

Ammonia Plant, Burrup Peninsula

Burrup Fertilisers Pty Ltd

**Report and recommendations
of the Environmental Protection Authority**

**Environmental Protection Authority
Perth, Western Australia
Bulletin 1036
December 2001**

ISBN. 0 7307 6662 4
ISSN. 1030 - 0120
Assessment No.1370

Summary and recommendations

Burrup Fertilisers Pty Ltd, proposes to construct and operate a 2,200 tonne per day (tpd) ammonia plant on the Burrup Peninsula. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

The EPA decided that the following environmental factors relevant to the proposal required detailed evaluation in the report:

- (a) Terrestrial flora – vegetation clearing and weed invasion from construction activities;
- (b) Terrestrial fauna – impacts on fauna habitat;
- (c) Gaseous emissions – limiting emissions to acceptable levels;
- (d) Greenhouse gas emissions – minimisation of greenhouse gas emissions and adoption of offset measures;
- (e) Noise – protect amenity of Hearson Cove;
- (f) Off-site individual risk – ensuring that the proposal is compatible with adjacent land uses; and
- (g) Liquid effluent management – limiting discharges to acceptable levels.

There were a number of other factors associated with the proposal, and the EPA has provided a brief evaluation of these in Appendix 3.

Conclusion

The EPA has considered the proposal by Burrup Fertilisers Pty Ltd to construct and operate a 2,200 tpd ammonia plant on the Burrup Peninsula.

The EPA notes that the vegetation in the King Bay – Hearson Cove Valley has high conservation value and that part of the floristic variation appears to be uncommon elsewhere on the Peninsula (Trudgen, 2001). The EPA recognises that the valley has been identified for industrial purposes in the endorsed Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) and therefore some impacts on the vegetation in the area will occur. The EPA is satisfied that the proponent has optimised the layout of facilities within its project lease to minimise impacts on vegetation. In particular, rock piles and upper slopes, which support significant vegetation assemblages, including the Priority 1 species *Terminalia supranitifolia* have been avoided.

The EPA also notes that most of the vertebrate species occurring around the Burrup Peninsula are widely distributed throughout the Pilbara. No fauna species endemic to the Burrup Peninsula were observed on the lease, although several species endemic to the Pilbara

were sighted. The EPA accepts that construction will result in the removal of some habitats. It notes that the project is not likely to impact on any Specially Protected (Threatened) Fauna or have a direct impact on larger fauna species. The EPA is satisfied that the plant layout and infrastructure has been sited to minimise disturbance to habitats for non-molluscan fauna. The EPA considers that impacts on two species of native terrestrial snails (*Pupoides* aff. *beltainus* and *P. contraries*), which are common to the lower slopes will be unavoidable, but notes that these species occur elsewhere on the Burrup Peninsula.

The EPA notes that the proposed emissions from the plant are small, both in absolute and relative terms. The main gaseous emissions from the plant under normal operating conditions are oxides of nitrogen. Dispersion modelling predicts that the National Environmental Protection Measure and other relevant criteria will be met, except possibly for ammonia and oxides of nitrogen during the unlikely event of ammonia flaring under worst dispersive conditions.

The EPA is satisfied that the proposed ammonia plant is thermally efficient and considers the predicted greenhouse gas intensity of 1.76 tCO₂/tNH₃ (corrected) to be consistent with best available technology. The EPA is of the opinion that all reasonable and practicable measures have been proposed by the proponent to minimise greenhouse gas emissions from the project. The EPA has recommended that as a condition of approval for the project, the proponent be required to prepare a Greenhouse Gas Emissions Management Plan, with the aim of reducing greenhouse gas emissions over the life of the project, and investigating and adopting appropriate offset measures.

The EPA notes that preliminary noise modelling predicts that the attenuated plant will comply with the *Environmental Protection (Noise) Regulations 1997* at the site boundary and that noise impacts at the nearest residential area in Dampier will be insignificant. The EPA notes that the noise impact from the ammonia plant is predicted to be 34 dB(A) at Hearson Cove and considers that this in itself will not unreasonably affect amenity. It therefore considers impacts from noise to be acceptable.

The EPA notes that the individual risk contours meet the EPA risk criteria. The EPA considers that it is essential that the ammonia loading exclusion zone be based on a risk assessment or consequence analysis and that its size must be reviewed during the Quantitative Risk Assessment (QRA).

The EPA notes that the proponent proposes to utilise a range of treatment processes on its liquid waste streams in order to minimise the discharge of contaminants and nutrients into the marine environment. The marine discharge will be via the Water Corporation's proposed Brine Discharge System and the level of contaminants in the discharge can meet the ANZECC/ARMCANZ (2000) 99% species protection trigger levels at end of pipe.

The EPA has therefore concluded that it is unlikely that the EPA's objectives would be compromised provided there is satisfactory implementation by the proponent of the proponent's commitments and the recommended conditions set out in Appendix 4 and summarised in Section 4.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment and Heritage:

1. That the Minister notes that the proposal being assessed is for the construction and operation of a 2,200 tpd ammonia plant on the Burrup Peninsula;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. That the Minister notes the EPA's other advice regarding the need:
 - to form an industry group to provide a coordinated approach to managing cumulative impacts from the King Bay - Hearson Cove Industrial Area; and
 - for the Office of Major Projects and the Department of Environmental Protection to investigate the cumulative impacts from industrial development at Hearson Cove. A noise target should be established that would be protective of amenity and/or an alternative beach should be opened up on the Burrup Peninsula for public recreational use.
4. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments.
5. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Conditions

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Burrup Fertilisers Pty Ltd to construct and operate a 2,200 tpd ammonia plant on the Burrup Peninsula is approved for implementation. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

- (a) that the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4;
- (b) the proponent shall prepare an audit program in consultation with and submit compliance reports to the Department of Environmental Protection;
- (c) that prior to commissioning, the proponent shall prepare a Greenhouse Gas Emissions Management Plan to ensure that "greenhouse gas" emissions from the project are adequately addressed and best available efficient technologies are used to minimise total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product, and that progress made in achieving this target is reported annually to the Environmental Protection Authority;
- (d) at least six months prior to the anticipated date of closure, or at a time agreed with the Environmental Protection Authority, the proponent shall prepare a Final Closure Plan designed to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority;

- (e) prior to commencement of construction the proponent shall submit a written prescription for contractor work practices covering plant and pipeline construction and operation, to ensure that work practices are carried out at the level of international best practice, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority; and
- (f) the proponent shall submit a performance review report every 5 years after the start of the operations/development phase to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority evaluating the outcomes and environmental performance over the five years.

Contents

	Page
Summary and recommendations.....	i
1. Introduction and Background.....	1
2. The proposal.....	
3. Relevant environmental factors	
1. 3.1	Terrestrial flora
2. 3.2.....	Terrestrial fauna
3. 3.3.....	Gaseous emissions
4. 3.4.....	Greenhouse gas emissions
5. 3.5.....	Noise
6. 3.6.....	Risk
7. 3.7.....	Liquid effluent management
4. Conditions and commitments	
8. 4.1.....	Proponent's commitments
9. 4.2.....	Recommended conditions
5. Other Advice.....	
6. Conclusions.....	
7. Recommendations	
Tables	
1. Summary of key proposal characteristics	
2. Vegetation clearing requirements	
3. Atmospheric emissions during normal operations	
4. Predicted ground level concentrations of ozone and oxides of nitrogen	
5. Annual greenhouse gas emissions	
6. Cumulative noise levels	
7. Process liquid waste streams	
8. Domestic wastewater discharge	
9. Proposed total wastewater discharge	

Figures

1. Project location
2. Process flow chart
3. Proposed plant layout
4. Vegetation units on the proposed site
5. Impacts from emissions of oxides of nitrogen (in isolation)
6. Impacts from emissions of oxides of nitrogen (cumulative)
7. Proposed pipeline route
8. Individual risk contours
9. Cumulative risk contours
10. Societal risk
11. King Bay – Hearson Cove industrial area
12. Brine and wastewater discharge system

Appendices

1. List of submitters
2. References
3. Identification of relevant environmental factors
4. Recommended Environmental Conditions and Proponent's Consolidated Commitments
5. Summary of submissions and proponent's response to submissions
6. Ministerial Conditions for the Desalination and Seawater Supplies Project, Burrup Peninsula (Ministerial Statement No. 567)
7. Burrup Fertilisers' proposed wastewater discharge
8. The Water Corporation's responsibilities for brine and wastewater discharge

1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal by Burrup Fertilisers Pty Ltd (Burrup Fertilisers), to construct and operate a 2,200 tonnes per day (tpd) ammonia plant on the Burrup Peninsula. At least 80% of the ammonia is expected to be exported to a large natural gas based fertiliser complex in India.

The proposal was referred to the EPA on 2 March 2001 and on 7 March 2001 the level of assessment was set at Public Environmental Review (PER) under Section 38 of the *Environmental Protection Act 1986*. The PER (SKM, 2001) was made available for a public review period of four weeks commencing on 6 August 2001 and ending on 3 September 2001.

The EPA's decision to assess the proposal at a level of PER was based on 7 main factors, namely, terrestrial flora, terrestrial fauna, gaseous emissions, greenhouse gas emissions, noise (with respect to social amenity of Hearson Cove), public risk (ammonia storage, transfer and shipping) and liquid effluent management.

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses the environmental factors relevant to the proposal. The Conditions and Commitments to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 provides Other Advice by the EPA, Section 6 presents the EPA's conclusions and Section 7, the EPA's Recommendations.

Appendix 1 lists the people and organisations which made submissions during the public review period. References cited in the EPA's report are provided in Appendix 2. The environmental factors considered during the assessment are listed in Appendix 3. Appendix 4 comprises the environmental conditions recommended by the EPA and the commitments made by the proponent. Appendix 5 contains a summary of submissions and the proponent's response to submissions and is included as a matter of information only and does not form part of the EPA's report and recommendations. The Ministerial Statement for the Desalination and Seawater Supplies Project is provided in Appendix 6. Appendix 7 contains details of Burrup Fertilisers' proposed wastewater discharge. Details of the Water Corporation's responsibilities in relation to its management of the multi-user brine and wastewater discharge system are provided in Appendix 8.

Issues arising from this process and which have been taken into account by the EPA appear in the report itself.

2. The proposal

Burrup Fertilisers proposes to construct and operate an ammonia plant on the Burrup Peninsula, approximately 1300 kilometres north of Perth. The selected project site is located in the King Bay-Hearson Cove Industrial Area and is approximately 6 and 10 kilometres from the towns of Dampier and Karratha respectively. The site covers an area of about 72 hectares (Figure 1) and the actual plant footprint and infrastructure (including a thermal desalination plant) will occupy an area of approximately 20 hectares.

The proposed ammonia plant will utilise a modern version of the conventional natural gas-steam reforming process based on the KBR Purifier ProcessTM developed by Kellogg Brown and Root. The plant at design capacity will consume approximately 74 terajoules of natural gas per day to produce 2,200 tpd of ammonia. The ammonia is to be stored as a liquid in either of two 40,000 tonne refrigerated atmospheric pressure ammonia storage tanks, prior to its export to Paradeep in Orissa State, India.

The following ancillary components of the project are not included in this proposal since they will be constructed and operated by different proponents:

- The construction of the natural gas pipeline;
- The construction of the ammonia pipeline from Burrup Road to the Dampier Public Wharf;
- The establishment of a thermal desalination plant;
- Construction of a seawater pipeline and saline water return line from the project lease to Burrup Road;
- A detailed assessment of the discharge of treated wastewater via Water Corporation's marine outfall to King Bay; and
- Capital and maintenance dredging of the shipping channel.

The ammonia plant process flow chart is shown in Figure 2 and the details of the plant layout is shown in Figure 3. The main steps of the ammonia production process are as follows:

- Feed gas desulphurisation;
- Primary reforming;
- Secondary reforming;
- Carbon dioxide shift conversion;
- Carbon dioxide removal;
- Methanation;
- Cryogenic purification;
- Ammonia synthesis; and
- Ammonia refrigeration.

Anhydrous ammonia is synthesised by reacting hydrogen with nitrogen in stoichiometric proportions, then compressing the gas and cooling it to -33°C to form liquid ammonia.

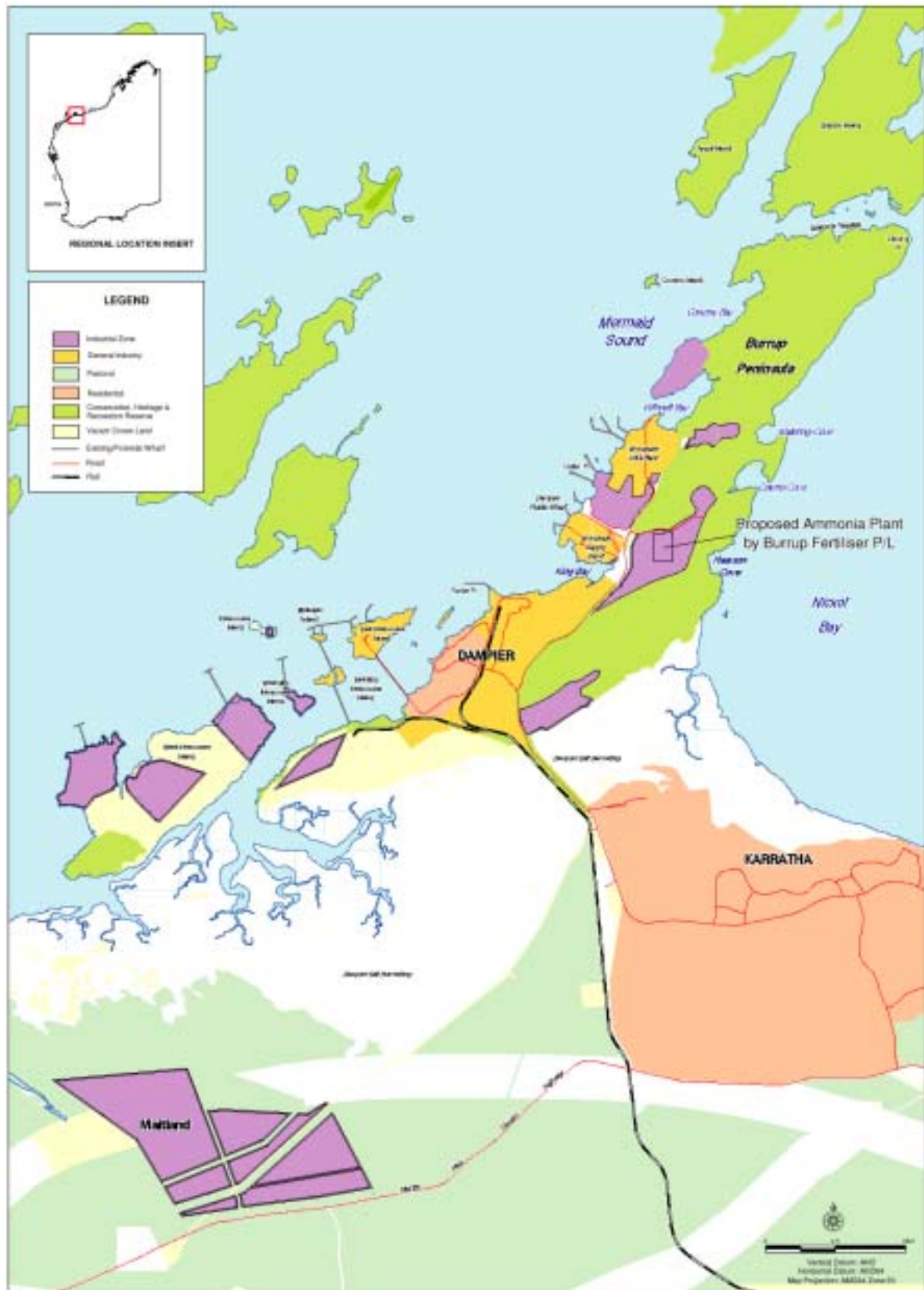


Figure 1. Project location (Source: Figure 2.1 SKM, 2001)

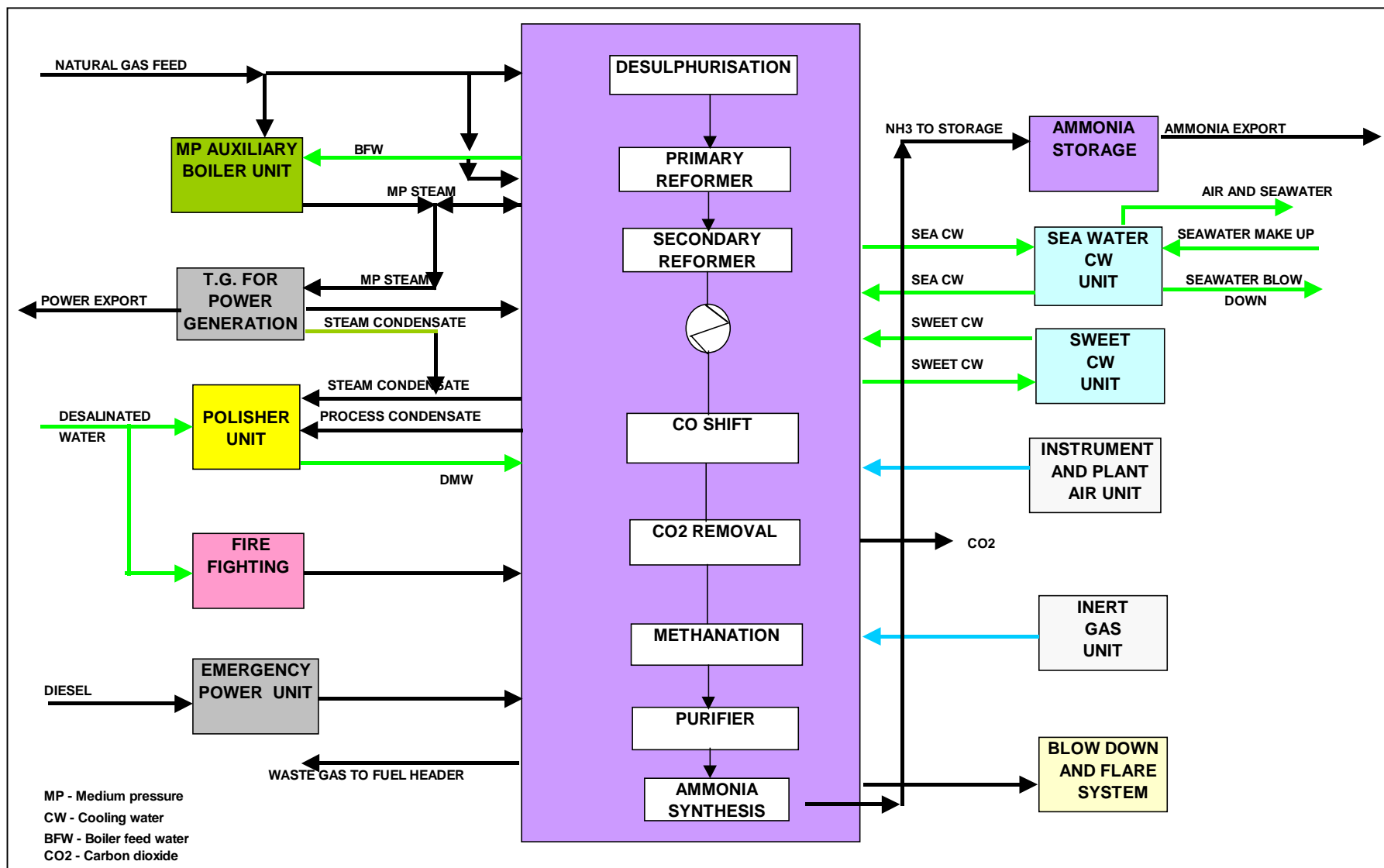


Figure 2. Process flow chart (Source: Figure 4.2 SKM, 2001)

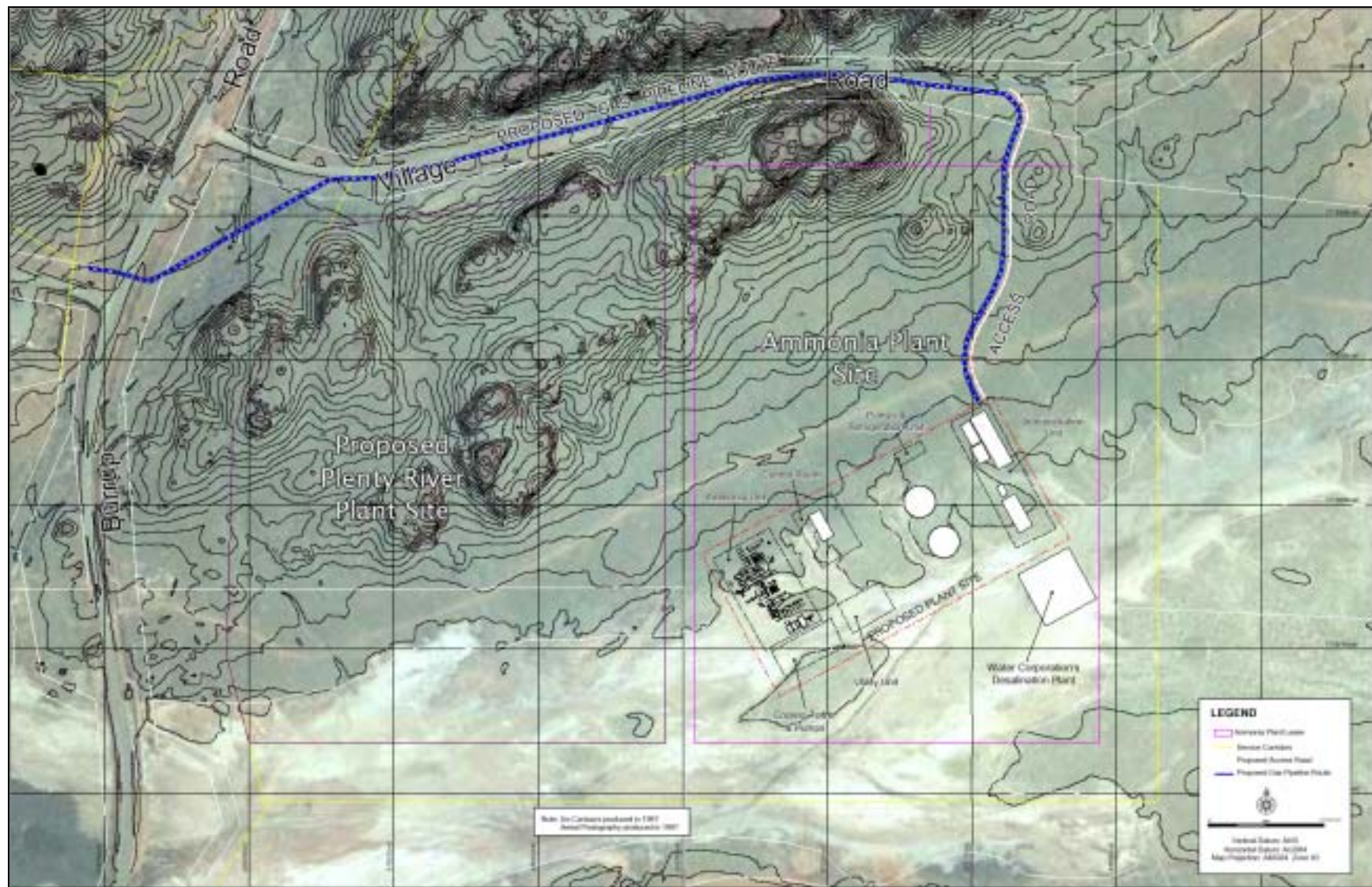


Figure 3. Proposed plant layout (Source: Figure 4.1 SKM, 2001)

Nitrogen is obtained from the air, while hydrogen is obtained from the catalytic steam reforming of natural gas. A detailed description of each process step is provided in Section 4.2 and Appendix C of the PER (SKM, 2001).

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Section 4 of the PER (SKM, 2001).

Table 1 – Summary of key proposal characteristics

Characteristic	Description														
Project Purpose	To produce liquid ammonia from natural gas using advanced production technology.														
Project Life	25+ years														
Plant Capacity	2,200 tonnes per day (design case); 770,000 tonnes per day														
Area of Project Lease	72 hectares														
Area of Disturbance	<table> <tr> <th>Item</th><th>Area (hectares)</th></tr> <tr> <td>Ammonia plant</td><td>16.0</td></tr> <tr> <td>Laydown area</td><td>8.0</td></tr> <tr> <td>Desalination plant proposed by Water Corporation</td><td>1.0</td></tr> <tr> <td>Access road and product pipeline to plant</td><td>2.4</td></tr> <tr> <td>Total</td><td>27.4</td></tr> <tr> <td>Approximately</td><td>28 (maximum)</td></tr> </table>	Item	Area (hectares)	Ammonia plant	16.0	Laydown area	8.0	Desalination plant proposed by Water Corporation	1.0	Access road and product pipeline to plant	2.4	Total	27.4	Approximately	28 (maximum)
Item	Area (hectares)														
Ammonia plant	16.0														
Laydown area	8.0														
Desalination plant proposed by Water Corporation	1.0														
Access road and product pipeline to plant	2.4														
Total	27.4														
Approximately	28 (maximum)														
Plant Facilities	Administration, maintenance and warehouse unit Ammonia storage unit Pumps and refrigeration unit Utility unit Control room Ammonia process unit Cooling tower														
Plant Operation	24 hours per day, 350 days per year (design case)														
Shutdown Time	Planned shutdown – 10 days per annum Emergency shutdown – 5 days per annum for 4 hrs per day														
Ammonia Storage	2 x 40,000 tonne cryogenic, double-walled, double integrity tanks														
Potable Water	7-10 kilolitres per hour														
Seawater	Approximately 1.6 megalitres per hour; 38 megalitres per day														
Power Generation	Internal generation. Two (1 x operating 100% capacity and 1 x operating 25% capacity) 20 megawatts steam turbine generators. Supply of energy (approx 4 megawatts of electricity) to the desalination plant.														
Power Export	None														
Emergency Power	Two emergency diesel generators (2.0 megawatts) for start-up power. May also provide power for construction.														
Steam Generation	Two (1 x operating and 1 x standby) 100 tonne per hour of medium pressure steam for plant start-up														
Low Pressure Steam Export	Capacity for about 10 tonne per hour														
Energy Efficiency	Approximately 29.7 ~ 29.9 megajoules per tonne of ammonia (ammonia plant); Approximately 32.6 megajoules per tonne of ammonia (entire project including shipping, transport of product, cooling etc.)														
Natural Gas Input	Approximately 74 terajoules per day														
Natural Gas Pipeline	Approximately 1.3 kilometres; below ground; from the Dampier to														

Characteristic	Description		
	Bunbury Natural Gas Pipeline to the plant; to be constructed by Apache Energy.		
Seawater Pipeline	Approximately 1.2 kilometres; likely to be below ground; from desalination plant to connect to brine discharge line along Burrup Road, to be constructed by Water Corporation.		
Ammonia Pipeline	Approximately 4.3 kilometres; above ground; from the plant to the Dampier Public Wharf.		
Catalysts	Aluminium, cobalt, copper, iron, magnesium , molybdenum and nickel oxides.		
Approximate Gaseous Emissions under Normal Operations:	Daily Load (kilograms per day)	Per tonne NH ₃ (kilograms per tonne)	Annual Load (tonnes per year)
NO _x	1439	0.65	503
CO ₂	4.03 x 10 ⁶	1832	1,411,000
CO	295	0.13	103
SO ₂	1.7	0.0008	0.6
NH ₃	Nil	Nil	Nil
VOC	Nil	Nil	Nil
Wastewater Discharges:	Annual Load (kilograms per year)		
Heavy metals	Negligible/background		
Ammonia (as N)	1		
Phosphorus (total)	36.5		
Nitrogen (total)	73		
Methanol	1		
Solid Waste:	Approximate quantities of solid wastes produced:		
Demineraliser Spent (Cation/Anion Resin)	27 tonnes every 3 years (Di-vinyl Benzene, Polystyrene Resin)		
Desulphuriser Spent Catalyst	33 tonnes every 3 years (zinc oxides); 16 tonnes every 6 years (cobalt and molybdenum oxides)		
Biosolids	Stabilised biosolids from wastewater treatment plant		
Domestic Waste	Variable quantity disposed to landfill weekly.		
Construction Period	Approximately 20 months		

Source Table 4-1 of the PER (modified)

3. Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

The identification process for the relevant factors selected for detailed evaluation in this report is summarised in Appendix 3. The reader is referred to Appendix 3 for the evaluation of factors not discussed below. A number of these factors, such as Aboriginal Culture and Heritage, are very relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

It is the EPA's opinion that the following environmental factors relevant to the proposal require detailed evaluation in this report:

- (a) Terrestrial flora – vegetation clearing and weed invasion from construction activities;
- (b) Terrestrial fauna – impacts on fauna habitat;
- (c) Gaseous emissions – limiting emissions to acceptable levels;
- (d) Greenhouse gas emissions – minimisation of greenhouse gas emissions and adoption of off-set measures;
- (e) Noise - protect amenity of Hearson Cove;
- (f) Off-site individual risk - ensuring that the proposal is compatible with adjacent land uses; and
- (g) Liquid effluent management – limiting discharges to acceptable levels.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors generated from the PER document and the submissions received, in conjunction with the proposal characteristics.

Details on the relevant environmental factors and their assessment are contained in Sections 3.1 - 3.7. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

3.1 Terrestrial flora

Description

Plant Construction

Astron Environmental conducted two vegetation surveys to coincide with the wet summer season (Astron, 2001a) and the dry season (Astron, 2001b). Seven broad vegetation types and 15 corresponding assemblages were found to occur within the project lease as shown in Figure 4. The seven main bands of vegetation identified are:

- Rocky uplands and outcrops;
- Uplands and upper slopes;
- Lower undulating slopes with shallowly incised drainage lines;

Figure 4. Vegetation units on the proposed site (Source: Figure 1 Astron, 2001b)

- Coastal flats;
- Drainage and broad drainage zones;
- Saline inlet and supratidal flats; and
- Tidal inlet.

A description of each vegetation assemblage within the lease is found in Section 5.7.4 of the PER (SKM, 2001). The vegetation assemblages considered of conservation significance at the proposed site, based on criteria compiled from Astron (2001a) and Trudgen, Weston and Long (2001), include:

- Vegetation assemblage 1a – rock pile vegetation;
- Vegetation assemblages 5a, 5b, 5c – drainage lines and broad drainage zones vegetation (especially mixed *grevillea* heath);
- Vegetation assemblages 6a, 6b and 6c – samphire communities;
- *Dolichandrone heterophylla* stand (rare on the Burrup)

A total of 131 vascular species (100 – dry season, 117 – wet season) were recorded within the project area. However, as the rainfall for the wet and dry season was low, this may not represent the full total. No Declared Rare Flora occur within the project lease, but one Priority 1 Flora species (*Terminalia supranitifolia*) was found on the site during the vegetation surveys. A total of 38 *Terminalia supranitifolia* individuals were located on or around the base of scree slopes and small rocky outcrops.

The project will require about 28 hectares of the lease area to be cleared to accommodate the ammonia plant, construction laydown area (temporary disturbance) and the corridors for the access road and product pipeline. The plant layout and infrastructure have been sited to avoid rock piles and upper slopes, which support significant vegetation assemblages, including the Priority 1 species *Terminalia supranitifolia*. However, six of the *Terminalia supranitifolia* trees are located near rock piles on the lower slopes close to the access road and product pipeline and may potentially be indirectly impacted (eg: by dust) during construction. Although the lower slopes of the project lease do not contain Priority flora species, they have several vegetation assemblages of conservation significance. The proponent advises that some impacts on these assemblages cannot be avoided. The vegetation types to be impacted are considered to represent the best stands of such communities on the Burrup Peninsula (Trudgen, 2001).

An estimate of the area and proportion of the vegetation types on the lease that will be impacted is shown in Table 2. The vegetation most affected will be the coastal flats (type 4) and saline inlet and supratidal (type 6). Within the project lease, over 50% of one samphire community (6b) and almost all of another samphire community (6c) will be cleared. In concert with the other projects in the vicinity, this proposal will remove most of these samphire communities from the Burrup (Astron, 2001a). Over 50% of vegetation assemblages 4a and 4d on the coastal flats within the project lease will also be cleared, including a stand of three *Dolichandrone heterophylla*. *Dolichandrone heterophylla* has conservation significance, as it rarely occurs on the Burrup. It was not recorded during the Burrup Vegetation Survey by Trudgen (2001).

Table 2 Approximate Vegetation Clearing Requirements

Vegetation Assemblage	Coverage within Project Lease and Adjacent Service Corridors (m ²)	Required Area to be Cleared (m ²)	% Removal*
Vegetation Type 2			
2a	41,027	67	0.2
Total Area of Vegetation Type 2	94,110	67	0.07
Vegetation Type 3			
3a	172,990	27,885	16.1
3b	41,243	2,755	6.7
Total Area of Vegetation Type 3	214,233	30,640	14.3
Vegetation Type 4			
4a	107,548	74,417	69.2
4c	41,284	8,771	21.3
4d	46,582	27,155	58.3
Total Area of Vegetation Type 4	218,412	110,343	50.5
Vegetation Type 5			
5ai	72,108	4,453	6.2
5b	22,749	3,236	14.2
Total Area of Vegetation Type 5	107,994	7,689	7.1
Vegetation Type 6			
6a	66,517	25,460	38.3
6b	38,534	23,830	61.8
6c	11,054	11,009	99.6
Total Area of Vegetation Type 6	116,105	60,299	51.9
Vegetation type 7			
7	183,744	29,226	15.9

*Percentage removal indicates the amount of a vegetation assemblage to be removed from the vegetation area surveyed as shown in Figure 4. It does not represent the area for the wider region of the Burrup Peninsula.

Source Table 6-2 of the PER.

The proposed pipeline corridor and access road within the lease will impact on the largest drainage line that traverses the project lease on the eastern boundary. Approximately 7% of the drainage lines and broad drainage zones (vegetation type 5) will be cleared, although direct impacts on the dense portion (vegetation assemblage 5aii) will be avoided. Dense strands of *Grevillea pyramidalis* found within this vegetation type are uncommon on the Burrup Peninsula (Trudgen, 2001).

The project may potentially impact the vegetation communities through the introduction and spread of weeds. Only two weed species (*Aerva* and *Cenchrus ciliaris*) of the thirteen known species established on the Burrup Peninsula were identified during the site vegetation surveys. Both weed species have been given a high rating as determined by CALM (1999). The introduction of other species is possible if machinery has come from an infested area and has not been washed down adequately.

Pipeline Corridor

The pipeline corridor between the Burrup Fertilisers plant site and Burrup Road was included in the dry season survey and the following two additional vegetation types were recorded:

- Drainline vegetation; and
- Valley floor vegetation.

A description of each vegetation assemblage along the pipeline corridor is found in Section 5.2 of the Dry Season Survey (Astron, 2001b). One new vegetation community (broad valley *Eucalyptus victrix* forest) was identified as being significant within the pipeline corridor. The pipeline corridor lies within the Hearson Village Road Reserve and has, for the majority, been previously disturbed (Astron, 2001b). The removal of a number of *Corymbia hamersleyana* and *Eucalyptus victrix* trees will occur during construction. The roadway verge is dominated by mixed *Triodia epactia* and buffel grass.

Submissions

Submissions received in relation to this factor expressed concern about the adequacy of the information in the PER, in particular the second (dry season) vegetation survey had not been conducted at the time and the results of the regional vegetation survey (Trudgen, 2001) were not presented in a form such that impacts on the vegetation could be evaluated within a regional context. Concern was also expressed about the cumulative impacts on vegetation assemblages of high conservation value as a result of clearing for industrial development in the King Bay – Hearson Cove valley. The need for research into the risk to the bio-physical attributes of the area from gaseous emissions was raised. The potential for the transfer of weeds along with fill material was also raised.

Assessment

The area considered for assessment of this factor is the proposed plant site and the pipeline corridor from the plant site to Burrup Road.

The EPA's environmental objectives for this factor are to:

- protect Declared Rare and Priority Flora consistent with the provisions of the *Wildlife Conservation Act 1950*; and
- maintain the abundance, species diversity, geographical distribution and productivity of vegetation communities.

The EPA acknowledges the findings in the recent vegetation survey on the Burrup Peninsula (Vol 2. Trudgen, 2001) that the vegetation in the King Bay – Hearson Cove Valley has high conservation value and that part of the floristic variation appears to be uncommon elsewhere on the Peninsula. The EPA understands that when the first volume (Vol 1. Trudgen, 2001) covering vegetation mapping and discussion of results becomes available, a review of this work will be conducted by the Office of Major Projects (OMP) to ensure that the information can be interpreted and used by future proponents to evaluate impacts in a regional context. It notes however, that the focus of the Burrup survey was upon rockpile related topography, and a representative sample of similar habitat in the Pilbara coastal hinterland. The EPA understands that the King Bay – Hearson Cove valley appears to be the only area on the Peninsula and islands where there is the development of both an infrequently submerged littoral zone and an extensive area of samphires and the littoral grass *Sporobolus virginicus*.

It considers that more comparative information is required for the valley vegetation and future development needs to incorporate the findings from such work into its planning.

The EPA notes that the valley is the only broad valley with gentle lower slopes and consequently has the best stands of a part of the range of vegetation structural/dominance units on the Burrup Peninsula (Trudgen, 2001). This project, along with other industrial developments in the valley will directly impact upon vegetation assemblages considered significant and in general will fragment the catena/topographic sequence on the northern side of the valley. However, the EPA is mindful of the fact that through the Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) about 5,400 hectares (62%) of the Burrup Peninsula has been set aside for conservation, recreation and heritage protection, and that the valley has been set aside for industrial development. The EPA expects proponents to take reasonable measures to minimise the impacts on the vegetation communities of highest importance as defined at a local and regional scale, having taken the available information on vegetation surveys into account when planning the footprint of their plants.

Based on the information provided, the EPA is satisfied that the proponent has optimised the layout of facilities within its project lease to minimise impacts on vegetation and other environmental and heritage features. The EPA considers that the proposed location of the plant on the low-lying portion of the lease is acceptable, since it will have the least overall impact on Priority Flora and significant vegetation communities. It considers that it is reasonable for the proponent to avoid the extreme southern region of the lease, as it is subject to flooding and would require extensive earthworks. The EPA notes that the proposed plant site will require significant fill to elevate it above the 1-in-100 year storm surge level.

The EPA notes that the final footprint of disturbance for the main plant site and infrastructure (including desalination plant) will be restricted to 20 hectares of the lease. It notes that a laydown area of approximately 8 hectares will also be required during construction and that the proponent has made a number of commitments with respect to rehabilitation of this area of temporary disturbance.

The EPA notes the findings of the "dry season" vegetation survey (Astron, 2001b) that none of the Priority 1 flora species *Terminalia supranitifolia* on the lease should be directly impacted by the proposal. It notes the proponent's commitment to attempt to replace any species should it be impacted during the life of the project. The EPA recognises that disturbance to a significant proportion of samphire communities is unavoidable. It notes the proponent's commitment to minimise the impacts as far as practicable, although the EPA has been advised by the DEP that up to 13% of the total samphire associations within the King Bay – Hearson Cove Valley may be affected by this proposal. Similarly the EPA considers that impacts on a portion of the drainage and broad drainage zones (vegetation type 5) within the lease to be unavoidable. The EPA notes that the proposed location of the access road and pipeline corridor has been designed to limit impacts to approximately 7% of this vegetation type and that the more dense stands (vegetation assemblage 5a_{ii}) will be avoided.

