



RAMBOLL

ENVIRONMENTAL NOISE ASSESSMENT

**WAITSIA GAS PROJECT
STAGE 2**

JULY 2019

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FOR

RAMBOLL

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EXECUTIVE SUMMARY

Ramboll, on behalf of AWE Perth Pty Ltd operating under the Mitsui E&P Australia brand (AWE), commissioned Herring Storer Acoustics to carry out an acoustic study of noise emissions for a proposed gas processing plant at the Waitsia Gas Fields, located 18km east-southeast of Dongara.

This acoustic assessment is required for the approval process and is being undertaken prior to the final design of the plant being known. Currently, there are two gas plant designs undergoing final consideration. For the purpose of the predictive noise modelling, both designs have been used as a basis for the assessment. Generally, the plants are not dissimilar in the equipment capacities, however the design layout varies.

Additional to the plants considered above, noise modelling also included the Xyris Production Plant, which is located approximately 300m from the north eastern boundary of the proposed Waitsia Plant, also owned by AWE.

The nearest noise sensitive premise is situated approximately 2.5km to the southwest of the proposed plant. Whilst considered as a highly noise sensitive premise for the purpose of this assessment, it is noted that this residence is the owner of the land the proposed plant is to be constructed on and is leasing the land to AWE under a contracted agreement. The second nearest noise sensitive premise is situated approximately 4.5 km to the east-northeast of the proposed plant.

The highest predicted noise emissions for the nearest noise sensitive premise is 30 dB(A) from a combination of all noise sources including the largest plant proposed, and the Xyris Production Plant.

For the most stringent time period (night) the assigned noise level is 35 dB(A).

The operating scenario considers all noise sources from the proposed facilities operating at the same time. The calculated noise level of an L_{A10} 30 dB(A) is assessed under the highest night-time propagation weather conditions. Given this, the noise modelling would be considered conservative, as it is unlikely that all noise sources are operating at the same time under the worst-case propagation conditions.

It is assumed that operational noise will not have a 'tonality' characteristic, due to the distance, and the noise levels approaching the existing background noise level. Hence noise characteristics such as tonality will be increasingly weak and would not be applicable. At noise emission levels around 30 dB(A) it will generally be the case that the noise emission level is low enough that the influence of background noise will result in the noise emission not being 'technically tonal', although that does not mean that some characteristics would not be audible.

For the purposes of subregulation (1) (a), a noise emission is taken to "significantly contribute to" a level of noise if the noise emission as determined under subregulation (3) exceeds a value which is 5 dB below the assigned level at the point of reception.

Hence, if the noise received at a premises is 5 dB(A) or more below the assigned noise level, then noise received at that premises is considered to be NOT "significantly contributing" and deemed to comply with the requirements of the *Environmental Protection (Noise) Regulations 1997* regardless of any other noise received at that premises from other sources.

The acoustic assessment shows that in the worst case, that noise received at a premise is, 5 dB(A) below the assigned noise level. Thus, noise emissions from the proposed Waitsia Gas Plant

would be NOT “significantly contributing” and deemed to comply with the requirements of the Regulations.

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1. INTRODUCTION

Ramboll, on behalf of AWE Perth Pty Ltd operating under the Mitsui E&P Australia brand (AWE), commissioned Herring Storer Acoustics to carry out an acoustic study of noise emissions for a proposed gas processing plant at the Waitsia Gas Fields, located 18km east-southeast of Dongara..

The *Waitsia Gas Project Stage 2* is to be located approximately 16 km south of Dongara.

When complete, the Waitsia Gas Project Stage 2 will comprise a gas gathering system and associated treatment plant involving wellheads, well flowlines, gathering hubs, gathering flowlines, gas conditioning (CO₂ removal, dew point control for water and hydrocarbon), liquids handling, compression (as required), custody transfer metering, export pipelines and condensate loadout facilities, along with associated utilities. This infrastructure will be installed to accommodate inlet and/or field compression to extend the Waitsia field life as it matures.

The proposed Waitsia Gas Plant will use similar components as those used for processing Waitsia Stage 1 gas from the existing Xyris Production Plant. These would comprise the following components:

- slug catcher and inlet separation as the gas enters the plant;
- mercury removal equipment should it be required;
- gas sweetening to help prepare the gas for entering the nearby gas pipeline;
- water content and hydrocarbon dew-point control;
- export compression and metering;
- produced water treatment; and
- support utilities.

The nearest noise sensitive premise is situated approximately 2.5km to the southwest of the proposed plant. Whilst considered as a highly noise sensitive premise for the purpose of this assessment, it is noted that this residence is the owner of the land the proposed plant is to be constructed on and is leasing the land to AWE under a contracted agreement. The second nearest noise sensitive premise is situated approximately 4.5 km to the east of the proposed plant. The Figure 1.1 shows the overall location plan for the Project, with Figure 1.2 detailing a conceptual layout.

