Iron Ore Mine, Downstream Processing (Direct-reduced and Hot-briquetted Iron) and Port, Cape Preston, WA

Austeel Pty Ltd

Report and recommendations
of the Environmental Protection Authority

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Summary and recommendations

Austeel Pty Ltd proposes to mine iron ore from the George Palmer Orebody on a pastoral lease about 25km south of Cape Preston. Ore will be fed to a purpose-built process plant to produce up to 13.8 million tonnes per annum of pellet iron and 4.7 million tonnes per annum of direct reduced iron (DRI) and/or hot briquetted iron (HBI). The products will be exported via a new port to be built at Cape Preston and Preston Island. Associated components comprise waste dumps, tailings storage facility, onsite accommodation for 420 (with up to 550 at Karratha), a 25km long transport corridor and a causeway from the mainland to the port off Preston Island. 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

In the EPA's opinion, the following are environmental factors relevant to the proposal, which require detailed evaluation in the report:

a) vegetation communities, including declared rare and priority flora; introduced species;

b) terrestrial fauna, including specially protected (threatened) fauna and stygofauna;

c) coastal features:-mangroves, foreshore, dunes, island shores and seabed;

d) marine fauna, including turtles, corals and benthic organisms; including introduced marine organisms;

e) marine water and sediment quality, including turbidity;

f) rivers, watercourses, ephemeral streams and flooding;

g) groundwater;

h) oil from spill incidents;

i) gaseous and particulate emissions, including greenhouse gases;

j) heritage issues; and

k) recreational values, including fishing.

A number of second order factors are also discussed more briefly. These cover soil contamination, noise, the infrastructure corridor options, risk and hazard, acid mine drainage, asbestiform minerals, and rehabilitation. In Section 5 under 'Other Advice' the need to consider mitigatory measures to aid the conservation effort in the Cape Preston region is considered.

Conclusion

The EPA has considered the proposal by Austeel Pty Ltd to mine iron ore and process the ore to create direct-reduced and hot-briquetted iron, build a power station and ship the product from a port to be built at Cape Preston.

The scope of this proposal and attendant potential environmental impacts are considerable, especially as it is to be sited in an essentially undeveloped and environmentally rich part of the Pilbara coastal strip, will have thousands of its construction and several hundred of its operations workforce living on site and will be a large producer of NO_X and greenhouse gases.

The assessment of this proposal has been hampered by the difficulty in obtaining adequate and timely studies on a number of environmental issues.

In light of these circumstances, the EPA has adopted a precautionary stance, requiring that decisions on various key components (such as the placement and design of the causeway / bridging structure from Cape Preston to Preston Island) are contingent on the results from surveys and modelling still to be carried out. This has led to several recommended conditions which are long and complex, in order to recognise important matters. There remains uncertainty on the distribution of the oniscoid Isopod species of stygofauna, which so far is only known from boreholes within the orebody. The effects of mining and groundwater depletion on the population of this organism are imperfectly known until sufficient work is done to establish its broader distribution and to characterise its preferred habitat. Precautionary conditions have been recommended to deal with this state of knowledge.

In summary, the EPA has concluded that the proposal can only be managed in an environmentally acceptable manner if there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments, and a satisfactory outcome from the surveys remaining to be completed.

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 Austeel Pty Ltd to mine and process iron ore and ship DRI /HBI product from Cape Preston 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; and

(b) a pit dewatering and vegetation monitoring plan;

(c) a subterranean fauna management plan;

(d) plans for management of the marine environment and the port at Cape Preston, including wastewater discharges and ballast water management;

(e) hydrological modelling of surface water flows and studies of levels on the Fortescue River floodplain;

(f) particulate and gaseous emissions (including greenhouse gas) management plan and the requirement for combined cycle power;

(g) noise;

(h) a recreational sites management plan;

(i) mitigatory measures to aid the conservation effort;

(j) compliance audit and performance reviews, and a closure plan.

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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 Austeel Pty Ltd to mine iron ore from the George Palmer Orebody on a pastoral lease about 25km south of Cape Preston. Ore will be fed to a purpose-built process plant to produce up to 13.8 million tonnes per annum of pellet iron and 4.7 million tonnes per annum of direct reduced iron / hot briquetted iron. The products will be exported via a new port to be built at Cape Preston and Preston Island, some 60km west of Dampier. Subsidiary components of the proposal comprise waste dumps, tailings storage facility, stockpiles, power station and distribution network, desalinated water plant, onsite accommodation, a 25km long transport corridor (for a conveyor and / or road) and a causeway from mainland Cape Preston to the port facility off Preston Island.

The proponent's main shareholder is Mineralogy Pty Ltd. Mineralogy holds the mining leases over the George Palmer iron ore deposit (some 25km south of Cape Preston), port facilities and infrastructure and has granted rights to Austeel Pty Ltd to use part of its tenements for the development and operation of the project.

The EPA's decision to assess the proposal at the level of PER was based on the number of components it comprises (mine, infrastructure corridor, gas spur line, process plant, accommodation village and port) together with the following relevant environmental factors: vegetation communities, terrestrial fauna including stygofauna, coastal features including mangroves, marine fauna (including turtles and corals), marine water and sediment quality, surface waters including watercourses, groundwater, oil from spill incidents, gaseous emissions including greenhouse gases, aboriginal heritage and recreational pressures. Although the project requires piped natural gas its supply does not form a part of this proposal and this aspect has yet to be referred to the EPA for consideration.

The proposal is to be sited in a relatively undisturbed area with distinctive flora and rich faunal communities. It will be built on or adjacent to several types of habitats, including stony and rocky hills and outcrops, cracking clays, floodplain creeklines, mangroves, island platforms, and beaches.

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 2 contains a summary of submissions and the proponent's response to submissions. It is included as a matter of information only and does not form part of the EPA's report and recommendations. Issues arising from this process and which have been taken into account by the EPA appear in the report itself.

2. The proposal

The main characteristics of the proposal were described in Part 2 of the PER (Austeel Pty Ltd, 2000). However, since the release of the PER for public review, modifications to the proposal have been made by the proponent. These were detailed in a Supplementary Environmental Review (HGM, Feb. 2002) which also provided details on studies completed since the time of writing of the PER. The changes to the proposal include:

- double the rate of mining to 44.8mtpa; from increased ore reserves of >1400mt;
- pit depth marginally increased from 200m to approximately 220m;
- project life shortened to approximately 20 years;
- double the rate of ore concentrated to 13.4mtpa;
- double the quantity of tailings to 31.4mtpa;
- double the quantity of pellet ore to 13.8mtpa;
- double the output of the power station to 640MW, with installed standby of 320MW;
- increase in gas supply, from 75,000Tjpa to 89,450Tjpa;
- increase in annual greenhouse gas emissions from 4.4mt to 5.4mt CO_2 equivalent, but an expected overall reduction over the shorter mine life;
- desalinated water will be required at double the original capacity at startup, falling to 38.5Mm^3pa; resulting in an
- increase in brine disposal from 33Mm^3pa to 57.8Mm^3pa once sufficient storage reserves are achieved;
- more than double the area of the plant site and power station to 220ha;
- a reduction in the area of the tailings storage to 800ha from 960ha (only one of the two facilities originally described is now proposed);
- an increase from 40 to 420 workers to be housed onsite for the operational phase, and up to 550 to be housed in Karratha;
- total area disturbed marginally increased from 1906ha to 1916ha. This includes previously undefined areas for the gas feeder pipeline lateral (36ha) and water storage dams (17ha);
- the area proposed for rehabilitation is increased marginally from 1686ha to 1696ha, on the assumption that the pit will be left open at the end of mining.

These significant changes to the proposal required considerable further studies to quantify the related and potential environmental impacts. Further work is also required prior to the start of construction and will have a bearing on the final design and placement of structures.

The potential impacts of the proposal initially described by the proponent in its PER document **(**prepared for Austeel P/L by HGM, December, 2000) and subsequently in its Supplementary Environmental Review (HGM, 2002)**,** together with their proposed management are summarised in Section 3). The main characteristics of the proposal are shown in Table 1. Figure 1 depicts the project's location; Figure 2 outlines its main components.

Table 1 – Summary of key proposal characteristics

Element	**Description**
MINE	
Mine ore reserves	Greater than 1400 million tonnes iron ore
Depth of pit	approximately 220m, left open at end of mining
Rate of mining	approximately 44.8 million tonnes per annum (mtpa)
Projected mine life	minimum 20 years
PROCESS PLANT	
Concentrator rate	13.4 mtpa
Produced waste to tailings storage	31.4 mtpa
Pellet production	13.8 mtpa
Direct reduced / hot briquetted iron	4.7 mtpa
Gas usage	55,280 terajoules per annum (Tjpa)
GASEOUS EMISSIONS	
Sulphur dioxide emissions	1573 tonnes per annum (tpa)
Nitrogen oxide emissions	19761 tpa
Particulates	2567 tpa
CO2 equivalents	5,558,000 tpa
INFRASTRUCTURE	
Power station capacity; gas usage	Open cycle 640MW+320MW standby, 34,170 Tjpa (proposed).
Product conveyor / haul road	25km from process plant at minesite to Cape Preston port
Groundwater borefield	not required for operational stage
Desalination plant	44 million cubic metres per annum (Mm^3pa)
Brine disposal	57.8Mm^3pa
Administration, storage, workshops, sewage treatment plant, village	
PORT	
Product stockyard capacity	1 million tonnes
Causeway to Preston Island	1.1km, solid fill to island (proposed), then trestle jetty seawards
Small craft harbour and import berth	
Dredging	up to 4.5 million cubic metres, disposed offshore
AREAS OF DISTURBANCE	
Pit	Approximately 220ha
Plant site / power station	Approximately 220ha
Waste dumps	Approximately 465ha
Tailings storage	Approximately 800ha
Other mine infrastructure	Approximately 186ha
Port stock yard	Approximately 25ha
Total	Approximately 1916ha
Total for rehabilitation	Approximately 1696ha
WORKFORCE	
Construction phase (3 years)	5000 peak
Permanent	up to 970
Accommodation	400 at minesite, 20 at Cape Preston, 550 commute from Karratha

Abbreviations

m	metres	Tjpa	terajoules per annum
mtpa	million tonnes per annum	km	kilometres
MW	megawatts	Mm^3pa	million cubic metres per annum
		ha	hectares

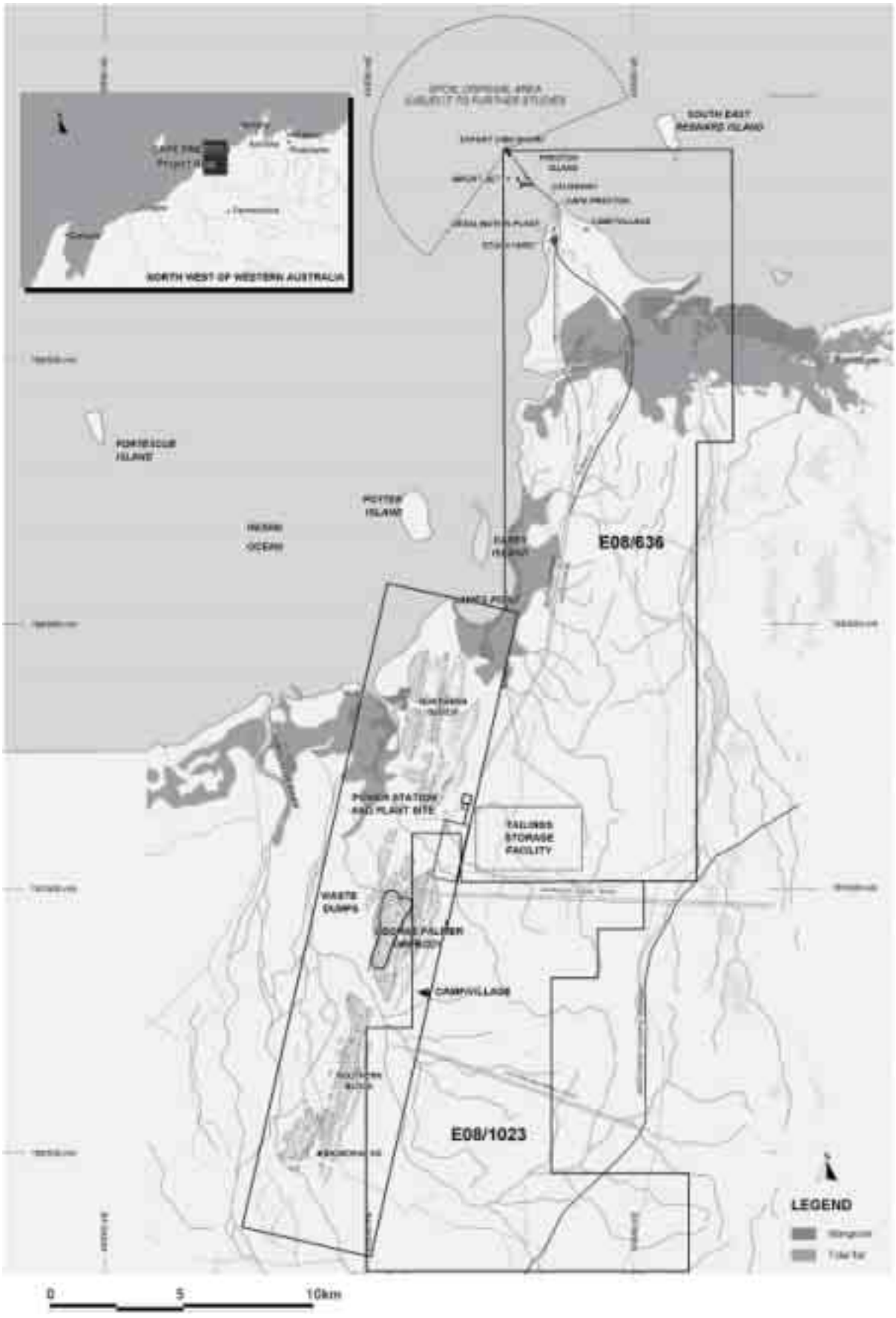

Figure 1: Location

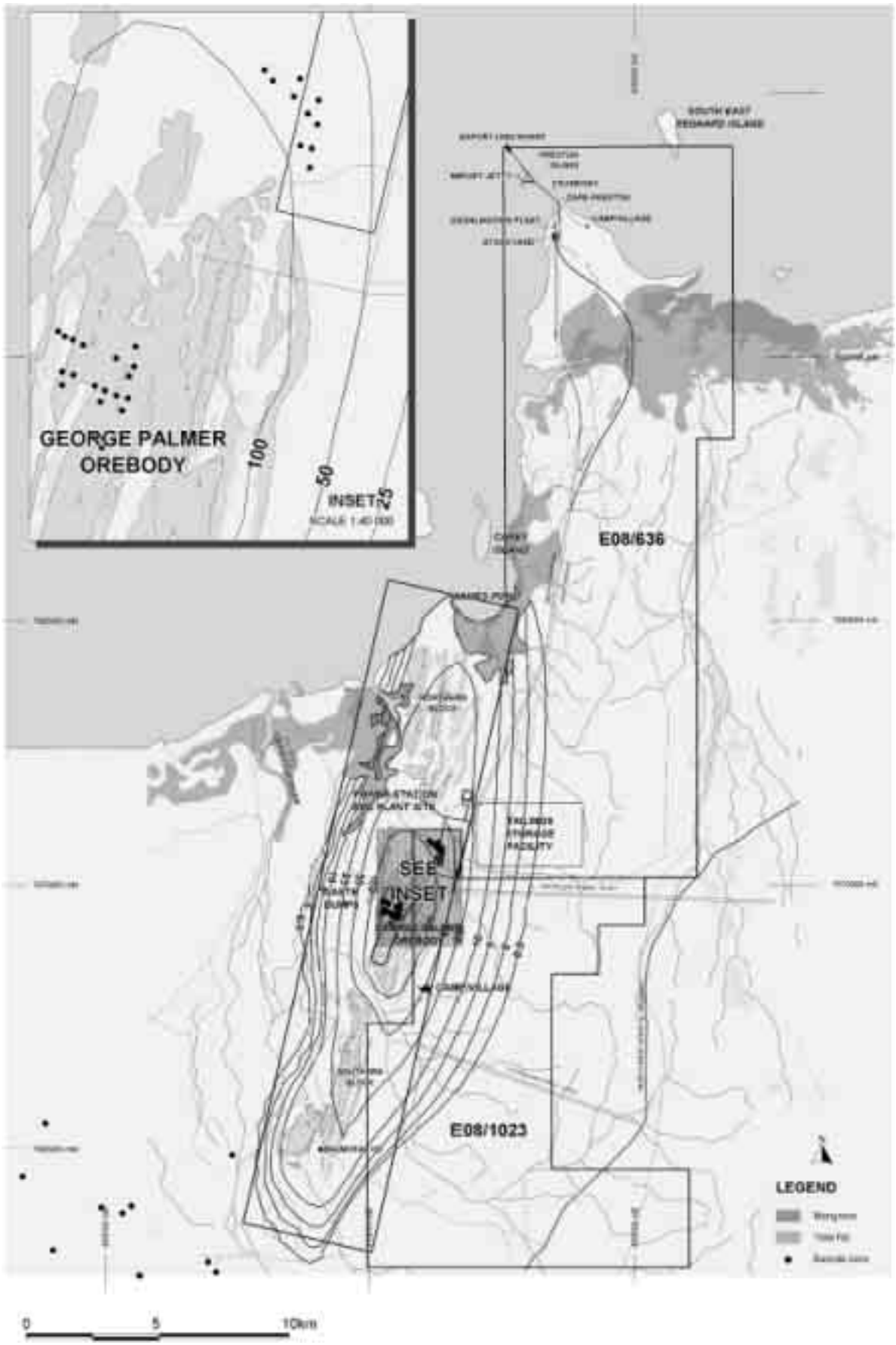

Figure 2: Key project components groundwater depletion zone and stygofauna sampling locations

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 other factors not discussed below. Some of these factors are 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) vegetation communities, including declared rare and priority flora; introduced species;

b) terrestrial fauna, including specially protected (threatened) fauna; and stygofauna;

c) coastal features:-mangroves, foreshore, dunes, island shores and seabed;

d) marine fauna, including turtles, corals and benthic organisms; including introduced marine organisms;

e) marine water and sediment quality, including turbidity;

f) rivers, watercourses, ephemeral streams and flooding;

g) groundwater;

h) oil from spill incidents;

i) gaseous and particulate emissions, including greenhouse gases;

j) heritage issues; and

k) recreational values, including fishing.

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 3.1-3.12. 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. A tabular summary of the assessment of the environmental factors comprises Appendix 3.

A number of other, second order factors are discussed more briefly in Section 3.13. These cover soil contamination, noise, the infrastructure corridor options, risk and hazard, acid mine drainage, asbestiform minerals, and rehabilitation. In Section 5 under 'Other Advice' the need to consider mitigatory measures to aid the conservation effort in the Cape Preston region is discussed.

3.1 Vegetation communities; declared rare and priority flora; introduced species

Description

Four hundred and twenty seven taxa of vascular flora were identified in the survey area. The significant number reflects the size of the survey area and its variety of habitats. In order to attempt local and regional comparisons broad correlations were made between the vegetation associations and the land systems comprising the survey area, of which there are nine. The orebody hosts portions of the Newman Land System, which is more common further inland.

The Priority Species List describes eight priority flora as occurring in the area:

- Priority 1- *Gunniopsis* sp Fortescue (M Trudgen 11019) and *Goodenia pallida*;
- Priority 2- *Ischaemum albovillosum*;
- Priority 3- *Abutilon trudgenii* ms; *Acacia glaucocaesia; Hibiscus brachysiphonius; Sida* sp. Wittenoom (WR Barker 1962); *Tephrosia* sp. Cathedral Gorge (F H Mollemans 2420); and *Themeda* sp. Hamersley Station (M E Trudgen 11431).

Abutilon trudgenii ms., *Hibiscus brachysiphonius* and *Sida* sp. Wittenoom, plus two additional Priority 3 species, namely *Eriachne tenuiculmis* and *Phyllanthus aridus*, were recorded in the area.

Some "flora of interest" were also identified. These are "species which are not listed as DRF or priority, but which are poorly known and / or could not be identified to species level for reasons other than poor condition of the specimens".

Clearing for the project is estimated to directly affect 1916ha out of a total area mapped of 20,885ha. Most individual vegetation types, including most of the riparian vegetation types. have relatively low percentages disturbed, apart from 'Rockpiles' at 23% and 'Flowlines' (high *Acacia sclerosperina* over *Chrysopogon* tussock grassland) with 75%.

Thirteen species of introduced flora were recorded from the project area. The most problematic is Mesquite (*Propsis* sp.) which is a declared noxious weed. Its occurrence in this area is part of the largest infestation in Australia. Many specimens grow on the Southern Orebody (not a part of the mining envelope) and it is often associated with creeklines and floodplains. A number of other introduced species are also present in the area but most are commonplace throughout the rest of the Pilbara. Creekline habitats were found to be particularly susceptible to weed invasion.

Dewatering of the mine pit will result in a depressed watertable, which is likely to affect vegetation in the drawdown zone, particularly deep-rooted (phreatophytic) creekline trees such as *Eucalyptus camaldulensis, E. victrix* and *Melaleuca argeniea* along parts of Edward and du Boulay Creeks and in the eastern channels of the Fortescue River floodplain. If Edward and du Boulay Creeks (which cross the project area) are affected in this way the current fauna corridors along these creeks will be degraded and the habitats of the upper reaches of these creeks could become isolated from downstream areas. Dewatering may also affect shallower rooted plants which draw water from the shallow (5-8m) water table found to exist in all sampled boreholes in areas off the orebody.

'Creeklines' scored highest (84 species out of a total of 179 vertebrate fauna species surveyed), in a comparison of fauna species versus habitat types, according this type of habitat a high conservation value within the project area. Other types with significant numbers of associated faunal species are 'low stony hill' (with 37 fauna species recorded) and 'rocky hills and outcrops' (29 species). These types are also regarded as important because of their 'island' basement rock remnant vegetation status in a sea of more recent alluvium.

Submissions

CALM stated it had concerns about the construction of a large industrial project in an area that is largely unmodified and contains values of high conservation significance. It was noted that only one flora survey had been completed and that at least one other should be done, particularly of vegetation types and habitats which may harbour rare and priority flora, such as the cracking clays of the Horseflats Land System. This system type is poorly known and severely degraded elsewhere in the Pilbara, whilst in "relatively good condition" (CALM submission) in the project area. Given its condition relative to elsewhere in the region, its occurrence here may be of considerable conservation significance. Approximately 12% of this system within the project area would be impacted by this project. Austeel should aim to minimise the impacts to it and develop strategies to conserve the system.

Mesquite is likely to become more abundant in areas disturbed by the project. Austeel should be prepared to become an active member of the Pilbara Mesquite Control Committee.

Assessment

The area considered for assessment of this factor is the entire terrestrial component of the project area. The EPA's environmental objective for vegetation communities is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities. The environmental objective for rare and priority flora is to protect them, consistent with the provisions of the *Wildlife Conservation Act 1950*. For introduced species the objective is to minimise their spread.

Austeel has committed to undertaking another survey (for flora and fauna), with the timing (awaiting favourable rains) to be determined in consultation with CALM. It will concentrate on the 25km infrastructure corridor which will transport the ore to the process plant at Cape Preston. The corridor traverses some of the high value (for flora and fauna) cracking clays of the Horseflats Land System. If any specimens of the Priority 1 species *Goodenia pallida* are identified, a management strategy will be developed in consultation with CALM to address their occurrence, including consideration of moving parts of the project so as to avoid impacts to populations of the plants.

Austeel has stated it is willing to become involved with Mesquite control as an active member of the control committee once it has established a permanent presence in the area.

The PER stated that upwards of 75ha of creekline vegetation would be cleared. Given the proposed pit depth and dewatering regime, loss of some creekline and other vegetation from the depression of the water table is unavoidable - the area of potentially affected (but not necessarily lost) creekline vegetation as a consequence of dewatering is calculated to amount to 1196ha (~12km^2) as indicated by modelling completed subsequent to the publication of the PER. This figure sums all creekline areas where the water table will be depressed, including those at the periphery of the zone where the drawdown is least (shown as contours from 0.5

to 2.0m in Figure 2). The total area covered by the drawdown zone is about 149km^2. Within that area the dewatering is expected to affect up to 237ha of creekline vegetation out of a total of 1153ha in the Lower Fortescue Basin (21%). The creekline vegetation comprises a lesser percentage of the total amount of phreatophytic vegetation. The other class of vegetation, which has less conservation significance, occurs on the floodplains and consists of scattered *Eucalyptus victrix* trees. The amount of this class potentially affected by dewatering is 960ha from a total of 4350ha, or 22%.

The vegetation loss figures have been applied conservatively and if drawdowns of less than 5m (ie those around the periphery of the drawdown envelope) are ignored the percentages drop from 21% to 13% and from 22% to 15%, respectively. (Five metres is an estimate as to the maximum root extension of phreatophytic vegetation in pursuit of a declining watertable over the period of mining.)

So as to allow the maximum time possible for tree roots to grow downwards, the EPA considers that the rate of groundwater pumping with respect to the pit should match the rate the base of the pit advances as mining progresses, rather than being far in advance of it.

As the creekline vegetation type provides habitat for a significant proportion of the total fauna species count for the project area (47%) its potential loss is of concern to the EPA. Austeel has indicated that it would be prepared to monitor the extent of creekline vegetation loss over the years. The EPA endorses this approach and recommends that it be incorporated into Austeel's environmental management programme.

Summary

Having particular regard to the:

(a) extra flora survey and the avoidance and management strategies with regard to rare and priority flora in high conservation value land systems to which Austeel has committed;

(b) proponent's commitment to be actively involved in Mesquite control once it has a permanent presence in the area; and

(c) relatively low proportion of riparian vegetation which would be lost due directly to clearing, and indirectly as a result of dewatering of the pit;

it is the EPA's opinion that the proposal may be managed to meet the EPA's environmental objectives for these factors provided that dewatering of the pit occurs only at the rate of mining, so that tree roots near the periphery of the drawdown zone are afforded the best chance to deepen at a rate which keeps pace with lowering of the water table.

3.2 Terrestrial fauna; specially protected (threatened) fauna

Description

The fauna survey recorded 179 vertebrate species (96 bird species, 17 native mammals, 5 introduced mammals, 58 reptile species and 3 amphibians). The variety of birds compares favourably with surveys carried out in other areas of the Pilbara, with the Little Corella being the most commonly recorded. With the exception of the Euro, none of the mammals was recorded in large numbers, although bats were relatively prominent. Two bat species of the 18 recorded have a reported strong preference for mangal habitat, where they roost and forage. The herpetofauna recorded in the survey represent a diverse community which

compares favourably with some Pilbara localities, although not as well against the Onslow Region (96 documented species by Storr and Harold, 1985) and the Exmouth Region with 114 species (Storr and Hanlon, 1980). Evidence of nesting sea turtles was found on one beach but the species involved was not clear.

Species numbers were recorded against habitat types. Of these the creeklines scored highest (84 species), followed by cracking clays (51), low stony hills (37) and mangroves (35). The other five habitat types recorded from 14 (beach strand) to 29 species (rocky hills and outcrops) between them. However, the beach strand habitat was not adequately surveyed due to its timing being outside of the seasonal visitation window for many of the birds and turtles.

Surveys did not record any Schedule-listed fauna but seven Priority-listed taxa were recorded:

- :Little Western Freetail Bat – *Mormopteris loriae cobourgensis* (Priority 1): restricted to the mangroves of NW Australia;
- Western Pebble-mound Mouse – *Pseudomys chapmani* (Priority 4): favoured habitat is low stony hills;
- Short-tailed Mouse – *Leggadina lakedownensis* (Priority 4): found in cracking clays within the route to be occupied by the services corridor;
- Bush Stone Curlew – *Burhinus grallarius* (Priority 4): prefers lightly wooded country near shelter;
- Beach Stone Curlew - *Esacus neglectus* (Priority 4): prefers sandy or shingle beaches and tidal reef flats;
- Eastern Curlew – *Numenius madagascariensis* (Priority 4*):* seasonal visitor to tidal mudflats, reef flats and sandy beaches; and
- Green Turtle – *Chelonias mydas* (Priority 4): observed in the tidal creek near Cape Preston which is to be crossed by the conveyor taking ore to the plant.

The cracking clays also appear to be home for two species of *Ctenotus: C aff. robustus*; and *C* sp. nov. The latter is believed to be a newly recorded species. CALM's database of threatened species includes the following species which were not recorded during the survey but which might be expected to be present at times in specific habitats present within the project area:

- Peregrine Falcon – *Falco peregrinus* (Schedule 4): likely to inhabit the creekline vegetation;
- Grey Falcon - *Falco hypoleucos* (Priority 4): prefers lightly wooded coastal and riverine plains;
- Asian Dowitcher – *Limnodromus semipalmatus* (Priority 3): migratory and unlikely to be seen at the time of the survey. Its preferred habitats are mudflats and tidal creeks, both of which occur in the Cape Preston area;
- White-shafted Tern - *Sterna (albifrons) sinensis* (Priority 4): preferred habitat is sheltered estuaries and mangrove creeks;
- Water Rat - *Hydromys chrysogaster* (Priority 4): known from tidal creeks and marine waters.

Submissions

Only one fauna survey has been carried out to date. The standard of the work was noted by CALM to be satisfactory to good. Additional work by the proponent (for wading birds, stygofauna and sea turtles) is proposed, the timing to be agreed with CALM. The results should be forwarded to CALM to allow for further assessment of risk and potential impacts. CALM believes that sea turtle nesting on the Cape Preston beaches may be significant.

Assessment

The area considered for assessment of these factors is the whole of the terrestrial part of the project. The EPA's environmental objective for fauna is to maintain faunal abundance, species diversity and geographical distribution. The objective for Specially Protected (Threatened) Fauna it is to protect these species and their habitats, consistent with the provisions of the Wildlife Conservation Act 1950.

In terms of faunal variety the key habitat systems within the project area (in descending order) are creeklines, cracking clays, low stony hills, and mangroves. Beaches may also be an important habitat at certain times of the year for migrating birds and nesting turtles, and the EPA endorses the proponent's proposal for additional survey work on wading birds and sea turtles as described above. All of these area types are likely to be impacted to some degree by the project.

Edwards and du Boulay Creeks, which cross the project area, complement the Fortescue River system. Vegetation within them and generally surrounding the pit in an elongated north-south pattern is likely to be affected by clearing and groundwater drawdown for several kilometres due to pit dewatering (discussed above). This is expected to lead to degradation of this habitat due to the reduction of groundwater available to vegetation, and may isolate upstream portions of the creek corridors from the more consistently watered areas downstream. The creeklines support Priority Flora including *Phyllanthus aridus* and *Eriachne tenuiculmis*, as well as *Eucalyptus camaldulensis*, *E. victrix* and *Melaleuca* trees. The loss of vegetation generally is expected to lead to faunal population reductions or changes in the affected areas.

Summary

Having particular regard to the:

(a) extra data to be forwarded to CALM by the proponent on completion of the subsequent flora and fauna surveys;

(b) the high faunal variety found in certain land systems within the project area;

(c) the loss of vegetation within the groundwater drawdown zone, leading to the degradation of faunal habitat; and

(d) the relatively low proportion (between 13% and 21%) of creekline habitat potentially affected by the impacts of dewatering;

it is the EPA's opinion that the proposal may be managed to meet the EPA's environmental objective for this factor provided that an independent review is conducted to confirm the relatively low proportion of creeklines (the most species-rich habitat type in the project area) potentially affected by the impacts of dewatering.

3.3 Stygofauna

Description

Initially Austeel, as reported in its PER, did not sample for stygofauna. Acting on advice that stygofauna should be expected, sampling was done in the orebody (46 bores), at the proposed plant area (10 bores) and in the Fortescue River Alluvials away from expected disturbance (10 bores) to the south west, on Mardie Station. (Sampling locations are shown in Figure 2). Results indicated that stygofauna were present in all three broad locations. The main rock type host for stygofauna in the orebody is altered dolerite dykes, through which groundwater communicates via joints and fractures.

All but one species of stygofauna, found in bore A10 in the orebody, were also found elsewhere. The species from bore A10 is thought to be a new genus and is described as an isopod and the first subterranean Oniscid ever recorded. A follow up survey was done to gather more information on the distribution of the lone Oniscid. The same species was found in two other bores in the orebody only.

As the mine pit progressively deepens it will intercept the water table and will need to be dewatered, potentially affecting stygofauna populations in the drawdown zone surrounding the pit. Groundwater investigations by Aquaterra (consultants to the proponent) have demonstrated that the Fortescue River Alluvials and the orebody are hydraulically connected and that the orebody receives its water from the alluvials. The proponent has hypothesised that stygofauna species are free to move between the alluvials and the orebody, especially as other species, less mobile than the Isopod species, are to be found both in the orebody and the adjacent alluvials.

Austeel has made the following commitments in relation to the stygofauna:

- additional sampling will be done in the project area during operations to increase the understanding of stygofauna distribution in the Pilbara; and
- Austeel will hold discussions with CALM on the possible provision of assistance to the proposed Pilbara Biological Survey.

The EPA believes that the commitment to additional sampling will be a valuable tool provided that a mutually acceptable stygofauna sampling programme can be developed between CALM and Austeel.

Submissions

CALM was concerned that the projected 8% of water from the Fortescue River Alluvium that will be diverted into the pit from its dewatering may translate into a greater proportion of the total stygofauna because of the regional heterogeneity of the water quality. The WA Museum submitted that, contrary to the data provided in the PER, sampling of the Fortescue River Alluvium established that there was a rich stygofauna, although their distribution and taxonomic status were unknown. The Museum advised it would be unsafe to advance the project until the nature and distribution of the stygofauna of the Fortescue River Alluvium (and elsewhere) has been established. Studies elsewhere have shown that changes to groundwater flow and direction can have a considerable impact on stygal communities and little is known of their life cycles and environmental requirements. Given their high conservation value, the groundwater upon which they depend should be given the highest level of protection.

Assessment

The area considered for assessment of this factor is groundwater drawdown zones which will be affected by the dewatering, centred around the orebody. Figure 2 shows the modelled dimensions of the drawdown zone surrounding the mine pit to be about 25km (north-south) and 8km (east-west) out to the 0.5m contour.

The environmental objective for this factor is to protect stygofauna, consistent with the provisions of the *Wildlife Conservation Act 1950* and maintain their abundance, species diversity and geographic distribution.

Borehole sampling has so far shown that the oniscoid *Isopoda* species appears to be a new genus which is thus far only known from three bores within the orebody. The second sampling survey, which sought to establish its presence elsewhere, failed to broaden its distribution beyond the orebody.

The proponent has met with CALM, University of WA and WA Museum staff to discuss the issue. Austeel believes that there is no known reason that the oniscoid isopod species should not be more widely distributed, especially in the much more extensive Fortescue River Alluvials. This aquifer feeds the altered dolerite dyke host rock in the orebody where the stygofauna were discovered. Less mobile species of stygofauna than this *Isopoda* have been recovered from within and beyond the orebody, which implies that there is no physical impediment to the isopod's movement into and out of the orebody. The lowering of the water table progressively over 20 years should allow stygofauna to follow the water down. It is believed that there are low densities of the isopod and that most likely insufficient sampling effort is the reason for its apparent restricted distribution.

CALM staff have indicated that many stygofauna species are quite restricted in their distribution due to factors not yet fully understood, and it does not necessarily follow that because there is hydraulic connectivity between the orebody and the adjacent alluvials the isopod species will be found in the latter. Both CALM and the EPA believe that the onus should be on the proponent to demonstrate that the isopod has a range which is not restricted to the orebody or the drawdown zone and that its population would not be significantly affected by the proposed mining.

The EPA notes that the risk of not finding the oniscoid isopod species elsewhere appears low, because the iron formation where they have been found persists for several kilometres beyond the proposed mining and associated groundwater drawdown envelope, and because of the hydraulic connectivity between the orebody and adjacent Fortescue Alluvium. Also, should surveys be carried out, it may be possible to establish that the stygofauna species, which has to date been found only in deeper boreholes, has a preference for the deeper portions of the orebody and may not be unduly affected by the lowering of the watertable. The EPA believes that these issues need to be clarified and greater confidence established that the proposal is unlikely to result in the loss of any stygofauna species, before mining is allowed to proceed.

Summary

Having particular regard to the:

(a) current restricted knowledge of the distribution of the oniscoid isopod in the orebody;

(b) likelihood of the low densities of the oniscoid isopods and undersampling to date accounting for their apparent restriction to the orebody;

(c) less mobile stygofauna such as large amphipods and the small ostracods collected being well represented throughout the sampling area;

(d) good hydraulic connectivity between the Fortescue River Alluvials and the altered dolerite dykes in the orebody which host the stygofauna; and

(e) large extent of the alluvials and potential for the oniscoid stygofauna to occur in them, as well as along strike in the iron formation;

it is the EPA's opinion that the proposal has not been shown to adequately meet the EPA's environmental objective for this factor and dewatering and mining should not proceed unless:

- prior to dewatering and clearing commencing, further investigations and sampling are undertaken, to the requirements of the Minister for the Environment and Heritage on advice from the EPA and CALM, to demonstrate that the proposal, if implemented, would not pose a significant risk of any species of subterranean fauna becoming extinct; and
- if the proponent proceeds, a Subterranean Fauna Monitoring Plan to assist in the conservation of subterranean fauna species is prepared.

3.4 Coastal features: mangroves, foreshore, dunes, island shores, seabed

Description

A well developed and structurally complex mangrove system fringes the major tidal creek which dissects Cape Preston. Six of the seven species of mangal known in the Pilbara Region were recorded in this area. The most abundant and widespread species are *Avicennia marina* and *Rhizophora stylosa*. The total area of the mapped mangal community is about 35.5ha, with a further area of 7ha of very open *Avicennia* shrubland beyond. Extensive cyanobacterial mats occur on the tidal flats to the east of the tidal creek.

A preferred crossing point for the conveyor in the services corridor is mentioned in the PER. If this were to be used the extent of direct destruction to mangroves would be in the order of 0.15ha. The final alignment of the corridor is to be discussed with CALM and located on advice from CALM and the Department of Minerals and Petroleum Resources (DMPR).

