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# Environmental Noise Assessment - Belisama Gas Development Project

**1906 Yandanooka West Road, Milo WA**

**Reference: 250810618-01**

Prepared for:
Hancock Energy

# Reference: 250810618-01


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# 1. INTRODUCTION

Lloyd George Acoustics was engaged by Hancock Energy to undertake an environmental noise assessment for a proposed 210 TJ/d gas processing facility to be located at 1906 Yandanooka West Road, Milo WA - refer *Figure 1-1 (source Google Earth)*.


***Figure 1-1: Subject Site Location***

With regard to noise emissions, consideration is given to noise from the processing plant at neighbouring properties, and compared against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997*.

Noise impacts to the accommodation and construction villages are also considered in accordance with Department of Water and Environmental Regulation (DWER) draft guideline: *Assessment of Environmental Noise Emissions* (May 2021).

*Appendix B* contains a description of some of the terminology used throughout this report.

# 2. CRITERIA

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations) as follows:

***"7. Prescribed standard for noise emissions***

*(1) Noise emitted from any premises or public place when received at other premises –*

*(a) must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and*

*(b) must be free of –*

*(i) tonality; and*

*(ii) impulsiveness; and*

*(iii) modulation,*

*when assessed under regulation 9.*

*(2) For the purposes of subregulation (1)(a), a noise emission is taken to significantly contribute to a level of noise if the noise emission … exceeds a value which is 5 dB below the assigned level at the point of reception."*

Tonality, impulsiveness and modulation are defined in regulation 9. Under regulation 9(3), *"Noise is taken to be free of the characteristics of tonality, impulsiveness and modulation if -*

*(a) the characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and*

*(b) the noise emission complies with the standard prescribed under regulation 7(1)(a) after the adjustments in the table [Table 2-1] … are made to the noise emission as measured at the point of reception."*

***Table 2-1 Adjustments Where Characteristics Cannot Be Removed***

| Where Noise Emission is Not Music* | | | Where Noise Emission is Music | |
|---|---|---|---|---|
| Tonality | Modulation | Impulsiveness | No Impulsiveness | Impulsiveness |
| + 5 dB | + 5 dB | + 10 dB | + 10 dB | + 15 dB |

* These adjustments are cumulative to a maximum of 15 dB.

The assigned levels (prescribed standards) for all premises are specified in regulation 8(3) and are shown in *Table 2-2*. The $L_{A10}$ assigned level is applicable to noises present for more than 10% of a representative assessment period, generally applicable to "steady-state" noise sources. The $L_{A1}$ is for short-term noise sources present for less than 10% and more than 1% of the time. The $L_{Amax}$ assigned level is applicable for incidental noise sources, present for less than 1% of the time.

***Table 2-2 Baseline Assigned Levels***

| Premises Receiving Noise | Time Of Day | Assigned Level (dB) | | |
|---|---|---|---|---|
| | | $L_{A10}$ | $L_{A1}$ | $L_{Amax}$ |
| Noise sensitive premises: highly sensitive area[1] | 0700 to 1900 hours Monday to Saturday (Day) | 45 + influencing factor | 55 + influencing factor | 65 + influencing factor |
| | 0900 to 1900 hours Sunday and public holidays (Sunday) | 40 + influencing factor | 50 + influencing factor | 65 + influencing factor |
| | 1900 to 2200 hours all days (Evening) | 40 + influencing factor | 50 + influencing factor | 55 + influencing factor |
| | 2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night) | 35 + influencing factor | 45 + influencing factor | 55 + influencing factor |
| Noise sensitive premises: any area other than highly sensitive area | All hours | 60 | 75 | 80 |

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

As all the land surrounding the proposed processing facility is rural and away from any commercial or industrial land uses, the influencing factor (IF), in relation to noise received at noise sensitive premises, has been calculated as 0 dB. Therefore, it is the baseline levels provided in *Table 2-2* that are applicable. It must be noted the assigned levels above apply outside the receiving premises and at a point at least 3 metres away from any substantial reflecting surfaces.

The assigned levels are statistical levels and therefore the period over which they are determined is important. The Regulations define the Representative Assessment Period (RAP) as "*a period of time of not less than 15 minutes, and not exceeding 4 hours*, *determined by* an *inspector* or *authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission*". An inspector or authorised person is a person appointed under Sections 87 & 88 of the *Environmental Protection Act 1986* and include Local Government Environmental Health Officers and Officers from the Department of Water Environmental Regulation. Acoustic consultants or other environmental consultants are not appointed as an inspector or authorised person. Therefore, whilst this assessment is based on a 4-hour RAP, which is assumed to be appropriate given the nature of the operations, this is to be used for guidance only.