The EPA notes that for the most part, the vegetation within the lease is in a "pristine" condition, although two weed species have been identified. The EPA considers the potential import of new weed species and the transfer of existing weed species to be a real threat in the long term, to the conservation value of remnant vegetation in the valley. It notes the commitment made by the proponent with respect to weed management and considers that close attention is also required by the relevant authorities to ensure that fill material is obtained from a suitable, weed free source and that proposed weed control measures are strictly followed during construction.

The EPA considers the impacts on vegetation within the pipeline corridor from the lease to Burrup Road to be acceptable, given that much of the vegetation has been previously disturbed. Construction activities should be managed such that impacts on *Corymbia hamersleyana* and *Eucalyptus victrix* are minimised.

The EPA notes the following commitments made by the proponent in order to minimise the impact on terrestrial flora:

- 1) Design plant and infrastructure layout and laydown areas to minimise impacts on terrestrial flora by minimising the extent of vegetation removal as far as practicable and avoid disturbance to rockpiles, drainage lines and samphire communities as far as practicable;
- 2) Detail pre-construction activities including to mark and peg all planned disturbances prior to earthworks and to stockpile vegetation and topsoil;
- 3) Prepare a Weed Management Plan that includes ensuring fill is obtained from a suitable weed free source;
- 4) Prepare a Rehabilitation Plan for rehabilitating areas of temporary disturbance that includes the requirement to backfill all excavations and revegetate with local native species;
- 5) Undertake seed collection from the site and immediate vicinity (especially including *Dolichandrone heterophylla*), prior to construction, to collect an adequate stock of seed for rehabilitation;
- 6) Commence germination trials at a local nursery for several prominent flora species (including the Priority 1 species *Terminalia supranitifolia*), with a view to replacing prominent species; and
- 7) Prepare an Erosion Control Plan to identify erosional features during operation.

Summary

Having particular regard to the:

- (a) topographical constraints of the site;
- (b) results of the vegetation surveys conducted by the proponent;
- (c) proponents demonstration that it has optimised the layout of the facilities within the project lease area to minimise impacts on vegetation, including the Priority 1 flora species *Terminalia supranitifolia*; and
- (d) commitments made by the proponent;

it is the EPA's opinion that the proposal is environmentally acceptable in relation to the factor of terrestrial flora.

3.2 Terrestrial fauna

Description

Astron Environmental was engaged to assess the terrestrial fauna and habitats of the project lease (Astron, 2001c). The fauna survey included a desktop study, opportunistic sightings and an investigation of the non-marine molluscan fauna of the site by the Western Australian Museum of Natural Science. A trapping survey was also conducted by Biota Environmental Sciences Pty Ltd (Biota, 2001) after the release of the PER (SKM, 2001).

The construction of the plant and related infrastructure will directly impact on habitats that occur within the areas required for the plant, access road and ammonia pipeline. The project is unlikely to have a major impact on larger fauna species, but will result in the removal of some habitats. The plant has been sited to avoid rockpiles and upper slopes which are considered to be significant in terms of supporting habitats for some fauna. Zoogeographically, most of the vertebrate species occurring around the Burrup Peninsula are widely distributed throughout the Pilbara and through much of the Eyrean Subregion (Astron, 1999). Although some Pilbara endemic species occur within the project lease, no fauna species endemic to the Burrup Peninsula were observed (Astron, 2001c). Vertebrate fauna species that are endemic to the Pilbara and were recorded on the lease include two unnamed species, a lizard *Lerista sp.* and a small insectivorous marsupial, *Planigale sp.* Both these species are known from other localities in the Pilbara and the proponent has made commitments to funding further research into their taxonomic status.

The lease area includes five of the six main fauna habitat types identified on the Burrup Peninsula as described by Astron Environmental (Astron, 1999). The habitat types within the lease are listed below and described in Section 5.81 of the PER (SKM, 2001):

- Rocky outcrops, rockpiles and rocky scree slopes;
- Valleys and drainage gullies;
- Grassland steppes;
- Disturbed habitats; and
- Saline tidal and supratidal flats.

None of the habitat types listed are restricted to the project lease and are all well represented throughout the area.

The results of the desktop fauna study and non-marine molluscan survey are described in Section 5.8.2 of the PER (SKM, 2001). The results of the fauna trapping survey are reported in the document “Burrup Liquid Ammonia Plant Targeted Fauna Survey” by Biota Environmental Sciences (Biota, 2001).

The significant fauna species that may potentially be located within the project lease are the Priority 4 species, the Western Pebble Mound Mouse (*Pseudomys chapmani*), the Water Rat (*Hydromys chrysogaster*) and the Pale Field-rat (*Rattus tunneyi*). None of these species were captured during the targeted fauna trapping survey. Thirteen *P. chapmani* pebble mounds were located on the lease (none showing evidence of recent use) and two systems resembling rat burrows were observed and extensively trapped, but revealed no *R. tunneyi*.

The trapping survey yielded four small skinks (*Lerista “muelleri”*) which were lodged with the WA Museum. The survey also identified two bat species (*Vespadelus finlaysoni* and *Taphozous georgianus*) from echolocation calls. The Pilbara Olive Python (*Morelia olivacea barroni*) is listed on CALM’s Declared Threatened Fauna List and inhabits the rocky outcrops and rockpile habitats of the Pilbara. The proponent has committed to contribute financially to research programs investigating the Pilbara Olive Python on the Burrup Peninsula.

None of the birds on the Burrup Peninsula are scarce or endemic to the Peninsula. The Priority 4 bird species, the Bush Stone-curlew was the only bird observed, which is listed as having special conservation status. Several bird species listed as “migratory” under the Federal *Environment Protection and Biodiversity Conservation Act 1999* were opportunistically recorded. The project however, is not expected to impact directly on any

listed migratory birds. The proponent has committed to participate and assist in a collaborative study into measures to minimise bird impacts and encourage their continued use of habitats on the Burrup.

The results of the non-marine molluscan fauna survey conducted by the WA Museum are described in the PER document (SKM, 2001). Five species of native terrestrial snails were recorded on the lease, all having been previously recorded from other localities on the Burrup Peninsula (Slack-Smith, 1999;2000). None are considered to be rare and/or endangered, however the local and regional significance cannot be determined with the current information available. The two species that occur in the low-lying areas of the project lease (*Pupoides* aff. *beltainus* and *P. contraries*) will be directly impacted by the project.

None of the six introduced or pest species known from the Burrup Peninsula (fox, dog, cat, house mouse, black rat and common honey bee) were observed on the project lease.

Submissions

The submissions received in relation to this factor expressed concern about the adequacy of the information in the PER, particularly as the trapping program was conducted after its release. Information was sought regarding additional species, the impacts on species listed under International Treaties, and the current status of the Pilbara Olive Python.

Assessment

The area considered for assessment of this factor is the project lease.

The EPA's environmental objectives for this factor are to:

- protect Specially Protected (Threatened) Fauna and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950*; and
- maintain the abundance, species diversity, geographical distribution of terrestrial fauna.

The EPA is satisfied that the plant layout and infrastructure has been sited to minimise disturbance to habitats for non-molluscan fauna. It notes that most of the vertebrate species occurring around the Burrup Peninsula are widely distributed throughout the Pilbara and that no fauna species endemic to the Burrup Peninsula were recorded within the lease area. The EPA concurs with the proponent in that the project is unlikely to have a major impact on larger fauna species, and accepts that construction will result in the removal of some habitats. It notes that the proponent's findings did not indicate that the project is likely to impact on any Specially Protected (Threatened) Fauna.

The EPA considers that impacts on the two species of native terrestrial snails (*Pupoides* aff. *beltainus* and *P. contraries*) which are common to the lower slopes will be unavoidable, but notes that these species occur elsewhere on the Burrup Peninsula. It notes that the proponent is prepared to contribute to a co-ordinated regional survey of molluscs in order to determine the local and regional significance of the non-marine molluscan species.

The EPA notes the following commitments made by the proponent in order to minimise the impact on terrestrial fauna:

- 1) Contribute to a coordinated regional survey of molluscan fauna;

- 2) Catalogue the presence and quantity of mounds and burrows made by the Pebble Mound Mouse. Monitor any burrows to determine whether the Pale Field-rat is present in the area;
- 3) Implement approved evacuation procedures if active mounds and burrows are identified;
- 4) Minimise disturbance of important fauna habitats, including non-marine molluscan fauna where practicable; and
- 5) Contribute financially to research programs investigating the Pilbara Olive Python, *Planigale sp.* and *Lerista "muelleri"* on the Burrup Peninsula.

Summary

Having particular regard to the:

- (a) widespread distribution of most of the vertebrate species which may occur within the plant area;
- (b) the information gathered from the fauna surveys and known information about the distribution of fauna on the Burrup Peninsula; and
- (c) commitments made by the proponent;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

3.3 Gaseous Emissions

Description

The proposed ammonia plant will utilise a modern version of the conventional natural gas-steam reforming process based on the KBR Purifier ProcessTM developed by Kellogg Brown and Root. The process in general is considered to be Best Available Technology (BAT) by the European Fertiliser Manufacture Association (EFMA, 2000). The proposed gaseous emissions from the plant are considered to be small both in absolute and relative terms and dispersion modelling predicted that the ground level concentration of pollutants would meet the National Environmental Protection Measure (NEPM) and other relevant criteria during normal operation.

The major gaseous emissions under normal operation will be oxides of nitrogen (NO_x) from the primary reformer (Table 3). However, NO_x emissions from the proposed ammonia plant (16.7g/s) are relatively small, being about 4% of the total NO_x emissions from existing and proposed industries within the region. Although small, the NO_x emissions do not meet BAT for new ammonia plants. The proponent will consider the feasibility of using low NO_x burners in the reformer during the detailed design phase.

Table 3 Atmospheric Emissions Characteristics – Normal Operations

Source	Stack Height (m)	Stack Diam. (m)	Emission Volume Am ³ /hr	Emission Temp. (°C)	Exit Velocity (m/s)	NO _x (g/s)	SO ₂ (g/s)	VOC (g/s)	PM10 (g/s)	CO (g/s)
Primary Reformer	36	3.56	455,000	140	12.7	15.4	Negl	0.0	0.28	3.1
CO ₂ Stripper	60	0.87	76,800	45	36.5	0.0	Negl	0.0	0.0	0.0
Package Boiler	15	1.69	40,250	177	5.0	1.3	0.02	0.0	0.03	0.31
Total	-	-	-	-		16.7	0.02	0.0	0.31	3.41

Notes:

- 1) Am³/hr is at actual stack conditions;

- 2) NO_x expressed as 100% NO₂;
- 3) VOC defined as volatile organic carbons;
- 4) Emissions at normal conditions are anticipated to occur for 350 days a year; and
- 5) A package boiler will operate at 25% load during normal operations.

Source: Table 7-2 of the PER.

Emissions during start-up and upset conditions are predominately NO_x, along with minor emissions of sulphur dioxide, hydrogen, methane and particulates. The emission rates during start up and upset conditions, along with their expected frequency and duration are presented in Section 7.2.1.2 of the PER (SKM, 2001). Hydrogen and methane are recovered and combusted during normal plant operation, but vented via one of two vent stacks for short periods during start-up, shutdown and upset conditions. The proponent estimated the annual emissions for hydrogen and methane to be 0.29 t/yr and 1.11 t/yr respectively. During the design phase, consideration will be given to the possibility of flaring rather than venting these gases. Ammonia is flared via a 35m flare stack in the event that the refrigeration plant to the ammonia storage tank fails, which given the double redundancy in all systems, is estimated by the proponent to occur less than once in 100 years.

The air quality impacts from NO_x emissions were predicted using air dispersion models that were recently evaluated by the DEP against detailed monitoring data obtained from the Pilbara Air Shed Study (DEP, 2001). DISMOD was used to estimate local impacts, while regional impacts were predicted by comparing the results of photochemical smog modelling (TAPM) conducted in 1998 (HLA-Envirosciences, 1999) with currently proposed cumulative NO_x emissions. Ausplume was used to verify the effects of building wakes on emissions from the relatively short stacks (startup, vent and flare stacks).

DISMOD Modelling

The air dispersion model DISMOD was used to predict the maximum concentrations of NO_x in the vicinity of the ammonia plant from individual and cumulative sources. The proportion of nitrogen dioxide (NO₂) in NO_x was then estimated using a measured relationship derived from an analysis of monitored nitric oxide (NO) and NO_x concentrations in Dampier, from Woodside's NO_x emissions.

The model predicted the maximum 1-hour concentration of NO₂ from the ammonia plant to be 37 µg/m³ (15% of the NEPM) during normal operation and up to 96 µg/m³ (39% of the NEPM) during abnormal or upset conditions as shown in Figure 5 and described in Table 7-9 of the PER (SKM, 2001). The predicted maximum 1-hour concentration of NO₂ at Dampier and Karratha during normal operation was small, being 15 µg/m³ and 8 µg/m³ respectively.

The cumulative impacts of NO₂ were determined from the following existing and proposed sources; Woodside Facilities (with additional trains 4 and 5), Hamersley Iron Power Station, Syntroleum Gas to Liquids plant, Plenty River Ammonia/Urea plant and the Burrup Fertiliser Ammonia plant. The 1-hour maximum concentration of NO₂ was predicted to be 136 µg/m³ (55% of the NEPM) near the Woodside facility. The proposed ammonia plant was predicted

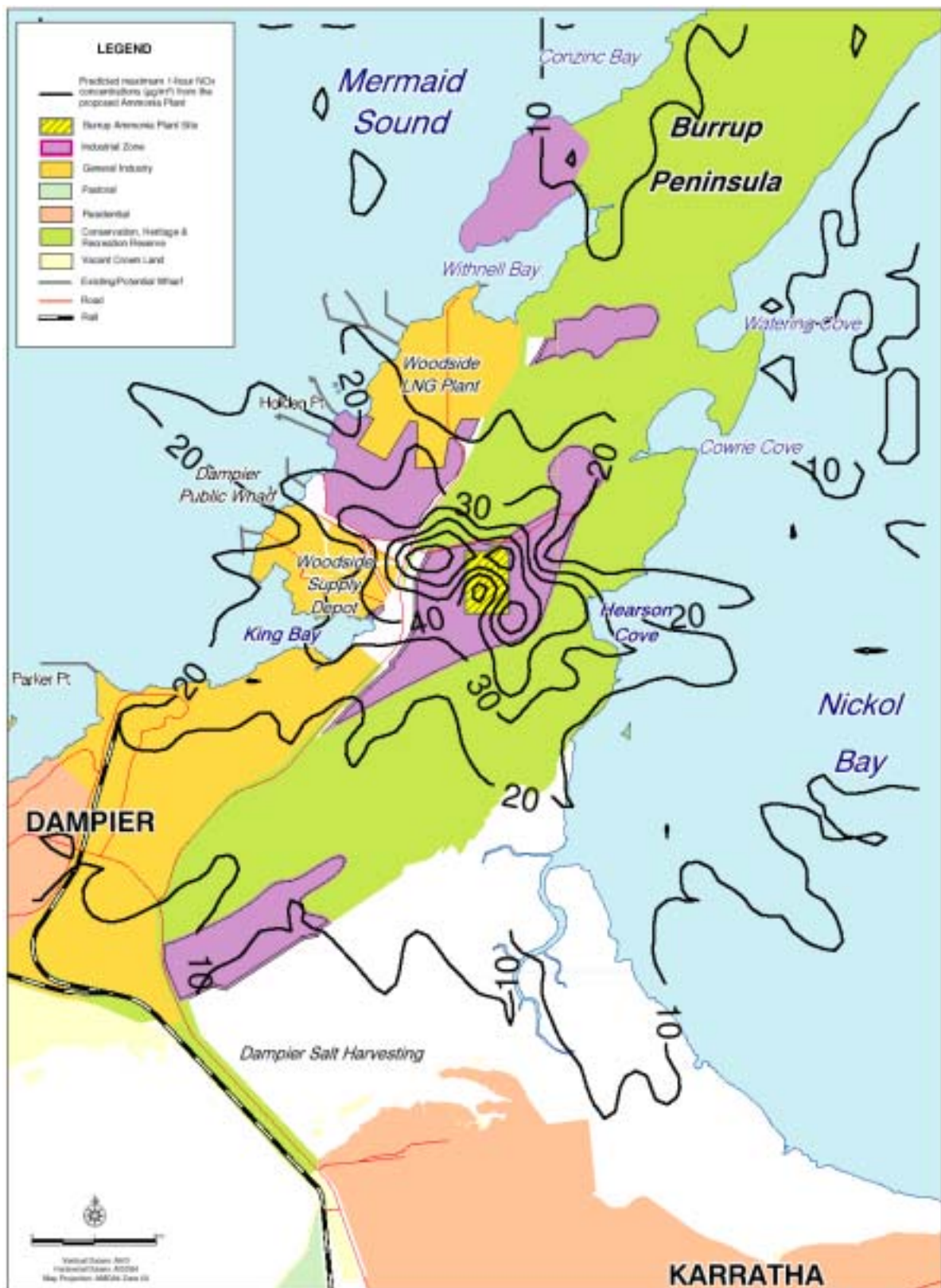


Figure 5. Predicted maximum 1-hour NO_x concentrations (µg/m³) from the proposed ammonia plant in isolation

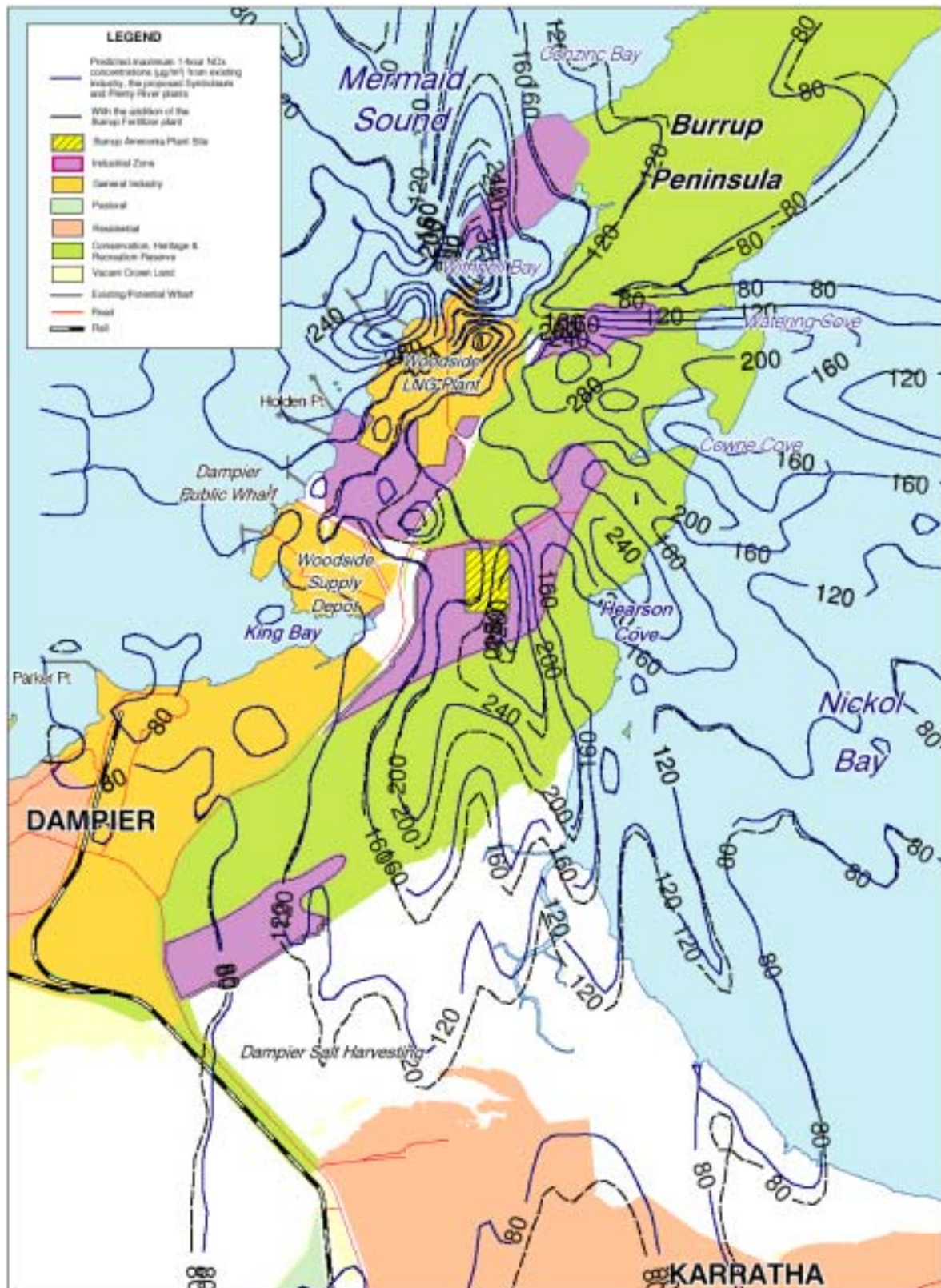


Figure 6. Predicted maximum 1-hour NO_x concentrations ($\mu\text{g}/\text{m}^3$) from existing industry, the proposed syntroleum and plenty river plants and with the addition of the Burrup Ammonia Plant (Source: Figure 7.3 SKM, 2001)

to have a negligible impact on the cumulative 1-hour ground level concentrations of NO₂ as shown in Figure 6. The predicted 1-hour maximum concentration of NO₂ at Dampier (39 µg/m³, 16% of the NEPM) and Karratha (38 µg/m³, 15% of the NEPM) from cumulative sources remained unchanged with the inclusion of the proposed ammonia plant.

The impacts of SO₂ and particulate emissions from the ammonia plant were predicted to be insignificant.

Ausplume modelling

Ausplume was used to assess the effects of the buildings on the site and nearby terrain on the plume dispersion. The model was found to be more conservative than DISMOD for near field impacts, predicting higher ground level concentrations of ammonia and NO_x on the small hills to the north of the plant. The predicted maximum 1-hour concentration of NO₂ from the ammonia plant was 78 µg/m³ (31% of the NEPM) under normal operation and 286 µg/m³ (116% of the NEPM) during upset conditions (ammonia storage tank flaring). However, as ammonia storage tank flaring is expected to be extremely rare, particularly under worst dispersive conditions, the NEPM is unlikely to be exceeded. The concentration of NO₂ at Hearson Cove during flaring was predicted to be 59µg/m³.

The maximum 3-minute ground level concentration of ammonia was predicted to be 1500 µg/m³ during ammonia storage tank flaring, which is 2.5 times the Victorian EPA Guideline (VEPA, 1999), although only 6% of the Workplace exposure standard. The area of concern is localised and as the predicted ammonia concentration is below the threshold of smell, no off-site odour impacts are expected. The impact from ammonia emissions is not considered significant, since storage tank flaring is expected to be extremely rare.

TAPM modelling

In 1998, CSIRO used the TAPM model to predict the NO₂ and ozone concentrations for existing industry and the proposed Woodside expansion, Plenty River plant and Syntroleum plant (HLA-Envirosciences, 1998). CSIRO was commissioned to review the likely changes and concluded that the maximum hourly-averaged concentrations of ozone and nitrogen dioxide would be barely different from those estimated in the previous study for a very similar emissions scenario (CSIRO, 2001). The maximum concentrations of ozone and nitrogen dioxide were predicted to be below the NEPM Standard as shown in Table 4.

Table 4 Predicted Maximum Concentrations (Existing and Proposed Projects as at 1998)

Location	Maximum NO2 ppb	Maximum Ozone ppb
Anywhere	62 (127)	70
Dampier	19 (39)	33
Karratha	17 (35)	49
NEPM Standard	120 (247)	100

Bracketed values in µg/m³.

Source Table 7-8 PER (Modified)

Dust will be generated during construction from vegetation clearing, earth moving activities, vehicular movement and possibly blasting. A Dust Management Plan and if required, a Blasting Management Plan will be developed that incorporates management strategies to minimise ambient dust levels during construction.

Submissions

Submissions sought additional information on a number of issues including, plant inventories vented during process upsets, justification for the predicted frequency of ammonia flaring (less than 1-in-100 years) and design modifications required in order to meet BAT with respect to NO_x emissions. CALM was concerned that the PER did not provide an assessment of the potential effects of SO_x and NO_x emissions on bio-physical attributes (vegetation, land snails, freshwater pools and their biota and the petroglyph base-rocks). A commitment to a suitable monitoring program to determine the impact of operations on these attributes was sought and that consideration should be given to an integrated program involving other emission producers.

Assessment

The area considered for assessment of this factor is the whole of the Burrup Peninsula, and includes the townsites of Dampier and Karratha.

The EPA's environmental objectives for this factor are to:

- Ensure that emissions of NO_x, SO_x, CO, hydrocarbons, ammonia and particulates are assessed and meet acceptable standards and the requirements of the *Environmental Protection Act 1986*;
- Ensure that all reasonable and practicable measures are taken to minimise discharges of NO_x, and other gaseous emissions and particulates;
- Ensure that there are no unreasonable odour impacts at the boundary of the plant or at Hearson Cove;
- Ensure that the impacts from the formation of smog are minimised; and
- Ensure that dust generated during construction and operation does not cause any environmental or human health problem or significantly impact on amenity.

The EPA notes that the proposed technology is a conventional steam reforming process that uses excess air and that the process in general is considered by the EFMA to be BAT. The EPA notes that the only significant gaseous emissions from the plant under normal operating conditions are oxides of nitrogen (NO_x). The EPA is aware that the proposed emission rate compares favourably with other existing and proposed ammonia plants in Western Australia. The EPA accepts that the proposed emission of NO_x does not meet BAT (EFMA, 2000), since the emission rate is considered to be small in absolute and relative terms. It notes the proponent's commitment to investigate during the design phase, the feasibility of using low NO_x burners in the reformer, to further reduce the emission.

The EPA notes that ammonia will not be emitted from the main stack under normal operation or released from either vent stacks during upset conditions. It notes that ammonia may be released via the flare stack as a result of incomplete combustion in the extremely rare event of a failure of the ammonia storage tank refrigeration plant. It notes that off-site impacts from flaring ammonia are predicted to be below the threshold of odour.

The EPA notes that dispersion modelling predicts that the NEPM and other relevant criteria will be met, except possibly for ammonia and oxides of nitrogen during ammonia flaring (1-in-100 years) under worst dispersive conditions. On the basis of the information provided by the proponent and advice from the DEP, the EPA considers that impacts from gaseous emissions will be acceptable.

The EPA notes the following commitments made by the proponent in relation to gaseous and particulate emissions:

- 1) Investigate the feasibility of meeting Best Available Techniques for NO_x emissions from the primary reformer;
- 2) Investigate the feasibility of flaring gases vented during startups and upset conditions;
- 3) Develop a Dust Management Plan and a Blasting Management Plan (if blasting is required), to manage and minimise dust emissions during construction;
- 4) Monitor the performance of dust control strategies during construction; and
- 5) Participate proportionally in a coordinated long term monitoring/management strategy in order to minimise the impacts of emissions on the environmental attributes of the King Bay-Hearson Cove valley.

Having particular regard to the:

- (a) proposed low emission rates;
- (b) expected infrequency of ammonia flaring;
- (c) predicted impacts complying with the relevant criteria; and
- (d) commitments made by the proponent;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

3.4 Greenhouse gas emissions

Description

The proposed ammonia plant will emit approximately 1.41 million tonnes of carbon dioxide (CO₂) per year. Relatively small quantities of the greenhouse gas, methane will also be released, resulting in a total greenhouse gas emission of about 1.44 million tonnes of carbon dioxide equivalent (CO₂ E) per year as shown in Table 5. This represents almost 0.4% of Australia's 1990 baseline for greenhouse gases (386Mtpa).

Table 5 Revised Annual Greenhouse Gas Emissions (Equivalent CO₂) from the Project

Source	CO ₂ E (tpa)
Clearing of vegetation during construction	Negl
Waste Water Treatment Plant	9
CO ₂ Stripper	1,053,000
Primary Reformer Stack	342,000
Diesel generator	83
Package Boilers and Start Up Heater	49,000
Methane Contribution	23
Total	1,444,115

Notes:

- 1) The above total includes emissions for the generation of 4 MW and 10 tph of steam of power for Water Corporation's thermal desalination plant. This is approximately equivalent to 33,000 of CO₂ emissions.
- 2) Vegetation clearing based on 28 ha cleared of spinifex rangeland including access roads and gradual decomposition of vegetation
- 3) Emissions from the CO₂ stripper and Primary reformer based on a plant availability of 350 days per year full time with 10 days of part operation of 20 hours.
- 4) Total CO₂ emission includes the small contributions from wastewater treatment, diesel generators and methane emissions.
- 5) Contribution of methane as per facsimile dated 18 October 2001, refer to Air Emissions point 4.

Source Table 7-10 of the PER (modified).

A number of significant process improvements has led to a large decrease in energy consumption for ammonia plants from 1960 to the mid nineties. The decrease has been primarily due to better recovery and utilisation of waste heat, improvements in boiler design and compressor efficiencies, increase in plant size and the use of methy diethanolamine solution to remove carbon dioxide. The energy consumption for the proposed plant of 28.8 GJ/t NH₃ (corrected to standard conditions) compares favourably with the European Fertiliser Manufacture Association values of 28.8 – 31.1 GJ/t NH₃ for BAT for steam reforming with excess air reforming ammonia plants (EFMA, 2000). Detailed information is provided in Section 7.2.1.12 of the PER (SKM, 2001), including a comparison with several other ammonia plants.

The greenhouse intensity (unit discharge of carbon dioxide per tonne of ammonia produced) for the proposed plant is expected to be 1.76 tCO₂/tNH₃ (on a corrected basis) and compares favourably with BAT and intensities for other new and proposed plants. It represents a decrease in greenhouse gas intensity of almost 10% on an estimated “business as usual” 1990 base case of 1.95 tCO₂/tNH₃. The 1990 base case being derived from what was considered BAT for energy consumption for steam reforming ammonia plants from 1960 to 2000 (KBR, 2001) and for 1995 and 2000 (EFMA 1995 and 2000). The “no regrets” measures to minimise greenhouse gas emissions will include the following:

- Adoption of the low energy excess air reforming process;
- Recovery of waste heat wherever possible;
- Recovery of fugitive gases such as methane and hydrogen;
- Hydraulic turbines to recover energy;
- Export of power and waste heat to a thermal desalination plant; and
- Use of low CO₂ content North West Shelf gas.

The proponent has also undertaken an initial evaluation of the following “beyond no regrets” measures.

- Potential use of the CO₂ by downstream industries;
- Re-injection of the CO₂ into gas or oil fields; and
- Establishment of tree farms as a means to offset the CO₂ emissions.

The ammonia plant will release approximately 1.05 Mtpa of pure (99.8% dry basis) CO₂ from the CO₂ stripper, which is a potential feedstock for certain downstream industries. The proponent has had initial discussions with a number of potential proponents of downstream processing plants, regarding utilising CO₂ in their processes, should they build on the Burrup Peninsula.

Woodside Petroleum contracted CSIRO to evaluate a range of offset measures to reduce total greenhouse emissions. The re-injection of gas from the onshore facilities (Woodside, 1998), although technically feasible, was discounted due to the very high cost (\$50 to \$100 per tonne of CO₂), limited injection life time of the fields and because the fields would not be available until after 2010.

A range of forestry options was also evaluated be Woodside (Woodside, 1998). The most effective “beyond no regrets” option is a five-year plantation with the wood harvested and

used for energy in place of fossil fuels. Indicative costs for the establishment and maintenance of a plantation are around \$2.5 million per 1,000 ha. The proponent considers that a more realistic “beyond no regrets” option would be to offset about 5% of the total annual CO₂ emissions, with a 3,500 ha plantation, at an estimated cost of \$9 million.

Submissions

The submissions received in relation to this factor sought a strengthening of the proponent’s commitment with respect to further investigations into the establishment of tree farms within Australia. Confirmation was also sought regarding a comparison of greenhouse intensity and energy consumption values with ammonia plants in other countries.

Assessment

The EPA considers this proposal to be an important contributor to Western Australia’s greenhouse gas emissions.

The EPA’s environmental objective is to ensure that potential greenhouse gas emissions emitted from proposed projects are adequately addressed in the planning/designing and operating of projects and that:

- best available technologies and measures are applied to minimise emissions; and
- appropriate off-set measures are adopted to further minimise emissions throughout the life of the project.

The EPA notes that the proponent has proposed a number of “no regrets” measures that are expected to reduce CO₂ emissions by approximately 10% of the 1990 “business as usual” baseline case. The EPA acknowledges that significant technological improvements have been achieved in ammonia production processes over the decades and that only small increases in efficiencies are expected in the near future. The EPA is satisfied that the proposed ammonia plant is thermally efficient and considers the predicted greenhouse gas intensity of 1.76 tCO₂/tNH₃ (corrected) to be consistent with best available technology.

Australia under the Kyoto Protocol (if and when ratified), would be required to limit its increase in greenhouse emissions in 2008-12 to no more than 8% above 1990 levels. In the absence of any measures to reduce emissions of greenhouse gases, Australia’s emissions in 2010 are expected to increase by 43% from the 1990 levels. Australia as a whole is challenged to reduce greenhouse gas emissions by 24.5% from the predicted “business as usual” level by implementing a combination of “no regrets” and “beyond no regrets” measures. This is equivalent to limiting greenhouse gas emissions in 2010 to 108% of Australia’s 1990 emissions levels.

The EPA strongly encourages proponents to seek ways and means of minimising the emissions of greenhouse gases, in combination with offset measures, with a view to reducing net emissions below the ‘business as usual’ case.

Burrup Fertilisers has made the following commitments in relation to greenhouse gas emissions:

- Enter the Greenhouse Challenge upon project go ahead, ensuring that the goal of minimising greenhouse gases is adopted during the detailed engineering design phase;
- Undertake investigations of practicable “no regrets” and ‘beyond no regrets’ measures throughout the operational life of the plant by including consideration of the following:

- Downstream processing industries (eg. urea, dry ice and methanol) to take CO₂ off gas;
- Establishing tree farms within Australia; and/or
- Generating power to replace non-renewable fuels; and
- Adopt practicable and feasible measures to offset CO₂ emissions.

The EPA is of the opinion that all reasonable and practicable measures have been proposed by the proponent to minimise greenhouse gas emissions from the plant to date. The EPA expects proponents to apply the principles of continuous improvement throughout the life of the project to strive to further reduce greenhouse gas emissions. Consistent with this, the EPA has recommended a condition that requires the proponent to prepare a Greenhouse Gas Emissions Management Plan, with the aim of reducing greenhouse gas emissions over the life of the project, and investigating and adopting appropriate offset measures.

Summary

Having particular regard to the:

- (a) thermal efficiency of the proposed plant;
- (b) estimated savings in CO_{2E} of almost 10% of the 1990 “business as usual” level; and
- (c) commitments made by the proponent;

it is the EPA’s opinion that the proposal can be managed to meet the EPA’s environmental objective for this factor.

3.5 Noise

Description

The proposed site is in an industrial area approximately 6 kilometres from the nearest residential area (Dampier) and about 1.5 kilometres from Hearson Cove, which is the only easily accessible recreational beach in the region. Acoustic modelling was carried out by Sinclair Knight Merz using the Environmental Noise Model (ENM) to predict noise levels at the premises boundary, Dampier and Hearson Cove.

The preliminary estimate of the overall sound power level from the plant was predicted to be 125 dB(A) during normal operations, as detailed in Section 7.2.2 of the PER (SKM, 2001). The major noise sources included the air compression section, ammonia refrigeration section and CO₂ venting.

Based on the preliminary layout and the assumed equipment sound power levels, the noise level was predicted to be up to 8 dB(A) above the assigned noise level at the plant boundary. A number of noise attenuation measures were identified and will be considered by the proponent during the detailed engineering design phase in order to achieve compliance with the *Environmental Protection (Noise) Regulations 1997*. Noise reduction measures include:

- Relocation of noise sources away from the boundary;
- Placement of buildings and sheds to afford acoustical shielding of noise sources;
- Building enclosures;

- Acoustic cladding on pipework; and
- Exhaust silencers on intake and discharge points.

The major noise sources were reviewed and a preliminary assessment was made of the likely noise attenuation measures that could be adopted and the expected reduction in sound power levels that could be achieved. Noise modelling was repeated using the attenuated sound power levels to re-determine the noise impacts. The ENM modelling demonstrated that a reduction of up to 9 dB(A) can be achieved at the plant boundary and nearest receptors by adopting the proposed noise attenuation measures. The noise impacts at Dampier (residential area) and Hearson Cove (recreational area) during worst case meteorological conditions were predicted to be < 20 dB(A) and 34 dB(A) respectively.

The predicted cumulative noise levels at Dampier and Hearson Cove from the proposed Burrup Fertilisers, Syntroleum and Plenty River Plants are shown in Table 6.

Table 6 Cumulative Noise Levels

Project	Noise Received at Dampier	Noise Received at Hearson Cove
1. Syntroleum	31 dB (A)	37 dB (A)
2. Plenty River Corporation	<20 dB (A)	33 dB (A) -nom
Cumulative Level (1+2)	31 dB(A)	38.5 dB(A)
3. Burrup Fertiliser	<20 dB (A)	34 dB (A)
Cumulative Level (1+ 2+3)	31 dB (A)	40 dB (A)

Note 1 – Incorporates preliminary noise control measures from Burrup Fertiliser facility

Source Table 7-18 of the PER (revised).

The noise emission from the proposed ammonia plant will have an insignificant impact at Dampier and will only result in a marginal increase in cumulative noise levels at Hearson Cove.

Submissions

The submissions received in relation to this factor sought additional modelling to be undertaken in order to provide more certainty that expected noise reductions could be achieved at the site boundary and Hearson Cove. Concerns were expressed regarding the cumulative impacts of noise on Hearson Cove from industrial development in the King Bay – Hearson Cove Industrial Area and a commitment to monitor noise levels at the cove was sought.

Assessment

The area considered for this factor is the project lease and surrounding area, including Hearson Cove, Karratha and Dampier.

The EPA's environmental objectives for this factor are to ensure that:

- noise impacts emanating from the proposed plant comply with statutory requirements specified in the *Environmental Protection (Noise) Regulations 1997*; and
- the amenity of Hearson Cove is protected.

The EPA notes that preliminary noise modelling predicts that the attenuated plant will comply with the *Environmental Protection (Noise) Regulations 1997* at the site boundary and that noise impacts at the nearest residential area in Dampier and Karratha will be

insignificant. Based on the information provided by the proponent, the EPA is satisfied that the proposed noise reduction measures can reasonably be expected to achieve the required noise attenuation for compliance with the Regulations.

The EPA considers that the predicted noise level at Hearson Cove (34 dB(A)) from the ammonia plant will in itself not unreasonably affect amenity. The EPA has been advised by the DEP that the marginal increase in cumulative noise levels at Hearson Cove from this proposal will not be readily discernable, assuming the Syntroleum and Plenty River projects proceed and that their noise emissions are as proposed. It therefore considers the predicted noise impacts at Hearson Cove from this proposal to be acceptable. Further comment on the issue of cumulative noise impacts is provided in Section 5 “Other Advice”.

Burrup Fertilisers has made the following commitments in relation to noise emissions:

- Adopt noise attenuation measures to ensure compliance with the *Environmental Protection (Noise) Regulations 1997* and meet the EPA objectives to protect amenity at Hearson Cove;
- Contribute to cumulative noise monitoring along with industry located within the King Bay – Hearson Cove Industrial Area; and
- Install silencers on gas and steam vents.

