Lloyd George Acoustics
PO Box 717
Hillarys WA 6923
T: 9401 7770
www.lgacoustics.com.au

Environmental Noise Assessment - Project Haber – Urea Production Plant

South Erregulla

Reference: 21096700-01

Prepared for:
Project Haber Pty Ltd

Reference: 21096700-01

Lloyd George Acoustics Pty Ltd
ABN: 79 125 812 544

PO Box 717
Hillarys WA 6923
www.lgacoustics.com.au

Contacts	General	Daniel Lloyd	Terry George	Matt Moyle
E:	info@lgacoustics.com.au	daniel@lgacoustics.com.au	terry@lgacoustics.com.au	matt@lgacoustics.com.au
P:	9401 7770	0439 032 844	0400 414 197	0412 611 330
Contacts	Rob Connolly	Daryl Thompson	Hao Tran	Matt Nolan
E:	rob@lgacoustics.com.au	daryl@lgacoustics.com.au	hao@lgacoustics.com.au	matt.nolan@lgacoustics.com.au
P:	0410 107 440	0420 364 650	0438 481 207	0448 912 604

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EXECUTIVE SUMMARY

Project Haber Pty Ltd (the Proponent) (ACN 652 999 785) proposes to develop Project Haber (the Proposal) a urea production facility, located approximately 105 km southeast of Geraldton in the Shire of Three Springs in Western Australia (WA). The noise impact resulting from the Proposal was assessed in accordance with the *Environmental Protection (Noise) Regulations 1997*. The assessment was carried out by way of computer noise modelling using project supplied source sound levels (and those used on similar past projects) for the proposed processes and equipment on site.

While in the early planning phases of the project, this assessment provides preliminary outcomes for the noise levels expected from the site. It is noted that some aspects of the facility are yet to be designed in detail, though sufficient information is available to model the majority of processes.

The facility is proposed to operate 24/7, therefore the night-time assessment is most critical. Noise impacts are summarised at the nearest affected noise sensitive premises and boundaries as follows:

- R1 – Approximately 6.3 km north east of the site. Compliance is achieved at this location.
- R2 – Approximately 7.0 km east of the site. Compliance is achieved at this location.
- R3 – Approximately 3.2 km east of the site; Compliance is achieved at this location.
- R4 – Currently unoccupied and located approximately 2.3 km south west of the site. Predicted worst-case levels exceed night assigned levels by 4 dB.
- R5 – The nearest point to R4 property boundary is approximately 150 m west of the site, and is not considered highly noise sensitive. Compliance is achieved at this location.

The outcome of predictive noise modelling determined that compliance can be achieved at all existing occupied premises. The south west residence is understood be an unoccupied premises in a state of disrepair and therefore may not be considered habitable. It is unknown if there is intent for this to be repaired to become a habitable residence in the future but, given its location within an area that is being carbon farmed and doesn't require any resident workforce, it is considered highly unlikely.

1. INTRODUCTION

Lloyd George Acoustics was engaged by Project Haber Pty Ltd to undertake an environmental noise assessment of a proposed Urea Facility called Project Haber to be located at South Erregulla - refer *Figure 1-1*. The surrounding area is noted to be predominantly rural in nature, with several homesteads within 10 km of the subject site.

Figure 1-1: Subject Site Location (Source: Google Earth)

Noise impacts are predicted by way of computer noise modelling, with reference to similar projects and source sound data provided by the Proponent's design engineers, Technip Energies. With regard to noise emissions, consideration is given to noise from the various chemical processes involved in producing and storing the urea, against the prescribed standards of the *Environmental Protection (Noise) Regulations 1997* to the nearest neighbouring premises.

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).

2.1. Regulations 7, 8 & 9

This group of regulations provide the prescribed standard for noise 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 as intrusive or dominant characteristics in regulation 9 (refer *Appendix B*). Under regulation 9(3), noise is to be taken to be free of these characteristics 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] to this subregulation 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

Note: *The below are cumulative to a maximum of 15dB.

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
Commercial Premises	All hours	60	75	80
Industrial and Utility Premises	All hours	65	80	90

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.