## 2.1. Noise to Accommodation Village

As the construction and accommodation villages are on the same site as the prescribed activity, the standard assigned noise levels do not apply. In these cases, the *Guideline – Assessment of Environmental Noise Emissions*, produced by DWER states that at a minimum, accommodation will be designed to achieve a level of $L_{Aeq}$ 40 dB, being indoor levels inside the village sleeping areas. Assuming a 20 dB increase in level when assessing outdoors, this equates to a level of 60 dB $L_{Aeq}$ outside sleeping areas.

# 3. METHODOLOGY

Computer modelling has been used to predict the noise emissions from the development to all nearby receivers. The software used was *SoundPLAN 9.1* with the CONCAWE algorithms selected, as they include the influence of meteorological conditions. Input data required in the model are listed below and discussed in *Section 3.1* to *Section 3.4*:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

## 3.1. Meteorological Conditions

Meteorological information utilised is provided in *Table 3-1* and is considered to represent worst-case conditions for noise propagation, which would occur during the night period. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

***Table 3-1: Modelling Meteorological Conditions***

| Parameter | Night (7.00pm to 7.00am)[2] |
|---|---|
| Temperature (°C) | 15 |
| Humidity (%) | 50 |
| Wind Speed (m/s) | 3 |
| Wind Direction[1] | All |
| Pasquil Stability Factor | F |

Notes:
1. The modelling package allows for all wind directions to be modelled simultaneously.
2. The conditions above are as defined in *Guideline: Assessment of Environmental Noise Emissions*; May 2021

## 3.2. Topographical Data

Topographical data was adapted from publicly available information (e.g. *Google*) in the form of spot heights and combined with the site plan.

## 3.3. Ground Absorption

The ground absorption has been assumed to be 0.0 (0%) for the processing area and 0.75 (75%) elsewhere, noting that 0.0 represents hard reflective surfaces such as water and 1.0 represents absorptive surfaces such as grass. Using a value of 75% allows for times after harvesting, where the ground may not be covered with crops (i.e. soft ground).

## 3.4. Source Sound Levels

The source sound power levels of the processing plant assumed in the modelling are provided in *Table 3-2*. The processing plant layout is provided in *Appendix A*.

***Table 3-2: Source Sound Power Levels, dB***

| Description | Octave Band Centre Frequency (Hz) | | | | | | | | Overall dB(A) |
|---|---|---|---|---|---|---|---|---|---|
| | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | |
| Amine Pumps | 75 | 83 | 87 | 96 | 102 | 99 | 91 | 82 | 105 |
| Compressor > 1750 KW (enclosed) | 57 | 68 | 77 | 80 | 88 | 89 | 84 | 76 | 93 |
| Condensation Cooler | 89 | 97 | 96 | 97 | 95 | 93 | 88 | 71 | 103 |
| Cooler Bed | 84 | 92 | 91 | 92 | 90 | 88 | 83 | 66 | 98 |
| Electric Pump | 58 | 73 | 83 | 86 | 83 | 86 | 86 | 71 | 92 |
| Inlet Cooler Fan | 59 | 67 | 66 | 67 | 65 | 63 | 58 | 41 | 73 |
| Inlet Separator | | | | 95 | | | | | 95 |
| Methane Gas Flare Discharge | 103 | 97 | 111 | 114 | 110 | 114 | 115 | | 120 |
| Methane Gas Flare Normal | 76 | 70 | 84 | 87 | 83 | 87 | 88 | | 93 |
| Reciprocating Engines (enclosed) | 64 | 71 | 78 | 83 | 90 | 89 | 79 | 71 | 93 |
| Reflux Pumps | 63 | 71 | 75 | 84 | 90 | 87 | 79 | 70 | 93 |
| Slug Catcher | | | | 92 | | | | | 92 |
| Engine Exhaust | 72 | 76 | 73 | 76 | 80 | 80 | 71 | 58 | 85 |
| Dew Point Controllers (JT Jet) | | | | 95 | | | | | 95 |
| Launchers/Receivers | | | | 92 | | | | | 92 |
| Workshop | 46 | 61 | 73 | 89 | 92 | 93 | 88 | 76 | 97 |

The following is noted in relation to *Table 3-2*:

- Sound power levels provided by Hancock Energy;
- Modelling assumes all plant is operating simultaneously;
- The noise data for all sources representative of its L10 level (except methane gas discharge);
- The methane gas discharge is representative of the L1 level; and
- The assumed enclosures for the compressors and engine is to ensure compliance with occupational health and safety standards of 85 dB(A) at 1 metres. This assessment does not assume any specific design or use of the enclosures.

# 4. RESULTS

The noise levels were predicted for two scenarios, being the $L_{A10}$ levels representative of normal operations and the $L_{A1}$ level, being during a gas flare discharge. The results are presented in *Table 4-1* and *Figure 4-1 and Figure 4-2* respectively. The noise from the plant may be considered to contain tonal characteristics and therefore attracts a +5 dB adjustment for assessment purposes.