Summary

Having particular regard to the:

- (a) proposed noise attenuation measures;
- (b) predicted noise impacts at the site boundary, Dampier, Karratha and Hearson Cove using attenuated noise emissions from the plant; and
- (c) proponent’s commitment;

it is the EPA’s opinion that the proposal can be managed to meet the EPA’s environmental objective for this factor.

3.6 Off-site individual risk

Description

Qest Consulting Group was commissioned to conduct a Preliminary Risk Assessment (PRA) of the proposed development, including the natural gas feed line, ammonia product line, ammonia loading and shipping (Qest, 2001). The report concluded that the risks from the proposed plant are conservative and acceptable for a PRA, provided that the identified risk reduction measures are undertaken. The PRA is based on preliminary drawings only and a Quantitative Risk Assessment (QRA) will be conducted prior to commissioning.

The PRA included the assessment of the following risks:

- Leakage or failure of process equipment;
- Hazards of supply, process, proposed storage operations;
- Knock on effects, process fires and explosions, and external events;
- Ammonia export loading; and
- Shipping.

The report identified the following hazards as having a potential to impact off-site:

- Natural gas feed line – release of methane from major leak or rupture;
- Ammonia plant – release of ammonia, methane or hydrogen from major leak or rupture;
- Refrigerated ammonia tank storage – release of ammonia from major leak;
- Ammonia export pump – major release of ammonia from pump;
- Ammonia pipeline – release of ammonia from major leak or rupture;
- Ammonia loading arm – release of ammonia from major leak or rupture; and
- Shipping channel – release of ammonia from a tanker as a result of a collision, onboard fire or explosion, or tank failure.

The Plant

The principal chemical hazards encountered in an ammonia plant are ammonia, methane and hydrogen. The event with the potential to have the largest fatality risk is the release of toxic ammonia as a result of a catastrophic failure of one of the two 40,000 tonne refrigerated ammonia storage tank. However, the PRA considered the risk to be low as the tanks will be designed as double-walled and double-integrity. The provision of water curtains will be a further mitigating measure. The potential release of ammonia from other vessels and pipework within the plant was considered to be minimal, given the design and redundancy of the control and shutdown systems. The nearest public residences are over 6 kilometres away.

There are no off-site impacts predicted from hydrogen or methane releases. The natural gas feedstock for the ammonia plant will be provided by Apache via a 1.3 km dedicated pipeline within the existing pipeline corridor. The pipeline will be buried to reduce the risk from external interference.

The plant will be designed utilising the following safety systems:

- Dedicated Safety Instrumentation Systems;
- Fail safe trip system;
- Automatic plant shutdown if certain operating parameter limits are exceeded;
- Provision of emergency manual trip stations;
- Ammonia flare system;
- Nitrogen purge facilities;
- Fire fighting facilities; and
- Emergency power system.

Ammonia Transfer and Ship Loading

Liquid ammonia will be pumped through a 500 mm diameter export pipeline that extends for 4.3 kilometres from the ammonia storage tanks to the Dampier Public Wharf (Figure 7). The insulated above ground export pipeline will contain about 670 tonnes of refrigerated liquid ammonia during the transfer operation. Several isolation valves controlled by an automated system will be installed to isolate sections of the line. A smaller recirculation line will run alongside the ammonia export line. A section of the export pipeline (approximately 1 kilometre) will be within a roadway reserve. Most of the reserve, however, is elevated above

the roadway and separated by a drainage ditch. The PRA considered the risk of failure of the ammonia product line to be low due to the low frequency at which fully welded pipelines

30

31

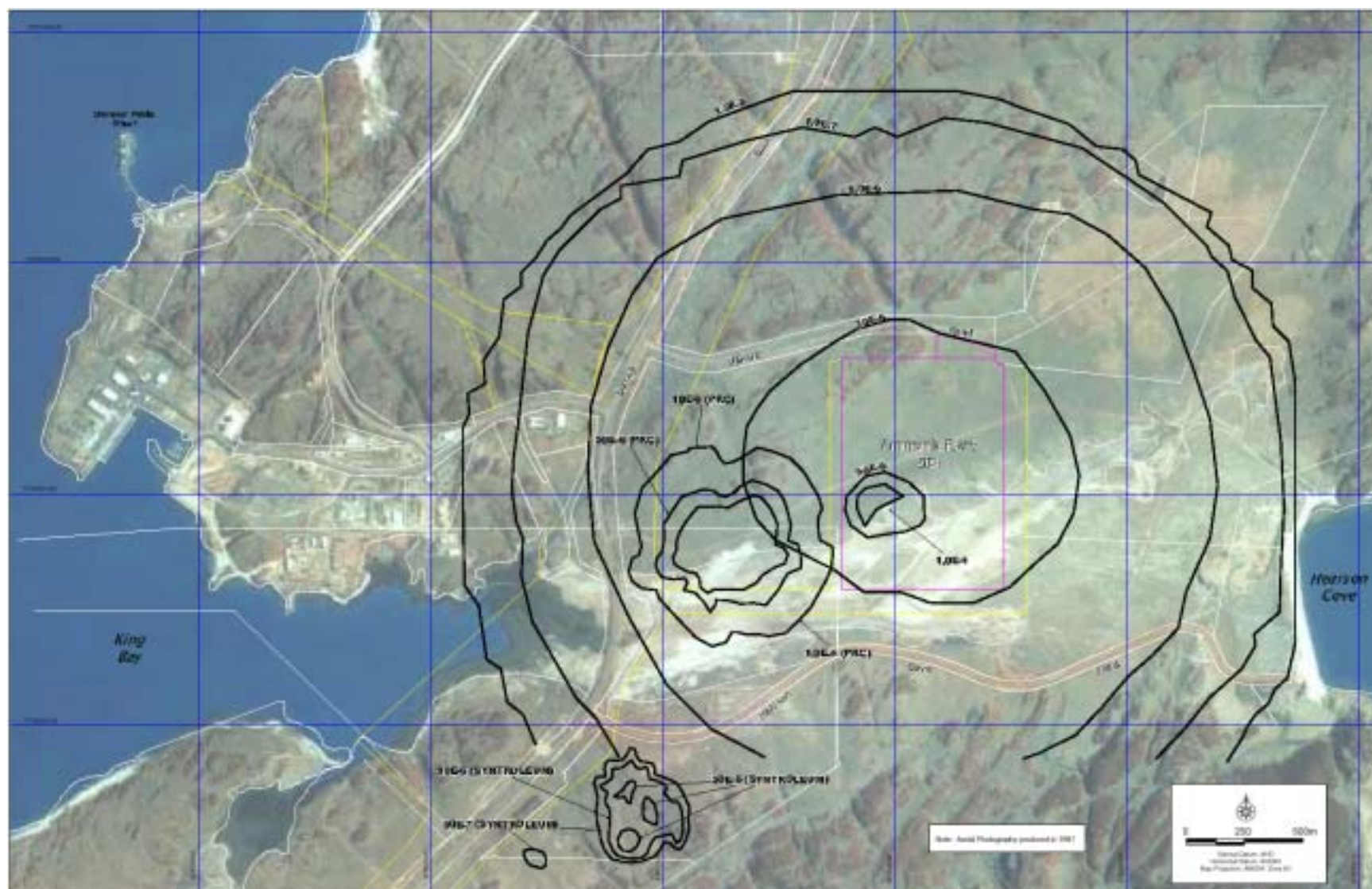


Figure 9. Cumulative risk contours (Source: Figure 8.3 SKM, 2001)

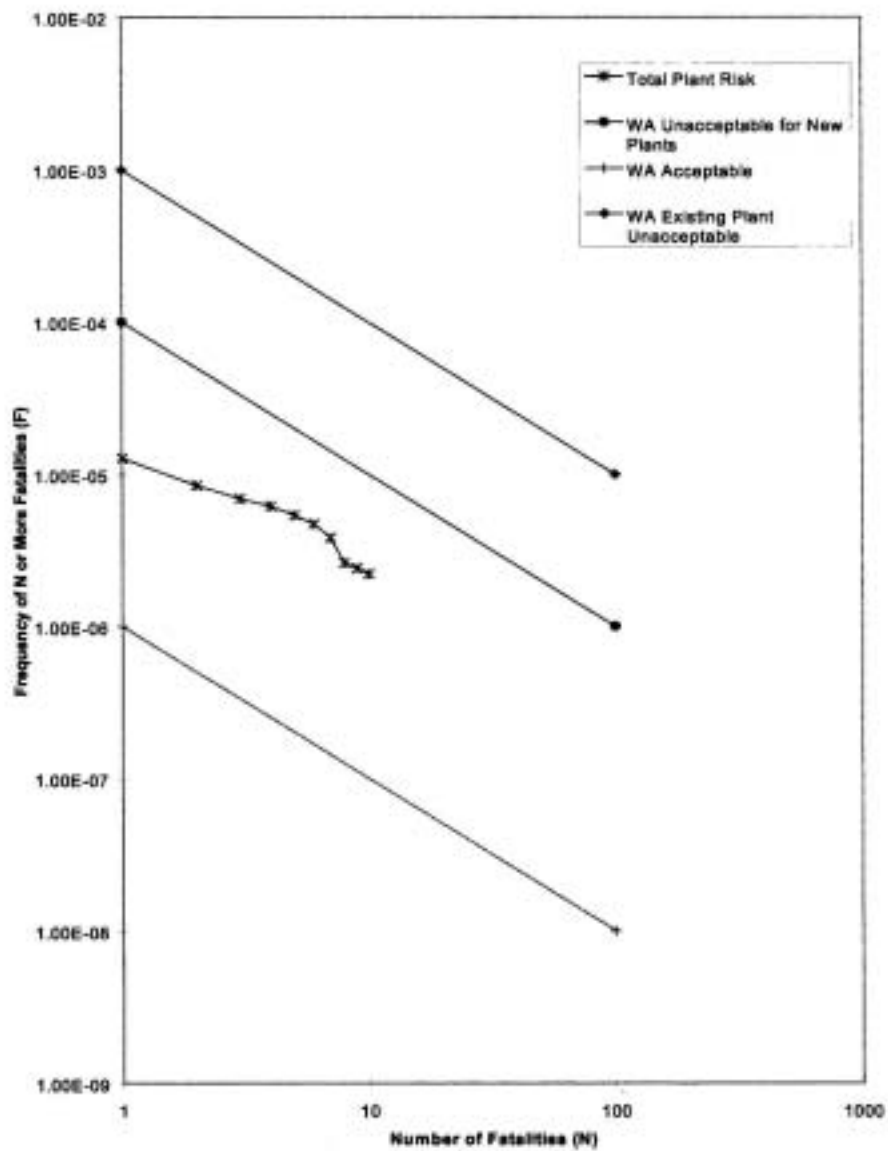


Figure 10. Societal risk (Source: Figure 8.2, SKM, 2001)

leak. The QRA will identify any need for further protection measures, such as bollards and steel barriers to minimise potential impacts from roadway traffic.

Ship movements and ammonia loading operations at the wharf will be conducted under procedures to be established jointly by the Dampier Port Authority (DPA) and the proponent. A clearance of 1.6 kilometres is required between any two vessels in the harbour and two vessels cannot use the same channel at the same time. Ammonia will be off-loaded to the refrigerated ammonia storage tankers via a specially designed loading arm. Load-outs of up to 35,000 tonnes of ammonia will occur about every two weeks. Risks associated with ammonia loading and shipping were assessed in the PRA and found to be low due to the low frequency of the event (Figure 8).

The following risk mitigation measures will be implemented during the loading operation:

- An operator will be stationed at the wharf throughout the loading operation with access to an emergency shutdown button;
- The loading operation will be monitored continuously by plant personnel within the control room via camera surveillance;
- All other activity on the wharf will cease during tanker loading operations; and
- An Emergency Shutdown System will automatically be activated on a no-flow or flow differential signal.

The PER (SKM, 2001) advises that a 200m exclusion zone will apply around the wharf with the general rule that no unauthorised personnel will be permitted within this zone during the ammonia loading operation. The exclusion zone is based on an accepted industry practice for vessels unloading ammonia at Kwinana. The size of the zone will be reviewed during the QRA to ensure that the EPA individual risk criteria is not exceeded during loading operations.

The predicted risk levels associated with the proposed ammonia plant meet the EPA individual risk criteria (Figure 8). The 10×10^{-6} risk contour for the proposed plant extends west over the proposed Plenty River ammonia/urea plant and east over the adjacent industrial site. However, it does not extend outside of the designated industrial area or impact on the Hearson Cove recreational area. The off-site individual risk fatality at the nearest residence, approximately 6 kilometres from the site, is considered to be negligible.

The proposed Plenty River ammonia/urea plant and the proposed Syntroleum synthetic fuels plant do not have a major impact on the Burrup Fertilisers ammonia plant site as shown in Figure 9. Cumulatively, the 10×10^{-6} risk contour may extend beyond the northern boundary of the industrial area. However, the terrain in that region is dominated by rocky outcrops and is not expected to be accessible to the general public. The cumulative 10×10^{-6} risk contour will be better defined during the QRA.

The societal risk from the ammonia plant is represented in Figure 10 and lies within the tolerable section of the societal risk criteria that was developed for the Kwinana Industrial Area.

Submissions

The Department of Mineral and Petroleum Resources (MPR) advised that the facility will be classed as a Major Hazard Facility and therefore a Safety Report meeting the requirements of the National Standard – Control of Major Hazard Facilities [NOHSC:1014(1996)] will be required prior to commissioning. The proponent's commitment to a Safety Management System will form part of the Safety Report. MPR also confirmed that the Explosives and

Dangerous Goods Division will provide advice to the proponent on the Safety Report, Scope of Works for the QRA and other regulatory requirements and that it should be contacted on these matters early in the detailed design phase. The QRA will need to confirm the assumptions made in the PRA and address a number of specific items raised by MPR

MPR and the Fire and Emergency Services Authority (FESA) sought justification in terms of consequence distance and/or risk for the 200m exclusion zone around the Dampier Public Wharf whilst loading ammonia. The proponent confirmed that it was prepared to review the size of the exclusion zone during the QRA.

FESA requested confirmation as to whether the Port of Dampier has all the facilities to enable it to comply with the provisions of AS3846-1998 "The Handling and Transport of Dangerous Cargoes in Port Area" to handle bulk ammonia. The Port is suitably equipped to enable it to comply with AS3846-1998. The provisions of this standard are expected to be regulated soon by MPR. They will be administered by MPR and will impose obligations on the berth operator, vessel Master, cargo consigner and cargo owner. MPR advised that DPA's Emergency Response Plan will need to be updated to incorporate ammonia export, prior to loading of the first shipment of ammonia.

FESA questioned if WA had an established risk criteria and advised that Netherlands societal risk criteria for 1992 would place all the values in the PER in the range where risk reduction would be desirable. FESA asked if the risk could be reduced. The proponent confirmed that the societal risk levels in the PER were developed for the Kwinana Industrial Area following investigations undertaken by OMP. The ammonia plant lies in the tolerable section of that risk criterion for new plants. There is a potential for the societal risk to be further reduced should the QRA indicate that additional risk reduction measures are required.

MPR, FESA and the DEP sought additional information on a range of issues mostly in relation to the ammonia storage tanks, ammonia pipeline, ammonia transfer and the provision of plant fire fighting water.

Assessment

The area considered for assessment of this factor is the proposed plant site and immediate surrounds, the ammonia transfer and ship loading operations at the Dampier Public Wharf and the supply of natural gas.

The EPA's environmental objective for this factor is to prevent, abate and control off-site risk from hazardous industrial plant for the protection and management of the environment.

To achieve this objective the EPA applies three complementary tests when assessing emissions and risk from hazardous industrial plant:

- Are the off-site individual fatality risk criteria set by the EPA met?
- Are all reasonable and practicable measures taken to minimise the off-site emissions and individual risk from industrial plant? and
- Are cumulative off-site emissions and individual risk from several industrial plants, or several risk generators on one operator's site, such that they do not cause cumulative impacts beyond the off-site individual fatality risk criteria?

The EPA's individual risk criteria as stated in EPA Guidance Statement No.2 (EPA, 2000), which would apply to the proposed plant and other relevant infrastructure are as follows:

- A risk level in residential areas of one in a million per year or less, is so small as to be acceptable to the EPA;
- Risk levels from industrial facilities should not exceed a target of fifty in a million per year at the site boundary for each individual facility, and the cumulative risk level imposed upon an industry should not exceed a target of one hundred in a million per year; and
- A risk level for any non-industrial activity located in buffer zones between industrial facilities and residential zones of ten million per year per year or lower, is so small as to be acceptable to the EPA.

The proposed plant is to be located within the King Bay - Hearson Cove Industrial Area. The selected site currently has no neighbours, but the EPA notes that sites to the west, east and north-east have been designated for specific industrial projects. The boundary of the industrial area runs along Village Road, just north of the proposed site as shown in Figure 11.

MPR reviewed the PRA. Based on its technical advice, the EPA is satisfied that the PRA is representative of the likely risk levels from the proposed ammonia plant. The EPA notes that the PRA is based on preliminary drawings only and that MPR requires a thorough QRA to be completed prior to commissioning of the plant.

The EPA notes that the individual risk contours meet EPA risk criteria (Figure 8) and is therefore acceptable. It also notes that although the ten in a million individual risk contour falls just within the designated industrial area to the north of the site (where the contour extends onto Village Road), the cumulative ten in a million risk contour may extend outside the industrial zone. The EPA is satisfied that the area of potential exceedance of the risk criteria is not likely to be an active open space and therefore considers it to be acceptable. It notes that the level of risk at Hearson Cove Beach will be significantly less than the EPA criterion of ten in a million fatalities in a year.

The predicted societal risk for the proposed plant would be acceptable, as long as “as low as reasonably practicable” (ALARP) risk reduction methods are applied.

The EPA notes that the proposed plant will be classified as a Major Hazard Facility and that the proponent is required to submit a Safety Report, including the details of the Safety Management System and QRA, to the satisfaction of the Chief Inspector of Explosive and Dangerous Goods, prior to commissioning, for the operations of the plant, export pipelines and the loading facility.

The EPA notes that ammonia loading will be managed by the DPA and regulated by MPR. It notes that the emergency procedures will be updated to incorporate ammonia export. However, the EPA shares the concern expressed by MPR and FESA that the proposed 200m exclusion zone during ammonia loading operations may be insufficient, given that the scale of the proposed operation is significantly greater than at Kwinana. The EPA considers that it is essential that the exclusion zone be based on a risk assessment or consequence analysis and that it must be reviewed during the QRA. The risk should not be annualised, as the exclusion zone would only apply during the ammonia loading operation.

The EPA notes the safety systems and risk reduction measures proposed by the proponent. It is of the opinion that the public risk associated with the implementation of the project is “as low as reasonably practicable” (ALARP), and in compliance with acceptable standards.

The EPA acknowledges the following commitments made by the proponent in regard to the management of risks and hazards.

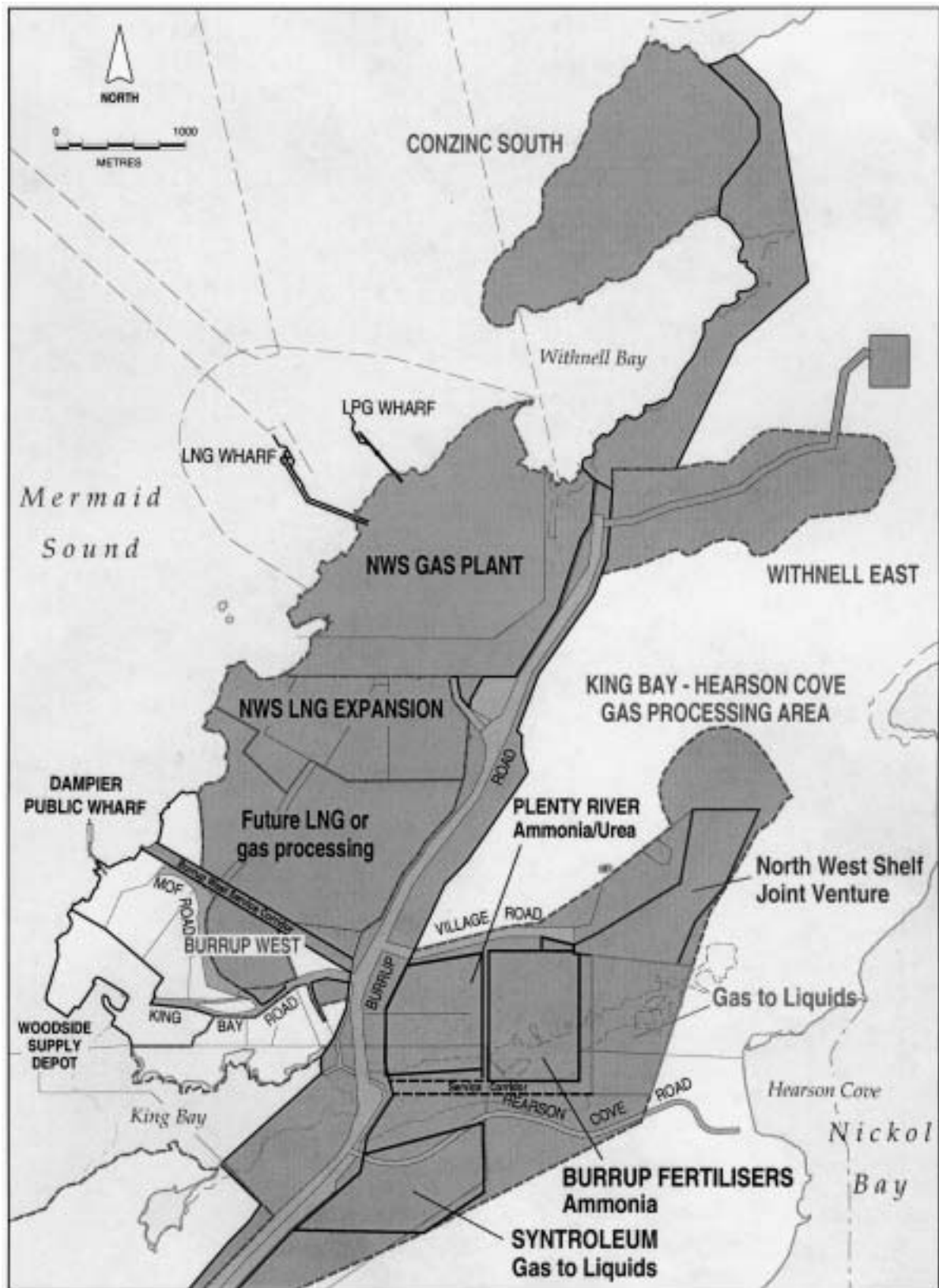


Figure 11. King Bay – Hearson Cove Industrial Area (source: Department of Mineral and Petroleum Resources).

- 1) Establish a Safety Report that includes the details of the Safety Management System, for the operations of the plant, export pipelines and the loading facility;
- 2) Prepare an Environmental Emergency Response Plan for the operational phase;
- 3) Conduct a QRA prior to construction to the satisfaction of the Chief Inspector of Explosives and Dangerous Goods and DEP to verify assumptions in the PRA and address issues raised by MPR;
- 4) Participate with other industries in the development of a Burrup Industrial Integrated Emergency Management Plan;
- 5) Install Water Monitors (curtains and/or sprays) at the ammonia distillation, ammonia scrubber and ammonia refrigeration sections;
- 6) Store ammonia in refrigerated doubled walled and double integrity tanks;
- 7) Install emergency release couplings to close wharf isolation valves;
- 8) Revise the size of the proposed 200m exclusion zone around the Dampier Port Authority wharf based on a risk assessment (not annualised) or consequence analysis during the QRA;
- 9) Station an operator (with access to an emergency shutdown button) at the wharf throughout the entire loading operation; and
- 10) Install an ammonia transfer Emergency Shutdown System.

Summary

Having particular regard to the:

- (a) project complying with the EPA's criteria for individual risk;
- (b) advice obtained from the DEP and MPR in relation to the management of risk and hazards; and
- (c) commitments made by the proponent;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

3.7 Liquid Effluent Management

Description

Treatment of liquid effluents from ammonia plant

The major sources of effluents from the ammonia plant are blowdown streams from the boiler, cooling tower, reformer jacket water and reformer steam drum boiler, as well as domestic wastewater, neutralised demineraliser regenerant wastewater, air compressor intercoolers and during plant upsets, process condensate. The expected flow rates and composition of the various waste streams prior to treatment are shown in Table 7.

Table 7 Description of Process Liquid Waste Streams

Source	Flow m ³ /hr	Temp. deg. C	Composition/ Contaminants	
Package Boiler Blowdown	2.0	100	Ca: 15.0 ppm Mg: 15.0 ppm Na: 160.0 ppm K: 12.5 ppm HCO ₃ : 2.5 ppm CO ₃ : trace Cl: 260.0 ppm	SO ₄ : 5.0 ppm PO ₄ : 15.0 ppm Fe: 2.5 ppm SiO ₂ : 2.5 ppm pH: 7-9 TDS: 500 ppm
Cooling Tower Blowdown	1,205	35 ⁽¹⁾	Concentrated seawater. pH: 6-9	TDS: 53,000 mg/L
Neutralised Demineraliser Regenerant Wastewater	33.3 ⁽²⁾ (Intermittent) Approx. 400m ³ /every 12 hours. 57.0 (maximum)	38	Ca: 250 ppm Mg: 250 ppm Na: 5,000.0 ppm K: 250 ppm HCO ₃ : 5 ppm CO ₃ : trace Cl: 5,000 ppm	SO ₄ : 8,500 ppm PO ₄ : trace Fe: 5 ppm SiO ₂ : 5 ppm pH: 6-9 TDS: 15,000 ppm
Reformer Jacket Water Blowdown	4	100	CO ₂ : 300 ppm NH ₃ : 100 ppm Methanol: 100 ppm	Fe: trace pH: 6-9 TDS: 500 ppm
Air Compressor Intercoolers	4	41	CO ₂ : 100 ppm HCO ₃ : 100 ppm Fe: trace	pH: 6-9 TDS: 200 ppm
Process Condensate (See Note 3)	Normally 0.0 Max. 96.5	70	CO ₂ : 3,000 ppm NH ₃ : 1,000 ppm Methanol: 1,000 ppm	pH: 6-9 TDS: 100 ppm
Reformer Steam Drum Boiler Blowdown	2.5	100	Ca: 2.5 ppm Mg: 2.5 ppm Na: 30.0 ppm K: 2.5 ppm HCO ₃ : 0.5 ppm CO ₃ : trace Cl: 50.0 ppm	SO ₄ : 1.0 ppm PO ₄ : 10.0 ppm Fe: 0.5 ppm SiO ₂ : 0.5 ppm pH: 7 – 9 TDS: 100 ppm

1. 35°C represents the design condition. Actual temperature depends on seawater supply temperature and prevailing wet bulb temperature. Actual blowdown temperature is expected to range between 23°C and 34°C.

2. Flow is intermittent with approximately 400kL every 12 hours. The maximum flow is 57kL/hour.

3. The plant is designed to recycle 100% of process condensate and dumping of condensate would only occur if quality of condensate was unacceptable for recycling as boiler feedwater due to contamination or problems with the downstream treatment system. This is a very rare situation.

Source Table 7-19 of the PER

The proponent has committed to treat these liquid waste streams to reduce concentrations of total dissolved solids, chlorine, biocides, ammonia, methanol, phosphorus and nitrogen to levels which are as low as reasonably practicable. The treated wastewater streams will then be discharged into King Bay via the Water Corporation's proposed multi-user Brine Discharge System.

The proponent has advised that the liquid waste streams will be processed in a Vendor Treatment Package, comprising a steam stripper and a chemical effluent treatment plant (SKM, 2001b). The chemical effluent treatment plant will aim to reduce chlorine, bromine

and other biocides from the cooling tower blowdown through chemical treatment to non-detectable levels. Steam stripping will reduce the concentration of ammonia and methanol in the process condensate and reformer jacket water blowdown and the “polished” water will be recycled to the ammonia process. During upset conditions these discharges will be sent to storage then returned for treatment once the plant has stabilised. Similarly the Package Boiler Blowdown and Reformer Steam Drum Blowdown will be sent to a demineraliser for treatment and recycling.

Domestic wastewater will be treated to secondary standard prior to being discharged with the other wastewater streams as shown in Table 8.

Table 8 Domestic Wastewater

Source	Flow m ³ /hr	Temp. deg. C	Composition/ Contaminants
Domestic Wastewater	Approx 10 m ³ /day	38	BOD5 < 20 mg/L TSS < 30 mg/L Total N < 20 mg/L Total P < 10 mg/M

Based on an operational (Karratha-based) workforce of 50 people.
Source

Disposal of liquid effluents from ammonia plant

The ammonia plant will discharge process wastewater (0.9 ML/day), domestic wastewater (0.01 ML/day) and brine from the cooling tower blowdown (38 ML/d, including Water Corporation’s proposed desalination plant brine discharge of 9 ML/day). All of these streams are combined prior to being discharged into King Bay via the Water Corporation’s proposed multi-user Brine Discharge System as shown in Figure 12 and described in EPA Bulletin 1014. The Water Corporation currently has environmental approval (Ministerial Statement 567, Appendix 6) to discharge brine from a desalination process with an elevated salinity (approximately 38‰ above ambient) and temperature (typically 2 °C above ambient). A 40m mixing zone at the outfall, enables the ANZECC/ARMCANZ (2000) environmental quality criteria for salinity and temperature to be met.

The Water Corporation is in the process of obtaining formal approval to allow treated industrial wastewater streams to be discharged into its Brine Disposal System. Modelling indicates that the brine and wastewater stream from the ammonia plant can in isolation meet the toxicant trigger values for the protection of 99% of species as defined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000). The predicted contaminant and nutrient discharge concentrations and annual loads from the ammonia plant are shown in Table 9.

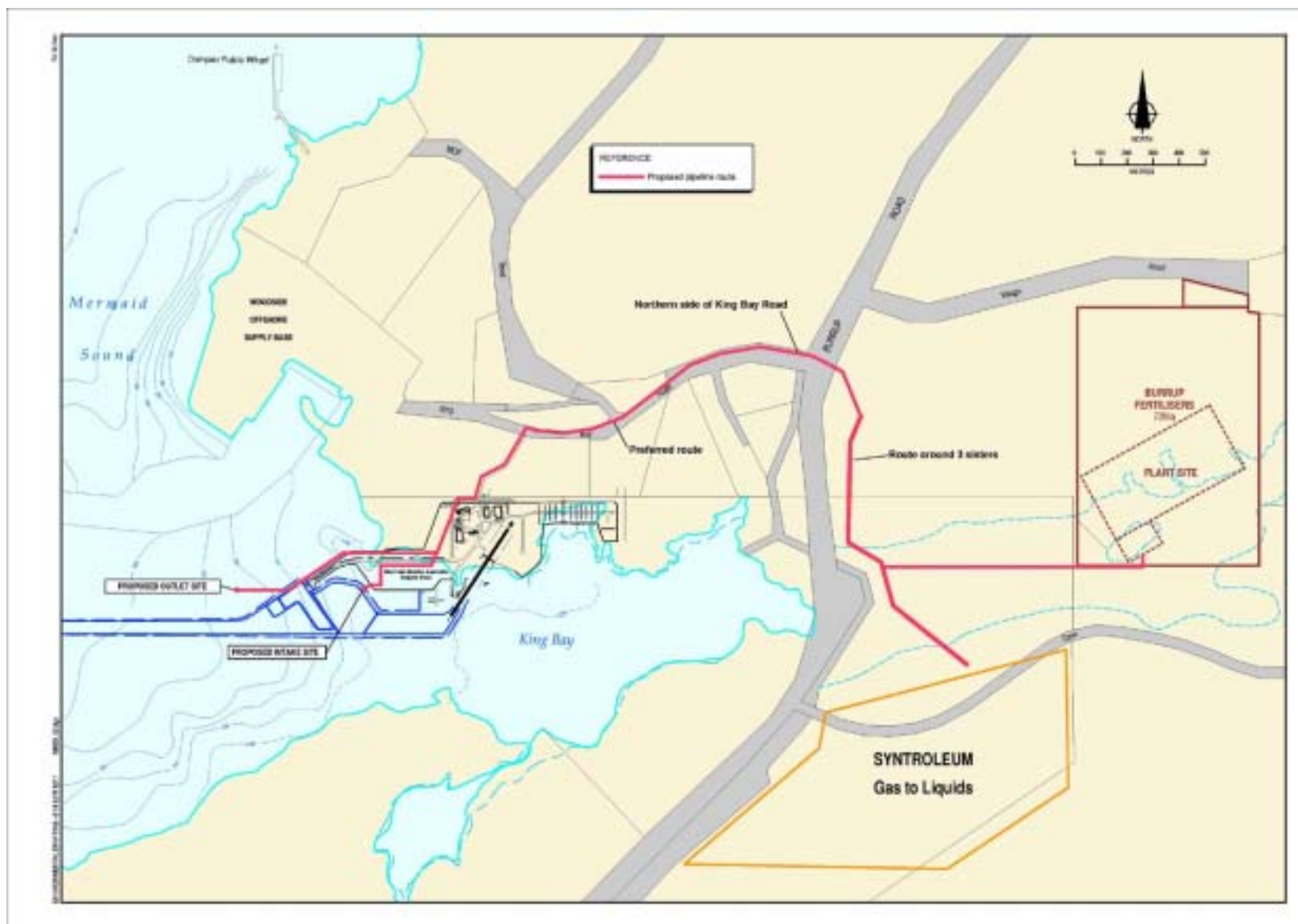


Figure 12. Water Corporation's proposed brine discharge system (source: Burns and Roe Worley).

Table 9 – Proposed wastewater discharges from the ammonia plant

Parameter	Waste Stream	Flow Rate	Concentration In source waste stream	Concentration at end of pipe*
Cadmium Chromium Copper Iron Lead Mercury Nickel Tin Zinc (plus other metals naturally occurring in seawater)	Cooling tower blowdown	1,205 m ³ /hr	Negligible/ Background	Negligible/ Background
Ammonia (as N)	Reformer Jacket Water Blowdown	Normally 0 m ³ /hr Nominal discharge of 100 m ³ /yr as a result of two leaks per year	Nominal concentration of 10ppm [~]	Normally negligible concentration & load. 12.8 µg/L Load – 1 kg/yr
Phosphorus (total)	Neutralised Demineraliser Regenerant Wastewater	38 m ³ /hr	Trace	Trace
	Domestic Wastewater	200 L/day per person [~]	10 ppm ⁺	2.5 µg/L Load – 36.5 kg/yr
Total Nitrogen	Domestic Wastewater	200 L/day per person [~]	20 ppm ⁺	5 µg/L Load – 73 kg/yr
Methanol	Reformer Jacket Water Blowdown	Normally 0 m ³ /hr Nominal discharge of 100 m ³ /yr as a result of leak	Nominal concentration of 10ppm [~]	Normally negligible concentration & load. 12.8 µg/L Load – 1 kg/yr
E-Coli	Domestic Wastewater	200 L/day per person [~]	2.5 million cfu/100mL [^]	6 cfu/100mL

* Assuming dilution with cooling tower (28.92 ML/day) and desalination plant blowdown (9.072 ML/day), neutralised demineraliser regenerant wastewater (0.8 ML/day), ir compressor intercoolers wastewater (0.096 ML/day) and domestic wastewater (0.01 ML/day). Volumes based on preliminary design only and subject to change following detailed engineering.

[~] As agreed with Department of Environmental Protection.

⁺ Typical effluent quality following secondary treatment. Subject to change following detailed engineering.

[^] Typical concentration following secondary treatment. Raw wastewater typically contains in the order of 50 million cfu/100mL

The Water Corporation will be responsible for the impacts from the marine outfall and will impose contractual obligations on Burrup Fertilisers and other system users, to ensure that the outfall complies with Ministerial Conditions and Licence Conditions that may be set. The Water Corporation has written to the EPA, providing details of its responsibilities in managing the multi-user facility. The Water Corporation has advised that it will require each system user to independently comply with Ministerial Conditions and licence requirements on its outfall. Burrup Fertilisers has provided details of its discharge to both the DEP and the Water Corporation (Appendix 7). The Water Corporation has written to the EPA to confirm its acceptance of the proponent's discharge (Appendix 8).

Submissions

Additional information was requested regarding the potential for methyl diethanolamine to enter the marine environment. The proponent confirmed that methyl diethanolamine will be contained in a separate closed loop system. No other concerns were raised, possibly because the discharge of treated wastewater into the environment will be managed by the Water Corporation and therefore subject to a separate approval process.

Assessment

The area considered for assessment of this factor is the marine environment in King Bay. The EPA notes that Burrup Fertilisers propose to discharge its treated wastewater and cooling tower brine into the Water Corporation's Brine Discharge System. It notes that the Water Corporation will seek EPA approval through a Section 46 Amendment of the Ministerial Conditions for the Desalination and Seawater Supplies Project, Burrup Peninsula (Ministerial Statement No. 567) to incorporate this discharge. The EPA, however, requires certainty during this assessment, that impacts on the environment from the ammonia plant's proposed wastewater and brine discharge will be acceptable.

The EPA's environmental objective for this factor is to maintain marine ecological integrity and biodiversity and ensure that any impacts on locally significant marine communities are avoided. In its assessment, the EPA considers that the proposal must demonstrate that the following two key and equally important elements have been met:

- The environmental values are protected by working within the Management Framework for State Coastal Waters; and
- Waste avoidance/minimisation principles with respect to minimising toxicants and nutrient loads at source.

The EPA notes the proponent proposes to minimise the discharge of contaminants and nutrients from the ammonia plant by:

- Chemical treatment and precipitation of the cooling tower blowdown with the aim to reduce chlorine, bromine and other biocides to non-detectable levels;
- Steam stripping of process condensate and reformer jacket water blowdown and recycle of polished water to prevent the discharge of ammonia and methanol;
- Demineralisation and recycle of blowdowns from the package boiler and reformer steam drum boiler; and
- Treatment of domestic wastewater to secondary standard to reduce the discharge of TSS, BOD, E-Coli, total N and total P.

The EPA notes that during the assessment process the proponent has demonstrated its commitment to minimise the discharge of contaminants and nutrients to as low as reasonably practicable levels.

The EPA notes that the contaminants in the ammonia plant discharge can meet the ANZECC/ARMCANZ (2000) 99% species protection trigger levels on entry to the Brine Discharge System and therefore considers that impacts from these contaminants will be acceptable. The proposed nutrient load is small and is not expected to significantly add to natural sources. It notes that the Water Corporation's outfall will be monitored (for water quality, sediments and biota) and that proponents will be required to further reduce their contaminant and/or nutrient loads if marine monitoring data show unacceptable impacts. The EPA considers that the proposed wastewater discharge from Burrup Fertilisers can be accepted into the Water Corporation's Brine Discharge System without compromising its objective for this factor.

The EPA acknowledges the following commitments made by the proponent in regard to the management of its liquid effluent:

- 1) Prepare and implement a Water Quality Monitoring Plan for construction that includes procedures for testing, monitoring and reporting potentially contaminated stormwater, liquid waste streams, and terrestrial and marine receiving environments, prior to the discharge of wastewater;
- 2) Prepare an Environmental Water Quality Monitoring and Management Plan that includes:
 - a) procedures for testing, monitoring and reporting levels of contamination in stormwater and process liquid waste streams to confirm that the Water Corporation and DEP criteria is met, prior to the discharge of wastewater;
 - b) a clear outline of the monitoring points and parameters that will be measured at each point;
 - c) monitoring of methyl diethanolamine in stormwater discharge in the event of a spill; and
 - d) specification of water quality acceptance criteria as defined by the DEP and Water Corporation and clearly defined criteria that trigger management action;
- 3) Prepare a Saline Water Spill Contingency Plan that includes details for the continuous monitoring of seawater cooling circuits for pressure, flow and temperature and management measures to minimise impacts from potential spills and to prevent recurrence; and
- 4) Treat liquid waste streams to reduce concentrations of total dissolved solids, chlorine, biocides, ammonia, methanol, phosphorus and nitrogen to levels which are as low as reasonably practicable.