The influencing factor (IF), in relation to noise received at noise sensitive premises, has been calculated as 0 dB, as only rural land uses are noted within 450m of all noise-sensitive premises and therefore the baseline assigned levels of *Table 2-2* are applicable. The following noise sensitive premises were noted to be most affected by the proposal:

- R1 – Approximately 6.3 km north east of the site;
- R2 – Approximately 7.0 km east of the site;
- R3 – Approximately 3.2 km east of the site;
- R4 – Currently unoccupied and located approximately 2.3 km south west of the site.
- R5 – the nearest point to a neighbouring boundary is approximately 150 m west of the site, and is not considered a highly sensitive area.

Noise sensitive premises are defined in the *Environmental Protection (Noise) Regulations 1997* under Schedule 1 Part C Items 1 through 3. In this instance the receiving premises are considered “Rural Premises” under Item 2, or “Premises occupied solely or mainly for residential or accommodation purposes” under Item 1.

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 includes Local Government Environmental Health Officers and Officers from the Department of Environment 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.

3. METHODOLOGY

Computer modelling has been used to predict the noise emissions from the proposed development. The software used was *SoundPLAN 8.2* with the CONCAWE algorithms (ISO 171534-3 improved method) 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.

Note that with any theoretical modelling approach, the predicted noise levels are not without a degree of uncertainty. The validity of the CONCAWE prediction model has been tested over the range 100 - 2000 metres and for wind speeds of up to 7 m/s. Extrapolation beyond these ranges as required for this project is to be considered with caution.

3.1. Meteorological Conditions

Meteorological information utilised is provided in *Table 3-1* and is considered by the Department of Water and Environmental Regulation (DWER) to represent worst-case conditions for noise propagation. 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)
Temperature (°C)	15
Humidity (%)	50
Wind Speed (m/s)	3
Wind Direction*	All
Pasquil Stability Factor	F

* The modelling package allows for all wind directions to be modelled simultaneously.

Alternatives to the above default conditions can be used where one year of weather data is available and the analysis considers the worst 2% of the day and night for the month of the year in which the worst-case weather conditions prevail (source: *Draft Guideline on Environmental Noise for Prescribed Premises*, May 2016). In most cases, the DWER default conditions occur for more than 2% of the time and therefore must be satisfied.

3.2. Topographical Data

Topographical data for the surrounding area was provided by the Proponent's environmental consultants as a shape file in the form of contours at 5 metre intervals and combined with the site plan (assumed levelled).

Figure 3-1 shows a 2D overview of the noise model area with the location of all relevant receivers identified (cyan colour). Royal blue dots represent point sources in the noise model (pumps, flares, and other plant).

Figure 3-1: Overview of Noise Model and Receivers

3.3. Ground Absorption

The ground attenuation has been assumed to be 1.0 (100%) throughout the model given the rural nature of the area, noting that 0.0 represents hard reflective surfaces such as water and 1.0 represents absorptive surfaces and soft ground such as grass, agricultural land, forest or gardens.

3.4. Source Sound Power Levels

The source sound power levels used in the modelling are provided in *Table 3-2*.

Table 3-2: Source Sound Power Levels, dB

Description	Source Height (m)	Octave Band Centre Frequency (Hz)								Overall dB(A)
		63	125	250	500	1k	2k	4k	8k	
AMMONIA/UTILITIES COOLING WATER TOWER + FANS, 40-CT-3001	10	138	130	123	119	116	114	112	110	**123**
UREA COOLING WATER TOWER + FANS, 40-CT-3002	10	135	127	120	116	113	111	109	107	**120**
FIRE PROCESS HEATERS (ATR), 10-H-201,202	14	129	122	115	112	110	109	109	108	**117**
CO_2 COMPRESSOR, 20-K-1001	5	125	120	115	115	105	105	105	105	**116**
STEAM TURBINE POWER GENERATION PACKAGE, 50-PK-1002	5	126	121	116	111	106	106	106	106	**115**
GAS TURBINE POWER GENERATORS	5	126	121	116	111	106	106	106	106	**115**
SYNTHESIS GAS / RECIRCULATION COMPRESSOR, 10-K-431	5	122	117	112	112	102	102	102	102	**113**
AMMONIA COMPRESSOR, 10-K-441	5	121	116	111	111	101	101	101	101	**112**
BFW PUMPS	4	121	116	111	111	101	101	101	101	**111**
PRODUCTION CONTINUOUS FLARE	50	115	112	111	109	105	104	99	105	**112**

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

- At this stage of the design, the sound power levels used in the noise model reflect whole plant processes, not necessarily single items of plant. All sources were modelled as point sources and located as per the concept site plan – *Appendix A*.
- The sound power levels above are based on provided data from the Proponent (from Technip Energies) and are a combination of similar project information and measured spectral data of operating equipment. The production flare source sound power level was adapted from the Perdaman Urea Project[1] which utilises a similar but higher output flare design; thus, noise results are conservative as the Project Haber production flare is anticipated to be quieter.