***Table 4-1: Predicted Noise Levels, dB(A)***

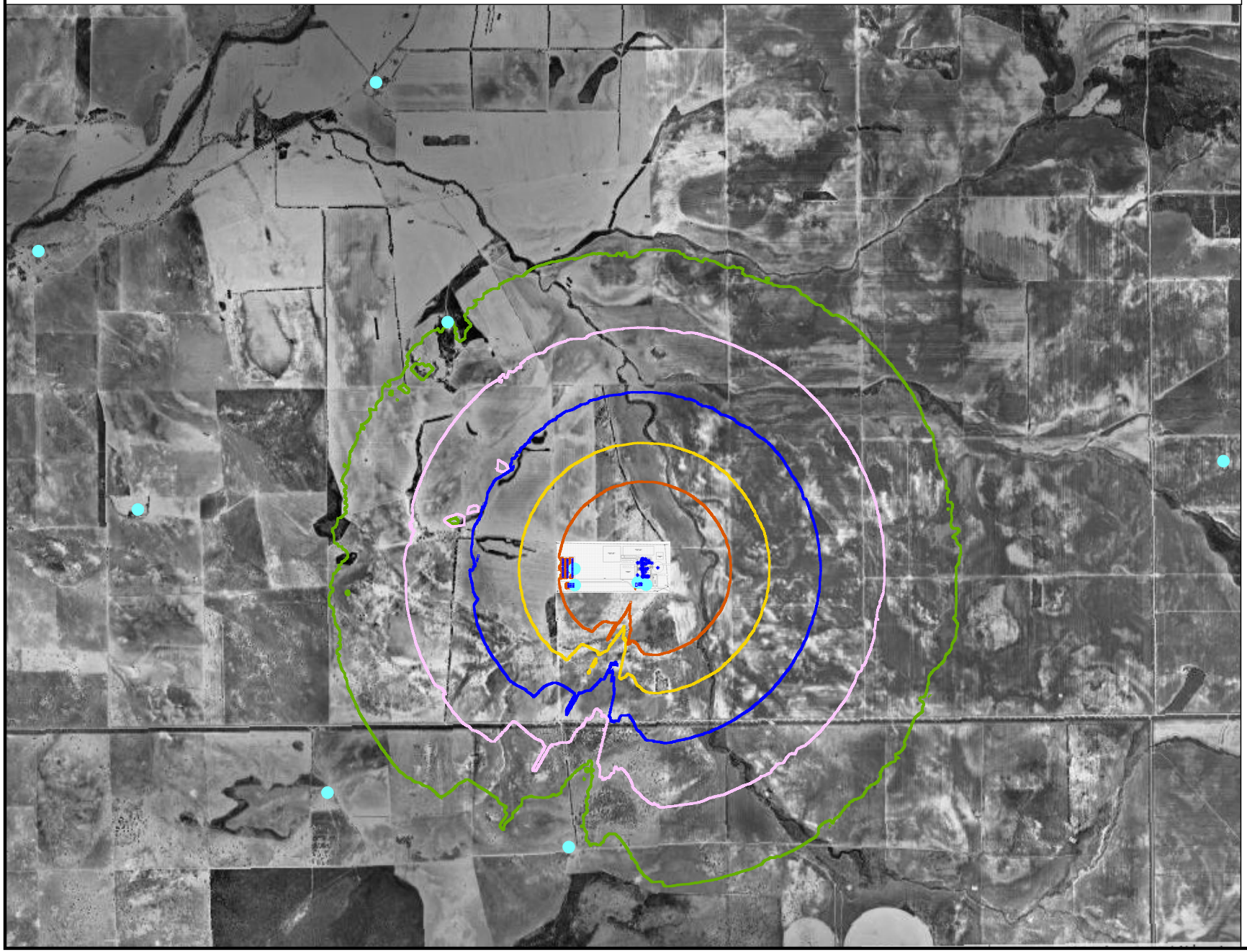
| Receiver | Predicted $L_{A10}$ Noise Level dB* | $L_{A10}$ Criterion | Predicted $L_{A1}$ Noise Level dB* | $L_{A1}$ Criterion | Comment |
|---|---|---|---|---|---|
| ***Nearest Noise Sensitive Premises*** | | | | | |
| Homestead at Lot 10075 on Plan 205997 | 10 | 35 | 12 | 45 | Compliant at all times |
| Homestead at Lot 9887 on Plan 206281 | 25 | 35 | 29 | 45 | Compliant at all times |
| Homestead at Lot 6479 on Plan 248545 | 15 | 35 | 19 | 45 | Compliant at all times |
| Erregulla Plains House | 14 | 35 | 18 | 45 | Compliant at all times |
| Jinsa Pty Ltd Homestead | 16 | 35 | 20 | 45 | Compliant at all times |
| Mondara Pastoral | 11 | 35 | 14 | 45 | Compliant at all times |
| Mt Adams Homestead | 20 | 35 | 25 | 45 | Compliant at all times |
| Mt Adams House | 22 | 35 | 30 | 45 | Compliant at all times |
| ***On Site Receivers*** | | | | | |
| Laydown Area | 69 | - | 71 | - | On same site as facility |
| Workshop | 74 | - | 76 | - | On same site as facility |
| Admin Building | 69 | - | 70 | - | On same site as facility |
| Construction Camp | 50 | 60 | 53 | 60 | Compliant with Guideline Level |
| Operations Village | 49 | 60 | 52 | 60 | Compliant with Guideline Level |

*Includes +5 dB adjustment for tonality characteristics.