Summary

Having particular regard to the:

- (a) Environmental quality objectives for King Bay being met at the Water Corporation's marine outfall;
- (b) commitments made by the proponent; and
- (c) Water Corporation's advice confirming its acceptance of the proponent's industrial discharge and its responsibilities in relation the overall management of the brine and wastewater discharge and commitment to refer this ancillary component of the project to the EPA for assessment;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

4. Conditions and Commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal and, following discussion with the proponent, the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for, and commitment to, continuous improvement in environmental performance. The commitments, modified if necessary to ensure enforceability, then form part of the conditions to which the proposal should be subject, if it is to be implemented.

4.1 Proponent's commitments

The proponent's commitments as set in the PER (SKM, 2001) and subsequently modified, as shown in Appendix 4, should be made enforceable.

4.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Burrup Fertilisers Pty Ltd to construct and operate a 2,200 tpd ammonia Plant on the Burrup Peninsula, is approved for implementation.

These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

- (a) that the proponent be required to fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4;
- (b) the proponent shall prepare an audit program in consultation with and submit compliance reports to the Department of Environmental Protection;
- (c) that prior to commissioning, the proponent shall prepare a Greenhouse Gas Emissions Management Plan to ensure that "greenhouse gas" emissions from the project are adequately addressed and best available efficient technologies are used to minimise total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product, and that progress made in achieving this target is reported annually to the Environmental Protection Authority;
- (d) at least six months prior to the anticipated date of closure, or at a time agreed with the Environmental Protection Authority, the proponent shall prepare a Final Closure Plan

designed to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority;

- (e) prior to commencement of construction the proponent shall submit a written prescription for contractor work practices covering plant and pipeline construction and operation, to ensure that work practices are carried out at the level of international best practice, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority; and
- (f) the proponent shall submit a performance review report every 5 years after the start of the operations/development phase to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority evaluating the outcomes and environmental performance over the five years.

5. Other Advice

King Bay – Hearson Cove Industry Group

The EPA advises that it is timely for the Government to give consideration to initiating the formation of an industry group to jointly manage cumulative environmental impacts from the King Bay – Hearson Cove Industrial Area. In particular, the EPA considers there is a need to monitor air quality and to research and monitor impacts of gaseous emissions (particularly sulphur dioxide and oxides of nitrogen) on the bio-physical attributes of the area. The EPA notes that Burrup Fertilisers has committed to seek membership of such a group, should it be formed. It is prepared to participate and assist in the following recommended objectives:

- Develop a local monitoring/management plan for the King Bay – Hearson Cove valley to assess and monitor the impact of emissions on the bio-physical attributes (vegetation, molluscan fauna, ephemeral pools and their biota and petroglyph base-rocks) of the area;
- Coordinate a regional survey of molluscan fauna;
- Coordinate infrastructure and services on the Burrup Peninsula;
- Develop a Burrup Industrial Integrated Emergency Plan;
- Coordinate cumulative noise monitoring at Hearson Cove; and
- Conduct a collaborative study investigating measures to minimise injury to birds and to encourage their continual residence on the Burrup Peninsula.

In view of the imminent assessment of a number of other industrial proposals within the King Bay – Hearson Cove Valley, the EPA recommends that Government should expedite the establishment of the industry group to manage and minimise cumulative environmental impacts, including impacts associated with noise, risk and gaseous emissions.

Amenity of Hearson Cove Beach

Hearson Cove Beach has been recognised by the EPA as an important recreational area. It is the only recreational beach on the Burrup Peninsula that can be accessed in a conventional vehicle. However, the beach is very close to the designated industrial area, being approximately 1.6 kilometres from the selected site for the ammonia plant and even closer to

other proposed leases. The EPA is concerned that the amenity of Hearson Cove could be affected by the cumulative impacts from industrial development in the King Bay – Hearson Cove Industrial Area. It notes that the cumulative noise levels are currently predicted to be about 40 dB(A) and it is of the opinion that any significant increase above this value may be intrusive and therefore likely to be unacceptable to users of the recreational beach at Hearson Cove. It considers that the issue warrants further investigation by the DEP and the Office of Major Projects (OMP) with a view to establishing a noise target that would be protective of amenity from cumulative impacts or, consideration of other measures such as provision of two wheel drive access to an alternative beach on the Burrup for public recreational use. This would provide direction for assessing future proposals in the King Bay - Hearson Cove region.

6. Conclusions

The EPA has considered the proposal by Burrup Fertilisers Pty Ltd to construct and operate a 2,200 tpd ammonia plant on the Burrup Peninsula.

The EPA believes that of the seven environmental factors identified as being relevant to the proposal, greenhouse gas emissions was the most significant.

The EPA notes that the vegetation in the King Bay – Hearson Cove Valley has high conservation value and that part of the floristic variation appears to be uncommon elsewhere on the Peninsula (Trudgen, 2001). The EPA recognises that the valley has been identified for industrial purposes in the endorsed Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) and therefore some impacts on the vegetation in the area will not be avoidable. The EPA is satisfied that the proponent has optimised the layout of facilities within its project lease to minimise impacts on vegetation. In particular, rock piles and upper slopes, which support significant vegetation assemblages, including the Priority 1 species *Terminalia supranitifolia* has been avoided.

The EPA also notes that most of the vertebrate species occurring around the Burrup Peninsula are widely distributed throughout the Pilbara. No fauna species endemic to the Burrup Peninsula were observed on the lease, although several species endemic to the Pilbara were sighted. The EPA accepts that construction will result in the removal of some habitats. It notes that the project is not likely to impact on any Specially Protected (Threatened) Fauna or have a direct impact on larger fauna species. The EPA is satisfied that the plant layout and infrastructure has been sited to minimise disturbance to habitats for non-molluscan fauna. The EPA considers that impacts on two species of native terrestrial snails (*Pupoides* aff. *beltainus* and *P. contraries*), which are common to the lower slopes will be unavoidable, but notes that these species occur elsewhere on the Burrup Peninsula.

The EPA notes that the proposed emissions from the plant are small, both in absolute and relative terms. The main gaseous emissions from the plant under normal operating conditions are oxides of nitrogen. Dispersion modelling predicts that the National Environmental Protection Measure and other relevant criteria will be met, except possibly for ammonia and oxides of nitrogen, during the unlikely event of ammonia flaring under worst dispersive conditions.

The EPA is satisfied that the proposed ammonia plant is thermally efficient and considers the predicted greenhouse gas intensity of 1.76 tCO₂/tNH₃ (corrected) to be consistent with best

available technology. The EPA is of the opinion that all reasonable and practicable measures have been proposed by the proponent to minimise greenhouse gas emissions from the project. The EPA has recommended that as a condition of approval for the project, the proponent be required to prepare a Greenhouse Gas Emissions Management Plan, with the aim of reducing greenhouse gas emissions over the life of the project, and investigating and adopting appropriate offset measures.

The EPA notes that preliminary noise modelling predicts that the attenuated plant will comply with the *Environmental Protection (Noise) Regulations 1997* at the site boundary and that noise impacts at the nearest residential area in Dampier will be insignificant. The EPA notes that the noise impact from the ammonia plant is predicted to be 34 dB(A) at Hearson Cove and considers that this in itself will not unreasonably affect amenity. It therefore considers impacts from noise to be acceptable.

The EPA notes that the individual risk contours meet the EPA risk criteria and is therefore acceptable. The EPA considers that it is essential that the ammonia loading exclusion zone be based on a risk assessment or consequence analysis and that its size must be reviewed during the QRA.

The EPA notes that the proponent proposes to utilise a range of treatment processes on its liquid waste streams in order to minimise the discharge of contaminants and nutrients into the marine environment. The marine discharge will be via Water Corporation's proposed Brine Discharge System and the level of contaminants in the discharge can meet the ANZECC/ARMCANZ (2000) 99% species protection trigger levels at end of pipe.

The EPA has concluded that the proposal is capable of being managed in an environmentally acceptable manner such that it is most unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.

7. Recommendations

The EPA submits the following recommendations to the Minister for the Environment and Heritage:

1. That the Minister notes that the project being assessed is for the construction and operation of a 2,200 tonne per day ammonia Plant on the Burrup Peninsula;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. That the Minister notes the EPA's other advice regarding the need for the formation of an industry group to provide a coordinated approach to manage cumulative impacts from the King Bay - Hearson Cove Industrial Area and the need for a strategic assessment to determine noise and visual impacts on Hearson Cove Beach amenity.
4. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4 and summarised in Section 4, including the proponent's commitments; and
5. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Appendix 1

List of submitters

Organisations:

- 1) Department of Conservation and Land Management
- 2) Conservation Council of Western Australia
- 3) Department of Mineral and Petroleum Resources
- 4) Fire and Emergency Services
- 5) Yamatji Land and Sea Council
- 6) Main Roads Western Australia
- 7) Department of Environment Water and Catchment Protection
- 8) Commissioner for Soils and Land Conservation
- 9) Shire of Roebourne
- 10) Department of Land Administration
- 11) Department of Indigenous Affairs

Individual:

No submissions were received from individuals.

Appendix 2

References

ANZECC/ARMCANZ (2000). *National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Astron Environmental Pty Ltd (1999). *Vegetation, Flora and fauna Survey. Natural gas to Synthetics oil Project*. Unpublished report prepared for HLA Environsciences Pty Ltd on behalf of Syntroleum Corporation Pty Ltd. Astron Environmental Pty Ltd, Karratha. W.A.

Astron Environmental Pty Ltd (2001a). *Flora and Vegetation Survey of the Proposed Ammonia Plant*. Unpublished report prepared for Sinclair Knight Merz on behalf of Burrup Fertilisers Pty Ltd. Astron Environmental Pty Ltd, Karratha. W.A.

Astron Environmental Pty Ltd (2001b). *An Addendum to Burrup Ammonia Plant, Burrup Peninsula, Vegetation and Flora Report – Dry Season Survey*. Unpublished report prepared for Sinclair Knight Merz on behalf of Burrup Fertilisers Pty Ltd. Astron Environmental Pty Ltd, Karratha. W.A.

Astron Environmental Pty Ltd (2001c). *Fauna of the Burrup Peninsula and the Proposed Ammonia Plant Site*. Unpublished report prepared for Sinclair Knight Merz on behalf of Burrup Fertilisers Pty Ltd. Astron Environmental Pty Ltd, Karratha. W.A.

Biota Environmental Sciences (2001). *Burrup Liquid Ammonia Plant Targeted fauna Survey*. Unpublished report prepared for Sinclair Knight Merz on behalf of Burrup Fertilisers Pty Ltd. Biota Environmental Sciences. Perth. W.A.

CALM (1999). *Environmental Weed Strategy for Western Australia*. Environmental Protection Branch. Department of Conservation and Land Management, Como. W.A.

CALM (2000). *Declared Rare and Priority Flora List*. Department of Conservation and Land Management, Perth. W.A.

CSIRO (2001). *The impact on regional ozone and nitrogen dioxide levels of emissions from an ammonia plant in the Pilbara region*. Report prepared for Sinclair Knight Merz by Bill Physick, CSIRO Atmospheric Research, Victoria.

Department of Environmental Protection (2001). *An Evaluation of air quality models for the Pilbara region*. Department of Environmental Protection. In preparation. Department of Environmental Protection, Perth. W.A.

Environmental Protection Authority WA, 2000. *Final Guidance No. 2, 'Guidance for Risk Assessment and Management: Off-site individual risk from Hazardous Industrial Plant'*. Environmental Protection Authority, Perth. W.A.

European Fertilizer Manufacturer's Association (1995). *European Fertiliser Manufactures' Association Best Available Technique Guidelines (EFMA BAT)*. European Fertilizer Manufacturer's Association, Brussels.

European Fertilizer Manufacturer's Association (2000). *Best Available Techniques for Pollution Prevention and Control in the European Fertilizer Industry. Production of Ammonia*. European Fertilizer Manufacturer's Association, Brussels.

HLA - Environsciences Pty Limited (1999). *Syntroleum Proposed Gas to Synthetic Hydrocarbons Plant, Burrup Peninsula, Western Australia. Consultative Environmental Review*. HLA - Environsciences Pty Limited

KBR (2001) *Modernizing Ammonia Plants with Innovative Technical Solutions*. Kellogg Brown & Root.

- O'Brien Planning Consultants (1996). *Burrup Peninsula Land Use Plan and Management Strategy*. Prepared by the Burrup Peninsula Management Advisory Board.
- Qest Consulting Group (2001). *Preliminary Risk Assessment of an Ammonia Manufacturing Plant*. Unpublished report prepared for Sinclair Knight Merz on behalf of Burrup Fertilisers Pty Ltd. Qest Consulting Group, Perth. W.A.
- Sinclair Knight Merz (2001) *Proposed 2,200 tpd Ammonia Plant, Burrup Peninsula Western Australia. Public Environmental Review*. Sinclair Knight Merz. Perth. W.A.
- Sinclair Knight Merz (2001b) *Burrup Ammonia Plant – Wastewater Discharge and Greenhouse Emissions*. Fax to the Department of Environmental Protection dated 24 October 2001.
- Slack-Smith, S.M. and Kendrick, G.W. (1999). *Survey of the Native Molluscs of the Proposed Syntroleum Corporation Plant Site Study Area, Burrup Peninsula, WA*, Western Australian Unpublished report. Perth. W.A.
- Slack-Smith, S.M. and Kendrick, G.W. (2000). *Survey of the Native Molluscs of Area within and surrounding the Proposed Syntroleum Corporation Plantsite, Burrup Peninsula, WA*, Unpublished report. Perth. W.A.
- Trudgen, M.E. and Associates (2001). *A flora, vegetation and floristic survey of the Burrup Peninsula, some adjoining areas and part of the Dampier Archipelago, with comparisons to the floristics of areas on the adjoining mainland*. Prepared for the Department of Mineral and Petroleum Resources. Perth, WA.
- Trudgen, M.E, Weston, A & long, V (2001) *Burrup Vegetation Classification*. Unpublished Flora List of Burrup Peninsula.
- Victorian Environmental Protection Authority, February 2001. *State Environmental Protection Policy (Ambient Air Quality)*. Victorian Environmental Protection Authority, Melbourne.
- Water Corporation (2001). *Burrup Peninsula Desalinated Water Supplies Project*. Environmental Protection Statement. Prepared by Burns and Roe Worley Pty Ltd. Perth W.A.
- Woodside (1998). *North West Shelf Venture. Additional Liquefied Natural Gas (LNG) Facilities*. Public Environmental Review (WA) and Public Environmental Report (Commonwealth).

Appendix 3

Summary of identification of relevant environmental factors

APPROVED NOT APPROVED
MINISTER FOR ENVIRONMENT AND HERITAGE

Table 1: Summary of identification of relevant environmental factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
BIOPHYSICAL			
Vegetation Communities	The project will directly impact 28 ha of the lease. Seven broad vegetation associations were identified on the plant site and adjacent service corridors, which included 15 different vegetation associations. A number of these vegetation assemblages are considered to be the best examples of such communities on the Burrup. Impacts from the construction of the natural gas pipeline, seawater pipelines and a section of the ammonia pipeline will be assessed separately.	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> Is the proponent now in a position to describe the impacts on vegetation in a regional context? What is the source of gravel fill and is there a procedure to prevent the transfer of weeds? <p>Conservation and Land Management</p> <ul style="list-style-type: none"> Will there be any impacts on the bio-physical attributes of this area from emissions, in particular, the potential effects of SO_x and NO_x emissions on vegetation? <p>Conservation Council of WA</p> <ul style="list-style-type: none"> The proposed site will dissect the tidal inlet itself, the fringing samphire flats, the coastal flats, lower stony hill slopes, higher rocky hill slopes and rocky outcrops. Four vegetation types were considered of high conservation value and removal of vegetation types and individual flora, including Priority 1 species, is unacceptable. It is the contention of the Conservation Council that when being asked to comment on the Burrup fertiliser's proposal the public has not been made sufficiently aware of other projects. These 	Considered to be a relevant environmental factor. It will be assessed under the heading of Terrestrial flora.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		<p>proposals are all intended for the same saline flats area and the cumulative impact of development, particularly the large extent of vegetation destruction has not been properly considered.</p> <ul style="list-style-type: none"> No comprehensive ecological survey work has been undertaken to establish whether or not the Pilbara coastline has the same samphire communities. Such a study should especially focus on species composition. 	
Declared Rare and Priority Flora	<p>No Declared Rare Flora occur within the lease.</p> <p>One Priority 1 species occurs within the lease - <i>Terminalia supranitifolia</i>.</p> <p>Some priority species may be removed during construction.</p>	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> How can <i>Terminalia supranitifolia</i> be removed if Vegetation Type 1a will not be impacted? <p>Conservation Council of WA</p> <ul style="list-style-type: none"> <i>Terminalia supranitifolia</i> has never been grown from seed or cuttings. The removal of Priority 1 species, is unacceptable, advice to Council is that each industrial development may remove between 12-30 Priority 1 species. 	<p>Considered to be a relevant environmental factor. It will be assessed under the heading of Terrestrial flora.</p>
Specially Protected (Threatened) fauna	<p>Four broad fauna habitats were identified on the site.</p> <p>Two Priority 4 Fauna species may occur on the lease – <i>Pseudomys chapmani</i> and <i>Hydromys chrysogaster</i>.</p> <p>The project will have an impact on two species of native terrestrial snails (<i>Pupoides</i> aff. <i>beltinus</i> and <i>P. contraries</i>) and possibly other terrestrial fauna.</p>	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> The results from the proposed trapping programme are essential for an assessment of the impacts of the proposal. These sections in the PER do not adequately assess the possible effects of the proposed project on fauna generally or conservation significant fauna specifically. How are species listed under International treaties likely to be affected? The opportunistic sitings of vertebrate undertaken during the three-day flora survey records only bird species, were other vertebrates sited? The fauna section does not represent a comprehensive list of the data sources. The Fauna species table should be titled Mammal species and has a number of errors. The list of birds known from the Burrup has some omissions. How will the project impact on bird species that are protected under the EPBC Act? <p>Conservation and Land Management</p>	<p>Considered to be a relevant environmental factor. It will be assessed under the heading of Terrestrial fauna.</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		<ul style="list-style-type: none"> • A more comprehensive survey for the endangered Pilbara Olive Python on the lease area would be appropriate. The proponent should liaise with the Department in relation to survey design. • There is not sufficient information to determine the status of some of the snail species now or in the event of disturbance. The commitment to a coordinated regional survey is commendable, but it should be strengthened to include actions within the control of the proponent. A commitment to a targeted area survey prior to commissioning of the plant would be appropriate. • The ephemeral freshwater pools contain freshwater crustaceans and molluscs for which the lifecycles are poorly understood. These communities are being evaluated for potential inclusion on the Departments Threatened Ecological Community database. There is a risk that acidic precipitates could lead to degradation of the pools and result in loss of freshwater biota. Does the proponent plan to have an ongoing evacuation procedure for threatened fauna during operation of the plant? 	
Marine Ecology	<p>The region supports a diverse range of species including fish, molluscs, corals, marine mammals and turtles.</p> <p>Possible impacts from wastewater and contaminated storm water discharge, TBT contamination, ballast water discharge and product spillage.</p> <p>Wastewater will discharge into Water Corporation's brine discharge system.</p>	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> • Have any investigations been done regarding the potential for exotic introductions from ships, given that India has similar water temperature? Does the proponent propose to establish baseline data and then regularly monitor for marine pest species that could potentially be introduced? • Can MDEA end up in the marine environment (via wastewater discharge) and if so what measures will be in place to monitor and manage potential emissions? 	<p>No further assessment by the EPA will be required as part of this proposal. Water Corporation will seek approval for brine and wastewater discharge into the marine environment. The proponent has committed to meet Water Corporation and DEP criteria.</p> <p>DPA will seek approval to dredge the shipping channel. Vessels will be required to meet DPA and AQIS guidelines to manage ballast water.</p>
Landform, drainage and site hydrology, including impacts from flood events.	<p>The plant site consists of five landform features: high scree slopes, Uplands and upper hill slopes, low undulating hill slopes, tidal flats and tidal inlet. The peak water level associated with storm</p>	<p>Soils Commissioner</p> <ul style="list-style-type: none"> • The Commissioner would like to be given the opportunity to comment on adequacy of the proposed "Erosion Control Plan" that the proponent intends developing prior to construction. <p>Conservation Council of WA</p> <ul style="list-style-type: none"> • In the context of possible climate change induced sea level rises, 	<p>No further assessment by the EPA will be necessary as plant is sited to minimise impacts, particularly on rock piles. The plant will be elevated above the storm flood level. Surface drainage will be diverted around the site and water quality</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
	<p>surge for a 1-in-100 year event is 4.8m AHD, within the tidal flats south of the proposed plant site. There are no permanent surface water features.</p> <p>Disturbance from cut and fill operations and construction of access road and product pipelines.</p>	<p>the presentation of a 'one in a hundred year' tide and flood level is misleading. Substantial further research is required to assess possible impact occurrence, such as combined cyclone and king tide event.</p>	<p>monitored. An erosion control plan will be developed and subject to review by the Soils Commissioner.</p>
POLLUTION			
Gaseous and particulate emissions	<p>The plant emissions will be:</p> <p>Nitrogen oxides (NO_x) – 503t/yr Carbon monoxide (CO) – 103t/yr Sulphur dioxide (SO₂) – 0.6t/yr Particulates – small Hydrogen - small Methane - small Ammonia (NH₃) – nil VOC's – nil</p> <p>Ammonia is toxic and odorous.</p> <p>Dust will be generated during the construction phase of the plant.</p>	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> The DEP requests all input data used in modelling and information on how building effects were modelled. Can the proponent indicate what design changes are required to meet BAT for oxides of nitrogen? The exit velocity of the package boiler should be greater than 10 metres per second to avoid wash down of the plume in the lee of the stack. Can the proponent provide an estimate of the quantities of each pollutant that could potentially be vented under worst case emergency shutdown scenarios? Can the proponent provide support for the statement that flaring is extremely unlikely (less than 1-in-100 years). <p>Conservation and Land Management</p> <ul style="list-style-type: none"> Will the proponent commit to a suitable monitoring program to determine the effect of operations on the bio-physical attributes (including vegetation, land snails, freshwater pools and their biota and the petroglyph base-rocks)? An integrated program involving other emission producers in the area should be considered? 	<p>Considered to be a relevant environmental factor.</p>
Greenhouse gases	<p>The plant will produce about 1.4 Mtpa of CO₂.</p>	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> Why is the greenhouse intensity for the proposed plant greater than the new CSBP ammonia plants when the unit energy consumption is less? 	<p>Considered to be a relevant environmental factor.</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		<ul style="list-style-type: none"> Is the proponent aware that a methanol plant may be located adjacent to the ammonia plant and has the proponent had initial discussions to determine if the CO₂ can be used as a feedstock for their process? The PER indicates that there may be potential for the plant to become a future net exporter of power. Please explain. Is the proponent in a position to strengthen the commitment to undertake further investigations into the establishment of tree farms within Australia to sequester carbon dioxide from the atmosphere? 	
Surface water and groundwater quality	<p>All areas of the plant site will be sited on hardstand surfaces above the 1-in-100 year flood line. Clean and potentially contaminated storm waters will be kept separate. All storm waters will be tested prior to discharge back to the environment. Leaks, spills and contaminated stormwater may impact the quality of the surface and groundwater.</p>	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> Can the proponent specify the tests to be conducted on the potentially contaminated storm water and provide details of the type of lining proposed for the sedimentation basin? Can the proponent indicate where the storm water parameters (TSS, pH, turbidity, total hydrocarbons and volumes) will be monitored? Can the proponent provide more details on the lined storage area for hazardous chemicals during construction? 	<p>No further assessment by the EPA will be necessary because the proponent has committed to collect runoff from potentially contaminated areas in lined ponds and to test and treat prior to discharge. Uncontaminated surface waters flows will be diverted around the construction site and into sediment traps and will be tested prior to discharge to the environment.</p>
Liquid and solid waste disposal	<p>All solid waste (domestic and construction) generated during construction will be disposed to Karratha landfill. Liquid wastes will be treated in a wastewater treatment system before entering the marine environment via Water Corporation's discharge system.</p>	<p>No comments received.</p>	<p>Considered to be a relevant environmental factor to ensure that liquid discharges are as low as reasonably practicable and that the proponent can meet Water Corporation and DEP criteria for its wastewater discharge.</p>
Noise and Vibration	<p>Noise and vibration will be generated during the construction and operational phases of the project. The nearest residential area is located in Dampier, about</p>	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> Will the proponent commit to undertaking compliance noise monitoring (including at Hearson Cove) after commissioning? The sound power levels for the acoustic model did not include steam and gas venting. 	<p>Considered to be a relevant environmental factor.</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
	6km from the plant. Hearson Cove Beach is located about 1.2km from the plant.	<ul style="list-style-type: none"> The Traffic Management Plan should include noise minimisation. Community consultation on noise levels at Hearson Cove has not been provided in the PER. The DEP is not convinced that plant noise levels at Hearson Cove will be 10-15 dB(A) less than initial predictions, once attenuation measures are incorporated to achieve compliance with the assigned noise levels at the plant boundary. <p>Conservation Council of WA</p> <ul style="list-style-type: none"> Industry will be visible and audible from Hearson Cove. The combined effect of the developments will greatly increase the prospect of industrial activities being audible from this beautiful beach. 	
Light Overspill	Lighting will be designed to meet best practice and comply with relevant Australian Standards.	No comments received.	No further assessment by the EPA will be required.
SOCIAL SURROUNDINGS			
Risk and Hazards	The operation of the plant, product pipelines and product transfer will lead to an increase in the risk of fatality from the release of hazardous liquids and gases.	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> How are the above ground ammonia pipelines protected from potential vehicular impacts? Is it normal practice for the ammonia remaining in the pipeline to be left to boil and slowly returns to the plant storage tanks? Can the operator stationed at the wharf during the loading operation instantly trigger a shutdown of the pumping operation and appropriate valves, should a leak be detected? <p>Department of Mineral and Petroleum Resources</p> <ul style="list-style-type: none"> Provide justification in terms of consequence distance and/or risk for the proposed 200m exclusion zone around the Dampier Port Authority wharf whilst loading ammonia. The proposed facility will be classified as a Major Hazard Facility and a Safety Report will be required prior to commissioning of the facility. A QRA is required prior to commissioning to verify the 	Considered to be a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		<p>assumptions made in the PRA, and to address a number of specific items, such as full-bore releases, exposure duration for ammonia releases and calculation of accumulated risk.</p> <ul style="list-style-type: none"> • Contact the Explosives and Dangerous Goods Division of MPR at an early stage of the detailed design phase, for <ul style="list-style-type: none"> • Requirements for storage facilities; • Requirements for ammonia pipelines; • Ammonia loading facility; • Scope of work for the QRA; and • Safety Report including SMS. <p>Fire and Emergency Services Association</p> <ul style="list-style-type: none"> • How much ammonia will be carried in the transfer pipe and what would be the consequences of an ammonia escape? • Does the Port of Dampier has all the facilities to enable it to comply with the provisions of AS3846-1998 “The Handling and Transport of Dangerous Cargoes in Port Areas”? • Is sufficient water available for fire fighting and usage as a water curtains for ammonia leakages? • Does WA has an established societal risk criteria. The Netherlands societal risk criteria (in 1992) would place all the values on Figure 8-2 in the range where risk reduction would be desirable. Can the risk associated with a frequency of 5 in a million be reduced for 10 fatalities? • A decommissioning commitment is required to cover the removal and disposal of hazardous waste stored onsite and to leave the site in a safe condition. • Emergency response plans need to be prepared in conjunction with FESA. <p>Conservation and Land Management</p> <ul style="list-style-type: none"> • It would be appropriate to have a point where local brigades and the Department could access water for fighting fires adjacent to the plant without entering the plant site. • The impacts of fire and smoke from a fire adjacent to the plant will need to be considered in the site emergency plan. 	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
Traffic Management	<p>The project is bound by Village Road to the north, Hearson Cove Road to the south and Burrup Road about 1km to the west. All roads are sealed.</p> <p>During construction, traffic along Burrup Road will increase due to construction workforce and transport of materials. Short delays may occur during pipe laying activities.</p> <p>Traffic increase will be minimal during operation.</p>	<p>Main Roads WA</p> <ul style="list-style-type: none"> The construction of a right turn pocket into Village Road and a left turn slip lane from Village Road maybe required. Main Roads WA will need to review the Traffic Management Plan prior to construction. All service crossings of Burrup road reserve will need to be done to Main Roads WA's requirements. OMP is currently considering the option of a conveyor belt to run over Burrup Road. Advise as soon as possible the likely dimensions of the largest prefabricated loads likely to be transported to site. <p>Conservation Council of WA</p> <ul style="list-style-type: none"> Access to other beaches on the Burrup requires 4WD vehicles. From an environmental perspective uncontrolled 4WD activities are not to be encouraged. 	<p>No further assessment by the EPA will be required in view of the proponent's commitment to submit the Traffic Management Plan to Main Roads WA. The plan will address issues raised by Main Roads WA and the Conservation Council of WA.</p> <p>Preliminary data of the largest prefabricated loads has been supplied to OMP.</p>
Aboriginal Culture and Heritage	<p>Of the ten archaeological sites within the project lease, one newly discovered site and two unregistered sites are likely to be disturbed during construction. None of the six registered sites that lie within a 100m of the proposed gas, ammonia and water pipeline routes will be further disturbed.</p>	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> Has a response been provided by the Aboriginal Affairs Department on the results of the archaeological survey work? <p>Conservation and Land Management</p> <ul style="list-style-type: none"> An assessment of the potential impacts on the rock faces of petroglyph sites from acidic precipitates would be appropriate. <p>Yamatji Land and Sea Council</p> <ul style="list-style-type: none"> The Pilbara Native Title Service is aware of only one meeting with the Ngarluma Injibarndi native title group and it was not properly constituted nor recognised as including their interests. No details of the meeting has been provided. The Pilbara Native Title Service is not aware of any heritage surveys with the participation of our clients nor of any efforts to ascertain whether there are any heritage sites that may be affected by the Project. A heritage management plan is a critical tool that will need to be developed in consultation with the Ngarluma Injibarndi group for the long-term management of the heritage values. <p>Conservation Council of WA</p> <ul style="list-style-type: none"> The aesthetics of the Burrup are unparalleled and have inspired a 	<p>No further assessment by the EPA subject to confirmation that representatives of the Aboriginal claimant groups have been adequately consulted.</p> <p>The proponent has committed to the employment of Aboriginal representatives during project works to monitor all ground disturbances and earth works.</p> <p>The impacts from acidic precipitates have been considered elsewhere by the EPA.</p>

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		<p>deep Aboriginal cultural connection with the area. It is unacceptable that these values should be diminished.</p> <p>Aboriginal Affairs Department</p> <ul style="list-style-type: none"> No reference is made in the PER Executive Summary to sites DRD135, P02411 or P01959. The statement in the PER that “none of these (Aboriginal Sites) will be disturbed during the plant construction of operations” needs clarifying. Site DRD135, P02411, P01959 are within or near a services corridor and could be impacted. Section 5.12 of the PER leaves the reader with the impression that the Burrup Peninsula contains little evidence of Aboriginal significance. Impacts upon areas defined as Aboriginal sites should be subject to an application pursuant to Section 18 of the <i>Aboriginal Heritage Act</i>. 	
Visual Amenity and Recreation	<p>The proposed site is currently undeveloped and undisturbed. The plant will be constructed on the low-lying areas of the lease. The average height of the structures will be 12m and up to 65m for CO₂ stripper stack, 30m for ammonia flare and 33m for ammonia storage tanks. The plant will be visible from Burrup Road and Hearson Cove Road, but only the top of a stack is expected to be visible from Hearson Cove.</p> <p>The gas pipeline will be below ground, but the ammonia pipelines will be above ground to facilitate maintenance inspections.</p>	<p>Department of Environmental Protection</p> <ul style="list-style-type: none"> The DEP has some concerns with loss of amenity at Hearson's Cove. It may be appropriate to establish a King Bay - Hearson Cove Industry group to jointly manage amenity, drainage etc in the immediate area. If such a group were to be established, would the proponent be interested in being a member? <p>Conservation Council of WA</p> <ul style="list-style-type: none"> The drive to Hearson Cove, the only easy accessible beach in the area, will now be lined with industry. No diminishing of the aesthetic and environmental values associated with Hearson Cove can be permitted. 	<p>No further assessment by the EPA will be required as the proponent has committed to reducing visual impacts as much as reasonably practicable during all phases of the project. Measures will include selecting colours for the buildings that are in sympathy with the surrounding area, rehabilitating temporary disturbances, maintaining a high standard of housekeeping and designing plant lighting to ensure off-site visual impacts are minimised.</p>

Appendix 4

Recommended Environmental Conditions and Proponent's Consolidated Commitments

Statement No.

RECOMMENDED CONDITIONS AND PROCEDURES

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

AMMONIA PLANT, BURRUP PENINSULA

Proposal: The construction and operation of a 2,200 tonne per day ammonia plant on the Burrup Peninsula, which utilises a modern version of the conventional natural gas-steam reforming process based on the KBR Purifier ProcessTM developed by Kellogg Brown and Root, as documented in schedule 1 of this statement.

Proponent: Burrup Fertilisers Pty Ltd

Proponent Address: Level 8, St George's Square,
225 St George's Terrace, PERTH WA 6000

Assessment Number: 1370

Report of the Environmental Protection Authority: Bulletin 1036

The proposal referred to above may be implemented subject to the following conditions and procedures:

Procedural conditions

1 Implementation and Changes

- 1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions of this statement.
- 1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment and Heritage determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.
- 1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment and Heritage determines, on advice of the Environmental Protection Authority, is not substantial, the proponent may implement those changes upon receipt of written advice.

2 Proponent Commitments

- 2-1 The proponent shall implement the environmental management commitments documented in schedule 2 of this statement.
- 2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of the conditions in this statement.

3 Proponent Nomination and Contact Details

- 3-1 The proponent for the time being nominated by the Minister for the Environment and Heritage under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment and Heritage has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.
- 3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.
- 3-3 The nominated proponent shall notify the Department of Environmental Protection of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

- 4-1 The proponent shall provide evidence to the Minister for the Environment and Heritage within five years of the date of this statement that the proposal has been substantially commenced or the approval granted in this statement shall lapse and be void.

Note: The Minister for the Environment and Heritage will determine any dispute as to whether the proposal has been substantially commenced.

- 4-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement to the Minister for the Environment and Heritage, prior to the expiration of the five-year period referred to in condition 4-1.

The application shall demonstrate that:

- the environmental factors of the proposal have not changed significantly;
- new, significant, environmental issues have not arisen; and
- all relevant government authorities have been consulted.

Note: The Minister for the Environment and Heritage may consider the grant of an extension of the time limit of approval not exceeding five years for the substantial commencement of the proposal.

Environmental conditions

5 Compliance Audit and Performance Review

5-1 The proponent shall prepare an audit program in consultation with and submit compliance reports to the Department of Environmental Protection which address:

- the implementation of the proposal as defined in schedule 1 of this statement;
- evidence of compliance with the conditions and commitments; and
- the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environmental Protection is empowered to audit the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement. Usually, the Department of Environmental Protection prepares an audit table which can be utilised by the proponent, if required, to prepare an audit program to ensure the proposal is implemented as required. The Chief Executive Officer is responsible for the preparation of written advice to the proponent, which is signed off either by the Minister or, under an endorsed condition clearance process, a delegate within the Environmental Protection Authority or the Department of Environmental Protection that the requirements have been met.

5-2 The proponent shall submit a performance review report every five years after the start of the operations phase to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority, which addresses:

- the major environmental issues with the project; the objectives for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those objectives;
- the level of progress in the achievement of sound environmental performance, including industry benchmarking, and use of best available technology where practicable;
- significant improvements gained in environmental management, including the use of external peer reviews;
- stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and
- the proposed environmental objectives over the next five years, including improvements in technology and management processes.

6 Closure Plans

- 6-1 Prior to construction, the proponent shall prepare, and subsequently implement, a Preliminary Closure Plan, which provides the framework to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

The Preliminary Closure Plan shall address:

- 1) rationale for the siting and design of plant and infrastructure as relevant to environmental protection, and conceptual plans for the removal or, if appropriate, retention of plant and infrastructure;
- 2) a conceptual rehabilitation plan for all disturbed areas and a description of a process to agree on the end land use(s) with all stakeholders;
- 3) a conceptual plan for a care and maintenance phase; and
- 4) management of noxious materials to avoid the creation of contaminated areas.

- 6-2 At least six months prior to the anticipated date of closure, or at a time agreed with the Environmental Protection Authority, the proponent shall prepare a Final Closure Plan designed to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

The Final Closure Plan shall address:

- 1) removal or, if appropriate, retention of plant and infrastructure in consultation with relevant stakeholders;
- 2) rehabilitation of all disturbed areas to a standard suitable for the agreed new land use(s); and
- 3) identification of contaminated areas, including provision of evidence of notification and proposed management measures to relevant statutory authorities.

- 6-3 The proponent shall implement the Final Closure Plan required by condition 6-2 until such time as the Minister for the Environment and Heritage determines, on advice of the Environmental Protection Authority, that the proponent's closure responsibilities are complete.

- 6-4 The proponent shall make the Final Closure Plan required by condition 6-2 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

7 Greenhouse Gas Emissions Management Plan

7-1 Prior to commencement of construction of the processing plant, the proponent shall prepare a Greenhouse Gas Emissions Management Plan to:

- ensure that “greenhouse gas” emissions from the project are adequately addressed and best available efficient technologies are used to minimise total net “greenhouse gas” emissions and/or “greenhouse gas” emissions per unit of product; and
- mitigate “greenhouse gas” emissions in accordance with the Framework Convention on Climate Change 1992, and consistent with the National Greenhouse Strategy;

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

This Plan shall include:

- 1) calculation of the “greenhouse gas” emissions associated with the proposal, as indicated in “Minimising Greenhouse Gas Emissions, Guidance for the Assessment of Environmental Factors, No. 12” published by the Environmental Protection Authority;
- 2) specific measures to minimise the total net “greenhouse gas” emissions and/or the “greenhouse gas” emissions per unit of product associated with the proposal;
- 3) monitoring of “greenhouse gas” emissions;
- 4) estimation of the “greenhouse gas” efficiency of the project (per unit of product and/or other agreed performance indicators) and comparison with the efficiencies of other comparable projects producing a similar product;
- 5) analysis of the extent to which the proposal meets the requirements of the National Greenhouse Strategy using a combination of:
 - “no regrets” measures;
 - “beyond no regrets” measures;
 - land use change or forestry offsets; and
 - international flexibility mechanisms.
- 6) a target set by the proponent for the reduction of total net “greenhouse gas” emissions and/or “greenhouse gas” emissions per unit of product over time, and annual reporting of progress made in achieving this target.

Note: In part 5 above, the following definitions apply:

- 1) “no regrets” measures are those that can be implemented by a proponent which are effectively cost-neutral and provide the proponent with returns in savings which offset the initial capital expenditure that may be incurred; and
- 2) “beyond no regrets” measures are those that can be implemented by a proponent which involve some additional cost that is not expected to be recovered.