The following habitat types are described around Cape Preston:

- sandy beach-(where turtles come to nest) dominates the western side of Cape Preston;
- rock / pebble-beach surrounds Preston Island;
- mud flat-found at the southern end of Cape Preston and colonised by mangroves; and
- rocky headland-at the tip of the Cape.

The sandy beach and the mud flat habitats have the greatest biological significance, due to their utilisation by birds, turtles, mangroves and bats (in the mangroves).

Offshore the following habitat types were identified to the west and north of the Cape:

- sand;
- sand and silt;
- sand and algae;
- sparse coral, algae and sponges (on hard substrate); and

- medium and high coral cover (on hard substrate).

Tidal currents were measured in the vicinity of Cape Preston. They are moderate to strong and run generally parallel to the coast for 5-6 hours before reversing. The associated tidal excursions are between 2.2km and 7.8km and give an indication of the maximum excursions of pollution, sediment plumes and coral and fish spawn on one tide. Wave energy from winds is generally stronger on the western side of the Cape, especially in the summer months when the southwesterly winds prevail. Sediment re-suspension is therefore likely to be more prominent off the western coastline.

Submissions

The Australian Heritage Commission raised the concern that placement of the tailing dam on creeklines that feed mangroves and tidal flats may affect the mangroves. The Conservation Council noted that changes in sedimentation loads and drainage patterns would have a significant effect on riverine and near-coastal ecosystems and that the mangroves in the Cape Preston area are designated in the EPA's *Draft Guidance on Protection of Tropical Zone Mangroves along the Pilbara Coastline* as internationally, regionally and locally significant. The Council has concerns that long term impacts, such as reduction in tidal flushing and inundation, changes in erosion and accretion patterns, impoundment of water at higher than natural levels, alteration of freshwater surface drainage and dust deposition regimes on mangroves have not been given sufficient weighting by the proponent. The Department of Fisheries raised concerns about the potential impacts of large numbers of people creating new roads and boat ramps into sensitive areas such as mangroves and possibly depleting stocks of fish and crabs.

Assessment

The area considered for assessment of this factor is the coastal strip and its immediate hinterland in the vicinity of Cape Preston, and the mangrove-lined tidal creek to the south, over which the service corridor would pass.

The EPA's environmental objective for this factor is that no development should take place that would significantly reduce the mangrove habitat or ecological function of the mangroves in the area, which is specifically referred to in Figure 5 of the EPA's Draft Guidance Statement No 1: *Guidance for the protection of tropical arid zone mangroves along the Pilbara coastline.*

Since release of the PER for public review the proponent has advised that the southern tailings dam (one of two originally proposed) is no longer required. Diversion of du Boulay Creek will therefore not be needed and potential downstream impacts from additional project-induced siltation in times of flood are expected to be reduced.

The EPA's draft guideline for proposals in the Cape Preston area calls for a significant understanding of the mangrove system, leading to an evaluation of how the mangrove ecosystem and its sustaining ecological processes would be affected by the proposal. The aim is to demonstrate that the proposal maintains the ecological function, overall biological value and environmental quality of the area. Any changes to the tidal, sedimentation and current regime causing impacts on mangroves may not become obvious for months or even years. Establishing the links are likely to be difficult unless careful monitoring programmes are in place prior to any coastal disturbances associated with the project. Direct impacts on the mangroves will be minimised by largely avoiding them. However, there is potential for them to be affected by dust arising from the transport of product from the plant to the port. At this stage the proponent has yet to decide whether a conveyor or a trucking system will be used.

Detailed hydrodynamic studies have not been carried out for the Cape Preston area. Austeel, in its Supplementary Environmental Review, committed to detailed modelling to demonstrate the environmental acceptability of the causeway and to provide the results to the EPA prior to the start of construction. Were the results to demonstrate the need for maintenance of water flow, pipes would be installed as necessary in the causeway.

The EPA has heard of instances where pipes inserted into causeways to mitigate undesirable effects have been ineffective and where the adverse environmental impacts are essentially irreversible unless the structure is removed. The solid causeway linking Cape Preston with Preston Island would alter the coastal current regime in its vicinity. The EPA's objective could be best met by the construction of a trestleway from Cape Preston to Preston Island rather than the solid causeway proposed. The EPA considers that a trestleway should be the initial design premise unless hydrodynamic studies are able to demonstrate that some other structure would not cause unacceptable marine environmental impacts.

The EPA considers that a detailed hydrodynamic survey should be carried out prior to the commencement of coastal disturbance. The aims should be:

- to implement, as soon as possible, careful baseline monitoring in order to establish what is natural seasonal variation in tidal and sedimentation regimes in the vicinity of Cape Preston; and
- to determine what changes would occur to these tidal and sedimentation patterns with the imposition of various bridging structures between the Cape and Preston Island, and how these changes would impact on habitats.

If results indicate adverse impacts are likely to the western beachline, mangals or high-cover coral communities, the proponent should be required to iteratively modify the design of the bridging structure prior to its final design and construction so as to demonstrate that unacceptable impacts as a result of the proposed modifications are unlikely to occur. This would enable the EPA's objective for mangroves (and corals) to be met.

If the project proceeds annual surveys should be undertaken to identify if unforseen adverse changes to coastal regimes and environmentally sensitive habitats are taking place and if so, modifications to the bridging structure should be proposed, submitted to the DEP and CALM for approval, and implemented.

With regard to the potential impacts on sensitive coastline from people this matter is addressed below under social impacts.

Summary

Having particular regard to the:

(a) small area of mangroves in the tidal creek that would be directly affected by the construction of the crossing;

(b) lack of data to predict changes to the coastal current and tidal regime as a result of project development;

(c) the proposed impacts to the high-cover coral community off the north side of Preston Island; and

(d) the time it may take for changing coastal processes resulting from the project, to manifest as indirect impacts to the mangroves, western turtle nesting beach and coral communities;

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's environmental objective for this factor provided the following additional work is undertaken:

- detailed baseline surveys of the tides and sedimentation regimes are undertaken to characterise normal seasonal variations in the Cape Preston vicinity;
- appropriate detailed hydrodynamic modelling, prior to disturbance from project development activities, is used to determine the design of the bridging structure between Cape Preston and Preston Island;
- the location and design of the bridging structure, including open sections where required, is prepared prior to disturbance from project development activities, to demonstrate that coastal regimes will not be unacceptably impacted;
- surveys to track changes to coastal regimes are carried out and submitted to the EPA for a period subsequent to construction sufficient to confirm that the bridging structure is causing no significant adverse impact on mangroves, sandy beaches or other nearby coastal and marine ecosystems, including the high-cover corals north of Preston Island; and
- effective management of dust, especially with respect to mangroves, will be addressed, as committed to in the proponent's environmental management programme.

3.5 Marine fauna, including turtles, corals, benthic organisms and introduced marine organisms

Description

The megafauna species most likely to occur in the area is the Green Turtle, but other species such as the Loggerhead and Hawksbill Turtles, may nest here. They are protected under the *Wildlife Conservation Act 1950* and also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* as either endangered (Loggerhead Turtle) or vulnerable (Green and Hawksbill Turtles).

The lighting associated with the port has the potential to disorient mother and baby turtles, which use the moon to navigate to and from their nesting beaches. The water intake and discharge points for the power station, the causeway, the shipping port extending from Preston Island, and dredging activities could also affect marine fauna. On another level, the effects of 500 people living nearby onsite and recreating are likely to be significant and in need of management. This aspect is considered in Section 3.12.

The proposed solid causeway could cause geomorphological changes to the beaches to which turtles currently come to nest, because it may change the pattern of longshore drift and sand deposition in the vicinity.

Seawater for power station cooling and fresh process and domestic water will be taken from a location adjacent to the causeway in about 10m of water. The inlet, with intake velocities in the order of 1m/sec, will be screened to prevent large debris and pelagic fish from becoming trapped. Hypersaline brine from the desalination plant and water from the power station at slightly above-ambient temperature will be discharged from one of two location options- either off the jetty north of Preston Island in 5-10m of water; or from the western beach of Cape Preston. It will also contain a variety of chemicals and is discussed below in 'Marine water and sediment quality'.

The tip of Cape Preston is characteristic of benthic communities on rocky shores and in shallow waters with reasonably large water movements. Prawns, corals, sponges, ascidians and zoanthids comprise the diverse benthic fauna community. The PER states that many of the corals and sponges (from Preston Island southwards to Preston Spit) are large old colonies that have survived for many decades. Potential for further growth is limited by the lack of uncolonised hard substrata and by the movement of sand.

The highest recorded coral cover and by far the highest diversity of coral species is found in a small community immediately north from Preston Island. It is more representative of mid-reef coral assemblages, like those which occur on the exposed side of the Dampier Archipelago. Given the quite large tidal excursions, the coral community here, although small, as described in the PER, may provide a valuable source of recruits for other reefs around Preston Island and Cape Preston. This colony was to have been avoided, but changes to the proposal outlined in the Supplementary Environmental Review include a re-alignment of the jetty to the north west for geotechnical and shipping safety reasons. The coral community is now directly in the path of the proposed jetty extending from Preston Island.

The DEP has sought information from CALM, the Australian Institute of Marine Sciences and WA Museum staff on coral communities in the Cape Preston area. Advice from CALM and the WA Museum is that the setting of Cape Preston is unusual in the Pilbara because there are so few promontories with clear water and coral so close to shore-the only others being the Burrup Peninsula and Point Samson. Six species from the Cape Preston survey were reported that were not found by the Museum expedition to the Dampier Archipelago in 1998, two of which (*Porites vaughani*-from the Kimberley coast-and *Caulastrea furcata*-from Scott Reef) had not previously been reported this far south in WA. Another species, *Leptoseris mycentoseroides*, has been recorded from the Houtman Abrolhos but not from the Dampier region. These species may therefore be rare or of patchy occurrence in the Dampier / Cape Preston area.

Other patches of coral which inhabit the nearshore zone around the Cape and Preston Island are more typical of communities between Onslow and Dampier and are thus well represented locally and regionally.

An area of about 70ha will be affected by the dredging of the shipping channel for port access and berthing pockets. The dredging will affect about 6ha of coral habitat for the small craft harbour and a larger area of mainly bare sand and silt. Up to 4.5Mm^3 of dredge spoil will be dumped offshore in an area which is not environmentally sensitive. This aspect is subject to separate Commonwealth government approvals.

The construction of the rock causeway from Cape Preston to Preston Island would result in the direct loss of 2.5ha of coral, algae and sponges and 3ha of sand / algae habitat. The jetty head and causeways for the service vessel facility off Preston Island would destroy a further 4ha of corals.

Shipping brings with it the potential to introduce exotic marine organisms via ballast water or directly off the hulls of the vessels.

Submissions

Further information was sought by CALM on marine habitats in the area, specifically if there are unique habitats or species in or adjacent to the areas which will be affected by the development. Further turtle survey work should be undertaken at the appropriate time of the year so as to determine the significance of potential impacts from the operations. The changes to the patterns of longshore drift around the island wrought by the causeway are likely to result in changes to transportation routes for coral and fish spawn, leading to

changes in the recruitment patterns in nursery areas along the coast. The PER did not detail the scope of the marine monitoring programme to be developed, but this aspect needs to be addressed.

On the subject of brine discharge, there was no reference to the EPA's Working Document (2000) relating to the level of protection for environmental quality objective 1 (EQO 1): maintenance of ecosystem integrity. The timing of dredging activities and selection of dredge spoil sites needs to be decided in close consultation with CALM and DEP as the activities have potential to cause significant impacts on coral communities.

The DEP wishes to see commitments to minimise or eliminate the use of TBT on ships using the proposed port and understands that ships carrying Austeel's products will travel to other parts of Australia and possibly overseas. Once they have unloaded the product they will be required to take on ballast water for the return to Cape Preston. There needs to be a management plan to ensure that the necessary precautions are taken to minimise the risk of introduction of foreign marine organisms.

Assessment

The EPA's environmental objective for this factor is to maintain faunal abundance, species diversity and geographic distribution. The area considered for assessment of this factor is the coastal strip in the vicinity of Cape Preston, the mangrove-lined creek to the south of the plant site, and the waters surrounding Preston Island and the trestleway / causeway running north from the island. Also affected will be the areas where the shipping channel is to be dredged, where dredge spoil will be dumped and where ships entering the port are expected to jettison ballast water.

With regard to introduced marine organisms the EPA's environmental objective is to minimise their risk of introduction. The proponent has committed to preparing and implementing a ballast water management plan prior to the start of operations, on the advice of the Australian Quarantine and Inspection Service (AQIS). This relates only to ballast water. It will be important for the proponent to undertake a baseline survey of benthic organisms prior to shipping using this port so that any subsequent changes to the variety of species is able to be recognised and dealt with expeditiously.

Marine habitat mapping outlined six main marine community types. There are no unique species known from the area although some of the corals described appear to be uncommon and as such are worthy of efforts to protect them. The hydrodynamic modelling to be done (discussed in the section above on coastal features) should broadly identify the extent of changes to tidal movements and longshore currents resulting from the placement of the causeway. If there are significant changes the western beach where turtles nest may be affected by loss of sand habitat.

The modelling will also enable an initial assessment of the probable changes to the migration paths of fish and coral spawn. The proponent has committed to preparing a marine monitoring programme, to be developed in consultation with CALM and the Department of Fisheries prior to the start of construction. This should incorporate data from the hydrodynamic modelling and baseline studies. Austeel has also committed to the preparation of a Marine Turtles Management Plan in consultation with CALM. This will need to address the issue of light overspill from the jetty, causeway and port buildings and its potential to disorient turtles on their way to or from the beach.

Because oceanic warming is believed to be stressing organisms such as coral polyps (thought to result in localised coral bleaching around the Northwest Shelf and elsewhere) disposal of biocides, anti-scalants and other chemicals via the brine discharge point may have a

disproportionately large incremental effect on coral polyps in the vicinity of Cape Preston already close to their upper thermal tolerance limits. The modelling data provided by Austeel have provided indications of the sizes of the mixing zones for the salinity component, but the combined affects of chemicals discharged in a heated brine on marine fauna in its path are unknown. This issue is addressed in more detail below in 'Marine water and sediment quality'.

The proposed dredging for shipping will be predominantly in bare sand and silt and the proponent has stated in its response to public submissions that TBT will not be used on ships owned by Austeel, nor on any marine structures.

Summary

Having particular regard to the proponent's commitments to:

(a) prepare marine and turtle monitoring programmes in consultation with CALM;

(b) undertake detailed hydrodynamic modelling to demonstrate the effects on marine circulation of the causeway prior to the commencement of construction and the zones of impact from the two wastewater outfall location options; and

(c) prepare and implement a ballast water management plan on the advice of AQIS;

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's environmental objective for this factor provided the following additional work is undertaken:

- the hydrodynamic modelling study for Cape Preston is scoped and carried out to the EPA's requirements;
- the study will be used to design and locate the bridging structure from Cape Preston to Preston Island, and other marine structures such as the wastewater outfall, to ensure that adverse impacts to marine fauna and sensitive habitats are minimised and remain environmentally acceptable, as determined by subsequent monitoring;
- significant damage to the high-cover coral community north of Preston Island is avoided;
- a baseline marine survey for benthic and planktonic organisms is undertaken in the area proposed for the port; and
- that the ballast water management plan committed to by the proponent also encompasses a strategy for the management of exotic organisms which may potentially be introduced from ships' hulls.

3.6 Marine water and sediment quality, including turbidity and spills

Description

Although construction and mining operations at the minesite have some potential through erosion and sediments in runoff to affect marine water quality it is the components of the proposal at Cape Preston and offshore that are most likely to have adverse effects. A shipping channel and berthing pockets will be dredged, and a rock causeway, harbour and trestle jetty (leading northwest from Cape Preston and Preston Island respectively) are proposed. Engineering works on Preston Island, because of its small size, are likely to be the

most difficult places from which to prevent sediments and contaminants from entering the sea. When the plant and port are operating, brine discharge, shipping discharges and product spillages could potentially affect the quality of water and sediments.

Austeel proposes to store bunker fuel and diesel in a tank farm at the port. It will be transferred between the tanks and ships via pipeline. Shipping could be the cause of spills but historically it is the transfer pipelines which rupture most frequently, often at the couplings. The pipeline will run along the jetty and leaks would be likely to quickly find their way into the sea. The pipe will be fitted with valves which turn off the supply if there is a sudden drop in pressure. There will be several isolation points along the pipeline to limit the amount of fuel which could be lost. Bunds will be designed to hold the contents of the largest tank plus 10%, or 25% of the total volume stored in the compound. The storage area will be graded to drain into a sump and passed through an oily water separator if required.

Brine from the desalination plant is proposed to be discharged at either a shoreline disposal point on the western beach, or from a deeper water point (5-10m) off the jetty to the northwest of Preston Island. It will be about 2^{o} higher in temperature than ambient, have a salinity of 64 parts per thousand (compared with about 36ppt for seawater) and will contain a variety of additives (biocides, anti-scalants, anti-corrosion agents and ammonia). Initial modelling of salinity contours from these two discharge points, as described in the PER, showed that the shore disposal mixing area is likely to be about 50m by 800m long and drift parallel with the coast, while the deeper water site would create a zone restricted to 50m of the outfall.

Changes to the proposal since publication of the PER include an increase in the intake water and discharged volumes from $33Mm^3$ per annum to $57.8Mm^3$ per annum. New modelling used a different program and parameters, with a discharge volume of $70Mm^3$pa (more than double the original value). The results indicated the shoreline outfall saline plume mixing dimensions would be 30m by 100m and parallel to shore. The proponent has stated that the initial modelling gave such a long shoreline plume because it was very conservative, and that the 30m by 100m zone in the second case is more realistic, despite the larger discharge volume. The modelling indicates a plume up to 150m in radius (~7ha) for the offshore option, but the configuration of the diffuser was not mentioned and so the shape of the plume is not known.

Submissions

The PER indicates that all site runoff would be collected in settling ponds, but no information was provided on the size of the rainfall event that the ponds would be designed to cope with. In addition, more detail is needed on the dredge spoil disposal site and the likely fate of the spoil post-dumping, together with attendant environmental implications. Measures to mitigate impacts to corals from the dredging sediment plumes around Preston Island and on breeding habitat for marine species need to be addressed. For example, dredging and its associated turbidity needs to be timed to avoid coral spawning events and should be planned in close consultation with CALM and DEP.

CALM emphasised that, in order to be consistent with other coastal installations in the region bunding should comply with standards set by the Department of Mineral and Petroleum Resources and be capable of holding all the fuel from the largest tank in the bund plus water from a 100 year return 24 hour rainfall event. Austeel has agreed to comply with this standard. The EPA notes that the DEP has its own set of works approval and licensing

requirements for the above-ground storage of chemicals and that these would need to be observed as well.

Assessment

The area considered for assessment of this factor is all components of the project where oils and other potential contaminants are to be used and marine waters around Cape Preston, Preston Island, the dredged shipping channel, the spoil dumping ground. The issue is more critical when associated with the port facilities because of the difficulty in containing liquid spills in the marine environment and the effects they may have on biota. The EPA notes the proximity of the proposed development to the proposed Dampier Archipelago Marine Park.

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

- maintain water quality and sediment quality consistent with the Australian and New Zealand Guidelines for fresh and marine water quality (ANZECC and ARMCANZ, 2000);
- maintain water quality and sediment quality and to protect environmental values of recreation, aesthetics, aquatic life or human consumption and maintenance of ecosystems in specified areas; and
- ensure that the risk of an oil spill is as low as possible, and that actions are taken to reduce identified risks.

Austeel's environmental management plan will contain a section on waste and hazardous materials management. Coupled with the proposed oilspill contingency plan the EPA believes that this factor can be adequately managed.

Austeel has indicated in its response to submissions that once the location of the dredge spoil site has been identified an additional marine survey will be conducted to provide the information needed to support the dumping permit application. Dredge spoil would be dumped in accordance with Commonwealth requirements and would avoid areas of reef coral and other sensitive locations.

The modelling report states that the dimensions of the mixing zone around the wastewater outfall are highly sensitive to the type of diffuser employed and its depth, but does not indicate what parameters were used for the diffuser. Elevated temperatures are expected around the outfall, but the size of this higher temperature mixing zone is not known. Other factors, such as the chemical make-up of the wastewater (additives such as citric acid, caustic soda, ammonia, biocide and anti-scalant) have not been modelled, but the PER states that they would be discharged at concentrations which individually are not expected to be toxic in the marine environment. The EPA considers that the longer term effects of adding such mixtures, including nitrogen (a nutrient) in the form of ammonia need to be addressed with ongoing monitoring. In order to minimise the amount of chemicals added to the waste stream the EPA recommends that, rather than steel, non-corrodable fibreglass-reinforced plastic pipe is used where possible so as to reduce the need for anti scalant and anti-corrosive additives.

The EPA has recently considered an environmental management framework for the waters in the vicinity of the outfall from the Water Corporation's proposed upgrade to its seawater supply / brine return facility on the Burrup Peninsula. The framework will rely on monitoring and feedback mechanisms that operate effectively.

As wastewater volumes from both the Burrup and Cape Preston plants are expected to be of the same order the EPA considers that similar criteria should be applied to Cape Preston. Accordingly the EPA recommends that environmental values be protected as follows:

- prior to commissioning seawater quality at the proposed intake and discharge points, and at a suitable reference station, should be characterised, to the requirements of the DEP. As a guide, such characterisation may entail monthly measurements over 12 months;
- the waters in the region of the proposal should have a High level of protection (reflecting the near-pristine nature of the vicinity), except as defined below;
- given the volume and stated salinity of the wastewater a Moderate Protection Mixing Zone of the order of 1ha in area (which in turn would be surrounded by the High Protection Zone) is considered to be more than sufficient to surround the diffuser;
- the salinity variation as a result of the discharge should not be greater than 5% above the ambient level more than 1% of the time anywhere around Cape Preston except within the proposed Moderate Protection Mixing Zone;
- toxicant concentrations should not exceed the 90% protection levels at the end of the outfall pipe more than 5% of the time and should not exceed the 99% species protection levels at the edge of the Moderate Protection Zone;
- social environmental values (fishing and swimming) should be protected in the High and Moderate Protection Zones;
- the construction, layout and operation of the outlet should avoid damage to sensitive habitats;
- monitoring and feedback programmes should be developed for the waste stream within the outfall to provide an early warning of potential risks to environmental quality; and
- monitoring of ecosystem health indicators should be carried out in the receiving marine environment. This requires that appropriate control sites are selected for inclusion in the programme.

The sizes of the shoreline disposal mixing zones as modelled for the PER and subsequently as described in the Supplementary Environmental Review appear to be counter-intuitive, are a cause for concern and would need to be verified. Keeping in mind that turtles use the proposed western beach the EPA considers that the shoreline disposal option on this beach is inappropriate. An offshore disposal point from the jetty should be selected with due regard to the size and shape of its mixing zone (as determined with input from measurements of currents) so as to avoid affecting sensitive coral communities, such as the areas of high-coral cover to the north of Preston Island.

Summary

Having particular regard to the:

(a) results of the modelling of the mixing zone of wastewaters from each site option;

(b) as-yet unknown effects of chemicals and thermal impacts superimposed on the elevated salinity of the waste brine and the need for further work to assess this;

(c) proximity of sensitive coral communities to the offshore site; and

(d) potential for a shore disposal site to affect the activities of nesting turtles;

(e) spill-limiting mechanisms on the fuel transfer pipeline;

(f) impervious surfaces and bunding design for all liquids storages; and

(g) waste and hazardous materials management plan and oilspill contingency plan;

it is the EPA's opinion that the saline wastewater discharge component of the proposal could be managed to meet the EPA's environmental objective for this factor provided that:

- modelling to determine the likely size of the mixing zone for elevated temperatures, biocides, anti-scalants, anti-corrosion agents and other chemicals at the anticipated concentrations is carried out for the offshore wastewater disposal site option;
- the effluent temperature does not exceed two degrees above ambient at the end of the outfall and its salinity does not exceed 65ppt;
- the results are submitted to CALM, the Department of Fisheries and DEP and are used to determine an environmentally acceptable offshore location for the outfall;
- any proposed changes to the volume and characteristics of the effluent discharge, including discharge of industrial waste, are referred to the EPA for assessment;
- dredging and spoil dumping are timed to occur outside of the annual coral spawn events; and
- the environmental management plan and the spill contingency plan are both prepared, submitted to the DEP and approved prior to the start of construction.

3.7 Rivers, watercourses, ephemeral streams and flooding

Description

This section considers both water quality and quantity.

Two major creeks traverse the project area and the Fortescue River floodplain lies immediately to the west of the project. Du Boulay Creek is a tributary of the Fortescue River and flows in a generally northwest direction across the area. In the PER the southern tailings dam was to straddle this creek, necessitating its diversion. Subsequent information from Austeel in the Supplementary Environmental Review indicates that the southern tailings site is no longer required and therefore the creek diversion will not be necessary. However, channels of the Edward Creek also run across the lease area, close to where the process plant, power station and a portion of the remaining tailing dam will be sited, requiring some diversions. While there will be a need to divert watercourses, there is no proposal to dam water which normally traverses the project area in defined watercourses, although runoff will be controlled to ensure it does not cause undue erosion and to guard against potential contamination of the stream. Runoff generated from the areas of hardstand associated with the plant and other buildings may be used for dust suppression.

Further to the west, the mine waste dumps will overlie a portion of the Fortescue River floodplain. Flood diversion works, involving a cut channel and armouring, will be required around the toe of these dumps to protect the structures from the erosive effects of flood flows.

The PER states that all the proposed works, storage facilities and the pit are located above storm surge levels and are not expected to be affected by marine incursions in the event of major rains or storm surge arising from the passage overhead of a cyclone.

Submissions

Consideration needs to be given to the control and minimisation of water-borne sediments resulting from disturbances associated with the project and a number of submissions focussed on the stated need to divert du Boulay Creek around the southern tailings dam. With the deletion of this dam from the proposal these issues are no longer pertinent. Austeel's proposed sediment sampling regime needs to be run for as many years as possible prior to ground disturbing activities (over several rain events) and control sites upstream of the project should be included.

The Water and Rivers Commission and the Pilbara Native Title Service (PNTS) noted that, to provide a reliable assessment of the Fortescue River's flood levels, detailed survey cross-sections are required of its floodplain, as the modelling data to date are too imprecise for useful predictions. Similar issues were raised with respect to storm surge and tsunami levels and their potential effects on project components. It was noted that the location of the village has not yet been decided, except that it will be above anticipated flood levels.

Information is sought on the size of the rainfall event that the settlement ponds to be used to collect site runoff will be able to contain. The DEP noted that there might be seepage from the tailings dam into the groundwater flowing towards the Fortescue River and that evaporative processes might make this flow more saline. A tailings dam underdrainage system was suggested as a way to contain this water. There is a concern that runoff from the waste dumps will wash into du Boulay Creek and compromise a nature trail proposed from a permanent waterhole to the du Boulay Crossing. A permit will be required to obstruct or divert any waterway, and any water discharged to a watercourse from pit de-watering would need a licence from the Water and Rivers Commission.

Assessment

The area considered for assessment of this factor is all parts of the project where there will be ground disturbance, potentially leading to runoff from rains and associated erosion. Areas specifically targeted include the eastern floodplain of the Fortescue River; further to the east, the channels of the Edward and du Boulay Creeks which traverse the project area; and north along the infrastructure corridor to Cape Preston.

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

- maintain or improve the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the Australian and NZ Guidelines for fresh and marine water quality. (ANZECC and ARMCANZ, 2000); and the NHMRC / ARMCANZ Australian Drinking Water Guidelines - National Water Quality Management Strategy;
- maintain the integrity, functions and environmental values of surface water flows;
- ensure that the quantity and seasonal variation in flow of surface water is maintained, throughout the life of the mine and after decommissioning; and
- ensure that alterations to surface water drainage do not adversely impact indigenous vegetation, cause unacceptable soil erosion, or flooding of public access ways.

Referring to the need for detailed river cross sections Austeel, in its Supplementary Environmental Review, advised that a consultant had been commissioned to undertake a level survey for eight cross sections on the Fortescue River Floodplain to quantify the extent of encroachment of the waste dump into the Fortescue floodplain. A more accurate flood assessment has been prepared for use during the detailed design phase. Water levels relating to a 100 year return cyclone event (930 millibar central pressure) were used in the

preliminary investigation. A level of around 10m AHD was indicated. The mine pit and all infrastructure are stated in the PER to be above this level.

A new estimate of the 100 year average recurrence interval pre and post-development flood levels, using the updated cross sections and stream flow data provided by the Water and Rivers Commission, has been made (Aquaterra, March 2002) and will be used in the detailed planning phase to influence decisions such as waste dump location, so as to avoid significant encroachment into the 100 year flood level. Aquaterra's report was reviewed by staff of the Water and Rivers Commission with particular emphasis on the location of the mine waste dump. The main points made by WRC were:

- that the study should be regarded as preliminary because the topographic information used for the modelling and floodplain mapping is not accurate enough to reliably be used with regard to major flooding events;
- the issue of high velocity floodwaters and the associated high potential for severe erosion of flood mitigation measures around the waste dump; and
- concern with the proposed location of the waste dump as it is essentially located within the 100 year average recurrence interval (ARI) floodplain.

The encroachment of the waste dump into the floodplain raises the upstream 100 year ARI flood level by 0.30 metre and significantly blocks off one of the main overflows of the Fortescue River. The Water and Rivers Commission recommends that the waste dump be re-positioned so as to encroach only minimally into the 100 year ARI floodplain. This would ensure that not only the flood risk but also the environmental risk due to the possible failure of flood mitigation works is reduced to an acceptable level.

Turning to runoff from the mine, process plant, power station, tailing dam, waste dumps and village, contaminants could potentially be released into these systems. Similar considerations apply also to the port at Cape Preston and the connecting infrastructure corridor. Austeel advised that sediment sampling opportunities will arise after rains during the three year long construction phase. The creeks flowing across the site only flow after significant rainfall, and flood flows are naturally turbid.

Seepage from the tailing dam will be contained using an underdrainage system to return the water, which will be used at the minesite for dust control purposes, road-making and rehabilitation. On the subject of runoff from the waste dumps, external surfaces and particularly the toe of the dumps will be rock-armoured to prevent erosion from undercutting. Initial dumping is to occur adjacent to the pit and should there be a need, Austeel has indicated that a perimeter drain could be constructed around the dumps to collect any runoff.

Summary

Having particular regard to the:

(a) removal from the proposal of the southern tailings dam on du Boulay Creek;

(b) proponent's commitment to prepare and implement a Surface Water Management Plan incorporating:

(1) a commitment to maximise the re-use of water, as for example in:

- the underdrainage system proposed for the remaining tailings dam to return water for re-use; and

- the collection and treatment of site runoff to remove sediment prior to release;

(2) a commitment to design and implement flood diversion and rock armour protection works and a perimeter drain around the toe of the waste dumps to contain runoff;

(3) bunds and perimeter drainage diversion works to keep potentially contaminated site runoff separate from natural runoff streams;

(4) appropriate sizing of containment systems to reflect the expected rainfall events;

(5) extra level of flood level detail required from the topographic data in order to apply the cross-section surveys and re-run the modelling; and

(6) the proponent's assurance that the pit and all infrastructure will be above 100 year return flood levels;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives for this factor, provided that:

- accurate topographic data are used to derive flood levels and site the mine waste dump and other project components out of the 100 year ARI flood levels;
- prior to site clearing and construction the location and levels associated with the proposed village site are submitted to the EPA for review; and
- best practice measures are employed in the creation and maintenance of the tailings dam and the waste rock dumps, and in the prevention of erosion and runoff from all the project components.

3.8 Groundwater

Description

In terms of water quality, potable water (<1000 mg/L TDS) is found in a central lobe corresponding to the main flow of the Fortescue River. Eastwards towards the project area the water becomes more saline but is generally suitable for stock drinking purposes.

As the pit progresses below the water table and groundwater is drawn into it to be pumped out or evaporate, a groundwater drawdown zone will develop and spread outwards from the pit. The Proterozoic basement rocks which host the orebody are relatively impermeable, as evidenced by the dryness of most of the holes drilled into the orebody, despite the relatively shallow water table (<5-<15m AHD). The pit is to be developed solely within the low-permeability basement rocks; this will reduce groundwater inflows and hence the size of the surrounding groundwater depletion zone.

Groundwater flow through the mine site, as depicted in the PER, is currently broadly to the north and northwest, into the Fortescue River Alluvials and towards the sea. It was thought originally that a lake would form in the pit once dewatering ceased. However (as described in the Supplementary Environmental Review) revised modelling shows that the pit should remain dry except during and after heavy rains, because groundwater entering the pit would evaporate faster than it could be replenished. The high evaporation rate will have a tendency to concentrate salts in the groundwater immediately surrounding the pit as water is drawn off.

The long term effect of this is that a saline body of water is expected to develop beneath the pit.

Dewatering the pit will create a situation where the direction of groundwater flow in the drawdown area, especially from the west and north, will tend to be drawn from the alluvials towards the pit. The effect diminishes with distance from the pit. The modelling described in the PER showed that the drawdown area would be elliptical, with the long axis parallel to the strike of the rocks running approximately north-south. The Supplementary Environmental Review indicates drawdown zone dimensions of around 8km by 25km offset slightly to the east of the pit.

The effect of the drawdown zone would be to reduce the amount of water available to deep-rooted plants (phreatophytes), such as the gum trees and melaleucas along the major creeklines, as discussed in the section on vegetation communities above.

Water pumped from the pit will be used around the minesite, mainly for dust suppression. Water for the power station, the process plant and for domestic purposes will also be obtained de-salinated from the sea at Cape Preston. Bore water will be necessary at the outset to supply all freshwater requirements until the de-salinating plant is operational and will continue to supplement requirements. A licence for groundwater abstraction will be required. The volume requested will be set for the maximum estimated sustainable yield from the Fortescue River Alluvials which was identified in earlier investigations and described in the PER (Bradberry Associates; 1963 and Commander, 1993) as being around 9.2Mm^3pa.

The tailings dam is expected to seep some water. This will be desalinated water from the process plant. Evaporation of this water from the surface of the tailings will have a tendency to concentrate salts but this water is expected to be no more saline than the existing groundwater in the area. The tailings will be deposited in such a way that minimises water losses, both from evaporative processes and from seepage, the latter by an under drainage system which returns water to a central sump for re-use.

Submissions

The Water and Rivers Commission noted the lack of site groundwater investigations in the vicinity of the mine, tailings dam and waste rock dumps. Some investigations have since been carried out, including foundation studies at the tailings storage dam site to assess its permeability. The Commission was concerned that the freshwater supply in the Fortescue River might become contaminated with saltier water from the process, however the process water will be desalinated and is unlikely to have this effect. There were concerns that the process water could contain chemicals which compromise the beneficial use of the water (for stock and domestic consumption). Austeel has provided information that indicates there are no heavy metals and that the water's main impurities are host rock and silica, with minor amounts of a collector agent such as oleic acid, which is not expected to affect the beneficial use. Austeel will aim for maximum recovery and re-use of this water and expects that the tailings dam will in time become self-sealing. Monitoring bores will be established down-gradient from all facilities with the potential for groundwater contamination and monitoring will be designed to ensure that any potential water quality problems are identified and managed accordingly.

Beneficial use of the groundwater is for stock in the vicinity of the mining operation, which is directly up-gradient from the higher quality resource in the Fortescue River. Austeel needs to ensure that this high quality water is not contaminated by brackish to saline plumes emanating from the tailings dam. The proponent has committed to augment the existing

station camp stock water supply if there is a project-induced impact and has made a similar commitment regarding a bore which is located in the alluvials for the Mesquite control camp.

Assessment

The area considered for assessment of this factor is all facilities with the potential to discharge contaminated water which could enter the groundwater flow, and especially the tailings dam. The mine pit, because of the associated evaporation and dewatering regime, will have a major effect on the existing groundwater flow patterns.

The EPA's environmental objectives for this factor are:

- maintain the quantity of groundwater so that existing and potential uses, including ecosystem maintenance, are protected; and
- ensure that groundwater resources used for public water supply are protected in accordance with NHMRC / ARMCANZ Australian Drinking Water Guidelines - National Water Quality Management Strategy and that land uses which could affect both the quantity and quality of groundwater are appropriately controlled.

The EPA prefers that pits which intersect the water table should not be left open at the cessation of mining if the water quality in the area is good and has a beneficial use. A number of mines in the Pilbara are committed to backfilling the pit to above water table level so as to protect the quality of the groundwater resource. The proponent has stated that more ore remains below the level at which the pit is proposed to be completed (200m) and that to backfill the pit would be to sterilise the remaining reserves, which might otherwise be mined later. The EPA notes that the water table is high (within 5-15m AHD) and that this would require backfilling to about three quarters of the way up the pit.

Summary

Having particular regard to:

(a) the commitment by the proponent to prepare a groundwater management plan which will incorporate appropriate water management plans, monitoring and reporting schedules;

(b) an underdrainage system for returning process water seepage from the tailings dam for re-use;

(c) the relatively benign characteristics of the process water as discharged with the tailings; and

(d) the commitment by the proponent to make good any existing station and Mesquite camp bore supplies which are adversely affected by the project;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that a satisfactory Pit Dewatering and Vegetation Monitoring plan is prepared in consultation with the DEP and Water and Rivers Commission.

3.9 Gaseous and particulate emissions

Description

The changes made to the proposal (as listed in the Supplementary Environmental Review) have increased the air emissions significantly, mainly due to the addition of a second pellet plant and larger power station. Table 2 below details the estimated point source emissions of air pollutants from the revised project during operation.

Table 2 **Estimated point source emissions of air pollutants from the project**

Emission Source	Pollutant - tonnes / year		
	Nitrogen oxides (NO_x)	Sulphur dioxide (SO_2)	Particulate matter (PM)
Pellet Plant A	7295	729	1042
Pellet Plant B	7295	729	1042
DRI Plant	2715	115	483
Power Station	2456	0	0
Total	**19761**	**1573**	**2567**

Source: SKM 2002

The Austeel plant will be by far the largest emitter of NO_X in the Pilbara region. The NO_X emission concentration from the power station meets the EPA Guidance limits of $0.07g/m^3$ for gas turbines. However, the NO_X emission concentration from the pellet plant is high at $0.4g/m^3$.

