Balmoral South Iron Ore Project, Cape Preston, WA

Mineralogy Pty Ltd

Report and recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Report 1340
October 2009

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
14/05/07	**Level of Assessment set (date appeals process completed)**	
09/03/09	**Proponent Document Released for Public Comment**	**95**
04/05/09	**Public Comment Period Closed**	**8**
22/09/09	**Final Proponent response to the issues raised**	**20**
05/10/09	**EPA report to the Minister for Environment**	**2**

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Assessment No. 1677

Summary and recommendations

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment on the proposal to develop and operate an open-cut iron ore mine with infrastructure and utilities located in the Cape Preston region, 80 km south-west of Karratha by Mineralogy Pty Ltd.

Section 44 of the *Environmental Protection Act 1986* (EP Act) requires the EPA to report to the Minister for Environment on the outcome of its assessment of a proposal. The report must set out:

- The key environmental factors identified in the course of the assessment; and
- The EPA's recommendations as to whether or not the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may include in the report any other advice and recommendations as it sees fit.

The EPA is also required to have regard for the principles set out in section 4A of the *Environmental Protection Act 1986.*

Key environmental factors and principles

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

(a) Flora and Vegetation;

(b) Terrestrial Fauna and Habitat;

(c) Mangroves;

(d) Marine Ecosystem;

(e) Groundwater and Surface Water;

(f) Air Quality;

(g) Greenhouse Gas; and

(h) Rehabilitation and Closure.

There were a number of other factors which were relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

The following principles were considered by the EPA in relation to the proposal:

(a) The precautionary principle

(b) The principle of the conservation of biological diversity and ecological integrity; and

(c) The principle of waste minimisation.

Conclusion

The EPA has considered the proposal by Mineralogy Pty Ltd to develop and operate the Balmoral South iron ore project (BSIOP) with infrastructure and utilities located in the Cape Preston region, 80 km south-west of Karratha.

Flora and Vegetation

The BSIOP is expected to impact on a number of land systems within the Roebourne subregion (Mineralogy, 2009). These Land Systems are widespread throughout the Pilbara and therefore are not considered regionally significant.

No Threatened Ecological Communities or Declared Rare Flora were identified within the project area.

The project is also expected to impact on vegetation communities that are known to support Priority One species *Goodenia sp*. East Pilbara and Priority Three species *Phyllanthus aridus*. The Priority Three species has been recorded in a number of different areas throughout the Kimberley (Maunsell, 2008) and is not likely to be significantly impacted. The Priority One species is located outside the area of impact and is not expected to be impacted by the proposal.

Phreatophytic vegetation in the area is unlikely to be significantly impacted by groundwater drawdown as the flora are well represented outside the area of impact.

Two species of Declared Plants, *Prosopis pallida* (Mesquite) and *Datura leichhardtii* (Native Thornapple), were recorded in the project area. There is potential for weeds to spread, however, the proponent has proposed satisfactory control methods.

Terrestrial Fauna

The proposal is unlikely to have significant impacts on terrestrial fauna including the Rainbow Bee-eater (*Merops ornatus*), Pilbara Leaf-Nosed Bat, the Olive Python and the Mulgara.

Subterranean fauna associated with the BSIOP and cumulatively with the Central Block Project (CBP) is unlikely to be impacted as these species are expected to occur in the remaining habitat outside the impact zones.

Mangroves

Establishment of exclusion zones (condition 9) outside proposed disturbed areas will ensure that the impact to the mangroves and algal mat habitat can be managed in an environmentally acceptable manner.

Marine Ecosystem

It is expected that 157,000 m^3/day (57 GLpa) of brine will be discharged to the marine waters.

Brine discharge has the potential to impact on local marine water and sediment quality, marine biota within the vicinity of the outfall and potentially reduce the abundance of sensitive Benthic Primary Producer Habitat (BPPH), including coral communities. The proponent has proposed a Low Ecological Protection Area (LEPA) of 4 ha to allow for the appropriate number of dilutions which will ensure that a

salinity level of no greater than 5% above ambient level will be met 99% of the time outside the LEPA.

Based on the proponent's modelling (GEMS, 2009) and additional information received during assessment (Oceanica, 2009), the EPA considers that conditions applied to the marine outfall should be consistent with both State and Commonwealth policy, in particular, *EPA Report 20 Environmental Quality Criteria Reference Document for Cockburn Sound* (2003-2004) and *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ, 2000). Consistent with the principles of these documents the EPA considers that a Low Ecological Protection Area (LEPA) of 70 m from all points on the diffuser should be applied and that a Moderate Ecological Protection Area (MEPA) should apply at the LEPA boundary and to a maximum distance of 250 m from all points on the port infrastructure. Beyond that a high level of ecological protection should apply. The EPA considers that condition 10 which requires location of the marine outfall at the port and defines a LEPA of 70 m from the diffuser would need to be implemented in order for its environmental objectives to be met.

Groundwater and Surface water

Design and construction of the Waste Disposal Facilities (WDFs) in this environment, close to a major river, will present challenges. With the use of best practice methods, it should be possible to construct WDFs which will be sustainable in the long term (including following mine closure) and which will ensure protection of ground and surface water. The detailed design of the WDFs will be vetted by technical specialists of the Department of Mines and Petroleum and the Department of State Development prior to construction.

Air Quality

Cumulative air dispersion modelling predicts compliance with the NEPM standard at camping areas and sensitive premises.

While the proponent considers that emissions of dioxin would be small, it would be prudent for the proponent to fully characterise all constituents in the stack emissions to confirm that emissions of dioxins and other toxics are negligible. As such condition 12 has been recommended.

Greenhouse Gas

The proposal will emit 2.7 Mtpa CO_2e. Over the 31 year project life, emissions are estimated to total 66.6 million tonnes.

The majority of greenhouse gas originates from the use of natural gas (in the power station and pellet plant). The proponent has selected combined cycle gas turbines for the power station and incorporated waste heat recovery from the process plant. The design of power stations represents best practice in maximising energy efficiencies.

Rehabilitation and Mine Closure

The proposed mine is located close to a major river. In addition there are some potentially acid forming materials (PAF) and asbestiform minerals associated with the ore body and these will require careful management. Sustainable closure and rehabilitation will therefore present substantial challenges.

Recommended condition 14 is a prescriptive condition requiring the preparation of a project-specific conceptual closure strategy prior to commencement of ground-disturbing activities. The requirement for an "up-front" project-specific conceptual closure strategy before mining commences is fully consistent with Australian and international mining industry best practice as set out in the Minerals Council of Australia's own policy on mine closure planning.

As the proposal relates to a State Agreement and not to Mining Leases managed by the Department of Mines and Petroleum, the application of a Performance Bond is not possible under the *Mining Act 1978*. Consequently, condition 15 has been included which provides for a Performance Bond as security for performance of condition 13 and 16.

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

Recommendations

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

1. That the Minister notes that the proposal being assessed to is for develop and operate an open-cut iron ore mine with infrastructure and utilities;
2. That the Minister considers the report on the key environmental factors and principles 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
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Mineralogy Pty Ltd to develop and operate an open-cut iron ore mine with infrastructure and utilities is approved for implementation. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

(a) Vegetation;

(b) Fauna;

(c) Groundwater and Surface Water Quality;

(d) Mangroves;

(e) Marine Ecosystem;

(f) Stack Emissions;

(g) Greenhouse Gases;

(h) Rehabilitation;

(i) Bond; and

(j) Mine Closure.

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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 Environment on the key environmental factors and principles for the proposal by Mineralogy Pty Ltd to develop and operate an open-cut mine and infrastructure located in the Cape Preston region (Figure 1).

The proponent is seeking approval for the Balmoral South Iron Ore Project (BSIOP) to construct and operate an open-cut iron ore mine, process facilities, materials handling facilities, utilities (desalination plant and power station) and other general infrastructure facilities (Figure 2).

The level of assessment of the proposal was set at Public Environmental Review (PER) with an eight week public review period under the Western Australian *Environmental Protection Act 1986* (EP Act). The public review period commenced on 9 March 2009 and closed on 4 May 2009.

The proposal is also considered a controlled action under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* due to the presence of listed species such as Sea Turtles, Dugong, Olive Python, Mulgara and Pilbara Leaf-nosed Bat.

International Minerals has entered into a series of agreements with the proponent Mineralogy Pty Ltd, which provides access to all of the tenements necessary to carry out the BSIOP. These agreements have been approved by the Minister for State Development and are set out in the First Schedule of the *Iron Ore Processing (Mineralogy Pty Ltd) Agreement Act 2002*.

The BSIOP lies adjacent and to the south of the Central Block Project (CBP), which was assessed by the EPA in July 2002 (Bulletin 1056) and received environmental approval from the Minister for Environment in October 2003 (Ministerial Statement No. 635) for the development of a mine, processing plant, stockyards, villages, port and associated infrastructure, subject to a number of conditions. The CBP is currently being developed by CITIC Pacific Mining Management under a commercial agreement with Mineralogy Pty Ltd. Figure 3 shows the locations of the CBP and the BSIOP.

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

Appendix 5 contains a summary of submissions and the proponent's response to submissions and is included as a matter of information only and does not form part of the EPA's report and recommendations. Issues arising from this process, and which have been taken into account by the EPA, appear in the report itself.