- 7-2 The proponent shall implement the Greenhouse Gas Emissions Management Plan required by condition 7-1 to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.
- 7-3 The proponent shall make the Greenhouse Gas Emissions Management Plan required by condition 7-1 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

8 Work Practices

- 8-1 Prior to commencement of construction, the proponent shall submit a written prescription for contractor work practices covering plant and pipeline construction and operation, to ensure that work practices are carried out at the level of international best practice, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.
- 8-2 The proponent shall ensure that the prescription of work practices required by condition 8-1 is implemented.

Procedures

- 1 Where the condition states "to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority", the Chief Executive Officer of the Department of Environmental Protection will obtain that advice for the preparation of written advice to the proponent.
- 2 The Environmental Protection Authority may seek advice from other agencies, as required, in order to provide its advice to the Chief Executive Officer of the Department of Environmental Protection.

Notes

- 1 The Minister for the Environment and Heritage will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environmental Protection over the fulfilment of the requirements of the conditions.
- 2 The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the *Environmental Protection Act 1986*.

Schedule 1

The Proposal (Assessment No. 1370)

The proposal is to construct and operate an ammonia plant on the Burrup Peninsula, approximately 1300 kilometres north of Perth. The location of the plant is in the King Bay-Hearson Cove Industrial Area, as shown in Figure 1 (attached). The plant site has an area of approximately 72 hectares. The actual plant will occupy an area of approximately 16 hectares.

The ammonia plant will utilise an excess air reforming process based on the KBR Purifier ProcessTM developed by Kellogg Brown and Root. The plant at design capacity will consume about 74 terajoules of natural gas per day to produce 2,200 tonne per day of ammonia. The ammonia is to be stored as a liquid in either of two 40,000 tonne refrigerated atmospheric pressure ammonia storage tanks, prior to export.

The main characteristics of the proposal are summarised in Table 1 below.

Table 1: Summary of key proposal characteristics

Characteristic	Description														
Project Purpose	To produce liquid ammonia from natural gas using advanced production technology.														
Project Life	25+ years														
Plant Capacity	2,200 tonnes per day (design case); 770,000 tonnes per day														
Area of Project Lease	72 hectares														
Area of Disturbance	<table> <tr> <th>Item</th><th>Area (hectares)</th></tr> <tr> <td>Ammonia plant</td><td>16.0</td></tr> <tr> <td>Laydown area</td><td>8.0</td></tr> <tr> <td>Desalination plant proposed by Water Corporation</td><td>1.0</td></tr> <tr> <td>Access road and product pipeline to plant</td><td>2.4</td></tr> <tr> <td>Total</td><td>27.4</td></tr> <tr> <td>Approximately</td><td>28 (maximum)</td></tr> </table>	Item	Area (hectares)	Ammonia plant	16.0	Laydown area	8.0	Desalination plant proposed by Water Corporation	1.0	Access road and product pipeline to plant	2.4	Total	27.4	Approximately	28 (maximum)
Item	Area (hectares)														
Ammonia plant	16.0														
Laydown area	8.0														
Desalination plant proposed by Water Corporation	1.0														
Access road and product pipeline to plant	2.4														
Total	27.4														
Approximately	28 (maximum)														
Plant Facilities	Administration, maintenance and warehouse unit Ammonia storage unit Pumps and refrigeration unit Utility unit Control room Ammonia process unit Cooling tower														
Plant Operation	24 hours per day, 350 days per year (design case)														
Shutdown Time	Planned shutdown – 10 days per annum Emergency shutdown – 5 days per annum for 4 hrs per day														
Ammonia Storage	2 x 40,000 tonne cryogenic, double-walled, double integrity tanks														
Potable Water	7-10 kilolitres per hour														
Seawater	Approximately 1.6 megalitres per hour; 38 megalitres per day														
Power Generation	Internal generation. Two (1 x operating 100% capacity and 1 x operating 25% capacity) 20 megawatts steam turbine generators. Supply of energy (approx 4 megawatts of electricity) to the desalination plant.														
Power Export	None														
Emergency Power	Two emergency diesel generators (2.0 megawatts) for start-up power. May also provide power for construction.														
Steam Generation	Two (1 x operating and 1 x standby) 100 tonne per hour of medium pressure steam for plant start-up														
Low Pressure Steam Export	Capacity for about 10 tonne per hour														

Characteristic	Description		
Energy Efficiency	Approximately 29.7 ~ 29.9 megajoules per tonne of ammonia (ammonia plant); Approximately 32.6 megajoules per tonne of ammonia (entire project including shipping, transport of product, cooling etc.)		
Natural Gas Input	Approximately 74 terajoules per day		
Natural Gas Pipeline	Approximately 1.3 kilometres; below ground; from the Dampier to Bunbury Natural Gas Pipeline to the plant; to be constructed by Apache Energy.		
Seawater Pipeline	Approximately 1.2 kilometres; likely to be below ground; from desalination plant to connect to brine discharge line along Burrup Road, to be constructed by Water Corporation.		
Ammonia Pipeline	Approximately 4.3 kilometres; above ground; from the plant to the Dampier Public Wharf.		
Catalysts	Aluminium, cobalt, copper, iron, magnesium , molybdenum and nickel oxides.		
Approximate Gaseous Emissions under Normal Operations:	Daily Load (kilogram s per day)	Per tonne NH ₃ (kilograms per tonne)	Annual Load (tonnes per year)
NO _x	1439	0.65	503
CO ₂	4.03 x 10 ⁶	1832	1,411,000
CO	295	0.13	103
SO ₂	1.7	0.0008	0.6
NH ₃	Nil	Nil	Nil
VOC	Nil	Nil	Nil
Wastewater Discharges:	Annual Load (kilograms per year)		
Heavy metals	Negligible/background		
Ammonia (as N)	1		
Phosphorus (total)	36.5		
Nitrogen (total)	73		
Methanol	1		
Solid Waste:	Approximate quantities of solid wastes produced:		
Demineraliser Spent (Cation/Anion Resin)	27 tonnes every 3 years (Di-vinyl Benzene, Polystyrene Resin)		
Desulphuriser Spent Catalyst	33 tonnes every 3 years (zinc oxides); 16 tonnes every 6 years (cobalt and molybdenum oxides)		
Biosolids	Stabilised biosolids from wastewater treatment plant		
Domestic Waste	Variable quantity disposed to landfill weekly.		
Construction Period	Approximately 20 months		

Schedule 2

***Proponent's*
Environmental Management Commitments**

6 December 2001

AMMONIA PLANT,
BURRUP PENINSULA (Assessment No. 1370)

BURRUP FERTILISERS PTY LTD



Figure 1. Project location (Source: Figure 2.1 SKM, 2001)

Proponent's Consolidated Commitments (Assessment No. 1370)

No	Topic	Action	Objective	Timing	Advice
1	Environmental management	<p>1) Prepare an Environmental Management System (EMS) to include procedures for:</p> <ul style="list-style-type: none"> a) Auditing; b) Reporting; c) Record and communication management; d) Monitoring; e) Checking and corrective actions; f) Environmental training; and g) Registering and responding to public complaints. <p>2) Implement the EMS.</p>	To manage environmental aspects of the development and minimise environmental impacts.	<p>Prior to construction commencing.</p> <p>Pre-commissioning</p>	
2	Environmental management	<p>Prepare a Construction Environmental Management Program (EMP) for construction of the plant and infrastructure. The program will outline responsibilities and obligations. The Construction EMP will incorporate the following plans:</p> <ul style="list-style-type: none"> • Rehabilitation; • Weed Management; • Traffic Management; • Water Quality Management; • Erosion Control; • Dust Management; • Blasting Management; • Noise Management; • Waste Management; and • Hazardous Materials Management. 	To manage all relevant environmental factors associated with the construction phase of the project.	Pre-construction	
3		<p>Prepare a Rehabilitation Plan that includes:</p> <ul style="list-style-type: none"> • procedures for rehabilitating areas of 	To maintain biodiversity and ecosystem integrity and	Pre-construction	CALM

		<p>temporary disturbance;</p> <ul style="list-style-type: none"> the requirement to backfill all excavations and revegetate with local native species; and the attempt to replace Priority 1 flora (<i>Terminalia supranitifolia</i>) that will be disturbed as a result of this proposal. <p>Implement the Rehabilitation Plan.</p>	<p>minimise impacts on visual amenity</p>	<p>Within 12 months following commissioning.</p>	
4		<p>Prepare a Weed Management Plan that includes ensuring fill is obtained from a suitable weed-free source.</p> <p>Implement the Weed Management Plan.</p>	<p>To prevent the spread of weeds and the introduction of new weed species.</p>	<p>Pre-construction</p> <p>During construction</p>	<p>CALM</p>
5		<p>Prepare a Traffic Management Plan that includes the requirement for all vehicles to keep to designated tracks.</p> <p>Implement the Traffic Management Plan.</p>	<p>To minimise potential traffic impacts and ensure safety of public during construction.</p>	<p>Pre-construction</p> <p>During construction</p>	<p>Main Roads WA</p>
6		<p>Prepare a Water Quality Monitoring Plan that includes procedures for testing, monitoring and reporting levels of contaminants in stormwater and liquid waste streams to meet DEP and WC acceptance criteria, before discharge off-site.</p> <p>Implement the Water Quality Monitoring Plan.</p>	<p>To maintain the quality of surface, marine and groundwater.</p> <p>To meet water quality acceptance criteria as defined by ANZECC guidelines.</p>	<p>Pre-construction</p> <p>During construction</p>	<p>WC</p>
7		<p>Prepare an Erosion Control Plan that includes procedures for testing, monitoring and reporting of turbidity and sediment loads.</p> <p>Implement the Erosion Control Plan.</p>	<p>To maintain the quality of surface water and marine water and to prevent the off-site deposition of sediment.</p> <p>To identify erosional features.</p>	<p>Pre-construction</p> <p>During construction</p>	<p>Commissioner of Soil and Land Conservation</p>
8		<p>Prepare a Dust Management Plan that includes:</p> <ul style="list-style-type: none"> procedures for controlling dust emissions; and monitoring and auditing procedures. <p>Implement the Dust Management Plan.</p>	<p>To ensure that dust does not cause an environmental or human health problem or adversely impact on amenity.</p>	<p>Pre-construction</p> <p>During construction</p>	
9		<p>Prepare a Blasting Management Plan that</p>	<p>To ensure that dust does not</p>	<p>Pre-construction</p>	

		includes dust management strategies, if blasting is required. Implement the Blasting Management Plan, if required.	cause an environmental of human health problem or adversely impact on amenity.	During construction	
10		Prepare a Noise Management Plan. Implement the Noise Management Plan.	To ensure that construction noise emissions comply with Regulations and meet EPA objectives to protect amenity at Hearson Cove.	Pre-construction During construction	
11		Prepare a Waste Management Plan based on a waste management hierarchy, which includes procedures for monitoring, recording and reporting waste quantities during construction. Implement the Waste Management Plan.	To minimise potential for groundwater and surface water contamination or risk to public health.	Pre-construction During construction	
12		Prepare a Hazardous Materials Management Plan that includes: <ul style="list-style-type: none"> • procedures for maintaining an inventory of hazardous materials, storage; • handling requirements; and • emergency response. Implement the Hazardous Materials Management Plan.	To minimise potential for groundwater and surface water contamination or risk to public health.	Pre-construction During construction	MPR
13		Prepare an Operation Environmental Management Program (EMP) for the operational phase of the plant. The program will incorporate the following plans: <ul style="list-style-type: none"> • Saline Water Spill Contingency; • Ammonia Spill Contingency; • Waste Management; • Hazardous Materials Management; • Erosion Control; • Water Quality Monitoring; and • Environmental Emergency Response. 	To manage all relevant environmental factors associated with the operational phase of the project.	Pre-commissioning	
14		Prepare a Saline Water Spill Contingency Plan that includes details for the continuous	To minimise potential for groundwater and surface water	Pre-commissioning	

		monitoring of seawater cooling circuits for pressure, flow and temperature and management measures to minimise impacts from potential spills and to prevent recurrence. Implement the Saline Spill Contingency Plan.	contamination.	As required	
15		Prepare an Ammonia Spill Contingency Plan that includes procedures to ensure that the transfer of ammonia from the plant to the ship is carefully controlled and management measures to minimise impacts from potential spills and to prevent recurrence. Implement the Ammonia Spill Contingency Plan.	To minimise the potential for spillage of ammonia and potential impacts on water quality, the marine environment and public health.	Pre-commissioning As required	MPR
16		Prepare a Waste Management Plan based on a waste management hierarchy and includes procedures for monitoring, recording and reporting waste quantities during operation. Implement the Waste Management Plan.	To minimise potential for groundwater and surface water contamination or risk to public health.	Pre-commissioning During commissioning	
17		Prepare a Hazardous Materials Management Plan that includes procedures for maintaining an inventory of hazardous materials, storage and handling requirements and emergency response during operation. Implement the Hazardous Materials Management Plan.	To minimise potential for groundwater and surface water contamination or risk to public health.	Pre-commissioning During commissioning	MPR
18		Prepare an Erosion Control Plan that includes procedures for testing, monitoring and reporting of turbidity and sediment loads. Implement the Erosion Control Plan.	To maintain the quality of surface water and marine water and to prevent the off-site deposition of sediment. To identify erosional features.	Pre-commissioning During commissioning	Commissioner of Soils and Land Conservation
19		Prepare an Environmental Water Quality Monitoring and Management Plan that includes: <ul style="list-style-type: none"> procedures for testing, monitoring and reporting levels of contamination in stormwater and process liquid waste 	To maintain the quality of surface, marine and groundwater.	Pre-commissioning	WC

		<p>streams to meet DEP and WC acceptance criteria, prior to discharge off-site;</p> <ul style="list-style-type: none"> • a clear outline of monitoring points and parameters that will be measured at each point; • monitoring of methyl diethanolamine in stormwater discharge in the event of a spill; and • specification of water quality acceptance criteria as defined by the DEP and WC and clearly defined criteria that trigger management action. <p>Implement the Environmental Water Quality Monitoring and Management Plan.</p>		During commissioning	
20		<p>Prepare an Environmental Emergency Response Plan that includes the impacts of fire and smoke from adjacent plants and any other emergency situations of adjacent plants.</p> <p>Implement the Environmental Emergency Response Plan.</p>	To ensure that the risk to the environment is as low as reasonably practicable and complies with acceptable standards.	<p>Pre-commissioning</p> <p>During commissioning</p>	FESA
21	Terrestrial flora	<p>Prepare a Terrestrial Flora Management Plan that includes:</p> <ul style="list-style-type: none"> • plant and infrastructure layout and laydown areas designed to minimise impacts on terrestrial flora. Adequate guidance will be provided in the Construction EMP; • seed collection from the site and immediate vicinity (especially Dolichandrone heterophylla); and • germination trials at a local nursery for several prominent flora species, including the Priority 1 species Terminalia supranitifolia. <p>Implement the Terrestrial Flora Management Plan.</p>	<p>To minimise the removal of vegetation, particularly avoiding landforms associated with significant vegetation (rockpiles, high scree slopes, drainage lines, low-lying grassed slopes, samphire communities and areas of marine influence), where practicable.</p> <p>To collect an adequate stock of seed for rehabilitation.</p> <p>To develop suitable techniques for the re-establishment of native vegetation on disturbed areas of the project lease.</p>	<p>During detailed engineering design phase.</p> <p>Pre-construction</p>	CALM

22	Terrestrial fauna	<p>Prepare a Terrestrial Fauna Management Plan that includes:</p> <ul style="list-style-type: none"> • cataloguing the presence and quantity of mounds and burrows made by the Pebble Mound Mouse (<i>Pseudomys chapmani</i>); • monitoring burrows to determine if the Pale Field-rat (<i>Rattus tunneyi</i>) is present in the area; • following approved evacuation procedures if active mounds and burrows are identified; and • contributing to research programs investigating the Pilbara Olive Python, <i>Planigale</i> sp. and “<i>Lerista “muelleri”</i>” on the Burrup Peninsula. <p>Implement the Terrestrial Fauna Management Plan.</p>	<p>To monitor the presence of significant fauna.</p> <p>To minimise the disturbance and loss of significant fauna.</p>	<p>Pre-construction</p> <p>During construction (complete catalogue prior to construction then update on a biannual basis thereafter).</p>	CALM
23	Topography and landform	Source fill and gravel as approved by the Shire of Roebourne.	To ensure that no potential adverse impacts occur as a result of the introduction of unsuitable fill and gravel.	Pre-construction.	Shire of Roebourne
24	Stormwater	<p>Design a stormwater drainage system that will:</p> <ul style="list-style-type: none"> • separate potentially contaminated stormwater from clean stormwater;. • divert surface water flows around the plant site; and • incorporate lined storage basins for potentially contaminated stormwater. <p>Construct the stormwater drainage system as designed.</p>	To minimise potential for groundwater and surface water contamination or risk to public health.	<p>During design phase.</p> <p>During construction</p>	
25	Noise	<p>Prepare a Noise Management Plan that includes:</p> <ul style="list-style-type: none"> • the adoption of noise attenuation measures to meet objectives (indicative overall plant sound power level would be about 115 dB(A), based on preliminary modelling); and 	To ensure that noise emissions comply with the Regulations and meet EPA objectives to protect amenity at Hearson Cove.	During design phase	

		<ul style="list-style-type: none"> the installation of silencers on gas and steam vents. <p>Implement the Noise Management Plan.</p>		During construction	
26	Marine water	Offer to join the committee of Terminal Operators under Dampier Port Authority jurisdiction.	To assist in the implementation of the Dampier Port Authority's Marine Pollution Contingency Plan.	Pre-commissioning.	DPA
27	Gaseous emissions	<p>Investigate and report on the feasibility of:</p> <ul style="list-style-type: none"> meeting Best Available Techniques for reformer gas emissions (75 ppmv); and flaring hydrogen and methane. 	To minimise the potential impacts on the environment, human health and amenity from gaseous emissions.	During design phase.	
28	Greenhouse gas emissions	<p>Investigate measures to further reduce emissions of greenhouse gases by:</p> <ul style="list-style-type: none"> continuing discussions with potential downstream processing facilities on the Burrup to take carbon dioxide off gas; undertaking further investigations into the establishment of tree farms to sequester carbon dioxide from the atmosphere; and generating power to replace other non-renewable fuels. <p>Adopt practicable and feasible measures to offset carbon dioxide.</p>	To minimise emissions of greenhouse gas to atmosphere in accordance with Commonwealth and State policies.	Ongoing.	
29	Greenhouse gas emissions	Enter the Greenhouse Challenge.	To minimise emissions of greenhouse gases to atmosphere in accordance with Commonwealth and State policies.	Pre-commissioning with ongoing participation, thereafter.	
30	Liquid Wastes	Treat liquid waste streams to reduce concentrations of total dissolved solids, chlorine, biocides, ammonia, methanol, phosphorus and nitrogen as low as reasonably practicable and for waste streams to meet Water Corporation and DEP acceptance criteria, prior to discharge into the saline water outlet pipeline.	To minimise potential for groundwater and surface water contamination or risk to public health.	During design phase.	

31	Liquid Wastes	Contain methyl diethanolamine solution within a closed pipeline loop that can be drained to a sump.	To maintain the quality of surface and groundwater and protection of ecosystems or risk to public health.	During design phase.	
32	Risk	Submit a Safety Report, including the details of the Safety Management System and a QRA for the operations of the plant, export pipeline and the loading facility.	To ensure that the risk to the public is as low as reasonably practicable and complies with acceptable standards.	Pre-commissioning	MPR (to the satisfaction of the Chief Inspector of the Explosives and Dangerous Goods)
33	Risk	The plant and export facility will include the following: <ul style="list-style-type: none"> the storage of ammonia in refrigerated and double walled, double integrity tanks; emergency release couplings to close wharf isolation valves; an ammonia transfer Emergency Shutdown System automatically activated on a no-flow or flow differential signal; water curtains/sprays at the ammonia distillation, ammonia scrubber and ammonia refrigeration sections; and barriers along sections of the ammonia export line, if recommended in the QRA. 	To ensure that the risk to the public is as low as reasonably practicable and complies with acceptable standards.	During design phase	MPR
34	Risk	Ammonia loading risk mitigation measures will include: <ul style="list-style-type: none"> stationing an operator at the wharf throughout the loading operation with access to an emergency shutdown button; monitoring the loading operation continuously by plant personnel from the control room via camera surveillance; and ceasing all other activity on the wharf during ammonia loading operations. 	To ensure that the risk to the public is as low as reasonably practicable and complies with acceptable standards.	During ammonia loading operation.	
35	Risk	Revise the size of the ammonia loading exclusion zone (currently proposed to be 200m) at the wharf, based on risk assessment (not	To ensure that the risk to the public is as low as reasonably practicable during ammonia	Pre-commissioning	MPR

		annualised) or consequence analysis.	loading.		
36	Risk	Provide access to fire fighting water outside of plant site.	To facilitate fire fighting for CALM and fire brigade.	Pre-commissioning	
37	Aboriginal Heritage	<p>Prepare an Aboriginal Heritage Management Plan that includes:</p> <ul style="list-style-type: none"> • employing Aboriginal representatives to monitor all ground disturbances and earthworks; • establishing an Aboriginal cultural awareness program and include within employee induction and training programme; • restricting access to Aboriginal heritage sites; and • assisting with the protection and management of heritage sites adjacent to the proposed lease area. <p>Implement the Aboriginal Heritage Management Plan.</p>	To ensure that changes in the biological and physical environment resulting from the proposal do not adversely affect cultural associations of the project lease.	Pre-construction	DIA
				During construction	
38	Visual amenity	<p>Prepare a Visual Amenity Plan that includes: colour buildings to blend into the surrounding terrain, where possible; and</p> <ul style="list-style-type: none"> • maintaining a good housekeeping standard. • Implement the Visual Amenity Plan. 	To minimise potential impacts on visual amenity.	During design phase	
				Construction	
39	Regional environmental impacts	<p>Seek membership to a King Bay – Hearson Cove industry group (if such a group is developed). Participate and assist in the following recommended objectives of the industry group:</p> <ol style="list-style-type: none"> develop a long-term monitoring/management plan for the King Bay-Hearson Cove Industrial Area; coordinate a regional survey of molluscan fauna; coordinate infrastructure and services on the Burrup Peninsula; develop a Burrup Industrial Integrated Emergency Plan; 	<p>To minimise the impacts of industry on the environmental attributes of the King Bay – Hearson Cove Valley.</p> <p>To increase knowledge base of existing status and distribution of molluscan fauna.</p> <p>To create synergies with other industries and to ensure that infrastructure and services are not constrained.</p> <p>To ensure that the risk to the public is as low as reasonably practicable and complies with</p>	During operation.	OMP CALM Shire of Roebourne MRWA MPR

		e) coordinated cumulative noise monitoring at Hearson Cove; and f) collaborative study investigating measures to minimise injury to birds and to encourage their continual residence on the Burrup.	acceptable standards.		
40	Plant decommissioning	Remove all equipment, waste products and foundations to a depth of 400 millimetres and ensure that the plant site is restored as near as possible to its 'as found' and safe condition.	To restore the project lease as near as possible to its 'as found' condition. To ensure that the site is left in a safe condition and there is no risk to public safety.	Decommissioning.	
41	Plant decommissioning	In the event that the plant is shut down for an extended period (more than 3 months), it will be placed under care and maintenance and will be maintained by allocated care and maintenance support personnel.	To ensure that the plant is kept in a 'ready' and 'working order' state for start-up until ammonia production recommences.	Decommissioning.	

Abbreviations

DEP – Department of Environmental Protection

MPR – Department of Mineral and Petroleum Resources

CALM – Department of conservation and Land Management

DIA – Department of Indigenous Affairs

MRWA – Main Roads Western Australia

DPA – Dampier Port Authority

Shire – Shire of Roebourne

OMP – Office of Major Projects

DOLA – Department of Land Administration

FESA – Fire and Emergency Services Authority

WC – Water Corporation

QRA – Quantitative Risk Assessment

Appendix 5

Summary of submissions and proponent's response to submissions

1. General

1. *The DEP has some concerns with loss of amenity at Hearson's Cove. It may be appropriate to establish a King Bay - Hearson Cove Industry group (similar to Kwinana Industry Council) to jointly manage amenity, drainage etc in the immediate area. If such a group were to be established, would the proponent be interested in being a member?*

Answer 1

Yes, in the event that a King Bay – Hearson Cove Industry group is developed (similar to the Kwinana Industry Council) the Proponent will be pleased to become a member. Burrup Fertilisers will commit to seeking membership in the event that such an industry group is developed:

Commitment 40: *Seek membership to an industry group if such a group is developed for the King Bay – Hearson Cove Industrial Area. The Proponent will be prepared to participate and assist in the following recommended objectives of the industry group:*

- a) Develop a local management plan for the King Bay-Hearson Cove Valley (formerly PER Commitment 6.1.1.9).*
- b) Coordinate a regional survey of molluscan fauna (formerly PER Commitment 6.1.2.3).*
- c) Coordinate infrastructure and services on the Burrup Peninsula (formerly PER Commitment 8.1.1).*
- d) Develop a Burrup Industrial Integrated Emergency Plan (formerly PER Commitment 8.2.1.3).*
- e) Coordinate cumulative noise monitoring at Hearson Cove (additional commitment).*
- f) Collaborative study investigating measures to minimise injury to birds and to encourage their continual residence on the Burrup (additional commitment).*

2. *The DEP notes that the proponent refers to a constraints mapping study of the King Bay – Hearson Cove Valley. Can the proponent provide more information on this study, as well as details of the local management strategy to manage and monitor potential impacts of industry in this area?*

Answer 2

The constraints mapping study is being developed by Office of Major Projects (formerly Department of Resources Development) and will be based upon the results of the Burrup Vegetation Survey. The mapping study is expected to be completed in the fourth quarter of 2001.

The local management strategy will be developed jointly between industry and government agencies as part of a policy to manage industry in the King Bay-

Hearson Cove valley. The strategy will be a long term one developed in consultation with the Department of Environmental Protection. The local management strategy will address the issues of cumulative impacts of industry on the surrounding environment.

As stated in the PER document (page 80), the Proponent will participate and assist in a government coordinated local management plan for the King Bay – Hearson Cove valley (**Commitment 40(a)**, formerly PER Commitment 6.1.1.9).

3. *CALM notes that a number of components of the project are mentioned but not specifically addressed in this PER:*
- ❑ *The gas supply pipeline for the plant – Section 4.4.2 Natural Gas Supply Pipeline*
 - ❑ *The seawater desalination plant and associated pipelines and the impact of discharge waste water into King Bay – Sections 4.3.2.6 Thermal desalination Plant, 4.4.6 Water Supply and Treatment, 7.1.1.4 Waste Water Discharge*
 - ❑ *Capital & maintenance dredging – Sections 6.2.4 Capital Dredging & 7.1.1.7 Maintenance Dredging*
 - ❑ *The above ground ammonia pipelines – Section 4.4.3 Product Pipelines*

CALM considers that as these components are excluded from the PER, a comprehensive assessment of the environmental impacts of the total project is not possible.

Answer 3

The first three components of the project as listed above will be constructed by others, as stated in the executive summary of the PER document (page ii). The natural gas pipeline will be constructed by Apache Energy, the seawater desalination plant will be constructed by the Water Corporation and dredging will be undertaken by the Dampier Port Authority. Separate environmental assessment and approvals will be undertaken by each of the relevant Proponents and as such these components were not specifically addressed in the PER document.

The ammonia pipelines are discussed in Section 4.4.3 of the PER document. The ammonia export and recirculation pipelines will run from the Dampier Public Wharf along the Burrup West service corridor, underneath Burrup Road via culverts then along the road reserve bordering the northern boundary of the project lease.

The Burrup West multi-user service corridor is being developed by the Office of Major Projects (formerly Department of Resources Development) and this area will be cleared and levelled by the Department. Hence, environmental assessment and approvals will be subject to a separate process to this project.

The ammonia pipeline route along the northern boundary of the project lease will be located within the Hearson Village Road reserve that has been previously disturbed and currently contains a fresh water pipeline. This pipeline is a remnant of the Woodside construction camp which was rehabilitated in 1991 and currently supplies fresh water to users from the existing water tanks north of the project lease.

A 10 metre wide corridor will be required to construct the ammonia pipelines. Impacts on terrestrial vegetation and fauna habitats within the Hearson Village Road reserve will be addressed during the spring vegetation survey and impacts within the Burrup West multi-user service corridor will be addressed by the Office of Major Projects.

4. *DOLA notes that the PER states on page 13 that a lease for the 72 hectare site will be sought from the State (through DOLA). This should be amended to (through Landcorp).*

Answer 4

The Proponent acknowledges that the 72 hectare project lease will be sought from the State (through LandCorp).

5. *DOLA advises that titles are required for three easements for the ammonia export pipelines to the Dampier Public Wharf. The first will be under the Land Administration Act, the Second will be granted by Landcorp and the third by the Dampier Port Authority.*

Answer 5

The PER document states in Section 2.2 that two easements for the ammonia export pipelines will be required. The Proponent acknowledges that in fact three easements will be required. The first easement will be granted through DOLA under the *Land Administration Act*, the second will be granted by Landcorp and the third by the Dampier Port Authority under the *Port Authorities Act*.

6. *The Commissioner for Soil and Land Conservation notes that the commitments contained at 6.1.3.3, 6.1.3.4, 6.1.4.3 and 6.1.4.4 are intended to deal with the Commissioner of Soil and Land Conservation concerns about likely soil erosion. The Commissioner would like to be given the opportunity to comment on adequacy of the proposed "Erosion Control Plan" that the proponent intends developing prior to construction (Commitment 6.1.4.4).*

Answer 6

To ensure the Commissioner of Soil and Land Conservation is given the opportunity to comment on the proposed Erosion Control Plan, the Proponent will specify the Commissioner as an advising agency for the development of the

Erosion Control Plan (**Commitments 2.6 and 4.5**, formerly PER Commitment 6.1.4.4). This will require Burrup Fertilisers to submit the Erosion Control Plan to the Commissioner for review prior to obtaining approval for the Plan from the Department of Environmental Protection.

7. *The Shire of Roebourne considers the main issue that is not addressed in the PER is the maintenance and/or rehabilitation of the site, if the plant is either temporarily or permanently de-commissioned. It considers that clear requirements and performance guarantee arrangements for the maintenance of the plant during a temporary de-commissioning phase and the rehabilitation of the site and any associated "off-site" works if the plant is permanently de-commissioned should be an integral part of any development approval for this or any other similar plant.*

Answer 7

The proposed ammonia plant is expected to have an operating life of at least 25 years with the potential to increase the operating life of the plant for a further 25 years. The Proponent is seeking a 25 year lease for the project site with a possible extension to another 25 years.

It is unlikely that the plant will be temporarily decommissioned. In the event that the plant is shut down as a result of economic downturn the plant will be placed under care and maintenance. During this time the plant will be maintained by allocated care and maintenance support personnel (**Commitment 42**). The plant will be kept in a 'ready' and 'working order' state for start-up until ammonia production becomes economically viable or in the event that the operations are purchased by an interested party.

When the plant is decommissioned at the end of its operating life, the plant site will be returned to its 'as found' condition as far as practicable. All components, structures, pipelines, waste etc will be removed from the plant site to a depth of up to 400mm below the surface. There will be some concrete foundations below this depth which will remain in situ. The project site will be shaped to blend into the surrounding terrain, ripped along the contour to prevent erosion and revegetated.

Unlike the mining industry there currently is no legislative requirements for downstream processing industry to have funds secured as 'performance bonds' to guarantee that sufficient funds are available for rehabilitation. However, to ensure that future obligations for decommissioning and rehabilitation are met, Burrup Fertilisers will sell its assets at an estimated value of \$1 billion to fulfil the requirements for decommissioning and rehabilitation.

2. Emissions to Air

8. *The DEP commends the proponent for adopting good engineering practice to limit emissions to acceptable levels. The DEP however, requests that SKM provides all input data used in modelling (as per DEP modelling guidelines), together with information on how building effects were modelled.*

Answer 8

Full input data used for a typical DISPMOD model run are presented in **Appendix A** of this document with an output file for an Ausplume model run presented in **Appendix B**. The DISPMOD input files were based on files developed for existing sources in the region by the DEP as part of the Pilbara Airshed Study. These input files were changed to group some of the minor sources together and to specify constant maximum emission rates for the Hamersley Iron and Woodside sources. The assumption of maximum emission rates resulted in slightly higher emissions than at average conditions, but had a minimal impact on predicted ground level concentrations. Additional input data for the proposed Plenty River plant was obtained from the Plenty River CER (Woodward Clyde, 1998), with data for the Syntroleum Plant obtained from the revised information made available to the DEP in 2001 (DEP, 2001). Building wake impacts of the plant were assessed using Ausplume. Building and structure dimensions were obtained from site diagrams as listed in **Appendix B**.

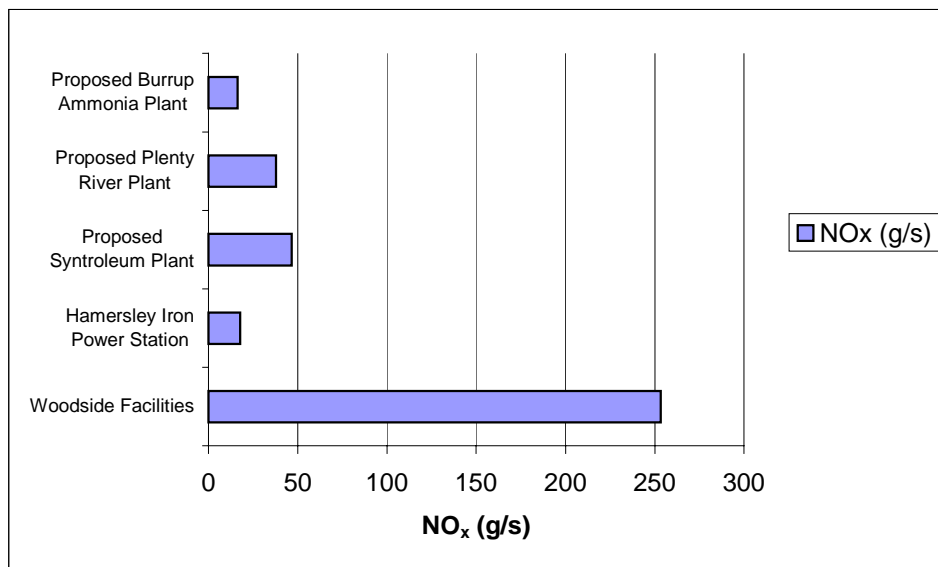
9. *CALM advises that research into and an assessment of the risk to the bio-physical attributes of this area from emissions would be appropriate prior to environmental approvals. Attributes should include vegetation, land snails, freshwater pools and their biota and the petroglyph base-rocks. A commitment to a suitable monitoring program to determine the effect of operations on these attributes should be included with the detail of the program, reporting procedures and management strategies addressed through the environmental management plan. An integrated program involving other emission producers in the area should be considered. Could the proponent please comment on this request?*

Answer 9

The proposed ammonia plant will be one of the smallest contributors to atmospheric emissions in the region (refer to **Figure 2-1**). There is currently no available information to the Proponent regarding any previous assessments that have been undertaken by industry in the area. There is also a lack of Australian (arid climate) criteria for determining impacts of NO_x, SO_x and ammonia on vegetation. The World Health Organisation (WHO) Guidelines for Europe (WHO, 2000) provide some criteria for temperate vegetation in Europe and North America. However, no criteria is specified for areas outside of Europe (pers. comm. F. Murray, Murdoch University). The WHO guidelines nominate the following critical levels (although preliminary due to insufficient data):

- ❑ 75 µg/m³ for NO_x as a 24-hour mean;
- ❑ 270 µg/m³ for NH₃ as a 24-hour mean;
- ❑ 30 µg/m³ for NO_x as an annual mean; and
- ❑ 8 µg/m³ for NH₃ as an annual mean.

Figure 2-1 Nitrogen Oxide Contributors to the Study Region



Atmospheric modelling of the ammonia plant in isolation predicts that maximum 1-hour NO_x concentrations will be 37 µg/m³. Using the DISPMOD model the predicted 24-hour mean of NO_x is 13.2 µg/m³. This emission of NO_x represents 17% of the guideline specified by WHO. On an annual basis, taking into consideration normal operations and maintenance and start-up conditions the annual mean of NO_x from the ammonia plant will be about 1.4 µg/m³ which is 5% of the WHO guideline.

With respect to emissions of ammonia (NH₃), it is very unlikely that the proposed ammonia plant will emit ammonia vapours to the atmosphere. It has been estimated in the PER document (Section 7.2.1.10) that the probability of such an event occurring will be less than 1-in-100 years. In the event that flaring does occur, the maximum 3-minute concentrations will be 1500 µg/m³ at the emission source reducing to 250 µg/m³ at Hearson Cove due to dispersion. Following dispersion the emission of ammonia is well below the 270 µg/m³ guideline specified by WHO.

Flaring will only occur as a single event and will not be continuous over a sustained period. As such it is not appropriate to estimate an annual mean for comparison with the WHO guideline.

On a cumulative basis there is potential for industry emissions to impact surrounding vegetation, land snails, freshwater pools and their biota and the petroglyph base-rocks. Using the DISPMOD model the predicted cumulative 24-hour mean of NO_x is 60 µg/m³ which is well below the WHO guideline of 75 µg/m³. On a cumulative annual mean basis it is predicted that NO_x will be 7.9 µg/m³ which is well below the 30µg/m³ WHO guideline.

As the proposed ammonia plant will be one of many industries emitting to the atmosphere the Proponent will be prepared to participate in a long term monitoring strategy as part of a government coordinated local management strategy to minimise impacts on environmental attributes of the King Bay – Hearson Cove valley. As the proposed ammonia plant will be a minor contributor the Proponent will be prepared to proportionally contribute to any long term monitoring strategy.

10. *The DEP notes in Table 7-6 that the proposed emissions of oxides of nitrogen, although relatively small, will be approximately 25% higher than the European Fertiliser Manufacturers Association best available technology (BAT) for new plants. Can the proponent indicate what design change can be made in order to meet BAT for new plants and the feasibility of utilizing BAT technology for oxides of nitrogen?*

Answer 10

Proposed NO_x emissions for this project are substantially reduced from standard ammonia plant emissions, which are typically 150 ppmv. Based upon the plant's preliminary design, the design engineer has specified performance guarantee for NO_x emissions of 94 ppmv, which is well below the Australian guidelines (170.5 ppmv) and also well below the very stringent German guidelines of 97.5 ppmv.

The Proponent has endeavoured to obtain information from the European Fertiliser Manufacturers Association (EFMA) in regard to NO_x emissions from other operating ammonia plants of similar scale such that a comparison can be made. However EFMA have advised 'that they do not have the mandate from their members to provide such information'.

KBR has advised that even lower emissions down to 75 ppmv (BAT as specified by the European Fertiliser Manufacturers Association) are likely to be demonstrated during the design phase when detailed information on specific equipment is available and purchased for the project.

The main contributor to the reformer flue gas NO_x emissions is the performance of the burners. The preliminary design of the plant, as adopted for the PER, does not include the adoption of low or ultra low NO_x burners. If necessary, a number of design changes will be considered by the Proponent including low NO_x or ultra low NO_x burners on the reformers during the detailed engineering phase. Neither of these potential technologies have been tried at the scale of a 2,200 tpd ammonia plant. As such, the Proponent is not confident in adopting such design changes and considers the risk of such a change in plant design to be high.

