

Appendix A

Blacktip Project – Environmental Noise
Assessment prepared by Air Noise Environment



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BLACKTIP PROJECT – ENVIRONMENTAL NOISE ASSESSMENT

October 2004

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EXECUTIVE SUMMARY

The Project

Woodside Energy Limited (Woodside), in association with its joint venture partner ENI Australia (ENI), proposes to develop the Blacktip gas field in permit WA-279-P of the Joseph Bonaparte Gulf, approximately 245 km south west of Darwin. It is proposed that gas and associated reservoir liquids are exported from the Blacktip field via a subsea pipeline to an onshore processing plant. The pipeline required will be approximately 110 km in length and will travel in a south-easterly direction to a suitable shore landing site. The shore landing for the export pipeline will be approximately 20 km west of the township of Wadeye.

Air Noise Environment Pty Ltd were commissioned by Sinclair Knight Merz on behalf of the joint venture to undertake a noise assessment for inclusion in the Environmental Impact Assessment being completed for the project. The assessment considered the potential impacts of noise associated with the following project activities:

- ✍ construction and operation of the onshore processing plant; and
- ✍ construction and operation of the onshore pipeline.

Methodology

Receptor Locations

A desktop review of surrounding landuses was undertaken to identify landuses and receptor locations nearby to the proposed development site. The report has identified two groups of sensitive receptors: Wadeye Township, which has approximately 2,500 residents located 12 km from the Blacktip Project; and Tchindi Aboriginal Camping Ground, which is used on an ad hoc basis, located 2.5 km away.

Existing Noise Levels

Background noise monitoring has been completed at Wadeye Township, and at the proposed Blacktip processing plant for a 24 hour period at each site. The results of the ambient noise monitoring has identified that the areas are generally quiet as would be expected in a rural/rural residential environment.

Noise Emissions – Construction Phase

Potential sources of noise emissions during the construction phase of the project considered by the assessment include:

- ✍ Shore crossing construction:
 - ✍ Trenching and dredging;
 - ✍ Blasting;
 - ✍ Beach and dune excavation;
 - ✍ Pipeline installation;

- ✍ Padding, shading and backfilling;
- ✍ Restoration and rehabilitation.

- ✍ Onshore pipeline construction:
 - ✍ Clear and grade;
 - ✍ Blasting;
 - ✍ Trenching and stringing;
 - ✍ Welding and joint coating;
 - ✍ Hydrotesting and dewatering;
 - ✍ Padding, shading and backfilling;
 - ✍ String and pit tie-ins;
 - ✍ Restoration and rehabilitation;
 - ✍ Commissioning.

- ✍ Gas processing plant construction:
 - ✍ Clearing of vegetation;
 - ✍ Blasting;
 - ✍ Laying foundations and erecting facilities;
 - ✍ Installing equipment and systems;
 - ✍ Installing ancillaries;
 - ✍ Testing and commissioning;
 - ✍ Clean-up and removal of construction related equipment;
 - ✍ Road traffic through Wadeye Township.

The most significant noise emission is from blasting due to the associated vibration impacts. However, it is unlikely that blasting will be required, and if necessary may only occur for a limited period where large rocks are encountered at the shoreline edge, and along the pipeline route depending on the ground encountered.

Noise Emissions – Operational Phase

Noise emissions associated with the operational phase of the project considered in the assessment include the emissions from the following activities and equipment:

1. Operational equipment:
 - ✍ Power generation equipment
 - ✍ Process pumps
 - ✍ Air coolers
 - ✍ Control valves
 - ✍ Slugcatchers
 - ✍ HP / LP Flare tips
 - ✍ Export Compressor
 - ✍ Relief / flaring from blow down
 - ✍ Condensate offloading pumps
 - ✍ Fire water pumps
 - ✍ Instrument Air Compressor
 - ✍ Standby Diesel Power Generation

2. Plant maintenance operations;

3. Flaring from blow down; and
4. Traffic movements.

Noise Predictions

Predictions of noise levels at nearby receptors have been undertaken for noise emissions from both the construction and operational phases of the project utilising preliminary plant and equipment information. The predictive modelling utilised a methodology that considered worst-case meteorological conditions combined with no shielding by surrounding terrain features.

Impacts and Recommendations

Construction Noise

The results of the predictive modelling have been compared with the legislative requirements of the Northern Territory Government Draft Waste Management and Pollution Control (Environmental Noise) Regulation. In addition predicted noise levels are compared with noise criteria levels designed to preserve acoustic amenity at nearby receptors.

Overall, the assessment has concluded that there is a limited potential for noise impacts from the day-time construction of the proposed onshore pipeline and processing plant due to the significant buffer distances to potentially sensitive receptors at Wadeye Township and the Tchindi Aboriginal Camping Ground.

However, if night-time construction works are proposed for the clear and grade, blasting and trench dredging stages it is recommended that validation monitoring is carried out to assess the actual noise levels during the works. If the noise levels are found to be above the recommended noise criteria outlined in Table 3.2, a noise management plan will need to be implemented.

In order to minimise the potential for noise impacts on surrounding landuses such as the Tchindi Aboriginal Training Ground, and Wadeye Township it is recommended that the following best practice measures be undertaken during the construction phase of the project.

1. Blasting: If blasting is required it is recommended that a noise management plan is submitted to the Northern Territory Office of Environment and Heritage where blasting is undertaken. This noise management procedure should include the following:
 - ✍ potentially sensitive receptors within a 2 km radius should be notified of the proposed works a minimum of 24 hours in advance;
 - ✍ where receptors occur at or within 1 km of the proposed blast site, prediction of potential air overblast pressure and vibration should be undertaken based on the proposed blast size and type;
 - ✍ the results of the predictions should be provided to the regulatory authority prior to commencement of blasting for approval along with any proposed mitigation measures

including the possibility to increase cover material depth, increase spacings between charges and reduce the size of charges detonated per event.

2. Road Traffic Noise: Woodside has confirmed that a noise management plan and traffic management plan will be implemented to ensure appropriate management of construction road traffic through Wadeye Township. The noise management plan should as a minimum identify suitable transport routes through the town to minimise impact. Where possible, heavy vehicle movements are to be restricted to normal day-time periods (ie, 7 am to 6 pm Monday to Saturday).

Operational Noise

Overall, the assessment has concluded that there is a limited potential for noise impacts from the operation of the proposed onshore pipeline and gas processing plant due to the significant buffer distances to potentially sensitive receptors.

It is recommended that prior to any planned maintenance or flaring from blow down at the processing plant, representatives of the Tchindi Aboriginal Camping Ground and any dwellings within a 5 km radius of the site should be notified at least 24 hours before the event.

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1 INTRODUCTION

1.1 THE PROJECT

Woodside Energy Limited (Woodside), in association with its joint venture partner ENI Australia (ENI), proposes to develop the Blacktip gas field in permit WA-279-P of the Joseph Bonaparte Gulf, approximately 245 km south west of Darwin. Investigations indicate that the Blacktip gas field, located in approximately 50 m of water, comprises gas condensate reserves of approximately 1 trillion cubic feet (tcf). It is proposed that gas and associated reservoir liquids are exported from the Blacktip field via subsea pipeline to an onshore processing plant. The pipeline required will be approximately 110 km in length and will travel in a south-east direction to a suitable shore landing site. The shore landing for the export pipeline will be approximately 20 km west of Wadeye. The onshore facilities will be located close to the beach landing and will be connected to the landfall by a 2.5 km underground pipeline

Air Noise Environment Pty Ltd were commissioned by Sinclair Knight Merz on behalf of the joint venture to undertake a noise assessment for inclusion in the Environmental Impact Assessment being completed for the project. The assessment considered the potential impacts of noise associated with the processing plant and pipeline construction and operation on nearby receptors.

1.2 SCOPE OF THE ASSESSMENT

The requirements for the noise assessment element of the EIS are defined in Section 7.9 of the Draft Guidelines for the Preparation of a Draft Environmental Impact Statement on the Blacktip Project¹.

The key noise issues identified in Section 7.9 of the guidelines are as follows:

- ✍ Identification of sensitive noise receptors adjacent to the pipeline route, and at the offshore and onshore facilities.
- ✍ Identification of typical background noise levels.
- ✍ Assess the impacts of noise generated during construction along the pipeline route, and at the offshore and onshore facilities, against current typical background levels, and the sensitivity of the receptor, and describe measures to mitigate it.
- ✍ Anticipate noise levels, their timings and duration should be considered in conjunction with the sensitivity of the receptor.
- ✍ Assess the potential impact of noise generation from the operation of the pipeline, offshore and onshore facilities, including noise from venting, flaring from blow down, and compressor stations.

¹ Woodside Energy Ltd, Draft EIS Guidelines – Part B Blacktip Gas Project, March 2003

✍ Identify mitigation measures as appropriate.

This report has carried out a detailed risk assessment for human impacts, however, the report does not consider potential impacts on the marine and terrestrial environments, or cultural heritage sites. A detailed assessment of the risks to these particular environments are discussed in the main draft EIS report (Sinclair Knight Merz 2004) and in the accompanying Technical Appendices:

✍ *EcOz Environmental Impact Statement for the proposed Blacktip Gas Project Terrestrial Fauna Study*; and

✍ *Begnaze Pty Ltd Environmental Impact Statement for proposed Blacktip Gas Development Archaeology and Historic Heritage Report*.

1.3 LIMITATIONS OF THE ASSESSMENT

This report has been carried out based on the information available at the time of preparing the noise assessment. If, at the detail design stage of the project, there are significant changes to the design of the project the noise implications may need to be reassessed and incorporated into the Noise Management Plan. Matters that could affect the conclusions of this report include changes to the pipeline route, the processing plant location, construction/operational equipment to be used, and changes in the proximity to sensitive human receptors of noise generating activities.

2 NOISE GOALS AND CRITERIA

2.1 OVERVIEW

At present the Northern Territory Government does not define specific environmental noise criteria that can be adopted for the environmental noise assessment. However, previous discussions with the Northern Territory Office of Environment and Heritage have indicated that the Draft Waste Management and Pollution Control (Environmental Noise) Regulation is considered to be the most appropriate approach for the purposes of this assessment.

Reference is made to this draft legislation in the assessment, and further criteria are determined on the basis of commonly adopted standards as appropriate.