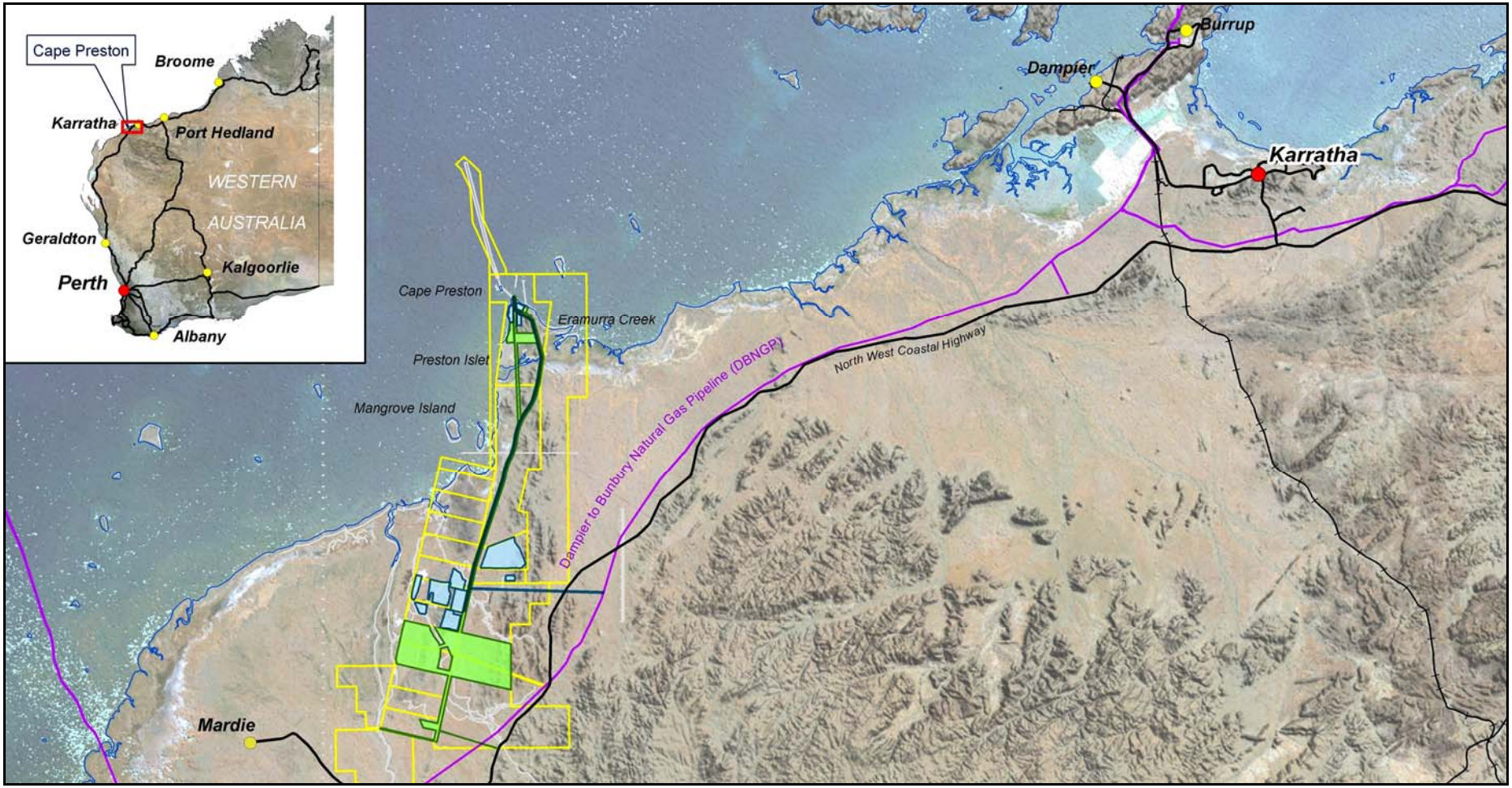

Figure 1: Regional location of mine site

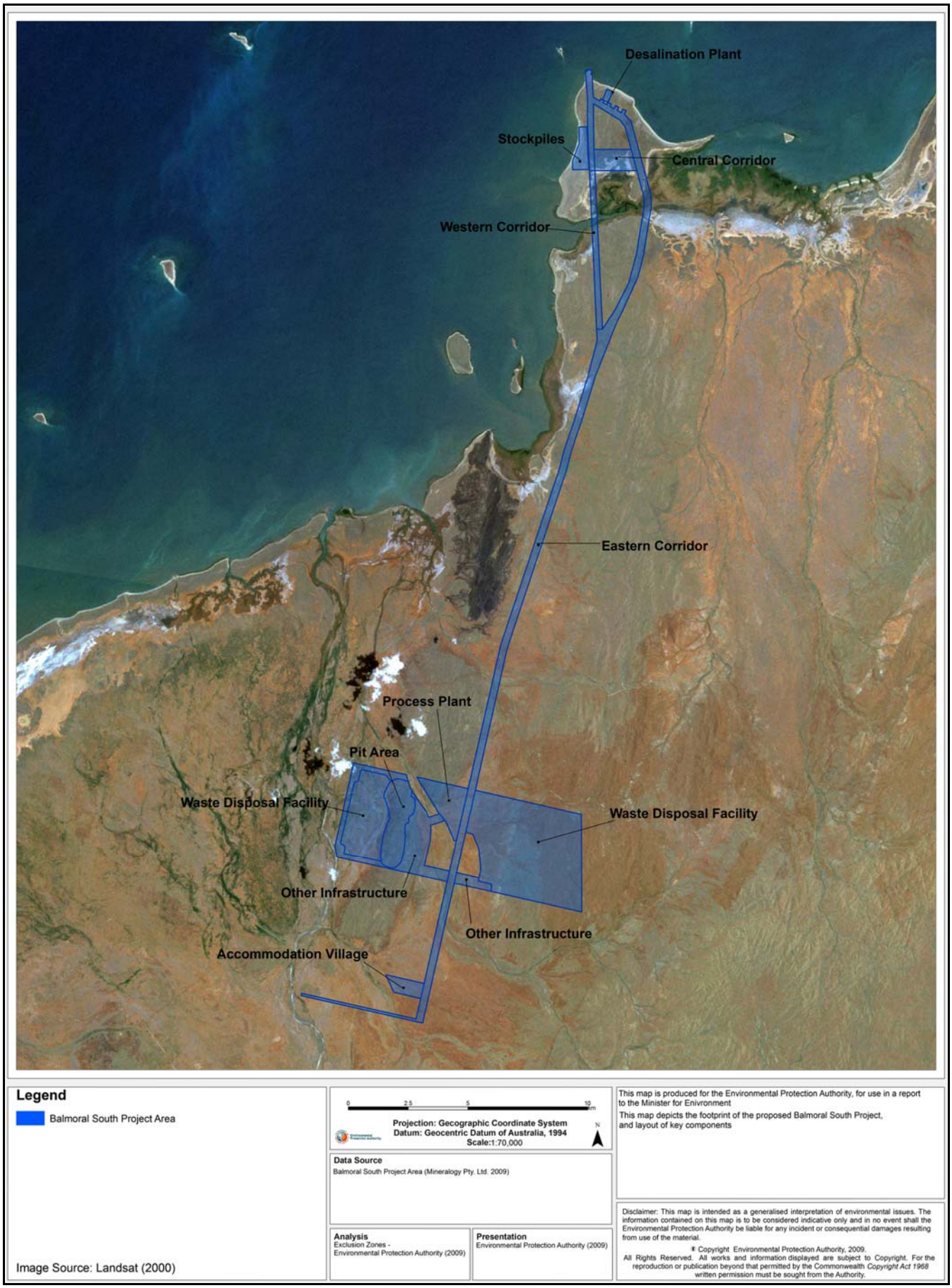

Figure 2: Project footprint and layout of key components

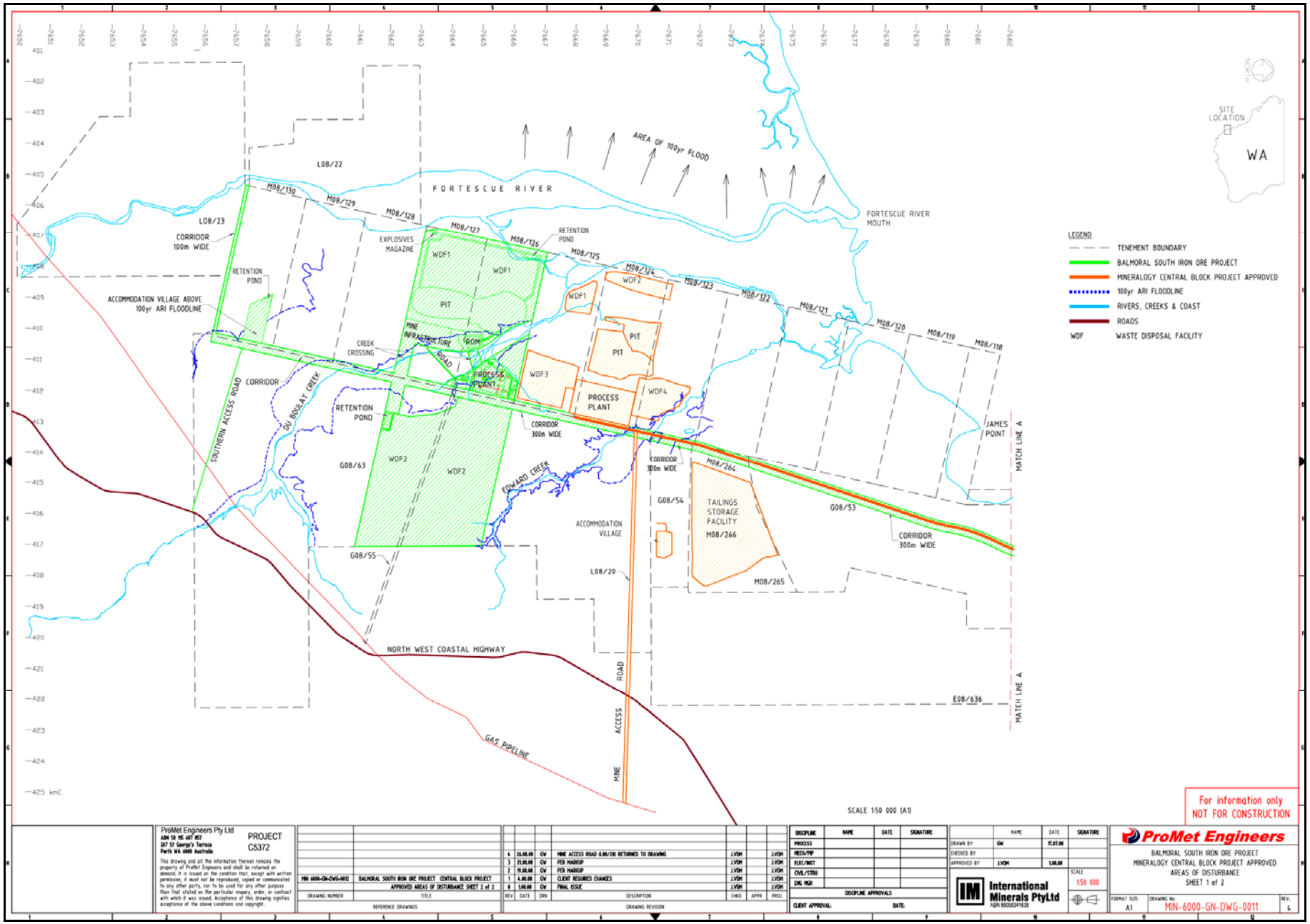

Figure 3a: Project footprints for BSIOP and CBP

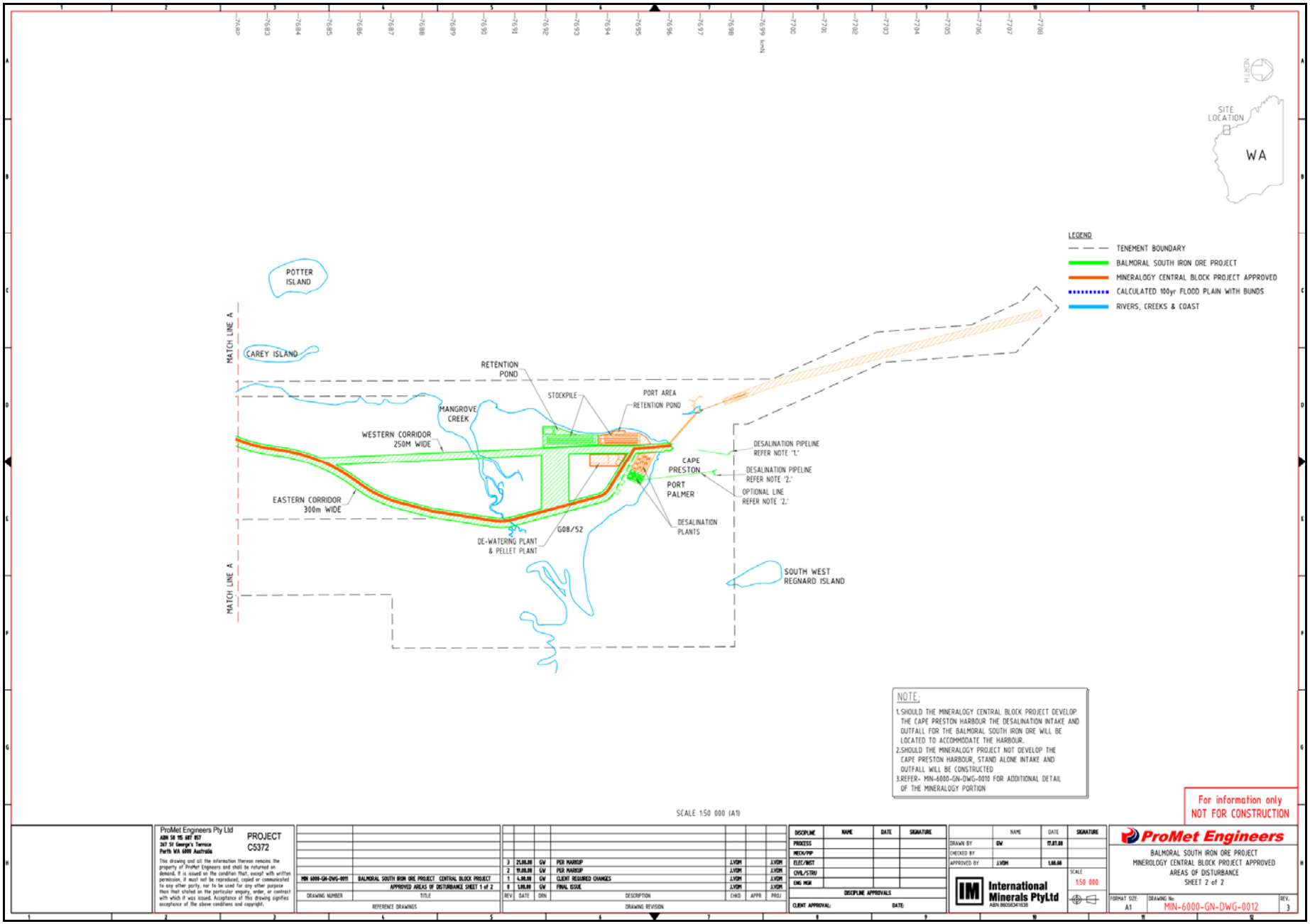

Figure 3b: Project footprints for BSIOP and CBP

2. The proposal

The BSIOP is located in the Cape Preston region, approximately 80 km south-west of Karratha on 17 tenements as listed in Table 2-1 of the "Balmoral South Iron Ore Project" PER document (URS, 2009). Figure 1 shows the regional location of the BSIOP and the project footprint and layout is defined in Figure 2.

The BSIOP proposal is described in detail in Section 2 of the PER document (URS, 2009). The main components include:

- an open-cut mine producing 80 million tonnes per annum (Mtpa) of magnetite ore;
- 80 Mtpa of overburden and waste disposal facilities (WDF 1 and WDF 2);
- processing facilities including crusher, concentrator and pellet plant;
- the production of 24 Mtpa concentrate with 14 Mtpa being pelletised;
- mine to port corridor with service roads, conveyors (or slurry pipelines) services pipelines; overhead power transmission lines and buried gas transmission pipeline;
- materials handling facilities including a 30 km conveyor linking the plant site to the port stockyard facilities at Cape Preston;
- distribution networks for power, communication, data, water and gas;
- utilities including a 40 gigalitre per annum (GLpa) desalination plant and 600 mega watt (MW) combined cycle power station;
- accommodation village; and
- supporting infrastructure.

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

Table 1: Summary of key proposal characteristics

Element	Description
General	
Project Life	Project Development - Approximately 3 years Operation - Approximately 28 years
Mining and Processing	
Ore resources	Up to 2 billion tonnes
Ore mining rate	Up to 80 Mtpa
Pit depth (ultimate)	300 m
Overburden and waste	Approximately 80 Mtpa
Materials handling	Conventional drill, blast, load and haul
Dewatering rate	Up to 4 GLpa
Dewatering disposal	Used in the process water stream and for dust suppression
Concentrator production	Approximately 24 Mtpa
Pelletising production	Approximately 14 Mtpa
Infrastructure	
Power	Up to 600 MW installed capacity gas fired combined cycle power station
Conveyor/slurry pipeline	Approximately 30 km in length between process plant site and Cape Preston stockyard

Element	Description
Gas supply	Up to 34, 000 Tjpa
Water supply	40 GLpa desalination plant and 4 GLpa pit dewatering
Port stockyard	2 Mt storage capacity
Disturbance Areas	