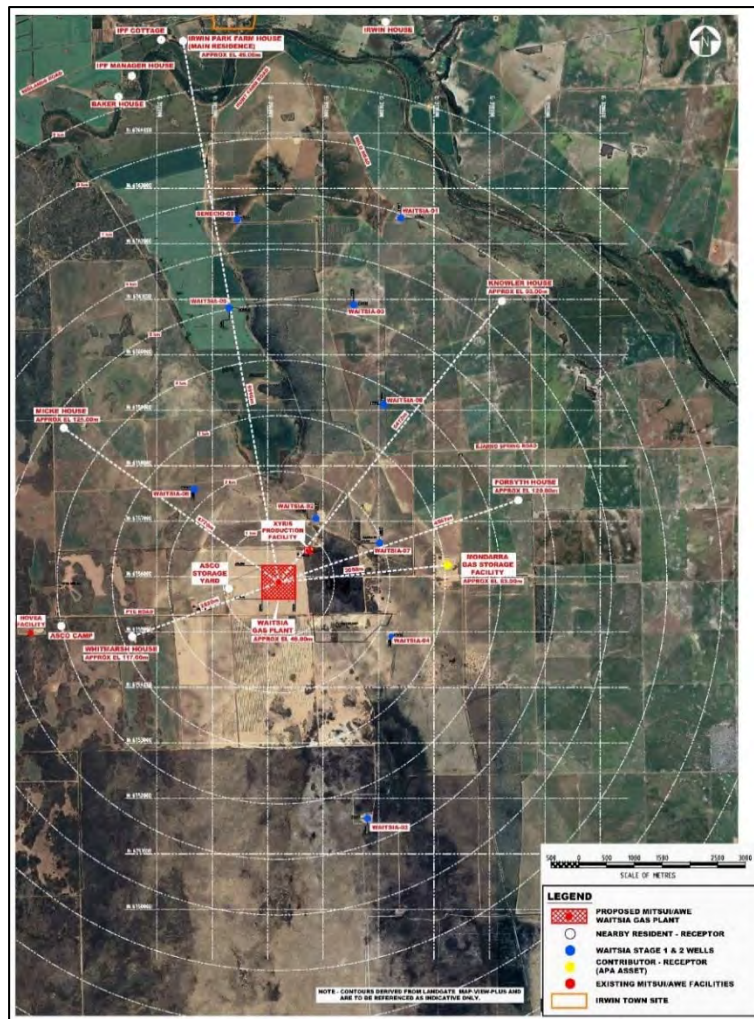


FIGURE 1.1 – LOCATION PLAN



FIGURE 1.2 – CONCEPT PLAN

This report assesses night-time (worst case) noise emissions under maximum propagation conditions for the processing plant for compliance with the requirements of the Western Australian Environmental Protection (Noise) Regulations 1997 (WA) (the Noise Regulations).

2. BACKGROUND

The decision to commence Stage 1A development of the Waitsia gas field was made in early January 2016 following the receipt of upfront government and regulatory approvals.

Stage 1A comprised the installation of new infrastructure and upgrades to existing assets that will connect the flow tested Waitsia-01 and Senecio-03 gas wells to Xyris Processing Plant (XPF) for an extended production test. Gas processed at XPF is being delivered via an existing pipeline to the Parmelia Pipeline for domestic consumption in Western Australia.

This infrastructure included installing two flowlines and a 7km pipeline to XPF, which had been in care and maintenance since 2010.

The initial capacity of XPF was approximately 10 TJ per day, and first gas from the extended production test commenced in August 2016.

The project required assessment and approvals from the lead agency, Department of Mines, Industry and Regulation Safety. Other approvals required by several state agencies, as well as the Shire, were also provided.

Results of appraisal activities providing valuable data are being used to assist the development process for the Waitsia Gas Project Stage 2.

3. ACOUSTIC CRITERIA

The nearest noise sensitive premise (Residence B) is situated approximately 2.5km to the southwest of the proposed plant. Whilst considered as a highly noise sensitive premise for the purpose of this assessment, it is noted that this residence is the owner of the land the proposed plant is to be constructed on and is leasing the land to AWE under a contracted agreement.

The other noise sensitive premise considered (Residence A) is situated approximately 4.5 km to the east-northeast of the proposed plant.

The proposed site boundary and receiver locations are shown in Figure 3.1, and Appendix A.