[1] https://www.epa.wa.gov.au/proposals/perdaman-urea-project

- It is assumed that all noise sources will be operating simultaneously. This will be conservative as the use of some plant would normally be associated with a problem with the plant, and so would usually be mutually exclusive of full plant load.
- Where identified, office buildings and minor sheds have been assumed at 4 metres high. However, the urea storage shed is assumed to be of metal construction and approximately 6 metres high. In terms of external noise emissions, it is assumed that the building will adequately attenuate any noise sources relative to sources outside the shed.
- Sources heights are relative to natural ground.

4. RESULTS & ASSESSMENT

The results for the worst-case operational scenario are provided in *Table 4-1,* being the night-time running of the facility which is proposed to be 24/7 in nature. A noise contour plot is also provided in *Figure 4-1*.

Table 4-1: External Predicted Levels (Night)

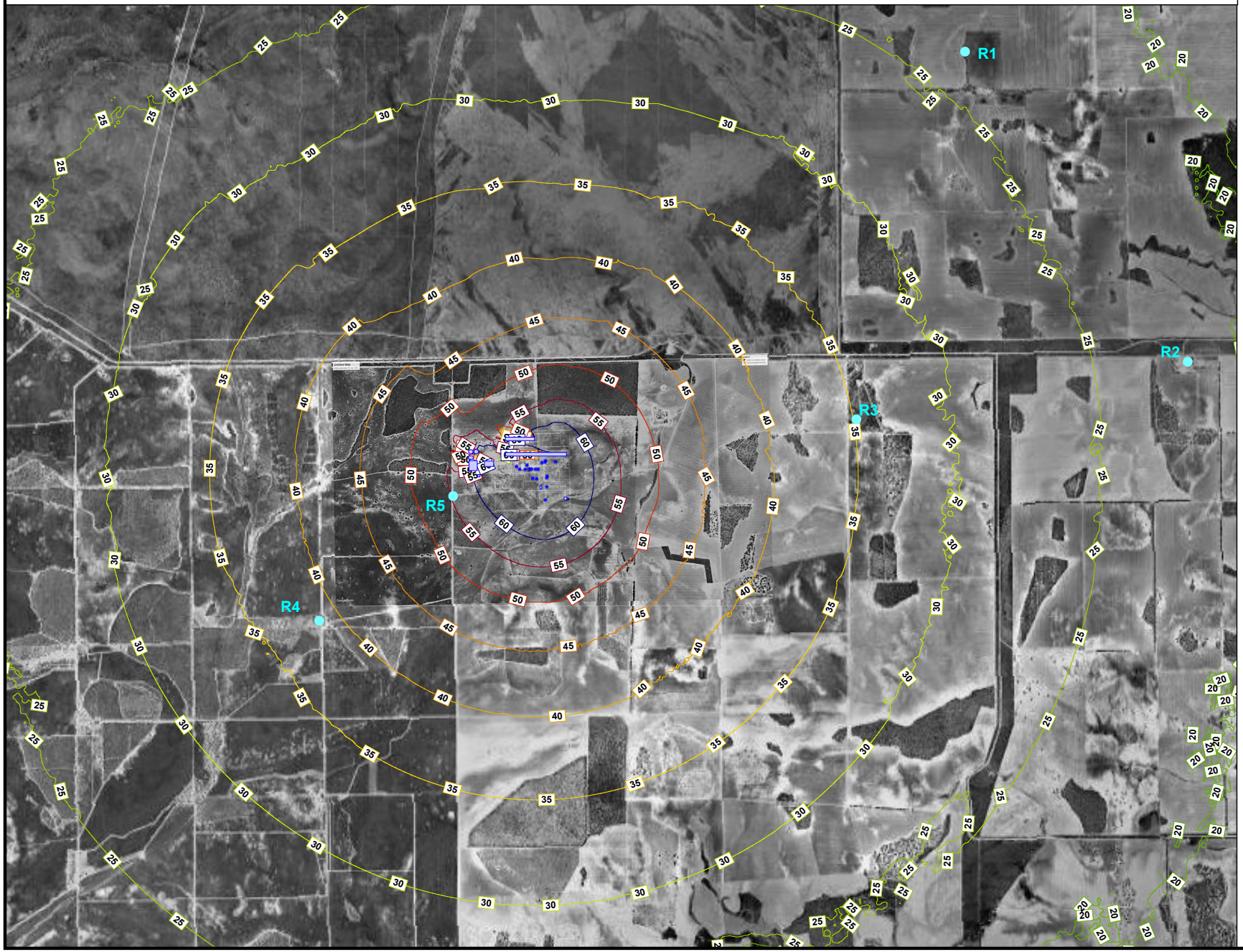
Receiver	Predicted Level, dB L_{A10}	Assigned Level, dB L_{A10}	Assessment
R1	24	35	*Complies*
R2	23	35	*Complies*
R3	35	35	*Complies*
R4	39	35	*+4*
R5	55	60	*Complies*