The proposed ammonia project is already proposing to incorporate low NO_x emission components on the gas-fired boiler and auxiliary boilers and the total NO_x emissions from this plant are substantially reduced compared to a standard ammonia plant. It is important to note that further design changes to the reformer

would only result in a marginal reduction in NO_x emissions from an ammonia plant already considered to have very good performance and will most likely be at a large expense to the Proponent.

Further to this the Proponent emphasises that the requested reduction of NO_x emissions be placed into context given that the proposed plant is one of the smallest contributors to the air shed and that such a reduction will need to be both financially and environmentally justifiable.

11. *The DEP notes that the relationship equation for nitrogen dioxide to oxides of nitrogen on page 113 is incorrect. $[NO_2] = 0.3 \times [NO_x] + 14.39$*

Answer 11

The typographical error is acknowledged. The relationship between NO₂ and NO_x is assumed as follows:

$$\begin{aligned} [NO_x] < 20.56 \mu\text{g}/\text{m}^3 & \quad [NO_2] = [NO_x] \\ [NO_x] \geq 20.56 \mu\text{g}/\text{m}^3 & \quad [NO_2] = 0.3 \times [NO_x] + 14.39 \end{aligned}$$

12. *The DEP advises that the exit velocity of the package boiler in Table 7.2 (5 metres per second) is much lower than desirable. It should be greater than 10 metres per second to avoid wash down of the plume in the lee of the stack. Can the proponent please comment on this advice?*

Answer 12

The emission parameters for the package boiler provided in the PER were adopted to ensure conservative predictions for emission modelling. In the detailed engineering phase, Burrup Fertilisers will ensure that an exit velocity of greater than 10 m/s is incorporated in the design. The assumptions are indicative at this stage and can not be refined until after the contract for the supply of the package boiler has been awarded

13. *The DEP notes that the proponent indicates that the exceedances of the PM10 NEPM standard for 2000 was mostly due to distant bush fires. Can the proponent please indicate the source of this information?*

Answer 13

Source of this information were from:

- Beale, B. (2001) 'Bad News Air', The Bulletin, Sydney, 3 April 2001, pp. 38-39.
- Sinclair Knight Merz (2001) Dust Monitoring Programme – Dust Levels 1993-2000. Confidential report prepared for Hamersley Iron Pty Limited.

The latter report in particular used dust monitoring results from a number of sites within the Pilbara, meteorological data at the time (particularly the wind direction) and satellite imagery of regional smoke hazes to determine the most probable source of PM10 at Dampier.

14. The DEP notes that Table 7-2 does not include the emission of ammonia under normal operation, although other pollutants are included even if their emission is zero. Can the proponent please confirm if the emission for ammonia is zero under normal operation?

Answer 14

The Proponent confirms that, under normal operations, emissions of ammonia will be nil. Ammonia vapours will only be emitted to the atmosphere in the event of flaring caused by a breakdown in the refrigeration compressor of the ammonia storage units. The probability of this occurring is less than 1-in-100 years.

15. The DEP notes that the shutdown process at worst will result in the plant being isolated and the inventory vented. Can the proponent provide an estimate of the quantities of each pollutant that could potentially be emitted? Is the plant isolation point prior to the synthesis of ammonia? If not how is ammonia prevented from being vented with the other process gases?

Answer 15

There are several isolatable sections in the ammonia plant which are activated upon shutdown or any other emergency situation. These sections are detailed in **Table 2-1**.

Table 2-1 Isolatable Section Inventories

Section	Max. Temperature, °C	Pressure (max), kPa	Volume, m ³
Gas Feed Pipeline	35	5700	49
Feed & Desulphurisation	322	5500	111
Reformer	912	4620	114
CO ₂ Conversion	670	3875	183
CO ₂ Absorber	70	3665	50
Methanator	344	3644	53
Cryo Purification	4	3476	122
NH ₃ Synthesis Loop	442	15487	103
NH ₃ Refrigeration	65	14871	103
NH ₃ Distillation	109	1956	10
NH ₃ Scrubber	-1	7018	10
MDEA Loop	121	837	3877
NH ₃ storage tanks	-33	101	120
Export pipeline	-33	101	126
Loadout Facility	-33	101	1
Loadout Pump	-33	101	1

Source: Qest, 2001. PRA of an Ammonia Manufacturing Plant. Prepared for Sinclair Knight Merz on behalf of Burrup Fertilisers Pty Ltd.

In the event that the ammonia plant undergoes emergency shutdown and an inventory is sent to vent, the following substances will be emitted (**Table 2-2**):

Table 2-2 Composition of Vent Gas

Compound	Composition [mole %]	
	Stack A (front end)	Stack B (back end)
Hydrogen	24.1	73.0

Compound	Composition [mole %]	
	Stack A (front end)	Stack B (back end)
Nitrogen	12.9	27.0
Methane	27.1	-
Water	35.95	-

Source: Qest, 2001. PRA of an Ammonia Manufacturing Plant. Prepared for Sinclair Knight Merz on behalf of Burrup Fertilisers Pty Ltd.

The ammonia plant is isolatable prior to the ammonia synthesis unit and inventory can be sent via a dedicated line to the vent prior to the synthesis of ammonia.

A leak or failure of the refrigeration compressor is the only scenario where ammonia may be released. In this event, the inventory of ammonia is sent to flare to minimise ammonia vapours.

16. *The DEP notes that a leak from a refrigeration compressor can result in liquid ammonia being sent to flare. Is the flare designed to combust emissions of liquid ammonia?*

Answer 16

The refrigeration compressor maintains a temperature of -33°C of ammonia in the ammonia storage tanks. In the event of a mechanical failure of the refrigeration compressor there is a double redundancy system to ensure that ammonia is kept refrigerated. The refrigeration compressor may also fail in the event of a power outage. Power supply is also maintained in emergency situations by a double redundancy system where a steam turbine and two diesel generators are kept on standby.

In the rare event that refrigeration of the storage tanks fail, the temperature of ammonia will gradually increase such that liquid ammonia is vapourised. This process may take from one to three days depending upon the ambient temperature outside of the insulated storage tank. To prevent the storage tank from rupturing as a result of the increasing pressure inside the tank, ammonia vapours will be sent to flare. It is important to note that it is not possible to flare a liquid. Vapour will be generated above the liquid level and this will be flared.

The Proponent will at this stage undertaken necessary emergency procedures such that the impact and release of ammonia vapours is minimised as far as practicable.

In contrast, if a leak in the ammonia storage tank is detected by the control system, ammonia is sent to flare. The control valve allowing ammonia to flare can also be manually operated.

17. *The DEP notes that the PER states that flaring is extremely unlikely (less than 1-in-100 years). Is the proponent able to support this statement on the basis of operational data from ammonia plants that use similar refrigeration plant technology?*

Answer 17

It is extremely unlikely that flaring will occur as the ammonia plant is designed for double redundancy. In the event of a mechanical failure of the refrigeration compressor there will be two compressors on standby. Power supply is also maintained in emergency situations by a double redundancy system where a steam turbine and two diesel generators are kept on standby. It is therefore extremely unlikely that the refrigeration compressor will fail due to power outage.

Given the Proponent's previous working experience with ammonia plants, data indicate that refrigeration compressors have never failed during the seven operating years of their ammonia plant in India. The Proponent is aware that India has about ten ammonia plants having been operating for at least twenty years (i.e. total of 200 operating years) and none of these plants has experienced the need to send ammonia vapours to flare. Based on this collective experience, the probability of flaring occurring will be less than 1-in-100 years.

18. *The DEP queries whether methane and hydrogen can be flared rather than vented.*

Answer 18

The preliminary design of the proposed ammonia plant is based upon venting methane and hydrogen. However, the Proponent will consider the possibility of flaring hydrogen and methane during the detailed engineering phase.

19. *The DEP would like the proponent to confirm if there will be any venting of the ship's ammonia storage tank during loading and if so what are the expected odour impacts.*

Answer 19

There will be no venting of vapour from the ship's ammonia storage tank as the ships will be equipped with a refrigeration plant. The refrigeration plant will take ammonia vapour from the storage tank and return it to the ammonia storage tank in liquid form. As a result, odour will not be an issue at the ship loading point.

20. *The DEP notes that the greenhouse gas emissions from a number of sources have been estimated, including methane emissions. The proponent did not include methane emissions from plant (eg start-up venting). Is this intermittent source of methane significant and if so can the proponent include its contribution in the calculation of the annual CO₂ E emission?*

Answer 20

Annual emissions of methane have been calculated based upon information provided in Tables 2-1 and 2-2 and the occurrence of venting about 11 times per year (1 cold start-up; 5 hit start-ups; 5 emergency shutdowns). The estimated annual emission of methane is 1.11 t/yr. Given that the global warming potential (GWP) for methane is a factor of 21, the contribution to CO₂ emissions is 23.31 tCO_{2E}/yr.

This is an insignificant contribution to the estimated annual greenhouse gas emissions of 1,411,000 tCO_{2E}/yr.

It is important to note that the information provided in Tables 2-1 and 2-2 is based upon information that is readily available from the Preliminary Risk Assessment which has been based upon the preliminary design of the plant. The inventory of gases that will be vented during shutdowns from normal operations have been extrapolated to also represent volumes expected from start-up. Hence the estimated emission of methane is conservative and will need to be confirmed during more detailed Quantitative Risk Assessment.

21. *The DEP notes that the energy consumption for the proposed plant is less than other proposed and existing plants, including the new CSBP plant. The greenhouse intensity for the proposed plant should also be smaller, but dividing the CO₂ emission by the ammonia production (Table 7-12) gives 1.777 for CSBP and 1.832 for the Burrup Ammonia plant. The DEP also notes that the CO₂ stripping figure for the proposed plant is higher than the CSBP (and Plenty River) plant. Is the difference solely due to a cooling water temperature correction factor or are there other reasons for the CO₂ emission from the proposed plant being greater than CSBP's emission?*

Answer 21

The proposed project will produce carbon dioxide from a number of sources. These are detailed in Table 7-10 of the PER document (page 119). The three largest contributors to the emission of CO₂ are:

- ☐ Carbon dioxide stripper;
- ☐ Primary reformer stack; and
- ☐ Package boilers and start-up heater.

The carbon dioxide stripper is the main contributor to CO₂ emissions. The design engineer has advised that the greenhouse intensity of the CO₂ stripper is 1.351 tCO₂/tNH₃ which is comparable to Plenty River and CSBP's greenhouse intensity for CO₂ stripping of 1.27 tCO₂/tNH₃ (Table 7-12 of PER, page 122). Given that emissions from the CO₂ stripper are based on a plant availability of 350 days per year full time with 10 days of part operation of 20 hours, the estimated emission from the carbon dioxide stripper will be 1,053,000 tCO₂/pa.

It is important to note that a credit for producing electricity (59596 t/hr medium pressure steam for power generation) and steam (10,000 t/hr low pressure steam)

for supply to the Water Corporation's desalination plant is estimated to be in the order of 33,000 tCO_{2e}/pa which reduces the overall greenhouse intensity from 1.832 to 1.81 tCO₂/ tNH₃

Also, including methane emissions as discussed in the Proponent's response to Question 19, there will be an additional 23.31 tCO_{2e}/yr.

Based upon the data provided by the design engineer and the conditions of plant operation per year (i.e 350 days with 10 days of part operation of 20 hours) the estimated overall greenhouse intensity for the proposed plant is 1.81 tCO₂/ tNH₃ (Table 7-12 of PER, page 122). Including a correction factor of -2.9% for the cooling water inlet temperature and product temperature the greenhouse intensity is reduced to 1.76 tCO₂/ tNH₃.

In summary, Table 7-10 of the PER should be revised as follows:

Table 2-3 Revised Annual Greenhouse Gas Emissions (Equivalent CO₂) from the Project

Source	CO ₂ E (tpa)
Clearing of vegetation during construction	Negl
Waste Water Treatment Plant	9
CO ₂ Stripper	1,053,000
Primary Reformer Stack	342,000
Diesel generator	83
Package Boilers and Start Up Heater	49,000
Methane Contribution	47
Total	1,444,139

Notes:

- 6) The above total includes emissions for the generation of 4 MW and 10 tph of steam of power for Water Corporation's thermal desalination plant. This is approximately equivalent to 33,000 of CO₂ emissions.
- 7) Vegetation clearing based on 28 ha cleared of spinifex rangeland including access roads and gradual decomposition of vegetation
- 8) Emissions from the CO₂ stripper and Primary reformer based on a plant availability of 350 days per year full time with 10 days of part operation of 20 hours.
- 9) Total CO₂ emission includes the small contributions from wastewater treatment, diesel generators and methane emissions.

Table 7-12 of the PER document provides a comparison of greenhouse intensities to the proposed Plenty River plant and existing CSBP plant from information that is publicly available. The Proponent advises that any comparisons of CO₂ emissions from the proposed ammonia plant with other ammonia plants should be made with caution as the basis of emissions data for other plants may vary considerably. The data and techniques which have been used by these companies to estimate greenhouse intensities is unknown and there is a potential for large differences in the operational conditions of the plants in that the number of days per year which they operate may be less, emissions from start-ups may be excluded etc.

Please also note that the Proponent has endeavoured to obtain information from the European Fertiliser Manufacturers Association (EFMA) in regard to CO₂ emissions from other operating ammonia plants of similar scale, however EFMA have advised that they do not have the mandate from their members to provide such information.

22. *The DEP notes that CO₂ produced from the stripping process can be utilised in methanol plants. Is the proponent aware that a methanol plant may be located adjacent to the ammonia plant and has the proponent had initial discussions with the proponent for the methanol plant to determine if the CO₂ can be used as a feedstock for their process?*

Answer 22

Burrup Fertilisers has had preliminary consultations with the potential developer of the proposed methanol plant. The methanol plant is still in the preliminary stage of development and the potential developer is not in a position to make commitments regarding the offtake of CO₂ gas from the ammonia plant. Burrup Fertilisers will continue to explore potential synergies with that developer as the project proceeds.

Synergies with the adjacent proposed ammonia/urea plant have also been identified by Burrup Fertilisers and discussions have been held with the existing Proponent regarding their requirements for ammonia. These discussions are ongoing.

23. *The DEP notes that there may be the potential for the plant to become a future net exporter of power. Can the proponent please provide information on the how this can be achieved?*

Answer 23

The proposed ammonia plant will not be connected to Western Power's electricity grid. The plant will be designed to produce surplus power in the order of 4MW. Emission estimations for the ammonia plant are based upon the surplus production of 4MW. This surplus power will meet the requirements of the Water Corporation's desalination plant which is proposed to supply freshwater to the ammonia plant.

The Proponent may become an exporter of power in the event that the desalination plant is not constructed within the project lease should Water Corporation decide to develop a 'central multi-user unit' on the Burrup. The Proponent will then be in a position to provide 4MW to the power grid. Alternatively, the Proponent may decide to rebalance the ammonia unit to produce less surplus power, and reduce emissions of CO₂.

Although the ammonia process is exothermic, and this waste heat is used to generate power through steam turbines, the power production process also requires additional inputs of natural gas as a fuel. The combustion of natural gas results in the production of CO₂ gas. Hence, rather than producing a 4MW surplus, the Proponent may consider reducing excess power supply such that less natural gas is required as fuel thus reducing emissions of CO₂.

24. *The DEP notes that the proponent has committed to undertake further investigations into the establishment of tree farms within Australia to sequester carbon dioxide from the atmosphere. Is the proponent in a position to strengthen this commitment?*

Answer 24

The development of tree farms is one option that is available to the Proponent to sequester CO₂ gas and address the issue of greenhouse gas emissions. The Proponent may be in a position to strengthen the above mentioned commitment (**Commitment 17**, formerly PER Commitment 7.2.1.4) following detailed investigations of *all* options available to the Proponent.

The Proponent is aware of the preparation of a draft guidance statement for Minimising Greenhouse Gas Emissions which aims to encourage:

- ❑ Commitments to an ongoing programme of research and adoption of practicable and feasible ‘no regrets’ and ‘beyond no regrets’ measures on-site with the aim of further reducing emission over time; and
- ❑ Commitment to an ongoing programme of research and adoption of sink enhancement actions to offset emissions with a view to reduce net emissions from projects by at least 24.5% from the ‘business as usual’ case.

In line with the objectives of the draft guidance statement, Burrup Fertilisers make the following commitments:

- ❑ **Commitment 17:** *Undertake investigations of practicable ‘no regrets’ and ‘beyond no regrets’ measures throughout the operational life of the plant by considering the following:*
 - a) *Downstream processing industries to take CO₂ off gas which may include urea, dry ice and methanol;*
 - b) *Establishing tree farms in Australia; and /or*
 - c) *Generate power to replace non-renewable fuels.*
- ❑ **Commitment 18:** *Adopt practicable and financially feasible measures to offset CO₂ emissions.*

25. *The DEP notes that the greenhouse intensity for the proposed ammonia plant should be 1.85 t CO₂/t NH₃ rather than the stated 1.81 t CO₂/t NH₃ (Table 7-12 of PER document).*

Answer 25

The Proponent advises that the value of 1.81 t CO₂/ NH₃ is correct and represents the greenhouse intensity for the CO₂ stripper (1.35 t CO₂/t NH₃) and combustion gases (0.5 t CO₂/t NH₃) with a credit for the supply of 4MW of power to the desalination plant (0.04 t CO₂/ NH₃)(i.e 1.35 + 0.50 - 0.04 = 1.81).

3. Noise

26. *The DEP notes that the proponent has indicated in the PER that compliance noise monitoring will be undertaken after commissioning of the project. Can the proponent include this undertaking as a commitment and will noise monitoring at Hearson Cove be included?*

Answer 26

Compliance monitoring will be undertaken following the commissioning of the ammonia plant. Compliance monitoring will be included as part of the Proponent's Environmental Management System (**Commitment 1**, formerly Commitment 6.0.1). As an additional commitment, the Proponent will be prepared to contribute to cumulative noise monitoring at Hearson Cove jointly with industry located in the King Bay – Hearson Cove Industrial Area (**Commitment 40(e)**).

27. *The DEP considers that the input sound power levels for the acoustic model appear to include the predominate sources in the process, with the possible exception of steam and gas venting. Could the proponent please comment on these potential sources of noise?*

Answer 27

During normal operations there will be no gas and steam venting. In any event, silencers will be installed on all vents, and these silenced levels have been assumed in the noise assessment model.

28. *The DEP notes that a noise reduction of about 8 dB(A) will be required to comply with the assigned noise levels at the plant boundary. The PER predicts a corresponding noise level reduction of 10-15 dB(A) at Hearson Cove (from 40-42 dB(A) to 25-32 dB(A)). The DEP considers the corresponding noise level reduction at Hearson Cove to be about 5 dB(A). The report indicates that the predicted noise levels are slightly conservative because:*

- ☐ *no conversion has been adopted between the predicted emission and the L_{A10} level;*
- ☐ *no account has been taken of directivity of plant items; and*
- ☐ *no account has been taken of noise attenuation of buildings within the site.*

However, the DEP is not convinced that the prediction is conservative because:

- ❑ *noise emissions are expected to be reasonably constant from this type of plant, so the $L_{A_{max}}$ and the L_{A10} levels should be close;*
- ❑ *the model assumes uniform directivity unless otherwise specified. If there is a specific item whose directivity is critical, that it should be identified in the report and its preferred orientation specified as part of the noise control measures. In the absence of this data, the model cannot be assumed to be conservative; and*
- ❑ *attenuation provided by buildings has already been identified as one of the means of achieving compliance at the site boundary, so it has already been taken into account to some extent. Some attenuation of low level sources by buildings is expected, but these have not been identified and assessed separately from the high levels of noise, thus the report does not demonstrate that the predictions are conservative.*

Could the proponent please comment on this issue?

Answer 28

Existing noise levels at Hearson Cove are typically low and range from 25 to 30 dB(A) based on limited operator attended surveys. Previous noise investigations undertaken by HLA-Envirosciences for the proposed Syntroleum gas to liquids plant indicate that cumulative noise levels at Hearson Cove from the proposed Syntroleum plant and Plenty River's ammonia/urea plant will be about 38.5 dB(A).

Table 7-17 of the PER document indicated that predicted "worst case" noise levels at Hearson Cove from the proposed ammonia plant in isolation will be 41 to 42 dB(A). However, in order to comply with boundary noise criteria the Proponent has committed to a range of noise attenuation strategies during the detailed engineering design phase, which will significantly reduce its noise contribution to Hearson Cove. Examination of the identified noise sources (presented in Figure 7-6 in PER) indicates that:

- ❑ The main noise source is from the compressor suction discharge piping, for which external cladding will be required;
- ❑ Other plant items include pump and motors and the like, these are likely low level and readily lend themselves to noise control;
- ❑ The two higher level items (turbine and CO₂ vent) combine to a level more than 10 dB(A) lower than the overall level (note: the CO₂ vent is assumed as a continuous item, although it is used very intermittently).

A review of the thirty-six 'noisiest' items has been undertaken and the likely noise attenuation measures and resultant sound power levels have been estimated (**Appendix C**). This review estimates a substantial reduction of sound power levels ranging from 20 dB(A) to 5dB(A) (**Figure 3-1**).

The attenuated sound power levels were run through the Environmental Noise Model (ENM) to determine noise levels at Hearson Cove. The assessment excludes the investigation of meeting compliance boundary criteria as it will be largely influenced by the plant layout which will not be confirmed until detailed engineering is completed.

Predicted single point noise levels in Dampier (residential area) and Hearson Cove (recreational area) under various meteorological conditions is provided in **Table 3-1**.

During worst case meteorological conditions, noise levels from the attenuated ammonia plant are predicted to occur between 32 dB(A) and 34 dB(A). This is reduced from previously predicted noise levels between 41 dB(A) and 42 dB(A) from the non-attenuated plant (Table 7-17 of PER document). Therefore it can be expected that the proposed ammonia plant will be able to achieve a reduction of up to 9 dB(A) having adopted noise attenuation controls.

Table 3-2 presents a summary of the “worst-case” cumulative noise levels at Dampier and Hearson Cove, based upon the predictions given in **Table 3-1**. Predicted levels for Dampier and Hearson Cove are 31 dB(A) and 40 dB(A), respectively. Not including the proposed ammonia plant, cumulative levels at Hearson Cove will be 38.5 dB(A). The predicted noise levels from the attenuated ammonia plant is 3 dB(A) less than the predicted noise levels from the approved Syntroleum plant.

Figure 3-1 Attenuated Sound Power Levels

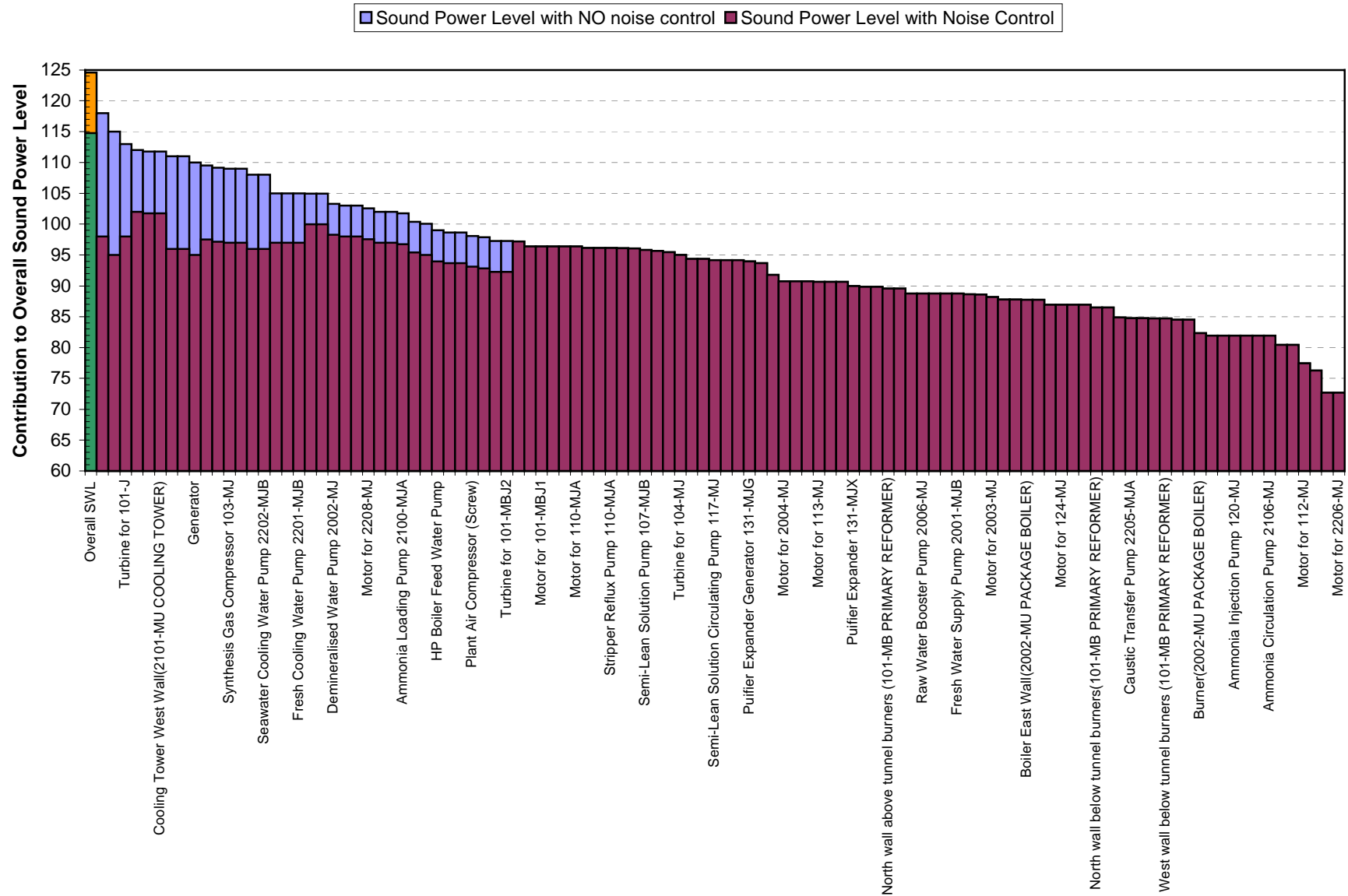


Table 3-1 Summary of Single Point Predictions – Operational Phase

Meteorological Condition	Day/Night	Noise Level (dB (A)) Hearson Cove	Noise Level (dB (A)) Dampier
Non-enhancing	Day/Night	26 dB (A) to 28 dB (A)	<20 dB (A)
Wind – 4m/s Source to receiver	Day	32 dB (A) to 33 dB (A)	<20 dB (A)
Wind 3m/s source to receiver plus 2°/100m temp inversion	Night	32 dB (A) to 34 dB (A)	<20 dB (A)

Note: The range of noise levels at Hearson Cove represents the levels at the extremities along the beach frontage.

Table 3-2 Cumulative Noise Levels

Project	Noise Source at Dampier	Noise Source at Hearson Cove
1. Syntroleum	31 dB (A)	37 dB (A)
2. Plenty River Corporation	<20 dB (A)	33 dB (A) -nom
Cumulative Level (1+2)	31 dB(A)	38.5 dB(A)
3. Burrup Fertiliser	<20 dB (A)	34 dB (A)
Cumulative Level (1+ 2+3)	31 dB (A)	40 dB (A)

Note 1 – Incorporates preliminary noise control measures from Burrup Fertiliser facility

The criteria used to assist in determining the extent of any acoustical impacts from a Project or development is defined within the *Environmental Protection (Noise) Regulations 1997*. Hearson Cove, although a popular passive recreation area, is not defined as a sensitive noise premise under the Regulations (Part C of Schedule 1). Under Schedule 1 the only other two categories for which assigned noise levels are specified are:

- ☐ Industrial and utility premise; or
- ☐ Commercial premise.

For the purposes of the PER and in the absence of specific criteria for recreational areas, the more stringent criteria for “commercial premises” was adopted for recreation users at Hearson Cove, being 60 dB(A). On this basis, the ammonia plant would be in compliance with Regulations.

29. *The EPA guidelines required community consultation on the issue of noise levels at Hearson Cove, but this information has not been provided in the report. Can the proponent provide feedback on this issue?*

Answer 29

The EPA guidelines for noise state the requirement to “Provide details of any potential impacts and how they will be managed, including community consultation.” The Proponent has understood this guideline to include community consultation as a means of managing noise as an environmental issue. This guideline was not interpreted to require community consultation during the assessment of potential impacts. The Proponent has proposed a range of noise attenuation strategies that will reduce noise contributions at Hearson Cove and commits to registering and responding to public complaints as part of the Proponent’s Environmental Management System (**Commitment 1**, formerly PER Commitment 8.7.1).

30. *The DEP notes that traffic movements and associated noise during the construction and operation phases have not been quantified in the report. The DEP recommends that the Traffic Management Plan should include noise minimisation as part of its objectives.*

Answer 30

The Proponent will address traffic movements and associated noise in the Traffic Management Plan. The Traffic Management Plan will be developed to the satisfaction of the Department of Environmental Protection, Main Roads WA and the Department of Minerals and Petroleum Resources (formerly Department of Minerals and Energy).

31. *The Conservation Council note that industry will be visible and audible from Hearson Cove. The combined effect of the developments will greatly increase the prospect of industrial activities being audible from this beautiful beach.*

Answer 31

Background noise levels at Hearson Cove have been monitored up to 30 dB(A). With the introduction of industry in the King Bay – Hearson Cove Industrial Area it will be difficult to prevent increases in noise levels. Cumulative noise modelling considering the proposed ammonia plant, Syntroleum's gas to liquids plant and Plenty River's ammonia/urea plant indicates that cumulative noise levels will reach up to 40dB(A). The predicted noise levels from the proposed ammonia plant would be in the order of 3dB(A) less than the predicted noise levels from the approved Syntroleum plant. On this basis the proposed ammonia plant would be an insignificant contributor of noise at Hearson Cove.

Three dimensional modelling of the proposed ammonia plant from Hearson Cove (view point 6 on Figure 8.4 and 8.10 of PER) indicates that the majority of the plant will be concealed behind the sand dunes and vegetation upon the dunes. Moreover, considering that there is a significant drop of elevation from the dunes to the shoreline of the beach, even the tallest structures (being the vent stack and CO₂ stripper) are likely to be entirely concealed from an observer standing on the beach at the waters edge.

The visual amenity of the proposed ammonia plant is addressed in the response to Question 102.

4. Marine, Groundwater and Surface Water

32. *The DEP queries if there been any investigations done regarding the potential for exotic introductions from ships, given that India has similar water temperature the risk of the establishment of introduced species could be high? Does the proponent propose to establish baseline data and then regularly monitor for marine pest species that could potentially be introduced from India?*

Answer 32

There have been no investigations undertaken to date by either the Dampier Port Authority or the Proponent regarding marine pest species at the Dampier Public Wharf.

Burrup Fertilisers will be one of many requiring the use of the Wharf and there is a potential for *all* users to introduce exotic species. The risk of introducing exotic species will be low given that all vessels carrying Burrup Fertiliser's products will undertake ballast water exchange in open ocean outside of Australian waters as required by AQIS ballast water guidelines. For these reasons the Proponent advises that baseline surveys and regular monitoring for exotic species should be undertaken by those managing the activities of the Wharf.

It is also important to note that the Dampier Port Authority proposes to undertake dredging that will be required to accommodate the ammonia ships that will be used for export. This

dredging will in effect result in a seabed free of exotic species within the vicinity of the berthing and turning pocket of the Wharf.

33. *The DEP notes that MDEA is soluble in water, alkaline and toxic to aquatic organisms and the consumption is expected to be about 20 tpa. How is MDEA lost from the plant? Can it end up in the marine environment (via wastewater discharge) and if so what measures will be in place to monitor and manage potential emissions?*

Answer 33

The use of MDEA in the ammonia plant is limited and will be about 2.4 kg/hr (21 tpa). MDEA will be contained in a closed circuit loop where it is segregated from water and other process streams. Losses of MDEA will only occur as a result of handling (i.e sampling and monitoring checks that will be required throughout the ammonia production process).

Following the use of MDEA in the process unit, the substance will be contained for suitable and approved disposal or the possible return to the chemical supplier for treatment. MDEA storage on the plant site will be banded as required for hazardous materials.

Considering the containment and separation of MDEA from water and other streams, MDEA will not enter stormwater or wastewater discharge and hence the marine environment. In the event of handling losses and potential spills MDEA will be contained by appropriating bunding, collected and disposed to an approved contractor for treatment or recycling.

34. *The DEP notes that stormwater will be monitored for a range of parameters (TSS, pH, turbidity, total hydrocarbons and volumes). Can the proponent indicate where these parameters will be monitored?*

Answer 34

The stormwater drainage system including monitoring points will be specified during the detailed engineering design phase. The design objectives will be to ensure that stormwater quality meets specified criteria prior to its release to the environment. Monitoring points and parameters that will be measured at each point will be clearly outlined in the Operation Environmental Management Plan (**Commitment 4.6**).

35. *The DEP notes that Woodside has recently tested for organotin compounds. Have the findings of the studies now been made available and if so can the proponent please comment on them.*

Answer 35

Monitoring that has been undertaken by Woodside is not readily available to the Proponent. However, the Proponent is aware that the Dampier Port Authority will be undertaking testing for organotin compounds for the proposed dredging of the Dampier Public Wharf. Discussions with consultants acting on behalf of DPA indicate that a Sampling and Analysis Plan will be submitted to Environment Australia as part of the Commonwealth approval process for dredging and will include sampling of organotins, heavy metals, TBT, TPH, PAH and PCBs.

36. *The DEP notes that potentially contaminated storm water will be tested prior to leaving lined sedimentation basins. Can the proponent specify the tests to be conducted on the storm water and provide details of the type of lining proposed?*

Answer 36

Potentially contaminated stormwater will be tested for various contaminants prior to leaving lined sedimentation basins. Parameters that will be tested include total suspended solids (TSS), pH, turbidity, total nitrogen, ammonium (NH₄), and total hydrocarbons. All parameters will be specified in the Water Quality Monitoring Plan (**Commitment 4.6**, formerly PER Commitment 6.1.4.3).

Storage areas for contaminated stormwater will be specified during the detailed engineering design phase. As such, specific details of the type of lining proposed is not currently available. Lining is typically of polyethylene material with minimum permeability of 10⁻⁹ cm/sec. However this will be confirmed during the detailed engineering design phase.

37. *The DEP notes that a lined storage area will be constructed to collect spillage of potentially contaminated substances during construction. Can the proponent provide more details of the storage area including the lining?*

Answer 37

Storage areas for hazardous materials and potentially contaminated substances will be specified during the detailed engineering design phase. Specific details of the proposed storage areas are not currently available however the Proponent will consider the following during the design phase:

- ❑ Design of storage basins to contain not less than 110% of the volume of the largest storage vessel or inter-connected system, and at least 125% of the total volume of substances stored in the compound;
- ❑ Design of storage basins such that jetting from any storage vessel or fitting be captured within the bunded area;
- ❑ Design of storage basins such that they are:
 - Graded or include a sump to allow recovery of liquid;
 - Be chemically resistant to the substances stored; and
 - Include valves, pumps and meters associated with transfer operations wherever practicable. Otherwise equipment shall be adequately protected and contained in an area to permit recovery of chemicals released following accidents.

Specific attention will be given to minimising the potential for hazardous materials to contaminate the groundwater.

38. *The DEP query and request further information regarding the proposed method of treatment of wastewater to meet Water Corporation's licence conditions issued by the*

DEP and expected target levels for contaminants and nutrients in the wastestreams prior to dilution with the brine. Buffer storage should also be considered for the wastestreams to ensure that contaminant concentrations are acceptable prior to discharge. Provide information on how the commitments on page 98 of the PER document will be achieved and more specifically the methods that will be used to remove biocides, including chlorine from the cooling tower blow down and other potential sources.

Answer 38

Specific details regarding the proposed methods of treatment of wastewater discharges will not be determined until the detailed engineering phase as investigations will commence in selecting the appropriate effluent treatment plant that is able to achieve Water Corporation's licence conditions. From the preliminary assessment of wastewater discharges the Proponent is prepared to adopt a steam stripping and chemical treatment type technology for the effluent treatment plant.

To reinforce the Proponent's previous commitment on page 98 and 134 of the PER, Burrup Fertilisers is pleased to make the following additional Commitments:

Commitment 22: *Treat liquid waste streams to reduce concentrations of TDS, chlorine, biocides, ammonia, methanol, phosphorus and nitrogen as low as reasonably practicable.*

Commitment 23: *Ensure that process condensate, the largest source of ammonia and methanol, will be sent to the Polisher Unit for recovery of methanol and ammonia rather than being discharged as a waste stream.*

Table 4-1 indicates the concentrations of contaminants in wastewater prior to and after dilution by blowdown. Please note that **Table 4-1** is based upon concentrations provided in Table 7-19 of the PER document. The process waste concentrations stated in Table 7-19 of the PER are derived from current operating plants equipped with some type of primary treatment. Investigations of the likely metal content of wastewater from corrosion of pipework are being undertaken. This is likely to be very small considering that the plant will use corrosion inhibitors. Therefore the levels of metals in wastewater streams is not considered to be a significant issue.

Table 4-1 Concentrations of contaminants in wastewater prior to and after dilution and without treatment from Vendor Treatment Package[^].

Parameter	Process and Domestic Wastewater* (ppm)	Process, Domestic and Blowdown Wastewater (ppm)
Chlorine	1808	187
Ammonia (Ammonium)	2.80	0.3
Methanol	2.80	0.3
Total Dissolved Solids	5493	48,087 [^]
Total Phosphorus [~]	1.80	0.19
Total Nitrogen [~]	7.59	1.08 (including NH ₃)

* Concentrations for process water based on existing operating plants with some type of primary treatment.

⁺ Dilution by blowdown also includes blowdown from the desalination plant as this stream will join the cooling tower stream.

[~] Nitrogen and phosphorus concentrations from untreated domestic effluent are 80 mg/L and 15 mg/L based upon generic data from Metcalf and Eddy (1985). Assumes no phosphate injection as biocide.

[^] Except TDS.

The Proponent emphasises that approval for the discharge of wastewater to the marine environment and permitted concentrations and loads of contaminants is being assessed as a separate approval process by the Water Corporation. The Proponent emphasises that they will meet Water Corporation's commitments.

A Vendor Treatment Package is proposed to be installed to treat cooling tower blowdown to ensure that Water Corporation's current commitments to the EPA are satisfied. Process wastewater may also be treated by the Vendor Treatment Package following the results and advice from dispersive modelling being undertaken by the Water Corporation. In the event that end of pipe modelling by the Water Corporation indicates unacceptable levels of the contaminants stated in **Table 4-1**, Burrup Fertilisers will, during detailed engineering design, ensure that process waste streams are treated prior to being discharged to Water Corporation brine return line.

The proposed Vendor Treatment Package will comprise a chemical and steam stripper effluent treatment plant (ETP) to remove contaminants. The solid waste produced will be disposed at an approved facility. Further detailed information regarding the specific technology that will be utilised by the Vendor is not readily available.

It is unlikely that buffer storage for treated wastewater will be required as the Vendor Treatment Package will be designed to uphold commitments made by the Water Corporation to the DEP. Nonetheless, during the detailed design the need for buffer storage will be considered based upon the performance of the Vendor Treatment Package.