Areas of disturbance	Total disturbance during project not more than 5,297 ha comprising: • Pit – not more than 355 ha • Waste Disposal Facilities – not more than 2,450 ha • Eastern corridor – not more than 1450 ha • Central corridor – not more than 150 ha • Western corridor – not more than 160 ha • Desalination plant – not more than 15 ha • Stockpiles – not more than 85 ha • Process plant – not more than 130 ha • Accommodation village – not more than 90 ha • Other infrastructure – not more than 460 ha

Since release of the PER, there have been no modifications to the proposal.

The potential impacts of the proposal initially predicted by the proponent in the PER document (URS, 2009) and their proposed management are summarised in Table 0-2 (Summary and Conclusions).

3. Key environmental factors and principles

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment 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 key factors selected for detailed evaluation in this report is summarised in Appendix 3. The reader is referred to Appendix 3 for the evaluation of factors not discussed below. A number of these factors, such as Noise and Vibration, Waste Material, Aboriginal Heritage and Recreational Values 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 key environmental factors for the proposal require detailed evaluation in this report:

(a) Flora and Vegetation

(b) Terrestrial Fauna and Habitat;

(c) Mangroves;

(d) Marine Ecosystem;

(e) Groundwater and Surface Water;

(f) Air Quality;

(g) Greenhouse Gas; and

(h) Rehabilitation and Closure

The above key 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 key environmental factors and their assessment are contained in Sections 3.1 - 3.8. 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.

The following principles were considered by the EPA in relation to the proposal:

(a) The precautionary principle;

(b) The principle of the conservation of biological diversity and ecological integrity; and

(c) The principle of waste minimisation.

3.1 Flora and Vegetation

Description

The proposal has the potential to impact on flora and vegetation through clearing for the mine site and infrastructure, dewatering and dust deposition from construction and mining operations.

The mine site is located within the Roebourne subregion of the Pilbara Biogeographic Region of Interim Biogeographic Regionalisation for Australia (IBRA). Kendrick and Stanley (2001) have broadly described the Roebourne subregion as quaternary alluvial and older colluvial coastal and sub-coastal plains with grass savannah of mixed bunch and hummock grasses and a dwarf shrub steppe of *Acacia stellaticeps* or *Acacia pyrifolia* and *Acacia inaequilatera* (URS, 2009).

The proposal is also situated within the Fortescue Botanical district of the Pilbara Biogeographic region and broadly consists of various *Acacia* Shrublands over *Triodia* Hummock Grasslands on the more rugged, shallow soiled habitats and *Eragrostis xerophila* Tussock Grasslands dominating the heavy clay soils. Drainage lines are dominated by *Eucalyptus* species over *Melaleuca* and *Acacia* Shrublands (URS, 2009).