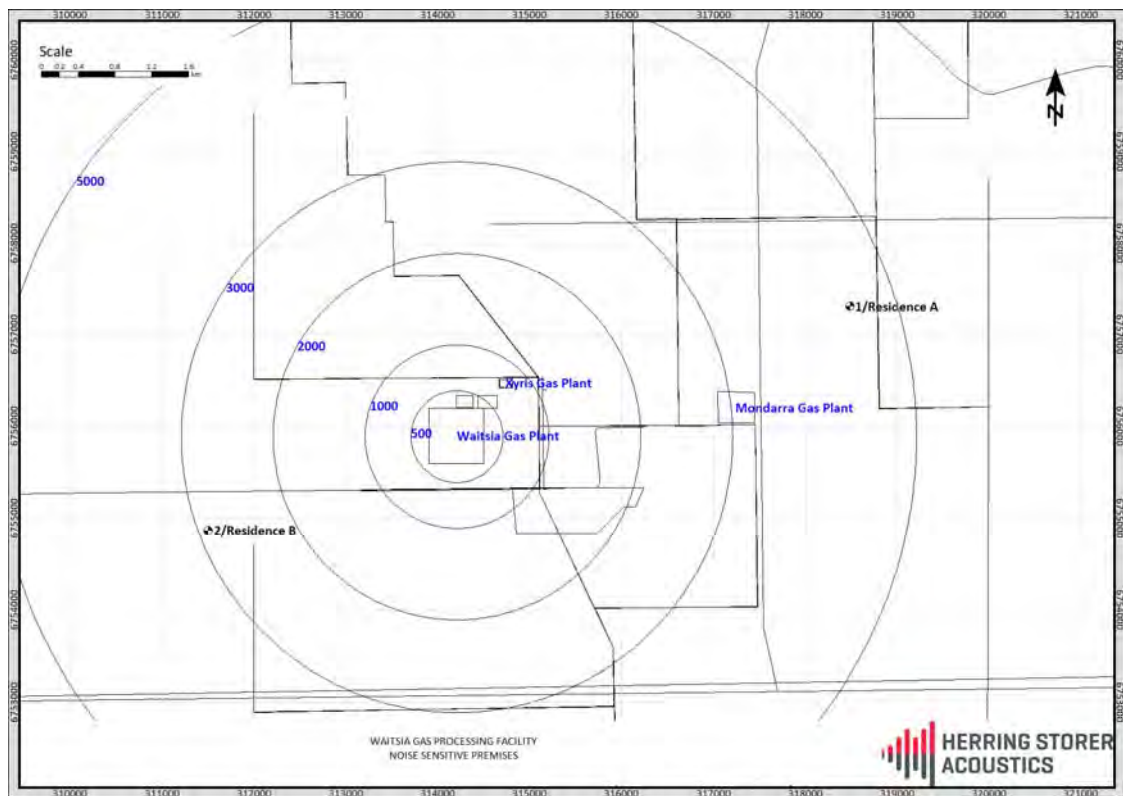


FIGURE 3.1 – RESIDENTIAL RECEIVER LOCATION MAP

3.1 ENVIRONMENTAL PROTECTION (NOISE) REGULATIONS 1997 (WA)

These regulations stipulate maximum allowable external noise levels that can be received at premises. For noise sensitive premise, the assigned noise levels are determined by the calculation of an influencing factor, which is then added to base noise levels. The influencing factor is calculated for the usage of land within the two circles, having radii of 100m and 450m from the premises of concern. For commercial and industrial premises, the assigned noise levels are fixed. The base assigned noise levels for noise sensitive premises and the fixed assigned noise levels for commercial and industrial premises are listed in Table 3.1.

TABLE 3.1 –ASSIGNED OUTDOOR NOISE LEVELS

Type of premises receiving noise	Time of day	Assigned level (dB)		
		L _A 10	L _A 1	L _A max
Noise sensitive premises: highly sensitive area (i.e within 15m of a dwelling)	0700 to 1900 hours Monday to Saturday	45 + IF	55 + IF	65 + IF
	0900 to 1900 hours Sunday and public holidays	40 + IF	50 + IF	65 + IF
	1900 to 2200 hours all days	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + IF	45 + IF	55 + IF
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

Note: The L_{A10} noise level is the noise that is exceeded for 10% of the time.
 The L_{A1} noise level is the noise that is exceeded for 1% of the time.
 The L_{Amax} noise level is the maximum noise level recorded.
 IF = Influencing Factor

At the neighbouring residences, the influencing factor would be 0dB(A) as there are no significant noise sources within the area of influence i.e. 100 and 450m. Hence, the assigned noise levels are as listed in Table 3.1.

Where the above characteristics are present and cannot be practicably removed, the following adjustments are made to the measured or predicted level at other premises.

TABLE 3.2 – ADJUSTMENTS FOR ANNOYING CHARACTERISTICS WHEN MUSIC IS NOT PRESENT

Where tonality is present	Where modulation is present	Where impulsiveness is present
+ 5 dB	+ 5 dB	+ 10 dB

Note: Where annoying characteristics are present, the adjustment is +10 dB, and is +15dB if impulsiveness is present. The adjustments are cumulative to a maximum of 15 dB.