To uphold Water Corporation's commitments, Burrup Fertiliser's advises (refer to pages 98 and 134 of PER document):

- ❑ Brine return TDS will be controlled at 53,000 mg/L. This will be done jointly by controlling the flow rate of cooling tower blowdown to the Vendor Treatment Package and precipitating out the dissolved solids.
- ❑ The average 24-hour seawater temperature of King Bay is 30°C. Cooling tower blowdown will be between 5 and 10°C above the wet bulb temperature of 22°C, hence producing a maximum temperature of 32°C. This will be within 2°C of the 24-hour average seawater temperature, a requirement stipulated by the Water Corporation.
- ❑ No heavy metals will be discharged over and above that occurring in the supplied seawater as the ammonia process does not involve, anywhere in the process, addition of heavy metals. Specifically wastewater streams will not contain any of the following heavy metals: cadmium, chromium III and VI, cobalt, copper, lead, mercury (inorganic), nickel, silver, tributyltin, vanadium and zinc. Some minor and gradual corrosion of pipework is expected which will add trace amounts of dissolved iron (Fe^+ , Fe^{2+}) only. Expected trace concentrations are being investigated. Pipework will not contain any heavy metals.
- ❑ Chlorine, bromine and other biocides will be removed from cooling tower blowdown through chemical treatment and precipitation proposed by the Vendor Treatment Package. Treatment will aim to reduce levels of chlorine, bromine and biocides to meet Water Corporation's requirements and if necessary to non-detectable levels.
- ❑ Process condensates and other process blowdowns will be treated in a steam stripping ETP to remove ammonia and methanol.

39. *The Conservation Council note that the proposed site of the Burrup Fertilisers Pty Ltd project occupies land running parallel to and encroaching upon the King Bay tidal inlet; an inlet that extends across the Burrup Peninsula from King Bay (west) to Hearson Cove (east). The tidal inlet lies at the floor of a broad valley formation. In the context of possible climate change induced sea level rises, the presentation of a 'one in a hundred year' tide and flood level is misleading. Substantial further research is required to assess impacts possible occurrence, such as combined cyclone and king tide event.*

Answer 39

Maximum flood levels from a combined cyclone event and king tide event were estimated. The term 'king tide' is an anomalous term referring to the highest astronomical tide. The 1-in-100 year tide and flood level stated in the PER document (section 6.1.4) is based upon a combined cyclonic surge, highest astronomical tide level and elevation in water level from wave action. The combination of these predicts a 1-in-100 year flood level of 4.8 mAHD.

Sea level changes attributed to the general global warming of ambient temperatures have been predicted to rise between 0.8 and 8.0 cm per decade, reaching 9 to 88cm above the 1990 level by the year 2100 (CSIRO, 2001). Climate change investigations for northern Australia predict a 4 to 24 cm sea level rise by 2030 (CSIRO, 1998). Given that the proposed ammonia plant will be commissioned in 2004 and will operate for a 25 year life to the year 2029, it is appropriate to assume (worst case) that a rise in sea level of 24 cm will be experienced during the life of the project.

Applying the factor of sea level change to the 1-in-100 year flood level estimated in the PER, the level will be between 4.84 mAHD (4 cm sea level rise) to 5.04 mAHD (24 cm sea level rise). It is emphasised that the 1-in-100 year prediction assumes the simultaneous occurrence of many rare events.

It is important to note that the foundations of the ammonia plant will be at a level of at least 4.9 mAHD and all plant components will be constructed on separate blocks ranging in height from 30 cm to 2 m. This will further elevate plant components between 5.2 mAHD and 6.9 mAHD, above the 1-in-100 year flood level of 5.04 mAHD.

5. Flora and Vegetation

40. *CALM considers that it appears that the flora and vegetation assessments are adequate for the purposes of describing the existing environment and assessing the direct impacts of the project. However, any potential for indirect impacts from emissions has not been addressed. Although the projected emissions are assessed against air quality standards, it is not clear whether there are likely to be any impacts on the bio-physical attributes of this area from emissions. In particular, the PER does not provide an assessment of the potential effects of SO_x and NO_x emissions on vegetation, molluscan fauna (including land snails), ephemeral freshwater pools and the nearby Aboriginal petroglyph galleries. Can the proponent please comment on this issue?*

Answer 40

Please refer to the Proponent's response to Question 9.

41. *The DEP notes in Table 6-2 that Vegetation Type 1a within the project lease will not be impacted. However, the proposal indicates that a number of Terminalia supranitifolia, which occur in this vegetation assemblage will be directly impacted. Can the proponent please clarify this apparent anomaly?*

Answer 41

The PER states there may be the potential removal of *Terminalia supranitifolia* although the species occurs in Vegetation type 1a which will not be impacted by the proposal. Although *Terminalia supranitifolia* was not found to occur in any other Vegetation types there is a potential for the species to occur on lower scree slopes near to the access road. The Proponent was not able to confirm whether or not stands of *Terminalia supranitifolia* would

be impacted as the initial vegetation survey was undertaken in the absence of a layout plan showing the access road and plant site.

During the second vegetation survey, the Proponent will confirm how many stands of *Terminalia supranitifolia* will be impacted.

42. *The DEP notes that the construction laydown area will disturb up to 8 hectares of vegetation. Can the laydown area be located in the area of the site that is almost devoid of vegetation (Tidal inlet) or has another location been identified.*

Answer 42

It is not possible to locate the construction laydown area in the tidal inlet due to the risk of the area becoming inundated in saline water. This could corrode the plant components and would also add to the handling distance between the laydown area and the plant site.

The construction laydown area will be located within the area of disturbance illustrated in Figure 5.2 of the PER document.

43. *The DEP notes that the Department of Resources Development commissioned a regional vegetation survey (Burrup Vegetation Survey) of the Burrup Peninsula and that the results are expected to be available in August 2001. Are the results now available and if so is the proponent in a better position to describe any impacts on the vegetation, in particular impacts on Vegetation Type 4, from this proposal, within a regional context?*

Answer 43

The Proponent has received the floristic report from the Burrup Vegetation Survey which provides details of all flora species and vegetation communities identified on the Burrup. The Office of Major Projects (formerly Department of Resources Development) has advised that the outstanding information will be made available upon completion which is expected to occur within the fourth quarter of 2001.

Floristic information that has been provided to the Proponent indicates that Trudgen's survey scope included terrestrial vegetation and flora only. Analyses of marine and saline vegetation units were beyond the scope of Trudgen's survey. Vegetation Type 4 is defined by Astron (2001) as coastal flat vegetation and as such the Proponent is unable to provide a better indication of the percentage of this vegetation type on the Peninsula that will be directly impacted by the proposed ammonia plant.

Other floristic information that is available from the Report will be used during the second vegetation survey to provide an assessment of impacts on flora and vegetation in a regional context. The key findings of this assessment will be made available to the Environmental Protection Authority during their assessment of the project.

44. *The DEP notes that approximately 70,000 m³ of fill and gravel is required from external sources. Can the proponent indicate the likely source of the fill and confirm that a procedure will be in place to prevent the transfer of weeds?*

Answer 44

The likely source of fill has not yet been determined, however the Proponent has four options:

- ☐ Purchase fill from an existing source;
- ☐ Seek permission from relevant authorities to establish a new borrow pit;
- ☐ Use dredged spoil from Mermaid Marine; or
- ☐ Use dredged spoil from Dampier Port Authority.

To ensure that the spread of weeds is minimised, all topsoil and vegetation will be removed to a depth of about 20 centimetres and stockpiled for later respreading back over the restored surface of the borrow pit. It is unlikely that seeds of weeds will occur at depths greater than 20 centimetres.

Following the use of the borrow pit, the areas will be terrain shaped, ripped and topsoil and vegetation respread over the disturbed surface.

All excavation equipment and other vehicles will be inspected for weeds and seeds of weeds prior to departing the borrow pit area.

The above procedures will be detailed in a Weed Management Plan to be prepared as part of the Construction Environmental Management Plan (**Commitment 2.3**, formerly PER Commitment 6.1.1.7).

45. *The DEP notes that there appears to be an error in Table 6-1 concerning the total area of “Type 4 Vegetation” to be removed.*

Answer 45

In Table 6-1, the total required area of Vegetation Type 4 to be cleared is stated as 27,163 m². This is incorrect and should read as 110,343 m². As a result the total percentage removal for Vegetation Type 4 will be 50.5%, not 12.4% as stated in Table 6-1.

46. *The Conservation Council note that on the northern side of the inlet (site for development) a concertina of different landforms exists. The proposed site will dissect the tidal inlet itself, the fringing samphire flats, the coastal flats, lower stony hill slopes, higher rocky hill slopes and rocky outcrops. Each of these landforms is the habitat of different vegetation types, including the Priority 1 species, Terminalia supranitifolia. It is to be noted that this species has never been grown from seed or cuttings.*

Answer 46

Although the project lease comprises vegetation types and habitats closely related to landforms that form a concertina across the King Bay – Hearson Cove valley, the siting of the proposed plant site has been optimised on the basis that (Section 6.1.1 of PER):

- ❑ The rockpiles and upper slopes located in the northern portion of the project lease should not be impacted as they are considered to be significant in terms of supporting:
 - Significant vegetation assemblages;
 - Priority flora (*Terminalia supranitifolia*);
 - Habitats for non-molluscan fauna; and
 - High density of Aboriginal artefacts.
- ❑ The lower slopes will provide a more suitable foundation for the ammonia plant and will:
 - Avoid disturbance to significant rockpiles and the important flora, vegetation, fauna and heritage attributes associated with the rockpiles;
 - Remove the need to undertake large quantities of blasting;
 - Require a lesser quantity of cut and fill to produce a level foundation;
 - Less likely to impact on Aboriginal artefacts as these are known to occur in the rockpiles in higher concentrations; and
 - Be more cost effective.

Siting the plant site over the lower and more level terrain of the site will result in the partial fragmentation of the catena sequence of two vegetation types; coastal flats and saline inlet and supratidal flats (refer to Figure 5.2 of PER). Such disturbance is unavoidable and it is important to note that throughout the King Bay – Hearson Cove valley it will be difficult for potential industry to avoid such fragmentation.

The PER document recognises the potential impact on *Terminalia supranitifolia* although this Priority 1 flora species occurs generally on or around the base of scree slopes and rocky outcrops. The second vegetation survey being undertaken will confirm whether *T. supranitifolia* will be impacted and will provide an estimate in early October of the number of stands that will need to be removed.

The Proponent is aware of previous unsuccessful attempts of germinating *T. supranitifolia* or growing it from cuttings. Therefore the Proponent will commission germination trials of this species and several other prominent native flora species to maximise the positive outcome of the rehabilitation efforts (**Commitment 8**, formerly PER Commitment 6.1.1.5).

The Proponent recognises that cumulative industrial impacts on the environmental attributes of the King Bay – Hearson Cove valley warrant some form of coordinated management. As such, the Proponent commits to participate in a government coordinated local management plan for the King Bay – Hearson Cove valley (**Commitment 40(a)**, formerly PER Commitment 6.1.1.9).

47. *The Conservation Council note that the King Bay – Hearson Cove valley is the only such tidal inlet across the Burrup Peninsula and the associated landform is unique to it. On the site, four vegetation types were considered of high conservation value. This was based on the fact that they do not commonly occur elsewhere on the Burrup, and/or are considered the best examples of the vegetation on the Burrup. This is largely related to the fact that this is the only such habitat for this vegetation of the Burrup. Some of the vegetation types are considered to be uncommon and restricted to the Burrup. These statements are supported by comments made by Malcolm Trudgen in his independent report (Trudgen, 2001).*

The removal of vegetation types and individual flora, including Priority 1 species, is unacceptable. Indeed, advice to Council is that each development may remove between 12-30 Priority 1 species.

Answer 47

As stated in the Proponent's response to Question 46, the siting of the ammonia plant site has been optimised to minimise impacts on important attributes of the King Bay- Hearson Cove valley. This valley has been designated for industrial use and the Proponent is prepared to assist government and nearby industries in co-ordinating and implementing a local management plan for the valley.

The need to remove Priority 1 species will be confirmed during the second vegetation survey in October. It is unlikely that a substantial number of stands will be impacted as the species occurs generally on or around the base of scree slopes and rocky outcrops and the plant site has been optimised to avoid these areas.

48. *The Conservation Council note that there are several known development proposals on this part of the Burrup, amongst these are:*

- ☐ *The Plenty River development (it is understood that the operators intend to move their current development from its original position – higher on the hill slopes-down onto the coastal grassland and saline flats);*
- ☐ *Syntroleum petrochemical plant and landing at Hearson Cove;*
- ☐ *Mitsubishi proposal;*
- ☐ *An additional gas plant; and*
- ☐ *Expanding light industry around King Bay and Withnell Bay.*

It is the contention of the Conservation Council that when being asked to comment on the Burrup fertiliser's proposal the public has not been made sufficiently aware of other projects in the area. It is to be noted that these projects will:

- ☐ *Occupy the land parallel to the road to Hearson Cove;*
- ☐ *That these proposals are all intended for the same saline flats area; and*
- ☐ *That the cumulative impact of development on the Burrup has not been properly considered.*

It is understood that there are many more proposals for the area, and that these are presently at the feasibility stage.

Foremost amongst the cumulative impacts associated with this proposal is the large extent of vegetation destruction. This vegetation destruction will especially impact on samphire vegetation complexes and associations that are not well represented elsewhere on the Burrup. Trudgen (2001) commented that this vegetation type is considered to be the best on the Burrup both in terms of its size and diversity of plant (samphire) communities.

Answer 48

In accordance with EPA Guidelines for the Public Environmental Review document (Appendix A of PER document), the Proponent was only required to address cumulative impacts from existing industries and publicly known proposed industries including plants proposed by Plenty River Corporation and Syntroleum Sweetwater. Information regarding these proposals were publicly available as each of these projects have been previously assessed by the Environmental Protection Authority.

It was not appropriate to address cumulative impacts from other proposals as these were still in the preliminary stage with little public information available on their potential impacts.

The proposed ammonia plant will impact on the samphire communities in the low lying areas of the project lease. This is discussed above in the response to Questions 46 and 47. The Proponent understands that the proposed Syntroleum plant will only impact a small portion of saline flat vegetation (Figure 4.3; HLA Envirosciences, 1999). Plenty River are in the process of re-locating the proposed ammonia/urea plant within their project lease. However the final layout of Plenty River's plant is not available to Burrup Fertilisers and, as such, the cumulative impact on samphire communities from Plenty River's plant can not be determined.

49. *The Conservation Council note that no comprehensive ecological survey work has been undertaken to establish whether or not the Pilbara coastline has the same samphire communities. Such a study should especially focus on species composition.*

Answer 49

Trudgen's assessment of the conservation value of vegetation found within the King Bay – Hearson Cove valley indicates that samphire communities occur sporadically along the Pilbara coastline and are considered to be less significant at a regional level. This information is based upon surveys of vegetation types along the Pilbara coastline including Cape Preston by Trudgen for the Burrup Vegetation Survey.

6. Fauna

50. *The DEP considers that Section 5.8.2 does not represent a comprehensive list of the data sources used to compile the faunal lists for the Burrup Peninsula. Information used to reach conclusions should be properly referenced. This is particularly important in substantiating the veracity of the vertebrate species listed in Appendix E. Can the proponent please provide the list of data sources?*

Answer 50

The following sources of information were used to establish the list of vertebrate species known or likely to occur near the Project Lease:

- ❑ Astron Environmental (1999b). *Natural Gas to Synthetic Oil Project: Plant site Vegetation, Flora and Fauna Survey*, Unpublished report prepared for HLA- Envirosciences, October 1999.
- ❑ Astron Environmental (2000). *Natural Gas to Synthetic Oil Project: A Vertebrate Survey of the Plant Site on the Burrup Peninsula*. Unpublished report prepared for HLA- Envirosciences, June 2000.
- ❑ Butler, W.H. & Butler, M.A. (1987). *Burrup Peninsula Fauna Survey*. Prepared for Woodside Offshore Petroleum Pty Ltd.

- ❑ Christidis, L. and Boles, W.E. (1994). *The taxonomy and species of birds of Australia and its territories*. RAOU Monographs 2. RAOU. Australia.
- ❑ Johnstone, R.E. and Storr, G.M. (1998). *Handbook of the Birds of Western Australia, Volume 1: Emu-Dollarbird*. Western Australian Museum, Perth.
- ❑ Kendrick, P (pers. comm). Unpublished data for the Burrup Peninsula.
- ❑ Pizzey, G. and Knight, F. (1997). *Field Guide to the Birds of Australia*. Angus and Robertson, Sydney.
- ❑ Storr, G.M., (1984). *Birds of the Pilbara Region of Western Australia*. Rec. W.A. Mus. 16.
- ❑ Storr, G.M. Smith L. A. & Johnstone, R.E. (1981). *Lizards of Western Australia Volume I: Skinks*. Western Australian Museum, Perth.
- ❑ Storr, G.M. Smith L. A. & Johnstone, R.E. (1983). *Lizards of Western Australia Volume II: Dragons and Monitors*. Western Australian Museum, Perth.
- ❑ Storr, G.M. Smith L. A. & Johnstone, R.E. (1986). *Snakes of Western Australia*. Western Australia Museum, Perth.
- ❑ Storr, G.M. Smith L. A. & Johnstone, R.E. (1990). *Lizards of Western Australia Volume III: Geckoes and Pygopods*. Western Australian Museum, Perth.
- ❑ Stahan, R. ed. (1998). *The Mammals of Australia*. 2nd Edition. Angus and Robertson, London.

51. The DEP notes that Table E1 should be titled *Mammal Species not Fauna Species*. This table has a number of errors and omissions and the reference sources for the species included are not given. In particular:

- The nomenclature used in Table E1 (quoted as “According to Australian Museum”) is substantially out of date and presumably refers to the 1982 “The Complete Book of Australian Mammals”. A better reference would have been the 1995 “The Mammals of Australia” to include name changes and new species named since 1982. Two species named after 1982 however are included, viz. *Pseudantechinus woolleyae* named in 1988 and *Pseudantechinus roryi* named in 2000, but no reference is included for these two species. Neither of these two species was listed for the Burrup Peninsula by Cooper et al. (2000). What, therefore, is the source of their inclusion in Table E1?
- Six of the common names used in Table E1 are incorrect and six are omitted completely and two of the scientific names are misspelt. The family name for *Rhynonictis aurantius* should be *Hipposideridae* or *Leafnosed-bats* and the common name should be *Orange Leafnosed-bat*.
- The Eastern Forest Bat, *Eptesicus pumilus* is an eastern Australian species, found east of the Great Dividing Range, and should be deleted. Presumably its inclusion here is based on old records predating the naming of Finlayson’s Cave Bat, *Vespadelus finlaysoni* in 1987. *Vespadelus finlaysoni*, is therefore included twice.
- The PER should include the CALM Priority listed Ghost Bat, *Macroderma gigas*, the Lakeland Downs Mouse, *Leggadina lakedownensis*, and the Golden-backed Tree-rat, *Mesembriomys macrurus* considering that their distribution in the 1995 “The Mammals of Australia” includes the Burrup Peninsula.
- What is the source of the data for the Spinifex Hopping Mouse, *Notomys alexis* on the Burrup Peninsula? If this record is correct it would be a range extension based on the distribution in the 1995 “The Mammals of Australia”.

Could the proponent please comment on these apparent errors in the PER and provide the requested data sources?

Answer 51

The Proponent has amended Table E1 of the PER in response to the above comments and this Table is provided in **Appendix D**. In response to each of the above points the Proponent advises:

Point 1

The occurrence of *Pseudantechinus woolleyae* and *P. roryi* on the Burrup Peninsula were sourced from unpublished data from the Department of Conservation and Land Management (pers. comm. P. Kendrick). It is also acknowledged that Cooper *et al* (2000) does not include the Burrup Peninsula as being part of the distribution range for these two species.

Point 2

Appropriate amendments have been made and these have been incorporated in the list of mammal species (**Appendix D**).

Point 3

Bat data have been amended and these have been incorporated in the list of mammal species (**Appendix D**).

Point 4

The Ghost bat, Lakeland Downs mouse and Gold-backed Tree-rat have been incorporated in the list of mammal species (**Appendix D**).

Point 5

The data source for the Spinifex Hopping Mouse is:

- Stahan, R. ed. (1998). *The Mammals of Australia*. 2nd Edition. Angus and Robertson, London.

52. *The DEP notes that data sources should be referenced for statements made in this section as well as justification for the listing of species in Table E-2.*

- *Table E-2 should list birds in the currently accepted families and taxonomic sequence and reference source chosen for this listing should be recent publications not an out of date 1985 field guide. Suggested sources are “The Taxonomy and Species of Birds of Australia and its Territories” by L. Christidis and W.E. Boles or alternatively the current checklist of the Western Australian Museum would be preferable as it includes changes since Christidis and Boles. Some of the names used in Table E-2 are incorrect and some are misspelt.*
- *This section should outline how the avifauna of the Burrup fits into a regional perspective. A suggested starting point is “Birds of the Pilbara Region, Western Australia” by G.M. Storr. Another more recent reference is “Handbook of the Birds of Western Australia, Vol 1” by R.E. Johnstone and G.M. Storr. Other regional references should have been referenced also. This would have allowed assessment in a local as well as a regional context as well as consideration of status and endemicity.*
- *The list of birds known from Burrup Peninsula has some unexpected omissions and some of the bird families listed probably should include additional species for the region. Some notable omissions include: Emu, additional cormorant species, ducks and other species utilizing areas that are inundated after heavy rain, and Brown Quail.*

Could the proponent please comment on these issues?

Answer 52

The Proponent has amended Table E2 of the PER in response to the above comments and this revised Table is provided in **Appendix E**. In response to each of the above points the Proponent advises:

Point 1

The Table provided in **Appendix E** follows current taxonomic sequence and nomenclature as revised by Christidis and Boles (1994).

Points 2 and 3

The Table provided in **Appendix E** includes a complete list of all birds that were either observed in the region during recent surveys, may inhabit the region temporarily or may visit the area due to anomalous meteorological events. Specifically **Appendix E**, includes the following:

- ❑ Those species actually observed during surveys undertaken by Astron Environmental on the Burrup Peninsula;
- ❑ Those species that may inhabit the region based on distribution cited in Storr (1981), Johnstone and Storr (1998) and Pizzey and Knight (1997). Some avifauna may not be documented by the mentioned references due to their retiring habit or temporary occupation of the area (e.g. migrating waders and nomadic emus); and
- ❑ Vagrant species that may occur in the area as a result of anomalous displacement from cyclonic activity (particularly seabirds) or sporadic eruptions of waterfowl after heavy flooding.

A description of avifauna in a local and regional context, their conservation and endemism follows:

The largest vertebrate group represented on the Burrup Peninsula is birds, with 165 species from 53 families recorded (Butler and Butler 1987; Johnstone and Storr 1998; Astron 2000). None of these are scarce or endemic to the region. The families, which make the greatest contribution to species richness, are the Scolopacidae (Curlews, Sandpipers, Snipes and Godwits - 17 species), Accipitridae (Kites, Goshawks, Eagles and Harriers - 11 species), Laridae (Gulls and Terns - 8 species), Charadriidae (Lapwings, Plovers and Dotterels - 8 species), Columbidae (Pigeons and Doves - 7 species), Meliphagidae (Honeyeaters - 7 species), and Artamidae (Woodswallows - 7 species).

The diverse avifauna of the Burrup Peninsula represents at the family level 70% and at the species level 46% of the total species recorded from the entire Pilbara region. Over 35% of the birds recorded in Australia and its territories occur in the Pilbara, making it one of the nation's most diverse regions for bird species. There are a number of important differences in the diversity of and type of birds occupying or visiting the Burrup Peninsula. First, there are no species endemic to the Burrup Peninsula; all birds recorded or purported to occur in the area occur elsewhere in the Pilbara. Second, the lower species diversity is in part accounted for by the limited range of habitats available compared with the Pilbara as a whole. For example the Burrup has no extensive open fresh water, has only a limited area of natural mangal, and few extensive stands of natural woodland.

The major differences in the avifauna between the Burrup and the Pilbara are such. There is a proportionate representation of land-birds on the Burrup, with 87 species

(56% of the total land-birds in the Pilbara). There are also relatively large numbers of waders with 21 out of the 40 species (52%) found in the area. As expected, there are few seabirds visiting this coastal area. Only nine of the possible 33 seabirds recorded from the Pilbara occur on the Burrup. Likewise, only 10 species of water-birds (20%) inhabit the region.

Whereas **Table E1** of **Appendix E** contains a complete list of all potential bird species that might inhabit or visit the broader region containing the project lease area, **Table 6-1** provides a list of birds actually observed during the most recent visit to the proposed ammonia project lease.

Table 6-1 Bird species observed during vegetation survey

FAMILY	GENUS SPECIES	COMMON NAME
Eagles	<i>Falco cenchroides</i>	Australian Kestrel
Pigeons/Doves	<i>Geophaps lophotes</i>	Crested Pigeon
Cockatoos	<i>Cacatua roseicapilla</i>	Galah
Swallows/Martins	<i>Hirundo nigricans</i>	Tree Martin
Cuckoo-shrikes	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
Warblers	<i>Cinchorhamphus cruralis</i>	Brown Songlark
Honeyeaters	<i>Manorina flavigula</i>	Yellow-throated Miner
Finches/Weavers	<i>Taeniopygia guttata</i>	Zebra Finch
Woodswallows	<i>Artamus personatus</i>	Masked Woodswallow
Magpie-larks	<i>Grallina cyanoleuca</i>	Australian Magpie-lark
Magpies/Butcherbirds	<i>Cracticus mentalis</i>	Pied Butcherbird

Birds such as the Australian Kestrel, Galah and the Cuckoo-shrike are mobile species with large home ranges and are likely to use the plant site for feeding and roosting. Smaller species, including honeyeaters, zebra finches, magpie larks, butcherbirds and crested pigeons are also likely to frequent the area for feeding and roosting, but may also use the project lease area for nesting.

53. The DEP notes that the number of land snake species referred to is correct (see Appendix E; Table E1) but the reference to worm snakes/blind snakes is incorrect as they are land snakes and are included in the total of 21 species. The data sources or justifications for identification for the listing should be stated. For example some species e.g. *Gehyra purpurascens*, *Rhynchoedura ornatus*, *Ctenotus leonhardii*, *Omolepida branchialis* (an old name for *Cyclodomorphus* and recorded only in the Geraldton region), and *Menetia surda*, are outside their known ranges according to published field guides e.g. *Lizards of Western Australia. 1 Skinks 2000, Lizards of Western Australia. 111 Geckos and Pygopods*, 1990. Could the proponent please provide the additional information?

Answer 53

The Proponent has amended Table E3 of the PER in response to the above comments and this Table and the source of information is provided in **Appendix F**. In response to each of the above points the Proponent advises:

- ❑ Two gecko species, *Gehyra purpurascens* and *Rhynchoedura ornatus*, and the skink species *Omolepida branchialis* have been removed from the list of reptiles (**Table F1 of Appendix F**), however the two skink species *Ctenotus leonhardii* and *Menetia surda* are known to fall within the range of the Burrup Peninsula (Storr *et al*, 1981; Wilson and Knowles, 1988) and have been retained in **Table F1**.
- ❑ The inclusion of the three elapid snakes, *Acanthophis wellsi*, *Suta fasciata* and *Suta punctata*, are based upon unpublished data from CALM (pers. comm. P. Kendrick).

54. *Table E4 presents a list of significant species that may occur on the Burrup Peninsula. In comparison to Table E2 it includes ten species not listed in Table E2. Some of the scientific names differ between tables and the sequence is different making comparisons difficult. The conservation status of 27 of the 39 species included in this table is not stated. Presumably most of these are species protected by the JAMBA CAMBA Migratory Bird Agreements and also protected under Section 209 of the Environment Protection and Biodiversity Conservation Act 1999. Please state specifically how the project will impact on species that are specially protected under the Environment Protection and Biodiversity Conservation Act 1999.*

Answer 54

To address the above mentioned inconsistencies Table E4 of the PER document has been incorporated into the main list of bird species recorded on the Burrup Peninsula. The amended Table is provided in **Appendix E** as **Table E1**. Scientific names, taxonomic sequence and the conservation status of the bird species have been reviewed and updated where appropriate.

With respect to the potential impacts of the proposed ammonia project on specially protected species under the *Environment Protection and Biodiversity Conservation Act 1999* and international treaties the following assessment is provided:

There are a large number of bird species that occur on the Burrup Peninsula which are considered to be significant and have special conservation status. Australian legislation protects most of these while others are protected through international agreements with countries like Japan and China. It is unlikely that the proposed ammonia plant will impact directly on any of the birds that inhabit or visit the area that are protected under the various domestic (*Environment Protection and Biodiversity Conservation Act 1999*) and international migratory bird agreements (China-Australia Migratory Bird Agreement, Japan-Australia Migratory Bird Agreement, Bonn Convention).

Many of the species covered by the CAMBA and JAMBA agreements are migratory waders (Scolopacidae and Charadriidae), species that rest and feed along the west coast of Australia during their non-breeding period. Most waders may pass through on their way to more favourable foraging areas or, if in residence for any duration, will restrict their activities to the immediate vicinity of the shoreline. The Families Falconidae and Accipitridae are also protected, however some (eg. Osprey and Nankeen Kestrel) often take advantage of man-made structures either for nest platforms, observation points or feeding sites. It is recommended that any elevated sites that may present a risk to birds of prey (uncovered flares) be adequately secured to prevent injury. It is unlikely, given the current level of

developments on the Burrup Peninsula, that any isolated disturbance to birds in this area could be attributed to a single proponent. Any measures to minimise injury to birds and encourage their continued residence on the Burrup should take the form of a collaborative study in association with other industries (**Commitment 40(f)**).

55. *The DEP considers that the results from the proposed trapping programme referred to in Section 6.1.2.3 are essential for an assessment of the impacts of the proposal. Proposed management of impacts cannot be provided until this information is available. These sections in the PER do not adequately assess the possible effects of the proposed project on fauna generally or conservation significant fauna specifically, nor are management proposals adequately addressed as required in the project guidelines. How are species listed under International treaties likely to be affected by the proposed project and how will these effects be managed? Additional species should be considered including the possibility of additional species, such as Ghost Bat *Macroderma gigas*, and Golden-backed Tree-rat, *Mesembriomys macrurus*, being present in the project area. The current status of the Pilbara Olive Python needs to be assessed and whether it occurs in the area needs to be evaluated.*

Answer 55

The Proponent made a formal commitment in the PER document (Commitment 6.1.2.2) to undertake a trapping survey and this survey has now been completed. Results of the survey will be made available to the Environmental Protection Authority in mid October during their assessment of the proposed project. The objectives of the trapping programme were to:

- ❑ Confirm the presence of *Pseudomys chapmani* and *Rattus tunneyi* on the project lease;
- ❑ Identify the presence of bat species occurring on and near the project lease; and
- ❑ Record other vertebrate species identified on or near the project lease during the survey.

As stated in the PER document (page 82), the Proponent committed to including in the trapping programme an investigation of the potential occurrence of the *Planigale* sp and the skink *Lerista "muelleri"*. In the course of discussions with the Western Australian Museum (pers. comm. R. How) and Department of Conservation and Land Management (pers. comm. P. Kendrick and S. van Leeuwen) the Proponent was advised that the WA Museum is currently investigating the status of the *Planigale* sp. and *Lerista "muelleri"* on the Burrup Peninsula.

It was therefore agreed that the results of current research programs investigating the *Planigale* sp and *Lerista "muelleri"* on the Burrup Peninsula could be made available to the Proponent to adequately address the status of these two species in the region. To assist in these ongoing research efforts, the Proponent is pleased to make the following additional commitment:

Commitment 10: *Contribute financially to research programs investigating the Pilbara Olive Python, *Planigale* sp and *Lerista "muelleri"* on the Burrup Peninsula.*

The Proponent advises that the results of these investigations will be made available to the Department of Environmental Protection in December 2001.

56. The DEP notes that opportunistic sitings of vertebrate undertaken during the three-day flora survey. The PER appears only to record bird species sited within the project area. If other vertebrate were sited, can the proponent please list the findings?

Answer 56

Vertebrate species were recorded during the flora survey, however these sightings were not recorded in a separate table as only one species, the common Wallaroo was sighted. The following describes the fauna that was observed during the flora survey:

Fauna observed during the flora survey

During the flora survey, opportunistic records were made of vertebrate fauna found to occur on the project lease. This information is valuable as it is the only known survey (albeit informal) for that location and revealed evidence of two small mammals species that are of particular interest. This evidence consisted of two old dis-used mounds of the Pebble Mouse (*Pseudomys chapmani*) located at (GPS):

E: 50K 0476 959

N: 7 719 339

E: 50K 0477 141

N: 7 719 241

The locations of these two mounds were provided in Figure 5.2 of the PER document.

The Western Pebble-mound Mouse inhabits hummock grassland areas of *Triodia*, *Cassia*, *Acacia* and *Ptilotus* on skeletal soils containing an abundance of pebbles. Its mounds are most common on spurs and the lower slopes of ridges where abundant pebbles of the preferred size (about 5g) can be found (Kitchener, 1983).

In addition, burrows approximately 6 cm in diameter, were found in soft sands paralleling the saline inlet in *Acacia bivenosa*/*Triodia epactia* scrub. These burrows are identical to those made by *Rattus tunneyi*, a common inhabitant of the nearby islands, which to date has not been captured on the Burrup Peninsula.

Other species recorded at the site were the common Wallaroo, *Macropus robustus* and echidnas, *Tachyglossus aculeatus*. The common Wallaroo was abundant in *Acacia bivenosa*/*Triodia epactia* scrub and the rocky outcrops. According to Poole (1983) the habitat of the common Wallaroo is varied but it usually favours steep escarpments, rocky hills or stony rises. In fact, any areas where overhanging rocks or ledges provide shelter and relief from extreme heat, as it leaves its shelter in the cool of the evening to graze, primarily on grasses and shrubs.

Echidna diggings were evident in undulating slopes dominated by *Triodia epactia*. The echidna can be found throughout Australia from regions of winter snow to the deserts. In arid areas, the echidna avoids temperature extremes by sheltering in caves or crevices and its activity is restricted to the night. The echidna has no particular habitat requirements, other than a supply of ants and termites on which it feeds (Augee, 1983).

A total of 11 bird species were observed during the vegetation survey, all of which have previously been recorded on the Burrup Peninsula. A list of the observed bird species are

given in Table 5-3 of the PER document. A complete list of bird species likely to occur on the Burrup Peninsula is provided in **Appendix E**.

57. *CALM notes a commitment to a trapping survey for fauna in September/October. A more comprehensive survey for the endangered Pilbara Olive Python on the lease area would be appropriate. The proponents should liaise with the Department in relation to survey design.*

Answer 57

To verify the presence of the Pilbara Olive Python on or near the project lease a number of discussions were held with CALM (pers. comm. S. van Leeuwen and D. Pearson) to investigate an appropriate methodology to survey the Python. During these discussions it was highlighted that any efforts made to record the Python during the September/October trapping survey would be wasteful as the best survey time for the Python is during the onset of the first rainfalls in the dry season. Further to this, CALM highlighted that they have received funding from Environment Australia to undertake further research regarding the Pilbara Olive Python.

Considering these factors and the conflict in timing, it was agreed between the Proponent and CALM that the most ideal approach would be for the Proponent to assist CALM to continue their research of the Pilbara Olive Python. This research would pay particular attention to the occurrence of the python on or near the project lease. To assist in these ongoing research efforts, the Proponent is pleased to make the following additional commitment:

Commitment 10: *Contribute financially to research programs investigating the Pilbara Olive Python, Planigale sp and Lerista “muelleri” on the Burrup Peninsula.*

The Proponent advises that the results of the above mentioned investigation of the Pilbara Olive Python will be made available to the Department of Environmental Protection in December 2001.

58. *CALM notes that the PER indicates there is not sufficient information to determine the status of some of the snail species now or in the event of disturbance. The commitment by the proponent is:*

“The proponent will be prepared to contribute, alongside industry and government bodies, to a coordinated regional survey of molluscan fauna”.

Although the commitment is commendable, it relies on other parties to make it happen. The commitment should be strengthened to include actions within the control of the proponent. A commitment to a targeted area survey prior to commissioning of the plant would be appropriate. This would not only provide a catalyst for an integrated survey of the Burrup area, but would provide the proponent with valuable baseline data for monitoring of impacts of emissions on molluscan fauna. A target area of the Hearson Cove-King Bay area, other sites likely to be influenced by SO_x & NO_x emissions and benchmark areas should be considered. Can the proponent comment on this request?

Answer 58

The Proponent is not in a position to strengthen the above mentioned commitment as it will be one of many industries becoming established on the Burrup Peninsula and having some degree of impact on marine and non-marine molluscan fauna. It is also important to note that the proposed ammonia plant will be one of the smallest contributors of NO_x to the air shed. The Proponent recommends that a government coordinated industry body be developed for the King Bay – Hearson Cove Industrial Area, or alternatively for all industrial areas of the Burrup Peninsula. Through this industry body, individual developers can contribute to coordinated efforts of managing potential impacts on environmental attributes of the Burrup Peninsula, or more specifically the King Bay – Hearson Cove valley.

A detailed monitoring methodology would need to be developed to ensure that sound scientific results are obtained. It is understood by the Proponent that the analysis of the effect of atmospheric emissions on vegetation, molluscs and petroglyphs will not be straight forward as such investigations have not been undertaken in the past.

The methodology would entail careful selection of monitoring sites not only within the Proponent's project lease but in surrounding areas outside of the industrial zoned land. Numerous monitoring sites, of at least ten, would need to be developed in addition to suitable control sites to ensure that adequate scientific results are obtained. The establishment of such a monitoring programme will require inputs from *all* industry and should not be bestowed on a single Proponent.

The Proponent will be pleased, as an additional commitment, to participate, assist and proportionally contribute to any government coordinated industry group for the Burrup in investigating potential cumulative impacts from industry (**Commitment 40**).

59. *CALM notes that Burrup's ephemeral freshwater pools contain freshwater crustaceans and molluscs for which the lifecycles are poorly understood. These communities are being evaluated for potential inclusion on the Departments Threatened Ecological Community database. In most instances these pool are formed by cemented calcium carbonate material (Tufa or Travertine). There is a risk that acidic precipitates could lead to degradation of the pools and result in loss of freshwater biota. Could the proponent please comment on this issue?*

Answer 59

Please refer to the Proponent's response to Question 9.

60. *The DEP notes that in the event of active mounds and burrows being identified, approved procedures for evacuating fauna will be followed and these will be incorporated into the Environmental Management Plan for construction. Does the proponent plan to have an ongoing evacuation procedure during operation of the plant?*

Answer 60

The Proponent proposes to initially catalogue the presence and quantity of mounds and burrows made by the Pebble Mound Mouse and *Rattus tunneyi* prior to the commencement of construction. In the event that such mounds and burrows are found to be active then

approved procedures will be followed to evacuate fauna. Throughout the operational phase of the plant, this catalogue will be updated on a biannual basis and where active mounds are found, approved procedures will be used to evacuate fauna (**Commitment 9**, formerly PER Commitment 6.1.2.5).

7. Risk

61. *The DMPR notes that Table 1-2 refers to Dangerous Goods Regulations 1992, and Explosives and Dangerous Act 1961-1986. It should be noted that the title of the Act is Explosives and Dangerous Goods Act 1961, and the title of the associated regulations has been changed to Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992.*

Answer 61

The Proponent acknowledges that the correct legislative terms are:

- ☐ Explosives and Dangerous Goods Act 1961; and
- ☐ Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992.