A noise contour plot of normal operational levels and during flare discharge, is presented with focus on the onsite areas such as the accommodation villages is presented in *Figure 4-3* and *Figure 4-4* respectively.

# *Figure 4-1 Scenario 1: Night Time Noise Ground Floor (1.5m AGL), dB $L_{A10}$*

*Alternate CPF Location, Perth Basin Conventional Gas Project*



**Predicted Noise level**

= 20
= 25
= 30
= 35
= 40

Legend

Receiver

Plant Source

N

Scale 1:70000

0 400 800 1600 2400 m

Project No: 250810618
Consultant: MM
Date: 14/11/2025
Algorithm: CONCAWE
SoundPLAN Version: 9.1

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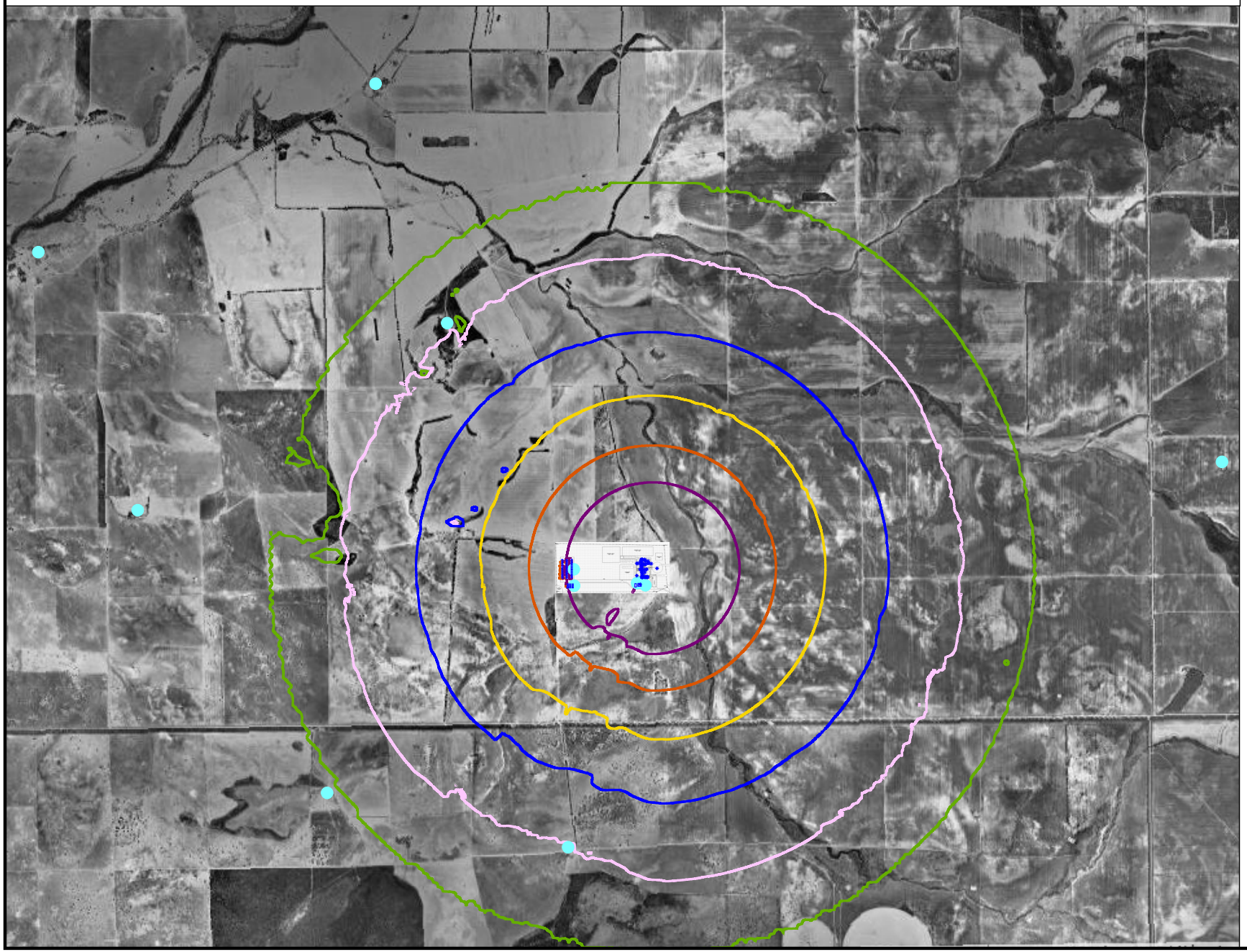
# *Figure 4-2 Scenario 2: Night Time Noise (Flare) Ground Floor (1.5m AGL), dB $L_{A1}$*