2.2 CONSTRUCTION NOISE

2.2.1 Draft Environmental Noise Regulation

The draft Environmental Noise Regulation specifies requirements in relation to construction noise. For construction undertaken between 7 am and 7 pm on a day that is not a Sunday or a public holiday, noise levels are deemed acceptable subject to the following:

- ✍ the work is undertaken in accordance with AS 2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites;
- ✍ the equipment used is the quietest reasonably available;
- ✍ if the occupier is required to prepare a construction noise management plan, the plan was approved and complied with.

For construction undertaken outside of the above hours the occupier of the construction site must demonstrate the following:

- ✍ the work is undertaken in accordance with AS 2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites;
- ✍ the equipment used is the quietest reasonably available;
- ✍ the construction work is being completed in accordance with an approved construction noise management plan;
- ✍ a minimum of 24-hours before the construction work notify in writing relevant premises that could be affected;
- ✍ it is reasonably necessary for the construction work to be carried out.

2.2.2 Existing Noise Levels and Intrusive Noise Criteria

In addition to the consideration of the recommended noise criteria in place in the Northern Territory the terms of reference for the project also specifically requires that the assessment:

“Assess the impacts of noise generated during construction along the pipeline route, and at the offshore and onshore facilities, against current typical background levels, and the sensitivity of the receptor, and describe measures to mitigate it.”

The intent of this clause is to assess potential impacts against existing noise levels to determine the potential for noise intrusion and annoyance at nearby landuses. The level of annoyance caused by noise intrusion is generally related to the audibility of the noise at the receiver's location, along with characteristics of the noise including tonality, impulsiveness and duration.

Audibility of noise sources at a receptor location is a function of both the magnitude and character of the noise source in comparison with pre-existing ambient noise levels. Typically, if the introduced noise source is limited to being at or below the background noise level, acoustic amenity for the existing landuse will be largely maintained. At these levels the introduced noise source would be barely audible at a typical receiver.

Similarly introduced noise levels of less than 5 dB(A) above existing background noise levels are generally assumed to be of marginal significance with respect to annoyance. For night time periods, a lesser allowable increase of 3 dB(A) is generally adopted due to the greater risk of noise impacts at night. Criteria based on allowable increases relative to background noise levels are consistent with criteria adopted in a number of states in Australia (eg, for environmental licences for industry in Queensland, by the Environmental Protection Agency) and by some overseas agencies. For construction noise the duration of the construction period is also commonly taken into consideration. In this instance, the construction duration is expected to be in excess of 6 months. For this reason, the criteria adopted would be consistent with those for a permanent facility.

It should be noted, however, that if the noise source being considered has significant tonal or impulsive characteristics it is typically more intrusive at the same noise level in comparison with a source without these characteristics. As such a correction needs to be applied to source noise levels likely to exhibit significant tonal or impulsive characteristics to account for this variable impact. These adjustments are discussed further in Section 5.

Using this approach for comparing source noise influences to background, Table 2.1 presents the recommended criteria for construction activities at surrounding receptors.

TABLE 2.1: RECOMMENDED NOISE CRITERIA FOR CONSTRUCTION ACTIVITIES

Period	Receptor Component Recommended Criteria (Average $L_{Amax,T}$)¹
Day (7 am – 6 pm)	Background plus 5 dB(A)
Evening (6 pm – 10 pm)	Background plus 5 dB(A)
Night (10 pm – 7 am)	Background plus 3 dB(A)

¹ Usually, the L_{A10} parameter measured over a minimum period of 15 minutes is generally adopted to represent the average $L_{Amax,T}$.

2.3 OPERATIONAL NOISE

For general noise sources, which include industrial and operational noise, acceptable maximum noise levels are presented in Schedule 2 of the Regulations. The maximum acceptable noise levels are defined according to the nature of the noise receiving area and are presented in Table 2.2 below.

It should be noted that the Regulations do not take into consideration existing background noise levels, hence these criteria are not entirely consistent with those adopted for the construction noise assessment. Where the construction noise criteria based on pre-existing background would be more conservative than the operational limits defined in the Regulations, this is commented on in the assessment of the predicted noise impacts (Section 5 of the report).

The noise levels presented in Table 2.2 must also be corrected to take account of tonal or impulsive characteristics. The relevant corrections as defined in Schedule 4 of the draft Regulations are presented in Table 2.3.

In Table 2.2 the following assessment periods also apply:

- ✍ Item 1: the specified noise level must not be exceeded for more than 10 % of the assessment period.
- ✍ Item 2: the specified noise level must not be exceeded for more than 1 % of the assessment period
- ✍ Item 3: the specified noise level must not be exceeded at any time.

TABLE 2.2 MAXIMUM NOISE POLLUTION LEVELS

Column 1	Column 2	Column 3		
		Noise Levels dB(A)		
Noise – Receiving Area	Time of Day	Item 1	Item 2	Item 3
Area 1 (Industrial and Utility Premises)	All hours	65	80	90
Area 2 (Commercial Premises)	All hours	60	75	80
Area 3 (Land not within Areas 1, 2, 4, 5 or 6)	All hours	50	65	70
Area 4 An area of noise-sensitive premises that is within 15m of a building used for noise-sensitive purposes on the premises, where the building is more than 100 meters from – (a) a road carrying more than 10,000 vehicles per day or (b) a significant business district	7am – 7pm Monday to Saturday	45	55	65
	9am – 7pm Sunday and public holidays	40	50	65
	7pm – 10pm all days	40	50	55
	10pm on any day to 7am Monday to Saturday and 9am Sunday and public holidays	35	45	55
Area 5 An area of noise-sensitive premises that is within 15m of a building used for noise-sensitive purposes on the premises, where the building is within 100 meters from – a) a road carrying more than 10,000 vehicles per day or b) a significant business district	7am – 7pm Monday to Saturday	50	60	70
	9am – 7pm Sunday and public holidays	45	55	70
	7pm – 10pm all days	45	55	60
	10pm on any day to 7am Monday to Saturday and 9am Sunday and public holidays	40	50	60

TABLE 2.3 ADJUSTMENTS TO EMITTED NOISE LEVELS

Adjustments where noise emission is not music		
<i>These adjustments are cumulative to a maximum of 15dB</i>		
Where impulsiveness is	Where modulation is present	Where tonality is present

present		
+ 10 dB	+ 5 dB	+ 5 dB

In terms of adjustments to emitted noise levels, factors for the noise sources are discussed further in Section 5.

For the proposed permanent accommodation on site, the Australian/New Zealand Standard Acoustics – Recommended design sound levels and reverberation times for building interiors 2107:2000 has been used (Section 5.2.2).

3 THE EXISTING ENVIRONMENT

3.1 SURROUNDING LANDUSE AND RECEPTOR LOCATIONS

Potentially sensitive human receptor locations have been identified for the gas processing plant, onshore/offshore pipeline and wellhead platform through a desk top review of topographic maps, photographs and other data provided by Sinclair Knight Merz.

The surroundings of the proposed onshore pipeline and gas processing plant is predominantly rural with no residential receptors identified within 1 km of any proposed operations. For the purposes of the assessment two receptor locations have been identified to represent the potential nearby residential receivers as follows:

- ✂ Receptor 1: The Tchindi Aboriginal Camping Ground (used on an ad hoc basis by the Wadeye Community) is located approximately 2.5 km away, however it is understood to have no permanent residents.
- ✂ Receptor 2: Wadeye township represents the closest permanent residential receptors to the proposed development site. Wadeye Township, an Aboriginal community of approximately 2,500 residents, is approximately 12 km away from the processing plant and onshore pipeline.

Given the surrounding landuses for Receptor 1, the Noise Receiving Area 4 criteria is considered appropriate (refer to Table 2.2) given that the area is more than 100 m from a major road, or town and as the background measurements (Section 3.2) are low. Noise Receiving Area 4 is considered appropriate (refer to Table 2.2) for Receptor 2 given that Wadeye Township is located more than 100 m from a major road carrying more than 10,000 vehicles a day, and is not a significant industrial or commercial district.

3.2 EXISTING NOISE LEVELS

3.2.1 Introduction

The terms of reference for the project require definition of typical background ambient noise levels for the surrounding landuses. Given this, noise monitoring was undertaken at two locations in the area surrounding the proposed project site in June 2004. The following sections give a brief overview of the methodology and results of the ambient noise monitoring undertaken.

3.2.2 Monitoring Locations

Two noise monitoring positions were selected to identify typical existing ambient noise levels for the identified receptor groups. Following is a brief description of the selected monitoring positions:

- ✂ Position 1 (Remote Bushland): Position 1 was located in bushland at the proposed Blacktip gas processing plant to represent existing noise levels at the Tchindi Aboriginal Camping

Ground. The microphone was located at approximately 1.2 m above soft ground in a free-field position. Measurements were made using an ARL Type 2 environmental noise logger (serial number 15-299-452). (Plates 1 - 2 Appendix A).

✂ **Position 2 (Wadeye Township):** Position 2 was selected as being representative of existing noise levels for Receptor 2. The monitoring position was located on top of the Police Station within Wadeye Township. The microphone was positioned approximately 4.5 metres above hard ground at this site due to security reasons. Measurements were made using an ARL Type 2 environmental noise logger (serial number 15-299-452). (Plates 3 – 5 Appendix A).

Figure 1 (Appendix A) identifies the monitoring locations selected for the purposes of the noise monitoring.

3.2.3 Noise Monitoring Methodology

Noise measurements were undertaken using an Acoustic Research Laboratories (ARL) Type 2 environmental noise logger (serial number 15-299-452). An averaging time of 15 minutes was adopted, and measurements were made over a full 24 hour period at each position (02/06/04 – 04/06/04). A windshield was fitted to the microphone throughout.

Meteorological data for Port Keats (Wadeye), the nearest station to the proposed development site was obtained from the Bureau of Meteorology. Noise levels during periods when winds exceeded 5 m/s or when rain was recorded have been excluded from the assessment to prevent weather related bias.

3.2.4 Results of Continuous Noise Monitoring

Appendix C presents in full the results of the background noise monitoring. Table 3.1 presents a summary of the existing noise levels for the two monitoring locations.