It is assumed that the operational noise will have not have a ‘tonal’ characteristic applicable, due to the distance and the noise approaching the existing background noise level, hence noise characteristics will be increasingly weak. At noise emission levels around 35 dB(A) it will generally be the case that the noise emission level is low enough that the influence of background noise will result in the noise emission not being ‘technically tonal’, although that does not mean that some characteristics would not be audible.

Where there is more than one industry that emits noise to a residence and the combined noise levels of all industries results in an exceedance to the assigned noise levels, each industry is required to be at least 5 dB less than these levels as documented below (Regulation 7(2)).

“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...”

*“...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.”*

Under the Regulations, noise received at a residence is deemed to be NOT “significantly contributing” to the noise received at a premises if it is at least 5 dB(A) below the assigned noise level. Table 3.3 presents the required outdoor noise levels at each residence to comply with the Regulations.

**TABLE 3.3 – NOT “SIGNIFICANTLY CONTRIBUTING”
 OUTDOOR NOISE LEVELS AT RESIDENCES**

Type of premises receiving noise	Time of day	Assigned level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area (i.e. within 15m of a dwelling)	0700 to 1900 hours Monday to Saturday	40	50	60
	0900 to 1900 hours Sunday and public holidays	35	45	60
	1900 to 2200 hours all days	35	45	50
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	30	40	50

4. METHODOLOGY

Noise immissions¹ at the nearest neighbouring residential premises, due to noise associated with the proposed operations, were modelled using the computer programme SoundPlan. Sound power levels used for the noise modelling were based on both manufacturer data and measured sound pressure levels of similar equipment proposed for use on site.

This acoustic assessment is required for the approval process and is being undertaken prior to the final design of the plant being known. Currently, there are two gas plant designs undergoing final consideration. For the purpose of the predictive noise modelling, both designs have been used as a basis for the assessment. Generally, the plants are not dissimilar in the equipment capacities, however the design layout varies.

The design configuration for each gas plant is contained in Appendix A. The sound power levels for individual equipment is shown in Table 4.1. Generally, the same sound power level has been used for each piece of equipment, in each plant (i.e. one sound power for reciprocating compressors etc).

The modelling of noise levels has been based on noise sources and sound power levels shown in Figure 4.1 and Table 4.1 and Figure 4.2 and Table 4.2. For ease of reporting the plants are identified as Plant A and Plant B.