*Alternate CPF Location, Perth Basin Conventional Gas Project*



**Predicted Noise level**

= 20
= 25
= 30
= 35
= 40
= 45

Legend

Receiver

Plant Source

N

Scale 1:70000

0 400 800 1600 2400 m

Project No: 250810618
Consultant: MM
Date: 14/11/2025
Algorithm: CONCAWE
SoundPLAN Version: 9.1

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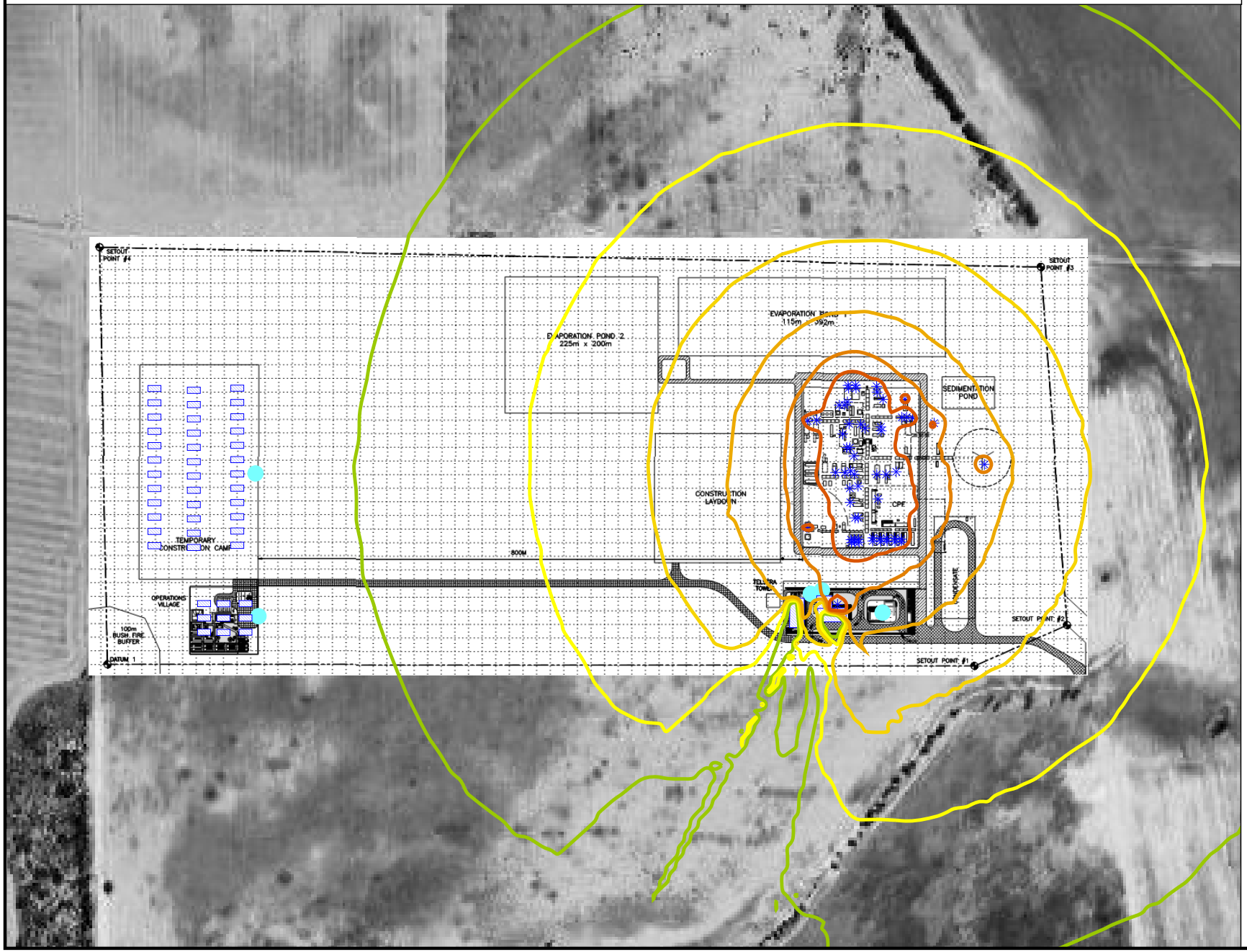
# *Figure 4-3 Scenario 1: Night Time Noise Ground Floor (1.5m AGL), dB $L_{A10}$*