TABLE 3.1: AVERAGE MEASURED BACKGROUND NOISE LEVELS (dB(A))

Monitoring Location	Period	Average L_{A90}	Average L_{A10}	Average L_{Aeq}	Average L_{Amax}
1	Day 7 am – 6 pm	33.6	42.2	48.8	64.0
	Evening 6 pm – 10 pm	30.4	33.9	36.7	46.8
	Night 10 pm – 7 am	28.3	32.4	33.6	42.9
2	Day ¹ 7 am – 6 pm	43.5	52.4	51.6	69.9
	Evening: 6 pm – 10 pm	41.8	50.6	48.9	68.8
	Night ² 10 pm – 7 am	40	52.7	53.9	66.3

¹ The monitoring data was not complete for the 3/6/04 and the 04/06/04, therefore the two days were combined to produce an average 1 day measurement.

² AS 1055.3 – 1997 R3 Noise Area Category night-time L_{A90} noise criteria has been used.

During the measurements at the Wadeye Police Station the following existing noise sources were identified:

- ✍ Police sirens;
- ✍ Road traffic;
- ✍ Air conditioning unit (during the day).

With the exception of the air conditioning unit, the noise sources observed to be impacting on the monitoring position occurred over short-term periods and as such are unlikely to have a significant impact on measured background (L_{A90}) noise levels (the noise level exceeded for 90 % of the time). As such the air conditioning unit was considered to be the most significant external noise source during monitoring.

The measured night-time L_{A90} noise level for Wadeye Township of 43.9 dB(A) is higher than the measured day-time L_{A90} . This is unusual, and may indicate that activities at the Police Station at night are affecting the background noise levels at the measurement position. Therefore, to provide a more appropriate indication of likely night-time background noise levels for the Wadeye Township, reference has been made to *AS 1055.3 – 1997 Acoustics – Description and measurement of environmental noise Part 3: Acquisition of data pertinent to land use*. AS 1055.3 presents a series of typical average background noise levels for different land use classifications and times of day. For this assessment the L_{A90} night-time noise level for an R3 Noise Area Category, an area with medium density transportation or some commerce or industry from AS 1055.3 – 1997, has been used to represent night time background noise levels for the Wadeye township.

To enable an assessment of the construction noise impacts, the receptor component (L_{A90}) criteria has been determined from the background monitoring data. Table 3.2 shows the criteria for the proposed Blacktip processing plant based on background measurements taken on site, which is considered a representative criteria for the Tchindi Aboriginal Camping Ground (Receptor 1). Table 3.2 shows the criteria for the Wadeye Township (Receptor 2), based on the background measurements taken at Wadeye Township.

TABLE 3.2: SUMMARY OF CONSTRUCTION NOISE CRITERIA BASED ON BACKGROUND NOISE LEVELS PLUS ALLOWABLE INCREMENT

Period	Receptor Component Recommended Criteria (dB(A))	
	Receptor 1	Receptor 2
Day (7 am – 6 pm)	39	49
Evening (6 pm – 10 pm)	35	47
Night (10 pm – 7 am)	31	43 ¹

1. The criteria for Receptor 2 assumes the recommended night-time background noise level from AS 1055 for the purposes of deriving the assessment criteria.

It is noted that the day-time criteria for construction are less stringent than those defined for operations (Area 4) in the Regulations. Conversely, for evening and night-time, the construction criteria are more stringent for Receptor 1 compared with the Area 4 criteria.

4 NOISE EMISSIONS

4.1 CONSTRUCTION PHASE

A summary of the construction activities and types of plant likely to be required for the construction of the proposed shore crossing, 2.5 km onshore pipeline and processing plant is presented in Appendix D. This assessment has assumed that the majority of the construction phase will occur during day-time hours or 7 am – 7 pm. However, night-time work may be required. As specified in the regulation, if work is to be undertaken outside of the day-time hours a construction noise management plan must be completed.

Typical source noise levels have been attributed to each of the construction plant to allow calculation of a total sound power level for each activity grouping. These sound power levels are used in the assessment of potential impacts for the construction phase presented in Chapter 6 of this report. The construction activities, types of plant, and construction noise sound pressure levels were provided by Woodside for the pipeline construction. Information on the equipment likely to be utilised for the shore crossing has been obtained from Chapter 4 of the SKM Preliminary Draft Project Description for Blacktip. For the gas plant, assumptions have been made about the likely equipment types and source noise levels based on previous experience of similar projects.

No correction factor for tonality or impulsiveness has been applied to the predicted receptor noise levels for the shore crossing, onshore pipeline, and processing plant construction. This approach has been adopted because the individual plant are assumed to be operating simultaneously. For a group of plant operating simultaneously, a broadband noise profile would normally be produced from the combined sources. Thus, it is not considered appropriate to apply intermittency or tonality corrections for the level of assessment undertaken.

4.2 OPERATIONAL PHASE

4.2.1 Introduction

This report considers potential noise impacts associated with the operation of the gas processing plant including both normal operations and maintenance periods.

It should be noted that this report does not consider the noise impacts associated with the operation of the offshore pipeline and wellhead platform. Further information on these operations can be obtained from the *Sinclair Knight Merz Draft EIS Marine Existing Environment Report*.

4.2.2 Gas Processing Plant - Normal Operations

The gas processing plant will produce between 110 and 119 TJ of dry gas daily for export, and will operate 24 hours a day, seven days a week throughout the year. Table 4.1 shows the processes that are likely to emit noise during the gas processing plant operation. Woodside has confirmed that the noise level of the operating gas processing plant will not exceed 85 dB at the site boundary.

TABLE 4.1: GAS PROCESSING PLANT CONTINUOUS & NON CONTINUOUS NOISE EMISSIONS

Equipment	Operation	Noise Level at 1 m (dB(A))
Power generation (either 2 x 100% Solar Saturns or 3 x 100% gas engines)	Continuous	85
Process pumps	Continuous	85
Air coolers	Continuous	85
Control valves	Continuous	85
Slugcatchers	Continuous	85
HP / LP Flare tips	Continuous	85
Export Compressor x3	Occasional requirement for dual compressor operation during change over	85
Relief / blow down valves	Spurious / unplanned events	85
Condensate offloading pumps condensate cargo	Only occasional when offloading	85
Fire water pumps during testing of system.	Either spurious unplanned event or during testing of system.	85
Instrument Air Compressor	Regular on / off (including pressure swing air dehydration units)	85
Standby Diesel Power Generation	Intermittent	85

Woodside has confirmed that noise from the HP/LP flare tips will be minimal during normal operation, and flaring from blow down will only occur during start-up and emergencies.

Woodside have confirmed that as a worse case, the noise level at the site boundary will be no more than 85 dB(A).

4.2.3 Gas Processing Plant – Maintenance

Full-scale maintenance operations, which will involve the complete shutdown of the plant will occur every three years for a period of three to five days. The maintenance activities will involve testing of the equipment, and replacement of the silica used for gas processing.

Woodside has confirmed that the HP/LP flare tip relief venting and flaring from blow down operations will occur during planned full-scale maintenance shutdowns, and possibly at other times where maintenance on equipment is necessary. For this assessment, it has been assumed that the noise level will be 110 dB at 1 m for the venting and flaring from blow down operations.

Flaring will occur quarterly, for a period of 1 to 24 hours. The source noise levels from this could be up to 110 dB.

There is the possibility that an underground valve may be located at the shore crossing, which will be approximately 2.5 km away from the Tchindi Aboriginal Camping Ground, where venting may occur.

4.2.4 Gas Processing Plant – Unplanned Releases

Unplanned releases generally relate to emergency events such as a rupture or equipment failure. In both instances there will be automatic control measures in place for the detection and control of accidental releases. Noise issues are likely to be limited to emergency and repair crews for events of this type, and the associated plant and equipment. As such activities would be limited in duration and the potential for impacts is likely to be relatively low.

It should also be noted that in the case of an emergency, issues such as noise (providing the noise levels are not above the limit at which hearing damage could occur) are generally exempt from normal environmental amenity criteria. This is because, in an emergency, other factors (such as life threatening releases) generally take priority over noise. Noise generally has no residual effect on the environment once the event has ceased, hence has little risk in terms of long term environmental impact. In view of this, unplanned releases have not been considered further in the assessment.

4.2.5 Traffic Movements

Woodside has confirmed that the onshore facilities will be manned by two to four personnel on site during operations, and that transport to the plant from Wadeye will be necessary. It is assumed that a 4 x 4 crewcab vehicle will be used. Given the low number of personnel involved, road traffic noise impacts on Wadeye Township will be minimal.

Full scale maintenance activities will be undertaken every three years for a period of three to five days, during which operations will shut down. Approximately 20 – 40 additional personnel will be required. It is assumed that transport through Wadeye Township will be kept to a minimum, with a maximum of 10 vehicles (i.e. 10 crewcab 4 x 4 vehicles) using this route. The noise impacts are expected to be minimal, as the overall number of vehicle movements remains small.

Given the small number of vehicle movements expected as a result of the operation of the project noise associated with traffic movements has not been assessed further in this report.

5 ASSESSMENT OF POTENTIAL IMPACTS

5.1 CONSTRUCTION NOISE

5.1.1 Modelling Methodology

To assess the potential for noise impacts as a result of both the construction and operational phase of the proposed gas processing plant and pipeline, predictive modelling has been undertaken. The noise modelling has been undertaken using the proprietary software 'Environmental Noise Model' (ENM). This model is widely approved by regulatory agencies for the prediction of potential noise impacts from proposed developments. The model allows incorporation and assessment of the influences of meteorology and terrain.

For the purposes of this assessment, a worst case meteorological scenario has been assumed:

- ✍ direct source to receptor wind direction;
- ✍ worst case atmospheric temperature gradient (stable inversion conditions); and
- ✍ 3 m s⁻¹ wind speed, which is a worst case for temperature inversion conditions.

This meteorological scenario is recommended by the New South Wales (NSW) EPA as a worst case assessment scenario for noise modelling. Discussions with the Northern Territory Bureau of Meteorology confirm that temperature inversion conditions are also relevant for the Territory, mainly during the winter months. Therefore, the adoption of a temperature inversion for the modelling of noise emissions is appropriate. It should be noted, however, that although a temperature inversion has been included in the modelling, this is unlikely to occur during construction periods unless construction occurs at night. If night time construction is to take place, a noise management plan is required prior to commencement.

For the purposes of the modelling, no noise shielding by terrain features has been assumed. This is a worst case approach as it is assumed that any potentially noise sensitive receptor, such as a person would have a direct line of sight to the source of noise emissions.

