcruisers. Daily site inspection + commute (130km)	Scope 1 site vehicles and Scope 3 upstream diesel
Excavator / Loader	15.00	L/hr	CAT Performance Handbook (Medium Load)	Scope 1 site vehicles and Scope 3 upstream diesel
Crane (150t)	30.00	L/hr	Liebherr Technical Data (Heavy Lift)	Scope 1 site vehicles and Scope 3 upstream diesel
Generator (Small)	10.00	L/hr	50% Load Factor on 22kVa set	Scope 1 site vehicles and Scope 3 upstream diesel
Heavy Truck (Semi)	0.60	L/km	Prime Mover (B-Double equivalent)	Scope 1 site vehicles and Scope 3 upstream diesel
Light Vehicle (Escort/Ute)	0.12	L/km	4WD Diesel Utility	Scope 1 site vehicles and Scope 3 upstream diesel
LNG Energy	54.40	Energy Content of LNG	GJ / tonne	
Continuous grid electricity demand	1.80	MW	Continuous operational demand assumed at 1.8 MW, 360 days pa	Scope 2 grid electricity
Diesel black-start generator load	300.00	kW	User-provided context: diesel generation only required for black starts at 300 kW	Diesel black-start calculation
Black-start duration	10.00	minutes/event	User-provided context: 10 minutes per black start	Diesel black-start calculation
Black-start events	12.00	events/year	User-provided context: 12 times pa	Diesel black-start calculation
Diesel energy content	38.60	GJ/kL	Diesel Energy Content 38.6 GJ/kL (NGA 2025)	Diesel litres/kL to GJ conversion
LNG production rate	70.00	t LNG/day	Scope 3 downstream LNG use: 70 tonnes per day, 360 days pa	Scope 3 use of sold products
LNG energy content selected for DETSI calculation	50.40	GJ/t LNG	VII: LNG energy content 50.4 GJ/t LNG	Scope 3 use of sold products
Alternative LNG energy content in Unit Conversions sheet	54.40	GJ/t LNG	Unit Conversions sheet: LNG Energy Content 54.4 GJ/t	QA check only
Downstream LNG transport trucks	2.00	trucks/day	approx 2 trucks per day	Scope 3 Category 9 downstream transport
Downstream truck round trip distance	880.00	km/truck	880 km round trip per truck	Scope 3 Category 9 downstream transport
Heavy truck fuel consumption	0.60	L/km	Heavy Truck (Semi), 0.6 L/km	Scope 3 Category 9 and Category 4 road freight
Light vehicle fuel consumption	0.12	L/km	Light Vehicle (Escort/Ute), 0.12 L/km	Construction freight escort vehicle calculations
Small generator diesel consumption	10.00	L/h	Generator (Small), 10 L/hr	Construction small generator calculations
Excavator / loader diesel consumption	15.00	L/h	Excavator / Loader, 15 L/hr	Construction equipment calculations
Crane 150t diesel consumption	30.00	L/h	Crane (150t), 30 L/hr	Construction equipment calculations
Concrete foundations	260.00	m3	Concrete foundations	Scope 3 Category 2 construction materials
Steel in LNG storage tanks	240.00	t steel	LNG storage tanks - 2 × 120 t	Scope 3 Category 2 construction materials
Steel in compressor skid and pipework	120.00	t steel	Compressor skid and pipework	Scope 3 Category 2 construction materials

Emission factor / parameter	Value	Units	Use in workbook	URL or attached file reference
Methane GWP	28.00	tCO ₂ -e/t CH ₄	Vented methane and uncombusted methane slip	https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2025.pdf
Natural gas combustion	51.53	kg CO ₂ -e/GJ	Gas-fired generation, commissioning flare, LNG combustion	https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2025.pdf
Natural gas upstream	8.80	kg CO ₂ -e/GJ	Scope 3 upstream natural gas fuel cycle	https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2025.pdf
Queensland grid electricity Scope 2	0.67	tCO ₂ -e/MWh	Scope 2 purchased electricity	https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2025.pdf
Queensland grid electricity Scope 3	0.09	kg CO ₂ -e/kWh	Scope 3 upstream electricity	https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2025.pdf
Diesel combustion	70.20	kg CO ₂ -e/GJ	Diesel vehicles, construction equipment and diesel black-start generator	https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2025.pdf
Diesel upstream	17.30	kg CO ₂ -e/GJ	Scope 3 upstream diesel fuel cycle	https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-account-factors-2025.pdf
CH ₄ to CO ₂ stoichiometric conversion	2.75	t CO ₂ /t CH ₄	Flare combusted methane to CO ₂	Standard stoichiometric conversion
Shipping - general cargo / tanker average	0.02	kg CO ₂ -e/t.km	Scope 3 upstream transport by sea	
Domestic passenger flight	0.16	kg CO ₂ -e/p.km	Scope 3 construction travel where included in workbook	
Concrete embodied emissions	0.35	tCO ₂ -e/m ³	Scope 3 Category 2 capital goods / 40MPa structural concrete	ISCA Materials Calculator v2 / Green Star
Steel embodied emissions	2.00	tCO ₂ -e/tonne	Scope 3 Category 2 capital goods / plate steel	WorldSteel Association Global Average for Plate Steel
KTA50-G3 fuel consumption at 25% load	76.00	L/h	Diesel black-start lower-bound check only	
KTA50-G3 fuel consumption at 50% load	139.00	L/h	Diesel black-start conservative calculation	

CEFA QLD LNG Project

Summary item	Total (tCO2-e)	Notes
Scope 1 operational	6,527.91	Recurring operational emissions only.
Scope 1 commissioning	99.84	One-off commissioning emissions, shown separately.
Scope 2	10,419.84	Revised using 1.8MW × 24 hr/day × 360 days. QLD grid
Scope 3	70,331.38	Includes calculable categories only (i.e., 2, 3, 4, 9 & 11)
Total excluding commissioning	87,279.13	Operational Scope 1 + Scope 2 + Scope 3
Total including commissioning	87,378.96	Operational total plus one-off commissioning emissions

Scope	GHG Protocol category / source type	Phase	Activity accounted for	Activity / input 1	Unit 1	Activity / input 2	Unit 2	Activity / input 3	Unit 3	Activity / input 4	Unit 4	Emissions (tCO2-e)	Comments
Scope 1	Commissioning venting	Commissioning	CH4 venting	2.09	t CH4	28.00	tCO2-e/t CH4					58.61	Initial estimations, commissioning calculation 365 m3 × 2 tanks × 4 cycles
Scope 1	Commissioning flaring	Commissioning	CO2 from combusted methane	13.33	t flare gas/year	0.93	combusted CH4 fraction	2.75	t CO2/t CH4			34.14	Initial estimations, recalculated: 4 events, 4 hours/event, 20 tpd, 95% CH4 , 98% combustion efficiency
Scope 1	Commissioning flaring	Commissioning	Uncombusted CH4 slip	13.33	t flare gas/year	0.02	uncombusted CH4 fraction	28.00	tCO2-e/t CH4			7.09	Initial estimations, recalculated: CH4 slip from 2% uncombusted
Scope 1	Process CO2 venting	Operational	Amine still CO2 vent	0.70	t CO2/day	360.00	days/year					252.00	AMINE STILL COLUMN. Annualised over 360 operating days.
Scope 1	Fugitive/process CH4 stream	Operational	Inlet compressor CH4 stream	0.11	t CH4/day	360.00	days/year	28.00	tCO2-e/t CH4			1,108.80	INLET COMPRESSOR - JGK; NGA Factors 2025 methane GWP
Scope 1	Process venting / Maintenance	Operational	Operational maintenance venting allowance	5.14	t CH4/year			28.00	tCO2-e/t CH4			144.00	Initial estimations, recalculated for 360 days
Scope 1	Flaring	Operational	Operational flare - CO2 from combusted methane	350.00	t flare gas/year	0.93	combusted CH4 fraction	2.75	t CO2/t CH4			896.09	Updated estimations, 70 t/day × 5 days, 95% CH4, 98% destruction efficiency
Scope 1	Flaring	Operational	Operational flare - uncombusted CH4 slip	350.00	t flare gas/year	0.02	uncombusted CH4 fraction	28.00	tCO2-e/t CH4			186.20	Updated estimations, methane slip from 98% destruction efficiency
Scope 1	Gas-fired electricity generation	Operational	Onsite gas-fired electricity generation (1MW)	24.00	MWh/day	360.00	days/year	51.53	kgCO2-e/GJ	1000	kg/t	3,894.42	Updated estimations: 1MW, natural gas combustion factor from NGA Factors 2025
Scope 1	Mobile combustion	Operational	Site vehicles	16.85	kL diesel/year	38.60	GJ/kL	70.20	kgCO2-e/GJ	1000	kg/t	45.65	Initial estimations, Site vehicles: 3x Toyota Landcruisers. Daily site inspection + commute (130km)
Scope 1	Diesel black-start generation	Operational	Diesel black-start generator - conservative 50% load fuel rate	2.00	hours/year	139.00	L/h	2.71	kgCO2-e/L	1000	kg/t	0.75	300 kW for 10 minutes, 12 times pa; Clarke Energy PWR Hybrid.pdf KTA50-G3 fuel consumption 50% load. Exact 300 kW fuel rate not provided
Scope 1	BOG	Operational	Boil-off gas (BOG) losses		N/A								All BOG returned to inlet of plant including excess BOG from customer sites.
Scope 1	LNG loading/storage handling	Operational	LNG loading/ storage losses		N/A								Dry-break couplings used; any LNG in pipework returns to tank or BOG system.
Scope 2	Purchased electricity	Operational	Grid electricity (1.8MW)	15,552.00	MWh/year	0.67	kCO2-e/kWh					10,419.84	Updated Emissions: 1.8MW continuous, 360 days; Queensland factor 0.67 tCO2-e/MWh
Scope 3	Category 2 - Capital goods	Construction	Concrete foundations	260.00	m3	0.35	tCO2-e/m3					91.00	Initial estimations; GHG Protocol Scope 3 Category 2
Scope 3	Category 2 - Capital goods	Construction	LNG storage tanks - embodied steel	240.00	t steel	2.00	tCO2-e/t steel					480.00	Initial estimations; GHG Protocol Scope 3 Category 2
Scope 3	Category 2 - Capital goods	Construction	Compressor skid and pipework - embodied steel	120.00	t steel	2.00	tCO2-e/t steel					240.00	Initial estimations; GHG Protocol Scope 3 Category 2
Scope 3	Category 3 - Fuel- and energy-related activities	Operational	Upstream electricity from grid electricity (1.8MW)	15,552.00	MWh/year	0.09	kCO2-e/kWh					1,399.68	NGA Factors 2025; GHG Protocol Category 3
Scope 3	Category 3 - Fuel- and energy-related activities	Operational	Upstream diesel for site vehicles	16.85	kL/year	38.60	GJ/kL	17.30	kgCO2-e/GJ	1000.00	kg/t	11.25	NGA Factors 2025; GHG Protocol Category 3
Scope 3	Category 3 - Fuel- and energy-related activities	Operational	Upstream diesel for black-start generator	2.00	hours/year	0.14	kL/h	38.60	GJ/kL	0.02	tCO2-e/GJ	0.19	Clarke Energy PWR Hybrid.pdf KTA50 50% load fuel consumption; NGA Factors 2025; GHG Protocol Category 3
Scope 3	Category 4 - Upstream transportation and distribution	Construction	Road freight - 12 x 40 ft modules on double trailers	6.00	trucks	1000.00	km	0.60	L/km	3.38	tCO2-e/kL	12.16	Initial estimations; GHG Protocol Category 4
Scope 3	Category 4 - Upstream transportation and distribution	Construction	Sea freight - 2 x 365 kL tanks from China to Mackay	240.00	t	8300.00	km	0.02	kgCO2-e/t.km	1000.00	kg/t	29.88	Initial estimations; GHG Protocol Category 4
Scope 3	Category 4 - Upstream transportation and distribution	Construction	Road freight - tanks to site with escorts	260.00	km	2.16	L/km convoy	3.38	tCO2-e/kL			1.90	Initial estimations; GHG Protocol Category 4
Scope 3	Category 4 - Upstream transportation and distribution	Construction	Sea freight - compressor Canada to Mackay	30.00	t	12000.00	km	0.02	kgCO2-e/t.km	1000.00	kg/t	5.40	Initial estimations; GHG Protocol Category 4
Scope 3	Category 4 - Upstream transportation and distribution	Construction	Road freight - compressor Mackay to site with escorts	260.00	km	1.08	L/km convoy	3.38	tCO2-e/kL			0.95	Initial estimations; GHG Protocol Category 4
Scope 3	Category 4 - Upstream transportation and distribution	Construction	Road freight - other equipment containers Brisbane to site	6.00	trailers	1200.00	km	0.60	L/km	3.38	tCO2-e/kL	14.59	Initial estimations; GHG Protocol Category 4
Scope 3	Category 4 - Upstream transportation and distribution	Operational	Consumables/spares deliveries	2.00	trucks/day	900.00	km return	360.00	days/year	0.00	tCO2-e/truck-km	1,313.17	Initial estimations; GHG Protocol Category 4
Scope 3	Category 9 - Downstream transportation and distribution	Operational	Downstream LNG road transport to customers	2.00	trucks/day	880.00	km/truck	360.00	days/year	0.00	tCO2-e/truck-km	1,283.99	GHG Protocol Category 9
Scope 3	Category 11 - Use of sold products	Operational	End-use combustion of LNG sold	25,200.00	t LNG/year	50.40	GJ/t LNG	51.53	kgCO2-e/GJ	1000.00	kg/t	65,447.22	NGA Factors 2025; GHG Protocol Category 11

Boundary, data-quality and unresolved items

Only values directly traceable to uploaded documents, client comments, or official GHG/NGA sources are used.

Diesel black-start emissions use the documented KTA50-G3 50% load fuel consumption as a conservative documented value

Electricity demand scenario: 1MW from gas generation+ 1.8MW from grid

Scope 3 Category 11 uses 50.4 GJ/t LNG from AdditionalDataRequest. The Unit Conversions sheet contains 54.4 GJ/t and is included as a QA check but not used in the primary calculation.

APPENDIX C. – AIR QUALITY ASSESSMENT (Trinity)

CENTURION LIQUEFIED NATURAL GAS FACILITY

Goonyella North

Air Quality Assessment

**South Queensland Environmental Expertise & Services Pty
Ltd**

Date
3 June 2026

Report
257401.5023.R01V02

DOCUMENT CONTROL

Prepared by: Trinity Consultants Australia
 ABN 62 630 202 201
 A: Level 3, 43 Peel Street
 South Brisbane, QLD 4101
 T: +61 7 3255 3355
 E: brisbane@trinityconsultants.com

Reference	Date	Description	Prepared	Checked
257401.5023.R01V01	19/01/2026	Final	Hector Machado	Samuel Wong
257401.5023.R01V02	03/06/2026	Response to DETSI Information Request	Samuel Wong	Hector Machado

Document Approval	
Approver Signature	
Name	Samuel Wong
Title	Manager – Air and Noise

COPYRIGHT AND DISCLAIMERS

This report has been prepared by Trinity Consultants Australia (Trinity), with all reasonable skill, due care and diligence in accordance with Trinity Quality Assurance Systems, based on ISO 9001:2015. This report and the copyright thereof are the property of Trinity and must not be copied in whole or in part without the written permission of Trinity.

This report takes account of the timescale, resources and information provided by the Client, and is based on the interpretation of data collected, which has been accepted in good faith as being complete, accurate and valid.

Trinity disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

This report has been produced specifically for the Client and project nominated herein and must not be used or retained for any other purpose. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Trinity.

CONTENTS

1.	Introduction	1
1.1	Overview	1
1.2	Information Request.....	1
1.3	Scope	3
2.	Study Area description	4
2.1	Zoning of Site and Surrounding	4
2.2	Identification of Sensitive Receptors	6
3.	Proposed Development	8
3.1	Key Features.....	8
3.2	Description of Operations	9
3.3	Air Emission Sources	10
3.3.1	Operational Sources	10
3.3.2	Construction Phase	10
4.	Air Quality Values and Criteria	11
4.1	Relevant Pollutants.....	11
4.1.1	Operation	11
4.1.2	Construction	11
4.2	Environmental Protection Air Policy	11
5.	Background Air Quality	13
5.1	Overview	13
5.2	Existing Local Air Emission Sources	13
5.3	Air Quality Monitoring Data	13
5.4	Summary of Background Data.....	17
6.	Meteorological Modelling.....	19
6.1	Overview	19
6.2	Model Year	19
6.2.1	TAPM Fundamentals.....	21
6.2.2	Observational Data Assimilation	21
6.3	CALMET.....	22
6.3.1	Overview	22
6.3.2	CALMET Modelling Configuration.....	22
6.3.3	Terrain and Land Use Data	22
6.4	CALMET Results	25
7.	Emission Sources	28
7.1	Overview	28
7.2	Emission Rates and Parameters.....	28
7.2.1	Power Generation	28
7.2.2	Flare	28
8.	Dispersion Modelling Method.....	31
8.1	Overview	31
8.2	CALPUFF Configuration	31
8.3	Building Downwash	32

8.4	Nitrogen Dioxide Modelling	32
9.	Dispersion Modelling Results	33
9.1	Limitations	33
9.2	Predicted Concentrations	33
10.	Conclusions	36
11.	References	37

APPENDICES

Appendix A Glossary

FIGURES

Figure 2.1:	Zoning Map (Isaac Regional Council Plan)	4
Figure 2.2:	Site Locations	5
Figure 2.3:	Sensitive Receptors	7
Figure 3.1:	Proposed Site Layout (Provided on 4 th December 2025)	9
Figure 5.1:	DETSI's Air Quality Monitoring Stations with at least 1 Year of NO ₂ Data (2020 – 2024)	14
Figure 6.1:	2019 -2023 Annual Wind Roses for the BoM Moranbah Airport Meteorological Station	20
Figure 6.2:	Wind Rose of BoM Moranbah Airport Meteorological Station Data and TAPM for year 2020	21
Figure 6.3:	Modelled Terrain	23
Figure 6.4:	Modelled Land Use	24
Figure 6.5:	CALMET Site Predicted Wind Rose	25
Figure 6.6:	CALMET Site Predicted Mixing Heights	26
Figure 6.7:	Diurnal Frequency of Stability Classes	27
Figure 7.1:	Flare Emissions Illustration	29
Figure 8.1:	Modelled Receptor and Source	32
Figure 9.1:	Predicted Cumulative CO 8-Hour Average Concentrations	34
Figure 9.2:	Predicted Cumulative NO ₂ 1-Hour Average Concentrations	35

TABLES

Table 4.1:	EPP (Air) Ambient Air Quality Objectives	12
Table 5.1:	NO ₂ Measured Concentrations in Queensland – 70th Percentile (1-hour Concentrations)	15
Table 5.2:	NO ₂ Measured Concentrations in Queensland – Annual Averages	16
Table 5.3:	CO Measured Concentrations at the Woolloongabba Station – 70th Percentile (8-hour Concentrations)	16
Table 5.4:	VOCs Measured Concentrations at Memorial Park Station	17
Table 5.5:	Summary of Adopted Background Concentrations	17
Table 6.1:	BoM Moranbah Meteorological Station Data Comparison	19
Table 7.1:	Emission Factors and Calculated Emission Rates	29
Table 7.2:	Modelled Source Parameters	30
Table 9.1:	Maximum Predicted Concentrations – CO and NO ₂	34
Table 9.2:	Maximum Predicted Concentrations – VOCs	34

1. INTRODUCTION

1.1 Overview

Trinity Consultants Australia (Trinity) was commissioned by South Queensland Environmental Expertise & Services Pty Ltd to provide an air quality assessment for the proposed Micro Liquefied Natural Gas (LNG) Plant at North Goonyella, Moranbah, Queensland.

The proposed development involves operation of a 70 tonnes per day (tpd) Micro LNG Plant. The plant will receive incidental coal seam gas diverted from flaring at the Centurion North Goonyella Mine, which will be piped to the site. The Micro LNG Plant is a modular facility and has recently been in operation at Mt Magnet in Western Australia. The plant will also include amine regeneration plant, gas generator, diesel generator (for black starts) and flare.

This air quality report is to accompany an Environmental Authority (EA) Application for consideration by the Department of Environment, Tourism, Science, and Innovation (DETSI) to carry out the proposed development. This report and the modelling that supports this report have been revised in response to request for information issued by DETSI, and associated amendments to the system design as discussed below.

1.2 Information Request

Trinity previously issued a report in January 2026 (257401.5023.R01V01). DETSI recently reviewed this original assessment and issued an information request on 30 April 2026 (application reference A-EA-NEW-101041729). The request items relating to air quality are copied below followed by a response.

- I. Please clarify whether the proposed facility includes gas-fired generators. If gas-fired generators are part of the proposal, the details on their specifications, expected emissions, and how they would impact the air quality assessment (AQA) must be provided.**

Operations will commence with a mixture of energy sources:

- from the grid supplied via Centurion Mining; and
- on-site gas powered generation (0.94 MW load).

When gas supply from Centurion Mining ramps up (nominally 1-2 years from start up), a second on-site gas generator will be commissioned to replace some or all of the supply of electricity purchased from the grid.

Power generation details are summarised as follows:

- Initial phase (from commissioning) – 1 x natural gas powered genset (MTU 16V4000), running continuously to supply 0.94 MW.
- Once grid supply is disconnected and if gas supply is sufficient – 2 x natural gas powered genset (MTU 16V4000), running continuously.
- Black start up only (estimated 10 minutes each time, 12 times a year) – 1250 kVA Diesel generator (KTA50 PowerBox)

For the air dispersion modelling, this revised assessment conservatively includes two gas powered gensets operating 24/7 (combined with the operation of flare, even though this would operate on an as required basis). The diesel generator has not specifically been modelled given the minimal operating time expected as well as large separation distance to sensitive receptors (i.e. 4.3 km).

Refer to **Section 7.2.1** for gas generator emission details.

- II. Please provide additional information on the design parameters of the flare system, specifically:**

a) Will the flare be designed to be smokeless under all operating scenarios including start-up, shutdown, commissioning, and upset scenarios.

Smokeless operations are not expected under all scenarios. Nonetheless, the flare will be operated efficiently, such that combustion processes will be as complete as possible, minimising the potential for particulate emissions. No changes to the modelling of the flare have been made (i.e. only CO, NO_x and VOC emissions have been modelled). The potential for impacts on off-site sensitive receptors is expected to be minimal given the large separation distance to receptors, short-term/intermittent nature of flare use and optimal operating conditions.

The modelling is noted to be conservative by assuming that flaring is occurring 24/7.

b) If there are scenarios where smoke or significant flame visibility is expected, provide details on those scenarios and how these will be managed to minimise environmental and aesthetic impacts.

Additional information on the design parameters and operation of the flare system has been provided by the proponent as follows:

- The proposed flare is designed to have a 98% conversion / destruction efficiency and has capacity for 100% of production (not 125% as indicated). As such the flare may not be 100% 'smokeless' under all operating scenarios, but smoke, and the scenarios when smoke may be generated are very limited.
- Under normal flare operations the flare will burn natural gas from coal seam gas wells that are used to clear gas for the safety of future mining operations and that will supply the plant. The source gas will be relatively pure methane and the flare will be predominantly free from smoke. Flame and convection currents associated with emitted thermal energy may be evident during flare operation. The flare flame will be most significant when the plant is stopped, and the product is diverted to the flare.
- Plant stoppages are undesirable and operators will work to avoid unnecessary stoppages and minimise the impact and duration of any stoppages that do occur.
- In terms of the aesthetic impacts of flare emissions, the flare will be located in an industrial facility, on a mine site, in a remote location that is distant (minimum ~ 4.3km) from all known sensitive receptors.

c) Confirm whether refrigerant gases or nitrogen will be directed to the flare during purging activities and how this will be managed to ensure complete combustion.

The proponent has provided the following information with regards to refrigerant gases and nitrogen:

- The MR compressor would only release MR components to the flare if there was a malfunction such as a seal failure. If the plant is stopped for any reason, the flow of natural gas would be directed to the flare to ensure the coal seam wells continue to flow. Under these circumstances MR product would be held in the system.
- Refrigerant would not be sent to the flare except in the event of a significant operational excursion that causes a relief valve to operate. It should be noted that refrigerant typically comprises mixed light hydrocarbon products that are fully combustible and clean burning.
- Refrigerant would not normally be purged except in preparation for major works on, or internal inspections of, the refrigerant system (nominally ≤once per 3 years) and be a fully controlled / permitted activity.
- Where the plant is stopped for a prolonged period, the refrigerant will be held (parked) in storage vessels. During operations, refrigerants remain in a closed loop and top-ups are not normally required.
- Nitrogen purging will only be required after a major shutdown, where a section of the plant has been opened and air has been allowed in (e.g., pressure vessel internal inspection). Purging equipment prior return to service will occur rarely (nominally ≤once per 3 years) and be a fully controlled / permitted activity.

1.3 Scope

This report describes the assessment of the air quality impacts, which is based on the following tasks:

- Review the project operations with respect to air quality.
- Review existing air quality monitoring data applicable to the project site
- Conduct a review to identify and understand:
 - existing sensitive receptors via desktop,
 - topography, and characterise surrounding land uses,
 - expected regional background concentrations of relevant pollutants using monitoring data from the Queensland Government air monitoring stations and other available sources,
 - existing operations and associated air emissions that could contribute to cumulative impacts
- Estimate pollutant emission rates based on available equipment supplier specifications and air emission databases
- Model meteorological conditions using TAPM and CALMET.
- Model the dispersion of expected air pollutants based on proposed activities using CALPUFF to estimate levels of the emissions reaching sensitive receptors and develop contours over the modelling domain.
- Analyse the results of meteorological and pollutant dispersion modelling, and compare modelling results with the relevant air quality criteria.

To aid in the understanding of the terms in this report a glossary is included in **Appendix A**.

2. STUDY AREA DESCRIPTION

2.1 Zoning of Site and Surrounding

The proposed site for the facility is located at the northern quadrant of the ML6949 Centurion Coal Mine lease area at North Goonyella, Moranbah, Queensland, approximately 41.3 km from the northwest edge of the Moranbah township. The site is a previously disturbed laydown area with existing hardstand and minimal vegetation.

The site for the development is designated as being within a Rural Zone under the Isaac Regional Council Planning Scheme 2021. The proposed development is surrounded by the following uses:

- To the north and east is predominantly vegetation
- To the west is the Old Denham Park
- To the south is North Goonyella Coal Mine

The zoning of the subject site and surrounding area is shown in **Figure 2.1**. The proposed development within the subject site is shown in **Figure 2.2**.