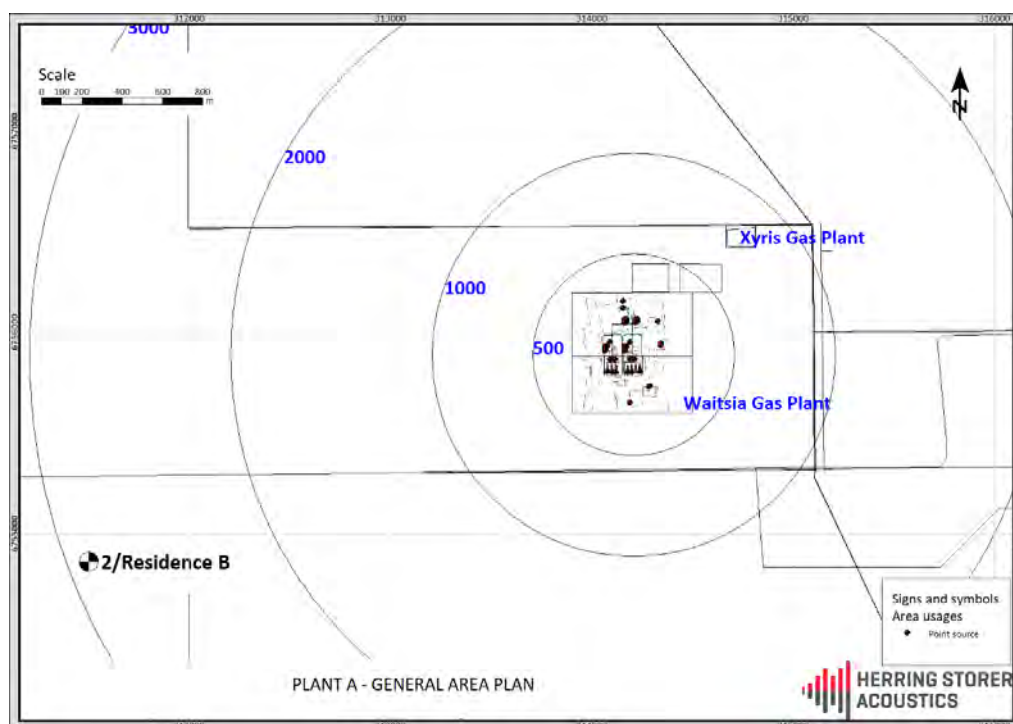


FIGURE 4.1 – PLANT A – ORIENTATION

1 Immissions – noise received at a source

2 Emissions – noise emanating from a source and / or location

TABLE 4.1 – SOUND POWER LEVEL - NOISE SOURCES dB(A) – PLANT A

Noise Source	Detail	Quantity	Noise Level dB(A)
Reciprocating Compressor	1 MW @8.48 MPa Out	7 (1 on Standby)	105
Centrifugal Inlet Compressor	2 MW 135 TJ/d 6000KpA In / 8500 KPa Out	2	105
Inlet Air Cooler	45 KW fan	6	98
Inlet Separator	MRU	2	95
Air Cooler (Amine)	75 KW fan	9 (3 on Standby)	98
Amine Pumps	250 KW (Electric Drive Piston Pumps)	4 (1 on Standby)	103
Dew Point Controller	-	2	95
Condensation Stabilisation	-	2	103
Reciprocating Generator (Engine)	1.5 MW (100% load)	4 (1 on Standby)	116
Reciprocating Generator (Exhaust)	Silenced	4 (1 on Standby)	83
Reciprocating DEA (Engine)	1.6 MW (100% load)	1	116
Flare	0.2 mmscfd	1	92
Launchers / Receivers	250 TJ/d @ 8.48 Mpa Out	1	92
Workshop	-	1	97
Slug Catcher / Metering Skid Filter	-	4	92
Electric Pump	-	4	92
Total SWL			123

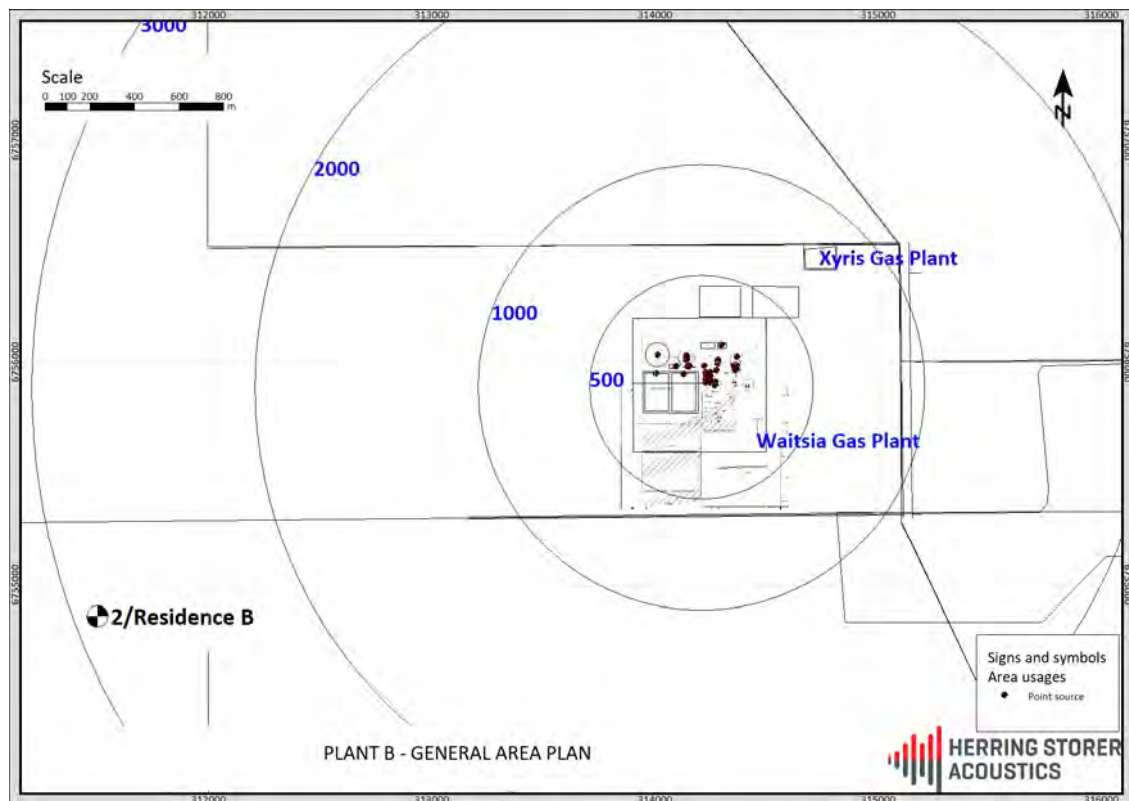


FIGURE 4.2 – PLANT B – ORIENTATION

TABLE 4.2 – SOUND POWER LEVEL - NOISE SOURCES dB(A) – PLANT B

Noise Source	Detail	Quantity	Noise Level dB(A)
Reciprocating Compressor	3.2 MW – 17 mmscfd 100KpA In / 5615 KPa Out	1	110
Reciprocating Compressor	2.8 MW – 60 mmscfd 4800KpA In / 8725 KPa Out	3 (1 on Standby)	105
Centrifugal Inlet Compressor	2.7 MW 135 TJ/d 6000KpA In / 9500 KPa Out	2	105
Inlet Air Cooler	45 KW fan	12 (3 on Standby)	98
Reciprocating Generator (Engine)	1 MW (100% load)	3 (1 on Standby)	116
Reciprocating Generator (Exhaust)	Silenced	3 (1 on Standby)	83
Flare	2 TJ/d 3 mmscfd	1	92
Workshop	-	1	97
Slug Catcher	-	4	92
Electric Pump	-	11	92
Diaphragm Pump	-	5	
Total SWL			120