62. *The DMPR notes that the PER indicates that a 200 metre exclusion zone around the Dampier Port Authority wharf will apply whilst loading ammonia. Justification in terms of consequence distance and/or risk, as to the use of this exclusion zone distance, should be provided.*

Answer 62

The 200 metre exclusion zone is based on accepted industry practice in Kwinana for vessels unloading ammonia at CSBP. The Proponent will at this stage of the project adopt this zone at the Dampier Port Authority wharf and will confirm whether this zone is suitable following the results of the Quantitative Risk Assessment (QRA). The assessment of the exclusion zone will be based on a risk and consequence analysis rather than annualisation. The Proponent will be prepared to advise the size of this exclusion zone if the QRA so indicates. The DMPR has advised that there is no statutory requirement for an exclusion zone as such, however to minimise risk to other users of the wharf such a zone is appropriate.

63. *DMPR and FESA note that Section 7.2.5.2 of the PER refers to Mines Safety and Inspection Regulations 1995 as one of the State regulations applicable to storage, handling and transportation of hazardous materials. These regulations do not apply to the proposed facility, as it is not classified as a mine site. Please note that the following acts and regulations apply to storage, handling and transportation of dangerous goods:*

- *Explosives and Dangerous Goods Act 1961;*
- *Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992;*
- *Dangerous Goods (Transport) Act 1998; and*
- *Dangerous Goods (Transport) (Road and Rail) Regulations 1999.*

Answer 63

The Proponent acknowledges that the Mines Safety and Inspection Regulations 1995 are not applicable to the proposed ammonia plant and that the following Acts and regulations will be complied with to manage storage, handling and transportation of dangerous goods:

- ❑ Explosives and Dangerous Goods Act 1961;
- ❑ Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992;
- ❑ Dangerous Goods (Transport) Act 1998; and
- ❑ Dangerous Goods (Transport) (Road and Rail) Regulations 1999.

64. *The DMPR notes that Commitment 8.2.1.5 indicates that the proponent will provide water curtains and/or sprays, where practicable, at the ammonia distillation, ammonia scrubber and ammonia refrigeration sections. However, Commitment No. 8.2.1.5 in Table 10-1 does not include consideration for ammonia distillation section. Can the proponent please comment on this possible oversight?*

Answer 64

Subject to the QRA findings, it is the Proponent's intention to provide protection for the ammonia distillation, ammonia scrubber and ammonia refrigeration sections using Monitors on the Fire Protection Systems. These Monitors would consist of high pressure water nozzles, adjustable with respect to direction and spray characteristics. Commitment 8.2.1.5 is therefore revised as follows:

Commitment 28: *Install Water Monitors at the ammonia distillation, ammonia scrubber and ammonia refrigeration sections (formerly PER Commitment 8.2.1.5).*

In the event that QRA indicates that Water Monitors are not sufficient to provide protection for the ammonia distillation, ammonia scrubber and ammonia refrigeration sections, the Proponent will consider the provision of alternative controls which may include automatic water curtains.

65. *The DMPR advises that the proposed facility will be classified as a Major Hazard Facility. Therefore, a Safety Report, meeting the requirements of the National Standard - Control of Major Hazard Facilities [NOHSC:1014(1996)], acceptable to the Chief Inspector of Explosives and Dangerous Goods, will be required prior to commissioning of the facility. The proponent has committed (Commitment No. 8.2.1.1) to developing a Safety Management System (SMS) prior to commissioning. This SMS should form part of the Safety Report and also meet the requirements of the National Standard.*

Answer 65

The Proponent has modified Commitment 8.2.1.1 to read:

Commitment 2: *Establish a Safety Report that includes a Safety Management System, a Safety Management Plan for operation and a Safety Emergency Response Plan (formerly PER Commitment 8.2.1.1).*

Commitment 4.7: *Prepare an Environmental Emergency Response Plan that includes the impacts of fire and smoke from adjacent plants and any other emergency situations of adjacent plants (formerly PER Commitment 8.2.1.2).*

66. *The DMPR notes that the PER indicates that the Preliminary Risk Assessment (PRA) was conducted based on preliminary drawings with limited information on the facility, and the PER recommends conducting a thorough Quantitative Risk Assessment (QRA) prior to the commencement of construction and production operations. The QRA should verify the assumptions made in the PRA, and in particular it should address the following items:*
- ☐ *It is assumed in the PRA that there will be a response time of 60 seconds for manual override, should the emergency shutdown system fails to shut the valve. This assumption needs to be confirmed in the QRA, and details as to how this will be achieved should be included - eg determination of time required for pressure drop to be detected, auto-shutdown to activate, alarm to be acknowledged, operator to respond to the alarm and valve to shut.*
 - ☐ *Exposure duration of 30 minutes for ammonia releases has been used in the calculation of risk/consequence distances. It is stated in the PRA that most (90%) of the large releases will cease in 60 seconds due to ESD philosophy. However, for releases that cannot be isolated (such as a large-hole release from storage tank) the exposure duration would be much longer. The exposure duration should be based on the time required for the toxic cloud from a large release (taking into consideration any water curtains) to pass a particular point.*
 - ☐ *The assumption that 90% of the large releases will cease in less than 60 seconds, needs to be confirmed in the QRA.*
 - ☐ *Duration of smaller releases needs to be included in the QRA.*
 - ☐ *The QRA should include assessment of risk from ammonia releases from tanker due to fire/explosion on board and releases due to tank material failure.*
 - ☐ *The justification for the assumption that auto-shutdown will occur within 10 seconds for flammable releases with a probability of 0.988, will need to be confirmed in the QRA. Time required for the cloud to be detected or pressure drop to be detected and ESD system to activate shutdown and closing of valve should be considered.*
 - ☐ *The PRA only includes 7mm, 2mm and 70mm releases, and not full bore releases. Full-bore releases will need to be included in the QRA.*
 - ☐ *The QRA should be based on exact inventory in isolatable sections.*
 - ☐ *The QRA should detail the risk levels at the site boundary.*
 - ☐ *The cumulative risk including two other proposed sites (Plenty River and Syntroleum) should be calculated rather than overlaying contours over one another.*
 - ☐ *The risk levels from export pipeline should be included in the QRA.*
- Can the proponent address these issues in the QRA?*

Answer 66

The Proponent advises that the scope of work for the Quantitative Risk Assessment will address these issues. The Proponent also advises that risk levels from export pipelines were included in the PRA and that full bore releases were considered for higher risk areas (eg vessel ruptures). All full bore releases will be considered in the QRA.

67. *The DMPR advises that the proponent contact the Explosives and Dangerous Goods Division of the Department of Mineral and Petroleum Resources (MPR, formerly DME) at an early stage of the detailed design phase, so that advice can be provided in relation to the Division's requirements, on the following matters:*
- ☐ *Requirements for storage facilities - a licence to store dangerous goods is required prior to commencement of any storage of dangerous goods.*
 - ☐ *Requirements for ammonia pipelines - an approval from the Chief Inspector is required prior to commissioning of the pipelines.*

- ❑ *Ammonia loading facility.*
- ❑ *Scope of work for the QRA - a QRA acceptable to the Chief Inspector is required prior to commissioning of the plant.*
- ❑ *Safety Report including SMS - a Safety Report to the satisfaction of the Chief Inspector is required prior to commissioning of the plant.*

Answer 67

The Department of Mineral and Petroleum Resources (formerly Department of Minerals and Energy) has been briefed by the Proponent on several occasions and the intentions of the Proponent have been discussed. Ongoing consultations will continue during the detailed engineering design phase with respect to:

- ❑ Dangerous goods licence;
- ❑ Requirements for pipelines and loading facility;
- ❑ Quantitative Risk Assessment; and
- ❑ Safety Management System and Safety Report.

68. *FESA notes in Section 4.3.2.2 that the ammonia storage tanks will be constructed to American Petroleum Institute (API) standards. Is the API standard a satisfactory standard to apply to bulk ammonia storage?*

Answer 68

The Australian Standard for Anhydrous Ammonia stipulates that the API standard be referred to specifically for the design of ammonia storage tanks.

69. *FESA queries how much ammonia will be carried on the transfer pipe during loading and what would be the consequences of an ammonia escape anywhere along the transfer pipe?*

Answer 69

During ship loading, ammonia export to the ship will occur at a rate of 1200 tonnes/hour. The ammonia export pipeline will have a diameter of 500 mm and the entire length of the pipeline, some 4.3 kilometres, will contain a total of 667 tonnes of liquid ammonia.

In the event that there is an escape of ammonia along the length of the pipeline there will be several isolation valves controlled by an automated system to isolate the leak. The spacing of the isolation valves will be determined following the conclusions of the Quantitative Risk Assessment. The inventory of ammonia within the isolatable sections will be pushed by an injection of nitrogen gas at a pressure of about 5 bar to the ammonia recirculation line to return the inventory to the ammonia plant. If cold liquid ammonia was to escape from the pipeline, the bulk of the liquid would sit as a pool on the ground and would slowly vapourise with the increase in temperature. Remediation of the leak would occur as per the Emergency Response Plan which will be based on the principles of 'Contain, Neutralise and Recover'.

Where the ammonia leak may result in liquid ammonia entering the marine environment, ammonia will dissolve quickly in water. In this instance, the Ammonia Spill Contingency Plan will be followed. A draft flowchart of the Ammonia Contingency Plan is provided in Appendix G of the Public Environmental Review document (Figure 7-8).

70. *FESA requests additional information on the size of the ships to transport ammonia. Are the vessels basically a single 35,000 tonne bulk tank?*

Answer 70

The Proponent has confirmed an agreement with a major international ammonia transport company, to take 100% of the ammonia produced by the plant. Up to 80% of this ammonia will be provided to the Oswal Group's DAP/NPK plant in Paradeep, India and the remaining 20% will be sold on the international market by the ammonia transport company.

The international ammonia transport company has up to 100 years of transport experience, including shipping, and owns several purpose built ammonia transport ships. These ships are sophisticated and able to contain multiple ammonia storage chambers that are all insulated, equipped with refrigeration units and necessary emergency and safety equipment. Information regarding more specific details of the ships, such as the number and size of the storage chambers, are not readily available to the Proponent at this stage. Further information will become available during the detailed engineering phase.

71. *FESA requests confirmation as to whether the Port of Dampier has all the facilities to enable it to comply with the provisions of AS3846-1998 "The Handling and Transport of Dangerous Cargoes in Port Areas" to handle bulk ammonia.*

Answer 71

The Port of Dampier is suitably equipped with facilities to enable it to comply with AS3846-1998. The provisions of AS3846-1998 are expected to be regulated soon by the DMPR (formerly Department of Minerals and Energy), with the regulations to be known as "*Dangerous Goods (Transport)(Dangerous Goods in Ports) Regulations 2001*". The Regulations will be administered by the DMPR and will impose obligations on the berth operator, vessel Master, cargo consignor and cargo owner. Burrup Fertilisers will comply with all relevant obligations stated in the proposed Regulations.

72. *FESA notes in Section 4.4.6.3 that water is available for fire fighting and usage as a water curtains for ammonia leakages. How much water will be stored and has it been determined to be sufficient for credible scenarios?*

Answer 72

About 10,150m³ of fire fighting water will be available at all times in the event of an emergency. Fire fighting water (desalinated water) will be continuously supplied from the desalination plant and stored within the ammonia plant. The plant site will be equipped with a fire pump rated at 570 m³/hr which will provide 17 hours of fire fighting capacity. Based on the Proponent's previous operating experience of ammonia plant, this will be sufficient for the needs of the proposed ammonia plant.

73. *FESA asks if WA has an established societal risk criteria. The Netherlands societal risk criteria (in 1992) would place all the values on Figure 8-2 in the range where risk reduction would be desirable. Can the risk associated with a frequency of 5 in a million be reduced for 10 fatalities?*

Answer 73

Western Australia has not yet developed societal risk criteria. Acceptable societal risk levels have been developed for the Kwinana Industrial Area (KIA) following investigations undertaken by OMP. The societal risk criteria shown in **Figure 8-2** of the PER document are the recommended criteria from the KIA risk study. The acceptable WA criteria for a single fatality ranges from 1×10^{-6} to 1×10^{-4} . The societal risk imposed by the proposed ammonia plant for a single fatality is just above 1×10^{-5} . The ammonia plant lies within the tolerable section of the societal risk criteria for new plants and suggests that risks are acceptable provided that risk reduction measures are considered.

During the QRA, there is a potential for the risk associated with a frequency of 5 in a million to be reduced for 10 fatalities as more specific information will be available for assessment. In the event that the QRA indicates risk reduction measures are required, typical measures that may be considered by the Proponent may include:

- ❑ The installation of water curtains/sprays;
- ❑ Allocation of additional isolation valves where practicable, such that the frequency of potential releases is minimised; and
- ❑ Improvement of detection and monitoring systems.

74. *FESA advises that the commitment for the preparation of an emergency response plan must be modified so that emergency response plans are prepared in conjunction with FESA and FESA's requirements in compliance with the National Standard for the Control of Major Hazard Facilities NOHSC:1014(1996)].*

Answer 74

The Proponent agrees to modify Commitment 8.2.1.2 as follows:

Commitment 24: *Submit a Safety Report that includes a Safety Management System, a Safety Management Plan for operation and Safety Emergency Response Plan (formerly PER Commitment 8.2.1.2).*

The Proponent also acknowledges that the requirement to consult with Fire and Emergency Services of WA (FESA) whilst preparing the Safety Emergency Response Plan. FESA have been identified as an advising agency in the Proponent's Summary of Commitments (**Table 1-1**).

75. *FESA advises that the proponent should include a commitment to cover plant decommissioning. From FESA's perspective it should include the removal and disposal of hazardous waste being stored onsite, as well as the site being left in a safe condition.*

Answer 75

The Proponent commits to:

Commitment 41: *Remove all equipment, waste products and foundations to a depth of about 400 millimetres and ensure that the plant site is restored as near as possible to its "as found" and safe condition.*

Commitment 42: *In the event the plant is shutdown as a result of economic downturn the plant will be placed under care and maintenance and will be maintained by allocated care and maintenance support personnel.*

76. The DEP notes that the two ammonia pipelines will be above ground and that a section will run along a road reserve. How are the pipelines protected from potential vehicular impacts particularly during ammonia transfer?

Answer 76

The ammonia pipelines will be located within the road reserve of Hearson Village Road. Between the pipeline and the road, a drainage ditch will be constructed. The natural terrain of the road reserve will also prevent vehicles from impacting the pipelines. Much of the road reserve is elevated above the surface of the road as it forms part of the large rockpiles (**Plates 7-1 and 7-2**). As a result much of the pipelines will be located above the level of the road surface, as is the situation for the existing water pipeline. In the event that the Quantitative Risk Assessment identifies the need for further protection, bollards and steel barriers will be provided where appropriate.

It is important to note that traffic along Hearson Village Road will be low and likelihood of vehicular impacts on pipelines is considered to be rare.

Plate 7-1 View of the existing water pipeline within the Hearson Village Road Reserve, looking west.



Figure 7-1
looking east.

Reserve,



77. *The DEP requests information on the type of instrumentation that will be provided to detect failure of the inner wall of the ammonia storage tank.*

Answer 77

Between the outer and inner walls of the storage tank there will be cavity which will be maintained at a slight vacuum by a small exhaust fan. The exhaust will be continuously monitored for ammonia vapours and will reveal whether there has been a failure of the inner wall. In addition to this, the Proponent will also employ one of the following options:

- ❑ A level switch will be installed between the inner and outer walls of the tank and will be able to detect the presence of ammonia in the cavity. The switch will activate a warning system when a floating device is no longer level with the base of the cavity.
- ❑ The storage tank will contain an outlet pipe from the cavity which will be continuously monitored for leaks.

78. *The DEP notes that facilities will be provided for the supply and distribution of fire fighting water for the whole plant. Is it proposed to use a fresh or saltwater supply?*

Answer 78

Fire fighting water will be supplied from the desalination plant and will therefore be desalinated water. In the event that a fire is extremely severe and the desalination plant together with assisting emergency response crews are unable to maintain sufficient capacity to fight the fire with fresh water, saltwater will be used to control the fire.

79. *The DEP notes that ammonia remaining in the pipeline is left to boil and slowly returns to the plant storage tanks. Can the proponent comment as to whether that is normal practice?*

Answer 79

The process of allowing ammonia to return to the plant in vapour form is standard practice for ammonia plants. Burrup Fertilisers confirm that this is adopted by a number of operating plants in India.

80. *The DEP notes that an operator is to be stationed at the wharf throughout the entire loading operation. Can the proponent confirm if the operator will be able to instantly trigger a shutdown of the pumping operation and appropriate valves, should he detect a leak?*

Answer 80

An operator will be stationed at the wharf during the ship loading process. The operator will have full access to an Emergency Shutdown button which will stop pumps at the ammonia plant, shut isolation valves along the ammonia export pipeline and will open the recirculating pipeline which will allow liquid ammonia to be returned to the plant.

Emergency shutdown can also be activated by personnel within the control room. The ship loading process will be monitored continuously by personnel in the control room via camera surveillance. Most importantly, if the control system detects a leak it will automatically activate emergency shutdown. The control system is able to detect leaks by monitoring the volume of ammonia leaving the site and the volume of ammonia arriving at the wharf. If there is any discrepancy in volume, the system will activate emergency shutdown.

81. *The DEP queries cumulative risk contours and the calculation of combined contours.*

Answer 81

Figure 8.3 of the PER document illustrates the cumulative risk contours for proposed plants within the King Bay – Hearson Cove Industrial Area. These contours have been overlayed to illustrate cumulative impacts. The Preliminary Risk Assessment did not entail the numerical combination of the risk contours. This will be undertaken as part of the more detailed Quantitative Risk Assessment.

82. *CALM notes that water for fire fighting will be distributed for the whole plant. It would be appropriate to have a point where local brigades and the Department could access water for fighting fires adjacent to the plant. This access point should be easily accessible without requiring travel across the plant site or site induction.*

Answer 82

A fire water pipeline and several fire hydrants will be installed around the perimeter of the plant site which will prevent the need for local brigades or CALM from entering the ammonia plant and the process unit. Several hoses and pumps will be available for connection to the fire hydrants. A fire truck will also be located on-site at all times.

The fire water system will be specified during the detailed engineering design phase and during this phase, consultations will be held with Emergency Services who are likely to respond in the event of a fire.

The Proponent is also prepared to assist in developing a coordinated emergency response plan for industry on the Burrup:

Commitment 40: *Seek membership to an industry group if such a group is developed for the King Bay – Hearson Cove Industrial Area. The Proponent will be prepared to participate and assist in (d) Developing a Burrup Industrial Integrated Emergency Plan. (incorporates former PER Commitment 8.2.1.3.)).*

83. *CALM advises that in the emergency plan to be developed for the site, the impacts of fire and smoke from a fire adjacent to the plant will need to be considered.*

Answer 83

The Proponent will ensure that the emergency response plan (**Commitment 4.7** (former Commitment 8.2.1.2 in PER) will consider the impacts of fire and smoke from adjacent plants and any other potential emergency situations arising from adjacent plants.

8. Aboriginal Heritage

84. *CALM is aware that the petroglyph sites are important and are listed on the Register of the National Estate. An assessment of the potential impacts on the rock faces from acidic precipitates would be appropriate.*

Answer 84

The Proponent is unaware of any existing information regarding impacts of acidic precipitates on rock faces and petroglyph sites. The proposed ammonia plant will be one of the smallest contributors of NO_x and SO_x emissions to the atmosphere in the region and will not be a significant influencing factor on potential impacts to rock faces.

Please refer to the Proponent's response to Question 9 for further details.

85. *The DEP notes that the results of the archaeological survey work have been compiled into a report entitled "Report on Archaeological Investigation of Aboriginal Sites: Burrup Fertilisers Ammonia Plant Project Area – Burrup Peninsula. Has that report now been forwarded to the Aboriginal Affairs Department and if so has the Department provided a response?*

Answer 85

Mr Garry Quartermaine undertook an archaeological survey of the proposed Burrup Fertiliser project areas on 19 July 2001.

A copy of the archaeological report was forwarded to each of the three Native Title claimant representatives in early August. In particular, copies of the report were forwarded to the Yamatji Land and Sea Council, who represent the Ngaluma Injibandi group, on 21 August 2001 (Attn: Mr David Ritter at the Geraldton office) and on 28 August 2001 (Attn: Mr Adrian Murphy at the Perth office). No comments on the report were received from the representatives of either of the three groups.

The archaeology report was submitted to the Aboriginal Affairs Department (AAD) on 28 August 2001. A meeting was held with the AAD's Mr Peter Randolph on the 5 September 2001 to discuss the reports that comprised the AAD submission. As of 18 September 2001, no response has been received from the Department.

86. *The Yamatji Land and Sea Council note that the PER states (pg 169) that preliminary discussion have been held with the Ngarluma Injibarndi native title group. The Pilbara*

Native Title Service is aware of only one meeting that was neither properly constituted nor recognised as including and representing the interests of the Ngarluma Injibarndi. No details are given of which members of the Ngarluma Injibarndi native title claimant group attended these meetings. It is also not mentioned how many and which members of the group took part in the meeting, on what topics they were “consulted”, or how Burrup Fertilisers Pty Ltd has responded to this “consultation”.

Answer 86

Commencing in late May 2001, and in subsequent months through to the present time, Burrup Fertilisers' heritage consultant Mr Harry Wyeth has formally approached both the Pilbara Native Title Service (PNTS) and the Yamatji Land and Sea Council to request an opportunity to meet with the Ngaluma Injibandi claimant group with a view to provide an overview of the proposed ammonia project on the Burrup Peninsula.

Despite all efforts by the Proponent to convene a meeting, none was forthcoming.

In late July, individual representatives of the Ngaluma Injibandi group were contacted with a view to convene a meeting on 30 July 2001 in Roebourne to be attended by the project's director Mr Vikas Rambal and Mr Harry Wyeth. The meeting was convened to provide general project information and was attended by approximately 24 Ngaluma Injibandi group members. The attendees included:

- ☐ Mr Kenny Jerrold
- ☐ Ms Maudi Jerrold
- ☐ Mr Bruce Monadee
- ☐ Mr Bruce Woodley
- ☐ Ms Daisy Moses
- ☐ Ms Dora Solomon
- ☐ Ms Jill Churnside
- ☐ Ms Berry Malcolm
- ☐ Mr Les Hicks
- ☐ Mr David Daniel
- ☐ Mr Jimmy Horrace
- ☐ Ms Bridget Warrie
- ☐ Ms Michelle Adams (proxy)
- ☐ Mr Allan Cheedy (PNTS representative)

A presentation using MS Powerpoint was provided to the attendees. The presentation provided overview details of the project and also sought to explain the consultation and negotiation process in respect of Native Title issues that would follow in the future. A CD copy of the presentation was duly forwarded to the PNTS on the 21 August 2001 (Attn: Mr David Ritter at the Geraldton office) and on 28 August 2001 (Attn: Mr Adrian Murphy at the Perth office).

87. *The Yamatji Land and Sea Council note that the PER states in Section 5.12.1 that “an archival review of the archaeological data pertaining to areas identified as suitable for the project infrastructure” has been undertaken. It appears to date, the Ngarluma Injibarndi group have not identified any sites of significance pursuant to Section 15 of the Aboriginal Heritage Act and no sites have been identified which impact on the Project’s development plans. The Pilbara Native Title Service are not aware of any heritage surveys commissioned by Burrup Surveys Pty Ltd with the participation of our clients, which had been or were attempted to be undertaken at the date of the PER to determine this question. Nor is the Pilbara Native Title Service aware of heritage*

survey which details the efforts of Burrup fertilisers Pty Ltd to ascertain whether there are any heritage sites that may be affected by the Project.

Answer 87

On the 29 May 2001, the PNTS was advised of the intent to engage Mr Gary Quartermaine to undertake archaeological survey work within the proposed project areas. The archaeological survey was duly conducted in June.

In early July, Australian Interaction Consultants (AIC) Mr Ron Parker confirmed to Wyeth & Associates that:

- ❑ he had been contacted by Ngaluma Lawman Mr David Daniel to undertake an ethnographic survey of the proposed Burrup Fertiliser project areas with a view to identify Aboriginal heritage sites that may become the basis of an *Aboriginal Heritage Act* section 18 submission to the AAD; and
- ❑ that he was willing to undertake the required ethnographic site consultations with representatives of the Ngaluma group that have previously spoken for the Burrup lands.

A copy of the archaeology report and a survey brief was duly provided to AIC on 5 July 2001.

The ethnographic survey was conducted by Mr Parker on 11 July 2001 with the following Ngaluma Injibandi informants in attendance.

- ❑ Mr David Daniel (Ngaluma)
- ❑ Mr Les Hicks (Ngaluma)
- ❑ Mr Garry Daniel (Ngaluma)
- ❑ Mr Rodney Kerr (Ngaluma)
- ❑ Mr Dal Jenkins (Ngaluma)
- ❑ Mr Cliff Samson (Ngaluma)
- ❑ Mr Brice Monadee (Injibandi observer and named claimant)

Each Aboriginal participant was confirmed to be qualified under Ngaluma Law to speak for the lands that were the subject of the survey.

AIC duly compiled the ethnographic report resulting from the July field work and a copy of the report was forwarded to the PNTS on 28 August 2001 (Attn: Mr Adrian Murphy at the Perth office).

88. *The Yamatji Land and Sea Council note that no details are provided on how Burrup Fertilisers Pty Ltd intends to approach the issue of the long-term management of the heritage values within the Project. A heritage management plan is a critical tool that will need to be developed in consultation with the Ngarluma Injibarndi group especially given its proximity to areas of cultural and historic significance.*

Answer 88

A heritage management plan will be developed as a key element of the project's Environmental Management Plan. Appendix G of the PER document provides an overview of the project's proposed Environmental Management Plan (EMP). Figure 7.1 within Appendix G makes specific reference to the structure of the project's proposed Environmental Management Plan including the management of Aboriginal Heritage aspects.

Section 5.12 of the PER document reports the Aboriginal heritage and cultural issues associated with the proposed development and Section 8.5 of the PER outlines proposed management and monitoring strategies to maintain heritage values. Specifically, Commitments 8.5.1 to 8.5.4 inclusive within the PER provide management strategies to address Aboriginal heritage and cultural concerns within and adjacent to the project areas. These commitments are repeated as follows:

***Commitment 34:** Employ Aboriginal representatives to monitor all ground disturbances and earthworks (formerly PER Commitment 8.5.1).*

***Commitment 35:** Establish an Aboriginal cultural awareness program and include within employee induction and training programme (formerly PER Commitment 8.5.2).*

***Commitment 36:** Restrict access to Aboriginal heritage sites (formerly PER Commitment 8.5.3).*

***Commitment 37:** Assist, where practicable, with the protection and management of heritage sites adjacent to the proposed lease area (formerly PER Commitment 8.5.4).*

Aboriginal heritage and cultural issues addressed in the PER were derived from consultations conducted during ethnographic field work in conjunction with representatives of each of the three registered Native Title claimant groups.

Representatives from each of the three Native Title claimant groups will be engaged during construction work to implement the commitments as stated within the PER.

89. *The Conservation Council note that the aesthetics of the Burrup are unparalleled. The rugged rockpile hills set against the aqua blue sea of the archipelago is scenery found nowhere else in the Pilbara or the world. These values have inspired deep Aboriginal cultural connection with the area. It is unacceptable that these values should be diminished.*

Answer 89

The proposed ammonia plant has been sited to avoid the significant rockpiles in the northern area of the project lease. The rockpiles of the Burrup are known to contain a wealth of Aboriginal art and sacred sites. For this reason, particular attention was given during the site orientation stage of the project to avoid areas of Aboriginal significance.

Further to these considerations, relevant representatives of Aboriginal claimant groups have been consulted in regard to the proposal. These consultations are ongoing and the Proponent has made a series of formal commitments to ensure that Aboriginal heritage values of the project lease are not diminished (refer to the Proponent's response to Question 88).

90. *The Aboriginal Affairs Department notes that no reference is made in the Aboriginal Heritage section of the Executive Summary of the Public Environmental Review (PER) to sites 18614 (DRD135) located in the southern services corridor nor sites 9756 (P02411) or 10208 (P01959) that are located in or near the northern services corridor. The omissions referred to above are carried forward into Table ES1 and section 8.5 of*

the chapter on Social Surroundings Impacts, Management and Monitoring (pp 162 – 163).

Answer 90

The Aboriginal heritage sections of the PER document is a concise summary of the more detailed archaeological and anthropological assessments forwarded to the Aboriginal Affairs Department. The PER document lists all sites previously recorded and registered within the vicinity of the project lease and pipeline corridor in Tables 5-9 and 5-10 (pages 71 and 72). Site DRD135 has been previously recorded to occur within the project lease, however during the archaeological survey and three anthropology field studies no evidence of site DRD135 was found. It is important to note that an archaeological site is defined as “any place containing traces of past human activity” (Fagan, 1980:7) and that state legislation allows artefact scatters to be registered as a site if it contains at least three artefacts with a density of at least 1/100m². Hence Site DRD135 was found to no longer represent the true sense of a ‘site’ and it was considered very unlikely that the proposed plant would impact Aboriginal cultural material that was once associated with this site.

Similarly, no evidence of Sites P02411 and P01959 were found. It is likely that the significant ground disturbance that has previously occurred within the vicinity of these two sites has contributed to the absence of the Aboriginal cultural material once associated with these sites.

As it was considered very unlikely that Aboriginal cultural material associated with the above three sites would be impacted, no reference to these sites were made in the executive summary and impact sections of the PER document.

91. *The Aboriginal Affairs Department note that on page 71 the PER document makes reference to the Aboriginal sites within the project lease and states “None of these will be disturbed during the plant construction or operations”. This is a confusing statement that probably only relates to the four sites that were registered at that time with this Department.*

Answer 91

To put the above mentioned statement into context the PER states ‘A total of ten Aboriginal heritage sites have been recorded to occur within the project lease. Four of the ten sites are registered with the Aboriginal Affairs Department. None of these sites will be disturbed during plant construction or operations.’ Wyeth and Associates confirms that the four registered sites are the subject of these statements and will not be impacted by the proposed project.

92. *The Aboriginal Affairs Department note that Table 5-9 indicates that site 18614 (DRD135) is “outside works area”, however it is within the southern services corridor and it is possible it could be impacted.*

Answer 92

Reference should be made to the “Submission to the Aboriginal Cultural Material Committee (ACMC) for consideration of a Section 10 Approval Pursuant to the Aboriginal Heritage Act 1972” as submitted by Wyeth & Associates on behalf of Burrup Fertilisers Pty Ltd on 27 August 2001.

The submission includes the archaeological and three anthropological reports that relate to the Burrup Fertiliser project areas and it is within these documents that reference is made to heritage site DRD135. Within the archaeological report a description of site DRD135 is provided as follows:

“The site is most likely to be artefacts and shell accumulation in an area measuring 30 by 40 metres. No evidence was found at the reported site location but this may be because recent floods have scoured the area.”

Discussion of the site is then presented as follows:

“The site is located within the proposed plant lease area. It is of low archaeological significance because of the large number of such sites in the area and the lack of any remaining archaeological material”

During the archaeology survey and three subsequent anthropology field studies no evidence of site DRD135 was found. This is probably due to post cyclone inundation and scouring of the area lying within the salt pan extension east of the King Bay drainage system.

Thus without current evidence as to the existence of the site, it is not possible to state with certainty whether the site, if it still exists, will be impacted or not.

93. *The Aboriginal Affairs Department note that Table 5-10 indicates sites 9756 (P02411) and 10208 (P01959) are “Outside works area”, however site 9756 and 10208 are within or near the northern services corridor.*

Answer 93

Reference should again be made to the above mentioned submission to the ACMC where Table 1 (pg 9) within the archaeological report provides the current assessment and significance of registered archaeological sites within the Burrup Fertiliser project areas. Sites 9756 (P02411) and 10208 (P01959) both have “cleared” status which is consistent with the following appraisals.

Site 9756 (P02411) is recorded as extending east from under Burrup Road and into the road reserve for a distance of approximately 30 metres. In this 30 metre interval the ground has been significantly disturbed by previous works including:

- ☐ Construction of the Burrup Road;
- ☐ Construction of the 600 mm gas pipeline and its attendant access track;
- ☐ Construction of the 300 mm water pipeline; and
- ☐ Construction of the power reticulation lines.

During the archaeology survey and three subsequent anthropology field studies no evidence of site 9756 (P02411) was found and this is because of the significant ground disturbance that has previously occurred over the area within which the site previously existed.

Site 10208 (P01959) is recorded as extending immediately south of the high tension power lines that run parallel to and south of the Hearson Village road. No evidence of this site was recorded during the current archaeological and anthropological field work and again this is probably due to previous construction activities related to the installation of the power lines. It should also be noted that the project’s proposed gas pipeline and ammonia pipeline alignments are north of the power lines and are therefore beyond the previously documented location of this site.

The Ministerial condition relating to this site as advised on 26 October 2001 will be adhered to, this being that “location 10208 (P01959) be avoided if possible”.

94. *The Aboriginal Affairs Department note that Section 5.12 Aboriginal Heritage leaves the reader with the impression that the Burrup Peninsula contains little evidence of Aboriginal significance. This could not be further from the truth. The area is world renown for its art, the density of sites is greater than most other areas of the State, the major survey and salvage project undertaken for Woodside Offshore Petroleum identified numerous occupation sites, engravings and man-made stone features (Vinnicombe, WA Museum 1987). In view of the heritage values of the Burrup Peninsula and the Dampier Archipelago, this Department has expressed its concern for many years in relation to the expansion of industry further north along the Peninsula.*

Answer 94

The PER did not intend to play down the significance of Aboriginal heritage associated with the Burrup Peninsula. The Proponent is well aware of the significance of Aboriginal heritage and has optimised the plant site specially to minimise the disturbance to Aboriginal sites associated with rockpiles as discussed in Section 6.1.1. The PER document highlights that '498 sites have been recorded in the northern, central and eastern parts of the Peninsula and from this, a density of 56.7 sites per square kilometre is estimated. The recorded main sites comprised stone pits (33.7%), artefact scatters (20.9%) and engravings (19.3%).' This clearly recognises the high density of sites occurring on the Peninsula.

95. *The Aboriginal Affairs Department note that the wording of 'Objective' for the Proponent Management Commitments 6.1.1.2 and 6.1.3.2 is confusing with regard to areas considered to be significant in terms of Aboriginal heritage. If such areas are defined as Aboriginal sites impact upon them should be subject to an application pursuant to Section 18 of the Aboriginal Heritage Act.*

Answer 95

Throughout the PER document, reference is made to the occurrence of Aboriginal sites near or on rockpiles that are common on the Peninsula. The rockpiles as an entity are well known to contain many petroglyphs and as a result the Proponent recognises the need to avoid disturbances to them and has committed to:

- Disturbance to rockpiles, drainage lines and samphire communities will be avoided where practicable(Commitment 6.1.1.2 of the PER document).

Although the PER demonstrates that the rockpiles will be avoided, the Proponent considers that such a significant entity of the Project Lease is warranted a commitment. Hence the objective of the commitment is to 'minimise disturbance to areas considered to be significant in terms of vegetation communities and Aboriginal heritage'.

96. *The reference section lists publications not cited in the text (e.g. Maynard, L 1977). This does not accord with the generally accepted practice for reports of this kind.*

Answer 96

The Proponent acknowledges the incorrect inclusion of the reference to Maynard (1977).

9. Traffic Management

97. *The longer term additional traffic associated with the plant is not considered to be significant. However combined with the other proposed developments along Village Road, the development may require the construction of a right turn pocket into Village Road and a left turn slip lane from Village Road. Has any consideration been given to this in development of the proposal by the proponent?*

Answer 97

The need for a right turn pocket has been discussed with the Shire of Roebourne however, no decision has yet been made. Burrup Fertilisers is aware that Main Roads WA are considering the upgrade of Burrup Road to dual lanes and will thus preclude the need for a right hand turning pocket. These issues will be investigated in detail in the Traffic Management Plan. The Shire of Roebourne and Main Roads WA will be consulted during the development of the Traffic Management Plan.

98. *The document refers to preparation of a traffic management plan. Main Roads WA will need to review this plan prior to commencement of construction.*

Answer 98

To ensure that Main Roads WA is given the opportunity to comment on the proposed Traffic Management Plan, the Proponent will specify Main Roads WA as an advising agency for the development of the Traffic Management Plan (**Commitment 2.4** (formerly PER Commitment 8.2.2.1)). This will require Burrup Fertilisers to submit the Traffic Management Plan to Main Roads WA for review prior to obtaining approval for the Plan from the Department of Environmental Protection.

99. *It is anticipated that the main environmental impact the project will have on Main Roads WA will occur during the construction of service crossings of Burrup Road. All crossings of the road reserve will need to be done to Main Road WA's requirements.*

Answer 99

The Proponent will ensure that the requirements of Main Roads WA are met with respect to constructing services across Burrup Road.

100. *As part of a service corridor to assist development along Burrup Road, the Office of Major Projects is currently considering the option of a conveyor belt to run over Burrup Road between the access to the port and Village Road. To assist in the design of the conveyor, it is requested that the proponents advise (as soon as possible) the likely dimensions of the largest prefabricated loads likely to be transported to site.*

Answer 100

The Proponent has considered the issue of Plenty River's proposed conveyor to the Dampier Public Wharf. Consultations have been held with the Office of Major Projects (OMP) and preliminary data of the largest expected prefabricated loads have been forwarded to OMP. The selection of equipment and components will be undertaken during the detailed engineering design phase and the size of the expected prefabricated loads will be confirmed again with OMP.

101. *The Conservation Council note that access to other beaches on the Burrup requires 4WD vehicles. From an environmental perspective uncontrolled 4WD activities are not to be encouraged.*

Answer 101

There are a number of beaches on the Burrup Peninsula which are only accessible by 4WD vehicles. These recreational areas are important to the residents of Karratha and Dampier. Access to beaches near to the project lease will not be impacted by the proposed ammonia plant.

Burrup Fertilisers will develop a Traffic Management Plan to ensure that traffic movements of the construction and operation workforce are controlled and that traffic is kept to designated tracks.

10. Amenity

102. *The Conservation Council note that Hearson Cove is the only easy access beach for Karratha residents on the Burrup. The implementation of this proposal will further diminish the amenity value of the area. The drive to the beach will now be lined with industry.*

No diminishing of the aesthetic and environmental values associated with Hearson Cove can be permitted.

Answer 102

The King Bay – Hearson Cove valley is zoned for industrial use in the Burrup Land Use and Management Strategy (O'Brien Planning Consultants, 1996). It is impossible to have industry establish in the area and be shielded from Hearson Cove road as a result of the low lying intertidal mud flats between the road and the industrial zoned land. A three dimensional model developed to assess the potential impacts on visual amenity illustrates the view of the proposed ammonia plant from Hearson Cove road (Figures 8.7, 8.8 and 8.9 of PER).

It is important to note that the proposed ammonia plant will be shielded from the shores of Hearson Cove. The stack of the carbon dioxide stripper will be visible by recreational users who stand at the top of the sand dunes (Figure 8.10 of PER).

To maintain the visual amenity of the plant, Burrup Fertilisers has made the following management commitment:

- ❑ **Commitment 38:** *Ensure the visual amenity of the plant is considered in terms of the colour of buildings to blend into the surrounding terrain, where possible and housekeeping standard (formerly PER Commitments 8.4.1 and 8.4.3).*

Furthermore, all temporary disturbances will be rehabilitated and revegetated with local species. This commitment (formerly PER Commitment 8.4.2) has been incorporated into **Commitments 2.2, 3, 7 and 8.**

Appendix 6

Ministerial Conditions for the Desalination and Seawater Supplies Project, Burrup Peninsula

Appendix 7

Burrup Fertilisers' proposed wastewater discharge

Appendix 8

The Water Corporation's responsibilities in managing the multi-user Brine and Wastewater Discharge System