Figure 2.1: Zoning Map (Isaac Regional Council Plan)

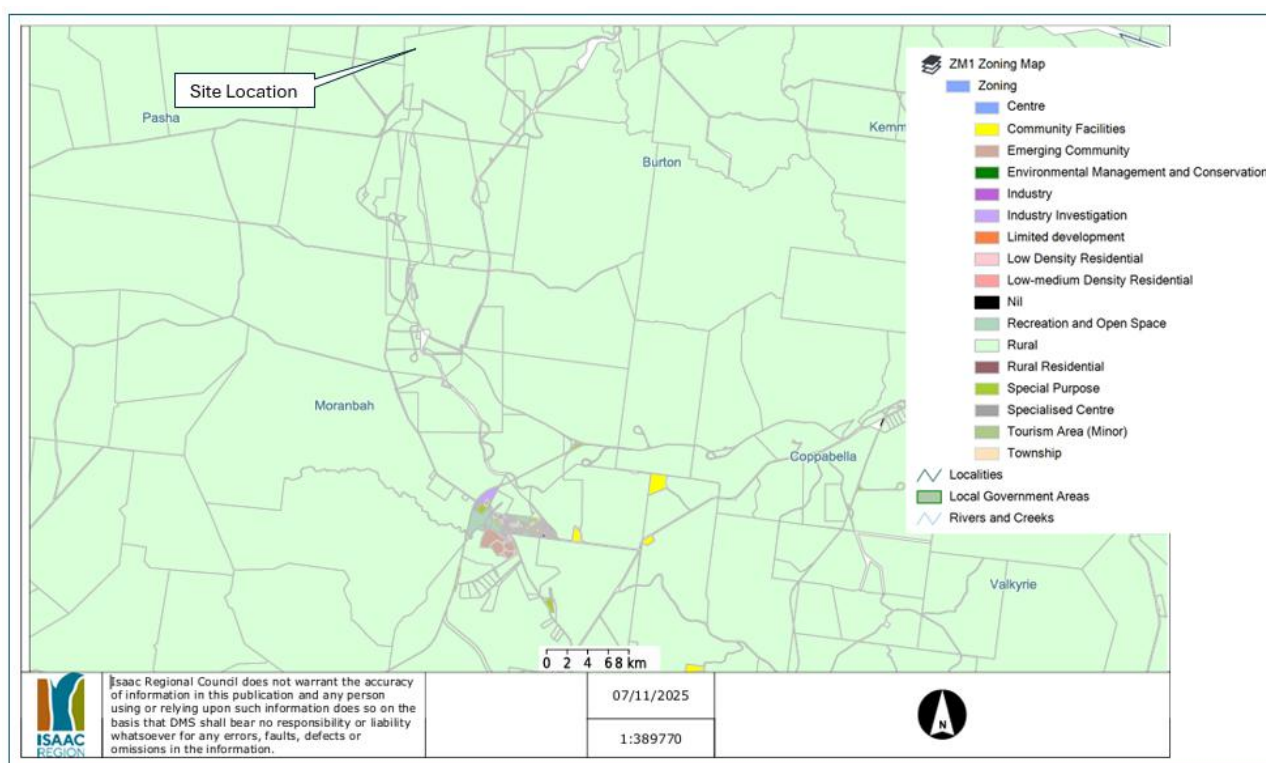


Figure 2.2: Site Locations



2.2 Identification of Sensitive Receptors

The Department of Environment, Tourism, Science and Innovation (DETSI) defines a sensitive place and commercial place as follows:

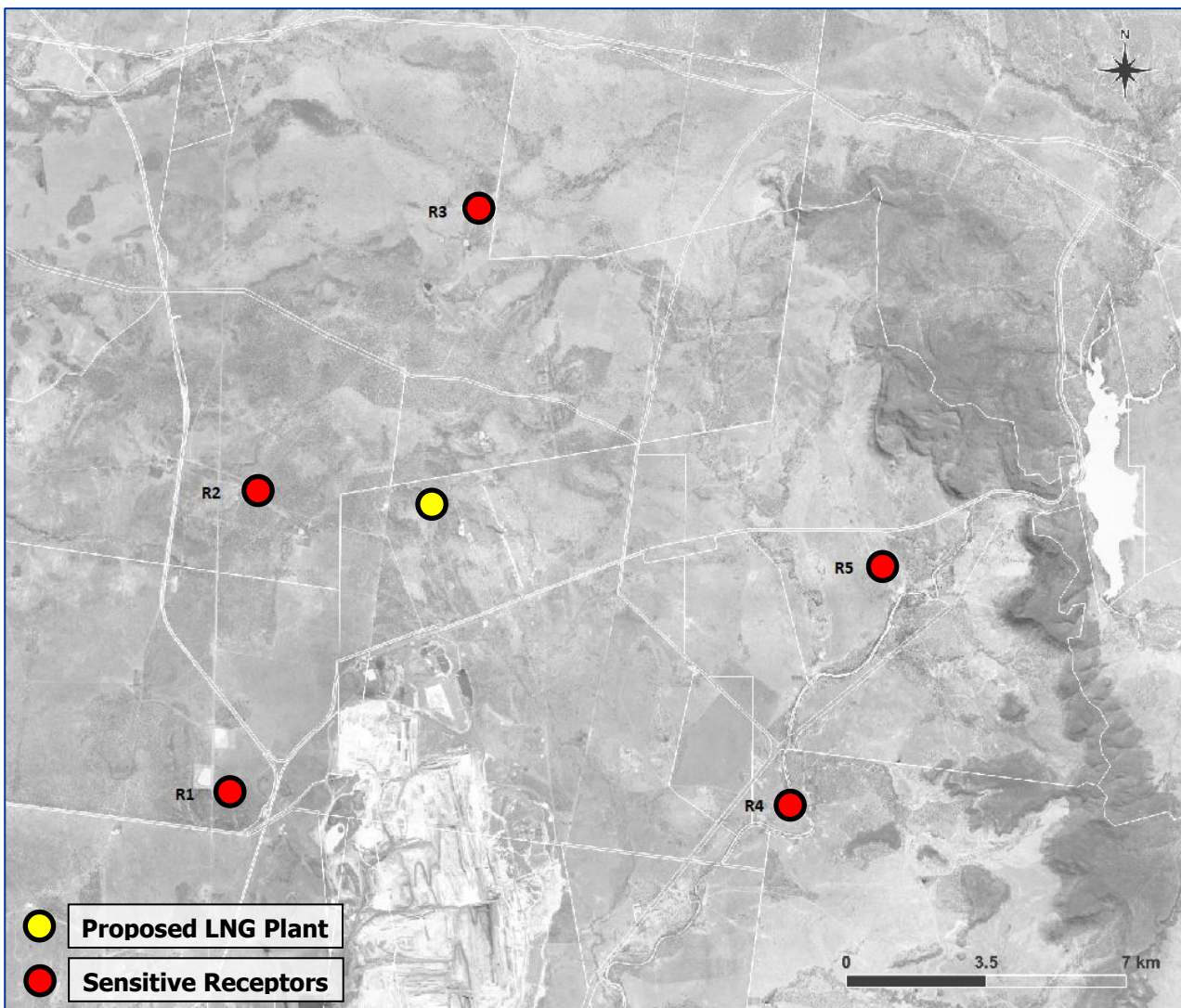
- Sensitive place:
 - A dwelling, mobile home or caravan park, residential marina or other residential place;
 - “dwelling” means any of the following structures or vehicles that is principally used as a residence-
 - a house, unit, motel, nursing home or other building or part of a building;
 - a caravan, mobile home or other vehicle or structure on land;
 - a watercraft in a marina.
 - a motel, hotel or hostel;
 - a kindergarten, school, university or other educational institution;
 - a medical centre or hospital;
 - a protected area;
 - a park or gardens; or
 - a place used as an office or for business or commercial purposes.
- Commercial place:
 - a place used as an office or for business or commercial purposes

Based on the definition, the nearest sensitive uses and separation distances from the development site are defined as follows:

- Residential/accommodation:
 - (R1) Lapunyah Homestead – 8.8 km south-west
 - (R2) Denham Homestead – 4.3 km west
 - (R3) Wards Well Homestead – 7.4 km north
 - (R4) Redhill Homestead – 11.6 km south-east
 - (R5) Burton Down Homestead – 11.3 km east

Locations of the nearest sensitive receptors are shown in **Figure 2.3**.

Figure 2.3: Sensitive Receptors



3. PROPOSED DEVELOPMENT

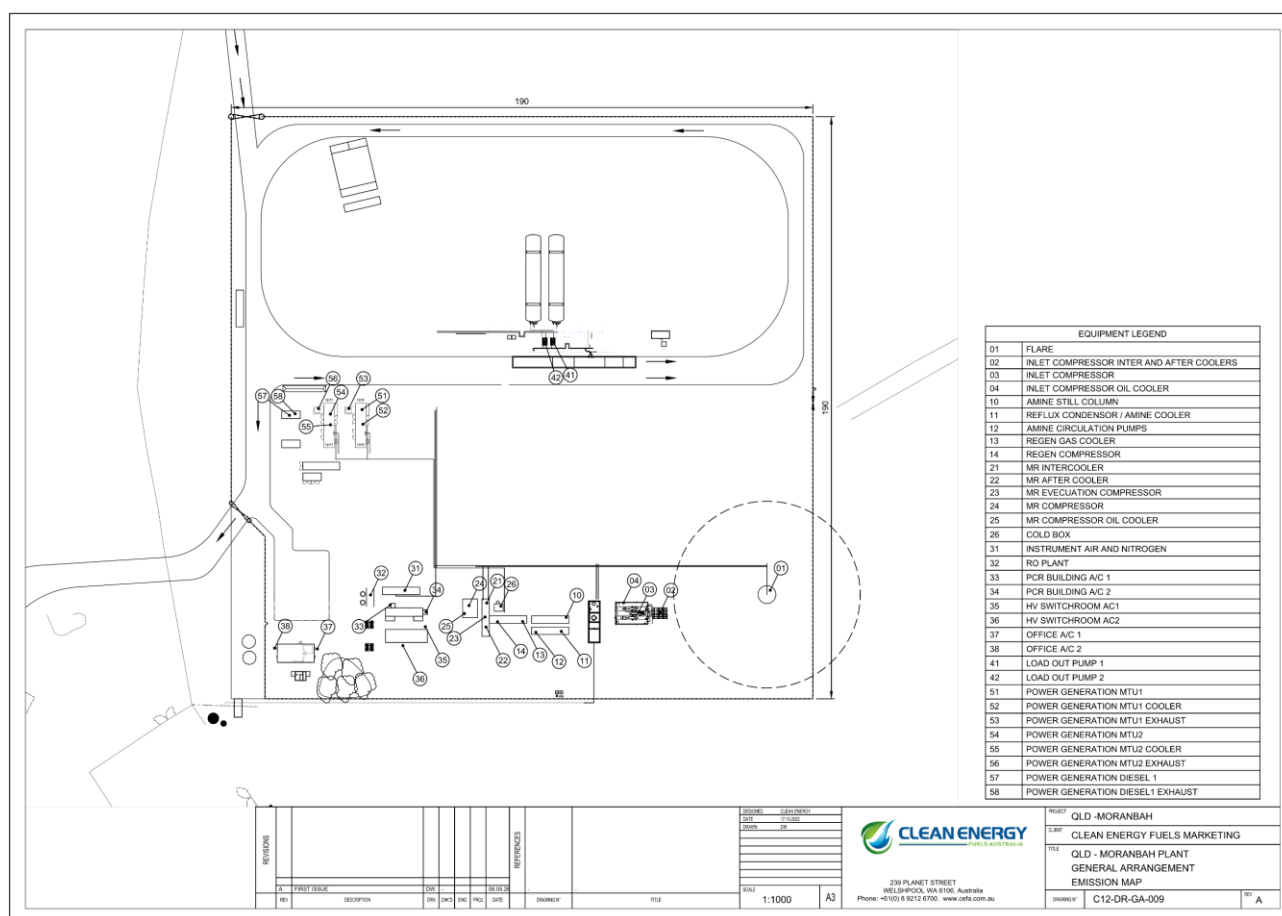
3.1 Key Features

The Micro LNG plant will be moved from another site to the new proposed location. The site layout of the plant is presented in **Figure 3.1**.

The development will include the following key components:

- LNG Production Facility
 - Modular liquefaction plant with a nominal capacity of 70 tonnes per day (t/d).
 - Approximately eight processing modules (each ~12 m long), vertical cold box, and switch-room.
 - Proprietary mixed refrigerant liquefaction technology.
- Ancillary Infrastructure
 - One HV transformer and electrical switch-room.
 - Offices, control room, first aid room, ablutions.
 - Potable and fire water tanks.
- Storage and Loading
 - Cryogenic LNG storage tank with 150 t capacity (below Major Hazard Facility threshold).
 - Road tanker loading bay for LNG transfer.
- Safety and Environmental Systems.
 - Flare system for non-liquefied gases.
 - Nitrogen generation for purging and instrument air.
 - Spill containment and fire protection systems.
- Power Generation:
 - The site will be powered by 1 gas generator and the electrical grid initially, then 2 gas generators will replace some or all of the electrical grid supply (after 1-2 years, subject to gas supply).
 - Initial phase (from commissioning) – 1 x natural gas powered genset (MTU 16V4000), running continuously to supply 0.94 MW).
 - Once grid supply is disconnected and if gas supply is sufficient – 2 x natural gas powered genset (MTU 16V4000), running continuously.
 - Black start up only (estimated 10 minutes each time, 12 times a year) – 1250 kVA Diesel generator (KTA50 PowerBox)

Figure 3.1: Proposed Site Layout



3.2 Description of Operations

The micro LNG Plant will convert incidental coal seam gas (ICSG) from the Centurion Mine into LNG for beneficial use, reducing flaring and displacing diesel consumption in regional operations. The process includes:

- Gas Pre-treatment and Compression:
 - Filtration, amine treating for CO₂ removal, molecular sieve dehydration.
 - Pre-compression from ~0.05 bar to ~6 bar.
- Liquefaction:
 - Mixed refrigerant system cooling gas to -161°C.
- Storage and Distribution:
 - LNG stored in cryogenic tanks and transferred to road tankers for offsite delivery.

A summary of the operating profile is provided below:

- Continuous operation 24/7, remotely monitored.
- LNG production: 70 t/d, equivalent to ~35 million m³ of natural gas annually.
- Road tanker dispatch: ~70 t/day (single or multi-trailer configurations).

The facility footprint is approximately 150 m x 170 m.

3.3 Air Emission Sources

3.3.1 Operational Sources

The main air emission source during the first 1-2 years of operation will be a single gas generator set (MTU 16V4000) operating continuously. Once gas supply from Centurion Mining ramps up, a second identical gas generator will operate. A diesel generator is also proposed, however, this would only operate during black startup situations.

The proposed development also incorporates a flare system designed for controlled combustion of LNG during non-routine events. Flaring will occur intermittently, primarily during start-up, shutdown, commissioning, and emergency conditions.

Other than the above sources, other minor sources include emissions from on-site traffic / trucks.

3.3.2 Construction Phase

Construction activities may generate minor air emissions; however, these impacts are expected to be negligible. The proposed facility will utilise the existing hardstand and vehicle access, and the modular design of the micro LNG plant minimises construction intensity. Works will primarily involve installation of prefabricated LNG modules and ancillary infrastructure, including:

- Site preparation (minimal earthworks, no vegetation clearing).
- Delivery and unloading of modules using cranes and forklifts.
- Installation of cryogenic storage tank and flare stack.
- Mechanical and electrical works, piping, and instrumentation.
- Road tanker loading bay construction.

Construction is anticipated to occur over 6–8 months, with a peak workforce of approximately 30 personnel. Heavy vehicle movements will be limited to module and equipment deliveries. Given the modular nature of the plant, minimal earthworks, and the separation distance of approximately 4.3 km to the nearest sensitive receptor, air quality impacts during construction are expected to be negligible.

4. AIR QUALITY VALUES AND CRITERIA

4.1 Relevant Pollutants

4.1.1 Operation

The proposed development includes gas generators to provide continuous power and flare used to combust LNG (or incidental coal seam gas (ISCG) when the plant is not operating). Flaring is an intermittent activity and is primarily associated with start-up, shutdown, commissioning, and emergency or abnormal operating conditions.

Combustion of LNG and ICSG, which are predominantly methane, results in emissions that are limited to a small number of combustion-related pollutants. Based on the nature of the emission source, the following pollutants are considered relevant to this assessment:

- Nitrogen dioxide (NO₂), formed from high-temperature combustion processes.
- Carbon monoxide (CO), produced under conditions of incomplete combustion.
- Volatile organic compounds (VOCs), arising from incomplete combustion.

Particulate matter (PM₁₀ and PM_{2.5}), expected to be negligible due to the clean-burning nature of LNG and has not been considered in this assessment.

Sulfur dioxide (SO₂) has not been considered further, as LNG contains negligible sulfur.

The assessment focuses on pollutants with established ambient air quality objectives under the Environmental Protection (Air) Policy 2019 and its amendments, and which have the potential to impact human health.

4.1.2 Construction

Construction of the proposed development will be limited in duration and scale due to the modular nature of the plant. The LNG modular plant will be relocated from the existing Mt Magnet facility in Western Australia and installed on site as a prefabricated modular unit.

Construction activities will primarily comprise preparation of concrete footings, delivery of modular plant components by truck, lifting and placement of equipment using mobile cranes, and mechanical and electrical connections and commissioning activities. No bulk earthworks, on-site material processing, or extended construction campaigns are required.

Potential air quality emissions during construction would be limited to short-term fugitive dust generated during footing preparation and vehicle movements, and exhaust emissions from construction vehicles, cranes, and delivery trucks. These emissions are typical of small-scale construction activities and are expected to be intermittent and of low intensity.

The nearest sensitive receptor is located approximately 4.3 kilometres from the construction area. Given this separation distance, together with the limited extent and duration of construction works, construction-related air quality impacts at off-site receptors are expected to be negligible.

Accordingly, construction emissions have not been quantitatively assessed, and no construction-specific air dispersion modelling has been undertaken.

4.2 Environmental Protection Air Policy

The Environmental Protection (Air) Policy 2019 (EPP(Air)) (and Amendment Policy 2024) provides objectives for air quality indicators (pollutants) that address health, the aesthetic environment, ecosystem and agriculture. The objectives relevant to this project and human health and wellbeing, and protecting aesthetic environment have been summarised in **Table 4.1**.

Table 4.1: EPP (Air) Ambient Air Quality Objectives

Pollutant	Environmental Value	Averaging Period	Air quality objectives ($\mu\text{g}/\text{m}^3$)
Carbon Monoxide (CO)	Health and wellbeing	8-hour	11,000
Nitrogen dioxide (NO ₂)	Health and wellbeing	1-hour	164
		Annual	31
Benzene	Health and wellbeing	Annual	5.4
Formaldehyde	Protecting aesthetic environment	30-min	109
	Health and wellbeing	24-hour	54
Xylenes	Health and wellbeing	24-hour	1,200
		Annual	950
Toluene	Protecting aesthetic environment	30-min	1,100
	Health and wellbeing	24-hour	4,100
		Annual	400

5. BACKGROUND AIR QUALITY

5.1 Overview

The following sections present information on background air quality for the purpose of the assessing cumulative impacts. This includes a review of existing air emission sources and ambient air monitoring data.

5.2 Existing Local Air Emission Sources

Section 2.3 presents details of the surrounding land uses. The key air emission sources other than the Project are associated with the operation of the North Goonyella Coal Mine to the south of the site. For the purposes of this assessment, these sources have not been modelled in combination with the proposed facilities. Instead, conservative background air monitoring data have been adopted, as discussed in the following section.

5.3 Air Quality Monitoring Data

To account for cumulative impacts, predicted results have been added to background air quality data obtained from the most representative air monitoring stations. DETSI operates air monitoring stations throughout Queensland. Raw data from 2010 onwards is freely available on the Queensland Government data website (<https://data.qld.gov.au>). The period from 2020 to 2024 has been specifically analysed for the purpose of the assessment.

The nearest DETSI air quality monitoring stations are Moranbah West and Moranbah East, located approximately 42 to 43 km south-east of the site. These stations measure PM_{2.5} and PM₁₀ only. No background monitoring data for NO₂, CO, or VOCs are available for the Moranbah area.

A review of DETSI's air quality network for the 2020 to 2024 period identified 27 monitoring stations that recorded at least one year of NO₂ data, including both active sites and stations decommissioned during this interval. A map showing their locations respect to the subject site location is provided in **Figure 5.1**. As illustrated, none of these stations are located close to the site. The nearest is North Ward in Townsville, approximately 285 kilometres northwest, followed by the stations in the Gladstone region located about 400 kilometres southeast.

To provide context, a review of all available data from 2020 to 2024 has been completed. The results are presented in **Table 5.1** and **Table 5.2** for the 70th percentile one hour concentrations and the annual averages. As can be seen, the monitoring stations with the highest recorded NO₂ concentrations, namely Woolloongabba and South Brisbane are heavily influenced by traffic which is the main source of background NO₂ in Queensland. Other stations closer to industrial areas or more rural areas present significantly lower NO₂ measurements than stations in urban areas.

On this basis, a conservative approach has been adopted for the cumulative assessment by applying background NO₂ concentrations measured at the Woolloongabba station. Given that background CO levels are predominantly traffic-related, Woolloongabba has likewise been adopted as a conservative location for assessing cumulative CO impacts. A summary of the 70th percentile 8-hour average concentrations at the Woolloongabba station is presented in **Table 5.3**.

For VOCs, the only monitoring station currently measuring VOC concentrations is Memorial Park in Gladstone. This station has been adopted to represent existing background VOC concentrations, as it is located in a setting broadly comparable to the project area. The Memorial Park station, established in 2009, is influenced by major industrial activities, including the RG Tanna Coal Terminal, but is not directly adjacent to such operations, which is considered representative of the nearest sensitive receptors to the project. Details on the measured concentrations are provided in **Table 5.4**.

Figure 5.1: DETSI's Air Quality Monitoring Stations with at least 1 Year of NO₂ Data (2020 – 2024)

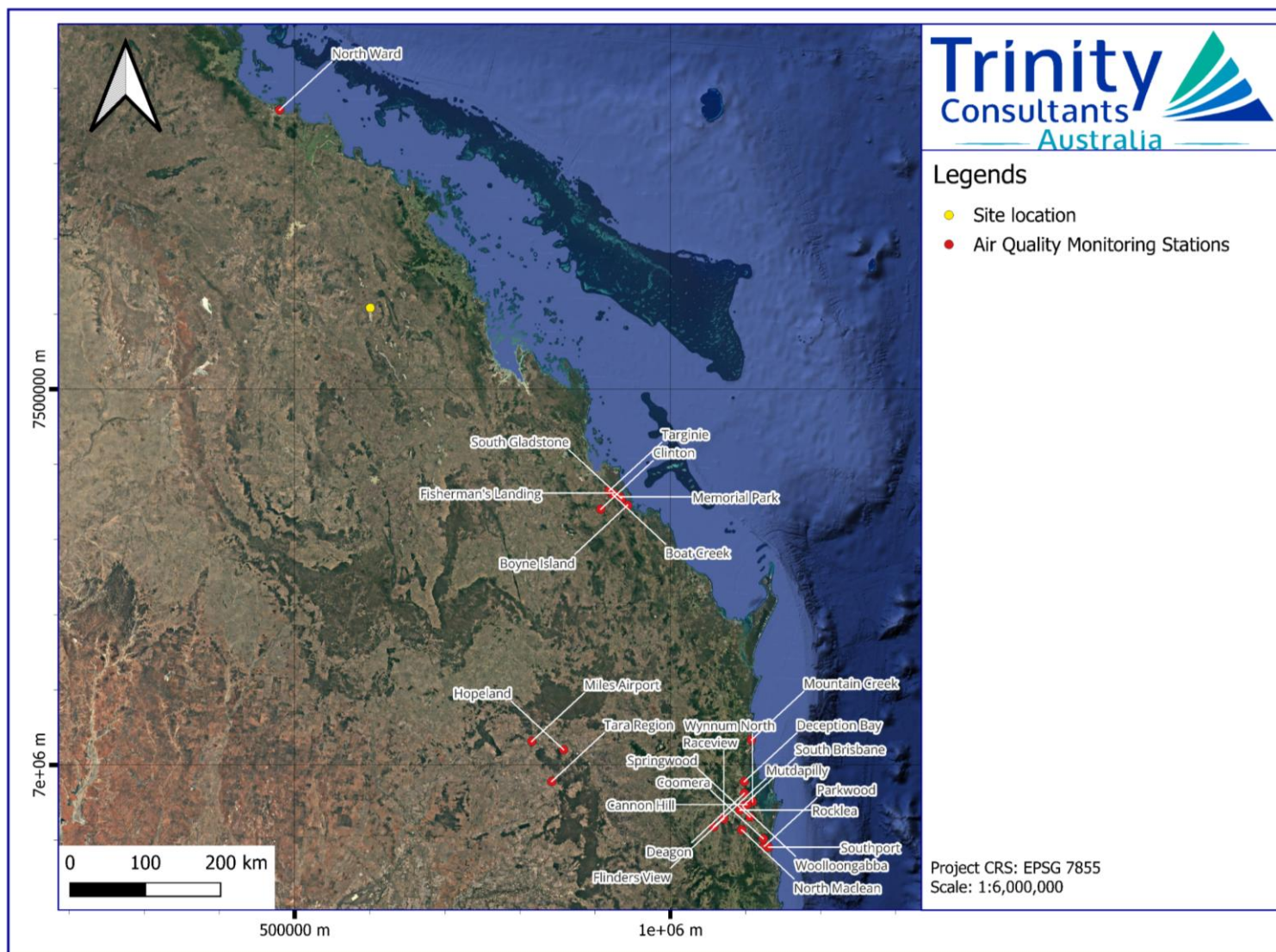


Table 5.1: NO₂ Measured Concentrations in Queensland – 70th Percentile (1-hour Concentrations)

Station Name	70 th Percentile (1-hour Concentrations)					
	µg/m ³					
	2020	2021	2022	2023	2024	Maximum
Woolloongabba	36.9	36.9	34.9	32.8	28.7	36.9
South Brisbane	32.8	30.8	32.8	30.8	30.8	32.8
Rocklea	14.4	14.4	20.5	22.6	22.6	22.6
Parkwood	-	-	-	20.5	16.4	20.5
Deagon	-	18.5	18.5	18.5	18.5	18.5
Wynnum North	12.3	18.5	14.4	14.4	12.3	18.5
Cannon Hill	-	16.4	16.4	16.4	16.4	16.4
Flinders View	16.4	16.4	14.4	16.4	14.4	16.4
Boat Creek	12.3	12.3	12.3	12.3	12.3	12.3
Raceview	-	-	-	-	12.3	12.3
Springwood	12.3	12.3	12.3	12.3	10.3	12.3
Clinton	8.2	6.2	8.2	10.3	10.3	10.3
Coomera	-	-	-	10.3	8.2	10.3
Deception Bay	10.3	10.3	10.3	10.3	10.3	10.3
Memorial Park	8.2	10.3	8.2	8.2	6.2	10.3
South Gladstone	10.3	10.3	10.3	10.3	10.3	10.3
Southport	8.2	10.3	8.2	10.3	8.2	10.3
Mountain Creek	8.2	8.2	8.2	8.2	6.2	8.2
Mutdapilly	8.2	8.2	6.2	8.2	6.2	8.2
North Maclean	8.2	8.2	6.2	8.2	6.2	8.2
Fisherman's Landing	8.2	6.2	-	-	-	8.2
North Ward	4.1	6.2	6.2	6.2	6.2	6.2
Targinie	6.2	6.2	6.2	6.2	6.2	6.2
Hopeland	4.1	4.1	2.1	4.1	-	4.1
Tara Region	4.1	4.1	-	-	-	4.1
Boyne Island	2.1	2.1	2.1	2.1	2.1	2.1

Table 5.2: NO₂ Measured Concentrations in Queensland – Annual Averages

Station Name	Annual Average µg/m ³					Maximum
	2020	2021	2022	2023	2024	
Woolloongabba	28.8	29.4	27.7	26.7	23.3	29.4
South Brisbane	26.0	25.3	25.7	24.2	25.4	26.0
Rocklea	11.8	11.4	15.1	18.5	17.8	18.5
Parkwood	-	-	-	16.9	13.9	16.9
Deagon	-	14.6	15.5	15.2	15.1	15.5
Wynnum North	10.5	15.2	12.5	12.6	11.5	15.2
Cannon Hill	-	13.7	13.2	14.7	13.8	14.7
Flinders View	14.1	13.0	11.9	13.7	12.8	14.1
Boat Creek	10.1	9.6	9.3	9.9	10.4	10.4
Raceview	-	-	-	-	9.9	9.9
Springwood	10.6	10.7	10.6	10.8	9.3	10.8
Clinton	6.6	5.9	6.8	8.5	8.0	8.5
Coomera	-	-	-	9.3	7.9	9.3
Deception Bay	8.9	9.5	8.5	9.6	8.2	9.6
Memorial Park	8.0	8.8	8.2	8.4	6.7	8.8
South Gladstone	9.8	9.4	9.2	8.8	8.4	9.8
Southport	8.1	9.0	7.8	9.8	8.1	9.8
Mountain Creek	6.7	7.2	6.7	7.2	6.4	7.2
Mutdapilly	6.6	6.1	5.8	6.2	5.2	6.6
North Maclean	6.5	6.0	5.0	6.4	4.8	6.5
Fisherman's Landing	7.6	6.1	-	-	-	7.6
North Ward	5.9	6.1	5.3	4.8	-	6.1
Targinie	4.5	5.3	5.5	5.0	4.9	5.5
Hopeland	7.1	7.3	6.5	6.9	7.1	7.3
Tara Region	3.7	3.4	2.9	3.8	0.0	3.8
Boyne Island	4.3	3.2	-	-	-	4.3

Table 5.3: CO Measured Concentrations at the Woolloongabba Station – 70th Percentile (8-hour Concentrations)

Station Name	70 th Percentile (8-hour Concentrations) µg/m ³					Maximum
	2020	2021	2022	2023	2024	
Woolloongabba	285.5	295.5	221.7	251.3	221.7	295.5

Table 5.4: VOCs Measured Concentrations at Memorial Park Station

Pollutant	Averaging Period	Statistical Value	Concentration $\mu\text{g}/\text{m}^3$					Maximum
			2020	2021	2022	2023	2024	
Benzene	Annual	Average	3.8	4.3	2.5	2.9	4.0	4.3
Formaldehyde	1-hour	70 th Percentile	6.1	6.3	4.3	3.6	3.4	6.3
	24-hour	70 th Percentile	6.6	5.9	4.0	3.4	3.1	6.6
Toluene	1-hour	70 th Percentile	7.8	7.4	5.8	4.9	5.3	7.8
	24-hour	70 th Percentile	7.6	7.2	5.2	5.1	4.7	7.6
	Annual	Average	6.8	6.6	4.9	4.7	4.5	6.8
Xylenes	24-hour	70 th Percentile	36.6	33.0	18.6	21.2	25.3	36.6
	Annual	Average	32.6	30.7	17.9	19.5	23.5	32.6

5.4 Summary of Background Data

The adopted conservative background concentrations for the assessment of cumulative impacts are summarised in **Table 5.5**.