An assessment of the project's impact on air quality was prepared by Sinclair Knight Merz (SKM, 2002). This report investigated the impact of the proposed Austeel plant on the air quality of the region and used meteorological data from Karratha.

Two different modelling approaches were used. The first approach uses the model ISCPRIME to predict the near-source ground-level concentrations (GLC) from the proposed plant. The second approach uses The Air Pollution Model (TAPM) to assess whether emissions from the plant are likely to contribute to photochemical smog formation.

ISCPRIME modelling

ISCPRIME is a plume dispersion model designed to predict ground level concentrations of pollutants emitted from sources such as stacks, area sources and volume sources.

The modelling that was undertaken examined the impact of the proposed plant on the ground level concentrations of nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and particulate matter (PM_{10}). The proposed plant was studied in its normal operational mode. Table 3 below shows a summary of ISCPRIME results under normal conditions.

Table 3 Summary of ISCPRIME results under normal conditions

Pollutant	Highest predicted GLCs µg/m^3	NEPM Standard µg/m^3	NEPM Standard timeframe	Comments
NO_2	185 5.6	246 62	1 hour 1 year	75% of NEPM
SO_2	55.3 6.7 0.5	572 228 57	1 hour 1 day 1 year	10% of NEPM
PM_{10}	57.7	50	1 day	115% of NEPM

Source: SKM 2002

[NEPM = National Environmental Protection Measure]

It should be noted that these levels are the highest predicted levels. Over the great majority of the year the levels are a fraction of these maxima. These levels would occur adjacent to the plant and in the hills to the northeast of the plant site and not in populated areas. There are two exceedances predicted of the NEPM standard for PM_{10} and both of these occur within 500m of the plant and within the plant boundary.

Normal conditions - NO_2, SO_2, PM_{10}

The highest predicted ground level concentration for NO_2 is 185µgm^{-3} (75% of the NEPM standard) and the highest predicted ground level concentrations for SO_2 are less than 10% of the NEPM standards. The highest predicted ground level concentration for PM_{10} exceeds the NEPM standard.

Abnormal conditions

Abnormal conditions for industrial projects typically occur during startups, shutdowns, stoppages, maintenance periods and power failures. However, the PER indicated that during upset conditions the emissions from the MIDREX plant actually decrease, with the only increase being during transient conditions when emissions increase for a few minutes at a time and result in a monthly average increase of less than 0.07%.

TAPM modelling

The proposed plant has the potential to impact on smog levels in the Dampier and Karratha townsites.

TAPM was developed by the CSIRO Division of Atmospheric Research and consists of prognostic meteorological and air pollution modules which can be run for multiple-nested domains.

Photochemical smog modelling examined the impact of the proposed plant on the existing ground level concentrations of nitrogen oxides (NO_x), nitrogen dioxide (NO_2) and ozone (O_3). Three emission scenarios were modelled with TAPM:

Scenario 1: existing sources, including Woodside facilities and Hamersley Power Station emissions;

Scenario 2 existing sources and approved projects, existing sources as described above and Woodside Trains 4 and 5, Plenty River Ammonium Nitrate Plant, Syntroleum Plant and Burrup Fertiliser Emissions; and

Scenario 3: existing sources, approved projects and Austeel.

The second highest 1-hour average predicted ground level concentrations are presented in Table 4 below.

Emission	*Scenario 1 (ppm)*	*Scenario 2 (ppm)*	*Scenario 3 (ppm)*	*NEPM Standard (ppm)*
NO_2 anywhere on grid	0.034	0.041	0.048	0.12
NO_2 Dampier	0.018	0.024	0.021	0.12
NO_2 Karratha	0.014	0.015	0.021	0.12
O_3 anywhere on grid	0.098	0.092	0.095	0.10
O_3 Dampier	0.031	0.029	0.030	0.10
O_3 Karratha	0.038	0.028	0.034	0.10

Source: SKM 2002

The table shows that with the addition of approved industry there is a slight increase in the NO_2 levels. With the addition of Austeel the highest concentrations typically increase by 17 to 50% above the "existing" emission scenarios and by up to 40% above the "existing and approved" emission scenarios.

With the introduction of the approved projects, the results show a minor decrease in the second highest predicted ground level concentrations anywhere on the grid and at Dampier and Karratha. This reduction is apparently due to the high NO_X to reactive organics in the existing industrial emissions. As found in the Perth photochemical smog study, emissions of plumes rich in NO_X into air with high NO_X to reactive organic carbon suppresses ozone formation (DEP, 1996).

None of the predicted values exceeds the National Environment Protection Measure Standard (National Environment Protection Council, 1998).

Odour

The proponent has advised that there will be no significant odours emanating from the plant. The products themselves are not odorous and none of the processes produces any significant odours.

Dust

The PER identifies the pellet plant as the major point source of dust, with smaller emissions from the DRI modules. There would also be fugitive emissions from materials handling and stockpiling areas.

The PER stated that the highest predicted GLC of PM_{10} from the point sources would be 75% of the NEPM. However, with the addition of the second pellet plant, the point source emissions increase from 49 g/s to 82 g/s and the highest GLC predicted is 115% of the NEPM.

The mine and loading facilities are potentially significant sources of dust. Summer south westerly winds would carry particulates towards Dampier and Karratha, however these towns are further than 60km away. There is also a concern that dust at the loadout terminal at Cape Preston and Preston Island could have an effect on marine organisms and mangroves.

Other impacts

It is not anticipated that the gas emissions from the proposed plant will have any impact on the rock petroglyphs on the Burrup Peninsula as the predicted contribution to NO_2 levels are on average very low there. Under normal operating conditions the highest level predicted is below the NEPM standard. The SO_2 levels are also well below the NEPM. There are no other air emissions that could be anticipated to impact the rock.

Submissions

The DEP noted that the requirement in the Air Quality and Air Pollution Modelling Guidance under "identify and quantify all emissions to atmosphere" to identify whether metals will be released from any of the stacks had not been addressed.

The DEP also noted that the requirement to determine the meteorological conditions causing highest concentrations at important receptors (in the *Air Quality and Air Pollution Modelling Guidance* under "presentation of modelling results") had not been addressed. This should be determined to check that the model is yielding sensible results. The DEP requested information on the effect of intermittent emissions expected under transient conditions.

Only very limited information was provided in the PER on fugitive dust management and the DEP requested detailed information on dust control at crushing, screening, concentrator, conveyor transfer points, stockpile areas and roads. Minimal additional information was provided.

CALM questioned whether iron ore dust could travel to the communities of Dampier and Karratha as had occurred with bushfire smoke. The proponent has advised that this is very unlikely.

Assessment

The area considered for assessment of this factor is the Cape Preston area and surrounding downwind region including the Burrup Peninsula, and the townsites of Dampier and Karratha.

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

(1) protect the surrounding land users, such that dust emissions will not adversely affect their welfare and amenity or cause health problems;

(2) protect mangroves and marine communities in the vicinity of Cape Preston from dust;

(3) ensure that emissions of NO_X, SO_X and particulates are assessed and meet acceptable standards and the requirements of the *Environmental Protection Act 1986*;

(4) ensure that all reasonable and practicable measures are taken to minimise discharges of NO_X, SO_X and particulates prior to finalising detailed engineering design; and

(5) ensure that conditions which could promote the formation of photochemical smog are managed to minimise the impact.

Stack Emissions

The EPA notes that Karratha meteorological data was used in the air emission modelling and while this is acceptable for indicating the likely impact at this stage, site specific data needs to be obtained and the modelling redone to provide better predictions. A condition requiring the establishment of a metrological station and a condition requiring the air emission modelling to be redone using site specific data prior to construction is therefore recommended.

In regard to point source gaseous and particulate emissions, air quality modelling indicated that ground level concentrations for NO_X under normal operating conditions would be below the relevant NEPM standard. The air quality modelling also indicated that impacts from oxides of sulphur (SO_X) would be well below the NEPM standard.

The modelling predicted two exceedances of the NEPM standard for PM_{10}, however both were within 500 metres of the plant and within the lease boundary.

The proposal will, however, be the largest emitter of NO_X in the region, emission concentrations from the pellet plant are high at 400mg/m^3 and ground level concentrations are predicted to reach 75% of the NEPM standard. On this basis the EPA recommends a condition requiring the proponent to investigate and report on best practice NO_X control and measures to reduce NO_X emissions from the pellet plant. In addition, the NO_X produced from the proposal can be reduced if a combined cycle power station was used instead of the open cycle power station. This is because more power can be generated per unit of fuel and as a result less combustion products (NO_X and CO_2) are produced per unit of power generated. This issue is further addressed in Section 3.10 under greenhouse gases.

The EPA also understands that monitoring of stack emissions from the proposed plant will be specified through the Works Approval and Licensing process.

Dust

Only limited information was provided on dust management in the PER, however the proponent did commit to prepare a dust management plan. The EPA is well aware of the need for iron ore projects to manage dust to avoid adverse impacts and believes a condition requiring the preparation of a dust management plan and outlining its content is warranted. As part of this plan, baseline data on ambient dust levels needs to be collected prior to clearing and construction commencing.

The EPA is aware that DRI is very reactive, particularly with moisture. The reaction is exothermic and produces hydrogen gas. This has caused safety problems in confined spaces with high moisture levels, such as during ocean transport. This reactivity can be reduced by stabilisation via hot briquetting (which reduces the surface area) or via passivation, where part of the DRI is oxidised (to create an insulation effect).

However there is still potential for process areas and materials handling to produce reactive DRI dust. DRI dust is known to cause health problems (eye damage) and damage to property (paint coatings). Because of this, the EPA believes that DRI dust needs to be treated more cautiously than iron ore dust and emissions must be required to meet best practice. As such the Dust Management Plan will need to specifically address the issue of reactive DRI dust from both point and fugitive sources.

Summary

Having particular regard to:

(a) the predicted impacts obtained from the air quality modelling results for the project being below relevant NEPM standards outside of the lease area;

(b) the recommended condition requiring the proponent to establish a meteorological station to gather site-specific data that will allow more accurate modelling of air emissions to be undertaken;

(c) the recommended condition requiring the proponent to revise the air emissions modelling using site-specific data;

(d) the recommended condition requiring the proponent to investigate and report on best practice NO_X control and measures to reduce NO_X emissions; and

(e) the recommended condition requiring the proponent to prepare and implement a Dust Management Plan (which includes baseline monitoring, specifically addresses reactive DRI dust and reports on best practice dust controls to reduce dust emissions from both point and fugitive sources);

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

3.10 Greenhouse gases

Description

Estimated plant emissions

The original Austeel proposal described in the PER was predicted to emit approximately 3.78 million tonnes of CO_2 per year. However, due to the expansionary changes made to the project during the assessment, the proponent has revised the prediction to approximately 5.5 million tonnes of CO_2 per year.

The PER originally proposed the installation of an open-cycle power station of 320MW, with provision for conversion to combined cycle if more power was required. The revised project now proposes a 640MW power station but still as open-cycle.

The greenhouse gas emissions from the revised project represent about 1.4% of Australia's 1990 baseline for greenhouse gases (390Mtpa) or 13% of WA's total in 1990. A breakdown of the quantities of CO_2 emitted from various sections of the plant is given in Table 5 below.

Table 5: Estimated CO_2 emissions from the project (typical in years 7-14)

Source	CO_2 Emissions (tpa)
Process gas	2,837,000
Electricity generation	1,800,000
Upstream production and delivery	774,000
Mobile plant equipment	138,000
Vegetation clearing	7,000
Blasting	2,000
Total emissions from project*	**5,558,000**

* ignoring shipping

The PER stated that the MIDREX process maximises the effective use of energy, with the major energy-efficient features being:

- recovery of maximum heat from the cooling of hot pellets;
- recovery of heat from the reformer flue gas to preheat the feed gas mixture and the burner combustion air; and
- the use of gas for direct reduction to produce metallic iron without using energy to melt the iron which occurs in smelting.

The PER stated that Austeel would use best engineering technology and management practices in designing, constructing and operating the plant to reduce greenhouse gas emissions as low as reasonably practicable. Also that Austeel would investigate "beyond no regrets" measures such as afforestation as a means of partially offsetting greenhouse gas emissions from the project.

Australia's greenhouse gas targets

In response to the predicted impact of increasing levels of greenhouse gases, international and national targets limiting the increases in emissions have been set. At the Kyoto Climate Change Conference of Parties in December 1997, the developed countries agreed to a collective target of at least a 5% decrease in greenhouse gas emissions from 1990 levels by the years 2008-2012. Australia has particular national circumstances whereby it is a major net exporter of energy, its industries are energy-intensive and it has a high industrial growth rate. Within this agreement Australia must limit its increase to no more than 8% above 1990 levels over the same timeframe. The six greenhouse gases which are covered by the Kyoto Protocol are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

Australia has decided not to ratify the Kyoto Protocol at this time. However, the Australian Government has signalled its intention for the Nation to meet the 108% Kyoto target regardless of ratification. Current trends indicate that Australia will exceed this target on a "business as usual" scenario. Thus, greenhouse gases is an environmental factor of considerable importance, and requires best practice measures to be taken.

The National Greenhouse Strategy (Commonwealth of Australia, 1998) provided some information as to the implementation of the Kyoto Protocol strategy. There are no State or project-specific requirements in the National Strategy, although the strategy does indicate responsibility for measures for the Commonwealth and State governments.

Implementation plans are to be developed by States and Territories as subsidiary documents to the National Strategy. These plans are to be guided by the same principles which have guided the National Strategy, namely:

- the need to have a Greenhouse response which is tailored to Australia's national interests;
- the need to integrate Greenhouse considerations with other government commitments;
- the pursuit of Greenhouse action consistent with equity and cost effectiveness and with multiple benefits;
- recognition of the importance of partnerships between governments, industry and the community in delivering an effective Greenhouse response; and
- the need for action to be informed by research.

In the assessment of the environmental factor of 'greenhouse gases' for the proposal, the EPA considered the agreement reached by the Australian Government at Kyoto in December 1997 and the subsequent Kyoto Protocol which was signed on 29 April 1998. It also considered the National Greenhouse Strategy (Commonwealth of Australia, 1998) which was released by the Australian Greenhouse Office in November 1998 and endorsed by the WA Cabinet on 5 August 1998 subject to four qualifications, which include: maintenance of international competitiveness, differentiation within Australia, the ongoing nature of the basis for a Greenhouse Strategy; and the cost of achieving greenhouse targets.

Submissions

The DEP noted that a detailed assessment of greenhouse gas emissions needed to be undertaken, in particular “no regrets” and “beyond no regrets” measures. The DEP also asked the proponent to consider waste heat recovery either via a combined cycle power station or in the desalination plant.

The Australian Greenhouse Office requested a complete inventory of all greenhouse gas emissions along with the methodology and calculations. It questioned the basis on which combined cycle was not considered economic and sought more details of “beyond no regrets” measures.

Assessment

The EPA considers this proposal would be a major contributor to Western Australia's greenhouse gas emissions. The EPA’s objectives in regard to this environmental factor from both a global and Australian context, consistent with the National Greenhouse Strategy, are to:

1) mitigate greenhouse gases emissions in accordance with the Framework Convention on Climate Change 1992, and in accordance with Australia’s National Greenhouse Strategy as endorsed by the State Government. (Environmental Protection Authority Guidance No. 12 *'Minimising Greenhouse Gas Emissions'*, (EPA, 2002);

2) minimise greenhouse gas emissions in absolute terms and reduce emissions per unit product to as low as reasonably practicable; and

3) estimate the gross amounts of greenhouse gases that may be further reduced by offset measures, including tree planting, CO_2 re-injection, carbon trading etc.

Assessment of the Austeel plant

To assess the project it is useful to compare the technology to a "business as usual" benchmark with a 1990 baseline. In order to make a reasonable assessment the following analyses were made:

- comparison of the proposed plant with the MIDREX design of about 10 years ago (i.e. ~1990) in terms of greenhouse gas emissions; and
- comparison with similar plants on a per-unit-of-product basis.

These two approaches are considered below.

Comparison of the proposed plant with 1990 baseline

The proponent has advised that the following process improvements have been made since the MIDREX design of 10 years ago. The resulting reduction in CO_2 emissions is shown in brackets:

increased furnace utilisation (2.6%);	increased in-situ reforming (0.7%);
higher reducing gas temperatures (0.9%);	increased reducing gas quality (1.2%);
decreased reformer size (1.4%);	greater combustion air reheat (2.8%);
greater feed gas preheat (7.2%);	natural gas preheat (0.5%).

These waste heat recovery measures and other process improvement measures result in a reduction of approximately 17.3% in greenhouse gas emissions from the 1990 plant (from 1,016,887tpa CO_2 equivalent per module for the 1990 plant to 841,225tpa CO_2 equivalent per module for the proposed plant). Thus, compared to the 1990 "business as usual" benchmark, the Austeel proposal could achieve a 17.3% reduction in greenhouse gases. The proponent has identified possible future greenhouse gas reduction measures related to increased process and energy efficiencies in the MIDREX process with the potential to reduce emissions by another 3.6%.

Comparison with other plants / technologies

The proponent provided data from Appendix D, Chapter 14, "Economics of Production and Use of DRI" of Direct Reduced Iron, Technology and Economics of Production and Use (Iron and Steel society 1999) which gives the following information for different types of DRI process technologies:

The consumption of natural gas (mtbu) per million tonnes of product:

Finmet: 11.55

HYL III: 11.33

MIDREX: 10.30

The consumption of electricity (kWh) per million tonnes of product:

Finmet: 150

HYL III: Not Available

MIDREX: 130

The consumption of water (m^3) per million tonnes of product:

Finmet: 2.50

HYL III: 1.76

MIDREX: 1.50

This comparison shows the MIDREX technology to be the most efficient of the three. The EPA also notes that when compared with coal-based technologies, the proposal would produce about 35 to 45% of the greenhouse gas emissions (per unit of product) of the coal based technologies.

Power Station

The power station, consisting of six open-cycle gas turbines, will supply all the power required for the project. The greenhouse gas emissions from it is approximately 1.8mtpa CO_2 -about one third of total greenhouse gas emissions from the project. Based on data provided in the Supplementary Environmental Review the installation of a combined cycle power station would increase energy efficiency from 34% to 54%. Assuming a consumption of 34,170TJpa, the installation of a combined cycle power station would reduce gas usage by around 12,640Tjpa, with a reduction in CO_2 of approximately 655,400tpa (11.8% of the total for the project).

Subsequently to the Supplementary Environmental Review Austeel has provided new calculations which show that, above the price of a conventional power station, the capital costs of installing combined cycle power (now stated to be $320 million-up from the $180-$200 million advised in the SER) versus cost saving from the reduction in the amount of fuel used gives a payback period of about 30 years. The proponent considers this is a "beyond no regrets" rather than a "no regrets" measure and has advised that the high added cost of this option makes it uneconomic.

The figures submitted for the extra capital costs associated with combined cycle power are not able to be independently verified because they do not indicate what power plant configurations have been used to generate the required 640MW of power and whether power requirements are steady or variable. Also it appears that the costings have been based on a scenario of only four x 160MW generators compared with six units in the previously provided revised data. There has been no indication from the proponent to date regarding any technical impediment to the use of combined cycle gas turbines in the project.

At approximately 5.5 million tonnes per annum the project will be a very significant producer of greenhouse gas.

The EPA has consistently encouraged proponents to seek out and implement the most energy-efficient technology with respect to large plants producing gaseous emissions. Accordingly, on the basis that:

(i) a combined cycle power station represents best practice with respect to energy efficiency and (CO_2 and NO_X) emissions reduction;

(ii) there is no stated technical impediment to the generation of combined cycle power for this project; and

(iii) the project would be a very significant producer of greenhouse gases and has the potential, with the installation of combined-cycle power, to save 11.8% (655,400tpa) of the total CO_2 equivalent emissions along with a reduction in NO_X emissions;

the EPA recommends a condition requiring the combined cycle power station option be implemented.

The EPA also expects the proponent to investigate greenhouse gas offset measures (such as afforestation) and others to reduce the total net greenhouse gas emissions from the project. Afforestation would be of particular benefit to the Western Australian environment since in addition to sequestering carbon dioxide, this measure could also assist in reducing the salinity problem in cleared agricultural regions.

Proponent commitments

Austeel has made the following commitment in relation to greenhouse gas emissions:

(1) Prior to commissioning of the project the proponent will prepare a Greenhouse Gas Emissions Management Plan to:

- ensure that greenhouse gas emissions from the project are adequately addressed and most energy-efficient technologies within the commercial viability of the project are used to minimise total net greenhouse gas emissions or greenhouse gas emissions per unit of product; and
- mitigate greenhouse gas emissions in accordance with the Framework Convention on Climatic Change 1992 and consistent with the National Greenhouse Strategy.

(2) Continue discussions with a Western Australian company on the establishment of a plantation crop to sequester carbon dioxide.

Summary

Having particular regard to:

(a) the energy efficiency of the proposed MIDREX plant;

(b) the estimated savings in CO_2 equivalent of 17.3% of the 1990 "business as usual" level, with a potential saving of another 3.6% through increased process and energy efficiencies;

(c) the project being a large greenhouse gas contributor and a recommended condition requiring the power station to be a combined cycle format which would reduce total project CO_2 emissions by approximately 11.8%; and

(d) commitments made by the proponent regarding investigations into and reporting on "beyond no regrets" measures;

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

- the combined cycle power station option is implemented; and
- a Greenhouse Gas Emissions Management Plan is implemented.

3.11 Heritage issues

Description

Austeel commissioned an Aboriginal ethnographic survey of an area somewhat larger than the project site, so it has the advantage of including lands which surround the project. Discussions have been held between the proponent and representatives from the major claimant groups. At the time of writing of the PER the Kurama, Yaburara, Mardudhunera and Marthudunera groups had not identified to Austeel any sites of significance which would impact upon the project.

Information from the Aboriginal Sites Register at the Department of Indigenous Affairs (DIA) identified 34 sites previously recorded from the general area of study. None of these would be affected by the proposed development. Austeel in the PER committed to ongoing discussions with appropriate representatives of the Aboriginal claimant groups and to further ethnographic and archaeological site surveys. It was reported in the proponent's Response to Submissions that both of the surveys had been completed and that the results would be forwarded to the relevant authorities (this has now been done). Likewise, Austeel reported that it had consulted with the wider Aboriginal community in the Pilbara and sought input from everybody listed on the Native Title Claims over the project area. The proponent placed advertisements in local newspapers and held public meetings in Roebourne after sending letters of invitation to all native title claimants.

Subsequent archaeological and ethnographic field surveys were carried out in April and May, 2001 and were submitted to the DIA. 72 new and 73 previously recorded archaeological sites were found in the vicinity of the survey areas. Of the totals, 11 of the previously recorded and 71 of the newly recorded sites are within the project area. The ethnographic survey was done in the company of members of all native title claimant groups and other relevant interested people. It recorded 28 sites of significance in the project area and provided recommendations for their management. A number of other sites were kept confidential as requested and are not listed in the report; however Austeel has advised that the project will not impact on them. None of the groups represented expressed concern that the project would significantly impact on cultural and social values of the area.

Several recommendations were made by the consultant who prepared the ethnographic report (O'Connor, 2001). These were:

- extreme care should be taken to avoid disturbing human remains on the eastern bank of the Fortescue River near Balmoral Homestead. (This is unlikely given that the focus of this project lies several kilometres to the north). Should these remains be encountered it is recommended that all work ceases and that the relevant authorities are notified;
- until the Minister's permission under Section 18 of the Aboriginal Heritage Act has been obtained, sites listed in this and the associated archaeological report, and all other Aboriginal sites, should be avoided. To facilitate this the proponent should ensure that all personnel on site are capable of identifying Aboriginal sites;
- the Aboriginal people associated with the project area have requested to be allowed to nominate persons to monitor ground disturbance and it is recommended that this should be permitted;
- the Aboriginal people associated with the project area have requested to be allowed to examine in detail proposed areas of disturbance when these are definitely identified and it is recommended that this should be permitted;

- ongoing liaison with the relevant Aboriginal people should be maintained by the proponent.

The proponent has not identified any European heritage issues or sites in the project area.

Submissions

The Aboriginal Affairs Department and the Australian Heritage Commission were both concerned to ensure that appropriate ethnographic and archaeological studies, and comprehensive consultation with title claimants would be carried out. The Kurama Marthudunera people advised that they are the custodians of the project site, (to which the proponent has advised that title to the land is being contested by up to four groups and the decision over custodianship has yet to be made by the Federal Court). The Pilbara Native Title Service (PNTS) advised that inappropriate consultants had been employed to carry out the ethnographic and archaeological surveys and that its client (the Kurama Marthudunera Group) was not prepared to accept surveys unless they approved of the consultants. Austeel was able to report subsequently in its Response to Submissions that it had been able to involve representatives from all groups (including the Kurama Marthudunera people) in the surveys. Damage by Austeel to heritage sites during the course of exploration work is alleged, but no evidence of such damage has been made available to the Department of Indigenous Affairs, despite invitations to do so. The PNTS claimed that a public meeting held by Austeel for the project in Roebourne was not adequately publicised and that it was badly run.

Assessment

The entire project area was considered for assessment of this factor. The EPA's environmental objectives for it are to:

(i) ensure that the proposal complies with the requirements of the *Aboriginal Heritage Act 1972*; and

(ii) ensure that changes to the biological and physical environment resulting from the project do not adversely affect cultural associations with the area.

The surveys have indicated that several sites lie within the project area. A management plan for them will be prepared and agreed with the involvement of interested aboriginal groups and the DIA. Austeel has committed to complying with the requirements of the *Aboriginal Heritage Act 1972*.

Summary

Having particular regard to the:

(a) ethnographic and archaeological studies which have been completed and submitted to the Department of Indigenous Affairs;

(b) media notices and consultations with all aboriginal parties with a connection to the area and each person listed on the Native Title Claims;

(c) advice that no group representatives have expressed concern that the project would significantly impact on the cultural and social values of the area;

(d) the proponent's commitments to prepare an Aboriginal Sites Management Plan; and

(e) commitment to consult with traditional owners in respect of additional Aboriginal site surveys in areas not already surveyed;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives for this factor provided that the recommendations listed above from the ethnographic report are incorporated into the Aboriginal Sites Management Plan. Austeel has agreed to add this requirement to its commitments.

3.12 Recreational use, including fishing

Description

There are two perspectives under consideration: (i) maintaining the current levels of access to recreational sites; and (ii) ensuring that environmentally sensitive areas do not become overrun under the recreational pressures generated by up to 420 employees and their families living on site.

Access to the pools and the mouth of the Fortescue River and to Cape Preston is currently via unsealed tracks which traverse the project area. There is a boat launching facility at the mouth of the Fortescue River and an informal campsite. The tracks will need to be diverted to avoid components of the minesite, process plant and infrastructure corridor from there to Cape Preston. The public will be excluded from the port area at Cape Preston.

Submissions

CALM and Fisheries WA submitted that it is likely that the consequences of the project would include possible local depletion of crab and fish stocks; increased compliance and public education activity costs incurred by the departments; marine safety issues arising from the increased number of small boats; and extra recreational fishing and camping pressures on the western margin of the proposed marine park. To manage these issues the Department of Fisheries recommended that the proponent conduct environmental inductions targeting these matters and Austeel has indicated in its response that it would include appropriate references to fishing in its induction programme. This will be addressed in its EMP which will be prepared in consultation with CALM and the Department of Fisheries.

Assessment

The area considered for assessment of this factor is recreational sites, especially those along river channels, along the coast and in nearshore areas where any of these have the potential to be affected by the project, either by restrictions to access for reasons of public safety, or because of the recreational impacts of large numbers of personnel.

The EPA's environmental objective is to maintain the recreational uses of the area without undue pressure on the local natural resources and public amenity. For fishing it is to ensure that fisheries, nursery areas and recreational fishing locations are not significantly affected by heavy visitor pressures.

The PER states that public use and camping at the river mouth will not be affected from noise associated with the project because of the distance separating the site (8km) from the process plant. The nearest residence (Fortescue River Roadhouse) is 25km from the plant site).

The EPA notes the proponent's commitment to address fishing issues in its induction programme as a part of its EMP. However, the EPA considers it appropriate to require the proponent to develop and implement a Recreational Use Management Plan to address:

- the maintenance of public access to key recreational sites;

- appropriate fishing practices (as committed to by the proponent); and
- protection of popular visitor locations from undue impacts arising out of uncontrolled and careless usage from project personnel.

Summary

Having particular regard to:

(a) the distance of key recreational sites on the coast and the nearest residences from the mine and plant site; and

(b) the requirement for a Recreational Use Management Plan;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives for these factors.

3.13 Other factors

The factors below were also considered as part of the EPA's assessment but are not thought to be as important as the preceding, or are expected to be adequately dealt with as outlined in the PER.

Soil contamination

There were no submissions on this issue.

The main potential for contamination arises from the storage, transfer and usage of fuels and other liquid substances and their waste products around the mine, workshops, process plant, power station, desalination plant and port complex. The details of how best to store and manage these substances is an issue which will be dealt with in detail during the works approval and licensing of the project plant under Part V of the *Environmental Protection Act 1986*. The proponent has recognised its responsibilities in the PER by stating that fuel storage and oily wastes will be managed in accordance with DEP requirements and has advised it will dispose of all hydrocarbon-contaminated soils in accordance with conditions specified by the DEP and consistent with EPA guidelines for oil farming of oily wastes.

Bunding and sealed surfaces will ensure that spills are contained from where they will be run into sumps and put through an oil separator.

Noise

Noise will be generated by the mining, process plant, power station, infrastructure corridor (either conveyor or haul trucks) and port activities. The PER indicates there will be no exceedances of noise levels at the boundaries of the project area and the nearest inhabited residence is more than 25km away, at the Fortescue Roadhouse. Balmoral Homestead, to the south of the minesite, is abandoned. Modelling of levels at the Fortescue River mouth (8km distant from the mine) indicated that levels (associated with the original proposal) there would be at or close to ambient.

To confirm boundary noise levels and offsite impacts the proponent should be required to re-run noise modelling to take into account the changes to the scale of the project since the original modelling was done prior to finalising detailed engineering designs.

Road transport / infrastructure corridor

It is not yet known whether a conveyor or a haul road will be built to transport the product to the port at Cape Preston. The road would be sealed if built and used as a haul road, this minimising dust from haul vehicles. This aspect will be addressed in the proponent's Environmental Management Programme which will be prepared in consultation with the EPA and other involved agencies as appropriate prior to construction. As such a condition is recommended.

Risk and hazard

Much of the detail for this issue remains to be assessed as part of the detailed planning stage and will be included in the Project Management Plan required under the Mines Safety and Inspection Act. A concern raised by the Department of Minerals and Petroleum Resources about the management of direct reduced iron from the DRI plant has been largely addressed because all the DRI produced goes to making HBI, thus keeping inventories at a minimum. DRI is pyrophoric, that is, it generates heat and hydrogen to create flammable atmospheres. Nevertheless hazardous zone analyses and consequence modelling of all flammable / toxic mixtures will be required to provide the necessary minimum distances for consideration of boundary and residential risk. This aspect will be addressed by requiring the proponent to prepare an Environmental Management Programme to consider, amongst other things, risks and hazards, both onsite and offsite. This is one of the proponent's commitments and is binding.

Acid mine drainage; asbestos

A submission on acid mine drainage was received from the Water and Rivers Commission. Austeel has stated that there no (acid-generating) pyritic shales were encountered during drilling and testing of the orebody. Nor were there any asbestiform minerals. Should pyritic shales or asbestiform minerals subsequently be found an action and management plan would be required to deal with them.

Rehabilitation

A number of agencies brought up issues related to rehabilitation and the need for early consideration of mine closure planning. Austeel has committed to providing a suitable walk-away solution at the completion of mining and to addressing this matter in its Mine Closure Plan prior to construction.

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 out in the PER and subsequently modified, as shown in Appendix 5, 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 and recommends they be imposed if the proposal by Austeel to mine iron ore, build a power station and process plant for pelletising / hot briquetted iron / direct-reduced iron and export the produce via a purpose-built port 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. The commitments cover the preparation of an Environmental Management Programme which will include Plans for:

- a further flora survey, vegetation monitoring, and Mesquite control;
- turtle and wading bird bird surveys;
- marine and port management, including ballast water management and spill contingency plans;
- surface and ground water management plans;
- subterranean fauna management;
- gaseous emissions, dust and noise controls;
- final layout of the accommodation village, mine waste dumps and alignment of infrastructure services corridor, for review;
- Aboriginal sites management;
- public access plan to recreational sites;
- personnel induction plan; and
- best practice measures for environmental monitoring, rehabilitation and decommissioning.

The remainder of the conditions address the following:

(b) that the project shall have substantially commenced within five years of the date on the Statement or approvals will lapse;

(c) dewatering of the pit should occur no faster than the rate of mining to protect as much as possible of the phreatophytic vegetation at the periphery of the groundwater drawdown zone;

(d) prior to dewatering and clearing for mining of the orebody further sampling be undertaken for subterranean fauna to determine whether the proposal, if implemented, would pose a significant risk to any species of subterranean fauna of their becoming extinct;

(e) detailed marine baseline surveys of tidal and sedimentation patterns are undertaken to characterise normal seasonal variations in the vicinity of Cape Preston;

(f) protection of marine ecosystem and social values in the vicinity of Cape Preston which are likely to be affected by the construction of a causeway between the Cape and Preston Island, by the location of a wastewater outfall and by dredging and the dumping of dredge spoil;

(g) management of light spill from the port and nearby developments to protect turtle nesting regimes;

(h) to safeguard against the introduction of exotic marine organisms ensure that the management plan encompasses the prevention of introductions from the exterior of ships' hulls;

(i) hydrological modelling to establish surface flows in the Fortescue River and creeks flowing through the mine and plant area to ensure that infrastructure is built and positioned after consideration of floodwater levels;

(j) with regard to gaseous and particulate emissions, the need for the establishment of a meteorological station and data collection, best practice technology to be applied and installed, with particular consideration to NOx and greenhouse gas emissions, both of which are large. This results in a requirement to install a combined cycle power station to maximise efficiency;

(k) noise, in particular from the mine, process plant, infrastructure corridor (haul road or conveyor system) and port facility;

(l) the need for a code of behaviour to be put in place within the umbrella of a recreational sites management plan to ensure that potential adverse impacts from people recreating and working in the area are recognised and minimised, especially with respect to sensitive environmental resources and popular recreational sites;

(l) mitigatory measures to aid the conservation effort;

(m) compliance audit and performance reviews, and a closure plan.

5. Other advice

The Cape Preston area is a part of the proposed Dampier Archipelago / Cape Preston Marine Conservation Reserve. Preston Island itself is in the Great Sandy Island Nature Reserve created for the purpose of conservation of flora and fauna. Being at the centre of the proposed port the island will inevitably be adversely impacted by the development and is unlikely to retain significant conservation values, with direct pressures coming from construction activities and potential longer term effects from spills, runoff and dust emissions.

The PER describes early considerations for the process plant and port alternatively sited on or near the Burrup Peninsula, but concluded that the proposed location at Cape Preston "offers the best economic solution….without imposing a significant environmental penalty."

On its own Preston Island is not considered to have intrinsically high conservation values. It is a small, low rocky platform with little vegetative cover. Nevertheless, this part of the nature reserve will be essentially lost to the conservation estate. The development is also likely to affect the proposed marine conservation reserve.

The EPA understands that Austeel has had preliminary discussions with CALM about mitigatory measures and believes there is scope for positive outcomes. The Authority recommends that those discussions should be progressed with a view to agreeing a set of measures which will aid the conservation effort in this area.

6. Conclusions

The EPA has considered the proposal by Austeel Pty Ltd to mine iron ore and process the ore to create direct-reduced and hot-briquetted iron, build a power station and ship the product from a port to be built at Cape Preston.

The scope of this proposal and attendant potential environmental impacts are considerable, especially as it is to be sited in an essentially undeveloped and environmentally rich part of the Pilbara coastal strip, will have of the order of five thousand of its construction and several hundred of its operations workforce living on site and will be a large producer of NOx and greenhouse gases.

The assessment of this proposal has been hampered by the difficulty in obtaining adequate and timely studies on a number of environmental issues.

In light of these circumstances, the EPA has adopted a precautionary stance, requiring that decisions on various key components (such as the placement and design of the causeway / bridging structure from Cape Preston to Preston Island) are contingent on the results from surveys and modelling still to be carried out. This has led to several recommended conditions which are long and complex, in order to recognise important matters. There remains uncertainty on the distribution of the oniscoid Isopod species of stygofauna, which so far is only known from boreholes within the orebody. The effects of mining and groundwater depletion on the population of this organism are imperfectly known until sufficient work is done to establish its broader distribution and to characterise its preferred habitat. Precautionary conditions have been recommended to deal with this state of knowledge.

In summary, the EPA has concluded that the proposal can only be managed in an environmentally acceptable manner if there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments, and a satisfactory outcome from the surveys remaining to be completed.

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 an iron ore mine, process plant to create direct-reduced and hot-briquetted iron, a power station, infrastructure services corridor, seawater desalination plant, accommodation village and a port to be built at Cape Preston.;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. 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 a satisfactory outcome from the surveys remaining to be completed; and
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Appendix 1

List of submitters

Organisations:

Department of Agriculture
Aboriginal Affairs Department
Australian Heritage Commission
Coastwest / Coastcare
Conservation Council of WA
Department of CALM
Fisheries WA
Pilbara Native Title Service
Ministry for Planning
Shire of Roebourne WA Museum
Water and Rivers Commission

Individual:

Barrack and Associates (for the Yaburara and Coastal Mardudhunera Aboriginal Corporation, Kevin Cosmos and Valerie Holborow)
Ray Ward

Appendix 2

Summary of Submissions and Proponent's Response to Submissions

Austeel Pty Ltd

Iron Ore Mine and Downstream Processing, Cape Preston, Western Australia

Response to Public Submissions

Prepared by

Halpern Glick Maunsell Pty Ltd

MARCH 2002

Austeel Pty Ltd response to questions arising from submissions to the PER.