Given the nature of the sources and distance to noise sensitive premises, the noise emissions from the urea plant are not expected to contain intrusive characteristics. The predicted levels in *Table 4-1* comply with the most critical assigned level of 35 dB L_{A10} at night-time with the exception of R4, where a 4 dB exceedance is noted. This building is understood to be an unoccupied and uninhabitable building.

Noise levels at all occupied noise sensitive premises are expected to comply during the evening and daytime periods, since the assigned levels are 5 dB and 10 dB higher, respectively, than those at night.

Figure 4-1 Strike Project Haber, Plant Noise, dB L_{A10}

East Arrowsmith Site



Predicted Noise level
dB(A)

= 20
= 25
= 30
= 35
= 40
= 45
= 50
= 55
= 60

Legend

Point receiver
Plant Source
Plant Structures

N

Scale 1:60000

0 350 700 1400 2100 m

Project No: 21096700
Consultant: MM
Date: 19/09/2022
Algorithm: CONCAWE
SoundPLAN Version: 8.2

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

5. CONCLUSION

A study of noise impact was carried out by way of noise modelling and regarding preliminary design of the proposed Haber Urea Plant. The only calculated exceedance is at an unoccupied dwelling, understood to be unoccupied and uninhabitable

The predicted noise levels in this study are based on preliminary plant design and indicative sound power levels. These assumptions should be confirmed through subsequent noise modelling as the detailed plant design progresses. Noise reduction measures will be investigated during the detailed design phase to ensure that noise emissions are kept as low as reasonably practicable.