Table 5.5: Summary of Adopted Background Concentrations

Pollutant	Averaging Period	Value $\mu\text{g}/\text{m}^3$	Source
NO ₂	1-hour	36.9	70 th Percentile Woolloongabba (2021)
	Annual	29.4	Max. Annual Woolloongabba (2021)
CO	8-hour	295.5	70 th Percentile Woolloongabba (2021)
Benzene	Annual	4.3	Max. Annual Memorial Park (2021)
Formaldehyde	1-hour	6.3	70 th Percentile Memorial Park (2021)
	24-hour	6.6	70 th Percentile Memorial Park (2020)
Toluene	1-hour	7.8	70 th Percentile Memorial Park (2020)
	24-hour	7.6	70 th Percentile Memorial Park (2020)
	Annual	6.8	Max. Annual Memorial Park (2020)

Pollutant	Averaging Period	Value $\mu\text{g}/\text{m}^3$	Source
Xylenes	24-hour	36.6	70 th Percentile Memorial Park (2020)
	Annual	32.6	Max. Annual Memorial Park (2020)

Note:

For pollutants with 30-minute average criteria, the corresponding 1-hour average background concentration has been adopted as the best available dataset.

6. METEOROLOGICAL MODELLING

6.1 Overview

Atmospheric dispersion modelling involves the mathematical simulation of the dispersion of air contaminants in the environment. The modelling utilises a range of information to estimate the dispersion of pollutants released from a source including:

- Meteorological data for surface and upper air winds, temperature and pressure profiles, as well as humidity, rainfall, cloud cover and ceiling height information;
- Emissions parameters including source location and height, source dimensions and physical parameters (e.g. effective height and length of side) along with pollutant mass emission rates;
- Terrain elevations and land-use both at the source and throughout the surrounding region;
- The location, height, and width of any obstructions (such as buildings or other structures) that could significantly impact on the dispersion of the plume; and
- Sensitive receptor locations and heights.

Meteorological modelling has been undertaken using TAPM and CALMET. The following sections present the methodology and outcomes of the meteorological modelling.

6.2 Model Year

Table 6.1 presents the measured average wind speed, proportion of calm conditions and proportion of wind speed less than 2.0 m/s for the BoM Moranbah Airport meteorological station for the years 2019 to 2023. The BoM Moranbah Airport Meteorological Station is the nearest permanent monitoring station to the site with complete dataset (approximately 50 km south of the subject site).

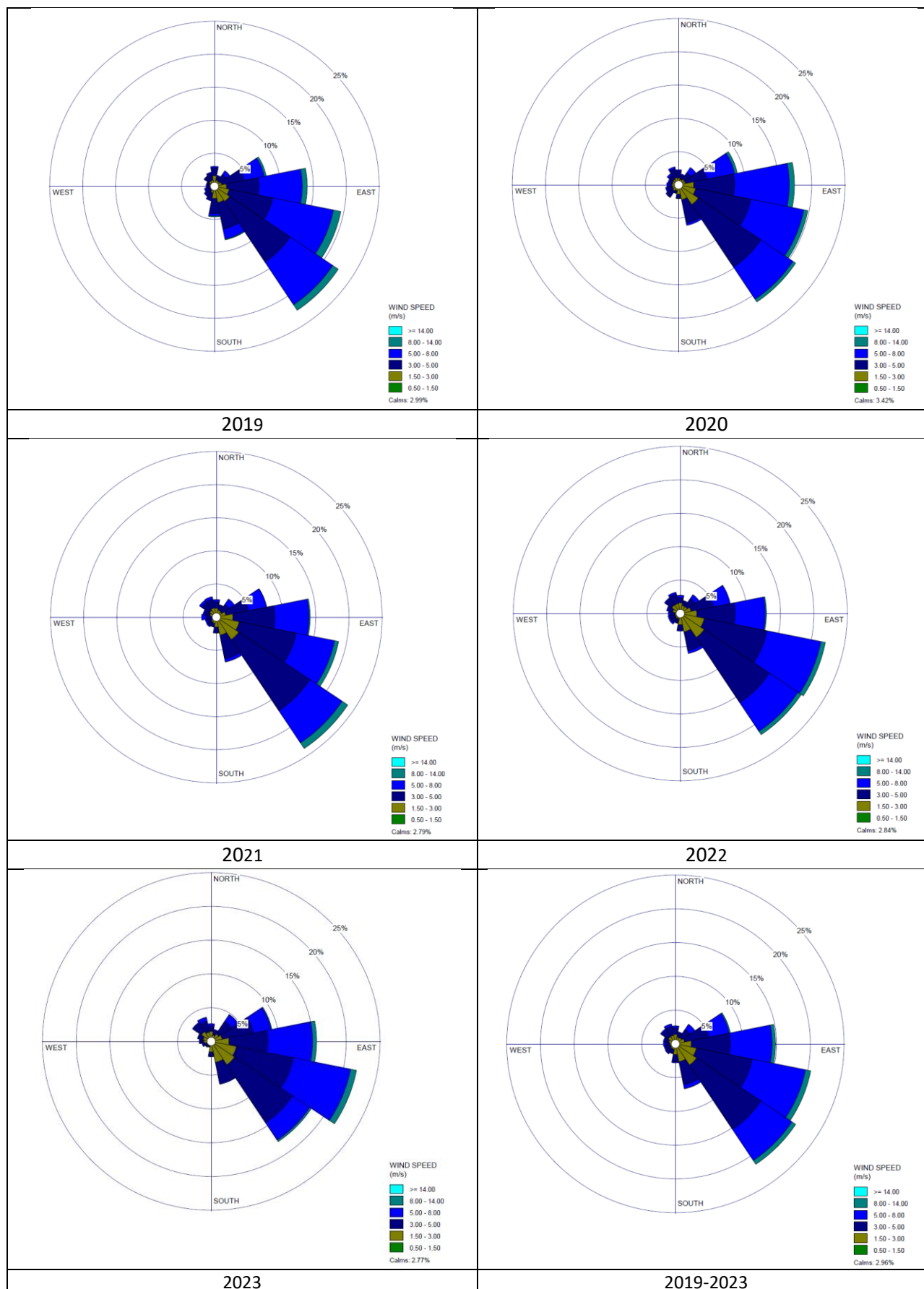
Figure 6.1 presents annual wind roses for the years 2019 to 2023. The wind roses show minimal variability in wind direction and speed. The 2020 wind rose shows a slightly higher proportion of easterly winds, which represent worst-case conditions for this assessment, given the nearest sensitive receptor is located approximately 4.3 km west of the site.

The model year 2020 has been adopted for the purpose of the assessment and is considered representative of the long-term average in terms of wind speeds and slightly conservative in terms of wind direction.

Table 6.1: BoM Moranbah Meteorological Station Data Comparison

Year	Calm Conditions (%)	Average Wind Speed (m/s)	Wind speeds <2.0 m/s (%)
2019	3.0	4.2	7.2
2020	3.4	4.1	8.0
2021	2.8	3.9	7.3
2022	2.8	3.8	8.0
2023	2.7	3.9	7.5
Average	2.9	4.0	7.6

Figure 6.1: 2019 -2023 Annual Wind Roses for the BoM Moranbah Airport Meteorological Station



6.2.1 TAPM Fundamentals

The meteorological component of The Air Pollution Model (TAPM) was used to provide wind fields over the region. The databases required to run TAPM are provided by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and include global and Australian terrain height data, vegetation and soil type datasets, sea surface temperature datasets and synoptic-scale meteorological datasets.

TAPM was setup using four nested 30 x 30 grids centred on latitude 21°37.5' south, longitude 147°58.5' east. The four nested grids were as follows:

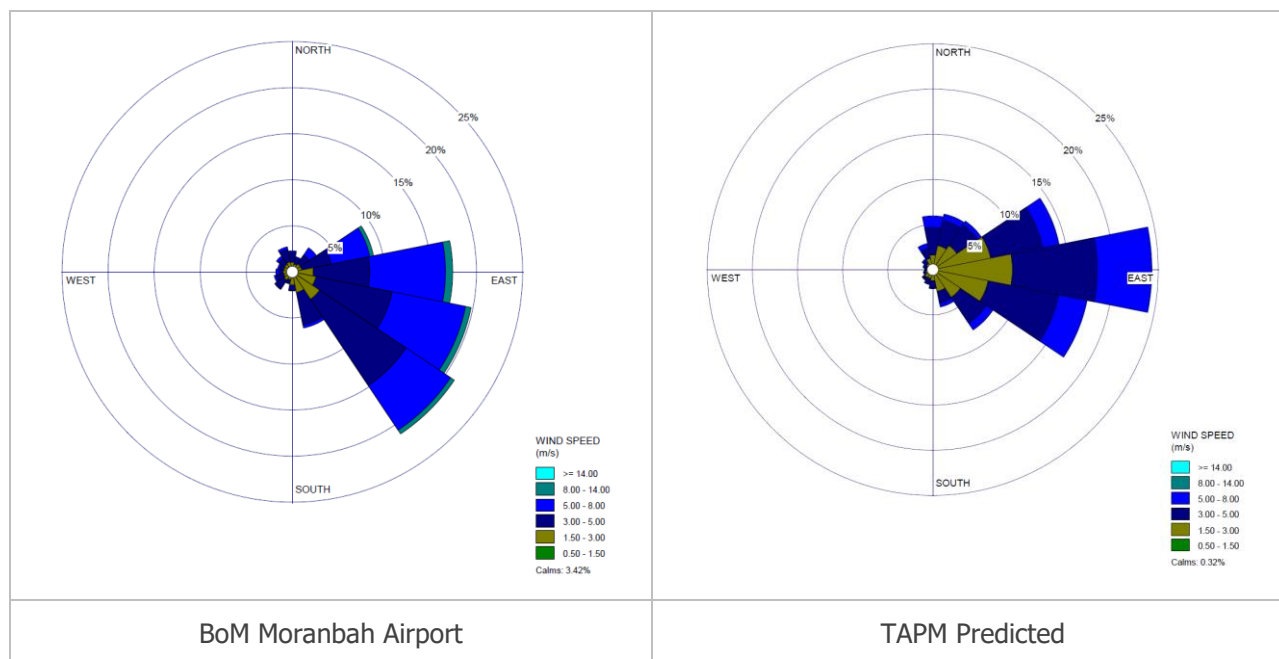
- 900 km x 900 km with 30 km resolution
- 300 km x 300 km with 10 km resolution
- 90 km x 90 km with 3 km resolution
- 30 km x 30 km with 1 km resolution

Twenty-five (25) vertical levels were used with lower-level steps at 10, 25, 50 and 100 metres up to 8 kilometres in altitude. Boundary conditions on the outer grid were derived from the synoptic analysis. Non-hydrostatic pressures were ignored due to the gentle terrain and moderate resolution.

6.2.2 Observational Data Assimilation

Wind data for the period from 1 January to 31 December 2020 were evaluated for assimilation into the model. TAPM was initially run without data assimilation, and a wind rose for the same period from the selected observational dataset was generated for comparison, as shown in **Figure 6.2**. Overall, the predicted and observed wind patterns are similar, with dominant easterly winds. Some differences are evident, including an under-prediction of south-easterly winds and an over-prediction of easterly winds. TAPM also under-predicts the frequency of calm conditions. On this basis, observational data from the Moranbah Airport station were assimilated into the TAPM model to generate the project meteorological dataset.

Figure 6.2: Wind Rose of BoM Moranbah Airport Meteorological Station Data and TAPM for year 2020



6.3 CALMET

6.3.1 Overview

As discussed in the previous section, a three-dimensional prognostic and observational dataset derived from the TAPM model was input to CALMET to predict meteorological conditions at the development and surrounding area. The following sections provide an overview of the data utilised in the CALMET modelling, along with details of some of the key parameters selected to establish calculation limits within CALMET.

6.3.2 CALMET Modelling Configuration

The CALMET configuration used is consistent with NSW OEH guidance (TRC, 2011). The model was run over the full year based on a 3-dimensional grid produced using the CALTAPM utility program to convert TAPM data to MM5 format suitable for CALMET to read. The CALMET grid was set to grid spacing of 250 metres and 110 by 110 grid points. Eleven vertical layers were modelled with cell face heights of 0, 20, 40, 80, 160, 320, 640, 1200, 2000, 3000, and 4000 metres.

Mixing height calculation parameters were set to default values except the Coriolis parameter which was set to -5.36×10^{-5} as calculated from the Coriolis parameter equation:

$$f = 2 \Omega \sin (\phi)$$

Where:

- F is the Coriolis parameter;
- Ω is the Earth's rotation rate ($2\pi/86400$ or $7.29 \times 10^{-5} \text{ rad}\cdot\text{s}^{-1}$);
- ϕ is the latitude which in this case is -21.627° .

6.3.3 Terrain and Land Use Data

Terrain height was based on data from the Shuttle Radar Imaging Mission (SRTM) and obtained from Geoscience Australia. This produced terrain height data on 1 arc-second longitude/latitude grid (approximately 0.03 kilometres) for a grid representative of the area around the existing landfill and waste management facility.

The TERRAD value in CALMET is used to determine the radius of influence for terrain features within the model domain. The TERRAD value has been calculated based on the rule 'ridge-to-ridge divided by 2, rounded up' recommended by the NSW Office of Environment and Heritage (TRC, 2011). Based on an average ridge to ridge distance a TERRAD value of 1 has been adopted.

Land use data was also created based on the Queensland Government Land Use Dataset and satellite imagery and incorporated into the CALMET model. Where land use categories do not correspond with the CALMET land use input file categories, satellite imagery has been reviewed to determine the most appropriate land use category. **Figure 6.3** and **Figure 6.4** present the modelled Terrain and land use in CALMET.

Figure 6.3: Modelled Terrain

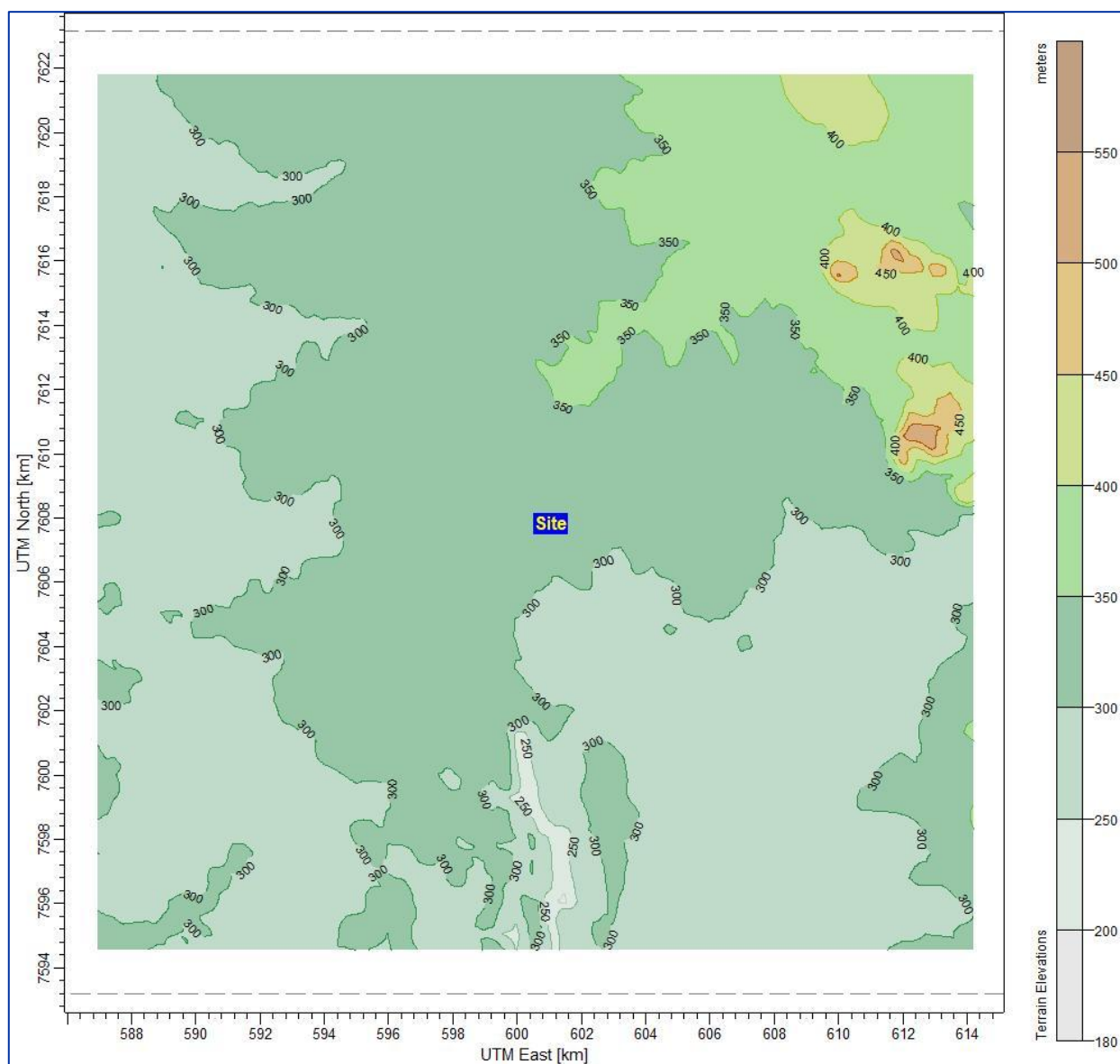
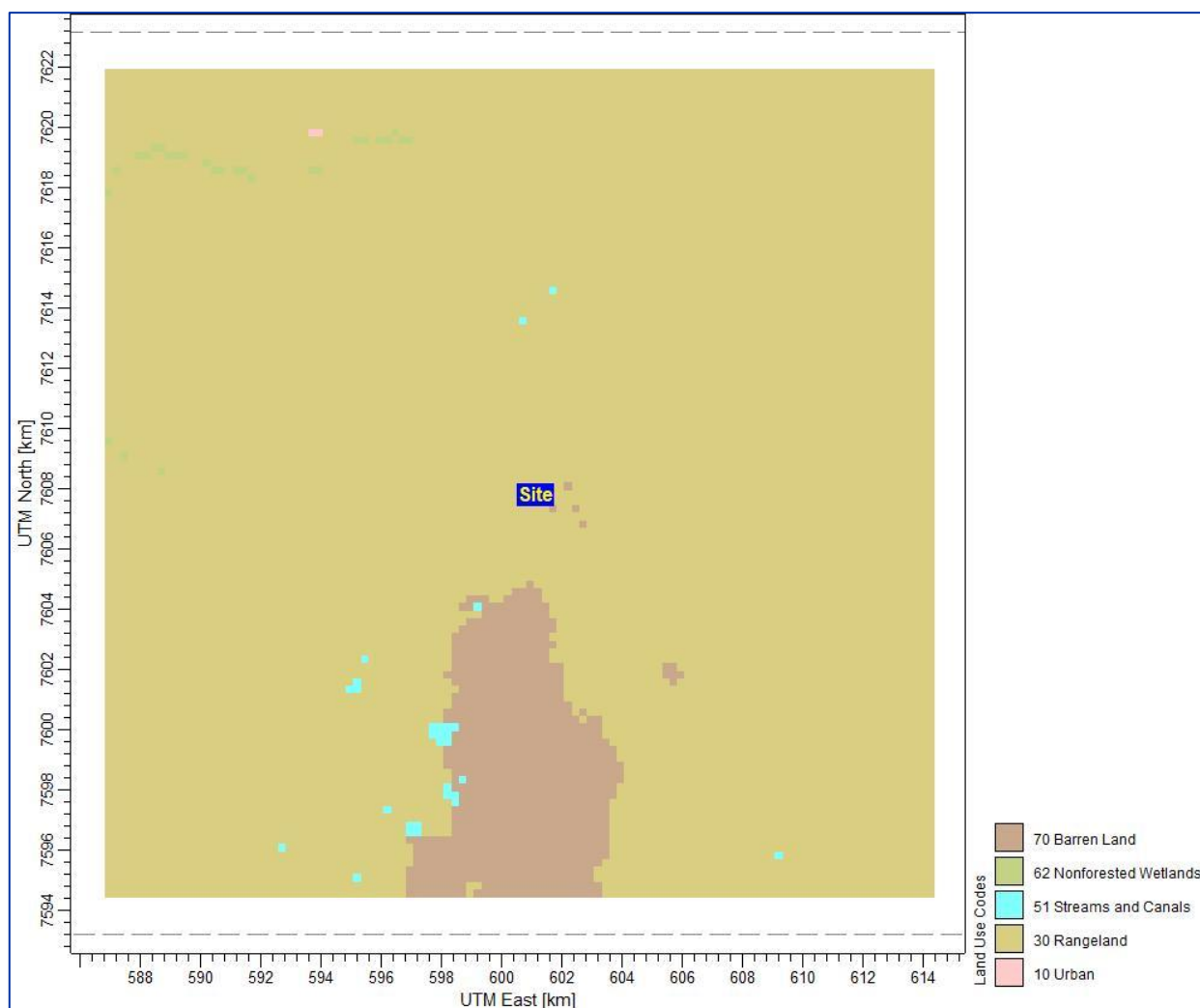


Figure 6.4: Modelled Land Use



6.4 CALMET Results

The frequency distributions of occurrences of winds for each direction sector and for each wind class (wind rose) as generated by CALMET are illustrated in **Figure 6.5**. The predicted wind rose is comparable to that measured at the BoM Moranbah Airport station, which is consistent with the predominantly flat terrain and absence of significant topographic features affecting local wind flows.

Figure 6.5: CALMET Site Predicted Wind Rose

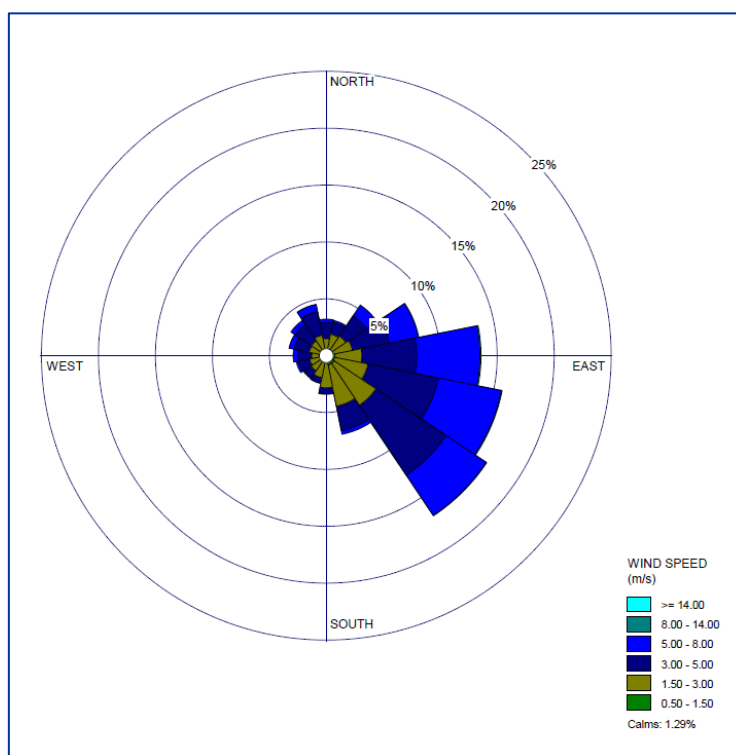


Figure 6.6 presents a plot showing predicted mixing heights for each hour of the day. As expected, higher mixing heights occur during the day period, while lower mixing heights occur during the night period when stable conditions are dominant and temperature inversions occur. In the morning, the mixing rises gradually, reaching an average of approximately 1.2 kilometres by the afternoon, then reforming near ground level again at nightfall.

Figure 6.6: CALMET Site Predicted Mixing Heights

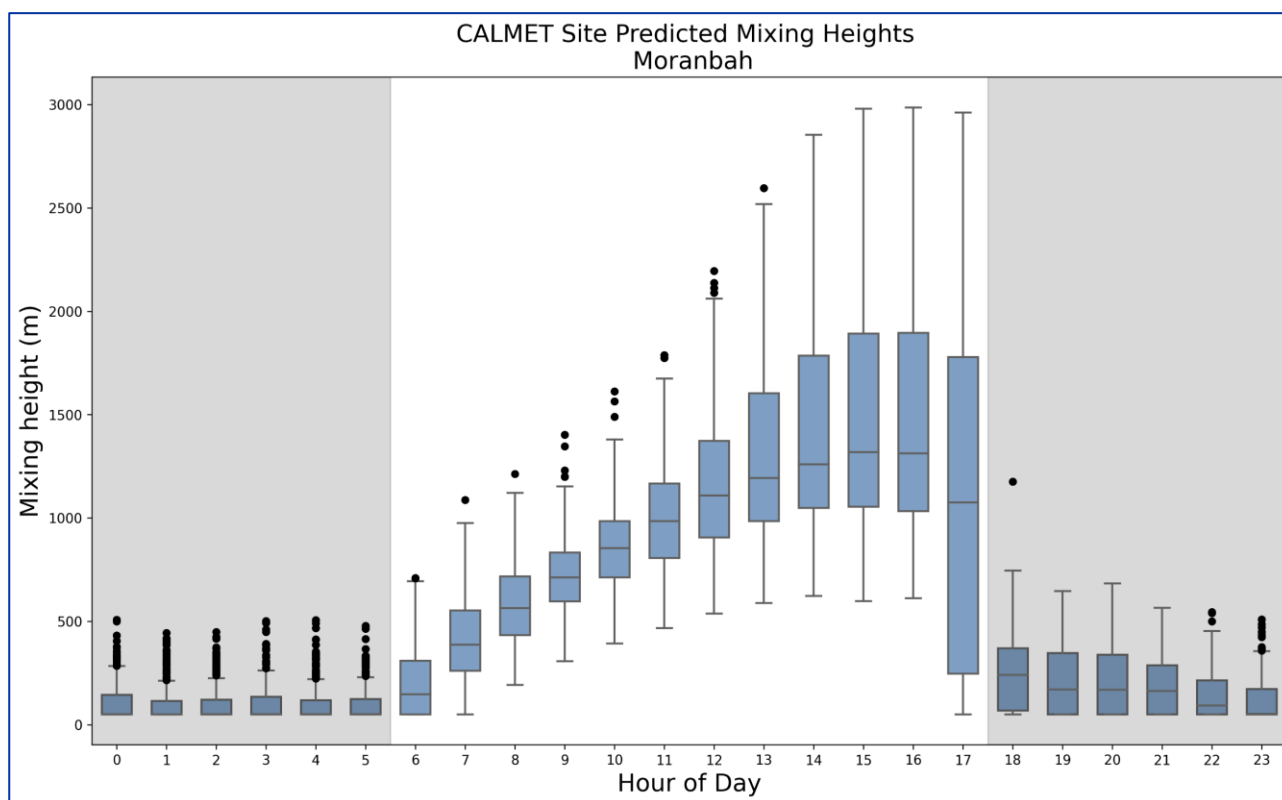
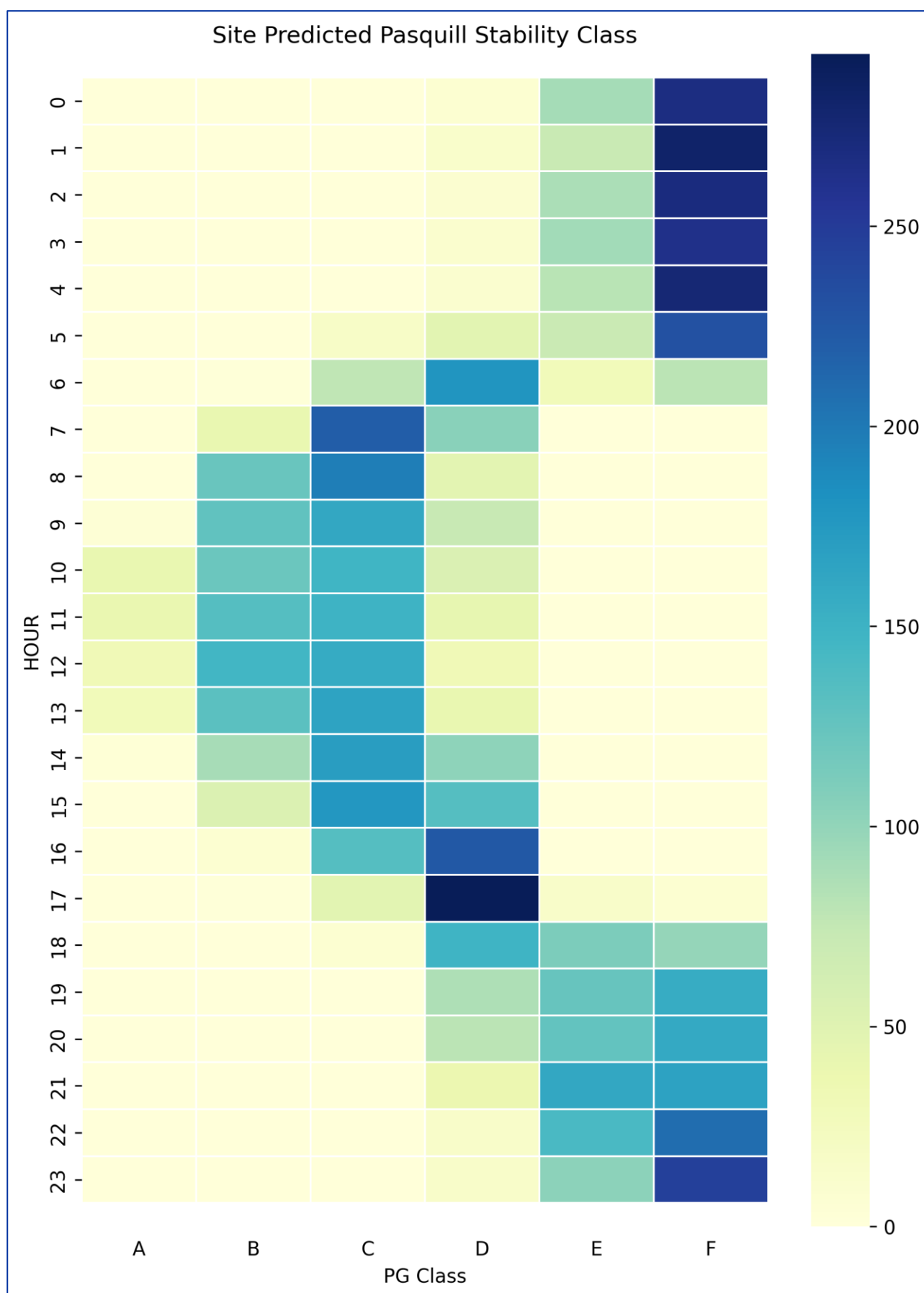


Figure 6.7 shows the frequency of stability classes throughout the day. Day time conditions are either neutral or unstable, whilst nighttime conditions are stable.