In 2004 the Minister for Planning and Infrastructure approved an area to be excluded from Mardie Station for inclusion within the conservation estate. This area is located approximately 8.2 km from the project area.

The Department of Agriculture (WA) has mapped the Land Systems of the region. Nine of those Land Systems identified will be impacted by the proposal. The total area of each Land System to be impacted by the project is provided in the table below.

Table 2. Total area of each Land System to be cleared

Land System	BSIOP (ha)	Cumulative Projects (ha) [BSIOP and CBP]
Boolgeeda	132.26	132.26
Cheerawarra	6.05	6.73
Horseflats	1,284.33	1,767.50
Littoral	375.37	433.32
Newman	447.06	1,263.51
Paraburdoo	973.77	1,482.96
River	33.87	33.87
Rocklea	1,452.11	1,927.35
Yamerina	592.13	718.13
Totals	**5,296.95**	**7,779.26**

Five detailed flora and vegetation surveys have been conducted. Within the entire Cape Preston project area a total of 500 vascular flora species, from 64 families and 196 genera were recorded. Two of those species include the Declared Plants *Prosopis pallida* (Mesquite) and *Datura leichhardtii* (Native Thornapple). One species, *Acacia victoriae*, was found to exhibit a range extension, however, the proposal will not impact on this species (URS, 2009).

Two Priority flora species, *Goodenia sp.* East Pilbara (Priority One) and *Phyllanthus aridus (Priority Three)* were identified within the Balmoral South project area. *Goodenia sp.* East Pilbara is located approximately 500 m east of the proposed infrastructure corridor and is not expected to be impacted. A single recording of *Phyllanthus aridus* occurs within the open pit and will be removed.

No Declared Rare Flora or Threatened Ecological Communities were recorded in the project area.

Three phreatophytic (a deep-rooted plant that obtains water from a permanent ground supply or from the water table) species occur in the areas. These include *Eucalyptus camaldulensis*, *Eucalyptus victrix* and *Melaleuca argentea*. Groundwater modelling predicts, as a worse case, that 460 ha of phreatophytic vegetation will be impacted as a result of groundwater drawdown, when combined with the CBP the total cumulative drawdown impact is approximately 1,271 ha.

The total loss of flora and vegetation from both groundwater drawdown and clearing is estimated to be 5,757 ha (BSIOP) and 9,051 ha (BSIOP and CBP).

The proponent has proposed measures to mitigate impacts to flora and vegetation (International Minerals, 2008) which include:

- minimising the time between initial clearing and rehabilitation;
- clearing areas only when required and where necessary;
- progressive rehabilitation;
- monitoring and managing weeds;
- implementing dust suppression;
- monitoring vegetation and vegetation stress;
- monitoring groundwater levels; and
- contingency actions when required.

Submissions

Key comments in submissions focused on:

- justification for all of the infrastructure corridors;
- impacts on phreatophytic vegetation; and
- conservation significant flora.

Assessment

The EPA's environmental objective for this factor is to maintain the abundance, diversity, geographical distribution and productivity of flora at species and ecosystem levels through avoidance or management of adverse impacts and the improvement of knowledge, and to protect the environmental values of areas identified as having significant environmental attributes.

No Threatened Ecological Communities or Declared Rare Flora were identified within the project area.

The BSIOP is expected to impact on a number of land systems within the Roebourne subregion (Mineralogy, 2009). These Land Systems are widespread throughout the Pilbara as demonstrated by the Department of Agriculture Land System Mapping and therefore are not considered regionally significant.

The EPA notes that 34 ha of the River Land System will be cleared. The River Land System is widely distributed in the region, but is not very abundant as it covers only a small portion of the land surface, occurring in association with river systems. This vegetation type is significant due to this limited shape and particularly as it provides connectivity along a vast area of landscape (URS, 2009). The proposal is unlikely to cause significant impacts as only 0.03% of the Land System within the Roebourne subregion and 0.01% within the Pilbara region is expected to be impacted. The EPA notes that the proponent has committed to providing a 100 m buffer around the Edward and Du Boulay Creeks and to minimise the impacts on the vegetation along the creek lines through its project design.

The project is also expected to impact on vegetation communities that are known to support Priority One species *Goodenia sp*. East Pilbara and Priority Three species *Phyllanthus aridus*. A single species of *Phyllanthus aridus* will be directly impacted through clearing as it is located within the proposed pit area. The EPA notes that this Priority Three species has been recorded in a number of different areas throughout the

Kimberley (Maunsell, 2008) and does not consider this loss to be significant. The *Goodenia sp*. East Pilbara is located approximately 500m east of the proposed infrastructure corridor and is not expected to be impacted by the proposal.

The proposed management of weeds in the project area include cleaning of machinery of mud and soil that may contain weed seed from other sites before entering the construction and operations site and sourcing topsoil from areas of lowest weed infestation. The EPA considers that these actions are appropriate to reduce the spread of weeds, however, further actions should be taken to reduce the weed density. The implementation of recommended condition 13 provides for the management of spread of weeds.

The EPA considers that the proposal is unlikely to cause significant impacts to phreatophytic vegetation in the area as all flora that is expected to be impacted by groundwater drawdown are well represented outside the area of impact. CBP is expected to impact on 20% of the phreatophytic vegetation of the surveyed areas. The additional impact from the BSIOP is 11% of the surveyed areas, which will result in 31% being impacted by both projects. The proponent has committed to monitor the health of the phreatophytic vegetation outside the area of expected impact and to implement contingency actions if required. The implementation of recommended condition 6 provides for the protection of the remaining phreatophytic vegetation.

Dust deposition on plants can potentially affect plant photosynthesis and reproduction. Although there are no dust standards to protect vegetation health, the EPA considers that with the implementation of the proponent's proposed dust management measure, impacts can be managed in an environmentally acceptable manner.

Summary

Having particular regard to the:

(a) lack of Threatened Ecological Communities or Declared Rare Flora;

(b) potential impact on the Land Systems in the Roebourne Subregion; and

(c) monitoring the health of phreatophytic vegetation (recommended condition 6),

the EPA considers the issue of Flora and Vegetation has been adequately addressed and the proposal can meet the EPA's objective(s) for this factor subject to implementation of conditions.

3.2 Terrestrial Fauna and Habitat

Description

The proposal has the potential to impact on fauna by direct loss and disturbance of habitat through clearing for the mine-site and infrastructure, dewatering and mining of the pit, mining operations and construction of pipelines.

Terrestrial fauna

The project area is located within the Roebourne subregion of the Pilbara IBRA which supports a number of fauna species that are afforded protection under the

Environment Protection and Biodiversity Conservation Act 1999. In addition, three specially protected fauna are also reported to occur within the sub-region.

Of the Nationally Significant Threatened Species, a targeted survey for the Pilbara Leaf-Nosed Bat, the Olive Python and the Mulgara yielded no recordings within the project area.

Two nationally significant migratory terrestrial bird species have been observed in the project area. The Rainbow Bee-eater (*Merops ornatus*) was found mostly along the river and creek lines and the White-bellied Sea-Eagle (*Haliaeetus leucogaster*) was sighted making opportunistic use of standing water in the Fortescue River.

Ten species of conservation significance are reported by DEC database searches to occur in the area with only the Bustard (*Ardeotis australis*) being recorded in the project area during the field surveys.

The Night Parrot (Schedule 1) and the Peregrine Falcon (Schedule 4) were not recorded during any of the fauna surveys, however, the Peregrine Falcon may hunt, but is not likely to nest, in the Project area.

The Priority 1 species, Little North-Western Mastiff Bat, was recorded in 2000 in the mangrove vegetation community at Cape Preston, north of the project area. Subsequent bat surveys using bat call analysis (Phoenix Environmental Sciences 2008) failed to detect this species.

Spectacled Hair Wallaby (Priority 3) was not recorded during the field surveys.

The Lakeland Downs Mouse, Kerakenga (*Leggadina lakedownsensis*), a Priority 4 species, was recorded in the 2000 field survey from the cracking clay habitat and low hills. This species is expected to occur in the project area. No evidence was encountered which would indicate that the Western Pebble Mouse (Priority 4 species) would occur in the project area. The other Priority 4 species (Bush stone Curlew and the Eastern Curlew) were also not recorded during the field surveys. However, the Bustard (*Ardeotis australis*) has been recorded to occur in four locations within the project area.

Subterranean fauna

The surveys conducted for the project area, in particular the pit and the groundwater drawdown impact zone, identified 15 species of stygofauna. All 15 species have been recorded to occur elsewhere in the Cape Preston area beyond the zone of impact (URS, 2009).

Nine species of troglofauna were collected at the project area. *Cryptos* sp B2 (nr *australis*) has been recorded in surface litter at Cape Preston outside the impact zones. The six other species were found to occur at the CBP. The only species found at Balmoral South but yet to be found elsewhere are the millipede *Polyxenidia* sp. B1 and silverfish *Trinemura* sp. B1 (nr *troglophila*).

The geology of the BSIOP is considered to be identical of the CBP deposit, which also contains the Joffre Banded Iron Formation of the Brockman Iron Formation. The

CBP is located along the same strike to the north of BSIOP and the ore bodies at both the BSIOP and CBP exhibit the same Brockman Iron Formation stratigraphy. It is also considered that there is a lack of major discontinuities between the ore-bodies (Strategen, 2009).

Submissions

Key comments in submissions focused on:

- fauna access should be considered in the project design to remove barriers for movement of terrestrial fauna; and
- troglofauna sampling effort outside of impact zones and the presentation of geological data to support habitat-based risk assessment are insufficient.