5.1.2 Results of Noise Modelling

5.1.2.1 Shore Crossing

Predicted receptor noise levels associated with each stage of construction of the shore crossing for the identified receptor groups is presented in Table 5.1. Comparison of the predicted receptor noise levels with the criteria noise levels show compliance is predicted for all stages of the construction for day-time (7 am – 6 pm) construction works. However, it is predicted that blasting will not comply with the night-time (10 pm – 7 am) construction criteria.

TABLE 5.1: NOISE PREDICTIONS FOR SHORE CROSSING ACTIVITIES (dB(A))¹

Activity	Receptor 1				Receptor 2			
	Predicted L _{A10}	Day	Evening	Night	Predicted L _{A10}	Day	Evening	Night
Trench dredging	29.4	39	35	31	<20	49	47	43
Blasting (preparation)	31.3	39	35	31	<20	49	47	43
Beach and dune excavation	21.4	39	35	31	<20	49	47	43
Pipeline installation	<20	39	35	31	<20	49	47	43
Padding, shading and backfilling	26.5	39	35	31	<20	49	47	43
Restoration and rehabilitation	23.3	39	35	31	<20	49	47	43

¹ Maximum predicted receptor noise levels have been calculated using minimum separation distances from source to receptor for the life of the project.

5.1.2.2 Onshore Pipeline

Table 5.2 presents predicted receptor noise levels associated with each stage of construction of the onshore pipeline for the identified receptor groups. Comparison of the predicted receptor noise levels with the criteria noise levels show compliance is predicted for all stages of the construction for day-time (7 am – 6 pm) operations, although the predicted noise levels for the clear and grade, and trenching stages are close to the criteria levels.

Compliance is not predicted for night-time (10 pm – 7 am) construction works for the clear and grade, trench dredging, and blasting stages. The trench dredging is also not predicted to comply for the evening (6 pm - 10 pm) construction criteria. The recommended management options for construction during night-time hours are discussed in Section 6.

TABLE 5.2: NOISE PREDICTIONS FOR ONSHORE PIPELINE CONSTRUCTION ACTIVITIES (dB(A))¹

Activity	Receptor 1				Receptor 2			
	Predicted L _{A10}	Day	Evening	Night	Predicted L _{A10}	Day	Evening	Night
Clear and grade	33.1	39	35	31	<20	49	47	43
Blasting (preparation)	31.3	39	35	31	<20	49	47	43

Activity	Receptor 1				Receptor 2			
	Predicted L _{A10}	Day	Evening	Night	Predicted L _{A10}	Day	Evening	Night
Trenching, trench breaking, stringing, bending and lowering in	36.2	39	35	31	<20	49	47	43
Welding and joint coating	27.2	39	35	31	<20	49	47	43
Hydrotesting and dewatering	24.5	39	35	31	<20	49	47	43
Padding, shading and backfilling	26.5	39	35	31	<20	49	47	43
String and pit tie-ins, and road crossings	29.9	39	35	31	<20	49	47	43
Restoration and rehabilitation	23.3	39	35	31	<20	49	47	43
Commissioning	23.3	39	35	31	<20	49	47	43

¹ Maximum predicted receptor noise levels have been calculated using minimum separation distances from source to receptor for the life of the project.

5.1.2.3 Gas Processing Plant

Table 5.3 presents predicted receptor noise levels associated with each stage of construction of the onshore pipeline for the identified receptor groups. Comparison of the predicted receptor noise levels with the criteria noise levels show compliance is predicted for all stages of the construction during day-time operations (7 am – 6 pm). Compliance is not predicted for evening (6 pm – 10 pm) and night-time (10 pm – 7 am) construction criteria for the clear and grade, blasting, and trenching stages. The recommended management options for construction during the evening and night-time are discussed in Section 6.

The predicted modelling of construction road traffic (modelled at 100 m) through Wadeye indicates that construction noise traffic (72.6 dB(A)) is only marginally above the measured daytime L_{Amax} at Wadeye of 69.9 dB. As this source of noise is expected to occur infrequently, it is not expected to pose a significant long term noise impact, although management of this potential noise impact is still recommended. In particular, heavy vehicle movements should be restricted to normal day-time hours of 7 am to 6 pm wherever possible.

TABLE 5.3: NOISE PREDICTIONS FOR GAS PROCESSING PLANT ACTIVITIES (dB(A))
1

Activity	Receptor 1				Receptor 2			
	Predicted L _{A10}	Day	Evening	Night	Predicted L _{A10}	Day	Evening	Night
Clearing of vegetation	33.1	39	35	31	<20	49	47	43
Blasting (if required)	31.3	39	35	31	<20	49	47	43
Laying foundations and erecting facilities	26.5	39	35	31	<20	49	47	43
Installing equipment and systems	26.5	39	35	31	<20	49	47	43
Installing ancillaries	26.5	39	35	31	<20	49	47	43
Testing and commissioning	23.3	39	35	31	<20	49	47	43
Clean-up & removal of construction related equipment	23.3	39	35	31	<20	49	47	43

¹ Maximum predicted receptor noise levels have been calculated using minimum separation distances from source to receptor for the life of the project.

5.2 OPERATIONAL NOISE

5.2.1 Onshore Pipeline

As the pipeline is relatively short (approximately 2 km in length), the usual above ground installations associated with the pipeline will not be installed due to the proximity to the gas processing plant. A pig trap will be installed within the plant, which is used for maintenance. During pigging a small amount of gas venting will occur within the plant. Although the gas venting is predicted to be minimal, venting of gas is generally designed to occur at sonic velocities for safety reasons. Because of this, venting may result in noise levels possibly in excess of 110 dB at the vent location (the gas processing plant) on infrequent occasions. The potential for noise impacts from this activity is assessed with the gas processing maintenance operations (Section 5.2.3).

There is the possibility that an underground valve may be located at the shore crossing, which will be approximately 2.5 km away from the Tchindi Aboriginal Camping Ground. During venting, gas may be released at this location.

5.2.2 Gas Processing Plant – Normal Operations

5.2.2.1 Surrounding Landuses

For the gas processing plant Woodside has confirmed that the maximum noise level at the processing plant edge will be 85 dB. The separation distance to the nearest potentially sensitive receptor at the proposed gas processing plant is approximately 2.5 km from the Tchindi Aboriginal Camping Ground, and approximately 12 km from Wadeye.

Likely receptor noise levels have been calculated as follows:

- ✍ an 85 dB(A) noise level at the site boundary;
- ✍ a 6 dB noise reduction per doubling of distance;
- ✍ a +5 dB correction for tonality; and
- ✍ a minimum separation distance of 2.5 km.

The resultant external receptor noise levels for the gas processing plant are predicted to be less than 25 dB at 2.5 km and less than 30 dB at 1 km. Therefore, noise levels at the Tchindi Aboriginal Camping Ground are predicted to be within the assessment criterion for Area 4. Wadeye Township, which has a larger separation distance, is predicted to be well within the Area 4 noise criteria. The predicted noise levels are also within the more stringent evening and night-time criteria adopted for construction noise impacts.

It is recommended that the site boundary noise levels are validated during the commissioning stage of the project to confirm that the assumptions adopted in this assessment are correct.

5.2.2.2 On-site Accommodation

Woodside propose to construct permanent accommodation on site. Australian Standard AS 2107:2000 – *Recommended design sound levels and reverberation times for building interiors* defines acceptable sound levels for hostels, residential halls and barracks as shown in Table 5.4. AS 2107 does not specify recommended noise levels for residential accommodation next to a gas processing plant, however, the recommended noise levels for a hostels, residential halls and barracks are considered appropriate to represent this situation.

TABLE 5.4: AS 2107:2000 RECOMMENDED INTERNAL NOISE LEVELS FOR HOSTELS, RESIDENTIAL HALLS AND BARRACKS

Residential activity	Recommended design sound level L_{Aeq} dB (A)	
	Satisfactory	Maximum
Sleeping areas	30	35
Common areas	40	45
Cafeterias	45	50
Games Rooms	45	50

Kitchens and Service Areas	45	55
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Assuming a noise level of 85 dB(A) at the plant edge, the predicted noise level of less than 30 dB(A) externally indicates that the internal noise levels will comply with the AS 2107:2000 recommendations as detailed in Table 5.4

5.2.3 Gas Processing Plant – Maintenance Operations

Planned maintenance operations are not expected to lead to significant changes in noise emissions, except where releases from relief valves and flaring from blow down activities occur. Woodside has confirmed that the HP/LP flare tips relief and flaring from blow down operations will occur during planned maintenance shutdowns every 3 to 5 years, with the possibility of flaring from blow downs at other times where maintenance of equipment is necessary. For this assessment, it has been assumed that the noise level will be 110 dB(A) at 1 m for the flaring from blow down or the flare tip relief operations. The flaring from blow down will occur quarterly and may last for up to 24 hours, although the noise levels are expected to be less than would occur during planned maintenance shutdown of the plant.

There is the possibility that an underground valve may be located at the shore crossing, which will be approximately 2.5 km away from the Tchindi Aboriginal Camping Ground, where venting may occur.

Likely receptor noise levels have been calculated as follows:

- ✍ 110 dB(A) source noise level;
- ✍ a 6 dB noise reduction per doubling of distance;
- ✍ a +5 dB correction for tonality; and
- ✍ a minimum separation distance of 2.5 km.

The resultant receptor noise level for the maintenance operations at the processing plant are predicted to be 47 dB(A) at 2.5 km. At the Tchindi Aboriginal Camping Ground the predicted noise level is within the Area 4 Noise Receiving criteria for daytime, evening and night-time operations not to be exceeded more than 1 % of the assessment period. As planned maintenance is likely to occur every 3 to 5 years, with the possibility of minor ad hoc maintenance on individual pieces of equipment, this would be acceptable. The noise levels from the quarterly flaring from blow down is predicted to be less than the planned shutdown of the plant, and would therefore also be expected to comply with the Area 4 criteria. The predicted noise levels are <35 dB(A) at the Wadeye Township and are therefore well within the Area 4 noise criteria due to the additional separation distance. The predicted noise levels at Wadeye Township are also within the more stringent evening and night-time criteria adopted for construction noise impacts.

As noise from the venting and flaring from blow down activities may be audible at the Tchindi Aboriginal Camping Ground, it is recommended that local representatives are notified in advance of a planned release event occurring. If possible, a minimum of 24 hours notice should be given.