The Department of Environmental Protection (DEP) notes that many of the issues in the PER have been covered in only a general and superficial way. This was foreshadowed in the DEP's PER release letter and has been echoed in the public submissions. In its response to public submissions, the DEP expects the proponent to undertake further studies and present results to adequately address the issues raised. In order to ensure that this is achieved, the DEP would be happy to review a draft and provide constructive feedback.

A **Since public release of the PER during December 2000, Austeel has made a number of project changes. An additional *Supplementary Environmental Review* (SER) report has been prepared which outlines the changes to the project. The main changes are:**

- **increase in mining rate and reduction to project life;**
- **net increase (~10ha) in total area disturbed (incorporates increases to the plant site and power station area and clearing for a gas pipeline lateral whilst allowing for a reduction in area for the removal of the southern tailings dam);**
- **increased power (and natural gas) demand (Extra two 160MW operating gas turbines plus two back-up turbines);**
- **increased ore concentration (to 13.4Mtpa);**
- **increase in pellet production (additional 6.9Mtpa for export);**
- **removal of the southern tailings dam (eastern tailings dam only);**
- **minimisation of waste dump encroachment into the Fortescue River Floodplain;**
- **identification of two options for the gas pipeline lateral;**
- **consideration of the option to haul product to the port site rather than use conveyor;**
- **modified jetty design; and**
- **increase in project workforce and changes to on-site accommodation.**

The main reason for these changes is due to the incorporation of increased production of iron ore pellets for export. This has resulted in an increase in demand for raw materials (ore, seawater for process water, natural gas for power, and other consumables involved in the concentrating and pelleting processes). Refer to Figure 1.1 and Table 1.2 in SER.

The *Supplementary Environmental Review* also outlines the environmental studies that have been conducted subsequent to release of the PER and the ongoing studies yet to be completed. The environmental studies undertaken and ongoing include:

- **Stygofauna Sampling;**
- **Marine Turtle Nesting Survey;**
- **Migratory Birds Survey;**
- **Aboriginal Heritage Studies;**
- **Geotechnical Study;**
- **Groundwater Level Drawdown Modelling;**
- **Atmospheric Emissions;**
- **Brine Disposal Modelling;**
- **Fortescue River Floodplain Modelling;**
- **Biological Survey; and**
- **Marine Survey;**

The results of these studies will be presented to the Department of Environmental Protection and other relevant government authorities upon completion of a written report.

General

1. Conservation and Land Management (CALM) acknowledges that this project could provide substantial economical benefits to the region and to the State. CALM also recognise that there could be significant impacts upon the marine and terrestrial environments in the area associated with this project. With appropriate commitments towards environmental offsets it may be possible to balance environmental impacts with benefits to conservation of biodiversity. There are a number of areas identified where further information is required and issues that have not been adequately addressed. CALM recommends that the project does not receive approval until the proponent provides suitable responses to these issues and makes commitments to environmental offsets. CALM is happy to provide advice in this regard.

A: Austeel has made a number of commitments to prepare Environmental Management Plans (EMP's) for various components of the project. In the preparation of these EMP's Austeel will hold discussions with relevant government agencies to ensure that the issues are addressed to their satisfaction. Specific questions raised by CALM are further addressed in this document.

Austeel recognises that development of the project in the Cape Preston region will result in a net loss to State conservation reserve assets and that a commitment to redressing this issue could centre on the provision of conservation offsets.

However, under the State Agreement Act, Mineralogy has granted rights to Austeel to use part of its tenements for the development and operation of the project. Austeel will hold further discussions with CALM and the Conservation Commission of Western Australia (CCWA) with regard to specific recognised high conservation areas in order to establish an agreement on the conservation management for these key areas.

In relation to the environmental management, Austeel makes the following commitment:

> ***Austeel commits to the implementation of best practice environmental management and rehabilitation within the project area. Details of progress against management objectives will be reported in Annual Environmental Reports. Best practice environmental management will include protection of turtle nesting sites, vermin control, management of mesquite and ongoing research in areas such as stygofauna.***

Refer also to SER (Section 3.3).

2. CALM notes that the PER indicates that "a key element to business success is excellence in environmental management". However the items that Austeel commits to in this policy statement are routine and would be expected of any organisation. CALM would like to see this policy reviewed and commitments made that clearly indicate the object of the policy is *excellence* in environmental management. Could the proponent provide a revised policy?

A: The EMP and the associated policy statement should be seen as outline documents that, over time, will be progressively refined. Detailed EMP's will be produced for both the construction and operations phases of the project and, ultimately, environmental management will be incorporated under the umbrella of an EMS. Austeel has no concerns about incorporating CALM's comments into the EMP but at this stage it would be premature to do so. In the development of the final EMP's a more detailed policy statement of Proponent Commitments will be developed.

Section 15 (Proponent Commitments) of the PER document provided a summary (Table 15.1) of Austeel's commitments. In particular, Commitments 1 and 2 stated that Austeel would prepare and implement an Environmental Management System (EMS) and Environmental Management Plan (EMP). Section 16 (Environmental Management Plan) of the PER provides a framework for the EMP, with Section 16.3.1 providing Austeel's current Environmental Policy. The Environmental Policy will be further reviewed and updated during the process of developing Austeel's EMS and EMP.

3. CALM and the Australian Heritage Commission (AHC) note there is only minor recognition in the report (Section 14.1 par. 4) that Preston Island is part of a nature reserve system of islands (vested in the Conservation Commission of WA). CALM advises that Preston Island is a small island less than 300 metres long and is part of the Great Sandy Islands Nature Reserve. There will also be a requirement for other infrastructure on the nature reserve that hasn't been indicated in the report. This additional infrastructure will be required to support the infrastructure proposed and the people working at these facilities e.g. Shelter, toilets and mess facilities, fuel and water pipelines, powerlines, temporary storage facilities, parking areas, laydown areas for construction and maintenance works. If Preston Island is to be used in this project, as indicated, there will be massive disturbance that will result in significant losses to the conservation value of the island. Consideration and endorsement by the Conservation Commission is required to determine if this disturbance is acceptable and, if so, under what terms and conditions. If the Conservation Commission does endorse this use for the island then it is likely that compensation in some form (including conservation offsets) would be required. Could the proponent comment on this issue?

A: Preston Island is a very small island of approximately 4.5ha in size. Under storm surge conditions it is likely that the island is completely inundated. For this reason CALM

provided advice that specific fauna trapping on the island would unlikely yield any species of interest. Given the size of the island and its rocky nature it is not considered that the island has significant conservation value for nesting birds. Austeel has investigated the option of avoiding impact on Preston Island (PER, section 3.2.7) however the cost to do so is estimated at $180M. Given the small size of Preston Island and the nature of the operations that are planned for the island, Austeel considers that it will be very difficult to maintain the existing conservation value of the island.

No evidence has been presented that the conservation significance of the area will be significantly affected by the Austeel development. Conservation values of the area, such as mangroves and the linear dune system, are recognised and will not be significantly impacted by the project.

4. CALM note that an indicative management plan for the proposed Dampier Archipelago/Cape Preston marine conservation reserve is currently in preparation with community involvement through the 'Advisory Committee for the proposed Dampier Archipelago/Cape Preston Marine Conservation Reserve'. The Cape Preston area is included in the planning boundary for the proposed reserve. Whilst this does not preclude the development, ecological targets for water quality, habitat disturbance, turtles and other parameters for the proposed reserve could affect the Austeel proposal. The advisory committee considered, but did not support the option of excluding an area at Cape Preston to accommodate the development. The development of the marine reserve proposal will take a number of years, with any gazettal likely to be three to four years away. As such the Austeel proposal could precede the marine reserve proposal. Management objectives and targets are currently being developed in consultation with the community (including industry representatives) and in liaison with Department of Resources Development (DRD) and the DEP. Once the reserve is gazetted, Austeel operations within or adjacent to the reserve will need to be managed so as to be consistent with maintaining the values of the reserve. There will be defined performance indicators for each of the ecological values to determine whether the targets for the ecological values have been met. Could the proponent address this issue?

A: The position of Austeel and the Department of Resources Development is that the Cape Preston port area should be excluded from the proposed marine reserve.

Although the Advisory Committee has currently rejected the option of excluding the port site from the proposed marine reserve, CALM has indicated that this could be reconsidered once the likelihood of the project proceeding becomes more definite (we understand that there are several other potential port sites that are also currently included in proposed marine reserves for a similar reason).

CALM has also indicated that if the port site remains within the proposed reserve that there is the option of creating a special use zone within the park which recognises the ports presence.

Management targets (ecological, water quality, sediment quality) are still being developed for the park. Regardless of whether the port remains within the park, Austeel will consult with CALM to develop appropriate management criteria for the area surrounding the port. These criteria are likely to be formalised via the Pollution Prevention Licence issued by the DEP.

5. CALM note the supply of gas for power generation would appear to be a critical component of this project, however, this issue was not considered as part of the PER assessment. The impacts of obtaining gas from the North West Shelf Joint Venture, in particular if it involves the construction of another pipeline on the Burrup Peninsula, is of critical importance to assessing the total environmental impacts of this project. More information needs to be provided with reference to pipeline routes and their environmental impacts and how these impacts will be mitigated, particularly on the Burrup Peninsula. Could the proponent provide this information?

A: Austeel has plans for natural gas to be supplied from the existing Dampier to Bunbury Natural Gas Pipeline (DBNGP) corridor. Supply of gas to the project will be via a lateral extension from the DBNGP corridor to the power station and plant site. Two alignments are currently under consideration (refer attached Figure 1) and the preferred alignment will be finalised following further environmental, heritage and geotechnical investigations.

Refer to SER Section 1.2.4.

6. The Water and Rivers Commission (WRC) believes that contingency planning for the management of environmental incidents that may occur as a result of operations are inadequate. It is imperative that plans and strategies are put in place to deal with these situations should they arise. Could the proponent provide further details on likely incidents and appropriate contingencies?

A: This question does not specify the environmental incidents of interest. Austeel has committed to preparing a number of EMP's for various aspects of the project. These EMP's will be developed in consultation with the relevant government agencies. Specific Contingency Plans, such as an Oil Spill Contingency Plan, Ballast Water Management Plan, Emergency Response Plan, etc., will be developed and implemented prior to commencement of operations. Relevant government agencies will be consulted in the development of each specific plan.

7. The WRC notes that the proponent has made some commitments with respect to the environmental management of the project, including a water management plan, groundwater monitoring program and flood diversion works. These commitments would need to be finalised, and the WRC would like the opportunity to review these before construction on the mining project commences.

A: WRC and other relevant agencies will be actively consulted for their input into a water management plan, groundwater monitoring programme and other environmental management of the project.

8. The AHC has major concerns about the construction of large industrial project in an area that at present is largely unmodified and contains a number of values of high conservation significance.

A: The area has been previously identified as having the potential for industrial development. Conservation values for the area that have been previously identified include the mangroves and linear dune system.

The project has been developed to minimise impact on the mangrove area and to avoid the linear dune system. Development of the project necessarily involves the crossing of the mangrove creek by the services corridor. Two crossing points are currently being considered: one that crosses at the point shown in the PER and one located on the high ground between the West and East sides of the mangrove creek (refer SER, Figure 1.2). The crossing points have been selected to minimise the direct removal of mangroves with the crossing being designed to retain the current tidal regime and hence avoid any indirect impacts due to changes in circulation.

Austeel does not believe that the conservation significance of the area will be significantly compromised by the project.

9. The CCWA would like to know why this new industry is not using the zoned Maitland Industrial Estate, instead of proposing to build right in the coastal area. The CCWA does not believe that consideration should be given to industry outside of this zone. Could the proponent address this issue?

As part of the project development process a number of alternative sites for process plant and port location were investigated (see PER Section 3.2). All the alternatives were assessed against a number of criteria that included:

- **plant economics, e.g. cost of building the facility at the site;**
- **economics of material handling, e.g. product transport costs;**
- **the capacity for expansion, ie. sufficient area for further downstream processing or materials stockpiles at the port site; and**

- **environmental risk and impacts, eg. pipeline rupture or transport incidents, increased greenhouse gas emissions due to mobile transport over greater distances.**

In considering the alternative siting of the pellet plant and/or DRI/HBI plant at Maitland Estate and having the port constructed on the Burrup Peninsula, an assessment against the above-mentioned criteria showed high capital costs and increased environmental risk, making these project options non-viable and financially unfeasible.

In particular:

- **transporting slurry concentrate 100km to a pellet plant located at Maitland Estate would involve an additional $190M cost and would seriously increase the risk of environmental damage if the pipeline ruptured. Also this would raise further environmental issues relating to the conveyance of 'excess' or 'return' water from the pellet plant to the mine site or disposal of this water elsewhere. This would require another dedicated pipeline, which would introduce further environmental risk. The construction of these dedicated pipelines would also require additional vegetation clearing and additional costs for pipeline maintenance;**

- **trucking or railing of large quantities of ore pellets to a DR/HBI plant at Maitland Estate would involve road haulage or rail construction. Costs associated with these activities (capital and operational) would make the project non-viable. In addition, the following impacts would occur:**
  - **increase in road transport activities increasing the risk of accidents (road);**
  - **additional vegetation clearing of approximately 300ha (rail);**
  - **increased risk to fauna (road and rail); and**
  - **increased greenhouse gas emissions (road and rail).**

- **energy requirements of an DRI/HBI plant at Maitland Estate would result in additional costs either as a result of the longer transmission distances of electricity from the power station at Cape Preston or from the requirement to build an extra power station at Maitland Estate; and**

- **a new port on the Burrup Peninsula would need to be constructed. This would require considerable dredging and increased cost. Further, Dampier Port Authority's policy of only allowing one ship in the channel at any time means that ship's need to remain at sea until channel is clear. This practice has the potential to cause delays, and can lead to increased ore exporting costs.**

In summary, the establishment of components of the project at Maitland is seen as costly and impracticable. The project as defined in the PER is the most economic and practical design for iron ore mining and downstream processing, and being forced to use the Maitland Estate would make the project non-viable. There are also no significant environmental constraints to use of the Cape Preston area.

Groundwater Issues

10. The WRC notes the most pressing issue raised by the PER is the lack of any groundwater (site) investigation in the vicinity of the proposed mine site, particularly the waste dumps and tailing dams. The Proponent has made many inferences and assumptions about the hydrogeology at the site; however, the groundwater issues are generally well discussed in the submission. Could the proponent undertake the investigations and provide this information?

A: Site investigations have been carried out, and information has been presented in the PER (Section 6.1) regarding:

- **water level and water quality monitoring in existing bores;**
- **rising and falling head tests to obtain aquifer parameter estimates;**
- **inspection of exploration hole drill core and review of historical information; and**
- **discussions with project geologists to obtain additional anecdotal information.**

This information was considered adequate for the purposes of documenting the PER. As discussed at a meeting with WRC, foundation investigations at the preferred (eastern) Tailing Storage Facility (TSF) site have now been carried out by Soil and Rock

Engineering (refer to SER Section 2.1.5). Also, as discussed, groundwater monitoring bores will be installed prior to construction.

Preliminary geotechnical investigations were carried out for the concept design of the TSF. The study included a site investigation programme using test pits and percussion drilled boreholes, followed by laboratory testing of typical soil samples.

11. The WRC notes that the beneficial use, based on groundwater quality, is stock usage within the vicinity of the mining operation [Section 6.1.2 - Page 5]. It should be noted that the mine site is directly up gradient of the Fortescue River alluvium that contains fresh groundwater. Hence, it will be most important that the Proponent ensures that any potential brackish to saline plumes beneath the tailings dams are contained at or close to the site. Could the proponent comment on this matter?

A: As discussed with WRC, the water entrained in the tailings will have very low TDS as the water is produced by desalination with the process water containing typically less than 100mg/L chloride and 150 mg/L calcium. The groundwater in the underlying basement rocks is brackish with salinities in the order of 1,500 to 2,000mg/L TDS and concentrations of various elements assessed to be typically in the following ranges: 300 to 600mg/L chloride, 200to 300mg/L sodium, 100 to 120mg/L calcium and 400 to 600mg/L bicarbonate. Any TSF seepage, then, will cause a fresh water plume. There may be some host rock minerals (mostly silica) and some process materials in the tailings water and there is the potential for evaporative concentration if open water ponds are left on the TSF for some time. However, given the costs associated with the production of the desalinated water, efficient operation of the TSF to maximise water recovery is essential. It should be noted that the option of thickening tailings above the current design of 55% is being examined in an effort to maximise the water return. Effective and efficient operating procedures will ensure that all recoverable water will be pumped back from the TSF to the plant and so evaporation of free water will be kept to a minimum. Also as discussed with WRC, monitoring bores will be installed down hydraulic gradient from all facilities with the potential for groundwater contamination (pit, TSF, waste dumps etc). Ongoing monitoring and the Water Management Plan (Commitment 3 in PER) will be designed to ensure that any potential water quality problems are identified and managed accordingly.

12. The WRC notes that the Proponent has acknowledged that the final pit void will form a groundwater sink [Section 6.2.3 - Page 8]. On cessation of the mining operations, the pit void will infill with groundwater flow and surface water capture. As evaporation losses in the area are about 3m/year, the groundwater salinity of the impounded water will progressively increase. As the pit void is confined within the fractured-rock environment and is hydrogeologically isolated from the Fortescue River alluvium, the WRC do not consider this a major issue. Could the proponent comment on this matter?

A: As outlined in WRC's response and as subsequently discussed with WRC, pit void salinity is not seen as an issue. It is expected that the pit will become a "groundwater sink" and that under most conditions water will flow into the pit and not out of the pit. There is the potential for saline water to sink below the bottom of the pit in the very long term if pit water salinity becomes sufficiently high that density differences are sufficient to overcome natural hydraulic gradients. Otherwise the pit will remain a net groundwater sink and regional hydraulic gradients will remain towards the pit. As such, any dense saline plume would tend to remain within the general pit area, but at depth below it. Notwithstanding the above, monitoring bores will be installed to allow for the detection and tracking of any saline plumes that might develop in the basement rocks around the pit.

13. The WRC notes the primary source of water supply is desalination of seawater, which will be supplemented by pit dewatering [Section 6.1.2 - Page 5]. The PER highlights concerns about impacts on stock watering points in the vicinity of the mining operations [Section 6.3.4 - Page 9]; however, impacts are likely to be localised and negligible. Could the proponent comment on this matter?

A: There are not likely to be any impacts on stock watering points on Mardie and Balmoral Stations since they are far removed from the project area and installed in the Fortescue alluvials. Austeel commits to augment the camp's water supply if there is a project-induced impact.

14. The WRC note that the proponent has not clearly demonstrated the reasoning of desalination of seawater versus the use of groundwater from the Fortescue River alluvium. At present, the groundwater resources in the alluvium are not utilised or allocated and it is confusing why these local, cheaper groundwater resources have not been considered. Could the proponent explain the reasoning?

A: The estimated total project water demand is 44 Mm^3 pa during start-up to build up the initial water capacity, decreasing to 38.5 Mm^3 pa (ie. 38.5 GL yearly) during normal operations.

The 'Pilbara Region Water Resources Review and Development Plan 1996, Volume 1' (Water and Rivers Commission Report 4) has highlighted that the Lower Fortescue Balmoral Aquifer has a potential annual yield of only 16 GL with an estimated annual recharge of 11 GL. Hence the volume of water supply is not sufficient for the Austeel project (Approx. 50% of project demand). As a consequence if this water supply were to be used a desalination plant would still be required for the balance.

In addition, Water and Rivers Commission has identified this aquifer as a potential potable water supply (Water and Rivers Commission Report 4). Use of this supply for the project would exhaust its availability for potable use.

Austeel believes that the use of desalinated seawater has less impact on the environment than groundwater and is cheaper. To use groundwater would require the installation of an extensive collection system and this has shown to be a high cost option for the project. Austeel also believes that there are no significant environmental impacts associated with the use of desalinated seawater. Major use of groundwater supplies would require additional modelling and acceptance of environmental impacts such as drawdown effects on vegetation and impacts on stygofauna.

15. The WRC notes that the proponent has made a number of assumptions about the likely result of seepage from tailing dams, based on no groundwater investigations [Section 6.3.3 - Page 9]. It is recommended that the Proponent conducts an investigation beneath the proposed tailing dam and waste dams to determine the presence and extent of any underlying aquifer material. Otherwise any assumptions about groundwater flow and permeability of aquifers under the tailing dams is hypothetical. Can the proponent undertake these groundwater investigations and provide details?

A: Soil and Rock Engineering has now undertaken foundation investigations of the preferred (eastern) TSF. This included drilling, falling head permeability tests, groundwater level assessment and groundwater quality (refer to SER Section 2.1.5).

Also seven groundwater monitoring bores were installed down hydraulic gradient of the TSF. It should be noted that the TSF will be designed to maximise water recovery and consequently to reduce the potential for evaporative concentration.

16. The WRC advise that groundwater extraction including dewatering will require a Groundwater Well Licence from the WRC. A full Hydrogeological Report proving the resource and evaluating potential impacts of the abstraction must support an application for a licence. In addition the land tenure associated with the borefield must match the purpose of the abstraction. Is the hydrogeological report available?

A: Austeel already holds a Groundwater Well Licence (No. 00071401) for exploration purposes. The Aquaterra investigation report of June 2000 was forwarded to WRC on 12 April 2001. This report will be updated to include the results of future groundwater investigations, revised to focus on groundwater abstraction issues (including construction water supply pumping), and will be submitted in support of applications for Groundwater Well Licences for production purposes prior to mine development.

17. The WRC notes that the PER commits to making good affected livestock bores but does not recognise the private bore operated nearby for the supply of water to a campsite of a mesquite processing operation. There should be some further work carried out as to the possible impact to this operation. The camp is located on the stock route adjacent to DuBoulay Creek. Could the proponent provide details of the impact on the private bore? Is there a long term commitment should the water quality/quantity suffer in the above bores?

A: Austeel does not expect the private bore to be affected due to its location within the Fortescue alluvium. Any impacts due to the project will be localised around the mine

site. The bore, as Austeel understands was established by Mineralogy predecessors and became part of Mineralogy's property on taking over the mining tenements. If there is a project-induced impact on the camp's water supply, Austeel commits to augment the supply.

18. The WRC notes that the summary in Section 6.2.2 Pit Dewatering is contradictory in its statements regarding the expected extent of the drawdown of regional groundwater as a result of dewatering. Initially the report states that drawdown will likely be restricted to 1 km to the west, 5 km to the north and much further to the south and east. Later in the same summary the report states that drawdowns would not be expected beyond several kms from the pit. It is important the zone of influence is understood, as there is potential for impacts on other users and groundwater dependent vegetation. Could the proponent clarify this matter?

A: Drawdowns are not expected to extend very far from the pit due to the low basement rock aquifer permeability (refer to typical permeability values for TSF site, given in response to Question 11). In low permeability aquifers, the drawdown "cone" will be steep and deep immediately adjacent to the pit and be flatter and shallower at distance from the pit. There is then, the potential for some, if only minor, drawdowns to extend away from the pit. However, the presence of the Fortescue River alluvium (1km to the west) and the coastal tidal flats (5km to the north), which will both tend to act as "constant head boundaries" (in terms of drawdowns around the pit) and restrict the extent of potential drawdowns in these directions. In other directions, the low permeability basement rocks will limit the extent of measurable drawdowns.

Refer to Figure 2.3 in SER Section 2.1.6, which shows the extent of area where phreatophytic vegetation will be permanently lost.

19. The Draft Environmental Management Plan section 16.6.4 fails to recognise the requirements of the WRC's Groundwater Well Licence (GWL). When issued the GWL will require that the licensee's prepare an operating strategy. The operating strategy will encompass all aspects of abstraction including borefield operation, a monitoring program, contingency plans, management targets and reporting schedule. The operating strategy will be required by licence and is subject to WRC approval. Therefore monitoring will not only be in compliance with DEP Licences it will also be in compliance with WRC licence and associated operating strategy. General Commitments should include compliance with WRC's Licence in relation to the abstraction of groundwater. Could the proponent amend the management plan and commitments to accommodate these matters?

A: The development and refinement of the EMP will be undertaken in consultation with WRC and other relevant agencies in order to produce appropriate management plans, monitoring programmes and reporting schedules. Austeel will acquire the necessary licences and permits associated with groundwater abstraction.

20. The WRC notes the PER states that "the tailings slurry will essentially contain fine sand and silt sized particles" however as the water is likely to impact several pastoral bores and a private domestic bore, is the chemical composition suitable for drinking water and livestock water supply? What about heavy metals etc?

A: Tailings slurry is essentially host rock and silica together with minor amounts of a collector agent such as oleic acid, and as such its chemical composition will not affect drinking water or livestock water quality. No heavy metals are present in tailings slurry. One of the objectives of water management for the project is the maximum recovery and reuse of water. It is expected that the tailings dam will become self-sealing, minimising the leakage of water, and that the water recovery circuit will maximise water recovery.

21. A submitter notes that the PER states that there would be little water coming into the pit, so this will not impact on the Fortescue River Aquifer (which is a potential water supply for Karratha). The submitter finds this very hard to believe, as three are three big underground streams that flow through the mine site, and that water is connected to the Fortescue River aquifer. Over pumping in the pit may affect water levels in the surrounding bores. Could the proponent comment on this matter?

A: Neither Aquaterra nor WRC are aware of any such "underground streams" that flow through the mine area. It is recognised that some drawdowns will occur in the area as a result of pit dewatering, although significant drawdowns are not expected to impact on local/regional water supply bores. However, the proponent has committed to making whole any existing water supplies impacted by mine operations.

22. A submitter points out that the Du Boulay Creek that flows through the ore body is only in flood when it rains locally but the main Du Boulay Creek flows for 6 months of the year, because it is a tributary of the Fortescue River (Section 7.1.3). Could the proponent comment on this matter?

A: Any impact resulting from pit dewatering will be confined to the ephemeral part of Du Boulay Creek. There will be no impact on the Fortescue River.

23. The PNTS notes that the PER states that a very low recovery rate for ground water levels has been identified. However, Part One of the PER (at 3.2.5) identified the Fortescue River alluvials as a potential and viable source of water. This water is required to make up approximately twenty percent of water that cannot be reused. If ground water levels in the area have a low recovery rate, it may not be viable to use the alluvials as a source of water. It has been noted, however (at 3.2.5) that this option has been rejected due to the high cost. Other water sources identified in the PER (at 3.2.5) include harvesting water from the Fortescue River when flooding.

However, it must be kept in mind that:

(a) the tailings dam overlaps part of the flood plain, and
(b) the possibility of flooding is minimal. Could the proponent comment on this matter?

A: On both environmental and economic grounds desalinated seawater has been identified as the preferred source of process water. Use of water from the Fortescue alluvials would exhaust a potential future potable source and would still require a desalination plant as backup and to augment supply.

The nature of the questions suggests some confusion in relation to groundwater recovery rates. The low permeability Brockman Iron Formation, within which mining will be confined, has a significantly lower water yield than the surrounding alluvials (section 6.0).

Additional floodplain modelling is being undertaken and the results will be taken into account during detailed design.

24. The PNTS notes that Section 6.1.2 'Aquifer Characteristics' refers to two sets of data relating to bulk permeability and transmissivity. The PER states that the earlier set of results are not considered conclusive as results have not been favourable when compared to the results of more recently conducted tests. There is a lack of any real evidence to support the statement that "recent test results are considered likely to represent upper limits to the range of permeability and transmissivity across the site." It is submitted that the results are no more than indicative current test results and as such should not be relied upon too heavily. Could the proponent explain why the recent tests are considered more reliable?

A: There are two types of results available with respect to aquifer permeability. There are qualitative results that provide broad indications of general permeability and there are quantitative results from specific permeability testing. The earlier results (little to no water yields or losses during drilling, the "tight" nature of drill core, and very slow water level recoveries after drilling) indicate low permeability in a qualitative sense. The later results provided some direct quantitative estimates of permeability (still low at around 10^{-2} m/d or 10^{-7} m/s) and indicates that the permeability in some boreholes that could not be tested was higher than indicated by the earlier results. As such we believe that the later results do provide/indicate permeabilities at the higher end of a broad range of permeabilities over the site. It is true, however, that in aquifers of this nature (highly anisotropic and heterogeneous), any results are not conclusive, but indicative of order of magnitude values.

25. The PNTS notes that Figures 6.4 'Regional and Groundwater Levels' and 6.5 'Minesite Ground Water Levels' give no indication of how these contours have been modelled. It appears that polygonal contouring has been used. This may not be the most appropriate groundwater model. In order to provide an accurate model, from which accurate conclusions may be drawn, the anisotropic nature of the basement geological units and the non-anisotropic nature of the more recent units (such as the quaternary river gravel) should be taken into account. This is indicated by the regional geology of the area showing a strike orientation running NNE to SSW in the basement rocks. There is an increased potential for error in interpreting contours which have not been generated with due account for in-situ ground conditions. A contouring algorithm

such as directional kriging may therefore be more appropriate. Could the proponent comment on this matter?

A: The anisotropic nature of the basement geological units and the non-anisotropic nature of the more recent units have been taken into account. The contours were produced manually by a hydrogeologist, taking into account differences in geology and aquifer types. As such there is some professional judgement in the contours, but this judgement is based on training and on experience. Austeel believe that it is not appropriate to apply any automatic contouring package.

Surface Water

26. The WRC notes that the project requires the diversion of Du Boulay Creek and Edward Creek. Under the *Rights in Water and Irrigation Act of 1914 Part III Division 1B section 17*, a permit is required from the WRC for any works which may obstruct, destroy or interfere with any water course. A permit will be required for the proposed diversion of these creeks. An application for a permit can be obtained from the Karratha Office of the WRC. Assessment of the application will be based on hydrological and ecological impact. Two options are presented for the diversion of Du Boulay Creek around the Southern Tailings dam. The first option involves drainage of Du Boulay around the eastern side of the tailings dam. The issue of soil disturbance, and resultant erosion has not been addressed. Measures need to be put in place to restrict erosion and resultant sedimentation downstream. The second option involves the diversion of the main tributary of Du Boulay Creek into Fortescue River. This option gives no consideration to the environmental water requirements of Du Boulay Creek and how this requirement would be supplemented. Could the proponent provide further details?

A: Refer to SER (Section 1.2.2 and Figure 1.2). The project does not now include a southern tailings dam and as a consequence Du Boulay Creek will not be diverted. Detailed design will seek to minimise disturbance to Edward Creek. Appropriate permits will be obtained if minor diversions are required.

27. The WRC notes that because of the need to divert the whole of the Du Boulay flow for the siting of the tailings dam, other designs and locations should be considered. An area to the North East of the chosen site, on the west bank of, and aligned parallel to, Edward Creek would be less intrusive, require less stream diversion and have less environmental impact. The proponent must be made aware that approval for surface water diversion is to be granted by WRC by way of Surface Water Licence. Could the proponent accommodate the suggested location? If not, why not?

A: See response to Question 26.

28. The WRC questions what is meant by an acceptable level of suspended sediment? Sediment monitoring must be done at strategic sites, in various flow situations over several years (prior to earthworks commencing) to establish background information. Will the proponent undertake this monitoring?

A: The construction phase of the project will occur over a period of around three years. There will be a number of opportunities during this period to collect baseline sediment data that can be used to establish acceptable levels. It should be noted that the creeks flowing across the mine site only flow for short periods of time, in response to significant rainfall, and as such flood flows are naturally turbid. Refer to SER (Section 2.2.1).

29. The WRC states that the suggested sediment monitoring initiative is commended. Details of the suggested sampling regime need to be provided. Sampling needs to be done in as many years as possible prior to earthworks commencing. Suspended sediment concentration is affected by many variables, not necessarily related, therefore monitoring needs to commence as soon as possible. Sites immediately upstream of the Southern Tailings dam site and upstream of the plant site on Edward Ck also need to be included as key sediment sampling sites. Could the proponent comment on this?

A: See response to Question 28 above. The project does not now include a southern tailings storage facility (see response to Question 26).

30. The WRC questions what the water source for the initial construction (pre Desalination Plant) would be? Note: The proponent would need a Groundwater Wells Licence (GWL), which would

need to be supported by a Hydrogeological Report and the correct land tenure should they require groundwater.

A: Austeel estimates that around 0.5 Mm^3 per annum of water will be required for construction purposes. The most likely source is the Fortescue alluvium from which previous studies have indicated a sustainable yield of up to 0.5 Mm^3 per annum per bore (Section 6.1.1). All the necessary licences and permits (e.g. Groundwater Wells Licence) shall be acquired prior to project construction. A Hydrogeological Report has been provided to WRC.

31. The WRC notes that the section on Water Quality is not quoting the current NH&MRC guidelines for drinking water quality. It is quoting the previous guidelines, which were superseded by the 1996 guidelines. Could the proponent provide the updated information?

A: **Austeel were given specific guidelines for the preparation of the PER. One specific guideline applicable to surface water, groundwater and marine water and sediment quality was that they "maintain or improve the quality of (surface water, groundwater, marine waters) to ensure that existing and potential uses, including ecosystem maintenance, are protected, consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA, 1993) and the NHMRC / ARMCANZ Australian Drinking Water Guidelines – National Water Quality Management Strategy."**

The statement of making "comparison of the reported laboratory data with the Western Australian Water Quality Guidelines for Fresh and Marine Waters" was made because there is no specific reference in the Australian Drinking Water Guidelines 1996 in relation to water quality guidelines for livestock watering – those guidelines are only presented in the WA 1993 guidelines.

Also the WA 1993 guidelines for raw waters for drinking purposes relate to the water quality of water that is used as the intake source for public use whilst the NHMRC guideline relates to the 'at tap water quality' based on WHO health guidelines.

Austeel is committed to ensuring that water quality is maintained throughout the project area, and shall comply with the most relevant and up-to-date water quality guidelines at the time of project construction.

32. The DEP and WRC note that section 6.3.1 Pit Dewatering of the PER states that all dewatering will be used as process water but then goes on to state *"if there becomes a requirement to discharge excess dewatering water, it is proposed to discharge excess to a point in the Fortescue River within the tidal fluctuation zone."*. The proponent should be advised that discharge of dewatering would require a licence from the DEP, which will stipulate the allowable quality, quantity and method of discharge. The issue of water discharge doesn't appear to be carefully thought through. Could the proponent provide further details on the likely quantity and quality of discharge?

A: **Austeel intends to make use of all pit dewatering water on site as process water input, in dust suppression and housekeeping. Excess dewatering water will be discharged into the tailings storage facility. Refer to SER (Section 2.1.5) for TSF design details.**

No dewatering water will be directly discharged into the Fortescue River or any of its tributaries.

33. CALM note the issue of discharging excess mine water (from dewatering operations) into the Fortescue River is problematic and carries a high level of environmental risk. Such a procedure would require settlement ponds and other filtration installations to ensure that only unpolluted water was discharged. The development of such facilities would require the clearing of additional land and may involve clearing mangroves. Alternative options include utilising excess mine water in the processing plant or redirection to the tailings storage facility. Could the proponent comment on this issue?

A: See response to Question 32.

34. CALM notes that Paragraph 3 in this section 5.2 and section 7.3.2 Site Run-Off, indicate all run off from site will be collected and directed into settlement ponds. No information is provided on the rainfall event the settlement pond will be able to handle. It is recommended that all settlement ponds be designed for a 1:100 year 24 hr rain event. Will the proponent adopt this recommendation?

A: This is a detailed design issue. Design criteria will meet current Pilbara standards.

35. CCWA and the Pilbara Development Commission note the Edward Creek system in particular has a relatively high conservation value given the arid nature on the local environment. Riverine vegetation of such, is indicative of creek systems/ drainage lines providing an important wildlife refuge via a linear corridor. Where possible every attempt should be made to retain the natural characteristics of the Edward and DuBoulay and Fortescue River systems.

A: No southern tailings dam will be built and consequently there will be no direct impact on Du Boulay Creek. Indirect impacts will occur in both creeks systems through groundwater drawdown affecting phreatophytic vegetation. This impact is unavoidable. Shallow rooted species will be unaffected by dewatering and consequently a vegetation cover will be retained. The detailed design phase of the project will seek to minimise direct impact on Edward Creek.

Flood Events, Storm Surge, Waste Dumps and Tailings Storage Facilities (TSF)

36. The WRC recognise that detailed survey cross sections are required to *'provide a reliable assessment'* of the Fortescue River Flood levels. Because of wet site conditions, the surveying was not done. Instead, cross sections were developed from 10m contours on 1:50,000 topographical maps. Examination of contours in the area corresponding to Figure 7.1 indicates that the river intersects two 10 metre contours – 20 m just west of Balmoral Homestead and 10m approximately 10 km downstream. The WRC questions how channel cross-sections can be estimated for this reach of river when there is effectively no defining information?

A: Detailed survey cross sections of the river flowpaths are required to provide a reliable assessment of the Fortescue River flood levels. However, due to wet site conditions, a detailed ground survey was not possible. Indicative cross sections for the river flowpaths were estimated from the 1:50,000 topographical maps, which contain 10m contours as well as spot levels along the floodplain. In addition, a site inspection of 6 sites on the river channel and eastern floodplain, where access was possible, helped estimate the main river channel and floodplain dimensions and flow characteristics. Comparative conditions for the western floodplain and other sections on the main flow channel, were estimated using available air photography and general characteristics of drainage lines from site inspections.

Austeel has commissioned Aquaterra Pty Ltd to undertake an additional survey across the Fortescue River floodplain and to use this information to improve the predictive nature of the HEC-RAS model. Refer to SER (Section 2.2.1).

37. The WRC notes that the PER mentions a reality check between the derived cross sections and a cross section carried out by Epic Energy, but no statement as to the result of the reality check. Could the proponent provide this?

A: The Epic Energy gas pipeline crosses the Fortescue River approximately 6km downstream of the North West Coastal Highway Bridge, which is upstream of the main study area. The gas pipeline profile survey data was used as a "reality check" for the corresponding river section and floodplain levels estimated using the 1:50,000 topographical mapping and site inspections. The floodplain ground levels agreed to within 1 to 2m, and the river channel profiles compared favourably.

38. The WRC notes that Section 7.1.2 Existing Hydrological Regime of the PER defines the Fortescue River main flow channel as typically 4 to 6 m deep. Further to the above argument, how can this channel be defined using 10 metre contours?

A: The Fortescue River channel cross sections were estimated during the on-site inspection.