Additional to the plants considered above, noise modelling also included the Xyris Production Plant, which is located approximately 300m from the north eastern boundary of the proposed Waitsia Plant, also owned by AWE. Noise sources included for the Xyris plant are detailed in Table 4.3 below.

TABLE 4.3 – SOUND POWER LEVEL - NOISE SOURCES dB(A) XYRIS PRODUCTION PLANT

Noise Source	Noise Level	Level Reference
Low Temperature Separator	97	Lw/unit
Methanol Separator	101	Lw/unit
Generator	86	Lw/unit
General Pipe Work Noise	75	Lw/m, m ²
Proposed Compressor Engine (100% Load)	116	Lw/unit
Proposed Compressor Exhaust (100% Load)	84	Lw/unit

It is noted the Xyris plant is undergoing an upgrade which allows for increased output. The assumptions in the predictive noise modelling assume the worst case (upgraded) plant noise emissions.

Based on noise emissions from the above equipment, the following operating scenario was developed:

SCENARIO 1

Proposed Waitsia Gas Plant A
Xyris Production Plant

SCENARIO 2

Proposed Waitsia Gas Plant B
Xyris Production Plant

It is noted, that for the scenarios considered, all equipment has been assumed to be operating at the same time.

The following input data was used in the calculations:

- a) Provided site layouts.
- b) Sound Power Levels as listed.
- c) Ground contours and receiver points provided by client.

Weather conditions for modelling were as stipulated in the Environmental Protection Authority's "Draft Guidance for Assessment of Environmental Factors No. 8 - Environmental Noise" as listed in Table 4.4.

TABLE 4.4 – WEATHER CONDITIONS

Condition	Night	Day
Temperature	15°C	20°C
Relative humidity	50%	50%
Pasquill Stability Class	F	E
Wind speed	3 m/s*	4 m/s*

* From sources, towards receivers.

It is noted that 'worst case' wind conditions refer to conditions where there is a temperature inversion in conjunction with light winds in the direction from noise source to receiver, resulting in the highest sound propagation towards receiver locations.

5. EXISTING AMBIENT NOISE LEVELS

Due to this being an initial desktop study to inform the client of the impact associated with the operations, the existing ambient noise environment has not been monitored. This can be carried out prior to the commencement of construction activities, if required.

6. RESULTS

A summary of the calculated noise levels for scenarios are shown in Table 6.1.

TABLE 5 – CALCULATED NOISE LEVELS, L_{A10} dB(A)

Receiver Name	Scenario 1 – Waitsia Plant A and Xyris Production Plant	Scenario 2 – Waitsia Plant B and Xyris Production Plant
House A	23	22
House B	30	28

Noise contour plots for the above scenarios are included in Appendix B for the Night propagation condition.

7. ASSESSMENT

The highest predicted noise emissions for the nearest noise sensitive premise is an L_{A10} of 30 dB(A) from a combination of all noise sources including the largest plant proposed, and the Xyris Production Plant.

For the most stringent time period (night) the assigned L_{A10} noise level is 35 dB(A).

As discussed previously, the operating scenario considers all noise sources from the proposed facilities operating at the same time. The calculated noise level of an L_{A10} 30 dB(A) is assessed under the highest night time propagation weather conditions. Given all this, the noise modelling would be considered as conservative, as it is unlikely that all noise sources are operating at the same time under the worst case propagation conditions.

It is assumed that operational noise will not have a 'tonality' characteristic, due to the distance, and the noise levels approaching the existing background noise level. Hence noise characteristics such as tonality will be increasingly weak and would not be applicable. At noise emission levels around 30 dB(A) it will generally be the case that the noise emission level is low enough that the influence of background noise will result in the noise emission not being 'technically tonal', although that does not mean that some characteristics would not be audible.

For the purposes of subregulation (1) (a), a noise emission is taken to "significantly contribute to" a level of noise if the noise emission as determined under subregulation (3) exceeds a value which is 5 dB below the assigned level at the point of reception.

Hence, if the noise received at a premises is 5 dB(A) or more below the assigned noise level, then noise received at that premises is considered to be NOT "significantly contributing" and deemed to comply with the requirements of the Environmental Protection (Noise) Regulations 1997 regardless of any other noise received at that premises from other sources.