6 SUMMARY AND CONCLUSIONS

6.1 OVERVIEW

Woodside Energy Limited (Woodside), in association with its joint venture partner ENI Australia (ENI), proposes to develop the Blacktip gas field in permit WA-279-P of the Joseph Bonaparte Gulf, approximately 245 km south west of Darwin. It is proposed that gas and associated reservoir liquids are exported from the Blacktip field via subsea pipeline to an onshore processing plant. The pipeline required will be approximately 110 km in length and will travel in a south-east direction to a suitable shore landing site. The shore landing for the export pipeline will be approximately 20 km west of the township of Wadeye.

Air Noise Environment Pty Ltd were commissioned by Sinclair Knight Merz on behalf of the joint venture to undertake a noise assessment for inclusion in the Environmental Impact Assessment being completed for the project. The assessment considered the potential impacts of noise associated with the processing plant and pipeline construction and operation on nearby receptors.

6.2 CONSTRUCTION NOISE IMPACTS

Overall, the assessment has concluded that there is a limited potential for noise impacts from the day-time construction of the proposed onshore pipeline and processing plant due to the significant buffer distances to potentially sensitive receptors at Wadeye Township and the Tchindi Aboriginal Camping Ground.

However, if night-time construction works are proposed for the clear and grade, blasting and trench dredging stages it is recommended that validation monitoring is carried out to assess the actual noise levels during the works. If the noise levels are found to be above the recommended noise criteria outlined in Table 3.2, a noise management plan will need to be implemented.

In order to minimise the potential for noise impacts on surrounding landuses it is recommended that the following best practice measures be undertaken during the construction phase of the project.

Blasting:

It is recommended that a noise management plan is submitted to the Northern Territory Office of Environment and Heritage where blasting is undertaken. This noise management procedure should include the following:

- ✍ potentially sensitive receptors within a 2 km radius should be notified of the proposed works a minimum of 24 hours in advance;
- ✍ where receptors occur at or within 1 km of the proposed blast site, prediction of potential air overblast pressure and vibration should be undertaken based on the proposed blast size and type;

- ✍ the results of the predictions should be provided to the regulatory authority prior to commencement of blasting for approval along with any proposed mitigation measures including the possibility to increase cover material depth, increase spacings between charges and reduce the size of charges detonated per event.

Road Traffic Noise:

Woodside has confirmed that a noise management plan and traffic management plan will be implemented to ensure appropriate management of construction road traffic through Wadeye Township. The noise management plan should as a minimum identify suitable transport routes through the town to minimise impact and where possible confine heavy vehicle movements to normal day-time periods of 7 am to 6 pm Monday to Saturday.

6.3 OPERATIONAL NOISE IMPACTS

Overall, the assessment has concluded that there is limited potential for noise impacts from the operation of the proposed onshore pipeline and gas processing plant due to the significant buffer distances to potentially sensitive receptors.

The potential for audible noise during planned maintenance has been identified, and following are recommendations for the minimisation of noise impacts during this operational element.

Planned Maintenance:

Prior to any planned maintenance such as flaring from blow down, it is recommended that representatives of the Tchindi Aboriginal Camping Ground and any dwellings within a 5km radius of the site should be notified at least 24 hours before the event.

It should be noted that the operational assessment has made assumptions about the noise levels expected from the site, and it is recommended that noise monitoring at the site boundary is completed at the commissioning phase of the project to confirm that the conclusions of the assessment remain valid.

APPENDIX A

FIGURES AND PLATES

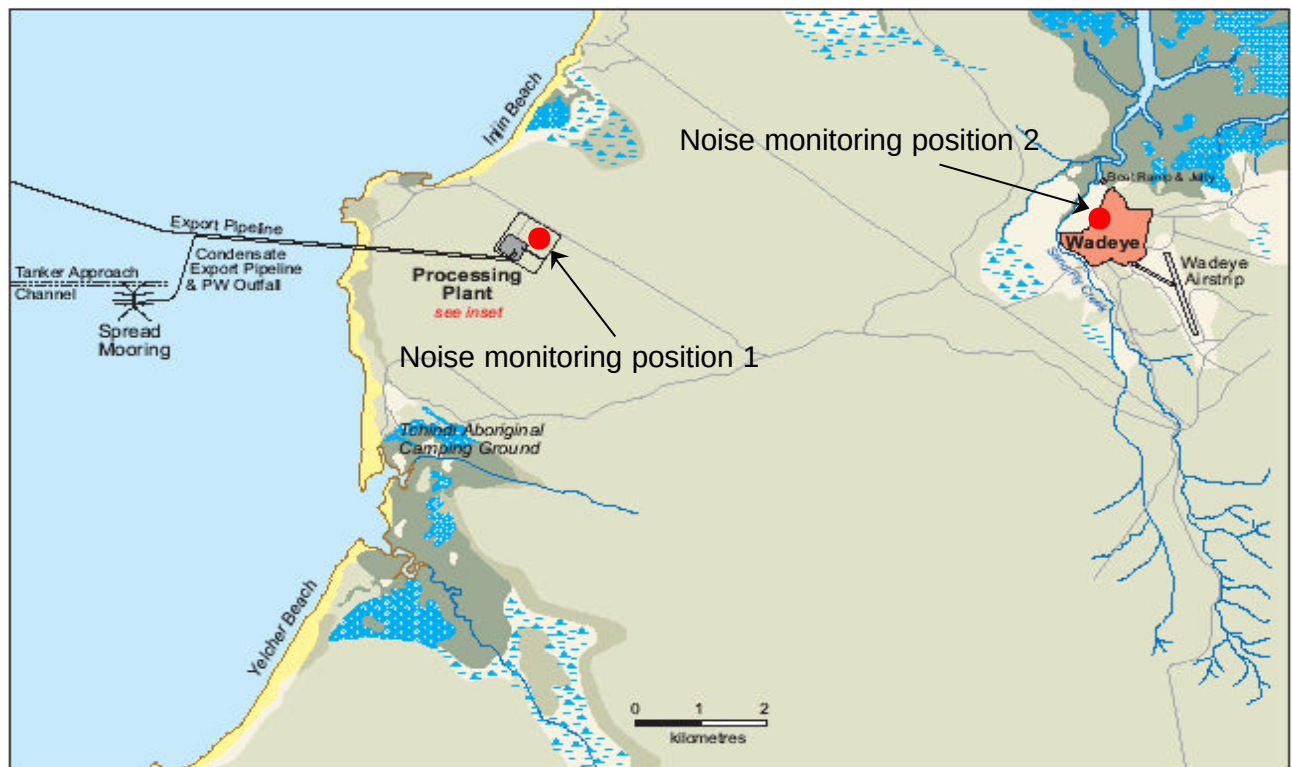


Figure 1: Location of the proposed Blacktip processing plant, and the background noise monitoring locations





Plate 1: Road to the proposed Blacktip processing plant where the background noise monitoring was undertaken.



Plate 2: Typical environment where the background noise monitoring was undertaken at the proposed Blacktip processing plant.





Plate 3: Front of the Police Station at Wadeye where the background noise monitoring was undertaken.



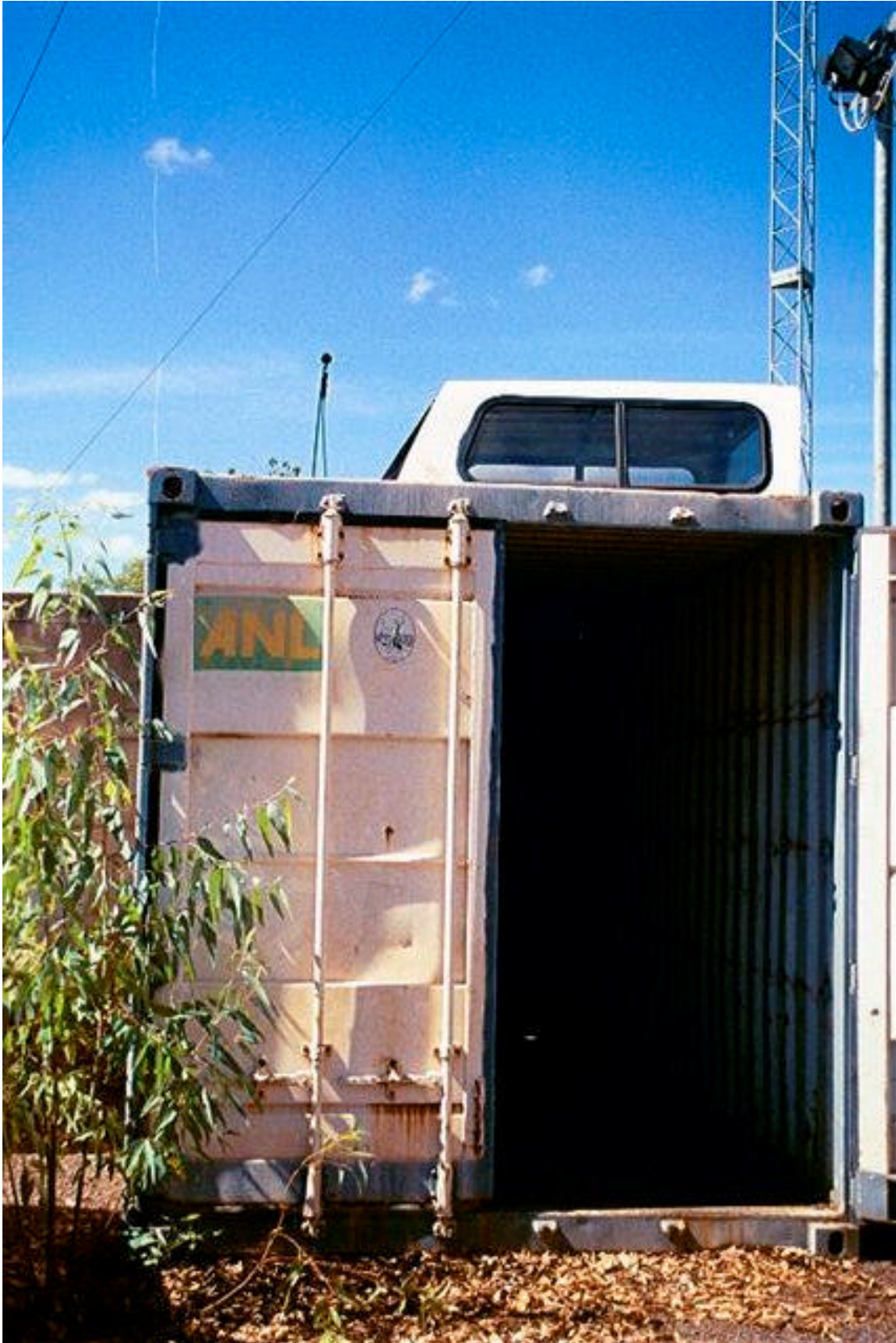


Plate 4: Location of the ARL logger microphone at the back of the Wadeye Police Station on top of a container roof.