*Alternate CPF Location, Perth Basin Conventional Gas Project*




**Predicted Noise level**

- = 45
- = 50
- = 55
- = 60
- = 65
- = 70

Legend

- Receiver
- New Buildings
- Plant Source

N

Scale 1:8000

0 50 100 200 300 m

Project No: 250810618
Consultant: MM
Date: 14/11/2025
Algorithm: CONCAWE
SoundPLAN Version: 9.1

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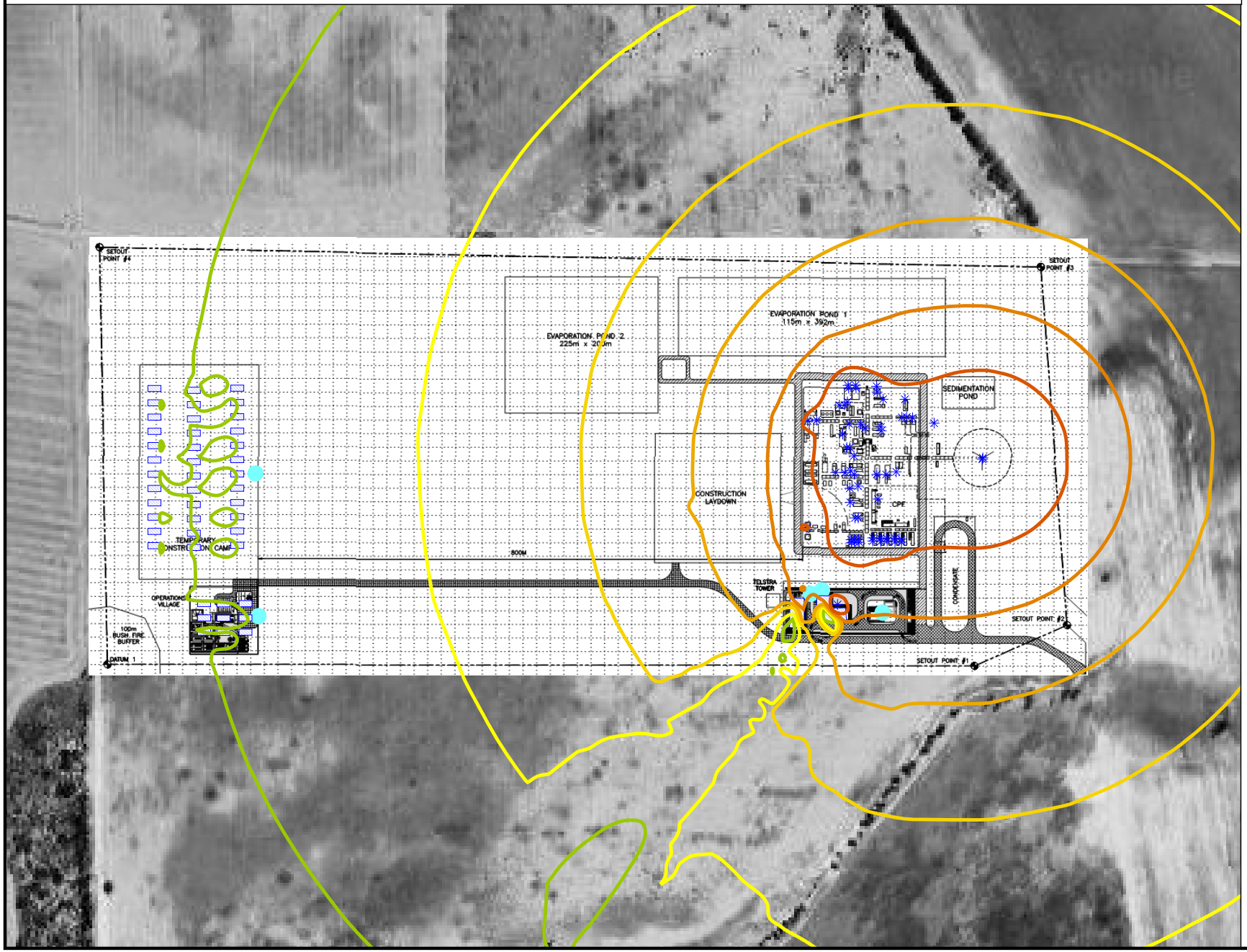
# *Figure 4-4 Scenario 2: Night Time Noise Ground Floor (1.5m AGL), dB $L_{A10}$*

*Alternate CPF Location, Perth Basin Conventional Gas Project*




**Predicted Noise level**

- = 45
- = 50
- = 55
- = 60
- = 65
- = 70

Legend

- Receiver
- New Buildings
- Plant Source

N

Scale 1:8000

0 50 100 200 300 m

Project No: 250810618
Consultant: MM
Date: 14/11/2025
Algorithm: CONCAWE
SoundPLAN Version: 9.1