Assessment

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

- protect Specially Protected (Threatened) and Priority Fauna and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950*;
- protect fauna listed on the Protect fauna listed on the Schedules of the *Environment Protection and Biodiversity Conservation Act 1999*; and
- maintain the abundance, species diversity, geographic distribution and productivity of fauna species and ecosystem levels through the avoidance or management of adverse impact and improvement in knowledge.

Terrestrial Fauna

The EPA notes that within the project area the Rainbow Bee-Eater (*Merops ornatus*) was found mostly along the river and creek lines and the White-bellied Sea-Eagle (*Haliaeetus leucogaster*) was sighted making opportunistic use of standing water in the Fortescue River. The EPA expects these species will not be impacted by the proposal as the Rainbow Bee-eater is common in the Pilbara. The White-bellied Sea Eagle has a widespread distribution with an ability to make long-distance movements, and has been recorded in a broad range of habitats (DEWHA, 2009).

The EPA notes that the Lakeland Downs Mouse, Kerakenga (*Leggadina lakedownsensis*), a Priority 4 species, was recorded in the 2000 field survey from the cracking clay habitat and low hills and is expected to occur in the project area. The EPA acknowledges that the cracking clay habitat is widespread in the region and that cumulatively the BSIOP and the CBP is not expected to remove a significant portion (less than 9% of the associated Land Systems within the Roebourne subregion) of this habitat.

The Bustard (*Ardeotis australis*) has been recorded to occur in four locations within the project area, in particular in association with the Fortescue River system. The EPA has noted that the proponent has endeavoured to minimise the impacts on the vegetation along the creek lines through its project design, ensuring barriers to native fauna are kept to a minimum, and minimising the loss of fauna linking corridors. The implementation of recommended condition 6 provides for protection of riparian vegetation.

The EPA acknowledges the proponent's management measures to reduce the potential for native fauna to be adversely impacted by open trenches. The EPA considers that

the implementation of condition 7 which requires management of pipeline construction will ensure that it is managed in an environmentally acceptable manner.

There were no recordings of the Pilbara Leaf-Nosed Bat, the Olive Python and the Mulgara within the project area and suitable habitat associated with these species has not been identified within the project area. Therefore the EPA does not consider the proposal will impact on these Nationally Significant Threatened Species.

Subterranean Fauna

Surveys undertaken for stygofauna in the project area identified 15 species. The EPA notes that all 15 species have been recorded elsewhere in the Cape Preston area beyond the zone of impact.

The recorded distributions of several species of troglofauna combined with the lack of major discontinuities between the ore-bodies in the Cape Preston area suggests that the Cape Preston troglofauna community extends through all ore-bodies in the area. *Troglarmidillo* sp. 3 was recorded at north of the CBP area and also south of the BSIOP area. Other species have also been recorded in more than one location throughout the banded iron formation. The banded iron formation in the Cape Preston area is widely distributed and there is likely to be habitat connectivity between the Cape Preston Brockman Formation and that of Bilanoo Hill, which is located to the south of the Great Northern Hwy, approximately 12-15 km south of BSIOP (Strategen, 2009).

Groundwater drawdown can potentially affect troglofauna by reducing the relative humidity of the subterranean habitat where the animals occur. Relative humidity however is not expected to change within the troglofauna habitat as it is considered that relative humidity is dependent on distance from root zone rather than the water table. Therefore as the water table lowers, the relative humidity is expected to remain unchanged and the impacts to troglofauna are considered to be minimal (Bennelongia, 2008b).

The EPA considers that the impact on subterranean fauna associated with the BSIOP and cumulatively with the CBP is not considered by the EPA to be significant as it is likely that all the species will occur in the remaining habitat outside the impact zones.

Summary

Having particular regard to:

(a) the measures taken to minimise the environmental impacts to terrestrial and subterranean fauna; and

(b) most habitat is well represented outside the project area.

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor subject to implementation of conditions.

3.3 Mangroves

Description

The proposal has the potential to impact on mangroves through the construction and operation of the eastern, western and central infrastructure corridors. Mangroves will be impacted by clearing, modification to tidal hydrology and surface flows, indirect loss of habitat through sediment smothering of mangrove roots hydrocarbon spill or leakages, and dieback arising from dust generated by vehicles crossing the causeway.

A well developed and structurally complex mangrove system is associated with the major tidal creek and connective tidal flats that join Cape Preston to the mainland. Other areas of mangroves occur in the wider locality, including a generally narrow zone of *Avicennia marina* which borders the western shoreline and embayments between the creek and the mouth of the Fortescue River (URS, 2009).

The local occurrence of mangrove species and assemblages within the creek system exhibited similar patterns to those observed elsewhere in the region in relation to species distribution, local geomorphology and substrate. The most abundant and widespread species were *Avicennia marina* (dominant or co-dominant in most assemblages in the study area) and *Rhizophora stylosa* (which formed dense monospecific assemblages). *Ceriops australis* and *Aegiceras corniculatum* are also known to occur in the area (URS, 2009).

The alignment of the eastern corridor is located as far east as possible and traverses high tidal flat areas that are largely devoid of mangroves (Figure 4-12, URS 2009). The creek crossing is in the upper reaches of a tidal creek system at a location where an approximately 30m wide band of mangroves fringe the creek channel. Construction of this corridor includes a solid filled structure. It is expected that 4.4 ha of mangroves and 6.3 ha of algal mat habitat will be impacted.

The alignment of the western corridor traverses a broad creek at a downstream location of the river mouth. Construction of the corridor includes a solid fill structure in the high tidal flats areas and a trestle structure within the mangrove areas and the broad creek crossing (Figure 4-12, URS 2009). The impact on the mangrove area is expected to be 1.3 ha and 7.8 ha of algal mat habitat will be lost.

Construction of the central corridor, located between the western and eastern corridors north of the creek channel, will result in a loss of 9.2 ha of algal mat habitat.

An additional 2.8 ha of mangroves will potentially be at risk as a result of reduced flushing from the construction of the solid fill causeway with culverts. This was based on modelling undertaken to simulate the effect on tidal levels upstream of the proposed solid fill causeway with culverts in the eastern corridor. Although a total culvert opening of 250m^2 is required to enable tidal floods to continue unhindered to Mean High Water Spring Tide 80% of the time, engineering design can only allow a maximum of 109m^2 (URS, 2009). The findings of the modelling using 109m^2 include:

- tidal levels above RL 1.5m AHD will no longer occur upstream of the service corridor, and that no ponding of waters will occur either;

- the reduced cross-sectional areas across the tidal flats will create a head on the western side during the spring tides and generate faster flow speeds through the culverts and potentially restrict the total mass of water passing through;
- the currents through the culverts at high spring tidal flows can reach 2 m/s and could cause some local scouring without appropriate mitigation measures; and
- the period of tidal wetting at RL1.31 m AHD during spring tides will be reduced by 50%.

Submissions

Key comments in submissions focused on:

- the western infrastructure corridor is located in the middle of an important area of mangroves; and
- the proponent should demonstrate that the cumulative mangrove and algal mat loss will not exceed 10% of these habitats within the management unit.

Assessment

The EPA's environmental objective for this factor is to maintain ecological function and sustainability of the tropical arid zone mangroves of the Pilbara coastline, habitats and dependent habitats.

The total area of mangrove habitat loss from both direct and indirect impacts is expected to be 8.5 ha, which equates to 1.7% of the total area of mangroves within the Benthic Primary Producers Habitat management unit. The maximum loss of algal mat habitat is 23.3 ha, which equates to 5.8% of the total algal mat within Benthic Primary Producers Habitat management unit. The estimated loss is below the cumulative loss threshold of 10% within defined management units for development areas as described in the *Guidance Statement No. 29 – Benthic Primary Producer Habitat Protection* (EPA, 2004), which is considered acceptable by the EPA.

The EPA notes that the proponent has proposed to avoid impact to mangroves by establishing exclusion zones outside the disturbance envelope; scrub-roll or cut close to ground rather and remove mangroves where possible; installing culverts to design specifications; refuelling and maintenance of vehicles to occur outside the tidal flats zone, dust suppression measures; neutralisation of potential acid sulphate soil material using the preformed disposal cell with treatment pad, guard layer and drainage lines; and containment of runoff from treatment pad and disposal cell with appropriate bunds, diversion drains and collection pond. The EPA considers that with the implementation of condition 8 which requires the establishment of an exclusion zones outside disturbed areas, the impact to the mangroves and algal mat habitat can be managed in an environmentally acceptable manner.

Summary

Having particular regard to the:

(a) measures for mangrove habitat management;

(b) estimated loss of mangrove and algal mat habitat not exceeding the cumulative loss threshold; and

(c) establishment of exclusion zones to protect mangroves (condition 8),

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor subject to implementation of conditions.

3.4 Marine Ecosystem

Description

The proposal has the potential to impact on water quality, benthic primary producer habitat (BPPH), coral reef and marine fauna from construction of the desalination plant and infrastructure pipeline and the discharge of brine.

Construction of desalination pipelines

The proponent has proposed that the discharge pipeline would be located approximately 1.6 km NE of Cape Preston in 7 m of water at Lowest Astronomical Tide. The intake pipeline would be located in 8 m of water at Lowest Astronomical Tide, approximately 1.9 km NNE of Cape Preston.

The pipeline and diffuser was to be located in an area mainly consisting of algal dominated limestone pavement and deep sand/silt and the discharge outfall will traverse an area of shallow sand veneered or exposed limestone pavement (URS, 2008).

Pipes would be laid within trenches which would be 4 m wide by 3 m deep and require the removal of approximately 30,000m^3 of marine sediment. A total area of approximately 1 ha of seafloor would be disturbed through trenching.

Excavation of trenches would be by barge mounted excavator, with spoil transported back to shore for sorting and potential use as selected backfill in the trench. The backfill used for the trench bottom and pipeline surrounds would be de-slimed engineered coarse material.