Figure 6.7: Diurnal Frequency of Stability Classes



7. EMISSION SOURCES

7.1 Overview

As discussed in **Section 3.3**, the key air emission sources are the gas generators. The flare operates intermittently and is not used during normal operations. Emissions occur during venting events and upset conditions, when excess gas is directed to the flare for controlled combustion to maintain safe operation of the facility.

Construction emissions would be limited to short-term fugitive dust and vehicle exhaust from minor construction activities. Given the separation distance of approximately 4.3 km to the nearest sensitive receptor and the limited duration of works, off-site air quality impacts are expected to be negligible. Accordingly, construction emissions have not been quantitatively assessed or modelled.

7.2 Emission Rates and Parameters

7.2.1 Power Generation

Emission rates and parameters for the power generation plant have been based on supplier specifications (MTU 16V4000 GS Technical Data Sheet), as shown in **Table 7.1** and **Table 7.2**.

Table 7.1: Modelled Source Parameters – Power Generation

X-Coordinate (m)	Y-Coordinate (m)	Effective Stack Height (m)	Exit Temperature (K)	Effective Diameter (m)	Exit Velocity (m/s)
600,639.5	7,608,192.6	9.6	748	0.46	21.6
600,629.5	7,608,198.3	9.6	748	0.46	21.6

Note: The capacity of each generator is 2 MW. Based on preliminary information, each generator could operate at 1.2 MW (60% load). Emission parameters have been provided at 50%/75%/100% load. 60% load parameters (flow rate/velocity, temperature) have been interpolated from the available data.

Table 7.2: Emission Factors and Calculated Emission Rates – Power Generation

Pollutant	Emission Factor (mg/Nm ³)	Emission Rate per Generator (g/s)
NO _x	< 500	0.66
CO	< 1000	1.31
Total VOCs*	0.0000033 kg/KWh	0.0011

Note *: VOC emission factor not provided by supplier. References has been made to the NPI Emission Estimation Technique Manual for Combustion Engines Version 3.0 (Table 51 – Uncontrolled gas turbine natural gas engines).

7.2.2 Flare

Flare emission rates were calculated using emission factors published in the USEPA AP-42 Compilation of Air Pollutant Emission Factors from Stationary Sources (USEPA, 2018). *Chapter 13.5 Industrial Flares* provides emission factors for nitrogen oxides, carbon monoxide and volatile organic compounds based on the thermal energy released.

The emission rates included in the air dispersion modelling are presented in **Table 7.3**. Although these emissions are intermittent, they have been modelled as continuous to provide a conservative assessment.

Table 7.3: Emission Factors and Calculated Emission Rates - Flare

Pollutant	Emission Factor (lb/10 ⁶ Btu)	Emission Rate ^{a,b} (lb/h)	Emission Rate (g/s)
NO _x	0.068	17.07	2.15
CO	0.31	77.81	9.80
Total VOCs ^c	0.66	165.66	20.87

Notes:

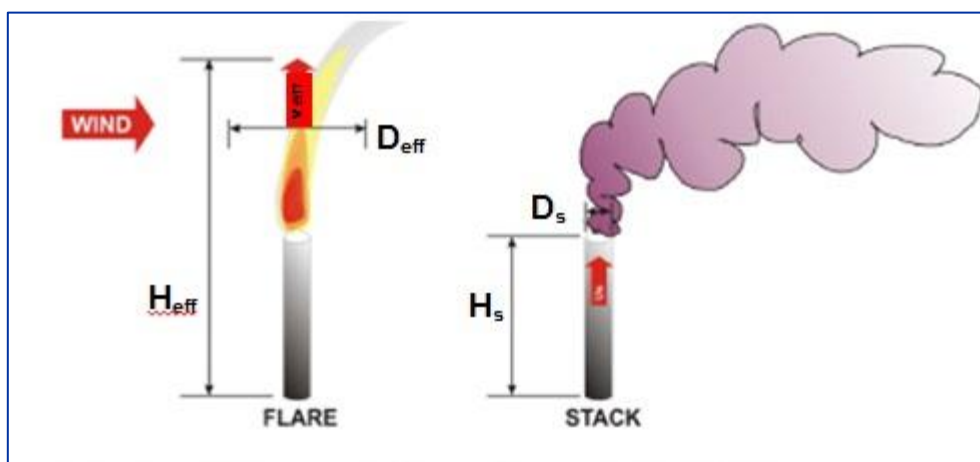
a – Calculations are based on a total heat release of 251 MMBtu per hour, as specified in the flare design provided by Aereon.

b – 1 MMBtu equivalent to 1,000,000 Btu.

c – Speciated VOC data is unavailable; therefore, the total VOC emission rate has been applied conservatively to each individual VOC species considered in this assessment.

Open flares are typically represented in dispersion models using a point source formulation, as most models do not include a dedicated flare source type. While this approach is acceptable, the key challenge lies in defining representative source parameters. Unlike conventional stacks typically seen at industrial facilities, open flares do not have a physical exhaust outlet. Emissions are released from the flame, which is characterised by high temperature and strong buoyancy. To account for this, effective source parameters, such as an effective release height and effective diameter (see **Figure 7.1**), are derived to approximate the location and characteristics of the emission point. These parameters are used to ensure that plume rise and dispersion are represented appropriately within the limitations of the model.

Figure 7.1: Flare Emissions Illustration



The effective release height above ground is calculated by adding the flare height to the stack height using Beychok equation as described in the *Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants* (USEPA, 1992):

$$H_{eff} = H_s + 4.56 \times 10^{-3} \times \left(\frac{H_r}{4.1868} \right)^{0.478} \quad \text{Equation 1}$$

Where:

- H_{eff} is the effective release height above ground (metres)
- H_s is the actual flare stack height above ground (metres)
- H_r is the net heat release rate (J/s)

$$H_r = H_t \times (1 - f) \quad \text{Equation 2}$$

Where:

- H_t is the total heat available from combustion (J/s)

- f is the percentage of heat loss by radiation (typically conservatively assumed 55% for example in the USEPA SCREEN3 model)

Based on Equations 1 and 2, and adopting an actual stack height of 15 m provided by the client with a total heat available from combustion of 251 MMBtu/h (73,560,839 J/s), the effective release height modelled is 24.04 m.

Typical values used for modelling flares, obtained from the SCREEN3 model, are somewhat arbitrary but are considered to produce reasonable buoyancy flux and plume rise estimates. These values are:

- $T_s = 1273$ K (pseudo point source release temperature)
- $V_{eff} = 20$ m/s (vertical velocity)

The approach used to calculate the effective diameter, which is widely applied by regulatory agencies such as the US EPA, uses Equations 3 and 4 derived from the Briggs plume rise equation:

$$D_{eff} = 2 \times \sqrt{\frac{F_b \times T_s}{g \times V_{eff} \times (T_s - T_{amb})}} \quad \text{Equation 3}$$

$$F_b = g \times \frac{H_r}{\pi \times \rho_{air} \times T_{amb} \times C_{p,air}} \quad \text{Equation 4}$$

Where:

- D_{eff} is the effective diameter (metres)
- F_b is the buoyancy flux (m^4/s^3)
- g is the acceleration due to gravity (9.81 m/s^2)
- T_{amb} is the ambient temperature in K (assumed 298 K)
- ρ_{air} is density of air at ambient temperature and pressure (1.2 kg/m^3)
- $C_{p,air}$ is the specific heat of dry air at ambient temperature (1004 J/kg.K)

The effective diameter of the pseudo point source is therefore 1.86 metres.

The modelled source details are summarised in **Table 7.4**.

Table 7.4: Modelled Source Parameters - Flare

X-Coordinate (m)	Y-Coordinate (m)	Effective Stack Height (m)	Exit Temperature (K)	Effective Diameter (m)	Exit Velocity (m/s)
600,731.1	7,608,063.6	24.04	1,273	1.86	20

8. DISPERSION MODELLING METHOD

8.1 Overview

A mathematical model is used to simulate the dispersion and deposition of pollutants after they are emitted into air. It is accepted by regulatory agencies that this type of modelling has associated uncertainties. These are normally addressed by using statistics over long simulation times and deriving emission rates based on published emission factors or data representing high emission conditions.

CALPUFF (Version 7.2.1) was chosen as the appropriate model for this assessment. The predictions undertaken for this assessment are based on the following method:

- Prediction of input meteorology was completed using TAPM developed by the CSIRO Division of Atmospheric Research. TAPM's prognostic 3-dimensional meteorological components can be used to generate hourly meteorological data for input into dispersion models. TAPM was run over a full representative year (2020) to include all seasons. It uses gridded terrain data at approximately 300 metre grid spacing to shape the wind fields.
- TAPM input meteorology was enhanced using CALMET, the meteorological pre-processor for CALPUFF. This fits the wind fields to the terrain based on gridded terrain data at approximately 5 metre grid spacing.
- Pollutant concentrations were predicted using CALPUFF.

8.2 CALPUFF Configuration

The 3-dimensional wind fields from CALMET were entered into CALPUFF for the full year (2020). CALPUFF was run over a computational grid the same size as the meteorological grid (28 kilometres x 28 kilometres) with 250 metre grid spacing.

Wind speed profile was set to the Industrial Source Complex (ISC) Rural exponents. Transitional plume rise, stack tip downwash and partial penetration of boundary layers were included. Numerical plume rise method was used as the emissions are significantly hotter than the ambient air.

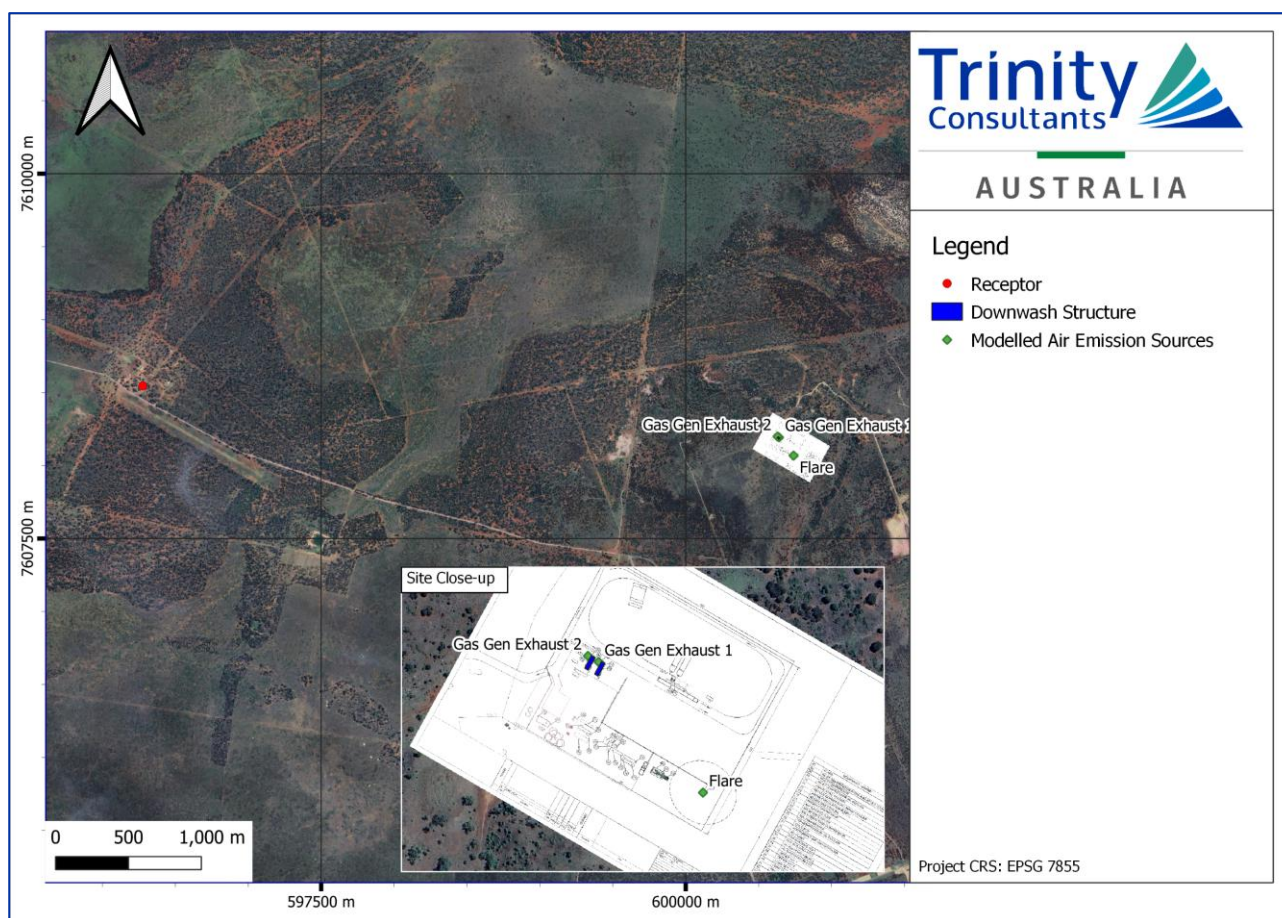
The emissions were modelled as puffs (no slugs) for more accurate point source modelling and puff splitting was turned off.

Dispersion coefficients were derived by the model using turbulence computed from micrometeorology. The Heffter curve was used to compute time-dependent dispersion beyond 550 metres. The partial plume path adjustment method was used to allow winds to approach hills as terrain increases.

The minimum turbulence velocity, σ_v , was set to 0.2 m/s.

Figure 8.1 shows the modelled source and receptor.

Figure 8.1: Modelled Receptor and Source



8.3 Building Downwash

Each gas generator unit (approximately 4 metres high) has been included as a downwash structure, potentially affecting pollutant dispersion from the exhaust stacks.

8.4 Nitrogen Dioxide Modelling

As a conservative approach, all predicted NO_x concentrations were assumed to be fully converted to NO_2 .

9. DISPERSION MODELLING RESULTS

9.1 Limitations

The uncertainties associated with this type of assessment are normally only dealt with in a qualitative manner, but include:

- source measurement estimation techniques
- source strength variability
- meteorological data variability
- inherent uncertainty in dispersion modelling.

Typically 95% confidence intervals are estimated to require a multiplicative factor of 2 or 3. In this case, the uncertainty is mostly due to assumptions regarding the details of emission sources. This has been addressed by adopting conservative source parameters, assuming continuous flare operation for modelling purposes, assuming 100% conversion of NO_x to NO₂, and applying total VOC concentrations to each individual speciated VOC.

9.2 Predicted Concentrations

The maximum predicted concentrations for the modelled discrete receptor are summarised in **Table 9.1** and **Table 9.2**. Concentration plots for CO (8-hour average) and (NO₂ 1-hour average) are presented in **Figure 9.1** and **Figure 9.2**.

The modelling predicts compliance with the air quality criteria for all pollutants and averaging periods assessed at the nearest sensitive receptor location. CO and NO₂ source-only predictions are very low and even considering highly conservative background concentrations, the cumulative concentrations are predicted to be below the criteria.

The NO₂ annual prediction is just below the annual average goal, however, the predicted concentration is defined by the adopted background concentration. The predicted source contribution is less than 1% of the annual average goal (even when assuming 2 generators are operating continuously and 100% NO_x conversion).

VOC predictions also demonstrate compliance with their respective goals, even under the conservative assumption that total VOCs are assigned to each individual VOC species. The closest result to a criterion is the annual average benzene concentration, with a predicted total VOC value of 5.3 µg/m³ compared to a benzene criterion of 5.4 µg/m³. However, the flare, which defines VOC predictions, is an intermittent source that has been conservatively modelled as operating continuously, and therefore the predicted annual average concentration is highly conservative and actual annual concentrations are expected to be significantly lower.

It is noted that the modelling assumes each gas generator operates at 1.2 MW each (total 2.4 MW). Ultimately, the final gas generator needs are not known at the current stage of the project and will also depend on gas supply. Based on the very low source only results, even if the power requirement was doubled (resulting in the doubling of emission rates), compliance with the air quality goals is still expected.

Overall, the results show very low source contribution at sensitive receptors, and this is largely due to the large separation distance. It is concluded that the Project is suitably located and designed with respect to minimising air quality impacts.

Table 9.1: Maximum Predicted Concentrations – CO and NO₂

Type	CO (µg/m³)	NO ₂ (µg/m³)	
Averaging Period	8-hour	1-hour	Annual
Source Only	14.1	23.4	0.3
Cumulative	309.6	60.3	29.7
Criteria	11,000	164	31

Table 9.2: Maximum Predicted Concentrations – VOCs

Type	Benzene (µg/m³)	Formaldehyde (µg/m³)			Toluene (µg/m³)	Xylenes (µg/m³)		
Averaging Period	Annual	30- minute	24-hour	30- minute	24-hour	Annual	24-hour	Annual
Source Only	1.0	30.9	1.0	30.9	6.7	1.0	6.7	1.0
Cumulative	5.3	37.2	7.6	38.7	14.3	7.8	43.3	33.6
Criteria	5.4	109	54	1,100	4,100	400	1,200	950

Figure 9.1: Predicted Cumulative CO 8-Hour Average Concentrations

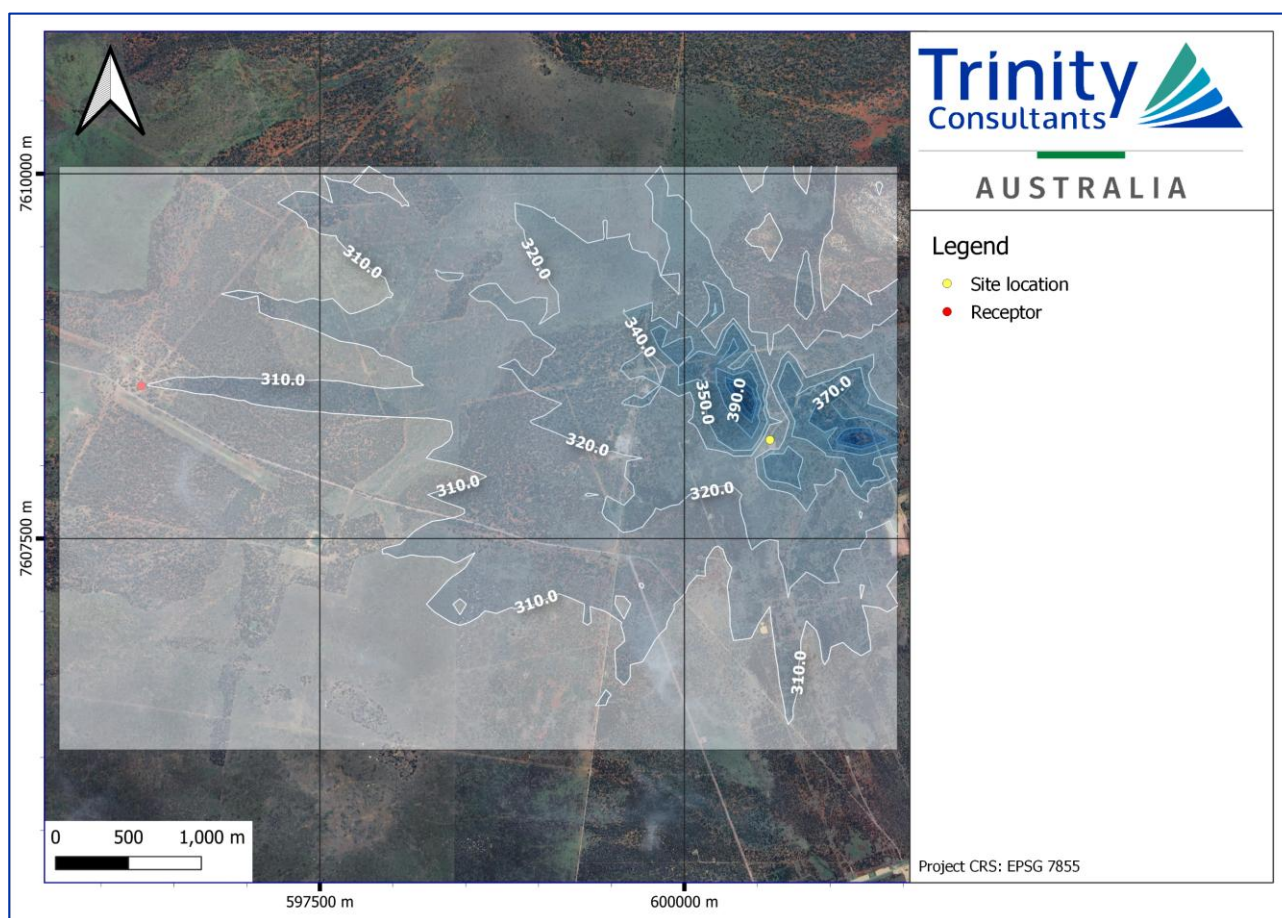
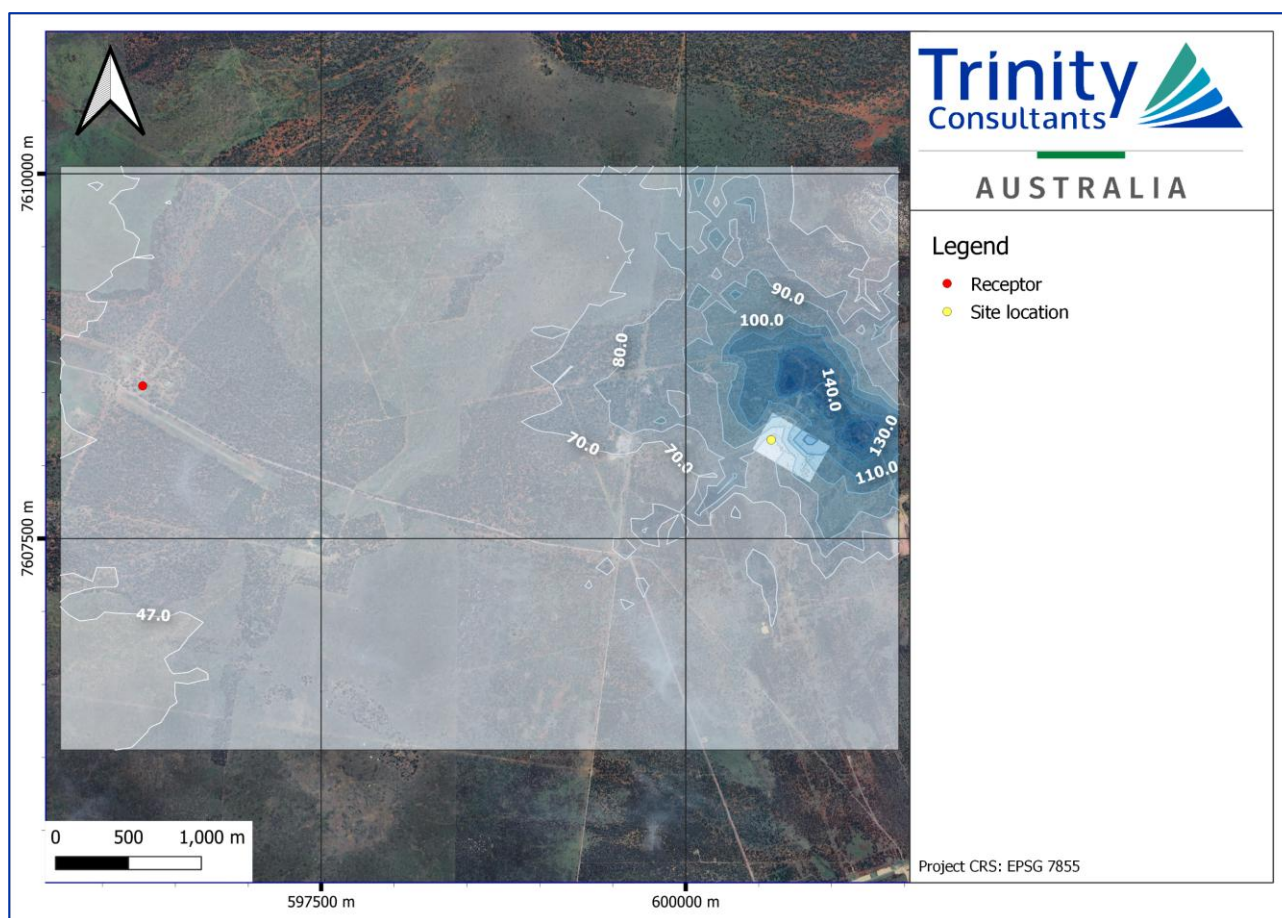


Figure 9.2: Predicted Cumulative NO₂ 1-Hour Average Concentrations



10. CONCLUSIONS

An air quality assessment has been conducted for the Micro Liquefied Natural Gas (LNG) Plant at North Goonyella, Moranbah, Queensland. The conclusions of the assessment are summarised as follows:

- The main air emission sources during operation are two gas generators operating continuously and a flare (operating when required). Construction emissions are limited to minor fugitive dust and vehicle exhaust during plant installation and minimal earthworks.
- The key pollutants considered are nitrogen dioxide, carbon monoxide, and volatile organic compounds associated with the combustion of natural gas, with particulate matter and sulfur dioxide deemed negligible.
- The nearest sensitive receptor is Denham Homestead located approximately 4.3 kilometres west of the proposed site, with other receptors further away from the site.
- Air dispersion modelling predicts compliance with all relevant ambient air quality objectives for nitrogen dioxide, carbon monoxide, and volatile organic compounds at the nearest sensitive receptor, even under conservative assumptions such as multiple gas generator units, continuous flare operation, full conversion of NO_x to NO₂ and elevated background levels.

Overall, the low predicted concentrations demonstrate that the Project is suitably located and designed with respect to minimising air quality impacts.

11. REFERENCES

- TRC. (2011). *Generic Guidance and Optimum Model Settings for the Calpuff Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessment of Air Pollutants in NSW, Australia', prepared for NSW Office of Environment and Heritage.*
- USEPA. (1992). *Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants.*
- USEPA. (2018). *AP 42 Compilation of Air Emissions Factors from Stationary Sources: Chapter 13.5 Industrial Flares.*

APPENDIX A GLOSSARY

Parameter or Term	Description
BoM	Bureau of Meteorology
CALMET	Diagnostic meteorological model included in the CALPUFF Modelling System
CALPUFF	Gaussian puff dispersion model included in the CALPUFF Modelling System
CALTAPM	Utility used to convert TAPM output files into a format readable by CALMET
CO	Carbon monoxide
Conversion of ppm to mg/m ³	Where R is the ideal gas constant; T, the temperature in Kelvin (273.16 + T°C); and P, the pressure in mm Hg, the conversion is as follows: $\text{mg/m}^3 = (P/RT) \times \text{Molecular weight} \times (\text{concentration in ppm})$ $= \frac{P \times \text{Molecular weight} \times (\text{concentration in ppm})}{62.4 \times (273.2 + T^\circ\text{C})}$
DETSI	Queensland Department of Environment, Tourism, Science and Innovation
EA	Environmental Authority
EPP(Air)	Queensland Environmental Protection (Air) Policy 2019
g/s	Grams per second
m/s	Metres per second
NO _x	Oxides of nitrogen including nitric oxide and nitrogen dioxide
NO ₂	Nitrogen dioxide
PM _{2.5}	Particulates suspended in air with aerodynamic diameter less than 2.5 microns
PM ₁₀	Particulates suspended in air with aerodynamic diameter less than 10 microns
ppb	Parts per billion by volume
ppm	Parts per million by volume
SO ₂	Sulphur dioxide
TAPM	The Air Pollution Model developed by CSIRO and used by ASK for meteorological modelling
Terrad	Radius of influence of terrain features in the CALMET model
µg/m ³	Micrograms per cubic metre
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTM	Universal Transverse Mercator coordinate system
Vic EPA SEPP	Victorian Environment Protection Agency State Environment Protection Policy
VOCs	Volatile organic compounds



BRISBANE

A: Level 3, 43 Peel Street
South Brisbane, QLD 4101
T: +61 7 3255 3355
E: brisbane@trinityconsultants.com

GLADSTONE (Vision Environment)

A: Unit 3, 165 Auckland Street
PO Box 1267
Gladstone, QLD 4680
T: +61 7 4972 7530
E: office@visionenvironment.com.au

SYDNEY

A: Upper Ground, 55 Brisbane Street
Surry Hills, NSW 2010
T: +61 2 7255 4077
E: sydney@trinityconsultants.com

APPENDIX D. – NOISE ASSESSMENT (Trinity)

CENTURION LIQUEFIED NATURAL GAS FACILITY

Noise Impact Assessment

**South Queensland Environmental Expertise & Services Pty
Ltd**

Date
3 June 2026

Report
257401.5023.R02V02

DOCUMENT CONTROL

Prepared by: Trinity Consultants Australia
 ABN 62 630 202 201
 A: Level 3, 43 Peel Street
 South Brisbane, QLD 4101
 T: +61 7 3255 3355
 E: brisbane@trinityconsultants.com

Reference	Date	Description	Prepared	Checked
257401.5023.R02V01	19/01/2026	Final	Burak Ayva	Sam Wong
257401.5023.R02V02	03/06/2026	New Layout - Additional Noise Sources	Burak Ayva	Sam Wong

Document Approval	
Approver Signature	
Name	Samuel Wong
Title	Manager – Air and Noise

COPYRIGHT AND DISCLAIMERS

This report has been prepared by Trinity Consultants Australia (Trinity), with all reasonable skill, due care and diligence in accordance with Trinity Quality Assurance Systems, based on ISO 9001:2015. This report and the copyright thereof are the property of Trinity and must not be copied in whole or in part without the written permission of Trinity.