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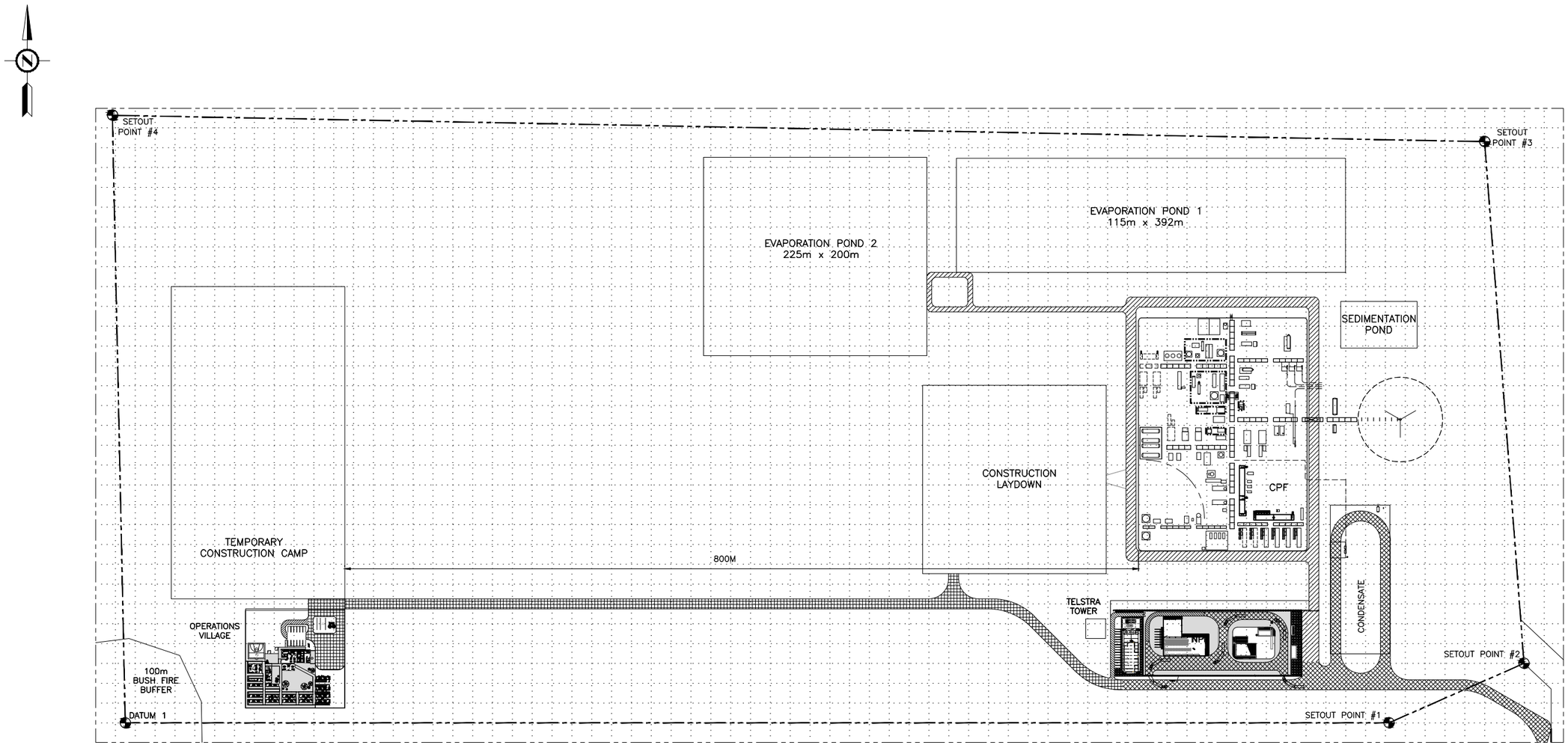
# 5. RECOMMENDATIONS & CONCLUSION

The predicted noise levels presented in *Section 4*, shows that the noise levels from the Belisama Gas Development Project can comply with the assigned levels prescribed within the *Environmental Protection (Noise) Regulations 1997,* at all nearest noise sensitive premises.

The noise levels predicted at the proposed on site accommodation (both the construction camp and operations village) are demonstrated to comply with DWER Draft Guideline – *Assessment of Environmental Noise Emissions (2021)*.

# Appendix A – Processing Facility Layout




LEGEND:

- B–DOUBLE (26m)
- SERVICE TRUCK (8.8m)
- BUS (12.5m)
- LV (5.2m)
- BITUMEN SEAL
- COMPACTED GRAVEL
- CONCRETE APRON/PATH
- GATE
- GATE
- TRAFFIC FLOW
- EQUINOX DATUM POINT

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Document Control
**ISSUED FOR INFORMATION**
2025-11-07

| REFERENCE DRAWINGS | | REVISIONS | | | | | | | SEAL | PERMIT |
|---|---|---|---|---|---|---|---|---|---|---|
| DRAWING NO. | DRAWING DESCRIPTION | REV | DATE | BY | CHK'D DFTG | CHK'D ENG | APP'D PM | REVISION DESCRIPTION | | |
| | | A | 2025–10–27 | AE | MF | TK for BT | TK | ISSUED FOR INFORMATION (EQUINOX PROJECT # 923–00–02) | | |