39. The WRC notes that for use of HEC-RAS – 'Roughness' is a critical input for this program, along with adequately defined cross sections. Even if only one roughness value is input for each cross section, the WRC questions how this estimation can be made using aerial photography?

A: Roughness is a critical input for the HEC-RAS backwater model. Roughness parameters (Mannings 'n') were derived from visual observations made during the site inspection

and extended to the inaccessible areas of the flowpaths using aerial photography. A sensitivity analysis of Mannings 'n' was undertaken (+/- 20%) and found to be not significant within the accuracy of the available data.

Aquaterra Pty Ltd has been commissioned to undertake an additional survey across the Fortescue River floodplain. Data on the hydraulic roughness and nature of the river flow-paths and floodplains will be used to further refine the HEC-RAS hydraulic backwater model for the Fortescue River floodplain. Refer to SER (Section 2.2.1).

40. Flood levels – "*These levels are likely to be accurate to within +/- 2m and provide a good indication of the Fortescue River flooding regime through the project are*a." With the channel slope of approx. 0.001, the WRC suggests that +/- 2m is nowhere near accurate enough to define the flooding regime i.e. the approximate area of inundation as represented on Fig 7.1 could be +/- 2 kilometres in error. Could the proponent provide more accurate details of the flooding regime?

A: The indicative 100 year ARI flood levels for the Fortescue River, as given in Figure 7.1, are relative to the elevations shown on published 1:50,000 mapping. These levels have been estimated using the flow cross sections and roughness parameters as described above. Within the accuracy limits of these estimation procedures, the shown flood levels provide a good indication of the flooding regime of the lower Fortescue River. These indicative levels are intended to be used for conceptual planning phases of the project, with the intent that a more accurate flood level assessment would be prepared for the project at the detailed design phase. Ongoing study of the Fortescue River Floodplain will provide more accurate details of the flooding regime. Refer to response to Question 39 above. Also refer to SER Section 2.2.1.

41. The WRC suggests that the proponent present the HEC-RAS results including cross section plots, water surface profiles and channel roughness for requested discharges, with an explanation of how the cross sections were derived. Without this verification, the whole 'Surface Hydrology' discussion has very little credibility. Could the proponent provide this information?

A: Details of the HEC-RAS modelling input data and results can be provided. However, as agreed at the meeting with the WRC, a more accurate flood level assessment will be prepared for the project area in the future, a report on which will be provided to the WRC for review. Refer to SER Section 2.2.1.

42. The WRC notes that for Edward and Du Boulay Creeks – Peak Discharges, flood levels, estimates of peak 10 and 100 year ARI discharges, flood depth, average velocity values are presented. These figures are base on ' *catchment characteristics and field observations of the creek hydraulic parameters'.* These characteristics, observations and parameters are not presented, therefore it is impossible to comment on the validity of the estimations. Could the proponent provide this information?

A: The catchment characteristics, observations and parameters for the Edward and Du Boulay Creeks were not presented in the PER for simplicity. As with the main Fortescue River, these are preliminary estimates prepared for project planning purposes. A more accurate assessment will be prepared at the detailed design phase. However, the preliminary data can be forwarded if required.

43. The last paragraph discusses the non-likelihood of Peak River discharge coinciding with peak storm surge arising from a cyclonic event. The WRC notes the Pilbara climate is unpredictable and it is quite conceivable to expect the combination of the effects of two distinctly different influences, albeit low probability. Could the proponent comment on this matter?

A: Storm surge and the peak river discharges resulting from a cyclonic event, are likely to occur at different times. The peak storm surge will occur when the cyclone crosses the coast, whereas the peak river flood will occur some time later when the cyclone has passed over the upper reaches of the catchment. This could be a number of days later, due to the large size of the Fortescue Catchment. Combining the peak storm surge level with the peak river flood level would result in a "joint probability event", with a joint probability much lower than that for each event separately.

44. The WRC notes that because the Fortescue Flood estimations are unreliable, discussion of the impact and extent of flood diversion works around the waste dump is premature. Detailed

cross sections are required to improve the reliability of flood estimations. Could the proponent provide this information?

A: Waste dumps are proposed to be constructed on the eastern floodplain of the Fortescue River. Discussion of the impact and extent of the likely flood diversion works around the waste dumps is valid, irrespective of the accuracy of the Fortescue flood level estimates. However, at this stage the diversion works are conceptual only and detailed cross sections will be prepared when detailed design is undertaken.

45. The WRC is concerned about the position of the proposed tailing dams, particularly the southern tailing dam that is located on and over the Du Boulay Creek. There are environmental and structural issues to be discussed and clarified by the Proponent in relation to the tailing dam positions. The main concern is that given a significant flooding event, there is potential for tailings to enter the surface water regime and migrate along the creek into the Fortescue River alluvium, hence, potentially impacting on the water supply. Could the proponent discuss and explain how this will be prevented?

A: No southern tailings dam will be constructed.

The northern tailings dam will be designed and constructed to prevent overtopping with the tailings dam being designed to contain 1:100 year rainfall events. Where necessary, rock armour will be used to protect the toe of the dam from scour and erosion.

46. The DEP is concerned that seepage is expected in 6.3.3, the TSF should be constructed as per the Department of Minerals and Energy (DME) guidelines with 10^{-9} metres/sec permeability and with underdrainage system to collect water during consolidation. The TSF should have perimeter drains to collect seepage from the TSF. Does the proponent intend to incorporate these measures?

A: The TSF will be constructed with an underdrainage system to maximise the reuse of water.

A permeability of 10^{-9} m/s is generally only obtained when a TSF is clay lined. Although sections of the TSF will be constructed on clay there will be areas where clay is absent.

Due to the nature of the materials being disposed in the TSF (fine fractions of the host rock), it is expected that the TSF will become self-sealing. In the interior, until sealing of the TSF occurs, there will be no contamination of the surrounding aquifer since no contaminated material will be deposited in the facility.

47. A submitter sees a problem with having the waste dumps on the west side of the mine site, because the run off from heavy rains will wash the waste into Du Boulay Creek and also into the underground water system. Opposite M08-124 is a permanent water hole, and from there to the Du Boulay crossing will be a nature trail this year. Could the proponent comment on how impact on this will be prevented?

A: The waste dump will contain overburden and interburden and hence will not contain any material that is not already part of the natural environment. The external surfaces, and particularly the toe, of the dump will be protected by rock armour to prevent any erosion. Initial dumping will occur adjacent to the pit as the construction of the waste dump progresses. Should there be a need, a perimeter drain could also be constructed around the dam gradient slopes to collect any runoff. at any stage of the progressive construction of the waste dump.

48. The PNTS notes that the PER states that waste dumps "will partially overlay the eastern extent of the Fortescue 100 year flood plain." The survey cross-section taken of the river and adjacent floodplains some 15 km upstream from the Project should not be used as a "Projection", given that the models employed are basic ones assuming a homogenous isotropic geology, the results of which have then been projected to the area site. The nature of geology means that this is not a realistic projection, and therefore it is not appropriate to assume that any potential flooding will produce the same results in a real case scenario. The PER also fails to state the exact extent to which the waste dumps will overlap the flood plain. Could the proponent comment on this issue?

A: The extent of the overlap was shown in Figure 7.1 of the PER. Although Austeel believe that the toe of the waste dump can be protected against scour through the placement of rock armour. Additional modelling is being conducted to quantify the extent of

encroachment of the dump into the flood plain and this will be taken into account during detailed design.

49. The PNTS notes it is proposed in the PER that a "paddock style tailings dam" will be built at an interim site in the event that native title negotiations have not been completed by the Project commission stage. The interim dam will be located within ML 08/126, ML 08/127 and ML 08/128. The report has not addressed any environmental issues arising in the event that the tailings dam is temporarily established at this location. This is of particular concern given that Du Boulay Creek runs through the proposed site. The PER also states at 3.2.8 that rehabilitation of the interim dam, if built, will occur. However, the PER has failed to even briefly outline not only what level of rehabilitation could be expected, but also the processes to be used in this rehabilitation. Could the proponent comment on this matter?

A: The southern tailings dam is now not required and will not be built.

Storm Surge and Flood

50. The WRC notes that the position of the proposed waste dump, in relation to the 100-year flood event is poorly discussed in the PER. The diagram showing the extent of the 100 year flood is cause for concern in the long-term, as it is possible with major flooding of the Fortescue that the base of the waste dump could be undercut resulting in instability and erosion. Could the proponent explain how this will be prevented?

A: Refer to response to Question 48.

51. CALM notes that there has been no specific modelling of storm surge or tsunami impacts on the proposal. This is critical to design of infrastructure, particularly tank farms and fuel lines. Evacuation of re-fuelling lines should be considered. Could the proponent comment on this matter?

A: Preliminary investigations of storm surge indicate a design level of RL+4.75m CD. This is based on a 1:100 year cyclone with a central pressure of 930 millibars passing directly over the site with the tide level at Mean High Water Springs. Subsequent work by WNI Science and Engineering indicates a marginally higher level of RL+4.96m CD.

52. Planning Western Australia notes that Section 7 of the PER considers the potential impact of cyclonic events. As there is no information in the PER on the proposed location or AHD level of land to be allocated for the construction village, there is no way of assessing the likely impact of storm surge on the workforce. Could the proponent provide the location and level of the construction village?

A: Austeel is yet to finalise the location for the construction camp and village. The sites selected will be located outside of areas that may be impacted by flooding.

53. Planning Western Australia and Shire of Roebourne state that consideration must be given to the potential impact of storm surge on the construction workforce and include an emergency evacuation plan. It is understood that some preliminary storm surge modelling has been undertaken and this should be refined and used to designate safe land for the construction village. Could the proponent provide an outline of the emergency evacuation plan?

A: Refer to response to Question 52. An emergency evacuation plan will be developed in consultation with the relevant authorities prior to construction commencing.

54. The Shire of Roebourne notes that the issue of storm surge has not been adequately addressed in the PER. The PER does not state how storm surge will impact on the development. (i.e. what is the 1:100 year AHD return period level so as the minimum floor level of the development can be set etc). Could the proponent provide this information?

A: The study undertaken on storm surge was for conceptual design only. The results were within the accuracy of the HEC-RAS modelling. A more detailed study has been undertaken which suggests a 1:100 year ARI of around 10m AHD. The mine pit and infrastructure are all above this level. However, if the proposed development works are "clearly" above the surge level, then we see no reason for this expense.

55. AHC are concerned about the placement of the waste pit and associated flood diversion works within the 1:100 year flood line of the Fortescue River. Could the proponent comment on this issue?

A: See response to Question 48.

56. The CCWA note that in Section 7.1.4, there is no estimation of the tidal/storm effect on the proposed site or show a contour map to give a clear understanding. It is the CCWA's understanding that there have been frequent flood events in this area over the last 5 years and the 100-year flood level indicated in Figure 7.1 needs to be reviewed. Could the proponent check the information and provide revised details if required?

A: See response to Question 54.

Vegetation

57. CALM notes that only one sampling trip was undertaken as part of the botanical survey for this project. It is acknowledged that the sampling coincided with a good season, resulting in a reasonable representation of ephemeral species. CALM strongly recommends that at least one other sampling trip be undertaken. This supplementary trip should endeavour to sample vegetation types and habitats which may harbour rare and priority flora together with those of special interests. Of particular interest are the cracking clay communities of the Horseflats Land System. These communities are poorly known and severely degraded elsewhere in the Pilbara. Will the proponent undertake this survey?

A: Austeel has commissioned an additional survey for the future, during more favourable conditions, the timing to be determined in consultation with CALM. Austeel will consult with CALM during the study to ensure the survey adequately addresses any conservation issues and obtain assistance in preparing appropriate management plans dealing with flora and fauna conservation. The study will concentrate on flora and fauna within the infrastructure corridor, which was not adequately detailed during the previous survey.

58. CALM note the completion and review of the consultants report (Halpern Glick Maunsell 2000b) will be necessary to determine the risks and potential impacts of the project on the botanical and ecological values of the project area. A copy of the report and assessment should be forwarded to CALM as soon as it has been completed. Could the proponent arrange this?

A: Austeel has provided this document to CALM.

59. CALM note that data to support the consultant's proposition that "vegetation types are relatively closely linked to Land Systems" (Terrestrial Biology- Section 8.1.2) should be provided. In the recently completed Carnarvon Basin Biological Survey, it was found that there was little correlation between Land System maps and the vegetation association maps developed during the survey (Neil Gibson CALMScience Woodvale, pers. comm.). A similar non-correlation was found throughout the Hamersley Range, especially when dealing with the floristic composition of associations (Stephen van Leeuwen, CALMScience Karratha, pers. Comm). Could the proponent provide this data?

A: This is an unreasonable request. Firstly, for the study area, the data has already been provided and shows a strong correlation between vegetation types and the land systems present there. Datasets provided for other surveys in the Fortescue district (e.g. Trudgen & Casson, 1998, which has data for 1,200 sites) also show such correlations, although there are undoubtedly exceptions. Secondly, the CALM work referred to for the Carnarvon Basin as contradicting the assertion is based on methodologies that are unlikely to be able to support the purported conclusions (as they deal with floristics, not vegetation) and on a dataset that is arguably inadequate to support the alleged lack of correlation between vegetation and land systems in any case (63 sites, N. Gibson pers. comm.). The work is based on a doctrinaire application of floristics as supplanting all other aspects of vegetation. Specifically, dominance and structure and the units defined by it are not vegetation associations in the generally accepted (and properly defined) use of the term. More critically for the issue under consideration, they are of undefined rank, an issue that has bedeviled earlier work (e.g. Gibson et al 1994) by the principal authors, but are likely (given the size of the dataset) to be of a significantly higher order than vegetation association (the number of associations in the Carnarvon Basin would far exceed the number of sites in a dataset used by CALM). As such, they are likely to not be of an appropriate level to disprove the assertion implied by the consultants. To be tested in any meaningful way, this assertion would have to be addressed at the plant community level, rather than at the level of a high order synthetic unit. It should be noted

that to do this adequately would require a dataset of 50 sites per land system to give any reasonable comparison to take into account variation both within and between them (i.e. it would require 3,000 sites at a minimum). Thirdly, there seems to have been an inaccurate understanding within CALM of what the Carnarvon Basin study has produced, as no maps of vegetation association (of any definition) present in the Carnarvon Basin have been produced (N. Gibson, pers. comm.). Fourthly, it is not the role of consultants to provide data to support or disprove generally accepted and reasonable propositions simply because it is alleged that unpublished studies of unknown quality, dataset size and inappropriate methodology contradict them.

In addition to the above points, the nature of the land systems of the project area is such that there are very distinct differences from one system to the next. The coastal and near-coastal nature of the area means that underlying geomorphology and geology change dramatically from one Land System to the next within the project area. This may not be the case to such an extent in the more inland systems elsewhere in the Pilbara that are referred to in this submission. The floristic composition of the vegetation of the study area shows similar marked changes from coastal types (which were strongly associated with the Littoral LS), Snakewood Shrublands (Paraburdoo LS) and the grassland units (Horseflats LS). Only the stony hills of the Newman and Rocklea Land Systems supported vegetation types that were similar. Whilst this was not statistically analysed as part of the impact assessment process, the intention is to run a PATN analysis of the survey data as part of a larger data set collected from the recent survey work conducted on the Burrup Peninsula when this other study is complete. Even without this analysis, general inspection of the mapping, site data and field ground-truthing indicated that Land System mapping did provide a reasonable match with vegetation changes in this particular project area (this may not always hold true for other parts of the Pilbara as noted above). In this particular study area, changes in Land System are linked to changes in the underlying geomorphology, from coastal sands, through cracking clays to stony hills, with marked changes in vegetation type also occurring with such changes in substrate.

It is accepted that this correlation is unlikely to be exact, particularly when more rocky Land Systems are involved. However, some frame of reference is required to provide local and regional context to the extent and distribution of the vegetation units present in the study area. If Land System mapping is not used then there is little other regional scale framework available unless Beard's vegetation mapping, which is 30 years older and of a far coarser scale, is used. Given this situation, the assessment took the position that recently completed Land System mapping, recognising its limitations in some systems, was more useful, particularly given the defined vegetation/substrate boundaries of this particular study area.

60. CALM note the consultant's assessment of the significance (regional significance in particular) of the different vegetation types in the project area appear to have been based on inferences drawn from the occurrence of Land Systems in the project area relative to the rest of the Pilbara. This assessment must be questioned unless data can be provided to support the assertion of the link between the vegetation associations and Land systems. It is also pertinent to remember that for the assessment process it is the species composition of associations that are of particular interest and not the structural arrangement of that association *per se*, although the structural arrangement of vegetation associations does have important implications for the assessment of faunal habitats. Could the proponent provide data to support the assertion?

A: The use of Land System mapping in relation to these issues is discussed in the response to Question 59. The consultants have provided an assessment based on available datasets using well accepted methodology. As discussed above, there have not been any criticisms produced of this approach that are sustainable. In fact, other work (e.g. Gibson et al., 1994) of a similar nature (but with a more adequate dataset) by authors including CALM staff supports the use of the approach used by the consultants for the Austeel study.

61. CALM notes that there is no mention of the Priority 1 taxon *Goodenia pallida* in the PER document. The distribution of this species is cited on CALM's Priority Flora List as 'Fortescue' and the collection details for the only known collection, the TYPE collection, are 127 miles (203 km) from Onslow on the Roebourne Road. The date of collection on the TYPE (Aug 1970) predates the current alignment of the North West Coastal Highway. Through interrogation of archival cadastral maps, it appears that the collection location was some 11.5 miles (18.5 km) north of Balmoral Homestead on the old highway. Therefore the TYPE collection location is

likely to be near Eramurra (Irramurra) Well (21° 01' 55"S 116° 15' 26" or E422835 - N7672297). This locality is inside the eastern edge of the project area. Further botanical surveys should be undertaken to determine if this species occurs in the project area. It is acknowledged that there is the possibility that one of the *Goodenia sp*. (1, 2 or 3) identified in Appendix 4 of the PER document could be this species. Could the proponent comment on this matter?

A: Further botanical collecting as suggested by this submission was always intended prior to the project commencing. It is agreed that it is possible that one of the *Goodenia* specimens that could not be fully identified could represent *Goodenia pallida*. The *Goodenia* specimens collected during the assessment survey and during any subsequent collecting exercises will be supplied to Leigh Sage, a specialist on the genus. If any of this material were confirmed as representing *Goodenia pallida*, then a management strategy would be developed in consultation with CALM to address the occurrence of the species. The starting point for this management strategy would be a review of project design to determine whether it would be feasible to modify the project such that any confirmed population would not be impacted. If this does not prove possible, then a management and rehabilitation programme would be developed specific to this taxon to the satisfaction of CALM.

62. CALM note that of particular interest are the cracking clay communities of the Horseflats Land System. These communities are poorly known, severely degraded elsewhere in the Pilbara (typically in fair to poor range conditions (72%) - Payne and Tille 1992 [1]), unrepresented on the conservation estate and are under consideration for nomination as a Threatened Ecological Community. It is noted that 11.9% of the Horseflats Land System within the project area would be directly impacted by the project. It is acknowledged by the botanical consultants in the PER that the Horseflat Land System in the project area is considered to be of moderate to high conservation significance (Table 8.11) and that the vegetation associations growing on the Land System "were in relatively good condition" (pg. 20). Given the condition of this Land System relative to elsewhere in the region, it would appear that it's occurrence within the project area would appear to be of considerable conservation significance. The proponent should minimise impacts to this land system and actively pursue strategies and mechanisms to conserve the system within the project area for the longer term. CALM would be happy to provide advice to the proponent in regard to options for long term management mechanisms and strategies. Could the proponent address this issue?

A: Current project design will impact on around 14.9% (274 ha of 1835 ha mapped) of the Horseflats LS (clay plains) occurring on the project lease. This land system has greater representation in the region with 13,500 ha occurring within approximately 90 km of the project area (although it is recognised that the condition of this LS will vary throughout the area). Austeel will consult with CALM regarding strategies and mechanisms for minimising the impact to this land system and to develop an appropriate management plan to ensure long term conservation of the land system within the project area.

63. CALM note the proposed Austeel lease appears to cover areas with significant areas of mesquite infestation. This is a declared environmental weed in the Pilbara. The infestations on the Austeel lease are part of the largest mesquite infestation in Australia, and one that has been subject to intensive control operations over many years. The Mardie mesquite infestation covers hundreds of thousands of hectares. The weed is likely to become more abundant as a consequence of ground disturbance associated with the project and the increased availability of surface water. It will be a challenge to ensure the environmental integrity of rehabilitated areas through effective management and prevention of recolonisation by mesquite. It is recommended that the proponent becomes an active and supportive member of the Pilbara Mesquite Control Committee. This group was recently formed to revitalise control operations on Mardie, and includes CSIRO, pastoral landholders, industrial interests, mesquite harvesters and Government agencies. Could the proponent comment on this issue?

A: Austeel representatives attended a Pilbara Mesquite Control Committee meeting on 5 April 2001. At this meeting Austeel stated its willingness to become an active member of the committee and indicated that active support could occur when Austeel had a permanent presence in the area (ie. following the commencement of construction). Once this occurs Austeel will be in a position to provide equipment use or other support for mesquite control activities.

[1] Payne, A.L. and Tille, P.J. (1992) An inventory and condition survey of the Roebourne Plains and surrounds, Western Australia. Technical Bulletin 83, Western Australian Department of Agriculture.

64. The WRC notes that the PER indicates the diversion of Edward and Du Boulay Creeks would result in the loss of 75 ha of vegetation, however it fails to indicate how this will be managed. How will the area be stabilised to prevent erosion etc? The Land Use Impacts section and Catchment and Waterways sections of the WRC should provide further advice on this issue. Could the proponent provide further information on management to, and seek advice from the above sections of the WRC?

A: The WRC assessment of the issue is incorrect. The 75ha area identified in the PER as being affected by the project (Section 8.5.1) refers to areas impacted by groundwater drawdown resulting from mine dewatering and the permanent reduction in groundwater levels following the cessation of mining. Impacts will be confined to phreatophytic vegetation (groundwater dependent) with no impacts expected on shallow rooted species. As a consequence there will not be extensive areas of bare land subject to erosion. Any bare areas that do develop will either revegetate naturally or will be revegetated by Austeel. Creekline monitoring will establish the need for rehabilitation.

With the removal of the southern tailings dam from the project there will be no direct impact on Du Boulay Creek. The plant site has been re-orientated to avoid direct impact on the main flow line of Edward Creek.

65. Agriculture WA would like to see Austeel Pty Ltd's commitment to the management of the declared plant mesquite, integrated into the proposal already drafted by the Pilbara Mesquite Management Committee to manage the weed in the Pilbara. There are several ways in which assistance could be rendered and probably the most effective would be for Austeel to appoint an environmental officer who had dual roles, one of which was to manage the mesquite project. Would the proponent be prepared to provide this assistance?

A: Refer to response to Question 63.

66. The AHC note that nearly 2000 ha of land is to be disturbed, including almost 1000 ha in area that is currently relatively undisturbed, and close to the coast, with relatively high flora and fauna diversity, and with a number of species that have a restricted distribution. Could the proponent comment on this issue?

A: The April 2000 biological survey identified areas of higher conservation value in which disturbance will be avoided or minimised. These areas are listed in Section 8.4.1. Section 12.1.2 indicates that up to 88.5% of the area will be rehabilitated at the completion of the project.

67. The CCWA are concerned about the clearing of native vegetation types with a limited distribution within the survey area. While the PER acknowledges this disturbance, no effort is made to deal with the issue. The CCWA believe that loss of such vegetation is unacceptable. Could the proponent explain how they will deal with this issue?

A: Refer to response to Question 66.

Mangroves

68. Fisheries WA note that the large number of extra personnel in close proximity will cause deterioration of roads and boat launching facilities. In response the public may clear unauthorised roads and boat ramps and this will impact on mangroves and coastal vegetation. Could the proponent explain how this would be managed?

A: Austeel will conduct environmental induction courses for employees and contractors to inform them of their environmental and legal responsibilities. There will be penalties imposed for contravening company environmental policy and rules, which could include employment termination in the event of a significant breach. All employees and contractors will have access to management plans that specify conservation areas and management strategies. Areas of high conservation value will have access constraints imposed. Public access to Cape Preston will only be available via existing tracks.

69. The AHC is concerned about the placement of tailing dams on creek lines that feed to mangroves and tidal flats, and in the case of the proposed southern dam, on a major tributary of the Fortescue River and within the river alluvium. Could the proponent provide further details of how protection of the mangroves will be managed?

A: The Austeel project does not now include a southern tailings storage facility.

The preferred (eastern) tailings storage facility will only impact on minor tributaries of Edward Creek. This facility will be constructed outside of the area of the 1:100 year flood event. There will be no impact on mangroves.

70. The CCWA note that changes in sedimentation loads together with drainage changes will have a significant effect on riverine and near coastal ecosystems. This area is included in the draft Guidance for the protection of tropical arid zone mangroves (area 9) as an area of mangrove of very high conservation value and is designated as internationally, regionally and locally significant. The list in 8.5.3 of longer-term impacts is far more likely to occur than as stated. If surface drainage systems are changed, sediment loads altered, together with dust problems, which seem inevitable, there is bound to be significant effects on the mangrove ecosystem. Could the proponent address this issue?

A: The CCWA statement relies on selective quoting of the April 2001 Guidance Statement and does not recognise that the area is designated for industrial and associated port use. Austeel believes that the impacts of the project on mangroves will be minimal. Management of impacts is discussed in Section 8.6.3 of the PER. There are not predicted to be any significant changes to sediment loads. Refer also to response to Question 116 in relation to dust.

Fauna

71. The DEP notes that the terrestrial fauna section is excellent and the results seem sound. There is however, inadequate information on subterranean fauna. Could the proponent undertake and provide the results of detailed studies on subterranean fauna?

A: Two stygofauna surveys have been undertaken on the project site. A complete report of the survey undertaken is presented in the SER (Section 2.1.1).

72. CALM advises that the terrestrial fauna work appears to be adequate, but it was noted that only a single survey period was sampled. It is noted that additional minor surveys are continuing (wading birds, stygofauna, sea turtles). The results of these surveys should be provided to CALM as they become available to allow for further assessment of risk and potential impacts. Does the proponent want to comment on this matter?

A: A biological survey has been planned for the future (the timing to be determined in consultation with CALM) to expand on the data set that was collected during the Autumn 2000 survey. In addition to the terrestrial fauna survey, further stygofauna sampling has been conducted in October 2001 (refer to Question 71). The results of the migratory birds and marine turtle surveys are presented in Sections 2.1.3 and 2.1.2 of the SER respectively.

73. CALM notes that a preliminary assessment of sea turtle activity on the Cape Preston beaches was made during the 2000/2001 nesting season. Unfortunately, this season has been

remarkable for the very low levels of green turtle activity on beaches. Despite this, a low level of turtle activity was observed, on both the eastern and western beaches. This implies that Cape Preston may support significant sea turtle nesting. Further surveys would be required to confirm this and to determine the potential impacts from the operations. The proponent should make a commitment to undertaking full survey of sea turtle nesting on Cape Preston in future nesting seasons in order to determine the significance of this issue. Will the proponent make this commitment?

A: Although the initial survey was conducted in a year of low activity, Austeel is prepared to accept that the area is an important nesting ground for turtles. As such, Austeel recognises the need to minimise direct impact on beach areas, restrict employee access, particularly during nesting times and to minimise the effects of light on hatchlings. Austeel will consult with CALM during finalisation of the detailed design to ensure that these issues are addressed.

Austeel commits to the development of a Marine Turtles Management Plan in consultation with CALM. Specifically, Austeel will commit to:

- **undertake further surveys of sea turtle nesting activities on Cape Preston;**
- **develop and implement management strategies (with performance indicators) and monitoring programs for sea turtle nesting areas to ensure that the project operations do not have a significant impact on the functions and values of the beach areas (to the satisfaction of the EPA on the advice of CALM); and**
- **report on monitoring results against performance indicators and proposals for remediation (if required) in the Annual Environmental Report (to the requirements of the EPA on the advice of CALM).**

Refer also to SER (Section 2.1.2).

74. CALM note that disorientation of both adult and hatchling turtles by lights inland can result in their deaths. Lighting on jetty structures off-shore may result in attraction of juvenile and hatchling turtles to areas where they are at high risk of predation. If surveys determine that the area is significant to sea turtles, a commitment is required to minimise the effect of light on the population and their nesting behaviour. Will the proponent make this commitment?

A: Refer to response to Question 73.

75. CALM notes that the proponent could make a significant contribution to sea turtle conservation, if they were to undertake to control fox predation of turtle nests and hatchlings. This could be a cooperative fox baiting program with CALM, under Western Shield. Would the proponent be prepared to contribute to this program?

A: Austeel would be prepared to contribute to this programme.

76. CALM note the inshore marine areas are significant for wading birds and the beach areas may be important to sea turtle nesting (see below). Tidal currents can be strong in this part of the coast, and the risk of impacts on the nearshore marine environment from the causeway needs to be examined closely before it is approved. Could the proponent comment on this issue

A: Austeel's preferred option is to build a solid causeway between Cape Preston and Preston Island.

Austeel holds the view that detailed modelling is unnecessary given that the area does not contain any sensitive or conservation significant marine communities, i.e. the potential environmental downside is minimal. All that will be achieved through modelling will be definition of a "zone of influence" rather than determining the acceptability or otherwise of the development.

Nevertheless, to overcome any concern regarding the causeway and brine discharge Austeel is prepared to make the following commitment:

Austeel commits to undertake detailed modelling to demonstrate the environmental acceptability of both the structure ultimately constructed between Cape Preston and Preston Island and the brine discharge. The results of the modelling will be provided to the EPA for review prior to construction commencing. If modelling demonstrates

the need for maintenance of water flow, pipes will be installed as necessary in the causeway.

77. CALM advises that it has statutory responsibilities for stygofauna, therefore needs to be included in the review of sampling design and results of survey programs. Could the proponent comment on this?

A: **Halpern Glick Maunsell consulted with CALM's Dr Stuart Halse to provide a review of the proposed survey methodology, timing and the handling of the results. Dr Knott carried out the species identification and has now finished curating the material, the results have been made available to Dr Halse for his comment (refer to response to Question 71). Dr Halse emphasised that follow-up sampling would be beneficial, rather than just the one sampling period. This was conducted in October 2001.**

Refer to SER (Section 2.1) for the results and conclusions drawn from the March 2001 and October 2001 stygofauna surveys.

78. The Western Australian Museum (WA Museum) note the information in the PER (Section 8 p15) on subterranean fauna is incorrect. The museum conducted limited subterranean fauna sampling in the Fortescue River alluvium in 1996 and found a rich stygofauna. About 8% of the groundwater flow in the Fortescue River alluvium is estimated to be diverted as a result of dewatering. However as the distribution and taxonomic status of the stygofauna within the alluvium is unknown, and the aquifer itself has regionally heterogeneous water quality (p5), then in terms of stygofauna, this may not be such a small proportion of the total groundwater throughflow (6.3.1). Could the proponent comment on this issue?

A: **No published data was found to indicate that stygofauna sampling had occurred within the Fortescue River alluvials. Prior to the publication of the PER, it was indicated by the WA Museum that there had been no known sampling of stygofauna within the vicinity of the project area. Subsequent conversations with the WA Museum have since identified that limited stygofauna sampling has occurred within the project area and this information, if it is made available, will be included within the project specific stygofauna sampling reports.**

Refer to SER (Section 2.1) for the results and conclusions drawn from the March 2001 and October 2001 stygofauna surveys.

79. The WA Museum believes it could be unsafe for the project to advance until the nature and distribution of the stygofauna in the Fortescue River alluvium (and elsewhere) has been established. There may need to be substantial work conducted on the groundwater ecosystem(s) with sufficient lead time to do the detailed scientific work necessary for an informed decision. Again, it must be emphasised that groundwater ecosystems need to be integrated into the planning of mining operations at the very earliest stages of planning; clearly this has not occurred in this case. Nothing is known about the functioning of these groundwater ecosystems. There is evidence from overseas studies that changes to groundwater flow and direction can have a considerable impact on stygal communities. Could the proponent comment on this issue?

A: **Refer to SER (Section 2.1) for the results and conclusions drawn from the March 2001 and October 2001 stygofauna surveys.**

80. The WA Museum quotes from (Australian and New Zealand Guidelines for Fresh and Marine Water Quality Strategy Paper No.4) "Groundwater should be managed in such a way that when it comes to the surface, whether from natural seepage for from bores, it will not cause the established water quality objectives for these waters to be exceeded, nor compromise their designated environmental values. An important exception is for the protection of underground aquatic ecosystems and their novel fauna. Little is known of the lifecycles and environmental requirements of these quite recently discovered communities, and given their hight conservation value, the groundwater upon which they depend should be given the highest level of protection." Could the proponent comment on this issue?

A: **As mentioned in the response to Question 78, investigations into the groundwater ecosystems have taken place and the results of these investigations (refer to SER Section 2.1) will assist in developing management practices suitable for these stygal communities.**

The project will not impact on groundwater quality. The TSF design will maximise the reuse of water and, due to the fine nature of the material disposed, will become self-sealing. Areas containing potentially hazardous materials (such as hydrocarbons) will be managed in compliance with appropriate regulations (refer PER Section 13.2).

Groundwater drawdown will be largely confined to the orebody with relatively minor inflows from the surrounding alluvium. Since the alluvium is well connected from a hydrological perspective, any localised loss of stygofauna surrounding the pit is not expected to affect the conservation significance of the group in a local or regional context.

81. The WA Museum is interested to know if there is any evidence of karst in the adjacent Trealla Limestone and Weeli Wolli Formation, as occurs elsewhere. Does the proponent have this information?

A: There is no evidence of karst in the adjacent Trealla Limestone and Weeli Wolli Formation. Both of these are low lying in the study area, subject to inundation and erosion, and any historical karst would now be filled.

82. The WRC notes that the PER indicates that the Basement Rocks are not suitable for stygofauna habitats [Section 6.1.2 - Page 4]. It should be noted that the WA Museum has identified stygofaunal communities in the alluvium of the Fortescue River. Assuming the alluvial aquifer in the Fortescue River is not impacted during mining operations, the WRC believes that stygofauna may not be an issue. Could the proponent comment on this matter?

A: Austeel agrees with the statement. Refer to response to Question 80.

83. The AHC note that the issue of the causeway interfering with turtle movements and other marine fauna has also not been considered. Could the proponent undertake the necessary investigations to address this issue?

A: The proposed causeway will be constructed in shallow water between Cape Preston and Preston Island. There is no evidence to suggest that the causeway will act as a barrier to the movement of marine fauna. Marine fauna will simply skirt Preston Island. In historical times of lower sea level this area would have been a land bridge and hence a natural barrier to the movement of marine fauna.

84. CCWA and the Pilbara Development Commission notes that mention is made in relation to light pollution from port infrastructure. The potential impacts from all infrastructures (eg desalination plant, laydown facilities, power station etc) need to be taken into consideration under the marine turtle management plan. In addition to careful selection of lighting colour frequencies and intensities, it would be preferred to have all lighting facilities visible from the coast fitted with protective shielding to further eliminate the likelihood of turtle disorientation occurring. Will the proponent incorporate these measures?

A: Refer to response to Question 73.

Marine

85. The DEP would prefer to see the port development avoid Preston Island. Could the proponent provide a detailed evaluation of options to achieve this?

A: In Section 3.2.7 of the PER, Austeel presented the two options for a port layout at Cape Preston:

- **Option 1, being the preferred option, involved the construction of a causeway to Preston Island.**
- **Option 2, provided a direct route to deep water, avoiding Preston Island.**

Option 2 would involve unacceptable economic costs and potentially pose construction difficulties. The additional cost of $180M for the construction of marine structures would affect the project's viability.

Another factor influencing the rejection of Option 2 relates to the existence of the basaltic ridge on Cape Preston, which intrudes to the east of Preston Island. This raises

the risk in increased costs related to dredging operations. The ridge may also involve special anchoring requirements for jetty foundations, further increasing costs.

Option 2 also fails to provide adequate protection against rough and/or cyclonic weather, leaving vessels in the service vessel facility largely unprotected. The cost of developing the Austeel project as a downstream minerals project in a remote region in WA is already high by international standards. Austeel believe that further capital costs (~$180M) in order to avoid Preston Island will affect the viability of the project.

86. The DEP notes that Section 9.3.1 of the PER has given insufficient attention to changes in nearshore current regime as a result of the presence of the causeway, and the potential for associated impacts including erosion due to diversion of tidal flows (augmented at times by storm surge and other extreme events). Could the proponent provide this information?

A: Refer to response to Question 76.

87. The DEP notes that more detail needs to be provided on the proposed dredge spoil disposal site, and the likely fate of the dredge spoil post dumping, together with the attendant environmental implications. Could the proponent provide this information?

A: Offshore disposal of dredge spoil will require commonwealth approval under the *Environmental Protection (Sea Dumping) Act* 1981. Once the location of the spoil ground has been identified an additional marine survey will be conducted to provide the information needed to support the permit application. The permit will specify a number of conditions including:

- **characterisation of the material to be dumped;**
- **location of the dump site and the method of dumping;**
- **condition of vessels and equipment;**
- **procedures dealing with the escape or release of material other than in accordance with the permit;**
- **monitoring requirements;**
- **reporting requirements;**
- **contingency planning; and**
- **procedures for emergency dumping.**

A shipping channel will be dredged to a depth of 14m to accommodate vessels of up to 100,000 dwt. Total spoil disposal is estimated at 4.5Mm^3. Dredge spoil will be disposed offshore consistent with the requirements of the Commonwealth Environmental Protection (Sea Dumping) Act 1981. Dredge spoil will not be disposed of in areas containing coral reef. The disposal site will be located in State marine waters and selected so as to avoid any sensitive marine communities.

The procedures adopted will be similar to those recently applied to dredging adjacent to Ward Reef at Onslow. In this instance, dredging adjacent to the coral reef had no adverse impact on reef ecology. Dredging activities will be regulated under the requirements of the Commonwealth Environmental Protection (Sea Dumping) Act 1981.

88. The DEP would like to see commitments in relation to minimising/eliminating the potential for TBT contamination, bearing in mind the position of the IMO and the Australian Government on this matter. The proponent should consider and state how these commitments will be implemented. Could the proponent provide this information?