This report takes account of the timescale, resources and information provided by the Client, and is based on the interpretation of data collected, which has been accepted in good faith as being complete, accurate and valid.

Trinity disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

This report has been produced specifically for the Client and project nominated herein and must not be used or retained for any other purpose. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Trinity.

CONTENTS

1.	Introduction	1
2.	Study Area Description	2
2.1	Zoning of Site and Surroundings	2
2.2	Identification of Sensitive Receptors	3
3.	Proposed Development	5
3.1	Key Features.....	5
3.2	Description of Operations	6
3.3	Noise Sources	6
3.3.1	Operational Sources	6
3.3.2	Other Operating Scenarios.....	7
3.3.3	Construction Phase	7
4.	Existing Acoustic Environment	8
5.	Noise Criteria	10
5.1	Overview	10
5.2	Environmental Protection Act 1994.....	10
5.3	Environmental Protection (Noise) Policy 2019	10
5.3.1	Overview	10
5.3.2	Acoustic Quality Objectives	10
5.3.3	Background Creep.....	11
5.4	Proposed Criteria.....	12
6.	Operational Noise Assessment	13
6.1	Model Description.....	13
6.2	Meteorology.....	13
6.3	Noise Source Data.....	13
6.4	Predicted Noise Levels	15
6.5	Predicted Noise Levels with Mitigation	16
7.	Recommendations and Conclusion	18

APPENDICES

Appendix A	Glossary
Appendix B	Noise Contours

1. INTRODUCTION

Trinity Consultants Australia (Trinity) was commissioned by South Queensland Environmental Expertise & Services Pty Ltd to provide a noise impact assessment for the proposed Micro Liquefied Natural Gas (LNG) Plant at North Goonyella, Moranbah, Queensland.

The proposed development involves operation of a 70 tonnes per day (tpd) Micro LNG Plant. The plant will receive incidental coal seam gas diverted from flaring at the Centurion North Goonyella Mine, which will be piped to the site. The Micro LNG Plant is a modular facility and has recently been in operation at Mt Magnet in Western Australia. The plant will also include amine regeneration plant, gas heater, diesel backup generator and flare.

This noise impact assessment report is to accompany an Environmental Authority (EA) Application for consideration by the Department of Environment, Tourism, Science, and Innovation (DETSI) to carry out the proposed development.

The purpose of this report is as follows:

- Outline the relevant project noise criteria.
- Present the results of historical noise monitoring.
- Predict and assess the noise emissions from the development and assess the noise impacts onto nearby noise sensitive receivers.
- Describe noise mitigation requirements, if any.

To aid in the understanding of the terms in this report a glossary is included in **Appendix A**.

Trinity previously prepared a report in January 2026 (Trinity report 257401.5023.R02V01). This revised report will be included in a response to request for information from DETSI issued on 30 April 2026 (application reference A-EA-NEW-101041729). The RFI did not specifically require additional information on noise, but responses to items relating to air emissions triggered the need to review the noise emissions and impacts, which requires consideration of additional noise sources.

2. STUDY AREA DESCRIPTION

2.1 Zoning of Site and Surroundings

The proposed site for the facility is located at the northern quadrant of the ML6949 Centurion Coal Mine lease area at North Goonyella, Moranbah, Queensland, approximately 41.3 km from the northwest edge of the Moranbah township. The site is a previously disturbed laydown area with existing hardstand and minimal vegetation.

The site for the development is designated as being within a Rural Zone under the Isaac Regional council planning scheme 2021. The proposed development is surrounded by the following uses:

- To the north is predominantly vegetation
- To the west is the Old Denham Park
- To the east is predominantly vegetation
- To the south is North Goonyella Coal Mine

The zoning of the subject site and surrounding area is shown in **Figure 2.1**. The proposed development within the subject site is shown in **Figure 2.2**.

Figure 2.1: Zoning Map (Isaac Regional Council Plan)

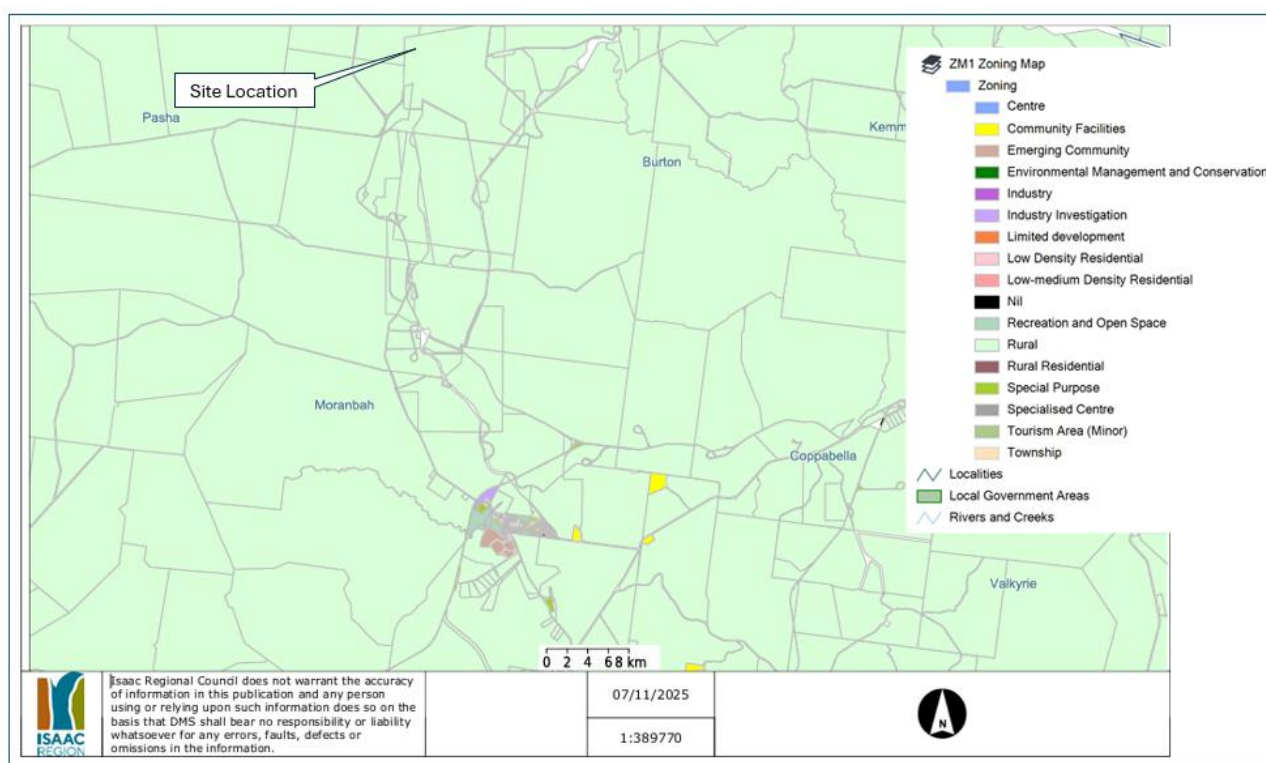


Figure 2.2: Site Locations



2.2 Identification of Sensitive Receptors

The Department of Environment, Tourism, Science and Innovation (DETSI) defines a sensitive place and commercial place as follows:

- Sensitive place:
 - A dwelling, mobile home or caravan park, residential marina or other residential place;
 - “dwelling” means any of the following structures or vehicles that is principally used as a residence-
 - a house, unit, motel, nursing home or other building or part of a building;
 - a caravan, mobile home or other vehicle or structure on land;
 - a watercraft in a marina.
 - a motel, hotel or hostel;
 - a kindergarten, school, university or other educational institution;
 - a medical centre or hospital;
 - a protected area;

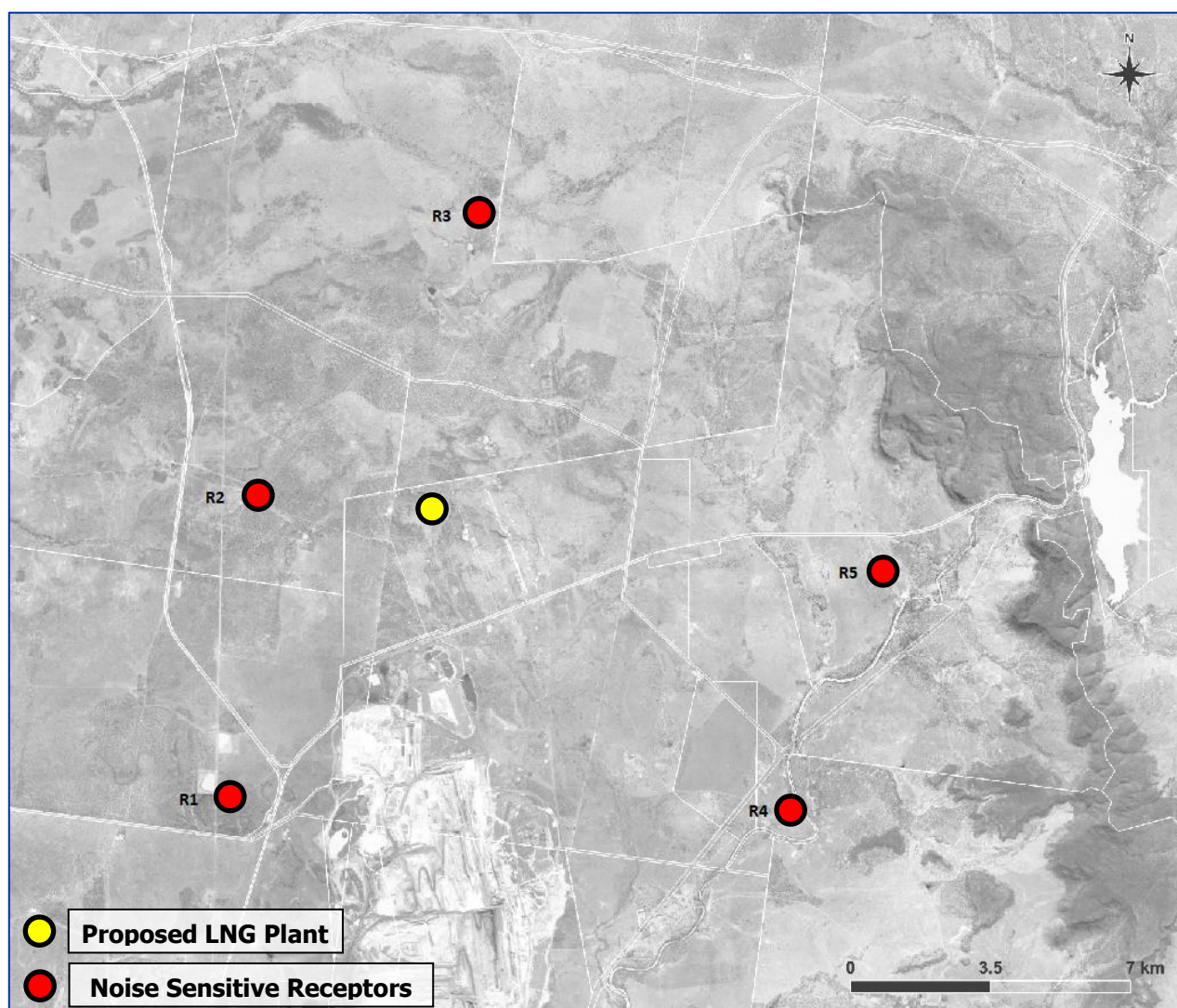
- a park or gardens; or
- a place used as an office or for business or commercial purposes.
- Commercial place:
 - a place used as an office or for business or commercial purposes

Based on the definition, the nearest sensitive uses and separation distances from the development site are defined as follows:

- Residential/accommodation:
 - (R1) Lapunyah Homestead – 8.8 km south-west
 - (R2) Denham Homestead – 4.3 km west
 - (R3) Wards Well Homestead – 7.4 km north
 - (R4) Redhill Homestead – 11.6 km south-east
 - (R5) Burton Down Homestead – 11.3 km east

The locations of noise sensitive receptors are shown in **Figure 2.3**.

Figure 2.3: Noise Sensitive Receptors



3. PROPOSED DEVELOPMENT

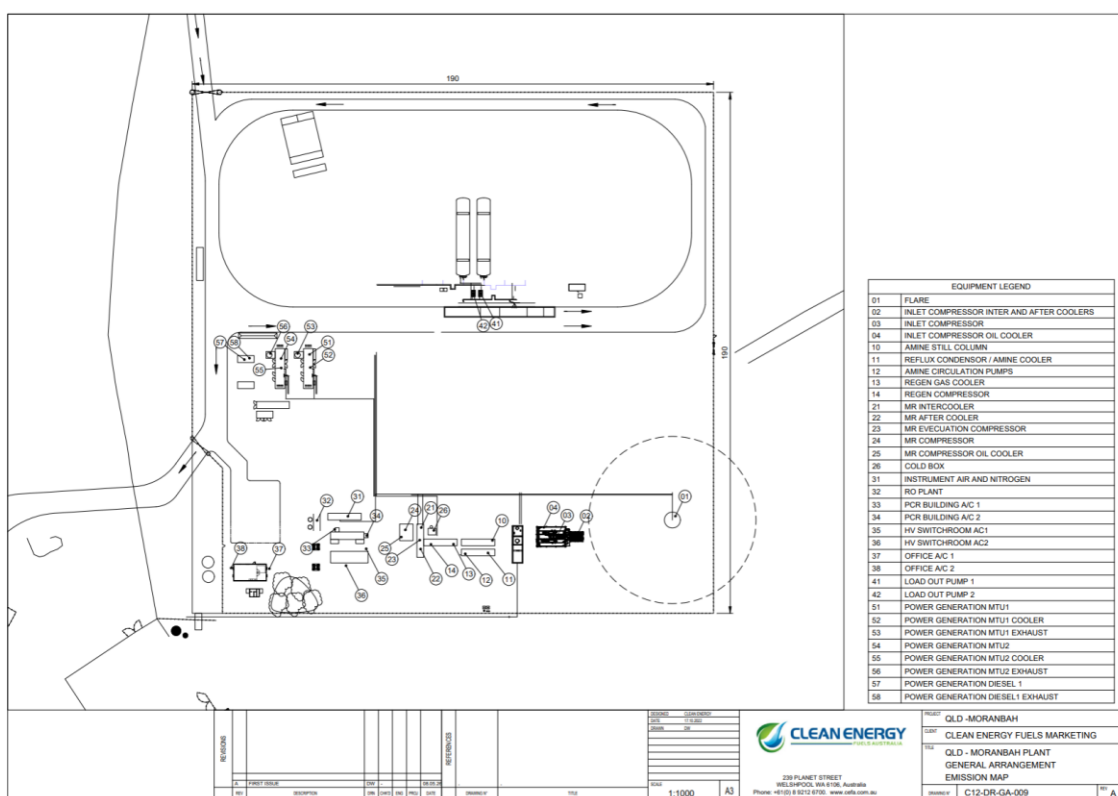
3.1 Key Features

The Micro LNG plant will be moved from another site to the new proposed location. The site layout of the plant is presented in **Figure 3.1**.

The development will include the following key components:

- **LNG Production Facility**
 - Modular liquefaction plant with a nominal capacity of 70 tonnes per day (t/d).
 - Approximately eight processing modules (each ~12 m long), vertical cold box, and switch-room.
 - Proprietary mixed refrigerant liquefaction technology.
- **Ancillary Infrastructure**
 - One HV transformer and electrical switch-room.
 - Offices, control room, first aid room, ablutions.
 - Potable and fire water tanks.
- **Storage and Loading**
 - Cryogenic LNG storage tank with 150 t capacity (below Major Hazard Facility threshold).
 - Road tanker loading bay for LNG transfer.
- **Safety and Environmental Systems.**
 - Flare system for non-liquefied gases.
 - Nitrogen generation for purging and instrument air.
 - Spill containment and fire protection systems.
- **Power Generation:**
 - The site will be powered by 1 gas generator and the electrical grid initially, then 2 gas generators will replace some or all of the electrical grid supply (after 1-2 years, subject to gas supply).
 - Initial phase (from commissioning) – 1 x natural gas powered genset (MTU 16V4000), running continuously to supply 0.94 MW.
 - Once grid supply is disconnected – 2 x natural gas powered genset (MTU 16V4000), running continuously.
 - Black start up only (estimated 10 minutes each time, 12 times a year) – 1250 kVA Diesel generator (KTA50 PowerBox)

Figure 3.1: Proposed Site Layout



3.2 Description of Operations

The micro LNG Plant will convert incidental coal seam gas (ICSG) from the Centurion Mine into LNG for beneficial use, reducing flaring and displacing diesel consumption in regional operations. The process includes:

- Gas Pre-treatment and Compression:
 - Filtration, amine treating for CO₂ removal, molecular sieve dehydration.
 - Pre-compression from ~0.05 bar to ~6 bar.
- Liquefaction:
 - Mixed refrigerant system cooling gas to -161°C.
- Storage and Distribution:
 - LNG stored in cryogenic tanks and transferred to road tankers for offsite delivery.

A summary of the operating profile is provided below:

- Continuous operation 24/7, remotely monitored.
- LNG production: 70 t/d, equivalent to ~35 million m³ of natural gas annually.
- Road tanker dispatch: ~70 t/day (single or multi-trailer configurations).

The facility footprint is approximately 150 m x 170 m.

3.3 Noise Sources

3.3.1 Operational Sources

The primary operational noise sources include:

- Compressors (MR compressor, gas booster) – continuous, high sound power levels.
- Cold Box Fans – continuous airflow noise.

- Pumps (amine circulation, MR makeup) – continuous.
- Flare System – intermittent during venting or upset conditions.
- Nitrogen Generation Package – compressors and PSA vessels.
- Road Tanker Loading – intermittent truck movements and loading pump noise.
- Power Generation Units – MTU V16 gas engine generators (total of 2)

Noise emissions from these sources are expected to be continuous or quasi-continuous, dominated by pumps and compressors. Tonal components and low-frequency noise (<250 Hz) may occur from compressors and fans. Supplier data indicates typical sound pressure levels in the range of 68–95 dBA in close proximity to each source. The dominant noise sources are continuous in nature. The flare represents the main intermittent noise source since it will be used during upset conditions only. All noise sources modelled, along with supplier noise specifications, are detailed in **Section 6**.

3.3.2 Other Operating Scenarios

This assessment focuses on the prediction of noise impacts during operations. The following comments are made with respect to noise impacts from other operational scenarios:

- Commissioning: Includes functional testing of compressors, pumps, and control systems. Noise levels expected to be similar or lower than normal operations.
 - During commencement and the first 1-2 years, only 1 gas generator will operate. Following this, an additional generator will operate. Only this worst-case operational scenario involving 2 gas generators has been considered in the modelling.
- Upset Conditions: Short-term flaring or venting may occur, producing intermittent elevated noise. These events are rare and of short duration.
 - The flare system was identified as a potential high sound power noise source. However, the flare will operate only under emergency or upset conditions such as process trips, maintenance depressurisation, or safety relief events. Under normal operating conditions, continuous flaring is not expected. Given the infrequent and short-term nature of flare operation, it has not been included in the quantitative noise predictions presented in **Section 6**, which focus on steady-state operational noise emissions in accordance with standard environmental noise assessment practice
- Decommissioning: Removal of modular equipment and rehabilitation of site. Noise emissions are expected to be similar to or less than operation phase.

Given the above information, no further detailed assessment of the above scenarios is considered warranted.

3.3.3 Construction Phase

Construction activity will generate noise; however, noise emissions are expected to be low because the proposed facility will utilise existing handstand, vehicle access, and the proposed micro LNG Plant is modular. Construction will involve installation of modular LNG plant components and ancillary infrastructure. Activities include:

- Site preparation (minimal earthworks, no vegetation clearing).
- Delivery and unloading of modules using cranes and forklifts.
- Installation of cryogenic storage tank and flare stack.
- Mechanical and electrical works, piping, and instrumentation.
- Road tanker loading bay construction.

Construction is expected to occur over 6–8 months, with peak workforce of ~30 personnel. Heavy vehicle movements will include delivery of modules and equipment. Given the modular nature of the plant and existing handstand, earthworks will be minimal, reducing noise impacts. Furthermore, the nearest sensitive receptor is approximately 4 km from the site, so construction noise impacts are expected to be negligible.

4. EXISTING ACOUSTIC ENVIRONMENT

Acoustic measurements were obtained from the noise assessment conducted by SLR for the Centurion Coal Mine environmental authority amendment application¹. As part of the study, noise monitoring data for the nearest sensitive receptors to the mine were reviewed. The noise measurement locations and sensitive receptors relevant to this assessment are shown in **Figure 4.1** and described as follows:

- Lapunyah Homestead: Noise logger located in south-eastern corner of front yard, approximately 20 m from the homestead.
- Denham Park: Noise logger located in south-eastern corner of front yard, approximately 15 m from the homestead.
- Buton Downs Homestead: Noise logger located in centre of front yard, approximately 100 m from the homestead (between homestead and working shed, next to fruit garden).

The SLR report states that all acoustic instruments used for noise monitoring were configured to A-weighting with a 'Fast' response, in accordance with the relevant Australian Standards and DESI's Noise Measurement Manual (EPA, 2020). The equipment employed during the surveys was designed to comply with AS/NZS IEC 61672.1-2019 Electroacoustics – Sound Level Meters: Specifications, and each carried a current manufacturer calibration certificate.

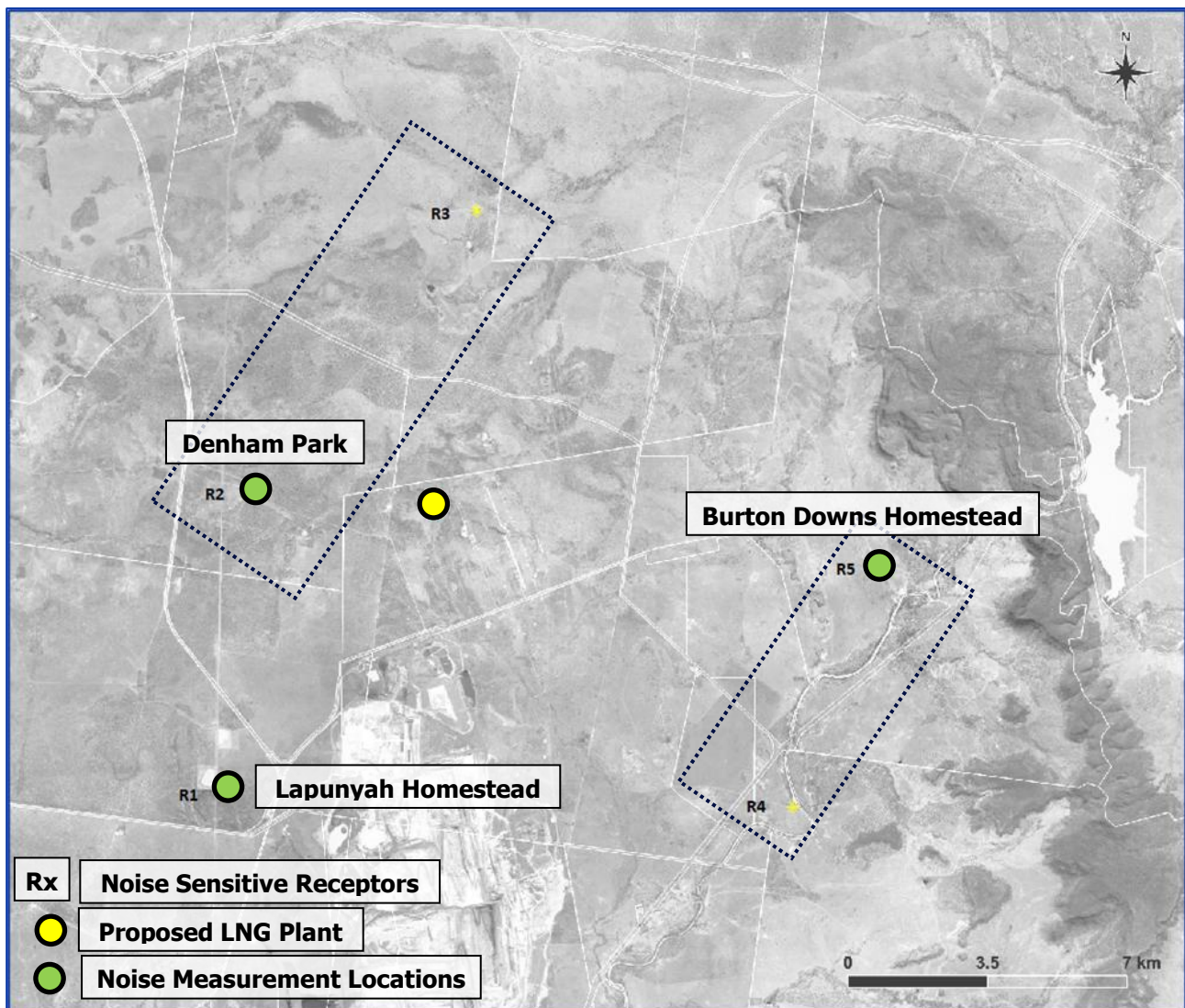
The measured baseline noise levels are summarised in **Table 4.1**.

Table 4.1: Background Noise Levels at Location L1

Period	Rating Background Noise Level (RBL) L ₉₀ dBA		
Location	Lapunyah Homestead	Denham Park	Burton Down Homestead
Day (7am to 6pm)	26	28	25
Evening (6pm to 10pm)	30	25	24
Night (10pm to 6am)	28	25	24

¹ Centurion Coal Mining Pty Ltd Environmental Authority Amendment Application Supporting Report, SLR Ref No.: 620.040594_Major EA Supporting Doc_V4.0.docx, SLR Project no: 620.040594, Dated 4 February 2025

Figure 4.1: Noise Measurement Locations



5. NOISE CRITERIA

5.1 Overview

Noise criteria are required to assess the potential impacts of the proposed operations on noise sensitive receptors. The relevant Department of Environment, Tourism, Science and Innovation (DETSI) noise criteria have been considered and are based on the following documents:

- Environmental Protection Act 1994
- Environmental Protection (Noise) Policy 2019

5.2 Environmental Protection Act 1994

In Queensland, the environment is protected under the Environmental Protection Act (EP Act) 1994. Key sections of the EP Act are summarised below:

- Section 3 of the EP Act states that the object of the Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development).
- Section 319 of the EP Act relates to General Environmental Duty and states that a person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm.
- Section 14(1) of the EP Act defines environmental harm as any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance.
- Section 15 of the EP Act defines environmental nuisance as an unreasonable interference or likely interference with an environmental value caused by (a) ... noise. The EP Act refers to the Environmental Protection Policies as being subordinate legislation to the Act.

The following sections presents details of the Environmental Protection (Noise) Policy, one of the subordinate legislative documents implemented for the protection of the acoustic environment and for achieving the EP Act outcomes detailed above.

5.3 Environmental Protection (Noise) Policy 2019

5.3.1 Overview

In respect of the acoustic environment, the object of the Act is achieved by the Environmental Protection (Noise) Policy 2019 (EPP (Noise)). This policy identifies environmental values to be enhanced or protected, states acoustic quality objectives, and provides a framework for making decisions about the acoustic environment.

5.3.2 Acoustic Quality Objectives

The EPP (Noise) contains a range of acoustic quality objectives for a range of receptors. The objectives are in the form of noise levels, and are defined for various periods of the day, and use several acoustic parameters. The objectives are not target levels but rather maximum levels. The reasonableness of the objectives should also consider the existing noise environment.