The acoustic assessment shows that in the worst case, that noise received at a premise is, 5 dB(A) below the assigned noise level. Thus, noise emissions from the proposed Waitsia Gas Plant would be NOT "significantly contributing" and deemed to comply with the requirements of the Regulations.

8. CONCLUSION

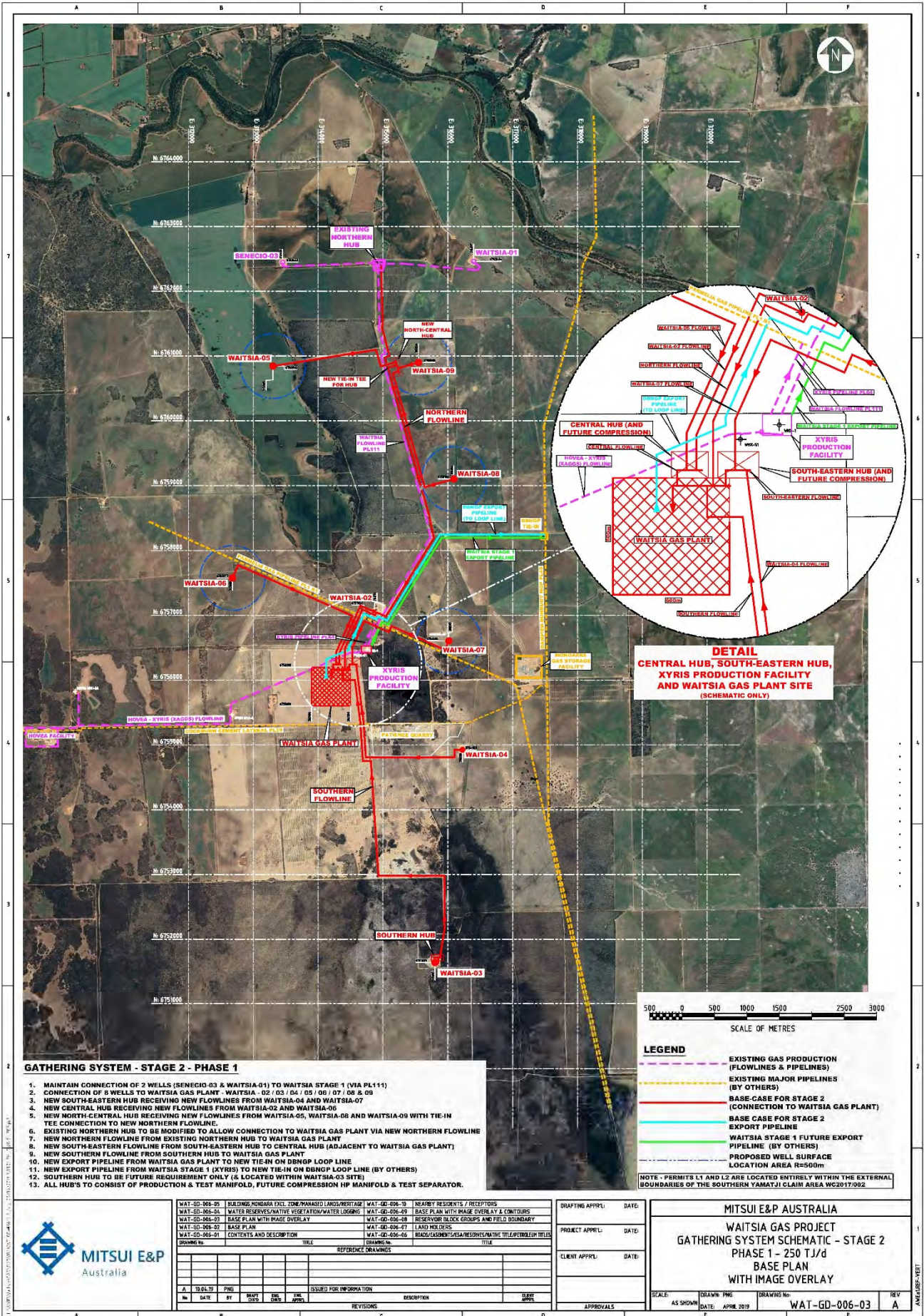
It is concluded that the project will comply with the requirements of the Western Australian *Environmental Protection (Noise) Regulations 1997* at all times.

The identified receptor location situated to the south west is the nearest noise sensitive premises. Assessable noise levels at this receptor is below the most stringent assigned noise level of 35 dB(A). This is for the worst case operating conditions for all noise sources operating at the same time, which is unlikely.