Trenching and backfilling activities for the installation of the pipeline and diffuser would take approximately two to three months to complete. As a result, turbidity generated from trenching activities would be temporary and localised and intermittent given that it would be undertaken by backhoe excavator and would be interrupted by tide and weather. It is expected that turbidity generated from trenching activities and backfilling activities would be minor and would be restricted to the non-significant habitats in the immediate vicinity of the pipeline corridor (URS, 2008).

The proponent considers that construction of the pipeline would unlikely affect sea turtles, humpback whale and dugongs. Sea turtles are listed as Threatened and Migratory Species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and dugong are listed as Migratory Species. Both Threatened Species and Migratory Species are matters of National Environmental Significance (NES) under the EPBC Act. Turtles and dugongs are known to occur in nearshore waters between Dampier and Exmouth, and small numbers of turtles are believed to nest on the beaches on the west side of Cape Preston. The size of the dugong population in this region is not reliably known, but sightings of single dugong have

been made by field survey teams in the region on more than one occasion (URS, 2009).

The humpback whale, listed as vulnerable under the EPBC Act, migrates along the Western Australian coast in winter and early spring. The whales are not known to aggregate in the waters offshore Cape Preston, but it is possible that individuals, as well as small pods of dolphins, may pass through the area (URS, 2009).

Desalination Plant – Operations and disposal of saline water

The desalination plant has the potential to impact on the marine biota due to noise and light spill from the plant. The discharge of saline water has the potential to impact on local marine water and sediment quality, marine biota within the vicinity of the outfall and potentially reduce the abundance of sensitive BPPH, including coral communities.

The desalination plant operations would involve the intake of seawater (via intake pipe), discharge of brine (via outfall/diffuser system) and unused seawater (via the overflow outfall pipe).

The seawater intake system has been designed to minimise potential ingress of marine fauna as these have the potential to block screens and hinder the seawater filtration and desalination process. The proposed intake openings would be located two metres above the seabed to protect against seabed silt entrainment and to provide adequate depth for pump suction. The proposed intake to the desalination plant would be designed so not to act as a hazard to marine fauna. The intake flow velocity would be maintained below 0.33 m/s which would allow most species to swim against the drawn current if they approach the vicinity of the intake. Three sets of progressively finer screens would further reduce the possibility of intake of marine fauna. Firstly, bars with 100 mm spacing would cover the intake openings to prevent large marine fauna from entering the intake. Second would be bars with 20 mm spacing, followed by 5 mm mesh screens (URS, 2008).

There is potential for unused seawater to be returned to the ocean. This water may contain low concentrations of coagulants and flocculates (ferric sulphate or polymer) used in the desalination process (URS, 2008). This discharge is unlikely to impact on marine water quality.

The brine outfall would be designed to manage a discharge of approximately 252,000 m^3/day (91 Glpa) for short durations during ramp-up either after break-down or start-up conditions. However under normal operating conditions 157,000 m^3/day (57 GLpa) would be discharged. The brine discharge would contain elevated concentrations of total dissolved solids, suspended solids and chemical additives used in the desalination process. The brine concentration would remain constant over various flow rates. The concentrated seawater discharge would have a salinity of up to 80 ppt at a temperature no greater than 2°C above the temperature of the intake seawater. Suspended solids concentration however would vary between 10 and 34 mg/L.

The proponent has proposed that in order to achieve a salinity concentration of 5% of ambient salinity for at least 99% of the time, a Low Ecological Protection Area

(LEPA) of 4 ha would be required. The boundary of the proposed LEPA would be located approximately 1.8 km away proposed Regnard Marine Management Area.

The proponent has proposed management measures for the wastewater outfall. These include:

- developing monitoring and feedback programs for the wastewater stream within the outfall to provide an early warning of potential risks to environmental quality;
- monitoring of ecosystem health in the receiving environment and select appropriate control sites for inclusion in the monitoring program;
- establishing Environmental Quality Objectives (EQOs) for uses and values and where they will be protected;
- establishing appropriate Environmental Quality Criteria (EQC) required to sustain each EQO; and
- providing a high level of ecological protection to waters in the region of Cape Preston, except for the LEPA surrounding the brine discharge and the moderate protection zone within the proposed port and surrounding operational areas.

The proponent has also proposed measures to minimise impacts on turtles, migratory shorebirds and their habitats, including

- installing lighting which is shielded/redirected/lowered/recessed;
- installing lighting which is of low disruptive colour and/or long wavelengths;
- limiting access to beaches;
- post-construction assessment of light spill and effectiveness will be conducted, particularly during nesting season for turtle response to lighting;
- establishing a fox baiting program and, if necessary, control programs for other feral animals;
- finalising the turtle monitoring program with DEC and implement as soon as possible; and
- noise management.

Submissions

Key comments in submissions focused on:

- impacts of brine discharge on water quality in relation to ecological protection zones;
- the loss of BPPH from construction of pipeline;
- impact on marine turtles and shorebirds and need to monitor impacts;
- impact to commercial fishing activities in the area; and
- need to discuss with the Aquarium Specimen Collectors Association and Professional Shell Fishermen's Association.

Assessment

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

- ensure that emissions do not adversely affect the environmental values or the health and amenity of people and marine users by meeting statutory requirements and acceptable standards relating to marine water quality; and
- maintain the abundance diversity, geographic distribution and productivity of benthic habitat and marine fauna at species and ecosystem levels through the avoidance or management of adverse impact and improvement in knowledge.

The EPA considers that brine discharge has the potential to impact on marine values in the vicinity of the outfall. Approximately 252,000 m^3/day (91 Glpa) of saline water would be discharged for short periods during ramp-up either after break-down or start-up conditions. However under normal operating conditions 157,000 m^3/day (57 GLpa) will be discharged. The concentrated seawater discharge would have a salinity of 80 ppt and would contain low concentrations of coagulants, anti-scalants and biocides.

The overflow outfall would discharge up to 3.62 m^3/s of filtered, untreated seawater for a duration of up to 30 minutes. The salinity, temperature, and ionic composition of the seawater is expected to be the same as the ambient waters, but may also include dosing from the coagulant and flocculation process (ferric sulphate or polymer).

The EPA notes that the proponent proposes to manage marine impacts by means of a discharge diffuser capable of achieving sufficient dilutions to meet background salinity and physical properties within four hectares. The proponent proposes to locate the diffuser in an area that has an intrinsic value worthy of a high level of environmental protection.

The brine discharge has the potential to impact on local marine water and sediment quality, marine biota within the vicinity of the outfall and potentially reduce the abundance of sensitive BPPH, including coral communities.

The EPA considers that it would be preferable to locate that outfall in the port area, which is to have a moderate levels of ecological protection due to port activities and the proposed brine discharge from the CBP (Statement 635).

Based on the proponent's modelling (GEMS, 2009) and additional information received during assessment (Oceanica, 2009), the EPA also considers that conditions applied to the marine outfall should be consistent with both State and Commonwealth policy, in particular, *EPA Report 20 Environmental Quality Criteria Reference Document for Cockburn Sound* (2003-2004) and *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ, 2000). Consistent with the principles of these documents the EPA considers that a Low Ecological Protection Area (LEPA) of 70 m from all points on the diffuser should be applied and that a Moderate Ecological Protection Area (MEPA) should apply at the LEPA boundary and to a maximum distance of 250 m from all points on the port infrastructure. Beyond that a high level of ecological protection should apply. The EPA considers that condition 9 which requires location of the marine outfall at the port and defines a LEPA of 70 m from the diffuser would need to be implemented in order for its environmental objectives to be met.

Summary

Having particular regard to:

(a) the EPA's recommendation that the marine outfall be relocated to the port area; and

(b) recommended condition 9,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor subject to implementation of conditions.

3.5 Groundwater and Surface Water

Description

Groundwater and surface can potentially be impacted from mining activities such as pit dewatering, dewater discharge, seepage or drainage from Waste Disposal Facilities (WDF) and acid and metalliferous drainage. Water supply for the plant and accommodation camp will be from a 40 gigalitres per annum (GLpa) desalination plant and therefore unlikely to pose a risk to groundwater.

Pit dewatering

Dewatering of the Central and Balmoral South ore bodies will produce a "cone of depression" in the regional groundwater table which will be elongated along a strike, with the predicted impacts extending up to 14 km to the north, 5km to the south, 7km to the east and 2 km to the west of the Balmoral South pit.

The proponent predicts that inflows peaking at around 1.7 ML/d and reducing to around 0.9 ML/d in the long term could be expected from basement lithologies throughout the development of the mine. In addition, inflows of around 0.35 ML/d and 1.9 ML/d may be expected once the Stage 2 and Stage 3 pits, respectively, breach the saturated Du Boulay Creek alluvium. Some groundwater through flow in the Fortescue River alluvium will also be captured by the dewatering cone of depression and diverted towards the pit. Modelling has also indicated that the pit will be a sink for groundwater and it will also remain dry at the cessation of mining due to the evaporation rate being greater than the predicted inflows into the pit (Aquaterra 2008).

Du Boulay Creek passes between the proposed pit and the processing plants. The pit will be protected by an armoured bund to prevent surface water from entering the pit.

Waste Disposal Facility

Mine waste rock and dewatered tailings will be co-disposed in the designated disposal areas. These include the WDF1 area to the west of the pit which encroaches slightly into the floodplain of the Fortescue River. The WDF2, to the east of the pit, does not encroach into the floodplain of the Du Boulay Creek.

The tails will be dewatered by pressure filtering and conveyed to the Waste Disposal Facility (WDF) by conveyors and stackers, or truck haulage, to either co-dispose with waste rock or dispose in specific areas allocated to dry tails within the WDF disturbance area. The toe of the disposal facilities will be protected by armour rock to resist erosion by the river. Drainage structures will be constructed within the WDF's to handle runoff from a 100 year ARI storm event.