Schedule 1 of the EPP(Noise) includes the following acoustic quality objectives which must be satisfied:

- Residence:
 - Outdoors
 - Daytime and Evening: 50 dBA $L_{Aeq,adj,1hr}$, 55 dBA $L_{A10,adj,1hr}$ and 65 dBA $L_{A1,adj,1hr}$

- Indoors
 - Daytime and Evening: 35 dBA $L_{Aeq,adj,1hr}$, 40 dBA $L_{A10,adj,1hr}$ and 45 dBA $L_{A1,adj,1hr}$
 - Night: 30 dBA $L_{Aeq,adj,1hr}$, 35 dBA $L_{A10,adj,1hr}$ and 40 dBA $L_{A1,adj,1hr}$
- Commercial:
 - Indoors
 - When activity is open for business: 45 dBA $L_{Aeq,adj,1hr}$

The attenuation provided by a façade can range considerably depending on various factors including construction materials and room dimensions. Façade attenuation for an open window may range from 5 to 15 dBA. In the absence of details of construction materials, a commonly adopted attenuation for a typical residential building façade is 7 dBA assuming open windows. That is, with an external noise source, a 7 dBA reduction in noise levels from outside a house to inside a house is expected when windows are fully open. For commercial building, 10 dBA reduction was assumed. The indoor noise objectives noted above could be converted to the following external objectives (with windows open):

- Residence:
 - Daytime and Evening: 42 dBA $L_{Aeq,adj,1hr}$, 47 dBA $L_{A10,adj,1hr}$ and 52 dBA $L_{A1,adj,1hr}$
 - Night: 37 dBA $L_{Aeq,adj,1hr}$, 42 dBA $L_{A10,adj,1hr}$ and 47 dBA $L_{A1,adj,1hr}$
- Commercial:
 - When activity is open for business: 55 dBA $L_{Aeq,adj,1hr}$

5.3.3 Background Creep

The current 2019 version of the EPP (Noise) no longer contains criteria for background creep, but states that background creep should be prevented or minimised, to the extent that it is reasonable to do so.

Background creep is defined as “a gradual increase in the total amount of background noise in the area or place as measured applying the document called the ‘Noise Measurement Manual’ published on the department’s website” (Section 9(4) of EPP Noise). This is understood to require consideration of cumulative impacts, including other developments.

The EPP Noise (2019) does not specifically define background creep criteria, however, it is noted that the 2008 version specified a Background Plus 5 dBA limit and relevant noise sections presented a Background 3-5 dBA limit depending on the noise source and time of the day (e.g. +5 for the day and + 3 for the night). For the purpose of the assessment, this Plus 3-5 dBA approach has been adopted.

When using background creep criteria, it is customary to use a minimum background noise level. Currently, the Queensland Department of Environmental Science and Innovation documents adopt the following lowest background levels for the purpose of deriving noise criteria:

- QLD Model Mining Conditions (7 March 2017) – 30 dBA for day/evening/night
- QLD Streamlined model conditions for petroleum activities (5 May 2016):
 - Day (7am to 6pm): 35 dBA
 - Evening (6pm to 10pm): 30 dBA
 - Night (10pm to 6am): 25 dBA
 - Morning (6am to 7am): 30 dBA.
- Draft Planning for Noise Control Guideline (2013 review) – 30 dBA.

Table 5.1 presents the background plus criteria based on the measured RBL values presented in **Section 4**.

Table 5.1: Background Plus Criteria

Location	Lapunyah Homestead		Denham Park		Burton Down Homestead	
Period	RBL	Noise Limit, L_{Aeq}	RBL	Noise Limit, L_{Aeq}	RBL	Noise Limit, L_{Aeq}
Day (7am to 6pm)	26	35 ^a	28	35 ^a	25	35 ^a
Evening (6pm to 10pm)	30	35 ^a	25	35 ^a	24	35 ^a
Night (10pm to 6am)	28	31	25	28	24	27

Note a: Minimum RBL of 30 dBA has been adopted for day and evening

5.4 Proposed Criteria

Based on the above review of noise criteria, **Table 5.2** presents a summary of the criteria adopted for the assessment. The most stringent criteria, which is Background Plus Criteria, was adopted.

Table 5.2: Proposed Noise Limits for Sensitive Receptors

Location	Lapunyah Homestead	Denham Park	Burton Down Homestead
Period	Noise Limit, L_{Aeq}	Noise Limit, L_{Aeq}	Noise Limit, L_{Aeq}
Day (7am to 6pm)	35	35	35
Evening (6pm to 10pm)	35	35	35
Night (10pm to 6am)	31	28	27

6. OPERATIONAL NOISE ASSESSMENT

6.1 Model Description

Noise modelling was carried out using the CONCAWE method, which is widely used and accepted for noise modelling and is accepted by DETSI. The CONCAWE method allows for modelling a number of discrete meteorological scenarios.

The SoundPLAN V9.1 program was used to develop a three-dimensional digital terrain noise model of the project area and the surrounding area including the location of sensitive receptors. The model incorporates terrain data for the proposed Project and the existing surrounding topography.

6.2 Meteorology

Noise levels from the facility at sensitive receptors can vary significantly depending upon the meteorological conditions, particularly due to changes in wind speed and direction and vertical temperature gradients, which include temperature inversions. It is possible to measure noise variations of the order of 10 to 15 dBA due to changes in meteorological conditions, depending on distance between noise source and receiver.

The SoundPLAN v8.2 model was set up to predict noise levels under neutral and adverse meteorological conditions. The conditions used in the noise model are shown in **Table 6.1**.

Table 6.1: Meteorological Scenarios

Parameter	Day Meteorological Scenario		Night Meteorological Scenario	
	Scenario D1-Neutral	Scenario D2-Adverse	Scenario N1-Neutral	Scenario N2-Adverse
Pasquill Stability Class	D	D	F	F
Temperature (°C)	25	25	10	10
Wind Speed (m/s)	0	2	0	2
Wind direction	No wind	Towards receptor	No wind	Towards receptor
Relative Humidity (%)	40	40	70	70

These meteorological scenarios are presented to give an indication of the range of noise levels from neutral to adverse conditions and are assessed against the criteria corresponding to the periods when they are most likely to occur. The most critical predictions are the night scenarios since this assesses the highest predicted noise levels against the most stringent night-time criteria.

6.3 Noise Source Data

The model uses the sound power level (L_w) of each noise source to predict noise emissions. The sound power levels used in the model were based on noise source data obtained from the supplier and are exclusive of tonality and impulsiveness penalties. The sound power levels for the proposed equipment for the project and modelled source heights are presented in **Table 6.2**.

The assessment has been based on continuous and representative operational noise sources. Flaring noise source associated with abnormal or emergency conditions has not been included in the predicted noise levels, as these events are not part of routine operations and are expected to occur infrequently and for limited durations.

It is conservatively assumed that the LNG plant equipment within the facility will operate 24/7, including the night. Specifically, the modelled scenario is highly conservative by assuming both gas generators and diesel generator are operating simultaneously. Under normal operations, only 1 gas generator will operate. If grid

power is completely disconnected, then the 2nd gas generator will startup. The diesel generator will only run during black startup.

Table 6.2: Noise Source Sound Power Levels

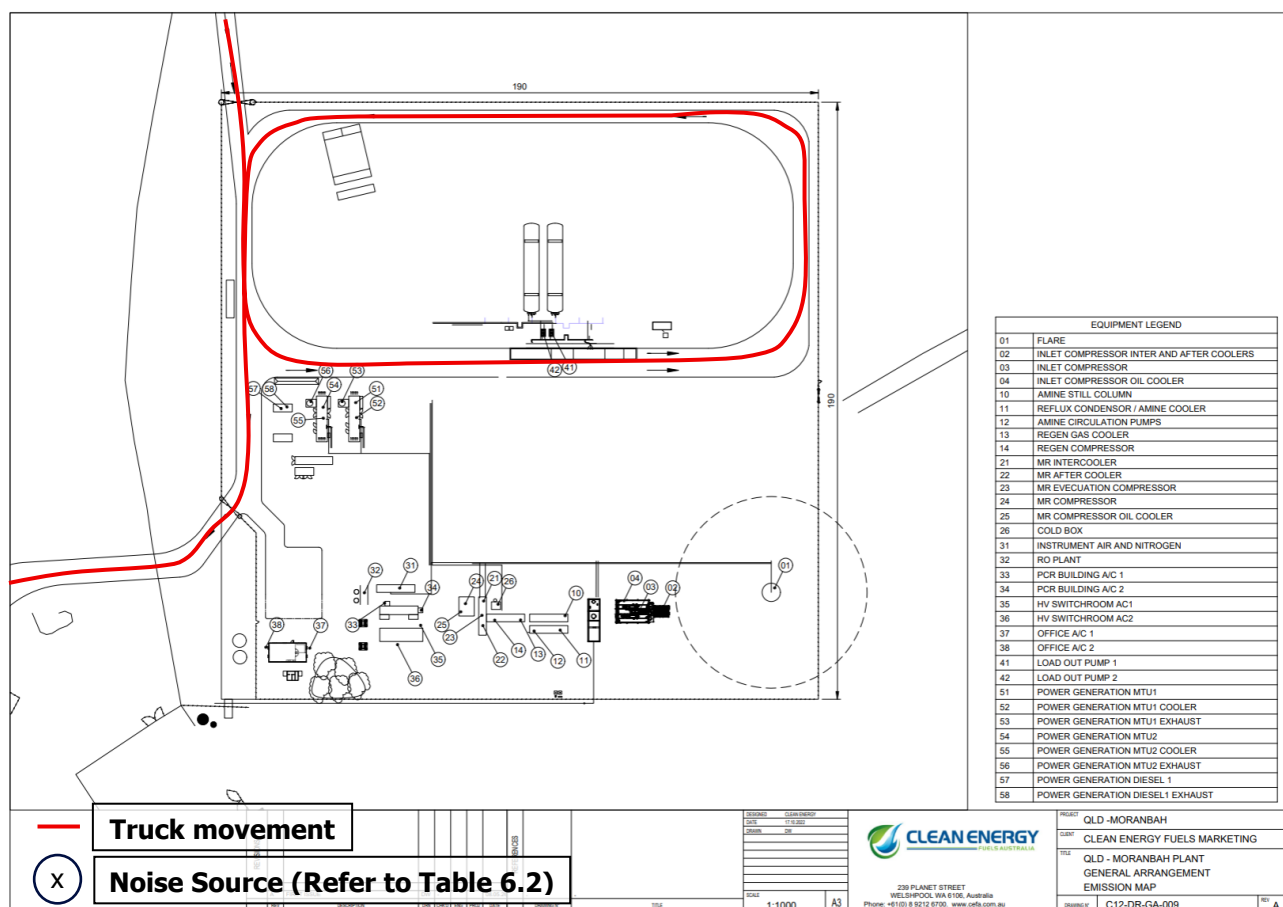
#	Equipment	Height Meter	Octave Band Sound Power Level $L_{w,eq}$ dBZ									Overall $L_{w,eq}$	
			32	63	125	250	500	1k	2k	4k	8k	dBZ	dBA
1	Flare##	15.0	132	133	128	122	117	116	113	109	103	137	122
2	Inlet Compressor Inter and After Coolers	2.0	83	85	88	92	95	96	94	90	85	101	100
3	Inlet Compressor - JGK	2.0	76	82	87	91	94	96	93	88	83	101	100
4	Inlet Compressor Oil Cooler	2.0		99	96	93	93	89	89	90		103	96
11	Reflux Condenser / Amine Cooler	2.0		101	98	95	95	91	91	92		105	98
12	Amine Circulation Pumps	2.0		94	82	90	83	84	86	77		97	90
13	Regen Gas Cooler	2.0	86	89	93	91	92	89	88	86	79	99	95
14	Refgen Gas Compressor	2.0	71	74	78	76	77	74	73	71	64	84	80
21	Mr Intercooler	2.0		103	100	97	97	93	93	94		107	100
22	Mr After Cooler	2.0	87	89	92	96	99	100	98	94	89	105	104
23	Mr Evacuation Compressor	2.0	77	80	84	82	83	80	79	77	70	90	86
24	Mr Compressor	2.0	84	90	95	99	102	104	101	96	91	109	108
25	Mr Compressor Oil Cooler	2.0		99	96	93	93	89	89	90		103	96
31	Instrument Air and Nitrogen Package	2.0		92	80	88	81	82	84	75		95	88
32	Ro Plant	2.0	76	75	71	74	81	74	74	74	75	85	83
41 & 42	Load Out Pump	2.0	81	80	76	79	86	79	79	79	80	90	88
51 & 54	Power Generation MTU Engine	2.0		105	111	110	113	113	112	119	121	125	124
52 & 55	Power Generation MTU Cooler	2.0	94	97	101	99	100	97	96	94	87	107	103
53 & 56	Power Generation MTU Exhaust	2.0		126	132	124	117	109	109	106	96	134	121
57 & 58	Power Generation Diesel With Exhaust	2.0	92	95	99	97	98	95	94	92	85	105	101
33 to 36	Air Conditioning Unit	2.0	50	56	61	65	68	70	67	62	57	75	74
37 & 38	Air Conditioning Unit (Office Use)	2.0	34	40	45	49	52	54	51	46	41	59	58
-	Road Train	2.0	-	84	92	97	102	106	105	98	85	110	110

Location of emission source shown in **Figure 6.1**

Emergency use only, intermitted noise source.

The modelled noise locations are shown in **Figure 6.1**.

Figure 6.1: Noise Source Locations



6.4 Predicted Noise Levels

Given that noise sources within the proposed LNG Plant are continuous in nature, impulsive characteristics under normal operating conditions are not expected. However, +2 dBA of tonality correction to predicted A-weighted results has been conservatively applied. The predicted noise levels with at nearby sensitive receptors are presented in **Table 6.4**.

Table 6.3: Predicted A-weighted Noise Level (Unmitigated)

Receptor ID	Predicted Noise Level, $L_{eq,adj,T}$ dBA				Noise Criteria $L_{eq,adj,T}$ dBA
	D1	D2	N1	N2	
R1	20	25	28	25	35 Day 35 Evening 31 Night
R2	29	34	36	35	35 Day 35 Evening 28 Night
R3	21	27	30	27	35 Day 35 Evening 28 Night
R4	16	22	25	22	35 Day 35 Evening 27 Night
R5	16	21	23	21	35 Day 35 Evening 27 Night

Compliance with the noise criteria is predicted with a margin of 1 dBA during the day and evening periods. However, during the night, predicted noise levels exceed the criteria by up to 8 dBA. Night-time exceedances are predicted at noise-sensitive receptors R2 and R3.

The dominant noise sources contributing to these exceedances are:

- Power Generation MTU Engine x 2
- Power Generation MTU Exhaust x 2

Predicted noise levels with potential mitigation measures are outlined in the following section.

6.5 Predicted Noise Levels with Mitigation

To mitigate the predicted exceedances, a 10 dB reduction for both the engine and exhaust sources is proposed. This reduction can be achieved through the implementation of acoustic enclosures and exhaust mufflers. Alternatively, MTU may provide other solutions to reduce total noise emissions from the generators.

The combined sound power level of the MTU engine and exhaust for each gas generator should not exceed 113 dBA / 122 dBZ (per gas generator).

The predicted noise levels with mitigation at nearby sensitive receptors are presented in **Table 6.4**. Predicted noise levels are also shown graphically as noise contours in **Appendix C** for the modelled scenario and day and night meteorological conditions, as follows:

- **Figure C.1** Day Scenario D1 - Neutral
- **Figure C.2** Day Scenario D2 - Adverse
- **Figure C.3** Night Scenario N1 - Neutral
- **Figure C.4** Night Scenario N2 - Adverse

These predicted noise levels (or component noise levels) do not include ambient noise level, indicating noise impact of the proposed facility only. Ambient noise levels at the noise sensitive receptors may be higher than the level predicted due to local noise sources such as insects, local traffic, and other extraneous noise sources.

As noted previously, noise sources within the proposed LNG Plant are continuous in nature, impulsive characteristics under normal operating conditions are not expected. However, +2 dBA of tonality correction to predicted A-weighted results has been conservatively applied.

Table 6.4: Predicted A-weighted Noise Level (Mitigated)

Receptor ID	Predicted Noise Level, $L_{eq,adj,T}$ dBA				Noise Criteria $L_{eq,adj,T}$ dBA
	D1	D2	N1	N2	
R1	10	16	19	16	35 Day 35 Evening 31 Night
R2	19	25	27	26	35 Day 35 Evening 28 Night
R3	11	17	20	17	35 Day 35 Evening 28 Night
R4	6	12	15	12	35 Day 35 Evening 27 Night
R5	6	11	13	12	35 Day 35 Evening 27 Night

Full compliance with the noise criteria is predicted. In particular, it is noted that compliance by margin 10 dBA is predicted during the day and evening periods. During the night, predicted noise levels are at least 1 dBA below the night period limit.

It is also noted that full compliance with the EPP Noise acoustic quality objective of 37 dBA is predicted (based on internal objective of 30 dBA plus 7 dBA open window attenuation).

The above results are based on normal operations (i.e. without the flare). Where the flare is required to operate (e.g. emergency situations, maintenance), then predicted noise levels with the flare are up to 33 dBA during night. This is above the Background Plus night limit, however, it is well within the 37 dBA EPP Noise acoustic quality objective for the night period.

Overall, the results show low noise levels at sensitive receptors, and this is largely due to the large separation distance. It is concluded that the Project is suitably located and designed with respect to minimising noise impacts.

7. RECOMMENDATIONS AND CONCLUSION

A noise impact assessment has been conducted for the Micro Liquefied Natural Gas (LNG) Plant at North Goonyella, Moranbah, Queensland. The conclusions of the assessment are summarised as follows:

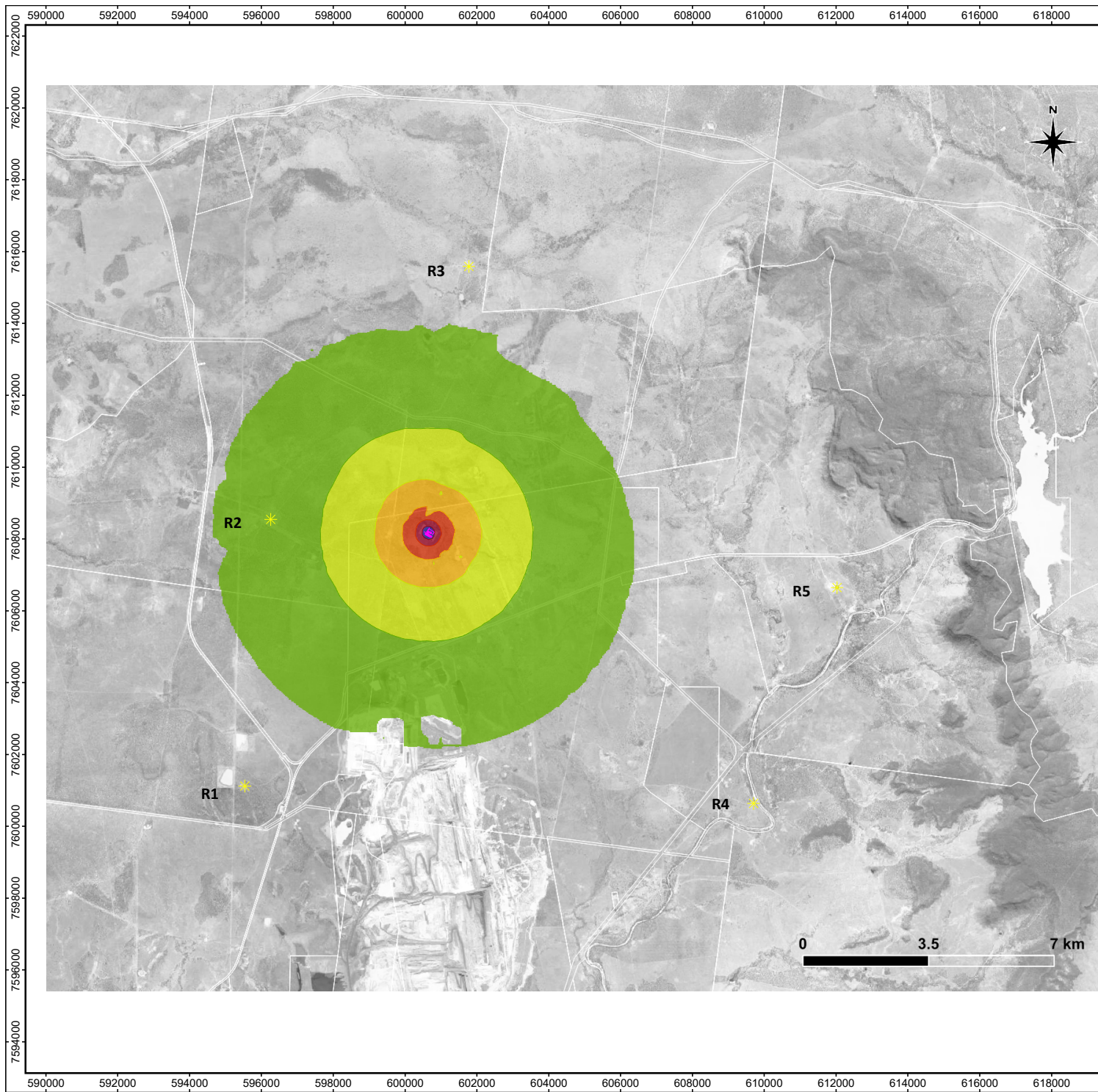
- The key noise sources are continuous in nature and include compressors, pumps and gas power generators. All noise sources modelled using the supplier noise specifications, are detailed in **Section 6**.
- The nearest noise sensitive receptor is a residential dwelling, approximately 4 km west to the proposed site. Identified noise sensitive receptors are shown in **Figure 2.3**.
- Noise criteria is outlined in **Section 5**. Proposed noise criteria is based on historical background noise monitoring data from the project area and the Environmental Protection (Noise) Policy 2019.
- Operational noise impacts were assessed in **Section 6**, using computational noise modelling, with a conservative +2 dBA tonality correction applied. Initial modelling without mitigation indicated potential exceedances during the night period at receptors R2 and R3.
- To address these exceedances, a 10 dB noise reduction for the power generation engines and exhausts has been incorporated, achievable through acoustic enclosures and exhaust silencers (or equivalent vendor-provided solutions). With the implementation of these mitigation measures, full compliance with all applicable noise criteria is predicted for day, evening, and night periods at all sensitive receptors.
- In summary, the key recommendation is that the combined sound power level of the gas engine and exhaust for each gas generator should not exceed 113 dBA / 122 dBZ (per gas generator). Achieving this sound power level will require an acoustic enclosure and exhaust muffler on each generator.
- The potential for noise impacts during other operational phases (e.g. startup, shutdown) and during construction are expected to be no greater than those predicted for normal operations. Ultimately, the nearest sensitive receptors are separated by a large distance, resulting in very low noise levels at these receptors.

Overall, the assessment demonstrates that the Project is suitably located and designed with respect to minimising noise impacts.

APPENDIX A GLOSSARY

Parameter or Term	Description
dB	The decibel (dB) is the unit measure of sound. Most noises occur in a range of 20 dB (quiet rural area at night) to 120 dB (nightclub dance floor or concert).
dBA	Noise levels are most commonly expressed in terms of the 'A' weighted decibel scale, dBA. This scale closely approximates the response of the human ear, thus providing a measure of the subjective loudness of noise and enabling the intensity of noises with different frequency characteristics (e.g. pitch and tone) to be compared.
Day	The period between 7am and 6pm.
Evening	The period between 6pm and 10pm.
Night	The period between 10pm and 7am.
Free-field	The description of a noise receiver or source location which is away from any significantly reflective objects (e.g. buildings, walls).
L ₁	The noise level exceeded for 1% of the measurement period.
L ₁₀	The noise level exceeded for 10% of the measurement period. It is sometimes referred to as the average maximum noise level.
L ₉₀	The noise level exceeded for 90% of the measurement period. This is commonly referred to as the background noise level.
L _{eq}	The equivalent continuous sound level, which is the constant sound level over a given time period, which is equivalent in total sound energy to the time-varying sound level, measured over the same time period.
L _{eq,1hour}	As for L _{eq} except the measurement intervals are defined as 1 hour duration.
L _{max}	Maximum A-weighted sound pressure level.
L _{eq} (24 hour)	The average L _{eq} noise level over the 24-hour period from midnight to midnight.
L ₁₀ (18 hour)	The arithmetic average of the one-hour L ₁₀ values between 6am and midnight. This parameter is used in the assessment of road traffic noise.
R _w	Weighted Sound Reduction Index – is a single number evaluation of the property of a partition to attenuate sounds. For the majority of partitions, the value of R _w will be similar to the value for STC. Partitions with particularly poor performance at 100 Hz may have lower values for R _w than for STC. Conversely, partitions with poor performance at 4000 Hz may have higher R _w than for STC. (As per AS1276.1-1999).