APPENDIX A

LOCATION PLANS

FIGURE 1 – GENERAL LOCATION PLAN



GATHERING SYSTEM - STAGE 2 - PHASE 1

1. MAINTAIN CONNECTION OF 2 WELLS (SENECIO-03 & WAITSIA-01) TO WAITSIA STAGE 1 (VIA PL111)
2. CONNECTION OF 8 WELLS TO WAITSIA GAS PLANT - WAITSIA - 02 / 03 / 04 / 05 / 06 / 07 / 08 & 09
3. NEW SOUTH-EASTERN HUB RECEIVING NEW FLOWLINES FROM WAITSIA-04 AND WAITSIA-07
4. NEW CENTRAL HUB RECEIVING NEW FLOWLINES FROM WAITSIA-02 AND WAITSIA-05
5. NEW NORTH-CENTRAL HUB RECEIVING NEW FLOWLINES FROM WAITSIA-05, WAITSIA-06 AND WAITSIA-09 WITH TIE-IN CONNECTION TO NEW NORTHERN FLOWLINE.
6. EXISTING NORTHERN HUB TO BE MODIFIED TO ALLOW CONNECTION TO WAITSIA GAS PLANT VIA NEW NORTHERN FLOWLINE
7. NEW NORTHERN FLOWLINE FROM EXISTING NORTHERN HUB TO WAITSIA GAS PLANT
8. NEW SOUTH-EASTERN FLOWLINE FROM SOUTH-EASTERN HUB TO CENTRAL HUB (ADJACENT TO WAITSIA GAS PLANT)
9. NEW SOUTHERN FLOWLINE FROM SOUTHERN HUB TO WAITSIA GAS PLANT
10. NEW EXPORT PIPELINE FROM WAITSIA GAS PLANT TO NEW TIE-IN ON DBNGP LOOP LINE
11. NEW EXPORT PIPELINE FROM WAITSIA STAGE 1 (XYRIS) TO NEW TIE-IN ON DBNGP LOOP LINE (BY OTHERS)
12. SOUTHERN HUB TO BE FUTURE REQUIREMENT ONLY (& LOCATED WITHIN WAITSIA-03 SITE)
13. ALL HUB'S TO CONSIST OF PRODUCTION & TEST MANIFOLD, FUTURE COMPRESSION HP MANIFOLD & TEST SEPARATOR.

DETAIL
CENTRAL HUB, SOUTH-EASTERN HUB,
XYRIS PRODUCTION FACILITY
AND WAITSIA GAS PLANT SITE
(SCHEMATIC ONLY)

LEGEND

- EXISTING GAS PRODUCTION (FLOWLINES & PIPELINES)
- EXISTING MAJOR PIPELINES (BY OTHERS)
- BASE-CASE FOR STAGE 2 (CONNECTION TO WAITSIA GAS PLANT)
- BASE CASE FOR STAGE 2 EXPORT PIPELINE
- WAITSIA STAGE 1 FUTURE EXPORT PIPELINE (BY OTHERS)
- PROPOSED WELL SURFACE LOCATION AREA R=500m

NOTE - PERMITS L1 AND L2 ARE LOCATED ENTIRELY WITHIN THE EXTERNAL BOUNDARIES OF THE SOUTHERN YAMATJI CLAIM AREA WC2017/002

WAT-GD-006-05	BUILDINGS, HINDARA EXCL. ZONE/MANAGED LANDS/HERITAGE	WAT-GD-006-10	NEARBY RESIDENTS / RECEPTORS
WAT-GD-006-04	WATER RESERVES/NATIVE VEGETATION/WATER LOGGING	WAT-GD-006-09	BASE PLAN WITH IMAGE OVERLAY & CONTOURS
WAT-GD-006-03	BASE PLAN WITH IMAGE OVERLAY	WAT-GD-006-08	RESERVATOR BLACK GROUPS AND FIELD BOUNDARY
WAT-GD-006-02	BASE PLAN	WAT-GD-006-07	LAND HOLDINGS
WAT-GD-006-01	CONTENTS AND DESCRIPTION	WAT-GD-006-06	ROADS/GASMENTS/GAS/RESERVES/NATIVE TITLE/PETROLEUM TITLES

NO.	DATE	BY	REVISION	DESCRIPTION	DATE APPROV.
A	10.04.19	PNB		ISSUED FOR INFORMATION	

DRAFTING APPRVL: _____ DATE: _____ PROJECT APPRVL: _____ DATE: _____ CLIENT APPRVL: _____ DATE: _____ APPROVALS: _____	MITSUBI E&P AUSTRALIA WAITSIA GAS PROJECT GATHERING SYSTEM SCHEMATIC - STAGE 2 PHASE 1 - 250 TJ/d BASE PLAN WITH IMAGE OVERLAY SCALE: AS SHOWN DRAWN: PNB DATE: APRIL 2019 DRAWING NO: WAT-GD-006-03 REV: A
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APPENDIX B

NOISE CONTOUR PLOTS