EQUINOX Engineering

HANCOCK ENERGY

PROJECT: BGP–BELISAMA GAS PROJECT

TITLE: MOUNT ADAMS CPF LOCATION
CENTRAL PROCESSING FACILITY
TRAFFIC MANAGEMENT PLAN

| SCALE | DRAWN BY | DATE | CLIENT | REGION | PROJECT | DRAWING NO. | REV |
|---|---|---|---|---|---|---|---|
| 1:2500 | MF | 2025–10–27 | 923 | 00 | 02 | GA–A–00–002–01 | A |

# Appendix B – Terminology

The following is an explanation of the terminology used throughout this report:

- **Decibel (dB)**

The decibel is the unit that describes the sound pressure levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

- **A-Weighting**

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as $L_A$, dB.

- **Sound Power Level ($L_w$)**

Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure level at known distances. Noise modelling incorporates source sound power levels as part of the input data.

- **Sound Pressure Level ($L_p$)**

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc. and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

- **$L_{ASlow}$**

This is the noise level in decibels, obtained using the A-frequency weighting and the S (slow) time weighting. Unless assessing modulation, all measurements use the slow time weighting characteristic.

- **$L_{AFast}$**

This is the noise level in decibels, obtained using the A-frequency weighting and the F (fast) time weighting. This is used when assessing the presence of modulation.

- **$L_{APeak}$**

This is the greatest absolute instantaneous sound pressure level in decibels using the A-frequency weighting.

- **$L_{Amax}$**

An $L_{Amax}$ level is the maximum A-weighted noise level during a particular measurement.

- **$L_{A1}$**

The $L_{A1}$ level is the A-weighted noise level exceeded for 1 percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

- **$L_{A10}$**

The $L_{A10}$ level is the A-weighted noise level exceeded for 10 percent of the measurement period and is considered to represent the “intrusive” noise level.

- **$L_{A90}$**

The $L_{A90}$ level is the A-weighted noise level exceeded for 90 percent of the measurement period and is considered to represent the “background” noise level.

- **$L_{Aeq}$**

The equivalent steady state A-weighted sound level (“equal energy”) in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the “average” noise level.

- **One-Third-Octave Band**

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20000 Hz inclusive.

- **Representative Assessment Period**

Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

- **$L_{Amax}$ assigned level**

Means an assigned level, which, measured as a $L_{ASlow}$ value, is not to be exceeded at any time.

- **$L_{A1}$ assigned level**

Means an assigned level, which, measured as a $L_{ASlow}$ value, is not to be exceeded for more than 1 percent of the representative assessment period.

- **$L_{A10}$ assigned level**

Means an assigned level, which, measured as a $L_{ASlow}$ value, is not to be exceeded for more than 10 percent of the representative assessment period.

- **Tonal Noise**

A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

– the presence in the noise emission of tonal characteristics where the difference between -

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

- **Modulating Noise**

A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

– a variation in the emission of noise that —

(a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band; and

(b) is present for at least 10% of the representative assessment period; and

(c) is regular, cyclic and audible.

- **Impulsive Noise**

An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness means:

– a variation in the emission of a noise where the difference between $L_{Apeak}$ and $L_{Amax}$ is more than 15 dB when determined for a single representative event.

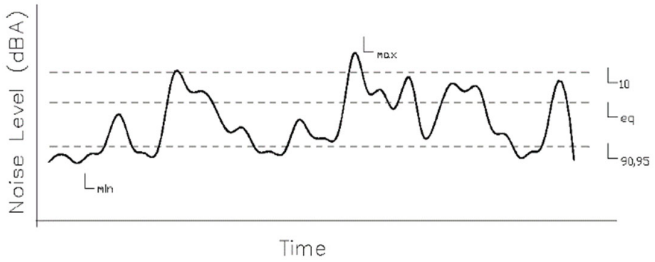
- **Major Road**

Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

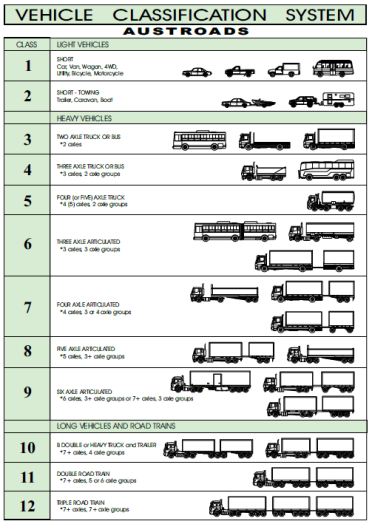
- **Secondary / Minor Road**

Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

- **Chart of Noise Level Descriptors**




- **Austroads Vehicle Class**




- **Typical Noise Levels**