APPENDIX B NOISE CONTOURS



Moranbah LNG Plant
Project Number: 257401.5023



Figure
C.1

Day - Scenario D1

Date: 28/05/2026
 Drawn By: Burak Ayva
 Prepared For: Clean Energy Fuel

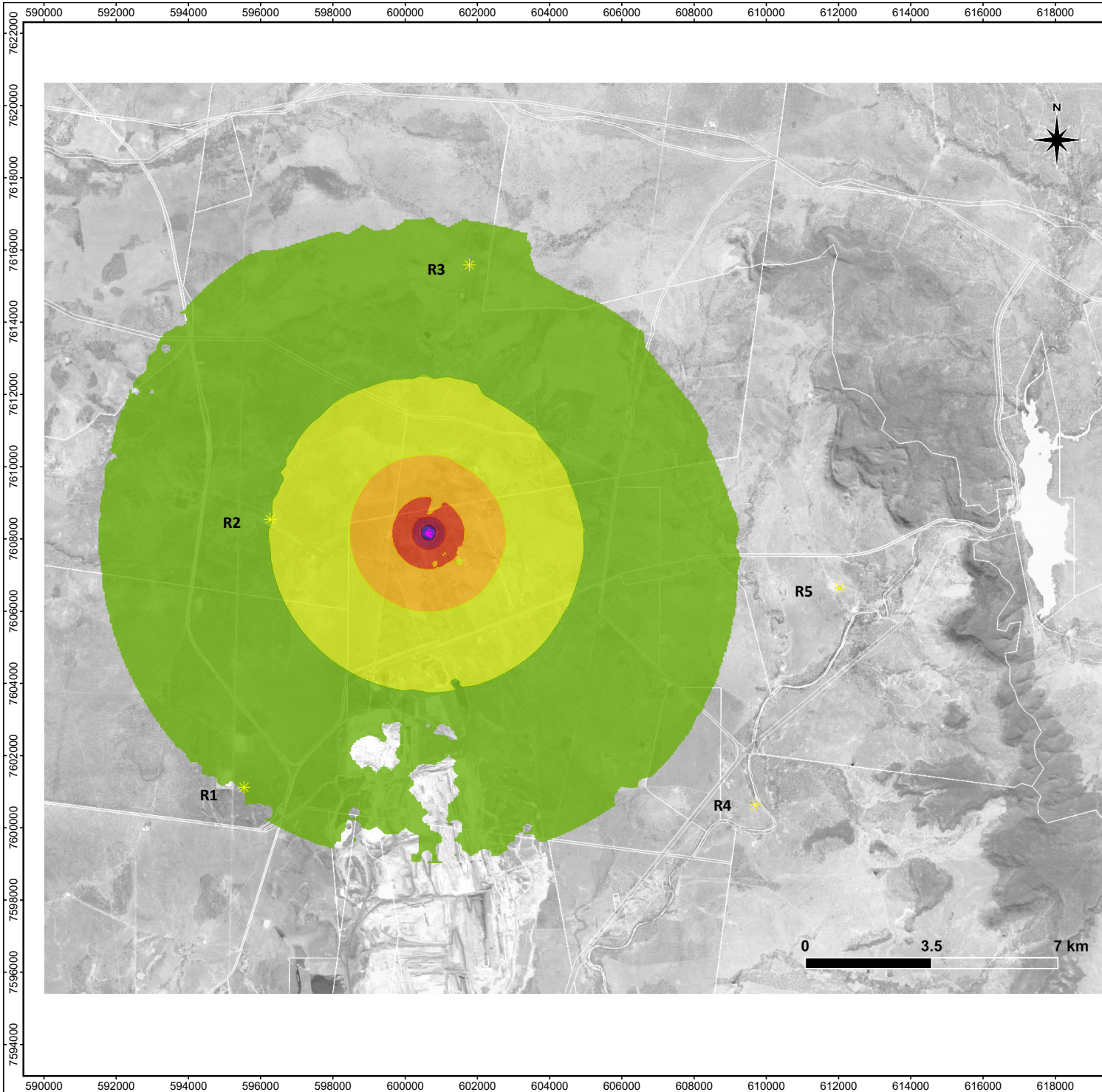
Free Field Noise Levels Leq(1 hour) dBA
 Ground Contour Calculation Height = 1.8m

15 <		<=	25
25 <		<=	35
35 <		<=	45
45 <		<=	55
55 <		<=	65
65 <			

Signs and Symbols

- Point receiver
- Point source
- Line source
- Area source





Moranbah LNG Plant
Project Number: 257401.5023



Figure C.2

Day - Scenario D2

Date: 28/05/2026
Drawn By: Burak Ayva
Prepared For: Clean Energy Fuel

Free Field Noise Levels Leq(1 hour) dBA
Ground Contour Calculation Height = 1.8m

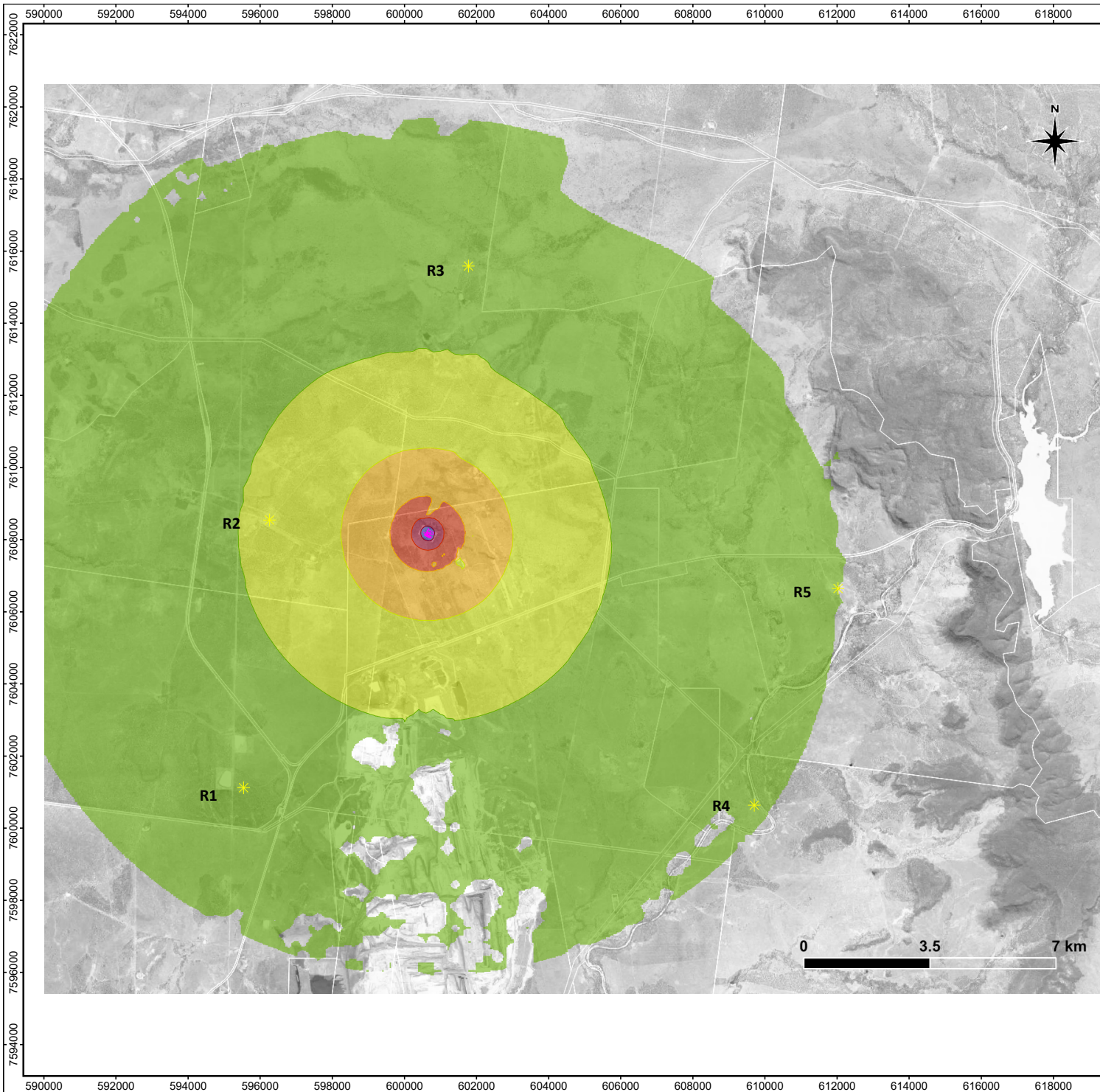
15 <		<=	25
25 <		<=	35
35 <		<=	45
45 <		<=	55
55 <		<=	65
65 <			

Signs and Symbols

- Point receiver
- Point source
- Line source
- Area source

Trinity
Consultants
Australia





Moranbah LNG Plant
Project Number: 257401.5023



Figure C.3

Night - Scenario N1

Date: 28/05/2026
 Drawn By: Burak Ayva
 Prepared For: Clean Energy Fuel

Free Field Noise Levels Leq(1 hour) dBA
 Ground Contour Calculation Height = 1.8m

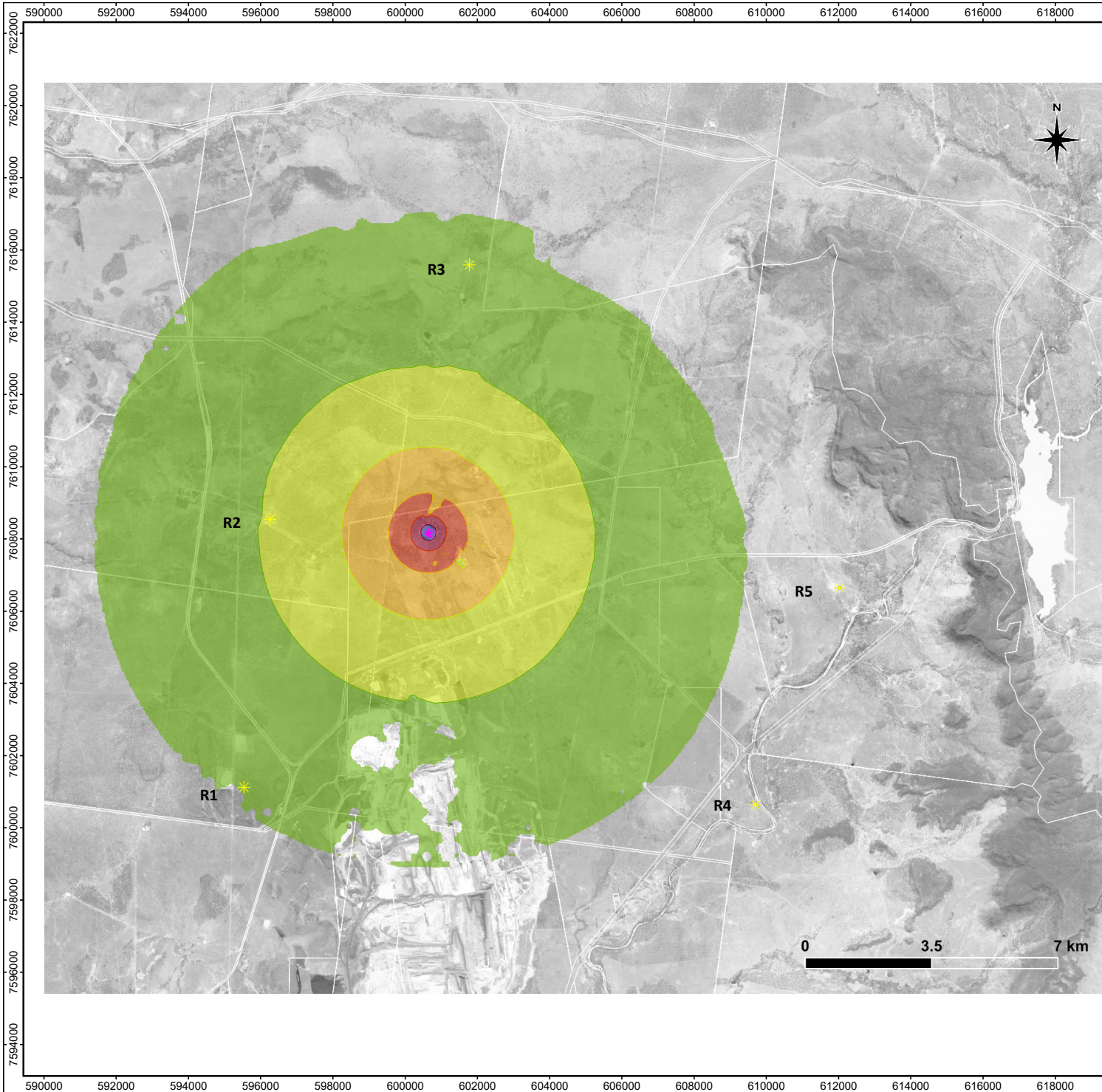
15 <	<=	25
25 <	<=	35
35 <	<=	45
45 <	<=	55
55 <	<=	65
65 <		

Signs and Symbols

- Point receiver
- Point source
- Line source
- Area source

Trinity
 Consultants
 Australia





Moranbah LNG Plant
Project Number: 257401.5023



Figure C.4

Night - Scenario N2

Date: 28/05/2026
Drawn By: Burak Ayva
Prepared For: Clean Energy Fuel

Free Field Noise Levels Leq(1 hour) dBA
Ground Contour Calculation Height = 1.8m

15 <	<=	25
25 <	<=	35
35 <	<=	45
45 <	<=	55
55 <	<=	65
65 <		

Signs and Symbols

- Point receiver
- Point source
- Line source
- Area source

Trinity
Consultants
Australia





BRISBANE

A: Level 3, 43 Peel Street
South Brisbane, QLD 4101
T: +61 7 3255 3355
E: brisbane@trinityconsultants.com

GLADSTONE (Vision Environment)

A: Unit 3, 165 Auckland Street
PO Box 1267
Gladstone, QLD 4680
T: +61 7 4972 7530
E: office@visionenvironment.com.au

SYDNEY

A: Upper Ground, 55 Brisbane Street
Surry Hills, NSW 2010
T: +61 2 7255 4077
E: sydney@trinityconsultants.com

APPENDIX E. – OEM SPECIFICATION – ADDITIONAL EQUIPMENT

400270122_270122_Q01_1_16L64_1954_50_500_EN_SI_V4

Voltage / Frequency

Cooling water temperature (in / out)

NOx emissions (dry, 5 % O₂)

Mixture cooler 1st stage water temperature (in)

Mixture cooler 2nd stage water temperature (in)

Exhaust gas temperature

Catalytic converter

Special equipment

Elevation above sea level

Combustion air temperature

Relative combustion air humidity

Standard specifications and regulations

V / Hz

°C

mg/m³ i.N.

°C

°C

°C

m / mbar

°C

%

11000	/	50
	78 / 92	
	< 500	
	58	
	425	
	not included	
500	/	950
	50	
	27	

Energy balance	%	100	75	50
Electrical Power ^{2) 3)}	kW	1954	1466	977
Energy input ^{4) 5)}	kW	4473	3418	2381
Thermal output total ⁶⁾	kW	2105	1647	1190
Thermal output engine (block, lube oil, 1st stage mixture cooler) ⁶⁾	kW	1152	859	597
Thermal output mixture cooler 1st stage ⁶⁾	kW			
Thermal output mixture cooler 2nd stage ⁶⁾	kW	92	54	26
Exhaust heat optional (120 °C) ⁶⁾	kW	(953)	(788)	(593)
Engine power ISO 3046-1 ²⁾	kW	2010	1511	1015
Generator efficiency at power factor = 1	%	97.2	97.0	96.3
Electrical efficiency ⁴⁾	%	43.7	42.9	41.0
Total efficiency	%	90.7	91.1	91.0
Power consumption ⁷⁾	kW			
Combustion air / Exhaust gas				
Combustion air volume flow ¹⁾	m ³ i.N./h	7405	5551	3768
Combustion air mass flow	kg/h	9566	7171	4868
Exhaust gas volume flow, wet ¹⁾	m ³ i.N./h	7786	5842	3971
Exhaust gas volume flow, dry ¹⁾	m ³ i.N./h	6957	5208	3530
Exhaust gas mass flow, wet	kg/h	9897	7424	5045
Exhaust temperature after turbocharger	°C	425	455	489
Reference fuel ⁸⁾				
Natural gas			CH ₄ >95 Vol.%	
Sewage gas			not applicable	
Biogas			not applicable	
Landfill gas			not applicable	
Propane HD 5			not applicable	
Fuel requirements ⁹⁾				
Nominal rated methane number	MN		80	
Range of heating value: design / operation range without power derating	kWh/m ³ i.N.		10.0 - 10.5 / 8.0 - 11.0	
Exhaust gas emissions ^{5) 8)} Compliance with emissions standards only for ≥ 977 kWel				
NOx, stated as NO ₂ (dry, 5 % O ₂)	mg/m ³ i.N.	< 500		
CO (dry, 5 % O ₂)	mg/m ³ i.N.	< 1000		
HCHO (dry, 5 % O ₂)	mg/m ³ i.N.	< 120		
VOC (dry, 5 % O ₂)	mg/m ³ i.N.			
Otto-gas engine, lean burn operation with turbocharging				
Number of cylinders / configuration		16	/	v
Engine type			16V4000L64FNER TR	
Engine speed	1/min		1500	
Bore	mm		170.0	
Stroke	mm		210.0	
Displacement	dm ³		76.27	
Mean piston speed	m/s		10.5	
Compression ratio			12.5	
BMEP at nominal engine speed min-1	bar	21.1		
Lube oil consumption ¹⁰⁾	dm ³ /h	0.36		
Exhaust back pressure min. - max. after module	mbar - mbar		26 - 30	
Generator				
Rating power (temperature rise class F) ¹¹⁾	kVA		2594	
Insulation class / temperature rise class			H / F	
Winding pitch			5/6	
Protection			IP 23	
Max. allowable p.f. inductive (overexcited) / capacitive (underexcited) ¹²⁾			0.8 / 1.0	
Voltage tolerance / frequency tolerance	%		+/- 5 / +/- 5	
Engine cooling water system				
Coolant temperature (in / out), design	°C		78 / 92	
Coolant flow rate, constant ^{13) 14)}	m ³ /h		80.0	
Pressure drop, design ¹⁴⁾	bar / m ³ /h	3.4	/	43.8
Max. operation pressure (coolant before engine)	bar		6	
Exhaust gas heat exchanger (EGHE)				
Exhaust gas temperature (out)	°C			
Coolant temperature (in / out), design	°C			
Coolant volumetric flow, constant ^{13) 14)}	m ³ /h			
Pressure drop, design ¹⁴⁾	kPa / m ³ /h		/	
Min. coolant flow rate / min. operation gauge pressure	m ³ /h / bar		/	
Max. operation pressure (coolant water)	bar			

400270122_270122_Q01_1_16L64_1954_50_500_EN_SI_V4

Mixture cooler 1st stage, external				
Coolant temperature (in / out), design		°C		
Coolant volumetric flow, design, constant ^{13) 14)}		m³/h		
Pressure drop, design ¹⁴⁾	Cv value ^{13) 15)}	bar / m³/h	/	
Min. coolant flow rate / min. operation gauge pressure		m³/h / bar	/	
Max. operation pressure before mixture cooler		bar		
Mixture cooler 2nd stage, external				
Coolant temperature (in / out), design		°C	58 / 60.8	
Coolant volumetric flow, design, constant ^{13) 14)}		m³/h	32.0	
Pressure drop, design ¹⁴⁾	Cv value ^{13) 15)}	bar / m³/h	0.42	/ 49.9
Max. operation pressure before mixture cooler		bar		6
Heating circuit interface				
Engine coolant temperature (in / out), design		°C		
Heating water temperature (in / out), design		°C		
Heating water flow rate, design ^{14) 16)}		m³/h		
Pressure drop, design ¹⁴⁾	Cv value ^{15) 16)}	bar / m³/h	/	
Max. operation gauge pressure (heating water)		bar		
Room ventilation				
Genset ventilation heat ¹⁷⁾		kW		115
Inlet air temperature: (min./design/max.)		°C		30 / 35 / 50
Min. engine room temperature ¹⁸⁾		°C		15
Max. temperature difference ventilation air (in / out)		°C		20
Min. supply air volume flow rate (combustion + ventilation) ¹⁹⁾				23500
Gearbox		%	100	75
Efficiency		%		
Starter battery				
Nominal voltage / power / capacity required	V / kW / Ah			24 / 2 x 9 / --
Filling quantities				
First filling quantity lube oil / refilling amount lube oil	dm³			365 / 330
Coolant in engine circuit	dm³			270
Coolant in mixture cooler	dm³			60
Heating water for plate heat exchanger ²⁰⁾	dm³			
Lube oil for gearbox	dm³			
Gas regulation line				
Nominal size / gas pressure min. - max. (at gas regulation line inlet)	DN / mbar - mbar	100	/	138 - 250
Engine sound level ²¹⁾ (1 meter distance, free field) +3 dB(A) for total A-weighted level tolerance; + 5 dB for single octave level				
Frequency	Hz	63	125	250 500
Sound pressure level	dB	84.8	90.5	90.0 93.0
Frequency	Hz	1000	2000	4000 8000
Sound pressure level	dB	92.5	91.8	99.2 101.4
Linear total sound pressure level	Lin dB	104.8		
A-weighted total sound pressure level	dB(A)	104.4		
A-weighted total sound power level	dB(A)	124.1		
Undamped exhaust noise ²¹⁾ (1 meter distance to outlet within 90°, free field) +3 dB(A) for total A-weighted level tolerance; + 5 dB for single octave level				
Frequency	Hz	63	125	250 500
Sound pressure level	dB	113.9	119.8	111.9 104.5
Frequency	Hz	1000	2000	4000 8000
Sound pressure level	dB	97.1	96.8	94.0 83.9
Linear total sound pressure level	Lin dB	121.6		
A-weighted total sound pressure level	dB(A)	108.0		
A-weighted total sound power level	dB(A)	120.6		
Dimensions (aggregate)				
Length	mm			~ 5500
Width	mm			~ 2200
Height	mm			~ 2300
Gross weight (dry weight)	kg			~ 18000 (~ 17000)
Power derating				
Maximum ambient air dew point on site	°C			26.0
Combustion air temperature				specific to the project
Mixture cooler coolant temperature (in)				specific to the project
Methane number				specific to the project
Boundary conditions and consumables				
Systems and consumables have to conform to the following actual company standards:		A001072		

- 1) Normal cubic meter at 1013 mbar and T = 273 K
- 2) Prime power operation will be designed specific to the project
- 3) Generator gross power at nominal voltage, power factor = 1 and nominal frequency (ISO 8528-6)
- 4) According to ISO 3046 (+ 5 % tolerance), using reference fuel used at nominal voltage, power factor = 1 and nominal frequency
- 5) Emission values during grid parallel operation
- 6) Thermal output at layout temperature; tolerance +/- 8 %
- 7) Power consumption of all electrical consumers which are mounted at the module / genset
- 8) Deviations from the layout parameters respectively the reference fuel can have influence on the obtained efficiency and exhaust emissions
- 9) Functional capability
- 10) Reference value at nominal load (without amount of oil exchange) oil density set to 860g/l
- 11) Generator (at nominal power) max. 1000 m height of location and max. 40 °C intake air temperature; else power derating
- 12) Max. allowable cos phi at nominal power (view of producer)
- 13) Stated values for cooling fluid composition 65% water and 35% glycol, adaption for use of other cooling fluid composition necessary
The system design must consider the tolerance.
- 14) Pressure loss at reference flow rate
- 15) The Cv value declares the volumetric flow in m³/h at a pressure drop of 1 bar. Min. and max. flow rate limits are defined.
- 16) Stated values for pure water, adaption for other cooling fluid composition necessary
- 17) Only generator- and surface losses
- 18) Frost-free conditions must be guaranteed
- 19) Amount of ventilation air must be adapted to the gas safety concept
- 20) Assemblies including pipe work
- 21) All sound pressure levels at nominal load, according to ISO 8528-10 and ISO 6798.
- 22) Max. admissible cos phi depending on voltage in accordance with the requirements of the valid 'Standard specifications and regulations'

PWR Hybrid

Clarke Energy 2 x 1MW PowerBox

CE-03811-T1-CQ-02

Proposal from Clarke Energy

6 May 2026



Engineer – Install – Maintain

Our Ref: CE-03811-T1-CQ-02

Date: 6 May 2026

PWR Hybrid
Level 2 / 66 Kings Park Rd, West Perth 6005

Attn: Om Dolasia

Clarke Energy 2 x 1MW PowerBox

Dear Om,

Thank you for your recent enquiry. Based upon our understanding of your needs we are pleased to provide you with our technical solution.

Having evaluated the information provided, our offer is based on the following generator sets:

Diesel PowerBox

2 off Clarke Energy LSIC1410S3 PowerBox generating sets producing a nominal electrical output of 1000kW_e/1250KVA Prime power 415V, 3 phase, 50Hz.

The proposed ISO20 PowerBox containerised package is a "plug and play" solution, with the engine packaged in an attenuated weatherproof container. This package includes essential auxiliary equipment such as ventilation, integrated electric air radiator and internal exhaust silencer, ComAp IG1000 control, motorised 415V generator circuit breaker, and LV power distribution and controls for auxiliary equipment. Preassembled & factory tested package for designed quick deployment.

We will provide a draft AS4911 Part A, B, and C separately. This will generally preserve the terms agreed previously, with amendments as required to set out the specific details of this offer.

Best Regards,

CLARKE ENERGY (AUSTRALIA) PTY LTD



David Jose
WA/NT Regional Sales Manager



Harold Del Pilar
Proposals Engineer

Clarke Energy
(Australia) Pty Ltd
40-46 West Thebarton Road,
Thebarton,
South Australia 5031,
Australia

Tel. +61(0)8 8290 2100
australia@clarke-energy.com
www.clarke-energy.com



Contents of Offer

1	Introduction to Clarke Energy	4
2	Scope of Works	8
	1 - 1MW PowerBox Generator Set	9
	2 - Engine Enclosure and Auxiliary Equipment	9
	3 - Pre Delivery Inspection	10
	4 - Delivery	10
3	Termination Interface Points	11
4	Terms and Conditions	13
5	Price Schedule	18
6	Appendices	20

Appendix 1: LSIC1410S3 Technical Description

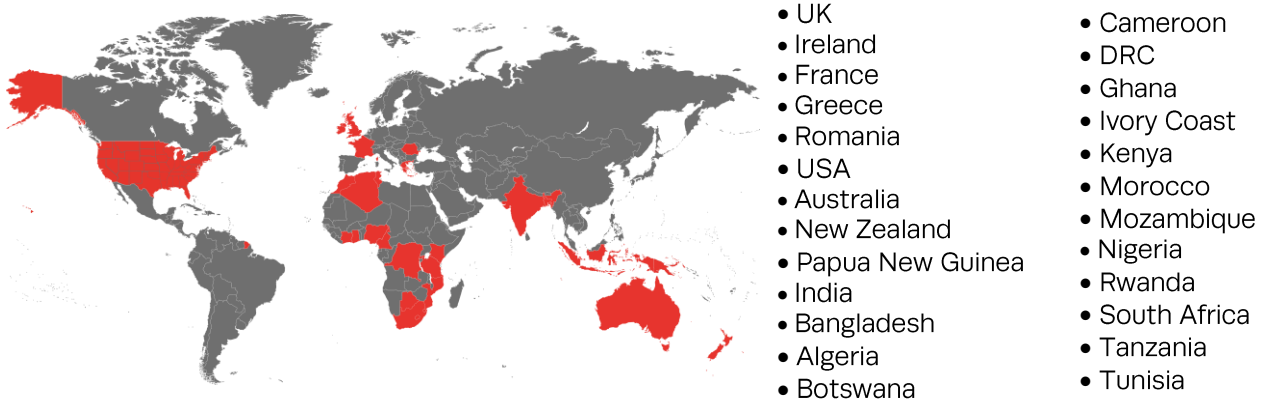
Appendix 2: LSIC1410S3 GA Drawing

1 Introduction to Clarke Energy

Introduction to Clarke Energy

Clarke Energy Limited was established in 1989 in Liverpool, UK as a specialist service company operating in the marine and offshore industries. In 1995 on the back of our unrivalled service support, Clarke Energy was awarded the sole distributorship for the Jenbacher range of engines in the UK.

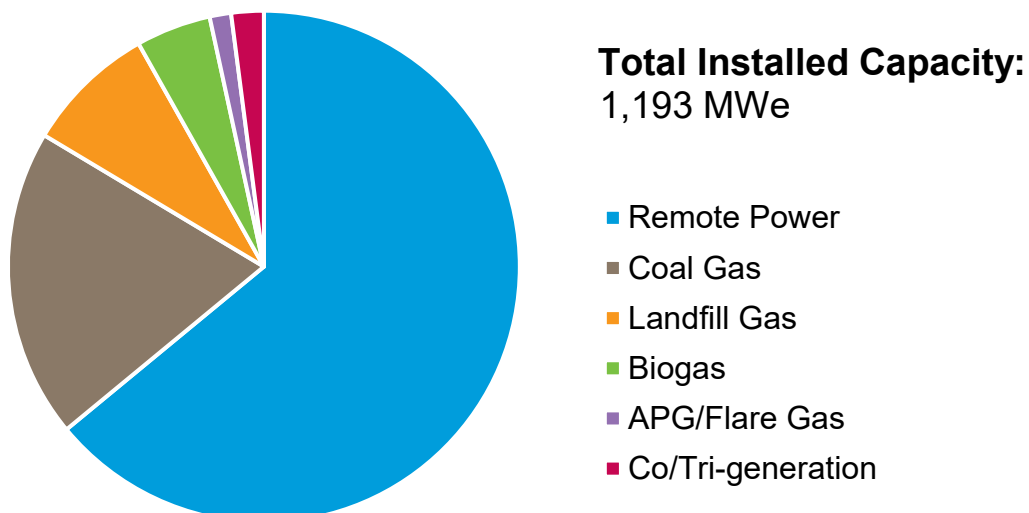
That relationship has continued to grow, resulting in us now being the largest independent distributor of the Jenbacher and Waukesha product lines, with an installed capacity of over 10GW_e across twenty-seven countries. Clarke Energy now employs in excess of 1,350 people worldwide.



In 2017, Clarke Energy was acquired by the Kohler Company, the world's third largest manufacturer of diesel engine generating sets. Kohler's high efficiency diesel product range has broadened the range of solutions that Clarke Energy can offer.

With over two decades experience encompassing a variety of power generation applications and climatic conditions, Clarke Energy is a world leader when it comes to the design, installation, project management, commissioning and long-term maintenance of gas and diesel engines in power generation and co-generation applications.

Clarke Energy Installed Base by Application in Australia Pacific Region



Clarke Energy is a world leader in the design, installation and long-term maintenance of gas and diesel engines in power generation and co-generation applications. Our portfolio includes several turnkey power stations in remote areas with generating capacity up to 63 MWe for ASX listed clients such as EDL, Santos, APA Group, BG Group/QGC, Origin Energy/APLNG, AGL, and Territory Generation.

Founded in 1873 and headquartered in Kohler, Wisconsin, USA, Kohler Co. is one of America's oldest and largest privately held companies. A global force in power solutions since 1920, Kohler is committed to reliable, leading-edge products and comprehensive aftersales support. Kohler's acquisition of SDMO in 2005 created one of the world's largest manufacturers of generators. These companies have a combined 150 years of experience in industrial power and now benefit from global research and development, manufacturing, and sales and service. In September 2024, Kohler Energy officially rebranded under its new corporate name Rehiko, when Platinum Equity completed a transaction with Kohler Company to establish then-Kohler Energy as a stand-alone business in May 2024.

INNIO is a bespoke engine manufacturer, producing reciprocating engines ranging from 250kW_e to 10.3MW_e electrical output. The fundamental design of the Jenbacher and Waukesha engines for operation on gas provides numerous benefits. These include increased operational efficiency, greater reliability, reduced maintenance costs and enhanced capability to operate on gases with lower calorific value or unusual composition, such as landfill, biogas, coal mine methane, flare gas, coke oven gas and syngas from gasification process.

Some of the benefits we believe Clarke Energy can bring to this project, which set us apart from our competitors include:

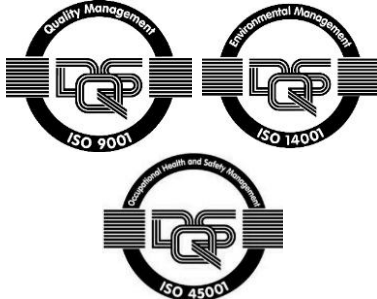
- We have represented Jenbacher for over 20 years and are their largest independent distributor and service provider with rights in 27 countries and an installed base of over 10GW_e. The client can be assured they are engaging with a partner who has the requisite knowledge and experience to ensure the equipment is installed correctly and will produce the highest levels of availability
- Clarke Energy, as the largest independent Jenbacher distributor in the world and a subsidiary of Kohler, can provide extensive technical support and training when called upon. We also have significant influence within the factories and direct contact with OEM engineers.
- 'After Sales Support' is part of our DNA – First and foremost we are a service led business. This is underpinned by our customer references and further demonstrated by the fact that many of our customers are repeat business customers.
- Clarke Energy have the largest stock holding of genuine spare parts outside of the factory and we often exceed factory performance in terms of first pick availability.
- Our robust safety and environmental policies and practices are demonstrated by our record – over 1GW_e installed (or under contract) in Australia with excellent safety performance and zero reportable environmental incidents.