The ultimate height for the WDF is 90 m above ground level and the outer layers will be constructed with inert coarse mine waste, and only material suitable to form a long term stable slope will be used. In areas that may be exposed to frequent water action, rip-rap over size material will be used to rock armour the WDF.

Plant and Accommodation Village

The site level for the processing plants has been set above the 100 year ARI flood level in Du Boulay Creek. Run-off from the plant site will be directed to a retention pond which has the capacity to contain a 1 in 5 year rainfall event.

The proposed accommodation village lies within the flood fringe of the Fortescue River so there is a risk of flooding of the village. In addition Du Boulay Creek located 2 km to the North East of the Fortescue River also has the potential to break out west towards the Fortescue River and impact on the village.

Discharge to the environment of excess water will only occur under extreme flood conditions, where water from surface run-off cannot be retained safely.

Acid and Metalliferous Drainage

An acid and metalliferous drainage (AMD) test work program was commissioned to investigate the potential for acid formation from the waste material encountered within the Balmoral South pit. Initial AMD sampling did not include all lithologies that may be exposed during mining, but instead focused towards high sulphur lithologies.

Analysis of these formations indicates that on a 0.5% total sulphur cut-off, approximately 1% of the Banded Iron Formation, 21% of the Shale and 6% of the remaining material has acid generating potential. Accounting for the total volumes of each of these units, only 5% of the total material being mined has some acid generating potential.

If any potential AMD waste is encountered it will be separately encapsulated in the waste disposal area, surrounded by low permeability material or blended with neutralising waste. Monitoring bores will be installed around to the WDF's to ensure performance of the AMD management actions.

Submissions

Key comments in submissions focused on:

- concern regarding potential for greater drawdown impacts to the west;
- minimum habitable floor levels of 0.5m above the adjacent ARI flood level should apply to ensure adequate flood protection;
- development should be located a suitable distance away from any flood protection bunds to minimise damage from erosive flows in the event of failure;
- details of design of the WDFs should be provided, in particular how materials will be encapsulated; and
- geophysical characteristics of all waste encountered should be assessed to ensure materials prone to dispersion are not deposited on the outer batters of the WDFs.

Assessment

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

- maintain the quality of groundwater so that existing and potential users, including ecosystem maintenance, are protected;

- maintain the integrity, ecological function and environmental values of watercourses, and to ensure that alterations to surface drainage do not adversely impact native vegetation or flow regimes; and
- ensure surface water does not adversely affect environmental values or the health welfare or amenity of people and land uses.

Groundwater can be impacted by a number of mining activities including pit dewatering, dewater discharge, WDF's and pit voids.

Pit dewatering & pit void

Pit dewatering will result in groundwater drawdown. The impact of groundwater drawdown on vegetation has been discussed in section 3.1 of this report. The EPA notes that the model predicts drawdown within the basement rock aquifers which will induce some leakage from the shallow alluvial aquifers. It is likely that these aquifers will be recharged seasonally and are expected to maintain some perched groundwater levels.

The EPA supports the proponent's commitment to investigate the potential for selective backfilling during operation in sections where it can be confirmed that ore reserve sterilisation will not occur. The EPA also acknowledges that the pit void is expected to remain mostly dry and that any long-term density flow of hypersaline water will be confined to the immediate pit area. Therefore, the EPA considers that it is unlikely that the pit void will impact groundwater quality.

Waste Disposal Facility

The EPA understands that the WDF1 has been designed to minimise seepage and considers that the WDF2 should also be designed to the same specifications. The EPA notes that only 5% of the total material being mined has some acid generating potential. The tails produced from processing magnetite ore consists of inert materials comprising a fine and coarse fraction.

The EPA considers it is important that the design of the WDFs should ensure that a stable land form is created and is designed so as to reduce the potential for acid mine drainage to develop and mobilisation of other contaminants through the WDF. The EPA is of the view that the WDFs should be designed to meet best practice and has recommended conditions 14 and 16 to ensure that the construction of the WDFs does not result in unacceptable environmental impacts.

The EPA notes that the WDF1 will potentially impact flood levels of the Fortescue River as it encroaches into the Fortescue 100 ARI floodplain. The proposed mine infrastructure encroaches into the Du Boulay Creek 100 year ARI floodplain. By bunding off a proportion of the floodplain adjacent to the proposed pit and plant site, flow is restricted in width during large flood events, and causes water levels to rise adjacent to the site. Downstream of the plant site, Du Boulay Creek is confined between the Central and Southern ore bodies, where the floodplain width is reduced by further proposed bunding.

The EPA considers that the risk of erosion and sedimentation is high as the Pilbara landscape is subject to extreme climatic events. WDFs and stockpiles have the

potential to discharge sediment laden water to the environment, and surface water runoff in general will typically be sediment laden, in particular on disturbed land.

The EPA notes the proposed management measures for groundwater and surface water. These include:

- diverting surface water flows around structures;
- establishing flood protection works and ensuring an additional 2 m freeboard above the predicted 100 year ARI flood plain levels;
- bunding of WDFs areas;
- using armour where impinging flood velocities exceed 2 m/s;
- directing potentially contaminated flow to ponds;
- diverting surface water discharge over spreader mechanisms to slow and disperse flows where ecosystem sensitive sheet flow zones are located immediately downstream;
- constructing erosion control berms near cleared areas to regulate surface water runoff; and
- constructing erosion control berms to follow land contours with appropriate gradient design for low velocity discharge.

The EPA notes that design and construction of the WDFs in this environment, close to a major river, will present challenges. The EPA is however of the view that, using best practice methods, it should be possible to construct WDFs which will be sustainable in the long term (including following mine closure) and which will ensure protection of ground and surface water. The EPA notes that the detailed design of the WDFs will be vetted by technical specialists of the Department of Mines and Petroleum and the Department of State Development prior to construction.

The EPA notes that 50% of the accommodation village is located within the fringe of the 100 year ARI Fortescue River floodplain. The impacts appear to be localised and given the measures to minimise impacts on surface water the EPA considers the impacts to be insignificant.

The EPA notes that the location of the accommodation village within the floodplain appears to pose safety issues. The EPA anticipates that this matter will be addressed through the approvals processes administered by DMP and DSD.

The EPA acknowledges that the proponent may need to discharge excess water to the environment under extreme flood conditions where water from surface run-off cannot be retained safely. The EPA notes that the proponent will ensure that water quality is in accordance with ANZECC standards prior to its release.

Summary

Having particular regard to the:

(a) proposed design of the WDFs; and

(b) measures to minimise impact on both surface and groundwater,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor subject to implementation of conditions.

3.6 Air Quality

Description

The main emissions sources listed in the PER are:

- two 7Mtpa Pellet Plants
- Power station comprising of two 240MW combined cycle gas turbines.

The main pollutants from these sources include; carbon dioxide (CO_2), oxides of nitrogen (NO_X), carbon monoxide (CO), sulphur dioxide (SO_2), particulates (PM_{10}), along with trace amounts of volatile organic hydrocarbons (VOCs). Carbon dioxide is addressed in the section on greenhouse gas and is not considered further in this section. The proponent considers that any emissions of dioxins would be minimal due to the absence of chlorine in potable water and natural gas.

Earthworks and mining activities also have the potential to generate fugitive dust emissions if not appropriately managed.

The proponent used the USEPA regulatory model AERMOD to predict local ground level concentrations (GLCs) and the CSIRO's Atmospheric Research air dispersion model TAPM to predict the regional formation of photochemical smog.

The predicated GLCs of the BSIOP proposal alone are shown in Table 3 and the cumulative GLCs which include emissions from CBP are shown in Table 4.

Table 3: Predicted maximum emissions from the BSIOP

Emission	Averaging period	Criteria (µg/m^3)	Applicability	Predicted concentrations (µg/m^3)	
				Anywhere	Nearby camps
NO_2	1-hour 1-year	264 62	Residential / camp sites	175 19.5	98 1.4
SO_2	1-hour 24 hour 1-year	572 228 57	Residential / camp sites	74 24 1.8	26 1.7 0.13
PM_{10}	24-hour	50	Residential / camp sites	30	2.1
CO	8-hour	11,240	Residential / camp sites	157	16

Table 4: Predicted maximum cumulative concentrations from BSIOP and CBP

Emission	Averaging period	Criteria ($\mu g/m^3$)	Background	Predicted concentrations ($\mu g/m^3$)	
				Anywhere	Nearby camps
NO_2	1-hour 1-year	264 62	4.2 2	179 26	130 7.6
SO_2	1-hour 24 hour 1-year	572 228 57	Negligible	74 24 1.9	42 3 0.25
PM_{10}	24-hour	50	22	113	35
CO	8-hour	11,240	Negligible	157	30

The air dispersion modelling for BSIOP predicted compliance with the NEPM standard for the key pollutants (NO_2, SO_2, PM_{10}) across the modelled area. The cumulative (BSIOP and CBP) modelling predicted compliance across the modelled area, with the exception of PM_{10}, however the PM_{10} exceedances do not occur near camping areas or other sensitive receptors.

The TAPM modelling predicts that the proposal is unlikely to cause the formation of photochemical smog in the region.

Submissions

Key comments in submissions focused on:

- an independent review be undertaken to ensure that best practice technology and strategies are adopted.

Assessment

The area considered for the assessment of this factor is the local and regional airshed surrounding the proposal site.

The EPA's environmental objective for this factor is to ensure that emissions do not adversely affect environmental values, or the health, welfare or amenity of people and land user by meeting statutory requirements and acceptable criteria.

The EPA notes that the cumulative air dispersion modelling predicts compliance with the NEPM standard at camping areas and sensitive premises.

While the proponent considers that emissions of dioxin would be small, the EPA considers it prudent for the proponent to fully characterise all constituents in the stack emissions to confirm that emissions of dioxins and other toxics are negligible. As such the EPA has recommended condition 11.