A: The IMO is set to adopt an "International Convention on the Control of Harmful Anti-fouling Systems" at a conference to be held during October 2001. This is in response to Assembly Resolution A.895 (21) which calls on the Marine Environment Protection Committee to develop an instrument, legally binding throughout the World, to address the harmful effects of anti-fouling systems on ships. The Resolution calls for a global prohibition on the application of organotin compounds, which act as biocides in anti-fouling systems, on ships by 1/01/2003, and a complete prohibition on the presence of organotin compounds which act as biocides in anti-fouling systems by 1/01/2008. Under the terms of the proposed Convention, Parties to the Convention would be required to prohibit and/or restrict the use of harmful anti-fouling systems on ships flying their flag.

The above implies that the control of anti-fouling systems will rest with both the country under which the ship is registered and with any countries that are signatories to the Convention. Adoption of the Convention by Australia would result in the embodiment of

the terms of the Convention in legislation. This legislation would apply to all relevant companies, including Austeel.

TBT will not be used on ships owned by Austeel nor on marine structures.

89. The DEP needs further detail of the scope of the marine monitoring program in order to determine adequacy. Could the proponent provide this information?

A: Austeel has committed to the preparation of a marine monitoring programme (Commitment 8) which will be prepared in consultation with CALM and Fisheries WA. The programme will be developed prior to construction commencing.

90. The DEP notes that the PER has not recognised or referred to the EPA's position document released in February 2000 on this matter. This section needs to be rewritten in the light of the EPA's document. It may not be necessarily appropriate to establish an E4 zone about the region of the brine outfall - an E3 zone may be more appropriate. This needs to be reconsidered in discussion with DEP. Could the proponent provide the rewritten section?

A: We assume that this question refers to the "Perth Coastal Waters – Environmental Values and Objectives", EPA Working Document (2000) in relation to the Level of Protection for EQO1: maintenance of ecosystem integrity. This document recognises four levels of protection ranging from "no detectable changes from natural variation" (E1) through to "large changes in natural variation" (E4). Level E3, "moderate changes from natural variation", identifies the limits of acceptable changes as being:

- **small changes in rates, but not types of ecosystem processes;**
- **biodiversity as measured on both local and regional scales remains at natural levels (no detectable change);**
- **small changes in abundance and/or biomass of marine life; and**
- **moderate changes beyond limits of natural variation but not to exceed specified criteria.**

The predicted changes associated with the brine outfall would be consistent with these criteria.

91. The DEP advises that the recently released ANZECC (2001) temperature guidelines should be taken into account. Could the proponent provide this information?

A: See response to Question 31. The new ANZECC (2001) guidelines were in draft form at the time of the PER's release and have as yet not been published at the time of this response. Furthermore, the new ANZECC Guidelines and the ANZECC 1992 Guidelines both reflect the same temperature guideline for marine waters as that specified in the WA Guidelines (EPA 1993), that is restricting temperature change in marine waters to less than 2°C.

92. The DEP notes that insufficient detail is given in relation to the brine disposal modelling - more justification is required. Could the proponent provide this detailed information?

A: Further brine disposal modelling has been undertaken since the PER document's release. A complete report is presented in Appendix E of the SER document. In summary, effective offshore disposal of brine would result in environmental criteria for salinity not being met within a radius of 150m.

For the nearshore disposal option, environmental criteria would not be met within an offshore distance of 20m and a longshore distance of 100m. None of the discharge would impact on sensitive marine communities.

93. CALM believes the options considered for the proposal should have been expanded to consider the possibility of excluding Preston Island from a development in the Cape Preston vicinity. Could the proponent address this issue?

A: Refer to response to Question 85.

94. CALM believe the construction of a solid causeway from Cape Preston to Preston Island is likely to cause significant changes to the patterns of sedimentation that will result in impacts upon the beach profile (including the dunefield and spit) on adjacent areas to Cape Preston. It has, therefore, the potential to adversely impact upon the geomorphological process which lead

to the development of these natural features. There is the potential for other impacts, other than the two listed (Section 9.1.3). Data have been collected which indicate that fish and coral spawn are transported between reef systems in the Pilbara (Dampier Archipelago, Montebellos, Barrow Island, nearshore islands) on ocean currents. A solid rock causeway between Cape Preston and Preston Island may have some impact on this interchange, and hence on biodiversity of nearby reef systems. In relation to marine habitat in the area, further information is required. Whilst we broadly know the distribution of habitats in the area, we do not know whether there are any unique habitats and/or species. This is relevant to the habitats in the area that will be permanently destroyed through construction of the rock causeway (and jetty) and impacted by downstream effects of changes in water circulation, increased turbidity, sedimentation and substrate erosion. As such, some studies of the relative importance of these habitats in a regional sense would be required to assess the full impact of this proposal. Could the proponent undertake these studies and provide the results?

A: Refer to response to Question 76 in relation to changes in physical processes. Six marine communities were mapped in the study area (Section 9.1.2). All are characteristic of nearshore regions along the Pilbara coast. Algal species were similar to those found by Borowitzka and Huisman (unpublished) in the Dampier Archipelago. There was little coral cover in the majority of the survey area and the coral occurring was similar to coral occurring on reefs between Onslow and Dampier. One patch of coral north of Preston Island was representative of mid-reef assemblages such as those observed around the outer islands of the Dampier Archipelago.

The PER (Section 9.1.3) and the SER (Section 1.2.6) identifies that the following loss of benthic habitat will occur:

- **~3ha of sand and algae;**
- **~2.5ha of sparse coral, algae and sponge;**
- **~3.4ha of medium coral; and**
- **~0.6ha of high coral; and**
- **~70ha of sand and silt.**

None of the marine communities have significance in a regional sense. None of the habitats are unique and it is highly unlikely that any unique species would be present.

An additional marine survey will be conducted. The scope of the survey will be discussed with CALM to ensure that any outstanding questions are addressed.

95. CALM notes that the timing of the dredging activities and selection of dredge spoil sites need to be done in close consultation with CALM and DEP. The construction of the shipping channel and dumping of dredge spoil has the potential to have significant impacts on coral communities. The timing (to avoid coinciding with coral spawning) and selection of dredge spoil sites needs to be carefully considered. Could the proponent comment on this matter?

A: These issues will be addressed in the application for spoil dumping under the *Commonwealth Environmental Protection (Sea Dumping) Act* 1981. Potential dredge spoil disposal sites will be surveyed once these become known. See also response to Question 87.

96. CALM would like to see the modelling for both ocean outfall sites confirming the zones of impact indicated in Section 9.1.3. Of the two proposed outfall sites CALM prefers the second outfall option for the brine where it is released from the jetty in 5 – 10 metres of water. Could the proponent provide this information?

A: Refer to response to Question 92.

97. The AHC questions the need for a port development in such a sensitive part of the coast when major port and industry infrastructure already exists approximately 70 km away at Dampier. Could the proponent address this issue?

A: Austeel does not believe that this is a 'sensitive part of the coast'. Justification for project location is provided in Section 3.2.3 of the PER. As previously stated (refer to response to questions 9 and 85). Austeel has investigated the suitability of existing ports in the region and alternative port location. Austeel found that existing ports did not meet the requirements of the project (channel length, shipping movements, port infrastructure capacity). Alternative port locations so as to avoid Preston Island would

result in significantly increased dredging and spoil volumes, and would increase capital costs by $180M thus affecting the viability of the project.

Aside from the economic reasons, alternative options for the port were also impractical due to issues relating to the need for special anchoring requirements for jetty foundations and by not providing adequate protection for small vessels against rough and/or cyclonic weather (see PER Section 3.2.7).

98. The AHC is concerned about the disposal of dredge spoil offshore, in an area of coral reef, and breeding habitat for marine species, and presumably in close proximity to the Great Sandy Island Nature Reserve. Could the proponent comment on this?

A: Dredge spoil will not be disposed of in areas containing coral reef. The disposal site will be located to avoid any sensitive marine communities. Evidence from other dredging operations (eg. Onslow) indicates that spoil grounds quickly become recolonised following disturbance. Evidence (also obtained from Onslow) demonstrates that spoil is relatively stable when deposited in 10 – 15m of water.

99. The AHC is concerned about the proposal to dispose of large amounts of waste water to an important and sensitive stretch of coastline. The AHC does not consider that the impacts on marine species and potentially important breeding habitats, as a result of raising the temperature, changing the salinity balance, and possibly water quality, for a significant volume of water have been adequately considered. This is particularly relevant given the arid nature of the coastline, which currently has intermittent runoff, and where only small amounts of nutrients enter the sea. Could the proponent provide detailed information on these issues?

A: No evidence has been presented that this is a sensitive stretch of coast. The PER indicates that the zone of influence of the brine discharge is entirely contained within marine habitats consisting of bare sand and silt. These communities do not have significant conservation significance. Brine will be discharged at approximately 64ppt and 1-2°C above ambient temperature. No nutrients will be discharged.

100. The AHC note that the construction of a solid causeway between Cape Preston and Preston Island may significantly alter the hydrodynamics along the coast, interfering with currents and movement of sediment, resulting in possible adverse impacts to adjacent salt flats, mangrove and reef areas. Could the proponent address this issue?

A: Refer to response to Question 76.

There are no salt flats or mangrove areas in the vicinity of Cape Preston that will be impacted by the port.

101. The AHC note that measures to mitigate adverse impacts to the coral community around Preston Island as a result of dredging are not adequately set out in the PER. Could the proponent provide details of the dredging?

A: Dredging details still need to be finalised. Section 9.3.1 of the PER sets out the main elements that will be considered in the marine monitoring programme. These are similar to those adopted to manage potential dredging impacts associated with the Onslow Salt operations. Dredging activities will be regulated under the requirements of the *Commonwealth Environmental Protection (Sea Dumping) Act* 1981.

See also response to Question 87.

102. Fisheries WA note the coastal waters to the south west of Cape Preston are designated as a "Nursery Area" under the Onslow Prawn Managed Fishery. This area is at times closed to prawn trawling by commercial operators, who fish these waters on a seasonal basis. The construction of a breakwater and the operation of a port have the potential to impact on fishing operations. The details of the fishing operations are best known by the fishermen themselves and it is recommended that the proponent should hold discussions with the Onslow Professional Fishermen's Association (c/o Mick Manifis [President] Lot 571 Beadon Creek Rd, Onslow 6710). The discussion should be to inform the fishermen of the proposal and to reach agreement on how the development can be built and operated in a way that has minimal impact on the fishery. Could the proponent undertake and provide a summary of these discussions?

A: It is assumed that the breakwater referred to in Questions 102 and 103 relate to the proposed causeway between Cape Preston and Preston Island. Contact was made with

Mick Manifis who indicated that Gary Kessell of the Nichol Bay Fisherman's Association was a better point of contact. Mr Manifis indicated that the members of the Nichol Bay Fisherman's Association used the area more regularly than did members of the Onslow Professional Fisherman's Association.

Mr Kessell indicated that around 25 boats would have access to the area but that it was not a huge part of the overall fishery, which extends from Barrow Island to Cape Londonderry in the northern Kimberley. Cape Preston is also at the extreme eastern end of the Fortescue Nursery area.

The key issues discussed were:

- **the extent of exclusion zones around the Port. Concern was raised that the exclusion zones around well heads and sub sea pipelines were resulting in the removal of significant areas from the fishery. However, given that the port area is not a major component of the prawning grounds and that it was a relatively small inshore structure, this was not seen as a significant issue;**
- **increase in recreational fishing with rubbish fish being dumped which is then blamed on prawn fishermen; and**
- **potential impact of brine disposal on prawn nursery areas. This was not seen as a major issue given the small area of impact of the plume. A preference for a shoreline brine disposal was identified as this would allow any plume time to dilute prior to the plume coming in contact with the nursery areas in deeper water.**

103. Fisheries WA note that habitats of seagrass and algal beds are of primary importance to the juvenile prawn stock. While the PER indicates that there are no seagrass beds in the immediate vicinity of the proposed port development, there are extensive areas of sand and algae and of sand covered with algae, sponges and sparse coral. The proponent should demonstrate how impacts to this habitat will be minimised. In particular the following:

- Sedimentation due to construction of the breakwater and as a result of changes in current and tide flow after construction.
- As a result of the release of elevated salinity water from the desalination plant. The proponent should provide some more detailed modelling of the predicted dilution of the effluent water and its contact with the seabed. Design of effluent pipes should be directed at achieving a minimum of exposure of the seabed to water of salinities significantly above ambient.

Could the proponent provide this information?

A: Refer to response to Questions 76 and 96. Effluent pipes will be designed to achieve maximum dilution within the minimum distance from the outfall.

104. Fisheries WA is concerned about the potential for impact on fish habitat in the area of high coral cover off the northern point of Preston Island – through direct or indirect impact (such as sedimentation) from construction of breakwater. Could the proponent comment on this issue?

A: The alignment of the jetty will result in unavoidable direct impact on the area of higher coral cover. This alignment is necessary to provide acceptable geotechnical conditions for construction of the jetty and to provide safer ship handling under the prevailing wind and wave climate. Given the size of the area (4 ha) it is not considered to be a significant fish habitat. Indirect impacts will be managed through the implementation of a marine monitoring programme during construction. Sedimentation is unlikely to be significant as rock will be used for construction. Any sediment plume will be short lived.

105. Fisheries WA note that although coral habitat may be lost it is also possible that the rock lined breakwater will be colonised by coral and may increase coral habitat. There is a potential for the rock wall to be constructed to include a reduced gradient below low water mark so that a narrow platform is constructed such that an artificial reef, which can be colonised by coral, is created.

This would compensate for any natural coral reef destruction and should be considered by the proponent in the design of the causeway. Could the proponent comment on this possibility?

A: The causeway between Cape Preston and Preston Island will not impact on coral reef. Around 4ha of reef of mostly medium (~3.4ha) and some high (~0.6ha) coral cover will be impacted by the jetty head. This structure will provide for additional fish habitat and for colonisation of coral. The area available for colonisation will more than make up for the area lost. The construction of a reduced gradient below low water would increase the overall cost of the structure.

106. Fisheries WA is concerned about the entrapment of fish in the desalination intake – larval and juvenile fish may still be caught (intake within the water column, rather than surface or bottom which is preferred), there is a need for monitoring and if necessary adjustment (for instance of screen configuration). Could the proponent comment on this matter?

A: Intake velocities will be in the order of 1m/s to reduce the likelihood of entraining pelagic fish. The final configuration of the intake still needs to be defined but it is likely that a near bottom intake will be constructed (to minimise water intake temperatures). Monitoring of the intake can be undertaken and used to refine the intake as necessary.

107. Fisheries WA is concerned about impact on prawn nursery grounds. The proposal requires some more detailed hydrological modelling over a range of tides (spring to neap) and weather conditions. Could the proponent provide this detailed modelling?

A: More detailed modelling will be conducted as part of the final design (refer to response to Question 76).

108. Fisheries WA would like the proponent to clarify as to whether any of the chemicals such as detergent, caustic soda and microbiological controlling agent will be released in the outlet water and if so what impact can be expected to the marine environment. Could the proponent provide ecotoxicity data and details of impact on the marine environment?

A: Seawater for the Reverse Osmosis desalination facility (RO Plant) will be supplied via a seawater intake and pumping system. The seawater intake will include trash racks (40mm) and travelling screens (1mm). Seawater will be pumped in at a rate of 1m/s. This design reduces the possibility of entraining fish into the desalination facility.

Incoming seawater must be chlorinated (using sodium hypochlorite) to control algae and biological growth. Free residual chlorine, after injection, will be approximately 0.5 ppm. A chemical feed system will provide the means for adjustment of make-up seawater and product water quality. Chemical treatment of the incoming stream will prevent scale deposits and corrosion on system piping. Bio-fouling and anti-oxidation counter measures will be properly adopted in the chemical feed system. The following chemicals will be used in the process:

- **Coagulant (ferric chloride) will be injected continuously and automatically upstream of the media filters to enhance filtration;**
- **Ammonia will be injected upstream of the media filters to remove the residual free chlorine;**
- **Anti-scalant will be dosed in the pre-treated feed upstream of the cartridge filters for membrane protection; and**
- **Sodium Hypochlorite and Hydrated Lime will be dosed in to the product water downstream of the product water pump to disinfect the water and increase the hardness and alkalinity to a desirable level of potable water.**

All of these chemicals are routinely used in desalination plants around the world and, at the levels used, would not be expected to have a significant impact on the environment.

The reject brine solution will have the following composition, based on the intake seawater concentration, presented in the Table below.

Composition Data for the Brine Discharge

Composition	Seawater Concentration	Brine Discharge Concentration
TDS	37,017	61,556
Ca^{++}	440	732

Mg^{++}	1,300	2,166
Na^{+}	11,000	18,281
K^{+}	220	365
NH_4^{+}	0.0	0.0
Sr^{++}	0.0	0.0
Ba^{++}	0.0	0.0
Fe^{++}	0.03	0.05
Mn^{++}	0.01	0.02
CO_3^{--}	0.0	2.8
HCO_3^{-}	110	179
SO_4^{--}	3,000	4,998
Cl^{-}	21,000	34,917
NO_3^{-}	0.1	0.15
F^{-}	2.1	3.5
SiO_2	1.0	1.7
CO_2	1.0	1.0
pH	8.3	8.5
Hardness (as $CaCO_3$)	6,452.30	10,748.63

109. The CCWA notes that Section 14.1 mentions the prawn and fish nursery areas, but these are not mentioned in Section 9 Marine and Nearshore Considerations. Changes to drainage systems, sedimentation systems, mangrove ecosystems and are going to have an impact on prawn and fish nurseries, though this is denied in 14.1. Section 9.1.3 states "there will be no biological impacts as a result of brine disposal". There is no discussion on the possible local impacts on the prawn nursery. Could the proponent provide this discussion?

A: No evidence has been provided to support the potential changes identified. These issues have already been addressed in the responses to Questions 70, 76, 83, 94 and 99.

The area of influence of the brine discharge is minimal (refer to Section 2.1.8 of the SER). There will be no significant impact on prawn nursery areas.

110. The DEP notes that the requirement in the Air Quality and Air Pollution modelling Guidance under "identify and quantify all emission to atmosphere" to identify whether metals will be released from any of the stacks has not been addressed. Could the proponent address this issue?

A: **The Midrex Direct Reduction Process does not contribute any additional metals over those contained in the product, consequently, the particulate analysis will be similar to the oxide analysis (Table A below). The particulate emission from the flue gas stack will be approximately 50% carbon and 50% oxide (see Table B below). The 50% carbon is generated by the products of combustion in the reformer.**

Table A: Charge Hopper and Briquette Dust Collection Stacks

Analyte (wt. %)												
Fe_2O_3	SiO_2	Al_2O_3	CaO	MgO	P	S	Na_2O	K	Mn	TiO_2	V	Cu
97.1	1.45	0.06	0.53	0.47	0.005	0.010	0.001	0.005	0.02	<0.001	0.010	<0.001

Table B: Flue Gas Stack

Analyte (wt. %)												
Fe_2O_3	SiO_2	Al_2O_3	CaO	MgO	P	S	Na_2O	K	Mn	TiO_2	V	Cu
48.5	0.73	0.03	0.27	0.24	0.003	0.005	0.001	0.003	0.01	<0.001	0.005	<0.001

111. The DEP notes that the requirement in the Air Quality and Air Pollution modelling Guidance under "Presentation of modelling results" to determine the meteorological conditions causing highest concentrations at important receptors should be determined to check that the model is yielding sensible results has not been addressed. Could the proponent perform this check?

A: Maximum 1-hour NO_2 concentration of 185.0 µg/m^3 (75% of NEPM standard) occurred on the tops of the hills to the northeast of the project area (refer PER Figure 10.1). This occurred under night time winds of 3.2m/s and F class stability. The emissions emanated predominantly from the Pellet Plant. A check was made on the next few highest concentrations, which were also found to be due to similar conditions.

Maximum 1-hour SO_2 concentration of 55.3 µg/m^3 (10% of NEPM standard) also occurred as above. Maximum 24-hour SO_2 concentrations were due to very strong winds of up to 15.6 m/s. For the majority of the day the winds were above 10 m/s with D class stability.

Maximum 24-hour PM_{10} concentration of 57.7 µg/m^3 (115% of NEPM standard) occurred in moderate 4 – 7 m/s winds and C class stability. Wind directions were steady and varied by around 20 degrees. There were two exceedances of the NEPM standards predicted, both of which occur within 500m of the plant. The concentrations of PM_{10} outside the lease boundary, where the NEPM standards apply, will however be lower (10 – 15 µg/m^3) and therefore compliant with these standards.

For the above "worst case" conditions, the meteorological data all appear realistic and plausible with the concentrations predicted considered reasonable.

Refer to SER Section 2.1.7 and Appendix D for a complete report of Atmospheric Emissions.

112. The DEP notes that Section 10.1.1 explains intermittent emissions expected from time to time and states that under transient conditions (lasting no more than 30 minutes per month) total emissions would increase by less than 0.07%. Is this averaged over the month?

A: The increase in emissions as a result of a nominal 30 minutes of transient emissions per month would result in a total increase in emissions of 0.07% for the year.

113. The DEP would need to see the effect of the high emissions during the 30-minute transition period, and a comparison with appropriate standards. Could the proponent provide this information?

A: Section 10.1.1 referred to a total (conservative) 30 minutes transition period for the month, however, a typical duration of transient conditions lasts only a few minutes. There is negligible effect (ie less than the 0.07% increase in emissions) during the

transition period which would not be expected to breach the air quality standards, especially when the standards usually reflect a one-hour average.

114. The DEP notes that the deduster stacks are only 20 metres high and yet building wake effects are not included. Are there buildings nearby? If so, could the proponent provide the revised modelling results?

A: There are no buildings in the vicinity of the stacks. The dust collection stacks are located to the east of the reduction furnace and the flue gas stack is located at the south end of the heat recovery casing.

115. The DEP needs a detailed assessment of greenhouse gas to be undertaken. In particular "no regrets" and "beyond no regrets" measures need to be detailed. (The proponent should examine the recent assessments of the Syntroleum Plant and the Woodside Expansion in Bulletins 962 & 985). Could the proponent provide this information?

A: Austeel will prepare a Greenhouse Gas Emissions Management Plan. The management plan will be a detailed assessment of project greenhouse gas emissions, focussing on minimising greenhouse gas emissions using the EPA's "Guidance for the Assessment of Environmental Factors, No. 12, Minimising Greenhouse Gas Emissions, June 1998." In particular, the management plan will include the "specific measures to minimise the total net greenhouse gas emissions … for the proposal" and "an analysis of the extent to which the proposal meets the requirements of the National Greenhouse Strategy using a combination of "no regrets" and "beyond no regrets" measures as discussed below:

<u>No Regrets</u>

In the past ten years significant improvement has been made in the reduction of emissions from the Midrex process including greenhouse gases. The sole source of greenhouse emissions from the Midrex process is the reformer flue gas. To reduce the emission of greenhouse gases from the reformer, Midrex has enhanced the direct reduction process to decrease the heat load on the reformer as well as improve the efficiency of the shaft furnace, which has led to a decrease in the size of the reformer.

Greenhouse gas reduction measures:

- **Increased Furnace Utilisation**

Utilisation is the ratio of total reducing gases ($CO + H_2$) consumed by the reduction reactions to the amount of reducing gases required according to equilibrium conditions. Utilisation is a measure of the effectiveness of the reducing gas in the reducing reactions occurring in the furnace. Midrex has increased the utilisation ~10% over the last twenty five years with an increase in utilisation of ~6% over the last ten years.

- **Increased In-situ Reforming**

In-situ reforming is reforming reactions taking place in the furnace. Increasing in-situ reforming decreases the heat load on the reformer. Midrex has increased in-situ reforming by ~20% over the last ten years.

- **Higher Reducing Gas Temperatures**

Increasing the reducing gas temperatures in the furnace improves the kinetics of the reducing reactions. With the development of oxide coating over the last ten years, Midrex has increased the reducing gas temperatures by ~23%.

- **Increased Reducing Gas Quality**

Reducing gas quality is the ratio of reductants ($CO + H_2$) to oxidants ($CO_2 + H_2O$) in the reducing gas and is an indicator of the reducing potential of the reducing gas. Increasing the reducing gas quality increases the reducing potential of the reducing gas. Midrex has increased the reducing gas quality by ~18% over the last ten years.

- **Decreased Reformer Size**

Increasing the reducing gas potential decreases the heat load on the reformer thus decreasing the required size of the reformer. A smaller reformer requires fewer burners and therefore requires less natural gas. The reformer size has been decreased by ~37% over the last 25 years with a decrease of ~19% over the last ten years.

- **Greater Heat Recovery**

Midrex utilises the hot flue gas exiting the reformer in a heat recovery system. By passing the flue gas across heat exchangers, much of the heat is recovered by preheating certain gasses. With the development of improved alloys, preheat temperatures can be increased without sacrificing the life of the tubes in the heat exchangers. The combustion air preheat temperature has been increased by ~23% and the feed gas preheat temperature has been increased by ~38% over the last ten years. Ten years ago, Midrex did not preheat the natural gas. Now Midrex preheats the natural gas thereby recovering more heat from the flue gas.

All of the actions above have an impact on decreasing the "process" natural gas as well as the reformer "burner" natural gas. Also, the actions above decrease the heat losses in the system, which further decreases the overall requirement for natural gas translating into a reduction in CO_2 emissions. The overall estimated reduction in potential greenhouse gas emissions is summarised in Table 1, which makes comparisons between current plant design and plant design ten years ago.

Table 1: Estimated CO_2 Emissions (tpa, per module)

Reduction Measure	Plant Design Ten Years Ago	Plant Design Current	CO_2 Reduction (Overall %)
Increased Furnace Utilisation	314,483	288,062	2.6
Increased In-situ Reforming	84,668	77,555	0.7
Higher Reducing Gas Temperatures	108,860	99,714	0.9
Increased Reducing Gas Quality	145,146	132,952	1.2
Decreased Reformer Size	169,337	155,111	1.4
Greater Combustion Air Preheat	52,486	23,714	2.8
Greater Feed Gas Preheat	132,187	59,725	7.2
Natural Gas Preheat	9,720	4,392	0.5
Total	**1,016,887**	**841,225**	**17.3**

Similarly, a comparison of project greenhouse gas emissions for plant design ten years and twenty five years ago can be made to demonstrate the continual advancement in processing technology in iron-making (Table 2).

Table 2: Estimated CO_2 Emissions (tpa, per module) –
Plant Design 25 years ago vs. Plant Design Ten Years Ago

Reduction Measure	Plant Design 25 Years Ago	Plant Design Ten Years Ago	CO_2 Reduction (Overall %)
Increased Furnace Utilisation	326,131	314,483	1.0
In-situ Reforming	84,668	84,668	0.0
Reducing Gas Temperatures	108,860	108,860	0.0
Reducing Gas Quality	145,146	145,146	0.0
Decreased Reformer Size	178,656	169,337	0.8
Greater Combustion Air Preheat	52,486	52,486	0.0
Greater Feed Gas Preheat	259,152	132,187	10.9
No Natural Gas Preheat	9,720	9,720	0.0
Total	**1,164,819**	**1,016,887**	**12.7**

Beyond No Regrets

For future plants, with the rising concern of energy efficiency and greenhouse gas emissions, Midrex is continuously developing improvements to the direct reduction process. One area that Midrex is concentrating on for the future is the shaft furnace and specifically the reactions that take place in the shaft furnace. Increasing the amount of oxygen to the reducing gas will increase the reducing gas temperature thus improving the kinetics for the reduction and reforming reactions. This will lead to improved furnace utilisation and efficiency beyond the current design. More research and observation is required in order to determine the extent to which the reducing gas temperature can be elevated to achieve optimum conditions inside the shaft furnace. Another area Midrex is focusing on is increased heat recovery for the combustion air, feed gas, and natural gas. A current study has demonstrated that with increased

furnace utilisation and heat recovery a reduction in greenhouse gases of 3.6% is possible (841,225 tpa to 810,839 tpa, per module).

Current studies show the possibility of a ~9% increase in utilisation, ~5% increase in in-situ reforming, ~8% increase in reducing gas temperatures, ~12% decrease in reformer size, and ~3% increase in feed gas preheat. More research is required in order to determine the extent to which these improvements can occur while achieving optimum conditions inside the reformer and shaft furnace.

Summary

In the last ten years, Midrex has made improvements to heat recovery, reformer operation, and shaft furnace utilisation. The changes made over the last ten years plus the potential future changes reflect a reduction in greenhouse gas emissions from the 1990 emission levels calculated as:

(1,016,887 – 810,839) / 1,016,887 = 20.3% Reduction in CO_2 Emissions.

Twenty-five years ago, Midrex only preheated the combustion air. The changes made over the last twenty-five years plus the future changes indicate a greenhouse gas emission reduction of:

(1,164,819 – 810,839) / 1,164,819 = 30.4% Reduction in CO_2 Emissions

Midrex will continue to make improvements in these areas for the future.

Conclusion

One of the difficulties Austeel has encountered is that the reporting of greenhouse gas emissions is not widely practised in other countries. The best information that we can easily obtain is from EPA Report and Recommendations - Bulletin 746, Page 50, on the Ausi Iron Project. The emissions as documented in this Bulletin in comparison to the Austeel Project are provided below:

- **Ausi Iron (HBI, power plant, port and mine) 0.78 t $CO_{2\text{-}e}$ / t HBI**
- **Austeel (HBI, power plant, conveyor, port, mine) 0.80 t $CO_{2\text{-}e}$ / t HBI**
- **BHP (HBI only (no port, mine, or power plant)) 0.85 t $CO_{2\text{-}e}$ / t HBI**
- **Austeel (HBI only (no port, mine, or power plant)) 0.61 t $CO_{2\text{-}e}$ / t HBI**

At this point Austeel wish to clarify that an earlier comparison of project efficiencies, previously stated in the PER (Section 10.3.3), were based on a simplistic relation between natural gas consumption and HBI production, and was not a representative comparison due to differing project parameters. In particular, the BHP HBI Plant figures excluded the power station (as shown above). The Austeel figures above are based on the production of 4.7 Mtpa DRI/HBI (only) which involves the consumption of around 72,430 TJpa of natural gas and produces 3.8 Mtpa CO_2 emissions (refer PER Section 10.3.2, Table 10.5).

Effectively, Austeel and Ausi Iron have similar efficiency when the total project is considered, with any minor differences easily accounted for by differences in the project (e.g. conveyor, distance to the port) and assumptions made on the extent of land clearing, use of mobile equipment, etc. In relation to the HBI component only, Austeel is around 28% more efficient than BHP.

Austeel's current design of producing 6.9 Mtpa pellets and 4.7 Mtpa HBI requires the consumption of approximately 89,450 TJpa of natural gas equating to approximately 5.4 Mtpa CO_{2e} emissions, based on full fuel cycling emission factors that takes into account:

- **fugitive emissions from venting, flaring and transmission/distribution losses;**
- **emissions from energy use in production, transmission and distribution; and**
- **emissions from combustion at the point of use (ie Power Plant and DRI Plant).**

Refer to SER (Section 3.1.5).

Further comparison using data published in Appendix D, Chapter 14, "Economics of Production and Use of DRI" of *Direct Reduced Iron, Technology and Economics of Production and Use* (Iron & Steel Society, 1999. Edited by J. Feinman and D.R. Mac Rae), the following information was presented for each type of DRI Process technology:

- **the consumption of natural gas (mbtu) (= 1.055 GJ) per Mt of product:**

  Finmet: 11.55
  HYL III: 11.33
  MIDREX 10.30

- **the consumption of electricity (kwh) per Mt of product:**

  Finmet: 150
  HYL III: Not Available
  MIDREX 130

- **the consumption of water (m^3) per Mt of product:**

  Finmet: 2.50
  HYL III: 1.76
  MIDREX 1.50

- **the consumption of iron ore pellets (Mt) per Mt of product:**

  Finmet: Not Applicable
  HYL III: 1.154
  MIDREX 1.154

where: Finmet technology is used by BHP HBI Project;
HYL III technology is used by Ausi Iron Project; and
MIDREX technology is proposed by the Austeel Project.

Clearly, in this independent comparison MIDREX technology was shown to be more efficient in relation to energy and resource use, which also translates to reduced greenhouse gas emissions per unit product.

Dust

116. The DEP notes that the proponent proposes to install a dedusting system at the oxide material screening station and briquetting machines. There are also other potential sources of dust; crushing, screening, concentrator, conveyor transfer points, stockpile area and access road. Details of dust management at these locations has not been provided in the PER. Could the proponent provide this information in detail?

A: Refer to section 10.2 of the PER. To manage fugitive dust emissions Austeel intends to comply with DEP Licence Conditions and integrate appropriate dust control strategies into the detailed design of the project. Occupational dust levels will be controlled in accordance with the *Mine Safety and Inspection Regulations* 1995.

The measures to be used to control potential dust generation include:

- **Crushing: Water sprays can be employed if dust emissions are significant.**
- **Screening: Dust extraction system (bag filter) plus water sprays if necessary.**
- **Concentrator: No controls necessary due to this being a wet process.**
- **Mine conveyor: Transfer points will be enclosed (if necessary), minimising any dust release.**
- **Stockpile area: DRI pellet and HBI stockpiles will generate minimal dust due to the material being hard, non-friable and heavy.**
- **Access road: Access roads will either be sealed or dust suppression measures such as water trucks will be used.**

117. CALM suggests that airborne dust may be a problem, especially with regards to its impact on the communities of Dampier and Karratha and potential for changes to water turbidity. Although somewhat removed from the project area these environments may still be impacted by airborne dust. Recent work by Hamersley Iron has demonstrated that during some periods

of high atmospheric dust loads that dust can travel over extensive and circuitous routes. At that time, when the dust problem in Dampier was attributed to their operations on East Intercourse Island, the actual source of the dust was bushfires south of the Fortescue Roadhouse in the vicinity of Cane River and Pannawonica. It appears that the dust and associated airborne particulates are blown out to sea by the prevailing diurnal easterly winds only to be deposited back onto the coast, further east (in the vicinity of Dampier) by the fresh south westerly afternoon sea breeze. If this pattern of atmospheric circulation is common, dust generated within the project area may affect the Dampier and Karratha communities or could impact upon nearshore marine water quality. Could the proponent comment on this possibility?

A: Austeel finds it very hard to believe that iron ore dust originating from iron ore operations travels over such distances.

The dust problems experienced at Dampier and Karratha are partially a result of the export of iron ore lump and fines from these ports. This will not be the case at Cape Preston since only HBI and pellets will be exported. The DRI pellet and HBI product are hard non-friable, heavy materials. There will be only very small quantities of dust amongst the product stockpiles. Further, Austeel will comply with the DEP Licence conditions on dust, employing control measures where necessary.

See also response to Question 116.

Land use and Zoning

118. Planning Western Australia notes that in April 1988 the Karratha Area Development Strategy (KADS) was released by the Western Australia Planning Commission. In regard to the Cape Preston area, the strategy recommends "Carry out a study to evaluate the optimal use of land and marine areas at Cape Preston and in this context determine the suitability of the area for a possible major industrial estate, port and the required buffer." Map 12 of the KADS shows the Cape Preston area as requiring further investigation to determine its optimal land use. This study has not been undertaken and it would seem somewhat premature to consider a major strategic industrial development in the Cape Preston area without such an evaluation. Planning Western Australia note that if the land is suitable for the proposed development then the proponent should initiate an amendment to the Shire of Roebourne's Town Planning Scheme No. 8 to reflect a "Strategic Industry" zoning. Could the proponent comment on this matter?

A: The issue was identified in Section 14.1 of the PER. Information contained within the PER answers a number of questions such as definition of the mineral resource, buffer definition, terrestrial conservation issues and marine conservation. Appropriate zoning will be sought under the Town Planning Scheme. This has been the subject of detailed discussion between the Government and Austeel and is dealt with in the Austeel State Agreement, which should be presented to Parliament 2001.

119. The Shire of Roebourne state that access to the DeGrey-Mullewa stock route must not be restricted. Could the proponent explain how access will be maintained during construction and operation?

A: Austeel questions why access needs to be provided to a redundant stock route. The tailings storage facility, plant site and the northern part of the George Palmer Orebody overlay the stock route. Access will not be maintained in these areas. The current conditions on the relevant Mineralogy Mining Lease state that mining may be undertaken on these areas in accordance with the other conditions of the mining lease which does not preclude impact on the stock route.

120. The PNTS note that Figure 2.1 ("Location Plan") and Plate 2.1 ("Aerial Photography of the Study Area") of the PER purport to show tenements required for the proposed Project. The PER is dated December 2000, yet these plans do not show a number of Mineralogy tenements along Cape Preston applied for in October 2000 (M08/256 – 08/262). These new tenement applications cover the area on which Austeel's proposed Project is to be based, and it is difficult to understand how they could not be connected to the Project. The lack of full disclosure of tenements applied for in the Project area has the capacity to mislead the public. Could the proponent clarify this matter?

A: Mineralogy is the holder of Exploration Licence 08/636 that was granted in 1993. M08/256 to M08/262 are contained within the bounds of 08/636. Whilst the applications were, in some instances, first applied for in October 2000 it was not clear at that time

they would remain with Mineralogy or, if so, under which title. This was the subject of negotiations between the Department of Minerals and Energy, Mineralogy and Austeel.

121. The PNTS note that at section 2.5 of the PER, entitled 'The Proponent', it is stated that Mineralogy Pty Ltd holds the leases associated with port facilities and infrastructure. In fact, the infrastructure corridor (L08/0007) was applied for in 1996 by Bexfan Pty Ltd, and is not currently granted. Similarly, the general purpose leases for the port facility, although applied for by Mineralogy, are not yet granted. Could the proponent clarify this matter?

A: Under Exploration Licence 08/636, Mineralogy has the exclusive right to have General Purpose Leases and Mining Leases granted over the area. These rights will be further strengthening under the State Agreement Act.

122. The Shire of Roebourne advise that should a new road be required to the mouth of the Fortescue River, the gazettal and construction costs would be required to be met by Austeel Pty Ltd. Could the proponent comment on this matter?