Availability is our Reputation – Our goal is to achieve the highest possible availability of all equipment under contract. Our dedicated operational personnel are on hand to schedule service operations and monitor the performance of the equipment under contract to ensure reliable, trouble free operation. Our Service Engineers are field based, working in geographical groups responsible for specific sites, ensuring familiarisation with the installation and safeguarding flexibility when a fast response is required.

For turnkey power generation solutions, Clarke Energy is the "one stop shop" solution. With two decades of experience encompassing a wide variety of different applications and climatic conditions, nobody is better qualified to meet your needs from equipment supply, design, installation, project management and commissioning through to long term maintenance contracts where Clarke Energy guarantee the performance – allowing the client to focus on their core activities.

For relevant projects that we have undertaken, please find enclosed a number of Case Studies.

Key Strengths Matrix

Criteria	Clarke Energy
Financial strength of Balance Sheet (Net Assets of Clarke Energy (Australia) Pty Ltd)	Over AUD \$100,000,000
Dedicated Australian Engineering & Project delivery resource	Over 100 personnel
Australia/New Zealand Field Service Technicians – Site based and mobile teams	Over 30 personnel
Australia/New Zealand installed capacity	500+ Engines (>1.1 GWe)
Local parts stockholding	Over AUD \$5,000,000
Complete spare generating sets available ex stock within Australia	✓
Certified Management Systems: ISO 9001:2008 Quality Management ISO 14001:2004 + Cor 1:2009 Environmental Management ISO 45001:2018 Occupational Health and Safety Management	
Office of the Federal Safety Commissioner (OFSC) Accredited	
Dedicated QUENSHT team and HSE Manager	✓
OEM accredited in-house customer training managers	✓
Thorough understanding of gas codes and design for gas safety and operability, with experienced in-house engineering, construction, and operations staff	✓
Experience with brownfield retrofit projects with minimal disruption	✓
Excellent safety and environmental record	✓



Clarke Energy's "Incident and Injury Free" ethos puts safety at the forefront of everything we do.

2 Scope of Works

Scope of Works

Engine Configurations

Option	Engine Model	Engine Configuration	Nominal Output Capacity
PowerBox	Clarke Energy LSIC1410S3	2 x 1MW	2 MW

Diesel Engine Generating Set – PowerBox

Description	Scope of Works	
	Supply	Exclusions
1 - 1MW PowerBox Generator Set		
Cummins KAT50-G3 Turbocharged 50HZ High Speed Diesel Engine	✓	
Stamford oversized alternator 415V 50Hz with digital AVR, Anti-condensation heater, PT100 winding temp sensor & SEI3 winding treatment for harsh environment	✓	
ComAp IG1000 controller & sync function, IV5.2 display	✓	
Heavy duty Donaldson air cleaners	✓	
24VDC starting system & lockable battery isolator	✓	
8KW engine jacket water heater	✓	
Standard factory testing	✓	
Standard factory OMM manuals, wiring schematics	✓	
2 - Engine Enclosure and Auxiliary Equipment		
Low noise ISO20 containerised, weatherproof and acoustically attenuated generating set package designed to achieve an average sound pressure level 83dBA @ 1m 100% load	✓	
Integrated 1,000lt bunded day tank, fuel supply valve & level sensor	✓	
Parker 3 x 1000FH fuel/water separator filters	✓	
Engine compartment ventilation system	✓	
Integrated exhaust silencer and stack	✓	
Remote/integrated engine 50C cooling system & electric fan	✓	
Murphy engine lube oil make-up system with 30lt day tank	✓	
LV electrical works and controls I/O for engine ancillary equipment	✓	
ABB 4 pole motorised circuit breaker	✓	
Access doors for cooling, control panel, engine maintenance	✓	
AUS/NZ standard cabling & wiring	✓	

Description	Scope of Works	
	Supply	Exclusions
Forklift pockets to base	✓	
Premium paint finish with C5M treatment	✓	
3 - Pre Delivery Inspection		
First fills of lube oil, coolant, and battery acid		✗
Generator Pre Delivery Inspection & test run (no load)		✗
Generator site commissioning – Refer to Price Schedule for Daily Rate	Daily Rate	
First fill diesel fuel		✗
Travel, Meals, and Accommodations for Service Technician		✗
Operator training		✗
4 - Delivery		
DDP Brisbane Port x 2 Units	✓	
Offloading at Port		✗
Site Delivery Kerbside		✗

3 Termination Interface Points

Termination Interface Points

Termination Interface Points – PowerBox

Diesel Fuel

Internal fuel day tank filler cap

Ventilation Air

No termination point – Enclosure ventilation intake and discharge to atmosphere.

Exhaust System

Exhaust stack outlet to atmosphere container roof

Lubrication Oil

Clean and waste oil isolation valve located at the engine base frame.

Filling, Draining and Pressure Relief

Various points at engine module and auxiliary equipment.

Electrical

415V Generator Electrical Output: Outgoing terminals of Generator Circuit Breaker (GCB) located in enclosure & external cable access panel

Earthing

Common earth bar and earth studs to enclosure

Footings

The ISO20 container module will have to be located on a flat level plinth, provided by others, which is structurally capable of supporting the weight of the unit.

4 Terms and Conditions

Terms and Conditions

This offer is made subject to the parties entering into a formal contract, which will be an amended AS4911, and on the terms set out below (the **Special Clauses**)

Special Clauses – Diesel PowerBox Engines

1.1 TERMS OF PAYMENT

- [a] 30% of the Contract Price to be paid within 3 days of order.
- [b] 70% of the Contract Price to be paid upon goods dispatch ex Shanghai port China + 30 days

Any variation to the above schedule may incur an increase in the Contract Price. Interest will be charged on all overdue accounts at the rate of 5% above the base lending rate of National Australia Bank, such interest to be calculated on a daily basis from the due date until the date of payment.

1.2 GOODS AND SERVICES TAX (GST)

All prices quoted are exclusive of GST.

1.3 FOREIGN EXCHANGE RATE

All prices quoted are based on current exchange rates as stated in the Price Schedule. The Contract Price shall be fixed according to the forward hedged exchange rates available at the date of order.

1.4 VALIDITY

Unless previously withdrawn in writing, this offer is valid for 30 days from the date of this proposal when updated factory pricing will be required.

1.5 INSEPARABILITY OF THE WORKS

This offer is based on a lump sum price. Any pricing structure provided is for information only. Portions of the Works may not be undertaken separately at the quoted prices.

1.6 EFFECTIVE CONTRACT DATE

The contract will commence from the date of receipt of an order and acknowledgement of our down payment invoice. All programme dates and lead times will be based from this date and any previous or proposed programme and timescales will be adjusted accordingly if necessary.

1.7 TERMINATION CHARGES

The Buyer may terminate this Contract at any time upon written notice to Seller and payment of termination charges in accordance with the schedule set forth below:

Termination Schedule

No. of Days after Receipt of Order	Termination Charge as Percent of Contract Price
Less than 30	10%
31-60	30%
61-90	50%
91-date of notice of Goods Ready for Dispatch in Innsbruck	70%
After date of notice of Goods Ready for Dispatch in Innsbruck	100%

Title to the Equipment and any work in progress shall remain with Seller in the event Buyer elects to terminate this Contract pursuant to this provision.

1.8 PERMITS, CONSENTS, LICENCES AND DUTIES

The Buyer before the commencement of the contract or order for Equipment is responsible for obtaining all permits, consents, licences, duties, building regulation approval or planning permissions applicable to the site or installation works of the Equipment.

1.9 TECHNICAL INFORMATION

Project specifications, documentation, drawings and other technical data submitted with the offer are for information only and are subject to confirmation. Specific details for the project will be submitted during the course of the contract.

1.10 GROUND CONDITIONS

The Buyer shall have made available to the Seller, before the award of the Contract, such data on hydrological and sub-surface conditions as have been obtained by or on behalf of the Buyer from investigations undertaken relevant to the Works, where no data is made available the Seller, unless otherwise stated, assumes the ground bearing conditions are in accordance with the loading requirements.

1.11 DELIVERY

The Manufacturing Period for Kohler generation equipment is currently 12-14 weeks (Ex Works) from receipt of a firm order. Allow an additional 4-5 working weeks shipping time from Ex Works to Australia. Actual delivery date will be advised at time of order.

Any delivery dates are only valid under the precondition that all payments have been paid on time, the Letter or Credit/Bank Guarantee (where applicable) has been issued on time and all commercial technical details are clarified by no later than 15 days after order.

Equipment will usually be delivered during normal working hours. Actual time of delivery will be advised by the Seller beforehand to ensure necessary access is available. Special delivery arrangements or weekend delivery may be subject to additional charges. Any delay in delivery outside the control of the Seller may incur storage and insurance charges, which will be passed on to the Buyer.

With regard to any lifting operations performed in connection with delivery and offloading of Equipment at any storage location or Site, Buyer shall comply with the requirements of AS 2550. The Buyer is therefore obliged to liaise with Seller or Seller's appointed representative in order to ensure that sufficient time is allowed for a lift to be planned. The Buyer shall also provide ground condition information for the crane setup area as required.

Where craneage has not been included within the Scope of Works and lift bars are loaned by the Seller, the Buyer shall assume all risk for the lift.

1.12 COMMISSIONING

Not offered.

1.13 ADDITIONAL COSTS & VARIATIONS

Should any additional work need to be carried out over and above what is inclusive in the scope of Works, then the Seller's labour rates applicable at the time for the type of personnel required will be payable by the Buyer for the time spent carrying out the works, and the cost of any additional materials or third-party services provided by the Seller will be charged to the Buyer on a cost plus basis.

Any

(a) modification to existing site electrical / mechanical / civil infrastructure beyond the stated scope of Works, or

(b) additional costs arising as a result of an electrical network connection agreement, fuel supply connection agreement, earthing study, fault study, HAZOP, soil test, or any other study, permit, audit, approval, etc.

shall be deemed a variation in accordance with this clause.

1.14 SITE ALLOWANCES

No allowance has been made for any site allowances, industry training, or contribution to any retrenchment or retirement schemes above and beyond current statutory requirement. Any such costs, if required, shall be borne by the Buyer.

1.15 WARRANTY

The Equipment offered is guaranteed against all material and workmanship defects for a period of

The Clarke Energy Equipment offered for prime power application is guaranteed against all material and workmanship defects for a period of

- (a) Fifteen (15) months from date Product leaves plant
- (b) Twelve (12) months from start-up of the equipment, or
- (c) 1,000hrs running hours

whichever is earlier (the "Warranty Period").

The warranty guarantee will be invalidated if the Equipment is not operated and maintained in accordance with manufacturer's instructions or the fuel quality is outside acceptable limits.

1.16 RETENTION OF TITLE

Notwithstanding that risk in the Equipment shall pass to the Buyer upon delivery, full legal and equitable title and interest in all or any of the Equipment supplied to the Seller shall remain in the Seller and shall not pass to the Buyer until the Seller shall have received payment in full of the Contract Price.

The Buyer shall not sell pledge or in any way charge by way of security for any indebtedness the Equipment or any part thereof, which is the property of the Seller. Without prejudice to the other rights of the Seller if the Buyer acts in breach of this clause all sums whatever owing by the Buyer to the Seller shall become immediately due.

The Buyer must insure the Equipment and keep it insured to its full price against all risks to the reasonable satisfaction of the Seller until property in the Equipment passes to the Buyer.

In the event of failure by the Buyer to pay the Contract Price the Seller may enter upon any premises owned occupied or controlled by the Buyer where the Plant is situated to repossess the Equipment.

1.17 MAINTENANCE PAYMENTS

If the Equipment is to be maintained by the Seller any maintenance work done by the Seller after commissioning will be paid for by the Buyer at the contracted rate even if handover has not taken place.

**1.18 CONNECTIONS TO ELECTRICITY NETWORK
(Generation Equipment)**

Not offered

1.19 LIMIT OF LIABILITY

Buyer may not claim damages of any kind for any legal basis whatsoever, whether in contract, indemnity, tortious damage (including negligence), strict or product liability, impossibility of service, positive breach of an obligation, or otherwise, arising out of the performance or breach of the Contract or use of any Equipment or part thereof, unless the foregoing is due to Seller's intentional misconduct or gross negligence. Buyer shall be required to prove the existence of such intentional misconduct or gross negligence.

The total liability for any and all damages hereunder shall not exceed ten percent (10%) of the Contract Price. All liability under the Contract shall terminate two (2) years after delivery of the Equipment or part thereof giving rise to the claim.

1.20 EXCLUSION OF CONSEQUENTIAL DAMAGES

In no event, whether as a result of breach of contract, warranty, indemnity, tortious damage (including negligence), strict or product liability, impossibility of service, positive breach of an obligation, or otherwise, shall Seller or Seller's subcontractors or suppliers be liable for loss of profit or revenues, loss of use of the Equipment or any associated equipment, cost of capital, cost of substitute equipment, facilities, services or replacement power, downtime costs, fines or penalties charged to the Buyer for failure to meet permits, or for any special, consequential, incidental, indirect or exemplary damages.

1.21 EXCUSABLE DELAYS

The Seller shall not have any liability or be considered to be in breach or default of its obligations under the Contract to the extent that performance of such obligations is delayed or prevented, directly or indirectly, due to:

- (a) causes beyond its reasonable control; or
- (b) acts of God, acts (or failures to act) of governmental authorities, fires, severe weather conditions, earthquakes, strikes or other labour disturbances (outside Seller's factory), floods, war (declared or undeclared), epidemics, civil unrest, riots, delays or accidents in transportation; or
- (c) acts (or omissions) of the Buyer including failure to promptly:
 - (i) provide the Seller with information and approvals necessary to permit the Seller to proceed with work immediately and without interruption, or
 - (ii) comply with the terms of payment or shipment to storage

The Seller shall notify the Buyer of any such delay and strive to mitigate the delay to the extent practicable. The Goods Ready for Dispatch in Innsbruck date or other date of performance shall be extended for a period of time necessary to overcome the effect of such excusable delay. If the Seller is delayed by acts or omissions of the Buyer, or by the prerequisite work of the Buyer's other Sellers or suppliers, the Seller shall also be entitled to an equitable Contract Price adjustment.

If such excusable delay extends for more than ninety (90) days and the Parties have not agreed upon a revised basis for continuing the work at the end of the delay, including adjustment of the Contract Price, then either Party (except where delay is caused by the Buyer, in which event only the Seller), upon thirty (30) days written notice, may terminate the Contract with respect to the portion of Equipment to which title has not yet passed, whereupon the Buyer shall promptly pay the Seller termination charges as set forth in the Termination Schedule.

1.22 INSURANCES

Buyer shall be responsible for the cost of any excess coverage for Public Liability, Professional Indemnity, Motor Vehicle, Plant and Equipment, Workers' Compensation, or any other insurance policy above the level of Seller's current standard coverage.

1.23 ADDITIONAL PROPOSAL DOCUMENTS

This offer is made subject to the following:

Clarke Energy Australia Pty Ltd Standard Conditions of Trading Conditions
Special Clauses
Equipment Technical Descriptions for the equipment offered

In the event of any conflict between Clarke Energy Australia Pty Ltd Standard Conditions of Trading and the Special Clauses, the Special Clauses shall take precedence over the Clarke Energy Australia Pty Ltd Standard Conditions of Trading.

5 Price Schedule

Price Schedule

Item	Description	Price (AUD, ex GST)
1	Supply and Delivery DDP Brisbane Port 2 x Clarke Energy 1MW PowerBox KTA50 ISO20 Container Package, ComAp IG1000 Control	\$822,633
Optional Item 1	Extended Warranty coverage to 2yrs on Clarke Energy 1MW PowerBox	\$ 10,284 per unit

Notes:

1. Items 1,2 &4 above are subject to variation in foreign exchange rates. Pricing will be fixed based on forward hedged rates available at date of order. The Euro cost element within the above Price Schedule has been calculated using the exchange rate of AUD\$1.00 = USD 0.71.
2. Commissioning is an additional cost charged at prevailing rates at time of commissioning. The current rate for a Commissioning Technician is AUD\$2,680 per day excluding travel, meals, and accommodations. CEA recommend an allowance of 5 days per genset based on 10 hours per day. Overtime rate of AUD\$402 per hour applies after 10 hours.
3. This offer remains valid 30 days from the date of this proposal, after which date it shall require revalidation in writing.
4. This offer is made subject to parties entering into a Contract based on amended AS4911 and the Special Clauses set out in Section 4. The proposed AS4911 Annexures Parts A, B and C will be provided separately.

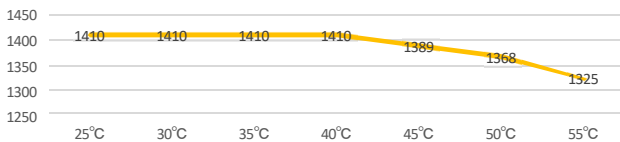
6 Appendices

Appendix 1: LSIC1410S3 Technical Description

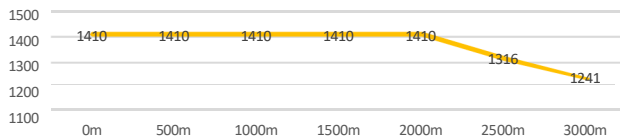


MODEL			LSC1410S3
Power Pf.0.8	Standby	kVA	1375
		kW	1100
	Prime	kVA	1250
		kW	1000
	Frequency	Hz	50
	Voltage	V	240/415
	Rated speed	rpm	1500

Temperature (Celsius) Derate Curves
Unit: kVA



Altitude (meters) Derate Curves Unit:
kVA



CEA generator sets meet the standards of ISO9001, CE, BS5000, ISO 8528, ISO 3046, IEC 60034, NEMA MG-1.22.

Standard reference Conditions:

Standard reference condition 25°C (77°F) air inlet temp, 100m (328ft) A.S.L 30% relative humidity. Fuel consumption data with diesel fuel with specific gravity of 0.85 and conforming to BS 2869: 1998, Class A2.

Standard Features

- Clarke Energy provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 50Hz generator set offers a AUS 2012 listing and CE 2015 listing.
- The generator set complies with ISO 8528-5, Class G3 requirements for transient performance.
- The generator set accepts rated load in one step.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.

Generator Features

- The brushless, rotating-field generator has broadrange reconnectability.
- The pilot-excited, permanent-magnet generator (PMG) provides superior short-circuit capability
- Controllers are available for all applications. See controller features inside.
- The low coolant level shutdown prevents overheating (standard on radiator models only)
- Integral vibration isolation eliminates the need for under-unit vibration spring isolators
- An electronic, isochronous governor delivers precise frequency regulation.

- Electronic engine controls and a generator microprocessor controller combine to deliver one of the most advanced control systems in today's generator market.

RATINGS: All three-phase units are rated at 0.8 power factor. **Standby ratings:** Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. **Prime power ratings:** Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult Clarke Energy. Obtain the technical information bulletin (TIS-101) on ratings guidelines for the complete ratings definitions, reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

Cummins engine Model: KTA50-G3



Engine Brand	CUMMINS
Engine Model	KTA50-G3
Cylinder No.& Configuration	16 cylinder Diesel.VEE type
Working Mode	Turbocharged and Aftercooled (Jacket water to cooler)
Bore x Stroke	mm 159*159
Displacement	L 50.3
Compression Ratio	13.9:1
Rated Power	kW 1097
Rated Speed	1500
Lubrication System	Pressure Lubrication
Lube Oil	Conforms above CF class or SAE10W-30,15w-40
Lube Oil Capacity	L 177
Battery Capacity	6-QW-200EP*4
Fuel Type	Diesel:0#(Summer),- 10#(Winter),-35#(Cold)
Fuel Consumption 25% load.....	L/H 76
Fuel Consumption 50% load.....	L/H 139
Fuel Consumption 75% load.....	L/H 199
Fuel Consumption 100% load	L/H 261

Alternator Stamford S6L1D-H41

Type	4-Pole, Rotating-Field
Exciter type	Brushless, Permanent-Magnet, Pilot Exciter
Voltage regulator	Solid-State, Volts/Hz
Insulation	NEMA MG1, Class H
Material	Synthetic, Nonhygroscopic
Temperature rise	130°C, 150°C Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Rotor balancing	125% 60 Hz, 150% 50 Hz
Voltage regulation, no-load to full-load(with < 0.5% drift due to temp. variation	3-Phase Sensing, $\pm 0.25\%$
One-step load acceptance	100% of Rating
Unbalanced load capability	100% of Rated Standby

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the generator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from two-thirds pitch windings and skewed stator.
- Digital solid-state volts-per-hertz voltage regulator with $\pm 0.25\%$ no-load to full-load regulation.
- Brushless alternator with brushless pilot exciter for excellent load response.

Controller – ComAp IG1000



Audiovisual annunciation with NFPA 110 Level 1 capability. Programmable microprocessor logic and digital display features. Safeguard circuit protection standard. 12- or 24-volt engine electrical system capability. Remote start, remote annunciation, and remote communication options. Refer to M6-46 for additional controller features and accessories

Product description

- True RMS measurement is used with Voltage, Current and Power measurement.
- Comprehensive paralleling Gen-set controller for island or mains parallel operation
- Cooperation with up to 64 gen-set / mains / tie controllers
- Direct communication with ECU
- Secure Remote control and monitoring
- Power save mode
- Highly flexible yet configurable solution for switchgear applications

Key features

- Hardware compliant to the latest switchgear market needs
- State of the art AC accuracy measurements which allows to participate on primary frequency control mechanism, grid balancing and demand response projects
- Cybernetic security by design, based on the ANSI/ISA-62443 standard
- Large portion of both local and remote monitoring options, with high number of at once connected clients split into "trusted" and "untrusted" zones

- Mains parallel operation with support of Grid codes, compliant to European Grid codes (Requirements for Generators, VDE-AR-N 4110:2018, VDE-AR-N 4105:2019, G99), American IEEE 1547
- Multiple Island operation with cooperation up to 64 additional gen-set/mains/tie controllers
- Several load transfer options with possibility of less than 100ms load transfer
- Redundant inter-controller line for critical applications like datacentres, hospitals
- Double redundancy of the kW and kVAr sharing
- User management allowing to handle up to 30 unique users
- AirGate 2.0 makes sure that the connection to the controller is established faster from all around the world, and is more reliable than ever before.
- Internal PLC interpreter with easy to use PLC Editor, for simple and fast creation of specific logic
- Up to 31 characters in texts, parameters, Alarms for system clarity and easy troubleshooting
- Compatibility with ComAp IG/IS/IM-NT line, IG200, IG500 controllers
- ENABLE/DISABLE concept of features and protections makes the system highly versatile yet simple and easy for both commissioning engineers and operators

Generating Set Standard Features

Engine

- Cummins KTA50-G3
- 4-stroke, water-cooled diesel engine
- Electronic governing
- Donaldson heavy duty air filters
- 3 x Parker heavy duty fuel/water separator filter
- Oil temperature sensor
- Low coolant level sensor
- Remote 50C radiator with electric cooling fan
- Water jacket heater 8KW
- 24VDC starting system

Alternator

- Oversized Stamford S6L1D-H41 alternator rated up to 1500KVA
- Class H insulation
- IP23 Protection
- Premium Stamford SEI-3 epoxy winding treatment
- MX321 Automatic Voltage Regulator (AVR)
- PMG excitation system
- PT100 winding sensor
- Single bearing alternator
- Class F temp rise
- Direct coupled single bearing
- Anti condensation heater 400VAC

Electrical system

- 4 x 12DC/200AH maintenance-free and anti-explosion battery
- Motorized 2000Amp 4 pole ABB breaker
- Battery charger 240VAC
- Lockable battery isolator
- AUS/NZ standard cabling & wiring
- AS3000-2017
- AS3010-2017

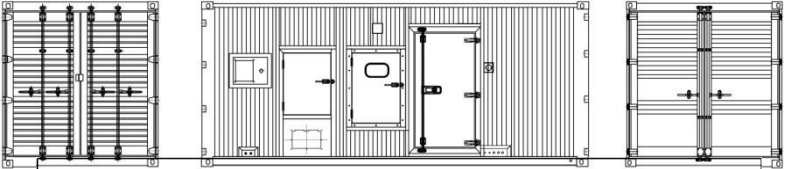
Packing

- Engine manual
- Alternator manual
- Genset operation and maintenance manual
- Wiring schematics
- Test certificates

ISO20 HC Container Package

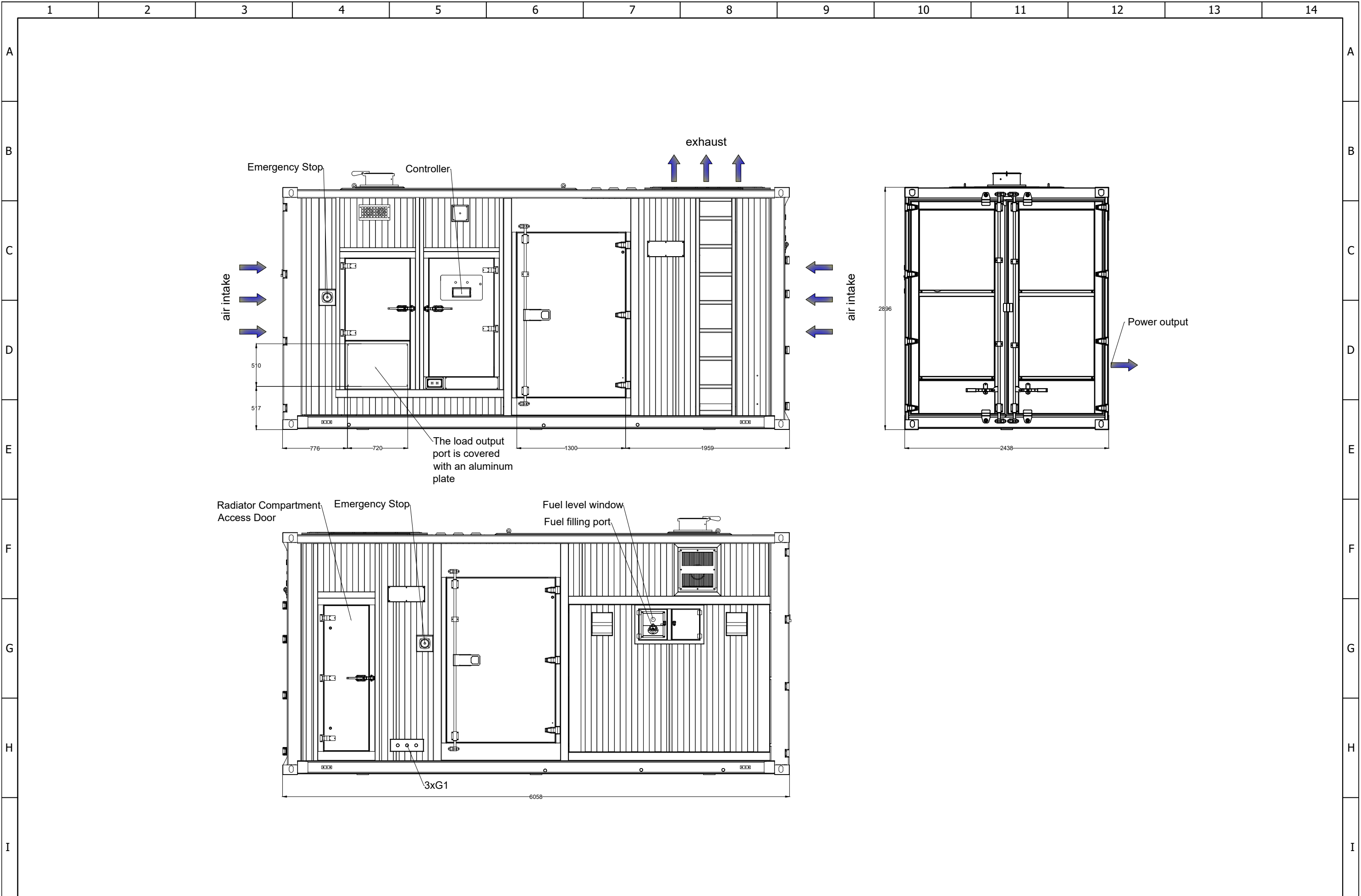
- Weatherproof & sound-attenuated ISO20
- Low noise 83dBA @ 1M
- 30lt auto oil make-up system
- 1,000lt bunded day tank + supply valve, fuel level sensor
- Forklift pockets
- Emergency stop button
- Integrated (inside) exhaust silencer
- Premium C5 paint treatment

Overview Dimension & Weight



LSC1410S3 (Containerized type)					
Configuration	L= Length (mm)	W= Width (mm)	H= Height (mm)	Weight (kg)	Fuel Tank Capacity(L)
Containerized Type	ISO 20'ft HQ			17500	1000

Appendix 2: LSIC1410S3 GA Drawing



		Project Name		Project Number				=	&	
				Drawing no.				+	Page	
Revise	Date	Name	Design	xiaohuyang	Approve			Date	Verify	Pages



Clean Energy Fuels Australia Pty Ltd
Level 21, 1 Spring Street, Perth, WA, 6000
T (08) 9212 6700
www.cefa.com.au