Plate 5: Close up of the ARL logger microphone located on a roof of a container at the Wadeye Police Station.



APPENDIX B

ACOUSTIC GLOSSARY

APPENDIX B: GLOSSARY OF ACOUSTIC TERMINOLOGY

A-Weighting	A response provided by an electronic circuit which modifies sound in such a way that the resulting level is similar to that perceived by the human ear.
dB (decibel)	This is the scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and the reference pressure (0.00002N/m ²).
dB(A)	This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (ie 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Facade Noise Level	Refers to a sound pressure level determined at a point close to an acoustically reflective surface (in addition to the ground). Typically a distance of 1 metre is used.
Free Field	Refers to a sound pressure level determined at a point away from reflective surfaces other than the ground with no significant contribution due to sound from other reflective surfaces; generally as measured outside and away from buildings.
Hertz (Hz)	A measure of the frequency of sound. It measures the number of pressure peaks per second passing a point when a pure tone is present.
L_{Aeq} Equivalent Continuous Sound Level	This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over the given period. For a steady sound with small fluctuations, its value is close to the average sound pressure level.
L_{A90,T}	This is the dB(A) level exceeded 90% of the time, T.
L_{A10,T}	This is the dB(A) level exceeded 10% of the time, T.
L_{A50, T}	This is the dB(A) level exceeded 50% of the time, T.
L_{WA}	The A-weighted sound power level in dB.

APPENDIX C

BACKGROUND NOISE LEVELS

Monitoring Location at the proposed Blacktip Gas Processing Facility

Date	Time	Lmax	L1	L5	L10	L50	L90	L95	L99	Lmin	Leq	Battery	Temp	Samples
2/06/2004	14:15	95.5	77.5	66	59	42	37.5	36.5	17.5	17	66	78	34	0
2/06/2004	14:30	62.5	52	47	44.5	40	36.5	36	35	34.5	43	78	35	0
2/06/2004	14:45	51	45	42.5	41	38	35.5	35	34.5	33.5	38.5	78	35.5	0
2/06/2004	15:00	61	46.5	44.5	43.5	39	35.5	35	34	33	40.5	78	35.5	0
2/06/2004	15:15	69	52	48	45.5	41	38.5	38	37.5	36.5	44.5	78	36	0
2/06/2004	15:30	69.5	54	45.5	43.5	40	38	37.5	36.5	36	45.5	78	36	0
2/06/2004	15:45	69	47.5	43.5	42.5	39.5	37	37	36	35.5	42.5	78	34.5	0
2/06/2004	16:00	55.5	47.5	46	44.5	41.5	39	38	37	36.5	42	78	34	0
2/06/2004	16:15	53	47	45.5	44.5	41	39	38.5	38	37.5	41.5	78	34	0
2/06/2004	16:30	66.5	58.5	45	43	39.5	37	36.5	35.5	35	45.5	78	34.5	0
2/06/2004	16:45	68	53.5	42	38.5	34.5	33	32.5	32	31.5	42.5	77	34.5	0
2/06/2004	17:00	51.5	40.5	36.5	35.5	33.5	31.5	31	30.5	30	34	78	34.5	0
2/06/2004	17:15	57.5	48	36	34.5	32	31	30.5	30	29.5	35.5	78	34	0
2/06/2004	17:30	58	53	44	39.5	32.5	31	30.5	30	29.5	39	78	33.5	0
2/06/2004	17:45	66.5	57.5	44.5	38	32.5	31	30.5	30.5	29.5	43	78	33	0
2/06/2004	18:00	64	52.5	40.5	36.5	31.5	30	29.5	29	28.5	40.5	77	32.5	0
2/06/2004	18:15	48.5	42.5	38.5	35	31.5	30	30	29.5	28.5	33.5	77	32	0
2/06/2004	18:30	64	55	42.5	39	34	32.5	32	31.5	31	41	78	31	0
2/06/2004	18:45	48	39.5	35.5	35	33.5	32	32	31.5	30.5	33.5	77	31	0
2/06/2004	19:00	48.5	40.5	36	35	33.5	31.5	31.5	30.5	29.5	33.5	78	30.5	0
2/06/2004	19:15	66.5	44.5	36.5	34.5	33	32	31.5	29	28.5	38	78	30	0
2/06/2004	19:30	53.5	49.5	46.5	43.5	33.5	31	30.5	29	28	39	77	29.5	0
2/06/2004	19:45	73	53	41	35.5	32.5	31.5	31.5	31	29.5	45	77	29	0
2/06/2004	20:00	39	34	33.5	33	31	30	29.5	29	28.5	31	77	29	0
2/06/2004	20:15	37	34.5	33.5	33	31	30	30	29	28.5	31	76	29	0
2/06/2004	20:30	35	32	31.5	31.5	30.5	29.5	29.5	29	28.5	30.5	77	28.5	0
2/06/2004	20:45	38	32	31.5	31	30	29.5	29	29	28.5	30	77	27.5	0
2/06/2004	21:00	48	34	31.5	31.5	30.5	29.5	29.5	29	28.5	30.5	77	28.5	0
2/06/2004	21:15	36	32.5	32	31.5	30.5	30	29.5	29.5	28.5	30.5	77	28.5	0
2/06/2004	21:30	39.5	32.5	32	32	31	30	29.5	29.5	29	30.5	77	28	0
2/06/2004	21:45	36	31	30.5	30.5	29.5	29	29	28.5	28	29.5	77	28	0
2/06/2004	22:00	37.5	33.5	31.5	30.5	29.5	29	28.5	28.5	28	29.5	76	27.5	0
2/06/2004	22:15	35.5	32	30.5	30.5	29.5	29	29	28.5	28	29.5	76	27	0
2/06/2004	22:30	50.5	46.5	39	35.5	30	29	29	28.5	28	34	77	28	0
2/06/2004	22:45	40	37.5	35	33.5	30	29.5	29	29	28	31	77	27.5	0
2/06/2004	23:00	41.5	31.5	30.5	30	29.5	29	29	28.5	28	29.5	76	27.5	0
2/06/2004	23:15	37	32	30	30	29	28.5	28	28	27.5	29	76	27	0
2/06/2004	23:30	39.5	32	29.5	29	28.5	27.5	27.5	27	27	28.5	76	26.5	0
2/06/2004	23:45	38.5	32	29.5	29	28	27.5	27.5	27.5	27	28	76	27	0
3/06/2004	0:00	34	29	28.5	28	27.5	27.5	27.5	27	26.5	27.5	77	27	0
3/06/2004	0:15	50.5	35	32	30	28	27.5	27.5	27	26.5	29	76	27	0
3/06/2004	0:30	45.5	34.5	31	29.5	28	27.5	27.5	27	26.5	28.5	77	26.5	0
3/06/2004	0:45	41	33	29.5	28.5	28	27.5	27.5	27	27	28	77	27	0
3/06/2004	1:00	43	35.5	29	28.5	28	27.5	27.5	27	27	28.5	76	27	0
3/06/2004	1:15	34.5	33	29.5	29	28	27.5	27.5	27.5	27	28	76	27	0
3/06/2004	1:30	35	32.5	30.5	29.5	28	27.5	27.5	27.5	27	28	76	26	0
3/06/2004	1:45	66	44	32.5	30.5	28	27.5	27.5	27.5	27	33.5	77	26	0
3/06/2004	2:00	37	31.5	29.5	29	28.5	28	27.5	27.5	27	28.5	77	26.5	0
3/06/2004	2:15	46	30.5	29.5	29	28	27	27	27	27	28	76	26	0
3/06/2004	2:30	38	31.5	29	28.5	27.5	27	27	27	26.5	27.5	76	26	0
3/06/2004	2:45	38	32.5	29	28.5	27.5	27	27	27	26.5	27.5	76	26	0
3/06/2004	3:00	39	34.5	30.5	29	27.5	27	27	27	26.5	28	76	26	0
3/06/2004	3:15	45	40	34.5	30.5	27.5	27	27	27	26.5	29.5	76	26	0
3/06/2004	3:30	40.5	35	31	29	27.5	27	27	27	26.5	28	76	26	0
3/06/2004	3:45	39	34	30	29	28	27.5	27.5	27	27	28	76	26	0
3/06/2004	4:00	39	32	29.5	29	28	27.5	27.5	27	27	28	76	26	0
3/06/2004	4:15	37.5	31	29.5	29	28.5	28	27.5	27.5	27.5	28.5	75	26	0
3/06/2004	4:30	51	35.5	32	31	29	28.5	28	28	27.5	29.5	76	26	0
3/06/2004	4:45	43	38.5	33.5	32	29.5	28.5	28	28	27.5	30.5	76	25.5	0
3/06/2004	5:00	43.5	41	38	33	29	28.5	28.5	28	27.5	31.5	75	26	0
3/06/2004	5:15	43.5	41.5	39.5	36	29	28.5	28.5	28	27.5	32.5	75	25.5	0
3/06/2004	5:30	43.5	42	39.5	36	30	29	29	28.5	28	33	75	26	0