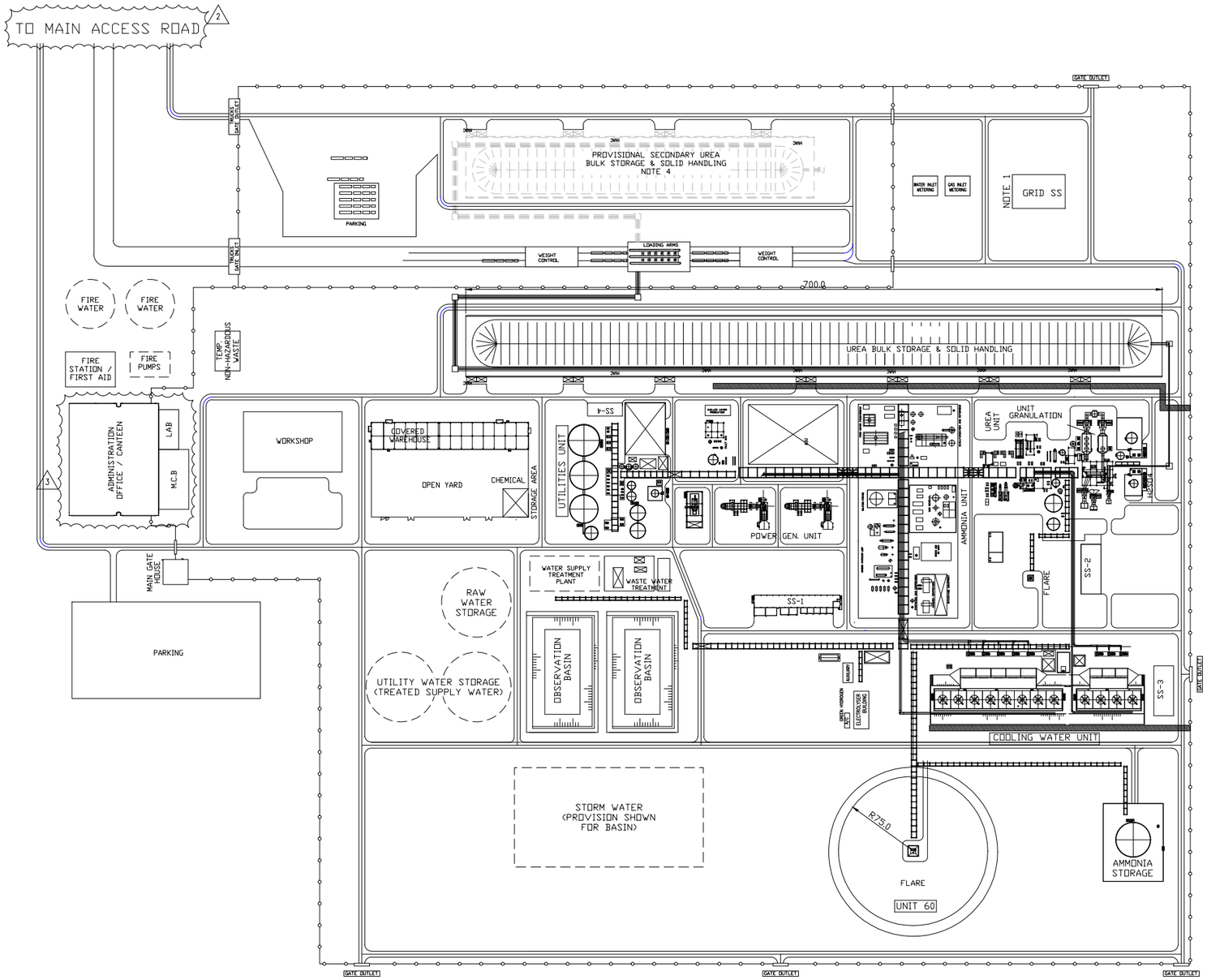
With regard to construction activities to establish the facility, precise equipment and methods are not known however, these should be reviewed as the site is prepared.

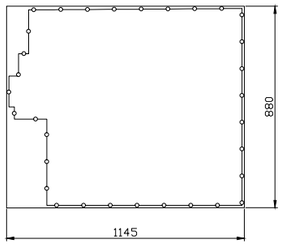
It is noted the only potential sensitive receivers are located more than 2 kilometres from the project site and construction is likely to be predominantly during the day-time. Therefore, noise impacts from construction noise are considered negligible and were not specifically assessed.

Whilst no ambient noise monitoring was conducted as part of this preliminary noise assessment, this may be useful in terms of likely audibility of intrusive characteristics as well as assessing the change of noise over time, once the plant is constructed.

Noise levels from the Proposal are expected to comply with the most critical, night-time assigned levels at all occupied sensitive premises.

Appendix A – Development Plans





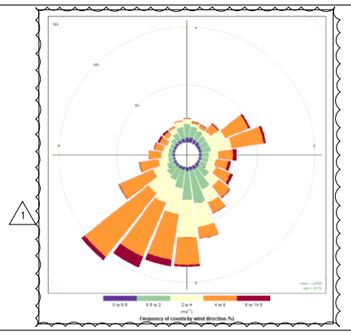
TOTAL OVERALL PLOT AREA :
101 HECTARES TOTAL AREA
83 HECTARES WITHIN FENCE BOUNDARY