A: Once the final design for the project has been completed Austeel will hold discussions with the Shire of Roebourne and the Department of Minerals and Energy on the acceptability of leaving the access road in its current position. If the road needs to be realigned it will be carried out at Austeel's expense.

123. The CCWA are concerned that Figure 3.2 is incorrect. Is this map the latest correct version? (see KADS where it is defined as 'further consideration and review of specific options, including heavy industrial site and development).

A: Figure 3.2 in the PER is a copy of Figure 8 in the KADS. The text referred to above relates to Figure 12 in the KADS. The issue of 'further consideration and review of specific options, including heavy industrial site and development' is addressed in PER Section 14.1.

European Heritage

124. The AHC recommends that the proponent engage a consultant to investigate whether there are places of State or local heritage significance, including historic shipwrecks. If it is found that there are places of historic heritage values, measures which avoid impacts or minimise any unavoidable adverse affects should be established. Could the proponent undertake this investigation and report the results?

A: No sites listed on the Register of the National Estate (or the Interim List of the Register) will be impacted by the proposal. Despite extensive diving around the Cape Preston area, no evidence of shipwrecks was found.

Social issues - Recreation

125. Fisheries WA note that the marine environment affords the primary recreational opportunity at the site. The experience in Karratha is that recreational fishing is very popular and that small boat ownership is amongst the highest (in per capita terms) in the state. It is likely then that consequences of the proposal would include:-

- Possible local depletion of fish stocks.
- Increased compliance and public educational activity costs to be incurred by Fisheries WA.
- Marine safety issues from increased number of small boats.
- Extra recreational fishing pressure on western margin of the proposed marine park.

It is recommended that "environmental induction" should cover fishing regulations and Fisheries WA's "Fish for the future" ethos. Could the proponent comment on this matter?

A: Austeel will include reference to the fishing regulations and "Fish for the Future" ethos in the induction programme.

126. CALM notes the management of the construction workforce (5000 people) will be critical to mitigating impacts on the environment. There are likely to be significant pressures on fish stocks in the Fortescue River, on mud crab stocks in the Cape Preston mangal community and on the near shore nature reserve islands (Potter, Fortescue, Steamboat, Carey & Regnard Islands) from recreational boating and camping pursuits. It will be an onerous task, although not insurmountable (as demonstrated at Marandoo), for the proponent to effectively manage

the construction workforce, particularly during their recreation and leisure time. If the proponent cannot establish adequate workforce management measures, there would be a considerable extra financial burden on CALM and other land and resource (e.g. Fisheries WA) managers in the area (e.g. extra cost in additional aircraft and boat patrols of the Cape Preston area, and islands nearby). CALM and other relevant agencies may reasonably expect to have the developer meet these additional costs. This issue needs to be critically addressed in the EMP, in close consultation with land managers (including CALM) and resource management agencies in the area. Could the proponent comment on this issue?

A: Austeel recognises the issues raised by CALM and will consult with CALM and other land managers during development of the project EMP outlined in Commitment 2.

Rehabilitation

127. The WRC believe it is important that the proponents commit to long term monitoring of the effects of the Pit and remediation measures if required. Rehabilitation, monitoring and remediation will be required well beyond the life of the mine and this must be recognised in the mine closure plan. Could the proponent comment on this?

A: The Mine Closure Plan will provide a self-sustaining walk-away solution at the completion of mining (Commitment 11). The plan will address removal of redundant infrastructure, rehabilitation, management of the final void and post mining monitoring.

128. CALM notes that leaving an open void (mined-out pit) at the completion of the project, particularly when the proponent does not intend to backfill the pit to a level above the watertable can have detrimental impacts on groundwater quality and quantity. It is noted that the proponent has modelled potential impacts and concludes that there will not be a significant effect. Monitoring is important to determine the impacts of the operation on groundwater. However, if the results indicate that the modelling is inaccurate and the tendency is towards significantly higher than predicted impacts, there needs to be a corresponding change in the operational plan. A commitment to adaptive management would be appropriate. Mine planning should also allow for in-pit dumping and back filling of the pit, at any time during the life of the mine as a contingency measure. Could the proponent comment on this matter?

A: Monitoring will be used to confirm the extent and, therefore, the acceptability of any impacts. In pit dumping will be considered once the pit reaches its ultimate depth, however, as identified in the PER (Section 4.2) this will result in ore sterilisation. Austeel will adopt the principle of adaptive management, however, it should be realised that an upfront expenditure of $2.5B is unlikely to see the pit backfilled prior to the completion of the project. Additional information is provided in response to the questions on groundwater, particularly questions 10 and 18.

Other

129. The WRC notes that there is no mention of acid mine drainage in the PER, particularly in relation to the waste dump. It is not clear if pyritic shales are present in the mining operations. Could the Proponent clarify whether acid mine drainage is an issue or not an issue?

A: Refer to Section 13.3 of the PER. Pyritic black shales (which can give rise to acid mine drainage) and asbestiform minerals have not been encountered during the extensive exploration drilling conducted over the orebody. An interpretation of the geology suggests that pyritic black shales and asbestiform minerals are unlikely to occur.

130. CALM notes that the service corridor will be a major corridor for infrastructure, however no schematic diagram is included within the document. It is not apparent from the PER whether issues such as the following have been considered in the design detail:

- Cross over points for people, vehicles and wildlife.
- Will a track be required on both sides? If not how will the conveyor be protected from a major wildfire if vegetation is allowed to grow up to and adjacent to the conveyor.
- The document indicates the corridor will also be used for power and water. Will there be a pipeline for diesel? If not, how will diesel be delivered to the minesite?
- No mention is made of infrastructure required for communications. Is there a requirement for communication infrastructure and where will it be?
- No cover is proposed over the conveyor. Will the conveyor system be able to handle the large amounts of water that will lie on the conveyor during a major rain event?

A: Appropriate crossover points of the services corridor will be dealt with in the detailed design stage and the placement of the corridor will be finalised following the completion of Aboriginal Heritage surveys. Austeel is investigating the option of trucking material to the port so as to eliminate the requirement for a conveyor from the plant to the port site. Diesel will be delivered in an enclosed tank by truck and there will be no diesel pipeline. Water will be delivered by pipeline and at this stage it is not proposed to deliver gas between the port and the plant site areas. Communications equipment between the port and plant site will be contained within the corridor. All communication exchanges will be located in the plant administration buildings.

131. CALM notes a fuel storage area is proposed in the stockyard area. The document is not clear on the type of fuel stored in this storage area. In addition, a fuel farm is proposed to allow bunkering of ships. Is the bunker fuel farm the same as the fuel storage area in the stockyard? No information is provided on the bunding required on these fuel areas. CALM recommends the following standard on fuel bunds:

- Bunds must comply with DME standards; and
- Bunds must also be capable of handling all the fuel from the largest tank in the bund and all the water that would fall into the bund during a 1:100 year 24 hr rainfall event.

The justification for these standards is on the basis that a tank failure event is more likely to happen during a cyclone. Staffing levels will be minimal and the ability to respond to a tank failure will not be possible. CALM has asked for similar bunds on offshore fuel facilities as well as installing this type of bund in the Pilbara national parks. Will the proponent comply with these recommendations?

A: Austeel will comply with these recommendations. A common fuel storage facility will be established. Storage will be for diesel and bunker fuel.

132. CALM note the power station layout indicates there is a fuel storage and a fuel loading facility in this layout. How do these facilities relate to the gas power station? Are they diesel fuel facilities for the adjacent minesite? If they are diesel fuel facilities, how is the diesel being delivered to site, and to what standard are the facilities being built?

A: Diesel is required to be stored on-site to provide emergency fuel in the event that the supply of gas to the project is temporarily lost and to provide fuel for start up of the power station. Diesel will be delivered to site by truck. Fuel storage will also be required on site for vehicles, generators etc. Storage will be to DME Standards (refer Question 131).

133. CALM notes that the document does not indicate where the hazardous waste materials (explosives) will be located, or what works will be required at this site. Will additional clearing be required to protect it from natural events such as fire?

A: The location of the facility for the storage of explosives has not yet been determined. Storage will be to DME standards. Some clearing will be required to provide fire protection.

Aboriginal Heritage

134. The Aboriginal Affairs Department (AAD) notes that correspondence from the proponent has indicated one objective for a meeting to be held in January 2001 was to determine the extent of the additional studies required to obtain 'clearance' under the Aboriginal Heritage Act 1972. The need for these surveys is clearly indicated in O'Connor 2000 in Section 3 (p2) and Section 8 (pp 7-9). The AAD would like specific confirmation of the commitment to archaeological and ethnographic surveys. Could the proponent comment on this?

A: Austeel made a commitment to undertake archaeological and ethnographic surveys within its mining tenements in the Fortescue River/Cape Preston area.

Following a consultation process with the following aboriginal groups:

- **Wong-Goo-Tt-Oo**
- **Ngaluma/Indjibandi**
- **Yaburarra/Marthudunera**
- **Kurama/Marthudunera**

it was resolved that independent archaeological and ethnographic consultants be appointed to undertake the surveys, and that an invitation be extended to all interested aboriginal groups to participate in the surveys by each nominating two representatives to accompany the consultants. Austeel initially received agreement from three of the above groups to participate in the surveys with each group nominating two representatives. Austeel commissioned Mr Rory O'Connor to conduct an ethnographic survey and Mr Gary Quartermaine to conduct an archaeological survey on the existence of aboriginal heritage sites within Austeel's mining tenements.

Austeel also advertised in the North West Telegraph and The West Australian newspapers in March 2001 of its intent to undertake these surveys, and it requested that any person who had knowledge of any aboriginal heritage sites should contact Austeel's Perth Office. Both surveys have now been completed and the results will be provided to the relevant authorities on completion. The fourth aboriginal group also participated in the heritage surveys.

135. The AHC notes that the PER states that the proponent recognises its legal responsibilities under the Western Australian Aboriginal Heritage Act 1972. The AHC notes that the proponent has commissioned an ethnographic study of the project area. The ethnographic survey identified Aboriginal sites listed in the site register maintained by the AAD in Western Australia. The PER mentions that the AAD register includes sites found during previous ethnographic and archaeological surveys in the vicinity of the project area. While this is indicative of the fact that Aboriginal heritage places occur in the area, the information obtained from register searches is rarely if ever fully comprehensive of all the heritage places in an area. Could the proponent comment on this matter?

A: In the case of a large development it is normal practice for a "desk top" study of Aboriginal heritage and related issues to be commissioned in advance of the field survey. This preliminary study has been carried out in this case. The heritage data was assessed and suggestions made for further work. Full ethnographic and archaeological Surveys have now been completed. There was no attempt to suggest that the preliminary work was the final survey report.

136. The AHC notes that the PER mentions that the ethnographic study included preliminary discussions with representatives of some of the major Native Title claimant groups. Meetings with representatives of some of the major Native Title claimants are also documented in the PER. There is no mention that the proponent has undertaken ethnographic or archaeological surveys in the project area with native title claimants or other knowledgeable Aboriginal people with rights or interests in the area. The AHC notes the commitment by the proponent to undertake an appropriate level of consultation and investigation prior to the Western Australian EPA finalising the assessment of the PER. The AHC advise that it is not possible to assess the risk of a threat of injury or desecration to significant Aboriginal sites or areas, and any national estate values that may exist within them, until the results of the proposed surveys are known. Could the proponent present the results of these surveys?

A: Refer to response to Question 134.

Austeel has consulted with the wider Aboriginal community in the Pilbara. Austeel has sought input from each and every person listed on the Native Title Claims over the project area. In addition Austeel has sought input from every listed aboriginal organisation in the Pilbara.

Austeel has also advertised in the local newspapers inviting any person who has knowledge of aboriginal heritage sites to contact Austeel's Perth office. Austeel held public meetings in Roebourne after sending over one hundred letters to all Native Title Claimants inviting them to the meeting.

137. The AHC would like to draw the attention of the proponent to the Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984. The AHC advises that the proponent may wish to consider strategies to minimise the risk of applications being lodged under this Act for protection of significant Aboriginal areas. Could the proponent comment on this?

A: Austeel is committed to carry out project development with minimum possible impact on Aboriginal heritage sites. Austeel has completed archaeological and ethnographic surveys to identify whether any heritage sites occur within the project area. The results of these surveys have been provided to relevant authorities. The correct procedures will be adopted to obtain permission to disturb any sites that cannot be avoided.

138. The Kurama Marthudunera people are represented by the Pilbara Native Title Service (PNTS), which has had dealings with Austeel since early 2001 about the Project. It is the Kurama Marthudunera people, in whose traditional lands Austeel Pty Ltd (Austeel) proposes to build and operate a mine, processing plant, two harbour facilities, water treatment plant, power station, and associated infrastructure (the Project). The Project will disturb nearly 2,000 hectares of land including significant parts of the coast that the Kurama Marthudunera people are culturally responsible for. Austeel does not propose to rehabilitate the mine site at the conclusion of the Project. The PNTS advise that the Kurrama Marthudunera people consider that the Project should not proceed on the basis of the current PER and Austeel's attitude and actions to date regarding proposals for Aboriginal heritage. These matters need to be carefully considered and Austeel should be required to entirely re-commence its proposals in relation to Aboriginal heritage. Could the proponent comment on this issue?

A: Austeel has had dealings with the Kurama Marthudunera people since early 1996.

There is no clear evidence that the Austeel project land is solely the traditional land of the Kumara Marthudunera people. There are currently three registered native title claims covering the Austeel project land, of which only one is representative of the Kumara Marthudunera group. The Federal Court of Australia is equally assessing all these claimants' rights to the land.

The comment states that the Kurama Marthudunera people are "culturally responsible" for the project area. This also needs to be established in the Federal Court of Australia. Presently the Kurama Marthudunera people are in conflict with other claimant groups and interested parties, such as the Ngaluma/Indjibandi people, as to who are the traditional owners of the Project land. All three native title claimant groups have tried to involve Austeel to support their claims.

Austeel's project is one of the biggest in the history of Australia with over five billion dollars investment involving renowned international and local companies as consortium members to the project. It has taken the project proponent over ten years of intensive work to bring this project to this level of development. The project has received full support from the Federal and State governments and it is in the interest of the wider Western Australian community that the project proceeds. Austeel suggests that the PNTS should re-examine their opposition to the project and work constructively with Austeel and other stakeholders, including the Commonwealth and State governments who not only support the project, but have strong economic and financial interest in the project as well. Austeel reiterates its position that it respects and recognises its legal responsibilities under the *Aboriginal Heritage Act* 1972 on heritage matters.

139. The PNTS notes that Austeel has appointed inappropriate consultants to undertake heritage (ethnographic and archaeological) surveys. PNTS has confirmed to Austeel on numerous occasions, both in writing and verbally, its instructions from the Kurama Marthudunera group that the group is willing to assist regarding heritage matters, but must be involved in the choice of a suitable heritage consultant. The company's attitude has been that it will engage the consultants it wishes to undertake heritage surveys, and that the Aboriginal people affected by this must elect whether or not to participate in the process as determined by Austeel. This breaches the representations made by Austeel during the Roebourne meeting, that Austeel would not tell people which consultants they had to work with. The Wong-Goo-Tt-Oo is the only native title claim group of the three prepared to work with Mr. Quartermaine and Mr. O'Connor, and at the Roebourne meeting several members of that group expressed dissatisfaction with their level of knowledge and involvement with decisions made on behalf of the group. PNTS has informed Austeel that our clients are not prepared to accept or endorse any heritage survey report produced by Mr. O'Connor or Mr. Quartermaine. It appears doubtful that Austeel has a real commitment to genuine consultation with Aboriginal people whose traditional country will be affected by the Project. Could the proponent explain why the consultant was not chosen via a consultative process?

A: Refer to question 134.

Following consultation with the aboriginal groups it was decided that independent archaeological and ethnographic consultants should be appointed to conduct the surveys.

Austeel's appointment of Mr Quartermaine and Mr O'Connor to undertake the archaeological and ethnographic surveys was initially acceptable to three of the four

aboriginal claimant groups, representing 93% of the total Aboriginal people interested in aboriginal heritage within the project area.

Mr Quartermaine and Mr O'Connor are suitably qualified and experienced to undertake the surveys.

Austeel made considerable efforts to include the Kumara Marthudunera group in the survey but found that the PNTS persistence in objecting to Austeel's consultants, in preference to their own consultants, unacceptable and that that it presented a conflict of interest.

Austeel is pleased to report that representatives from all of the aboriginal groups have now participated in the surveys.

140. The PNTS notes that some time during 2000, Austeel conducted bulk sampling and drilling work on-site, without any heritage survey being undertaken. PNTS was informed by Austeel in our initial meeting that a 'desk-top' survey had been undertaken by Mr. Rory O'Connor. PNTS has not seen the report of this survey, although it is presumably the report by Mr. O'Connor referred to in the PER at 14.3 (Preliminary Ethnographic Report on MLs 08/118 to 08/130, 2000). The Kurama Marthudunera claimants were not informed or consulted at all regarding this work or its impact on heritage sites. PNTS has explained to Austeel that by undertaking the work in this manner they may have breached the Aboriginal Heritage Act 1972. PNTS was informed by Austeel at a meeting held with them and the Department of Resources Development on 1 February 2001, that heritage sites had been damaged by their exploration activity. The response from Austeel staff was that this damage occurred before the current staff were employed. Could the proponent comment on this matter?

A: Austeel staff has never admitted that damage to any site has occurred. Austeel find this allegation defamatory and unsubstantiated as no damaged site has ever been identified by PNTS. Austeel is not aware of any site that has been damaged by any of its work.

The Aboriginal Heritage Act does not prohibit such work nor require a survey to be carried out before such work is undertaken. Austeel advises that the results of an archaeological survey by Mr. Gary Quartermaine have shown that there are no archaeological sites in the vicinity of the bulk sampling/drilling operations.

On a number of occasions PNTS has been asked to specify exactly the site that it alleges has damaged but this information has never been provided. Minutes from the meeting of 1 February 2001 show no reference to an admission by Austeel that "heritage sites have been damaged". The Austeel representative in attendance would not have had knowledge of whether any heritage sites had been damaged and consequently would not have been in a position to make such an admission.

To this date PNTS has not provided Austeel with full particulars or any evidence of any alleged interference by Austeel or any other person of an Aboriginal site in the project area.

141. The PNTS requested a copy of the Preliminary Ethnographic Report from Austeel. Austeel has refused to allow PNTS to view the report, stating that the document "is confidential company information…not for distribution" (facsimile from Austeel to PNTS, 30 March 2001). Could the proponent provide the report or explain why it can not be released?

A: PNTS represents only one of a number of interested parties and claimant groups. As such, it is difficult to see why they alone should have a right to view confidential Company documents. There are only a few sentences from the document in question which relate to the claimant group represented by PNTS. The remainder of the document does not refer to them. This document has subsequently been obtained by PNTS under Freedom of Information.

The nature of the information contained in the document and the circumstances in which it was obtained also make it inappropriate for the company to simply release it to the public (see response to Question 142).

142. The PNTS note that the PER refers (at 14.3) to three Aboriginal people with whom "discussions were held" during the study: Patricia Cooper, Wilfred Hicks and Cane Hicks, none of whom are from the Kurama Marthudunera native title claim group. The PER states at 14.3 that "[t]o date, the Kumara Marthudunera 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 development plans". We are not aware of any heritage surveys commissioned by Austeel 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. Accordingly, such a statement is of dubious weight. Could the proponent comment on this matter?

A: In the course of preparation of the desk-top report, discussions were held by Mr R O'Connor with the three named persons, and with others who did not wish to be named, regarding the nature of further Aboriginal heritage work to be undertaken in the Project area. This is standard methodology for such a document. In addition, Austeel wrote letters to the Kurama Marthudunera people and all other Native Title Claimants to request that they provide any details of sites to Austeel or to report these to the Aboriginal Affairs Department. This is consistent with the provisions of the Aboriginal Heritage Act. Also the current Austeel Ethnographic Survey has been undertaken with the participation of Jean Lockyer a senior member of the Kurama Marthudunera people.

143. The PNTS note that the PER states at 14.3 that there is the recognition that a detailed archaeological field survey of the study area will reveal further heritage sites. However, no details are provided on how Austeel 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 Kurama Marthudunera group. Will the proponent make this commitment?

A: The archaeologist's report will contain recommendations for management of any archaeological sites discovered. Further, any heritage management plan would need to be developed in consultation with all Native Title Claimant Groups. The PNTS should not pre-empt the Federal Court by assuming that their clients will be the sole native title parties to the Austeel Project area, an unlikely scenario given the anthropological evidence. The archaeology survey has now been completed.

144. The PNTS note that at 3.2.6 of the PER, it is stated that a service corridor route has been identified, and is "unlikely to vary significantly". The PER provides that final alignment will be determined in consultation with CALM following further biological and heritage studies. The PER provides for no process for dealing with Aboriginal heritage in relation to this issue. Given that heritage issues are of relevance to the route of the service corridor, the development of the route should be undertaken with adequate consultation with Aboriginal people, not only with CALM, with the commitment that the route be redrawn if necessary to safeguard sites of heritage significance. Will the proponent undertake to consult and make the suggested commitment?

A: Aboriginal Heritage surveys have been conducted that cover the entire Project area and consultation has been undertaken with representatives of all Aboriginal groups with interests in the area.

145. At a meeting at DRD in January, PNTS indicated that the Kurama Marthudunera people wanted to be involved in heritage protection, but the arrangements for a heritage survey (such as methodology, conduct etc) was a matter upon which the group would decide. Austeel indicated, during this meeting, that it wanted to perform a heritage survey of the entire Project area and related tenements. PNTS explained to Austeel's representatives that PNTS could provide Austeel with a detailed proposal outlining what heritage work would need to be done on the Project area before ground-disturbing work could occur. Austeel accepted PNTS's offer and agreed to provide PNTS with maps and information to assist PNTS's preparation of the proposal. Despite repeated requests, Austeel has never provided PNTS with adequate maps. Could the proponent explain why the maps were not provided?

A: Austeel was of the view that appointment of the PNTS to be responsible for the conduct of the heritage survey, and who represent only one claimant group, was not in the best interests of the remaining groups. As a consequence Austeel appointed independent consultants. This approach has been successful with representatives from all claimant groups having taken part in heritage surveys.

146. The PNTS notes the PER states at 14.3 that Austeel's consultation with Aboriginal people "will involve meetings with representatives of the claimant groups during the public review period for the Project and archaeological and ethnographic site investigations." Austeel held a "public meeting" in Roebourne in late February 2001. Perhaps more than anything else, the manner in which this meeting was arranged and held reflects Austeel's approach to Indigenous affairs. Austeel arranged the meeting with numerous Aboriginal people from the Pilbara region but

neglected to inform the Pilbara representative body until one working day before the meeting. Had PNTS been consulted (or even notified) in advance of Austeel's intention to hold a meeting, we could have arranged that all members of the claim group were properly informed in time to attend the meeting. As it was, those who did receive notice received it only one working day before the proposed meeting, which made it difficult for them to make arrangements to attend. Austeel's representatives arrived over 1 ½ hours late for the meeting. The day was hot, and not conducive to elderly people being prepared to wait in the sun in the car park outside the Roebourne for that period of time. PNTS officers present at the meeting understand Austeel did not refer to the PER and no copies of the PER were distributed.

Several Yindjibarndi people briefly attended the meeting, as they had been invited by Austeel. This was the cause of a significant degree of tension, as members of the native title groups present had to inform Austeel's representatives that this was inappropriate. Some Yindjibarndi people who arrived, when informed of the location of the proposed Project, immediately noted that this was not within the traditional country of the Yindjibarndi people, and left the meeting. The Roebourne meeting was not organised or handled at all well. Its mishandling suggests a total lack of familiarity with Aboriginal affairs by Austeel's officers, and a lack of commitment by Austeel to genuine consultation. Could the proponent comment on this issue and outline a plan for appropriate and meaningful consultation?

A: See response to Questions 134, 136.

Austeel received encouraging feedback from all groups participating at the meeting, which has resulted in all groups participating in the Heritage Survey. The PER document was sent to PNTS and to everyone else requested by the DEP on the "free" mailing list during December 2000.

In addition, it appears that PNTS is unaware of the fact that the Aboriginal Legal Service amended the Ngaluma – Injibandi application in the course of the recent Federal Court hearings and that the claim, as amended, now deals separately with "Ngaluma land" and "Indjibandi land", rather than with a composite. We thank the PNTS for confirming that the Ngaluma have no rights beyond the Maitland River and would ask them to notify their client, David Daniel, of their opinion on the matter. However, we note an inherent contradiction in Questions 146,147 and 148. Sub-groupings of the Indjibandi people undeniably have traditional rights to stretches of the Fortescue River. For that reason, Austeel is involving them in the consultation and surveys of the Project area. This is the "broader scale" to which the PNTS refers in Question 148. To ask Austeel to undertake this broader work and at the same time to criticise them for doing it (see Question 148) is self-contradictory and patently silly. Austeel's view is that it will consult with all people who make up the communities in the Pilbara, regardless of race, and Austeel is not prepared to accept directions from PNTS as to who it may discuss it's project with.

147. The PNTS has subsequently learnt that Austeel may be arranging for Yindjibarndi people to be included in the heritage survey arrangements for the Project. A brief examination of the native title claims shows that the Ngaluma Injibandi (the different spelling relates to the name as filed in the Federal Court) claim does not include any land near Cape Preston. Historical and contemporary anthropological reports covering the Pilbara show Yinjibarndi lands do not include Cape Preston. If a heritage survey relies on assessment by Yindjibarndi people of any area with which they have no traditional connections, the credibility of such a report would be in question. Could the proponent comment on this matter?

A: See response to Question 146.

The meeting was notified to all Aboriginal groups and aboriginals directly in the Pilbara.

148. The PNTS state that it should be noted that the entire length of the Fortescue River is culturally significant to many Aboriginal people within the Pilbara region. For this reason, consultation regarding heritage and the social impact of the Project would need to occur not only with the three claimant groups that have lodged native title claims over the Project area, but also with other groups who have traditional responsibility for the maintenance and preservation of the cultural and social values associated with this river system. Therefore, consultation with Aboriginal groups about the Project needs to be undertaken on a broader scale, in order to determine people's attitudes on heritage and other matters. Could the proponent undertake this consultation and present the results?

A: See response to Question 146.

One wonders how PNTS can ask such a question considering their Question 148. Public advertisements were lodged and direct mail-outs sent to all interested aboriginals in the Pilbara.

149. The PNTS notes that the PER states, at 14.3, that a Mr. David Harvey of the ALS attended meetings between Mineralogy and members of the Kuruma Marthudunera native title claim group on 21 February and 2 March 2000. This appears to be an error, as the ALS have advised that no-one by the name of David Harvey has been employed by the ALS. In any event, no details are given of which members of the Kuruma Marthudunera native title claim group attended these meetings. Could the proponent clarify this matter?

A: The person Mineralogy originally dealt with from ALS was a person named David Hyams.

150. Barrack and Associates (BA), who represent the Yaburara / Mardhudunera claimant group note that it is their understanding that Mr O'Connor was never consented to by the group to undertake ethnographic surveys over the subject land. Indeed, it appears that there may be a conflict of interests in the fact that Mr O'Connor acted or still acts for one of the overlapping claimant groups, namely Wong-Goo-Tt-Oo. Could the proponent comment on this matter?

A: Barrack and Associates are, to the best of Austeel's knowledge, accountants for some members of the Yaburra and Coastal Marthundunera group. They do not represent the entire group. Mr O'Connor gave evidence as an expert witness to the Federal Court in regard to the Wong-goo-tt-oo native claim title. As such, he was not "acting for" them as he had a duty to present to the Court all relevant evidence, be it supportive or destructive of the claim (see the Federal Court *Rules for Expert Witnesses*). Indeed, Mr O'Connor assisted the Yaburra and Coastal Marthudunera also, by completing and lodging their application for determination of native title and acting as their Perth representative until such time as they appointed McDonald Rudder as their legal representatives. In any event, Austeel has been advised that the members of the group relevant to Mardie and Balmoral Stations have consented to Mr O'Connor being appointed, so this comment is inaccurate.

151. BA note that the PER mentions Austeel's ongoing discussions with major Aboriginal groups in the area but there has been little or no detailed discussions with Yaburara / Mardhudunera claimant group. Could the proponent comment on this matter?

A: See response to Question 134.

Also, please note, following the Roebourne meeting, Austeel sent individual letters to all members of the Yaburara/Marthudunera Native Title Claimants, and to date no single member has responded to Austeel in a negative manner.

152. BA note that their clients have never seen a copy of the draft agreement of 30 October 1996 mentioned in the PER. Could the proponent provide a copy?

A: The agreement was sent to their legal representative at the time. The agreement and its contents are now not relevant some 5 years later since the issue and law has changed substantially.

153. BA note that the PER mentions that the Yaburara / Mardhudunera claimant group have failed to identify Aboriginal Sites upon the Austeel project area, however there is evidence that the claimants advised Austeel at the time of the importance of survey work being undertaken prior to commencement of any site works or publication of reports. Could the proponent comment on this matter?

A: See response to Questions 134, 136 and 137.

Aboriginal heritage and archaeological surveys have now been completed and results have been made available to relevant parties. No site locations have ever been identified to Austeel or Mineralogy by BA or their clients.

154. BA note that their clients are also investigating strong anecdotal evidence that the proponent has disturbed and impacted on Aboriginal sites without the prior consent of the Yaburara / Mardhudunera claimant group. Could the proponent comment on this matter?

A: It appears that BA is stating that they are aware of the existence of a place or thing to which the *Aboriginal Heritage Act* (1972 – 95) may apply. If so, they have a clear duty

under Section 15 of the Act to declare that knowledge to an appropriate person, as nominated in the Act. They should be aware that not to do so is an offence and that the Act was written to protect Aboriginal heritage. The allegation against Austeel is untrue, unsubstantiated and highly defamatory.

Appendix 3

Summary of identification of relevant environmental factors

APPENDIX 3 IDENTIFICATION OF RELEVANT ENVIRONMENTAL FACTORS

Preliminary environmental factors	Proposal characteristics	Government Agency and Public comments	Environmental Factors
BIOPHYSICAL			
Vegetation communities: maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities	Total area of disturbance is 1916ha, prior to rehab. of 1696ha (all but the pit). Of the mapped vege. types only two affected by over 20% of the totals mapped: creeklines within the Horseflats System (75%) and rockpiles in Newman and Rocklea systems (23%), the latter being the site for the tailings storage.	Area is largely unmodified and contains a number of values of high conservation, including mangroves, linear dunes, riverine systems and cracking clay communities (the Horseflats Land System). CALM recommends a second survey, in the Horseflats land system and other areas where rare and priority flora are most likely to be found. Site for the village has not yet been defined-any related flora and fauna survey issues? Groundwater drawdown will result in vegetation loss, including from riverine system.	Considered to be a relevant environmental factor
Introduced species: minimise their spread	Project covers part of the largest Mesquite infestation in Australia.	Weeds could become more abundant as a result of project-related ground disturbance. Recommend Austeel becomes an active member of the Pilbara Mesquite Control Committee.	Considered to be a relevant environmental factor
Declared Rare and Priority Flora: protect, consistent with the provisions of the Wildlife Conservation Act 1950.	8 Priority flora species listed as occurring in the area. A further Priority 1 sp. may be present.	As well as the 8 species listed, any specimens of *Goodenia pallida* found during further botanical collecting (to be done prior to commencement of project) and in the way of the project to be managed to requirements of CALM	Considered to be a relevant environmental factor
Terrestrial Fauna: maintain their abundance, species diversity and geographical distribution.	Relatively species rich, especially along creeklines and in cracking clays.	CALM notes that only a single survey was carried out but that additional work on wading birds is being done. This should be forwarded to CALM when completed.	Considered to be a relevant environmental factor
Specially Protected (Threatened) Fauna: • • protect Threatened Fauna and Priority Fauna sp. and their habitats, consistent with the provisions of the *Wildlife*	No Schedule-listed species were recorded in the survey but seven Priority-listed species recorded.	Terrestrial fauna survey work appears to have been well done.	Considered to be a relevant environmental factor

Conservation Act 1950.			
Preliminary environmental factors	**Proposal characteristics**	**Government Agency and Public comments**	**Environmental Factors**
stygofauna: protect, consistent with the provisions of the *Wildlife Conservation Act 1950* and maintain their abundance, species diversity and geographic distribution.	One isopod species has been described from bores in the orebody but from nowhere else. All other species sampled from the orebody are also found elsewhere.	Groundwater ecosystems need to be integrated into the earliest stages of project planning. The WA Museum has recorded a rich stygofauna elsewhere in the Fortescue River Alluvium. CALM notes that only a single stygofauna survey was carried out, but that additional work is being done. It could be unsafe for the project to advance before the nature and distribution of stygofauna in the area is established. Because of its statutory responsibilities for stygofauna CALM needs to be included in the review of sampling design and the results of surveys. The proportion of groundwater estimated to be diverted due to dewatering of the pit could affect a disproportionately larger percentage of stygofauna due to the heterogeneously distributed groundwater and the unknown status and distribution of the stygofauna.	Considered to be a relevant environmental factor Note that the submissions do not reflect later survey data that one Isopod species is found only in the orebody.
COASTAL FEATURES			
mangroves: • no development should take place that would significantly reduce the mangrove habitat or ecological function of the mangroves in the area as designated in Figure 5 of the EPA's Draft Guidance Statement No 1: *Guidance for the protection of tropical arid zone mangroves along the Pilbara coastline*.	A well developed mangrove system fringes the major tidal creek south of Cape Preston. Its total area is 30-40ha. The crossing point of the service corridor is expected to directly impact 0.15ha. Impacts from sedimentation, changing coastal drainage and tidal patterns are harder to quantify and would take longer to manifest.	Placement of the tailing dam on creeklines that feed mangroves and tidal flats may affect the mangroves. Changes in sedimentation loads and drainage patterns would have a significant effect on riverine and near-coastal ecosystems. The Conservation Council states that mangroves in the Cape Preston area are designated as internationally, regionally and locally significant. Long term indirect impacts such as reduction in tidal flushing and inundation, changes in erosion and accretion patterns, impoundment of water at higher than natural levels and alteration of freshwater surface drainage or dust deposition regimes on mangroves could be significant. There is potential for impacts from large numbers of people creating new roads and boat ramps into sensitive areas.	Considered to be a relevant environmental factor
Foreshore (beach): • maintain its stability. integrity, function and environmental values. **Dunes:** maintain their integrity, function and environmental values.	The sandy beach and mud flats have the greatest biological significance, due to their usage by birds, turtles and mangroves	Inshore marine areas are significant for wading birds and possibly turtles. The risk of impacts to the status quo from the solid causeway needs to be examined closely before it is approved. Sensitive coastal locations could become degraded under visitation pressure from employees.	Considered to be a relevant environmental factor

Preliminary environmental factors	Proposal characteristics	Government Agency and Public comments	Environmental Factors
Island shores: • maintain the abundance, biodiversity, productivity and geographic distribution of the associated plants and animals. • maintain the abundance, biodiversity, productivity and geographic distribution of associated marine life.	Preston Island will need to accommodate port and loading facilities, toilets, mess facilities, fuel and water pipelines, power lines, storage facilities parking and laydown areas	Insufficient recognition that Preston Island is part of a nature reserve system of islands vested in the Conservation Commission of WA (the Great Sandy Islands Nature Reserve). The proposal means massive disturbance of the island. Its conservation values will be essentially lost. Compensation in some form for this loss is likely to be required.	Considered to be a relevant environmental factor
Marine Fauna: maintain their abundance, species diversity and geographic distribution	The seawater intake will be sited adjacent to the causeway in about 10m of water. The brine discharge will be either off the west beach or adjacent to the jetty in 5-10m of water	Fish may be trapped in the seawater intake, especially during their larval and juvenile stages. Fisheries Dep't seeks a commitment to monitoring (and adjustment if necessary) of the intake screen configuration. Also concerns about possible impacts to prawn nursery grounds. There will be a discharge zone of water with contaminants and at slightly elevated temperature which may affect marine organisms such as corals. Construction will cause sedimentation and turbidity, possible spills. Operations may cause dust, runoff and possible spills.	Considered to be a relevant environmental factor
turtles: • protect, consistent with the provisions of the *Wildlife Conservation Act 1950*. • avoid impacts on turtles and their habitats, to meet the requirements of the Wildlife Conservation Act and the Commonwealth Endangered Species Act, and to adhere to national and international obligations.	The sandy beaches on the west side of Cape Preston will not be directly affected by the development but a change to the current and long shore regime caused by the causeway may change sedimentation patterns in this area.	Due to unusual seasonal circumstances a low level of turtle activity was recorded. It is expected that normally turtle counts would be higher. A further survey is recommended in future seasons in order to determine how significant the Cape Preston area is. The Australian Heritage Commission has concerns that the solid causeway could interfere with the movements of turtles and other fauna. Lights can disorient adult and hatchling turtles and lead to mortalities. Austeel should commit to minimise the effects of lights if the survey finds that the area has a significant nesting population. Controls of predation of hatchling turtles by foxes would be a significant contribution to the conservation of sea turtles.	Considered to be a relevant environmental factor

Preliminary environmental factors	Proposal characteristics	Government Agency and Public comments	Environmental Factors
coral reefs: • maintain their abundance, species diversity and geographic distribution. • maintain the abundance, biodiversity, productivity and geographic distribution of the marine life of the coral reefs. • protect their abundance, diversity, geographic distribution and productivity.	The proposed jetty, dredged channel and berthing areas will destroy coral and benthic communities. Dumping of dredge spoil will create short term turbidity with possible effects, depending on where the dumping ground is located. This is not yet known.	The DEP found there is a need better measures to mitigate adverse effects on corals around Preston Island from proposed port development and shipping. Potential for impact to fish habitat in the area of high coral cover off the northern point of Preston Island through direct impacts or via sedimentation from the construction or presence of the causeway. The Department of Fisheries stated that though coral habitat may be lost there is potential for new habitat to be created around the rock-lined causeway. This could be maximised if designed accordingly to allow a shallow platform to be formed to enable colonisation by coral polyps.	Considered to be a relevant environmental factor.
introduced marine organisms: minimise their risk of introduction	Up to 4 ships (from 20,000 to 140,000DWT) per week can be expected to use the port.	There is a risk of introducing exotic marine organisms into the environment during ballast water discharge when ships come to load product, or directly from the ships' hulls.	Considered to be a relevant environmental factor
Marine water and sediment quality: • maintain consistent with the Australian and NZ Guidelines for fresh and marine water quality. (ANZECC and ARMCANZ, 2000); • maintain water quality and sediment quality to EPA (1993) standards and to protect environmental values of recreation, aesthetics, aquatic life or human consumption, aquaculture, industrial water supply and maintenance of ecosystems in agreed areas.	Returned brines will be discharged at one of two locations-either into shallow water on the western beach or off the trestleway in 5-10m of water. The volume has increased from 33 million cubic metres per annum (Mm^3pa) in PER to 57.8 Mm^3pa. It will be at 1-2^o higher than ambient temp, hypersaline (64ppt) and contain additives to control algal growth, scaling and corrosion. Modelling demonstrates a zone of impact 150m wide at the deepwater site and 100m x 30m for the shoreline disposal point	DEP would like commitments to eliminate or minimise TBT contamination in the proposed port. Seek clarification with regard to the chemicals which will be released to the discharge outfall and what effects they may have on the marine environment. Need detailed hydrological modelling over a range of tides and weather conditions.	Considered to be a relevant environmental factor