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3/06/2004	5:45	56	43.5	42	41	30.5	28.5	28.5	27.5	27	36	76	26	0
3/06/2004	6:00	45.5	44	43	42	32	29.5	29	29	28	37.5	75	25.5	0
3/06/2004	6:15	46	44.5	44	43	37.5	30	29.5	29	28.5	39.5	76	25.5	0
3/06/2004	6:30	49.5	45	44.5	44	41	32	31	29.5	28.5	41	75	25.5	0
3/06/2004	6:45	46.5	45	44.5	44	41.5	34.5	32.5	30.5	28.5	41.5	75	25.5	0
3/06/2004	7:00	46.5	45	44	43.5	36.5	28	27.5	27.5	27.5	39.5	76	25	0
3/06/2004	7:15	60.5	52	47.5	44	31.5	28.5	28.5	28	27.5	40.5	76	25	0
3/06/2004	7:30	66	51	41.5	39.5	32.5	29	28.5	28	27.5	41	75	25.5	0
3/06/2004	7:45	72	57	45	39	31	28.5	28.5	28	27.5	43.5	76	24.5	0
3/06/2004	8:00	75	62	50.5	39.5	30	28	28	27.5	27	48	74	25	0
3/06/2004	8:15	72	59	50	42	30	28.5	28	27.5	27.5	46	74	25	0
3/06/2004	8:30	72.5	61	46.5	41	31	29	28.5	28	27.5	47.5	75	25	0
3/06/2004	8:45	64	56	43.5	39	31	29.5	29	28.5	28	42	76	25	0
3/06/2004	9:00	70	50	42	39.5	32.5	29.5	29.5	28.5	28	40	76	24.5	0
3/06/2004	9:15	68.5	62	48.5	42.5	34.5	32	31.5	30.5	30	47	75	26	0
3/06/2004	9:30	56	46.5	42.5	41	35.5	32	31.5	31	30.5	38	75	26	0
3/06/2004	9:45	63.5	51	44.5	42.5	37.5	33.5	32.5	32	31.5	40	75	27	0
3/06/2004	10:00	67	53.5	48	46.5	40	36.5	36	35.5	35	44	75	27.5	0
3/06/2004	10:15	64	54.5	45.5	43.5	38	35.5	35.5	34.5	34	42	76	29	0
3/06/2004	10:30	69.5	59	51.5	49	43	36.5	35.5	34.5	34	47.5	76	29.5	0
3/06/2004	10:45	61	50.5	48	47	42	37	36.5	35	34	43.5	76	29.5	0
3/06/2004	11:00	57	49.5	45.5	44	38.5	35	34	33	32.5	40.5	75	31	0
3/06/2004	11:15	61.5	49.5	44	42.5	38	34.5	33.5	33	32.5	40.5	76	33	0
3/06/2004	11:30	64	51	44	42.5	40	36.5	36	35	34	42	76	34	0
3/06/2004	11:45	49	45	43.5	42.5	38	33.5	32.5	32	31.5	39	75	35	0
3/06/2004	12:00	56.5	45.5	43	42.5	38.5	34.5	33.5	32.5	31.5	39.5	75	35.5	0
3/06/2004	12:15	61	48.5	45.5	43	36	33	32	31	30.5	40	76	37	0
3/06/2004	12:30	56	41.5	39.5	38.5	35	33.5	33	32	31	36	75	37.5	0
3/06/2004	12:45	68	48	39	38	35	33	33	32.5	30	41	76	38	0
3/06/2004	13:00	49	46	44	43.5	39.5	37	36.5	36	35.5	40	76	37	0
3/06/2004	13:15	67	55	46	44.5	39.5	36	35.5	35	33.5	44.5	76	37.5	0
3/06/2004	13:30	68	54	46.5	45	39.5	34	33.5	32	31	44	76	38	0
3/06/2004	13:45	62.5	52.5	49	47.5	42	34.5	33	32.5	32	44.5	75	37.5	0
3/06/2004	14:00	56	47.5	44	43	39	36	35.5	34.5	34	40	75	37	0

Monitoring Location at Wadeye Township

Date	Time	Lmax	L1	L5	L10	L50	L90	L95	L99	Lmin	Leq	Battery	Temp	Samples
3/06/2004	15:30	74	65	55.5	53.5	48	45.5	45	44	43.5	52.5	76	39	0
3/06/2004	15:45	68	58	55	53	48.5	46	45.5	44.5	43	50	75	41	0
3/06/2004	16:00	72.5	60	55	53	48	45	44.5	43.5	43	50	76	41.5	0
3/06/2004	16:15	70	59	54.5	52.5	47	44.5	44	43.5	42.5	50	76	41	0
3/06/2004	16:30	66.5	60	56	53	47.5	45	44.5	43.5	42.5	50.5	77	41.5	0
3/06/2004	16:45	64	59.5	56.5	54.5	47	44.5	44	43	42.5	50.5	76	42	0
3/06/2004	17:00	68.5	64	58	55	47	44.5	44	43	42	52	75	41.5	0
3/06/2004	17:15	74	57	54	51	45.5	43.5	43	42.5	42	48.5	76	40.5	0
3/06/2004	17:30	61	57	53	50	44.5	43	42.5	42	41.5	47	76	40	0
3/06/2004	17:45	65	58.5	54	50.5	44.5	43	43	42.5	42	48	77	39	0
3/06/2004	18:00	62	58	52.5	50	45	43.5	43	42.5	41.5	47.5	75	39	0
3/06/2004	18:15	65.5	58.5	54	51	45	43.5	43	42.5	42	48	76	38	0
3/06/2004	18:30	69.5	59	54	51	46	43.5	43	42.5	42	48.5	76	37.5	0
3/06/2004	18:45	77	59.5	54.5	51	45.5	43.5	43	42.5	41.5	51.5	75	37.5	0
3/06/2004	19:00	84	59	55.5	52.5	45.5	43	43	42.5	41.5	51	75	37.5	0
3/06/2004	19:15	68.5	62	55.5	53	46	43.5	43	42.5	41.5	50.5	75	36	0
3/06/2004	19:30	70	60.5	55.5	53	45	43	43	42.5	41.5	50	75	34	0
3/06/2004	19:45	69	59	54.5	52.5	45.5	43.5	43	42.5	42	49.5	74	32.5	0
3/06/2004	20:00	69.5	64	60	56	46	43.5	43	42.5	42	52.5	74	31.5	0
3/06/2004	20:15	70	58.5	53	49.5	43.5	41	40.5	39.5	39	47.5	74	30	0
3/06/2004	20:30	64	59.5	54	51.5	43.5	40.5	40.5	39.5	39	48	75	30	0
3/06/2004	20:45	63	56	50.5	47.5	43	40.5	40	39	38	45.5	75	28.5	0
3/06/2004	21:00	76.5	56.5	50.5	47.5	42	39.5	39	38.5	37.5	48	75	28.5	0
3/06/2004	21:15	67.5	55	49.5	47	41.5	39.5	39	38.5	37.5	45	75	28	0
3/06/2004	21:30	65	55	49	46.5	40.5	39	38.5	38	37	44.5	75	27.5	0
3/06/2004	21:45	62.5	55.5	49.5	46.5	42	39.5	39	37.5	36	45	74	26.5	0
3/06/2004	22:00	60	56	54.5	53.5	43.5	42	41.5	41	40.5	48	74	27	0

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3/06/2004	22:15	68.5	57	55.5	54.5	50.5	43.5	42.5	41	40.5	51.5	74	26.5	0
3/06/2004	22:30	65.5	56	55	53.5	42.5	41	41	40.5	40	47.5	74	26.5	0
3/06/2004	22:45	67	57.5	51	49	43	41	41	40.5	40	46.5	74	26	0
3/06/2004	23:00	57	52	46	43.5	41.5	40.5	40.5	40.5	40	42.5	73	26	0
3/06/2004	23:15	72	66	62	56	42.5	41	41	40.5	40	53.5	73	25.5	0
3/06/2004	23:30	64	54	46	44	42	41.5	41.5	41	40.5	44	74	24.5	0
3/06/2004	23:45	70.5	67.5	59	52	42	39	38.5	38	37	53.5	73	25	0
4/06/2004	0:00	71.5	65.5	58	51.5	40	38	37.5	37	36	51.5	72	24.5	0
4/06/2004	0:15	76	68	60.5	58.5	54.5	44	42.5	40.5	37.5	56.5	73	24	0
4/06/2004	0:30	70.5	64	60	60	59	57	56.5	54.5	51	59	73	24	0
4/06/2004	0:45	61.5	61	60.5	59.5	54	50	49	41	37.5	55.5	73	23.5	0
4/06/2004	1:00	58.5	56.5	55.5	55	53	47.5	45	38	35.5	52.5	74	23.5	0
4/06/2004	1:15	70.5	59.5	57	56	51	39	37.5	36	34.5	52.5	73	23	0
4/06/2004	1:30	74.5	59	58.5	58	56.5	54	53	48.5	36.5	56.5	73	23	0
4/06/2004	1:45	60	59	58	57.5	51.5	39	38.5	37	35	52.5	72	23	0
4/06/2004	2:00	67	60.5	53.5	51.5	46	40.5	40	38	36.5	49.5	73	22.5	0
4/06/2004	2:15	77.5	70	64	60	53	45	41.5	40.5	37.5	58	73	22	0
4/06/2004	2:30	69	57	55	53.5	38	36	35.5	34.5	33.5	47.5	73	22	0
4/06/2004	2:45	74	67.5	61.5	57	54	40.5	39.5	36	34	56	73	22	0
4/06/2004	3:00	76	69	63.5	59.5	56.5	54	53	51.5	45	58.5	73	22.5	0
4/06/2004	3:15	75	68	64	60.5	58.5	56	55	52.5	39.5	59.5	73	22	0
4/06/2004	3:30	71.5	65.5	60.5	58	56.5	54	53.5	51.5	42.5	57	72	21.5	0
4/06/2004	3:45	76	69.5	65	60	57.5	55	54.5	52.5	45	59.5	73	21.5	0
4/06/2004	4:00	78.5	63.5	59	58.5	56	44	43	42	39	56.5	72	22	0
4/06/2004	4:15	68	63	53.5	51	44.5	42.5	42	41.5	39	50	73	21.5	0
4/06/2004	4:30	58.5	55	54.5	54	50.5	45.5	45	44	41	51	73	21	0
4/06/2004	4:45	62.5	57.5	56.5	56	53	50	49.5	43.5	40	53.5	72	20.5	0
4/06/2004	5:00	58	57	54.5	45.5	41.5	37.5	36	35	34	46	72	21	0
4/06/2004	5:15	59	52	45	44	39	36	35.5	35	34.5	42	73	21	0
4/06/2004	5:30	54	47	46	45.5	44	42	41.5	40.5	36.5	44	72	20.5	0
4/06/2004	5:45	53	47.5	46	45	43.5	41.5	41	40	36	43.5	72	20.5	0
4/06/2004	6:00	74	56	47.5	45.5	42	38.5	37	36	35	47.5	72	20.5	0
4/06/2004	6:15	64.5	54	50.5	48.5	44.5	43	42	41	37.5	46	72	21	0
4/06/2004	6:30	52.5	47.5	46.5	46	44.5	42	41.5	40	37.5	44	72	20.5	0
4/06/2004	6:45	52.5	45.5	44.5	44	42.5	40.5	40	39	37	42	71	20.5	0
4/06/2004	7:00	58.5	50	47	45	43	41.5	41	40	37.5	43.5	71	20.5	0
4/06/2004	7:15	76	56.5	51	49.5	45.5	38.5	37.5	37	36	49	70	20.5	0
4/06/2004	7:30	79	70	58	47.5	39	37.5	37	36.5	35.5	55.5	71	20.5	0
4/06/2004	7:45	78.5	57.5	50	47	41	38.5	37.5	36.5	35	49	72	19.5	0
4/06/2004	8:00	77.5	60.5	51.5	46.5	39	37	36.5	36	35	50	71	20.5	0
4/06/2004	8:15	76.5	58.5	50.5	46	40	37	36.5	35.5	33.5	47	71	20.5	0
4/06/2004	8:30	79	77	54.5	50.5	41.5	37.5	37	36	34.5	59.5	72	22	0
4/06/2004	8:45	72	60	55.5	52.5	42.5	37.5	37	36	35	49	72	22	0
4/06/2004	9:00	70	59.5	55	50.5	45	43.5	43	42.5	40.5	49	71	22.5	0
4/06/2004	9:15	67.5	57.5	53	51.5	47	44	43.5	43	42.5	48.5	71	23	0
4/06/2004	9:30	78	69.5	58.5	56	47.5	44.5	44	43.5	43	56.5	72	26	0
4/06/2004	9:45	78.5	70	63	60	47.5	44.5	44	43	42.5	58	72	28	0
4/06/2004	10:00	76	69.5	65	62.5	47.5	44.5	44	43.5	42.5	57.5	72	31	0
4/06/2004	10:15	69	63.5	60	57.5	46.5	44.5	44	43	42	52.5	73	34	0
4/06/2004	10:30	69	65	56.5	53	47	44.5	44	43.5	43	52	73	36.5	0
4/06/2004	10:45	73.5	64.5	56.5	54	46	43.5	43.5	43	42.5	52.5	72	38	0
4/06/2004	11:00	64.5	60.5	56.5	54.5	46.5	44	43.5	42.5	42	50.5	72	37.5	0
4/06/2004	11:15	61.5	58.5	55	53	46	44	44	43.5	42.5	49	73	38	0
4/06/2004	11:30	79	60	54.5	51.5	46	44	43.5	43	42	53.5	73	38.5	0
4/06/2004	11:45	66	58	54.5	52	47	45	44.5	43.5	42.5	49	73	38.5	0
4/06/2004	12:00	76.5	61.5	57	55	48	45.5	45	44.5	43.5	54	74	40	0
4/06/2004	12:15	75	64	53.5	51	47	45	44.5	43.5	42	51.5	74	40.5	0
4/06/2004	12:30	76.5	64.5	56	54	49	45.5	45	44.5	43.5	54	74	41.5	0
4/06/2004	12:45	63.5	56	53.5	52	47.5	45.5	45	44	43.5	49	73	42.5	0
4/06/2004	13:00	60.5	56.5	53.5	52	48	45.5	45	44	43.5	49	74	43	0
4/06/2004	13:15	60	57	54	52.5	47	44.5	44	43.5	43	49	74	43	0
4/06/2004	13:30	74.5	61.5	55.5	54	49	46	45.5	44.5	43.5	52	74	43.5	0