GRAPHIC SCALE 1/2500
0 50 100 150 200m

NOTES

1- PRELIMINARY GRID SUBSTATION LOCATION TO BE CONFIRMED WITH WESTERN POWER INPUT.
2- LAYOUT UPDATES HAVE BEEN DEVELOPED FOR ASSESSMENT OF REQUIRED SITE AREA ONLY FOR THE PURPOSES OF THE SITE SELECTION STUDY AT SOUTH ERREGULLA
3- TOTAL AREA WITHIN FENCE BOUNDARY : 83 HECTARES
4- PARALLEL STORAGE SHED IS SHOWN AS PROVISIONAL ONLY, WITH THE REQUIREMENT FOR EITHER A SINGLE LONG SHED OR 2 PARALLEL SHORTER SHEDS TO BE CONFIRMED IN FEED.
5- LAYOUT AND DIMENSIONS FOR WATER STORAGE TANKS ARE PROVISIONAL ONLY. REQUIREMENTS AND DIMENSIONS TO BE CONFIRMED IN FEED.

WIND ROSE – BASED ON WAITSIA



GENERAL NOTES

1-ALL DIMENSIONS ARE IN METERS (m) UNLESS OTHERWISE SPECIFIED.

2-LOCAL COORDINATES WILL BE SET IN FEED

3-CURRENT GEOGRAPHIC COORDINATE SYSTEM : UTM84-50S (WGS 84)

4-VERTICAL DATUM : GRADE LEVEL EL. + 100.00 CORRESPONDING TO AHD + 25 m

5-WIND ROSE DIAGRAM, EXTRACTED FROM: WAITSIA GAS PROJECT STAGE 2: WORKS APPROVAL SUPPORTING DOCUMENTATION:
HTTPS://WWW.DER.WA.GOV.AU/IMAGES/DOCUMENTS/OUR-WORK/LICENCES-AND-WORKS-APPROVALS/APPLICATIONS/W6515-2021-1%20SUPPORTING%20DOCUMENTS%20FP.PDF

6- NO ALLOWANCE IS CURRENTLY SHOWN FOR EVAPORATION PONDS IF THESE ARE REQUIRED IN THE FUTURE.

UNIT	DESIGNATION
-Unit 000	Common
-Unit 010	Ammonia Unit
-Unit 020	Urea Unit
-Unit 030	Urea Granulation Unit
-Unit 040	Utilities Production Unit
-Unit 050	Power Generation
-Unit 060	Offsites
-Unit 070	Buildings, Electrical, Instrumentation & Automation
-Unit 080	Interconnecting
-Unit 090	Green Hydrogen

HOLDS

1- WIND ROSE & PREVAILING WINDS TO BE CONFIRMED AND UPDATED.
2- LOCATION OF ROADS TO BE FINALISED SUBJECT TO SITE FINAL LOCATION.
3- LAYOUT OF BUILDING TO BE CONFIRMED DURING FEED.

ACRONYMS

MCB: Main Control Building
SS: Sub-Station

REFERENCE

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B	16-JUN-2022	Issued for Information (IFI)	MFA	DHA	HSI
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strike energy

T.EN TECHNIP ENERGIES

STRIKE HABER PRE-FEED PROJECT

OVERALL PLOT PLAN FOR ATR PROCESS

(CONCEPTUAL UPDATES FOR ERREGULLA SITE SELECTION STUDY)

DOC. CLASS:	SCALE : 1/2500	SHEET : 1/1	
Technip Energies Doc. Ref.	202008C – 000 – DW – 0051 – 0003 (Project – Unit No – Doc. Type – Doc. Code – Serial No)	REVISION: B	FORMAT: A1

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_{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_{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.

- **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

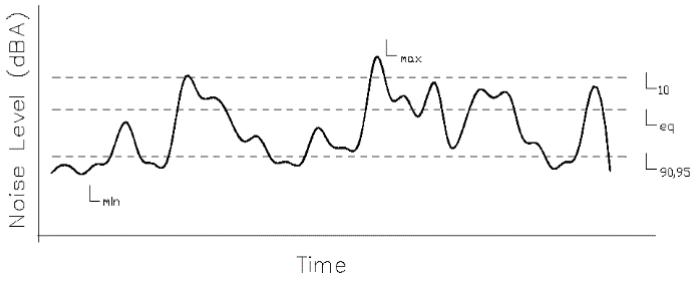
(c) is regular, cyclic and audible.

- **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.

- **Chart of Noise Level Descriptors**



- **Typical Noise Levels**