Preliminary environmental factors	Proposal characteristics	Government Agency and Public comments	Environmental Factors
turbidity: maintain turbidity levels from construction and operation of port activities to accepted ANZECC criteria to protect agreed environmental values	In the marine environment this will be caused by dredging, dumping of the dredge spoil, & creation of the rock causeway, trestle jetty and port runoff. Ships using the channel and port may also cause regular short term turbidity	Detail required on dredge spoil disposal site and the fate of the spoil post-dumping and the likely environmental implications. Details of the scope of the marine monitoring programme are required to assess its adequacy. Timing of dredging and dumping of dredge spoil needs to be considered in consultation with CALM and DEP. These activities have the potential to have a significant effect on coral communities. Must avoid coral spawning event.	Considered to be a relevant environmental factor
Seabed: development should not have a significant impact on existing coastal processes, including off-shore sediment movement.	The solid causeway from Cape Preston to Preston Island is likely to affect existing tidal regimes and hence the sedimentation and scour patterns in the area	The PER has insufficient attention to changes in nearshore current regime as a result of the causeway. There is potential for impacts such as erosion due to diversion of tidal flows augmented at times by storm surge.	Considered to be a relevant environmental factor
Rivers, watercourses and ephemeral streams: maintain their integrity, functions and environmental values. • ensure that the quantity and seasonal variation in flow of surface and groundwater is maintained, throughout the life of the mine and after decommissioning. • ensure that alterations to surface water drainage do not adversely impact indigenous vegetation.	The minesite, tailing dam, waste dumps and infrastructure are generally situated within or adjacent to the Fortescue River flood-plain. The Edward and du Boulay Creeks traverse the project area. Some channel diversions will be needed. Drainage to the east of the pit will be diverted southwards.	To provide a reliable assessment of the Fortescue River's flood levels, detailed survey cross sections are required of its floodplain. Storm surge and tsunami levels and their potential effects on project components are not well understood. Runoff from the waste dumps could wash into du Boulay Creek and compromise a nature trail proposed from a permanent waterhole to the du Boulay Crossing. The location of the village has not yet been decided.	Considered to be a relevant environmental factor

Preliminary environmental factors	Proposal characteristics	Government Agency and Public comments	Environmental Factors
Surface water quality: • maintain or improve the quality of surface water to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the Australian and NZ Guidelines for fresh and marine water quality. (ANZECC and ARMCANZ, 2000); and the NHMRC / ARMCANZ Australian Drinking Water Guidelines - National Water Quality Management Strategy.	With the proposal traversing the Edward and du Boulay Creeks and lying adjacent to the Fortescue River floodplain there is potential for contaminated runoff to affect these systems.	A permit will be required from the Water and Rivers Commission to obstruct or divert any waterway. Consideration needs to be given to the control and minimisation of water-borne sediments arising from disturbances associated with the project. A creek sediment sampling regime needs to be implemented as soon as possible to obtain sufficient data (over several rain events) before the start of construction. Any water discharged to a watercourse from pit de-watering would need a licence from DEWCP. Information is sought on the size of the rainfall event that the settlement ponds to be used to collect site runoff will be able to contain.	Considered to be a relevant environmental factor
Groundwater quantity: • maintain so that existing and potential uses, including ecosystem maintenance, are protected. • Ensure that groundwater resources used for public water supply are protected in accordance with NHMRC / ARMCANZ Australian Drinking Water Guidelines - National Water Quality Management Strategy.and that land uses which could affect both the quantity and quality of groundwater are appropriately controlled.	The existence of the pit will create a drawdown zone which has the potential to adversely affect a very high proportion of the deep-rooted creekline vegetation in the area	Insufficient level of detail in the groundwater investigations in the vicinity of the mine, tailings dam and waste rock dumps. Bores for stock and humans downstream from the project may be adversely affected.	Considered to be a relevant environmental factor
Groundwater quality: • maintain or improve its quality to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the Australian and NZ Guidelines for fresh and marine water quality. (ANZECC and ARMCANZ, 2000); and the NHMRC / ARMCANZ Australian Drinking Water Guidelines - National Water Quality Management Strategy.	There is potential for contaminated runoff and seepage from the facilities and tailings dam to enter the groundwater system unless properly managed and monitored	Concern that the freshwater supply in the Fortescue River might become contaminated from the upstream effects of the project. Bores for stock and humans downstream from the project may be adversely affected.	Considered to be a relevant environmental factor

Preliminary environmental factors	Proposal characteristics	Government Agency and Public comments	Environmental Factors
POLLUTION MANAGEMENT			
Particulates / Dust: • ensure that the dust levels generated by the proposal do not adversely impact upon welfare and amenity or cause health problems by meeting statutory requirements and acceptable standards. • (i) ensure that particulate emissions, both individually and cumulatively, meet appropriate criteria and do not cause an environmental or human health problem; and (ii) use all reasonable and practicable measures to minimise the discharge of particulate wastes.	The proposal has the potential to emit dust from construction activities and the storage and handling of iron ore such as: Crushing Screening Concentrator Conveyor transfer points Stockpile areas Access roads.	The DEP requested that the proponent provide details of dust management at the potential emission points. CALM suggested dust may be able to reach Dampier and Karratha and requested further information on this possibility.	Proponent has provided information on managing fugitive dust emissions that are considered adequate to manage the issue. Considered to be a relevant environmental factor
Gaseous emissions: • ensure that gaseous emissions do not adversely affect the environment or health, welfare and amenity of nearby land users by meeting the statutory requirements (including Section 51 of the Environmental Protection Act 1986) and acceptable standards. • (i) ensure that gaseous emissions, both individually and cumulatively, meet appropriate criteria and do not cause an environmental or human health problem; and (ii) use all reasonable and practicable measures to minimise the discharge of gaseous emissions.	Plant emissions to air under normal operating conditions are predicted to be: Nitrogen oxides (NOx): 19761 tpa Sulphur dioxide (SO2): 1573 tpa Particulate matter (PM10): 2567 tpa The proposal would be by far the largest emitter of Nox in the region.	The DEP noted that the requirement in the Air Quality and Air Pollution Modelling Guidance under "identify and quantify all emissions to atmosphere" to identify whether metals will be released from any of the stacks had not been addressed. The DEP noted that the requirement in the Air Quality and Air Pollution Modelling Guidance under "presentation of modelling results" to determine the meteorological conditions causing highest concentrations at important receptors should be determined to check that the model is yielding sensible results had not been addressed. The DEP noted that the effect of intermittent emissions expected under transient conditions had not been provided and requested this information.	Considered to be a relevant environmental factor

Preliminary environmental factors	Proposal characteristics	Government Agency and Public comments	Environmental Factors
Greenhouse gases: • ensure that greenhouse gas emissions meet acceptable standards and requirements of Section 51 of the Environmental Protection Act 1986 (all reasonable and practicable measures are taken to minimise greenhouse gas discharge). • (i) ensure that greenhouse gas emissions, both individually and cumulatively, meet appropriate criteria and do not cause an environmental or human health problem; and (ii) use all reasonable and practicable measures to minimise the discharge of greenhouse gases.	Greenhouse gas emissions to air are predicted to be: CO2 equivalent: 5,558,000 tpa The proposal would be a major contributor to WA's greenhouse gas emissions.	The Department of Environmental Protection (DEP) noted that a detailed assessment of gas emissions needed to be undertaken. In particular "no regrets" and "beyond no regrets" measures needed to be detailed. The DEP also asked the proponent to consider waste heat recovery either via a combined cycle power station or in the desalination plant. The Australian Greenhouse Office (AGO) requested a complete inventory of all greenhouse gas emissions along with the methodology and calculations be provided. They questioned the basis on which combined cycle was not considered economic. The AGO also sought more details of "beyond no regrets" measures.	Considered to be a relevant environmental factor
oil (from spill incidents): ensure that the risk of an oil spill is extremely low, that actions are taken to reduce identified risks	Operations at the port and shipping could cause spills.	There is a need for a marine management plan which includes an oilspill contingency plan. Austeel has committed to developing these, as well as a waste and hazardous materials management plan as part of its EMP.	Not considered to be a relevant environmental factor
Soil contamination: • ensure the rehabilitation of the site to an acceptable standard that is compatible with the intended land use, consistent with appropriate criteria.	Fuel storage and oily wastes will be managed in accordance with DEP requirements	The proponent will dispose of all hydrocarbon-contaminated soils in accordance with conditions specified by the DEP and consistent with EPA guidelines for oil farming of oily wastes. There were no submissions on this issue.	Not considered to be a relevant environmental factor
Noise: • ensure that noise impacts emanating from the proposed plant comply with statutory requirements and acceptable standards.	Noise will be generated by the mining, process plant, power station, conveyor system and port activities	The closest noise-sensitive residence is at the Fortescue River Roadhouse which is over 25km away. The mouth of the Fortescue River is some 8km distant. Modelling indicates that noise levels here will be at or close to ambient. Low-noise equipment will be used. Blasting will occur at designated times during daytime.	Not considered to be a relevant environmental factor
Road transport: • ensure that noise levels meet acceptable standards and that an adequate level of service, safety and public amenity is maintained.	Product from the process plant may be either transported by conveyor or by road to the port.	Concern that public access to the mouth of the Fortescue River and other recreational sites will be constrained by a haul road, with attendant safety issues. The proponent has committed to maintaining public access, although the road might need to be diverted.	Not considered to be a relevant environmental factor

Preliminary environmental factors	Proposal characteristics	Government Agency and Public comments	Environmental Factors
SOCIAL SURROUNDINGS			
Public health and safety			
risk and hazard: • ensure that risk is managed to meet the EPA's criteria for individual fatality risk off-site and the MPR's requirements in respect of public safety.	The public will be excluded from the immediate project area. Risk levels beyond the exclusion zone will comply with accepted standards.	With regard to the service corridor, will there be crossover points for people and wildlife; will there be a pipeline for diesel? The proponent has indicated that details of crossovers will be finalised following completion of aboriginal heritage surveys and that diesel will be transported by tanker. Common storage will be created for both diesel and bunker fuel at the port. As well there will be diesel stored at the power station. All storage will be to DMPR standards.	Not considered to be a relevant environmental factor
Heritage: comply with statutory requirements in relation to areas of cultural or historical significance.	There are no known European heritage sites, nor any shipwrecks discovered in the Cape Preston area.	The Shire of Roebourne stated that access to the DeGrey-Mullewa stock route ought not to be restricted.	
Aboriginal culture and heritage: (i) ensure that the proposal complies with the requirements of the Aboriginal Heritage Act 1972; and (ii) ensure that changes to the biological and physical environment resulting from the project do not adversely affect cultural associations with the area.	34 sites are recorded in the Aboriginal Sites Register. Discussions with the four main Aboriginal groups associated with the area have not identified any sites of significance with the potential to impact on the project	Native title to the land is being contested by three groups and the decision over custodianship has yet to be made by the Federal Court. The PNTS, representing the Kurama Marthudunera Group, advised that its clients were not prepared to accept ethnographic and archaeological surveys unless they approved of the consultants. [This issue was subsequently overcome.] The PNTS complained that a public meeting held in Roebourne by Austeel was inadequately publicised and badly run.	Not considered to be a relevant environmental factor as no sites are expected to be impacted.
Recreational values: to maintain recreational uses of the area.	Current access to the mouth of the Fortescue River is via an unsealed track across the project area. The public will be excluded from some areas at Cape Preston and Preston Is.	The service corridor carrying product, power lines and pipelines needs to contain crossovers for people, vehicles and wildlife. How would the conveyor be protected from wildfires-is there a firebreak on both sides? Will pipelines also carry diesel to the minesite? What arrangements are being made for a communications infrastructure?	Not considered to be a relevant environmental factor

Preliminary environmental factors	Proposal characteristics	Government Agency and Public comments	Environmental Factors
Fishing: ensure that fisheries, nursery areas and recreational fishing locations are not significantly affected by heavy visitor pressures	There will be up to 5000 (construction) and around 420 (operational phase) employees and contractors living on site. Pressures on fishing and other recreational spots are expected.	Coastal waters to the SW of Cape Preston are designated as a Nursery Area. The proposed breakwater and port operation could impact on fishing. Also a concern about environmental damage from overuse of tracks and overfishing by Austeel recreational anglers.	Not considered to be a relevant environmental factor

Appendix 4

Recommended Environmental Conditions
and
Proponent's Consolidated Commitments

Statement No.

RECOMMENDED ENVIRONMENTAL CONDITIONS and PROCEDURES

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

IRON ORE MINE, DOWNSTREAM PROCESSING

(DIRECT-REDUCED AND HOT-BRIQUETTED IRON)

AND PORT CONSTRUCTION,

CAPE PRESTON, PILBARA

Proposal: The construction and operation of a 22.4 million tonnes per annum iron ore mine, power station, desalination plant, processing plant and accommodation and port facilities in the Cape Preston area, as documented in schedule 1 of this statement. The processing plant will produce pelletised, direct-reduced iron / hot–briquetted iron.

Proponent: Austeel Pty Ltd

Proponent Address: Level 1, 220 St George's Terrace, PERTH WA 6000

Assessment Number: 1114

Report of the Environmental Protection Authority: Bulletin 1056

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 Surface Waters

5-1 Prior to clearing and construction for the accommodation village site, the proponent shall demonstrate that its location and survey levels with respect to calculated flood water levels are environmentally acceptable, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

5-2 Prior to the final mine design plan, the proponent shall demonstrate that using accurate topographic survey data, that the mine waste dump and other project components are above the 100-year average recurrence interval flood levels to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

5-3 The proponent shall employ best practice measures in the design and construction of the waste rock dump and mine tailings storage facility to ensure that erosion and runoff from these structures, and all other project components, are minimised to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

6 Pit Dewatering and Vegetation Monitoring Plan

6-1 Prior to the commencement of pit dewatering, the proponent shall prepare a Pit Dewatering and Vegetation Monitoring Plan for the pit and its surrounding groundwater depletion zone, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

The objective of this plan is to allow deep-rooted vegetation, by extending their root systems, the maximum opportunity to adjust to the dropping water regime by dewatering the pit as slowly as possible, commensurate with the requirements of mining.

This Plan shall include monitoring of representative stands of creekline vegetation and other areas of conservation significance within the zone of groundwater depletion, to determine the extent of effects of groundwater drawdown on this vegetation.

6-3 The proponent shall implement the Pit Dewatering and Vegetation Monitoring Plan required by condition 6-2 to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

6-4 The proponent shall make the Pit Dewatering and Vegetation Monitoring 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 Subterranean Fauna

7-1 Prior to the commencement of pit dewatering, the proponent shall undertake further investigations and sampling of subterranean fauna, to demonstrate that the proposal does not pose a significant risk of the extinction of any species of subterranean fauna, to the requirements of the Minister for the Environment and Heritage, on advice of the Environmental Protection Authority.

Note: In the preparation of advice to the Minister, the Environmental Protection Authority expects to obtain advice from the Department of Conservation and Land Management.

7-2 Prior to the commencement of pit dewatering, the proponent shall prepare a Subterranean Fauna Monitoring Plan, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.
The objective of this Plan is to assist in the conservation of subterranean fauna species.

This Plan shall include:

1. subterranean fauna surveys of the areas to be affected by dewatering operations;
2 characterisation of subterranean fauna habitats to be affected by dewatering;
3 subterranean fauna surveys of similar habitats outside the areas to be affected by dewatering operations; and
4 specific measures to record and preserve biological information on any species collected in the project area.

7-3 The proponent shall implement the Subterranean Fauna Monitoring Plan required by condition 7-2 to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

7-4 The proponent shall make the Subterranean Fauna Monitoring Plan required by condition 7-2 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

7-5 The proponent shall submit the results of the Subterranean Fauna Monitoring Plan to the Environmental Protection Authority, the Department of Conservation and Land Management and the Western Australian Museum.

8 Marine Management Plan

8-1 Prior to commencement of ground-disturbing activities at Cape Preston, the proponent shall prepare a Marine Management Plan, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

The objectives of this Plan are to:

- accurately predict changes in coastal water movements, quality, residence times, bathymetry, sedimentology, beach alignment and habitat cover associated with the project, and
- allow for appropriate management measures to be identified and implemented.

This Plan shall address, as part of the iterative design of the project:

1) detailed marine surveys to establish existing regimes of currents, bathymetry, sedimentology, shore alignment and habitat cover, and modelling to predict the changes to those regimes associated with the construction and operation of a causeway between Cape Preston and Preston Island;

2) the iterative design of bridging structures, including open sections, to demonstrate that the regimes referred to above will not be unacceptably impacted;

3) the significance of, and changes to, habitats associated with dredging and dredge spoil dumping operations, and strategies to manage any associated environmental impacts;

4) the means to avoid significant damage to the high cover coral community at survey Location 9 to the north of Preston Island, including avoidance of dredging and spoil dumping during coral spawning events, from the construction and operational stages of the project;

5) detailed modelling of the areas of influence associated with the wastewater outfall location options with regard to temperature, salinity and discharged additives; and associated environmental effects;

6) coastal surveys to track changes, carried out for a sufficient period after construction and submitted to the Environmental Protection Authority, to confirm that the bridging structure and the wastewater outfall, together with other potential impacts from emissions and dust, are not causing significant impacts on mangroves, sandy beaches, or other coastal and marine ecosystems, including the corals off Preston Island; and

7) strategies to restore environmental quality to acceptable levels if surveys referred to in (6) above demonstrate that significant impacts have occurred to mangroves, corals, beaches, nursery habitats or other sensitive coastal and marine ecosystems.

8-2 The proponent shall implement the Marine Management Plan required by condition 8-1, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

8-3 The proponent shall make the Marine Management Plan required by condition 8-1 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

9 Marine Wastewater Outfall

9-1 Prior to commencement of construction of the wastewater outfall, the proponent shall characterise seawater quality at the proposed intake, discharge points of the outfall, and at a suitable reference station, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

9-2 Having regard for the findings arising from condition 9-1, prior to commencement of construction of the wastewater outfall, the proponent shall prepare a Wastewater Outfall Management Plan, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

This Plan shall:

- provide a High level of protection to the waters in the region of Cape Preston, except for the Moderate Protection Mixing Zone surrounding the outfall, both of which zones will protect social values (swimming and fishing);
- restrict the size of the Moderate Protection Mixing Zone surrounding the diffuser to one hectare in area;
- protect sensitive habitats from the construction, layout and operation of the outfall;
- develop monitoring and "feedback" programmes for the waste stream within the outfall to provide an early warning of potential risks to environmental quality;
- develop monitoring of ecosystem health indicators in the receiving marine environment, and select appropriate control sites for inclusion in the monitoring programme;
- ensure that the salinity variation resulting from the discharge is no greater than five percent above the ambient level for more than one percent of the time anywhere around Cape Preston (except within the proposed Moderate Protection Mixing Zone); and

- ensure that toxicant concentrations do not exceed the ninety percent species protection levels at the end of the outfall pipe for more than five percent of the time, nor exceed the ninety nine percent species protection levels at the edge of the Moderate Protection Zone.

9-3 The proponent shall implement the Wastewater Outfall Management Plan required by condition 9-2 to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

9-4 The proponent shall make the Wastewater Outfall Management Plan required by condition 9-2 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

10 Port Environmental Management Plan

10-1 Prior to commencement of ground-disturbing activities at Cape Preston and / or Preston Island (whichever is the sooner), the proponent shall prepare a Port Environmental Management Plan to address emissions from the port berthing facility, product-handling facilities, desalination plant, and associated structures, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

This Plan shall also be submitted to the Department of Conservation and Land Management and the Department of Fisheries.

The objectives of this Plan are:

- to maintain an adequate level of water quality in waters surrounding the port;
- to minimise runoff and spills;
- to avoid ballast water contamination and the introduction of exotic marine organisms from ships' hulls; and
- to contain light spill so as to minimise impacts on turtles.

This Plan shall:

1) establish Environmental Quality Objectives (EQO) that explicitly identify uses and values and where they will be protected, and the appropriate Environmental Quality Criteria required to sustain each Environmental Quality Objective.
   The Environmental Quality Objectives will include:
   - the ecosystem health objective (EQO 1) as defined in the Environmental Protection Authority document 'Perth's Coastal Waters, Environmental Values and Objectives' in the zones delineated in Figure 2 of schedule 1;
   - the fishing and aquaculture objective (EQO 2) in the zones delineated in Figure 2 of schedule 1; and
   - the recreational and aesthetic objectives (Environmental Quality Objectives 3 and 4 respectively) in the zones delineated in Figure 2 of schedule 1.

   Note: The above Environmental Quality Objective zones are subject to review in both extent and the guideline values and standard criteria applying to them, and may be varied from time to time on advice of the Environmental Protection Authority.

2) ensure that light spill is contained to minimise impacts on turtles;
3) ensure runoff and spills are contained;
4) incorporate an oilspill contingency plan;
5) incorporate a ballast water management plan; and
6) include a hull-fouling organisms management plan, which includes a risk assessment and a baseline marine survey for benthic and planktonic organisms in the area designated for ship berthing to minimise the risk of introduction of exotic marine organisms from ships' hulls.

10-2 The proponent shall implement the Port Environmental Management Plan required by condition 10-1, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

10-3 The proponent shall make the Port Environmental Management Plan required by condition 10-1 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

11 Air Emissions

11-1 Prior to construction of the process plant and power station (whichever is the sooner), the proponent shall establish a meteorological station to gather site-specific data which will allow the calculation of atmospheric stability and more accurate modelling of air emissions. The parameters to be measured shall be determined in consultation with the Department of Environmental Protection.

11-2 Prior to commissioning of the process plant and power station (whichever is the sooner), the proponent shall revise the air emission modelling using detailed design emission levels and at least twelve months of site specific meteorological data, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

11-3 Prior to commencement of construction of the process plant, the proponent shall investigate and implement best practice NO_X control and measures to reduce NO_X emissions from the pellet plant, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

11-4 Prior to commencement of construction of the process plant, the proponent shall prepare a Dust Management Plan which:

(1) incorporates baseline and ongoing monitoring;
(2) details management measures to minimise dust during construction;
(3) demonstrates best practice and details the methods to be used for all point and fugitive sources;
(4) incorporates monitoring to determine the size and composition of particulates;
(5) incorporates further investigations into reactive DRI dust and details measures to minimise impacts;
(6) provides for continuous improvements in dust management; and
(7) details complaint response procedures;

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

11-5 The proponent shall implement the Dust Management Plan required by condition 11-4, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

12 Greenhouse Gas Emissions

12-1 Prior to commencement of construction of the process plant and power station, 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) up-to-date 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) up-to-date 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; and
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.

12-2 The proponent shall implement the Greenhouse Gas Emissions Management Plan required by condition 12-1, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

12-3 The proponent shall make the Greenhouse Gas Emissions Management Plan required by condition 12-1 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

12-4 The proponent shall design and construct the power station in a combined cycle configuration, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

Note: combined cycle technology requires that the waste heat in the exhaust stream of the turbines generating electricity is used to generate more steam to drive steam turbines, which produce additional electricity. This improves the overall efficiency of the electricity-generating process. In an open-cycle power station the heat from the exhaust stream would normally be allowed to dissipate.

13 Noise Management Plan

13-1 Prior to the commencement of ground disturbing activities, the proponent shall prepare a Noise Management Plan to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

This Plan shall include:

1) modelling of cumulative noise levels associated with components of the expanded project at personnel accommodation sites, the project boundary and at the public campsite near the mouth of the Fortescue River; and
2) a strategy to protect popular "visitor locations" from undue noise levels associated with the project.

13-2 The proponent shall implement the Noise Management Plan required by condition 13-1 to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

13-3 The proponent shall make the Noise Management Plan required by condition 13-1 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

14 Recreational Use Management Plan

14-1 Prior to the commencement of ground-disturbing activities, the proponent shall prepare a Recreational Use Management Plan, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

This Plan shall include:

1) a strategy to maintain public access to recognised "visitor locations" including the Fortescue River mouth and permanent pools along the river (as committed to by the proponent);
2) consideration and steps to facilitate maintenance of appropriate fishing practices by employees (as committed to by the proponent); and
3) strategies to protect popular "visitor locations" (such as the mouth of the Fortescue River and permanent pools along it).

14-2 The proponent shall implement the Recreational Use Management Plan required by condition 14-1, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

14-3 The proponent shall make the Recreational Use Management Plan required by condition 14-1 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

15 Compliance Audit and Performance Review

15-1 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 that 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 by either 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.

15-2 The proponent shall submit a performance review report every six 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 associated with the project; the targets for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those targets;
- the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the 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 targets over the next six years, including improvements in technology and management processes.

16 Conservation Estate

16-1 In the event that the port facilities at Preston Island are to be developed, the proponent, in consultation with the Department of Conservation and Land Management, shall determine and report on appropriate mitigatory measures to aid the conservation effort in the vicinity of the project area, to the requirements of the Minister for the Environment and Heritage, on advice of the Environmental Protection Authority.

16-2 Prior to construction of the port facility the proponent shall incorporate these measures into a Conservation Estate Management Plan which addresses the following:

1) the effect of the port facility on the conservation values of the Great Sandy Island Nature Reserve, of which Preston Island is a part;
2) the potential effects of the port development, including dredging, spoil dumping and causeway / bridging structures on the Cape Preston area, which is a part of the proposed Dampier Archipelago / Cape Preston Marine Conservation Reserve; and
3) mitigatory measures to address the above effects,

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

16-3 The proponent shall implement the Conservation Estate Management Plan required by condition 16-2 to the requirements of the Minister for the Environment and Heritage, on advice of the Environmental Protection Authority.

16-4 The proponent shall make the Conservation Estate Management Plan required by condition 16-2 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

17 Decommissioning and Closure Plans

17-1 Prior to construction, the proponent shall prepare, and subsequently implement, a Preliminary Decommissioning and Closure Plan, which provides the framework to ensure that the project area 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 Decommissioning and 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) long term management of ground and surface water systems affected by the tailings storage facility and waste rock dumps;
3) 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;
4) a conceptual plan for a care and maintenance phase; and
5) management of noxious materials to avoid the creation of contaminated areas.

17-2 At least five years prior to the anticipated date of closure, or at a time agreed with the Environmental Protection Authority, the proponent shall prepare a Final Decommissioning and 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 Decommissioning and Closure Plan shall address:
1) removal or, if appropriate, retention of plant and infrastructure in consultation with relevant stakeholders;
2) long term management of ground and surface water systems affected by the tailings storage facility and waste rock dumps;
3) rehabilitation of all disturbed areas to a standard suitable for the agreed new land use(s); and
4) identification of contaminated areas, including provision of evidence of notification and proposed management measures to relevant statutory authorities.

17-3 The proponent shall implement the Final Decommissioning and Closure Plan required by condition 17-2 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.

17-4 The proponent shall make the Final Decommissioning and Closure Plan required by condition 17-2 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

Procedures

1 Where a 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.

3 The Minister administering the *Iron Ore Processing (Mineralogy Pty. Ltd) Agreement Act* (or its equivalent following its gazettal*)* will establish a formal review mechanism to ensure that a bond is placed on the proponent at the appropriate time to facilitate completion of environmental programs.

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. 1114)

The proposal is to establish and operate an iron ore mine, process plant (pelletising / direct-reduced iron / hot–briquetted iron), accommodation and port facility in the Cape Preston area. (Figure 1 shows the project site).

The project has the following main components:

- conventional open pit mining of the George Palmer orebody (Figure 2);
- stockpiling, waste and tailings storage facilities at the mine site;
- process plant for pelletising, and the production of direct-reduced iron and hot-briquetted iron;
- gas fired power station;
- 25km long infrastructure corridor (conveyor or haul road) from the mine and process plant site to Cape Preston;
- solid causeway from Cape Preston to Preston Island;
- stockpiling, seawater desalination plant and port facilities at Cape Preston and off Preston Island.

Dewatering will be required during mining as there will be mining below the water table.

Table 1 Key Proposal Characteristics, as modified during the process of assessment (Assessment No. 1114)

Element	Description
MINE	
Mine ore reserves	greater than1400 million tonnes iron ore
Depth of pit	approximately 220 metres, left open at end of mining
Rate of mining	approximately 44.8 million tonnes per annum
Projected mine life	at least 20 years
PROCESS PLANT	
Concentrator rate	approximately 13.4 million tonnes per annum
Produced waste to tailings storage	approximately 31.4 million tonnes per annum
Pellet production	approximately 13.8 million tonnes per annum
Direct reduced / hot briquetted iron	approximately 4.7 million tonnes per annum
Gas usage	55,280
INFRASTRUCTURE	
Power station capacity; gas usage	640MW; 34,170Tjpa
Product conveyor / haulroad	25km from process plant at minesite to Cape Preston port
Groundwater borefield	not required for operational stage
Desalinated seawater	approximately 44Mm^3pa
Brine disposal	57.8Mm^3pa
Administration, storage, workshops,	sewage treatment plant, village, port facilities
PORT	
Product stockyard capacity	approximately 1 million tonnes
Causeway to Preston Island	approximately 1.1km, solid fill to island, then trestle jetty seawards
Small craft harbour and import berth	
Dredging	up to 4.5 million cubic metres, disposed offshore
AREAS OF DISTURBANCE	
Pit	approximately 220ha
Plant and power station site	approximately 220ha
Waste dumps	approximately 465ha
Tailings storage	approximately 800ha
Other mine infrastructure	approximately 136ha
Port stock yard	approximately 25ha
Total for rehabilitation	approximately 1696ha

Key to abbreviations

m	metres	km	kilometres
mtpa	million tonnes per annum	Mm^3pa	million cubic metres per annum
MW	megawatts	ha	hectares
Tjpa	terajoules per annum		

FIGURES

1. Location plan
2. Key project components, groundwater depletion zone and stygofauna sample locations

Proponent's Environmental Management Commitments

as modified during the course of the project assessment.

No.	Topic	Objective	Action	Timing	Advice
1	Environmental Management System	To manage the relevant environmental factors and to fulfill the requirements of the conditions and procedures in the Ministerial Statement.	Prepare and implement an Environmental Management System (EMS) for the project, to include: • an environmental policy and corporate commitment to the EMS • planning to meet environmental requirements • specification and implementation of actions to meet environmental requirements • measurement and evaluation of environmental performance • review and improvement of environmental outcomes The Management Plans identified below will form part of the EMS.	A Construction Phase EMS will be completed prior to construction. An Operations Phase EMS will be substantially completed prior to operations.	Accredited assurance service.
2	Environmental Management Programme.	To manage the potential impacts of the construction and operations phases of the project.	Prepare, implement and regularly revise an Environmental Management Programme (EMP). The EMP will contain plans, guidelines and procedures to manage environmental issues associated with construction and operation of the project, including: • flora and fauna monitoring and management plans (see Commitments 3, 5, 6) • overburden storage • pit dewatering and vegetation monitoring plan (see C'mt 4) • subterranean fauna management plan • marine management plan (see C'mt 7) • spill contingency plan (see C'mt 10) • port management plan • surface water (including flood) management (see C'mt 8) • groundwater management (see C'mt 9) • dust and noise • gaseous emissions • greenhouse gas emissions plan • risks and hazards management plan • Aboriginal sites management plan (see C'mt 12) • recreational sites management plan(see C'mts 13, 14) • decommissioning and closure plan	A Construction Phase EMP will be prepared prior to construction. An Operations Phase EMP will be prepared prior to operations.	DMPR, CALM, WRC and OMP (depending on the project component).
3	Flora survey	To determine vegetation species in the 25km infra-structure corridor	Undertake a flora survey -in particular in the cracking clay environment. If any specimens of the Priority 1 species *Goodenia pallida* are identified, a management strategy will be developed with CALM.	Prior to ground disturbance and after significant rains	CALM
4	Vegetation Monitoring Plan	To determine the extent of vegetation loss from mining, groundwater drawdown and associated project activities	Prepare a Vegetation Monitoring Plan to determine the extent of creekline vegetation loss. Establish transects across the drawdown zone and compare health of vegetation with control transects. Establish vegetation monitoring at other sensitive locations (such as the infrastructure corridor crossing of the mangrove creek). Implement the Vegetation Monitoring Plan.	Prior to pit dewatering During dewatering	

No.	Topic	Objective	Action	Timing	Advice
5	Mesquite (*Prosopis pallida* hybrid) Control Plan	To reduce the incidence of Mesquite and prevent its spread into areas disturbed by the project	Undertake Mesquite control as an active member of the Mesquite control committee, such activities as determined with the Mesquite Control Committee	Once the proponent has established a permanent presence in the area-at the start of construction	Department of Agriculture and Mesquite Control Committee
6	Fauna Management Plan	To establish the importance of specific areas for wading birds and turtles in order to avoid sensitive areas and ensure their protection from project-induced impacts	Prepare a Fauna Management Plan which will include; ▪ fauna counts at appropriate times of the year; ▪ results from the turtle baseline survey to develop strategies that protect nesting areas and minimise effects of lighting Implement the Fauna Management Plan	Prior to construction at Cape Preston as agreed with CALM During construction and operational phases	CALM
7	Ballast Water Management Plan.	To minimise the potential release of exotic organisms to the marine environment.	Prepare a Ballast Water Management Plan which will contain plans, guidelines and procedures on the methods to be employed to minimise the potential release of exotic organisms. The plan will be provided to all shippers. Implement the Ballast Water Management Plan	Prior to operations. During operations.	AQIS.
8	Surface Water Management Plan	To manage the potential effects of operations on surface water regimes; maintain existing catchment flow volumes and quality, and maintain existing flow paths, where possible.	Prepare a Surface Water Management Plan to cover: • normal surface runoff; • armouring of the waste dump; • flood diversion works; and will use and contain plans, updated cross sections of the floodplain, updated modelling of streamflows from WRC guidelines and procedures to manage environmental issues relating to the potential effects of operations on the surface water regimes across the Fortescue River Floodplain Implement the Surface Water Management Plan	Prepared and implemented prior to mining. Design and implement flood diversion works prior to construction. During construction and operations	WRC and CALM.
9	Prepare a Groundwater Management Plan.	To confirm the extent of groundwater drawdown and prevent adverse impacts on the groundwater users of the area	Prepare a Groundwater Management Plan addressing: ▪ the effects of the operations on groundwater quantity and quality; ▪ maintenance of the existing pastoral camp stock water supplies and the bore used by the Mesquite control camp; ▪ establishment and locations for groundwater quality monitoring bores. Implement the Groundwater Management Plan	Prior to dewatering. During construction and operations	WRC and Dep't of Agriculture.

No.	Topic	Objective	Action	Timing	Advice
10	Spill Contingency Plan.	To ensure protection of the marine environment from spills.	Prepare and implement (as necessary) a Spill Contingency Plan. The Spill Contingency Plan will contain plans, guidelines and procedures to manage any spillage.	Prior to operations.	Australian Maritime Safety Authority.
11	Final project layout	To ensure that project components are sited above 100 year ARI* flood levels.	Liaise with Water and Rivers Commission on the siting of project components and equipment. * ARI – average recurrence interval	Prior to ground-disturbing activities.	CALM, WRC and OMP.
12	Aboriginal Sites Management Plan	To identify heritage sites, ensure no sites are inadvertently damaged and that sites which conflict with the project are first submitted to DIA for approvals to disturb.	Prepare an Aboriginal Sites Management Plan. This will include: ▪ consultation with traditional owners in respect of additional Aboriginal site surveys in areas not already surveyed; ▪ further consultation with representatives of the claimant groups; ▪ additional surveys in areas not already surveyed within the project area that are likely to be disturbed or otherwise affected by mining operations, downstream processing or export operations and associated infrastructure; ▪ delineation of sites with respect to project components with adjustments where appropriate to the location of those components; and ▪ abiding by the recommendations made in the project ethnographic survey (O'Connor, 2001). Implement the Aboriginal Sites Management Plan.	Prior to construction During construction and operations.	Agreed with the involvement of interested aboriginal groups and the Dep't of Indigenous Affairs.
13	Public access to sites for recreational purposes.	To ensure continued public access for recreational activities.	Maintain public access to the mouth of the Fortescue River and to other sites required for recreational purposes following discussions with local Shire and CALM on an acceptable alternative route. Install appropriate signage.	Prior to construction.	Shire of Roebourne and CALM.
14	Personnel induction	Ensure responsible use of the project area and the surrounding region by project personnel	Protect sensitive fishery nursery habitats from overfishing by including appropriate references to fishing practices in the personnel induction programme and liaising with the Department of Fisheries and CALM to establish conservation values and strategies to maintain them.	Prior to construction	CALM and Department of Fisheries
15	Best practice.	To ensure high levels of appropriate management throughout all phases of the proposal and appropriate ongoing research.	Implement best practice environmental management and decommissioning and rehabilitation management plans within the project. Details of progress against management objectives will be reported in Annual Environmental Reports.	Develop prior to construction and implement during operations.	

ABBREVIATIONS

ARI average recurrence interval

DIA Department of Indigenous Affairs

AQIS	Australian Quarantine Inspection Service
CALM	Department of Conservation and Land Management
WRC	Water and Rivers Commission
DMPR	Department of Mineral and Petroleum Resources
OMP	Office of Major Projects

Appendix 5

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