APPENDIX D

CONSTRUCTION STAGES

APPENDIX D: CONSTRUCTION STAGING

The types of construction activity and typical plant associated with each activity for the shore crossing is presented in Table D1, and for the 2 km pipeline in Table D2. The type of plant and numbers would be associated at each work site for the given phase of activities. More than one work site may be operating at any given time along the construction route. Typical sound pressure levels for each plant item and for each group of plant (assuming all operate simultaneously) are also presented in Table D1, and D2. Table D3 presents the construction noise information for the facilities.

TABLE D1 GENERAL CONSTRUCTION ACTIVITIES FOR SHORE CROSSING

Stage	Description	Typical Plant Types & Numbers	Sound Power Levels dB(A)
Nearshore trench dredging	Soft sediments and fractured rock will be dredged from the trench and stockpiled on the barge.	Dredge diesel rotary drill hydraulic excavator Boat	105 118 113 99
Blasting	Controlled drilling and blasting may be required for large rocks.	Rotary and Percussive Rock drill Drill rig 1 4x4 crewcab	109 128 85
Beach/Dune trench excavation	Onshore section of the landfill is to be excavated, and material stored for reuse once pipeline installation is complete.	hydraulic excavator 1 off D9 Dozer	113 117
Pipeline installation	Pipeline will be pulled ashore from a barge using winch set up.	Pneumatic winch Boat	108 99
Padding, shading and backfilling	To avoid damage to the pipeline, the trench is padded with sand or fine soil to a depth of 150mm. The trench is then backfilled, and the soil compacted.	2 off Padding machine (Ozzie Padder) 1 4x4 crewcab 1 off Dozer (backfill) 1 off Rubber tyre grader (compaction)	120 85 117 117
Restoration and rehabilitation	Stockpiled topsoil, and vegetation is spread back over the work area.	1 off Dozer 1 off Grader 1 off Tractor	117 117 110

TABLE D2 GENERAL CONSTRUCTION ACTIVITIES FOR PIPELINE

Stage	Description	Typical Plant Types & Numbers	Sound Power Levels dB(A)
Clear and grade	Pipeline corridor (30 m width) will be cleared of heavy vegetation, and stockpiled for later reuse. Topsoil will be stripped & set aside for later reuse.	20 off D9 Dozer 1 off Grader 1 4x4 crewcab	117 117 85
Blasting	In areas with large amounts of rock, blasting may be required.	Rotary and Percussive Rock drill Drill rig 1 4x4 crewcab	109 128 85
Trenching, trench breaking, stringing, bending and lowering in	A trench for the pipeline will be excavated. The pipe joints will be distributed along the pipeline laydown area, bent as required and placed on skids to protect pipe coating from damage. Side booms are used to lower the pipe into the trench. Spray foam walls will be installed on steeper slopes to avoid erosion of the trench.	1 off Bucket wheel trencher Cleveland 1 off Rock saw Vermeer 2 off Hydraulic excavators 15 off Extendable semi trailers 1 off Vaculift (vacuum lifting device for pipe) 2 4x4 crewcab 1 off 2.5 tonne flatbed for skids and sawdust bags 1 off 2.5 tonne flatbed 1 off Diesel driven hydraulic bending machine 1 off Sideboom tractor 1 off Diesel generator	117 120 116 120 117 85 110 110 117 117 113
Welding and joint coating	Pipe sections are welded together. 2-3 crews are used to perform each weld. Welded joints will be grit blasted.	2 off Sideboom tractors 7 off Diesel welding machines 1 off Diesel air compressor 1 off Diesel generator set 1 off Diesel welding machine 1 off 2.5 tonne flatbed 1 off Diesel air compressor (grit blasting) 1 off Diesel generator (epoxy spray equipment)	117 110 110 117 110 110 110 113
Hydrotesting and dewatering and drying	Pipeline will be hydrostatically pressure tested using water. Water will be moved to next section or disposed of and pipeline section will be dried.	1 off Diesel driven centrifugal fill pump 1 off Diesel air compressor 1 off Semitrailer 1 off Diesel generator 1 off Diesel refrigeration drier 1 off Diesel air compressor	108 110 117 113 117 110

Stage	Description	Typical Plant Types & Numbers	Sound Power Levels dB(A)
Padding, shading and backfilling	To avoid damage to the pipeline, the trench is padded with sand or fine soil to a depth of 150mm. The trench is then backfilled, and the soil compacted.	2 off Padding machine (Ozzie Padder) 1 4x4 crewcab 1 off Dozer (backfill) 1 off Rubber tyre grader (compaction)	120 85 117 117
String and pit tie-ins, and road crossings	This is required to tie one string to another & where the route crosses a road.	2 off Sideboom tractors 1 off Hydraulic excavator 2 off Diesel welding machine 1 off Diesel air compressor (grit blasting) 2 off Hydraulic excavators 2 off Diesel welding machine 1 off Diesel air compressor (grit blasting) 1 off Diesel generator (epoxy spray equipment)	117 117 117 110 117 117 110 113
Restoration and rehabilitation	Stockpiled topsoil, and vegetation is spread back over the work area.	1 off Dozer 1 off Grader 1 off Tractor	117 117 110
Commissioning	Fill the pipeline with nitrogen and then with gas.	1 off Nitrogen tanker and vaporiser 1 off 2.5 tonne flatbed	120 110

TABLE D3 GENERAL CONSTRUCTION ACTIVITIES FOR GAS PROCESSING PLANT

Stage	Description	Typical Plant Types & Numbers	Sound Power Levels dB(A)
Vegetation clearing	Plant area will be cleared of vegetation.	20 off D9 Dozer 1 off Grader 1 4x4 crewcab	117 117 85
Blasting	Blasting may be required if rock is encountered.	Rotary and Percussive Rock drill Drill rig 1 4x4 crewcab	109 128 85
Laying foundations and erecting facilities	Laying concrete foundations of site, and erecting facilities.	Compactor 2 off D9 Dozer 3 off Diesel welding machine 1 off Diesel air compressor 1 off Diesel generator set 3 concrete mixer 154 t dump truck	116.5 117 110 110 117 109 113
Installing equipment and systems	Will include installing communication, instrument and electrical systems.	crane 2 truck 2 forklift truck	118 113 118
Installing ancillaries		crane 2 truck 2 forklift truck	118 113 118
Testing and commissioning	Testing and adjustment of equipment for all components. Please note as equipment details were not provided, the information on equipment supplied for the pipeline have been utilised here.	1 off Nitrogen tanker and vaporiser 1 off 2.5 tonne flatbed	120 110
Clean-up and removal of construction related equipment	Removal of all construction related material from construction of the plant.	forklift truck 2 truck	118 113
Road Traffic	Road traffic through Wadeye Township	Semi-trailer	120