The EPA notes the DEC advice that the ongoing emissions from the pellet plant and power station stacks can be adequately regulated under Part V of the EP Act. Part V is also appropriate for the management of fugitive dust from earthworks and mining operations. The EPA recommends that the DEC require best practice pollution controls on the pellet plant stacks, along with monitoring and reporting of stack emissions in the Works Approval and operating Licence.

Summary

Having particular regard to the:

(a) compliance with the NEPM standard at camping areas and sensitive premises;

(b) characterisation of all constituents in the stack emissions (condition 11); and

(c) regulatory measures available Part V of the EP Act,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor subject to implementation of conditions.

3.7 Greenhouse Gas

Description

The project would be developed in two stages. Stage 1 would cater for 12Mtpa of product and include a 7 Mtpa pellet plant and a 300W power station. Stage 2 would double the capacity to 24 Mtpa with the addition of a second pellet plant and a second power station.

Initially, with stage 1 operational, the proponent estimates greenhouse gas emissions to be around 1.4 Mtpa of CO_2e (carbon dioxide equivalent). When stage 2 becomes operational, greenhouse gas emissions would jump to 2.7 Mtpa of CO_2e. Over the 31 year project life, emissions are estimated to total 66.6 million tonnes.

Submissions

Key comments in submissions focused on:

- the expected GHG emissions are significant and will add to WA's emissions considerably; and
- the proposal is expected to be fully covered under the Carbon Pollution Reduction Scheme.

Assessment

The EPA's objectives are to:

- minimise greenhouse gas emissions in absolute terms and reduce emissions per unit of product to as low as reasonably practicable; and
- mitigate greenhouse gas emissions, mindful of Commonwealth and State greenhouse gas strategies and programs.

The EPA notes that the majority of greenhouse gas originated from the use of natural gas (in the power station and pellet plant). The proponent has selected combined cycle gas turbines for the power station and incorporated waste heat recovery from the process plant. The EPA considers these measures to be appropriate and to represent best practice in maximising energy efficiency.

The EPA notes that the proponent would be covered under the Commonwealth's proposed Carbon Pollution Reduction Scheme. There is still considerable uncertainty around this scheme. The EPA has recommended condition 12 to greenhouse gas emissions are as low as reasonably practicable.

Summary

Having particular regard to the:

(a) measures to maximize energy efficiency;

(b) proponent's proposed management actions and design features; and

(c) DEC's advice that it can manage the emissions through Part V of the EP Act,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor subject to implementation of conditions.

3.8 Rehabilitation and Closure

Description

Open cut mining would be used to mine the Balmoral South deposit. The proposed mine is expected to operate for at least 28 years after the first three years of construction and commissioning.

The total disturbance, including both direct and indirect impacts, during the project is expected to be approximately 5,757 ha. There is the potential for unstable landforms, erosion, contamination, altered groundwater and surface water regimes, and the unsuccessful return of vegetation to result. The proponent has committed to rehabilitating 4,927 ha.

The post mining land use for the project area is proposed to replicate current vegetation and support the post-project land-use of pastoralism. The proponent has stated that progressive backfilling of the pit may be considered in the future and this may prove to be an effective way to reducing mining costs over the life of mine, provided it can be achieved without sterilisation of potential ore resources.

Aquaterra (2008) has confirmed that the pit void would remain a sink for groundwater, based on mass-balance calculations. Based on that modelling, at the completion of mining and the cessation of pumping, pits will fill with water to a level defined by the long-term balance between inflows and outflows. However Aquaterra consider that the pit will remain dry at the cessation of mining due to the evaporation rate being greater than the predicted inflows into the pit.

Approximately 80 Mtpa of waste rock would be produced during the mine life. It is proposed that the waste would be distributed to the two waste disposal facilities (WDF) located to the west and east of the pit. Tailings material would also be disposed of to the two WDFs (i.e. there will be no separate tailings storage facility).

Rehabilitation of the WDFs will occur progressively. The outer layer will be constructed within inert mine waste with rip-rap over size (boulders >1 tonne) being placed in areas exposed to frequent water action. The top of the dump will be covered in scree and raked out of waste so that the surface is dust free.

The proponent has proposed a number of rehabilitation management measures including:

- retaining topsoil, vegetation debris, logs and leaf litter to use during rehabilitation;
- applying topsoil as soon as practicable;
- ensuring reshaped land is stable and adequately drained;
- developing and implementing rehabilitation trials throughout the operational life of mine to develop appropriate site specific methodology;
- investigating and testing the use of various WDF profiles to determine the best placement of topsoil, minimise long-term erosion, and assist in revegetating with local native plant growth;
- ensuring compacted surfaces are ripped and seeded;
- ensuring natural drainage is restored as far as practicable to minimise erosion at the time of closure; and
- developing a final decommissioning and closure plan.

The proponent has indicated that there is some potentially acid forming (PAF) material associated with the ore body. There is also some asbestiform material associated with the orebody. The proponent has indicated that both will be disposed of to the WDFs using best practice methods.

Decommissioning of infrastructure will be in accordance with the *Iron Ore Processing (Mineralogy Pty Ltd) Agreement Act 2002*.

Submissions

Key comments in submissions focused on:

- Further information be required for the closure and rehabilitation of the pit void as this has potential for long-term impacts on water quality and conservation of native fauna in the area;

Assessment

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

- ensure that mining is planned and carried out so to ensure a sustainable mine closure outcome is achieved, consistent with mining industry best practice as set out in the Australia and New Zealand Minerals and Energy Council / Minerals Council of Australia, 2000, *Strategic Framework for Mine Closure*;
- ensure that self-sustaining native vegetation communities are returned after mining, which in species composition and ecological function are as close to possible to naturally occurring analogue sites; and
- ensure that final mine pit lakes do not cause significant environmental impacts through groundwater pollution or by attracting wildlife, birds or stock which may be harmed by contact with contaminated water, or, if the water is of good quality, by attracting increased numbers of grazing and predatory animals which may consequently impact on the ecology of the surrounding area.

The EPA acknowledges that the proponent has committed to progressive rehabilitation and to plan for closure and rehabilitation, commencing from the early stages of project development, which will be further defined through stakeholder consultation, detailed engineering design and various studies.

The EPA notes that the proposed mine is located close to a major river. In addition, there are some potentially acid forming materials (PAF) and asbestiform minerals

associated with the ore body and these will require careful management. Sustainable closure and rehabilitation of the mine will therefore present substantial challenges.

In order to ensure the long-term success of mine closure and rehabilitation the EPA recommends that condition 14 be imposed on the proponent. That condition requires that the proponent be required to submit a full project-specific conceptual closure strategy prior to the start of ground-disturbing activities. This approach of requiring "up-front" mine closure planning is fully consistent with Australian and international mining industry best practice as set out in the Australia and New Zealand Minerals and Energy Council / Mining Council of Australia, 2000, *Strategic Framework for Mine Closure* and the Australian national "Leading Practice" handbook on mine closure and completion (Department of Industry, Tourism and Resources, 2007).

The EPA notes that one pit void would remain at the cessation of mining and that the pit is expected to stay mostly dry (ie there would be no pit lake after mine closure). Recommended condition 14 requires the proponent to provide information to confirm this prediction.

Recommended condition 13 requires that rehabilitation achieve specific outcomes to ensure that, at closure, the waste dumps and other disturbed areas above ground are left in a safe, stable and non-polluting condition. This type of condition is a standard requirement for any mine in Western Australia.

As the proposal relates to a State Agreement and not to Mining Leases managed by the Department of Mines and Petroleum, the application of a Performance Bond is not possible under the *Mining Act 1978*. Consequently, condition 15 has been included which provides for a Performance Bond as security for performance of condition 13 and 16.

Condition 16 requires the proponent to prepare a Final Closure and Decommissioning Plan at least 5 years prior to the final completion of mining. This requirement is again consistent with Australian and international mining industry best practice for sustainable mine closure.

Summary

Having particular regard to the:

(d) proposed management measures;

(e) planning in early stages of project development; and

(f) continuous consultation with stakeholders,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor subject to implementation of conditions.

3.9 Environmental principles

In preparing this report and recommendations, the EPA has had regard for the object and principles contained in s4A of the *Environmental Protection Act (1986)*. Appendix 3 contains a summary of the EPA's consideration of the principles.

4 Conditions

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment 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.

4.1 Recommended conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Mineralogy Pty Ltd to construct and operate the Balmoral South Iron Ore Project is approved for implementation.

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

(a) Flora;

(b) Vegetation;

(c) Fauna;

(d) Groundwater and Surface Water Quality;

(e) Mangroves;

(f) Marine Ecosystem;

(g) Greenhouse Gases;

(h) Rehabilitation;

(i) Bond; and

(j) Mine Closure.

It should be noted that other regulatory mechanisms relevant to the proposal are:

- *Explosive and Dangerous Goods Act 1961* – dangerous goods licence;
- *Dangerous Goods Safety Act 2004* – licence for the storage, handling and transport of dangerous goods;
- *Rights in Water and Irrigation Act 1914* – licence for abstraction (dewatering);
- *Wildlife Conservation Act 1950* – licence to handle and remove trapped native fauna from construction areas;
- Part V of the *Environmental Protection Act 1986* – various Works Approvals and an operating licence would be required for construction and operation of the project;
- *Environmental Protection (Noise) Regulations 1997* – for construction and operational noise;

- *Mining Act 1978* – mining proposal is required to be approved by the Department of Mines and Petroleum; and
- *Iron Ore Processing (Mineralogy Pty Ltd) Agreement Act 2002* – proposal is required to be approved by the Minister for State Development.

5 Conclusions

The EPA has considered the proposal by Mineralogy Pty Ltd to develop and operate the Balmoral South iron ore project (BSIOP) with infrastructure and utilities located in the Cape Preston region, 80 km south-west of Karratha.

Flora and Vegetation

The BSIOP is expected to impact on a number of land systems within the Roebourne subregion (Mineralogy, 2009). These Land Systems are widespread throughout the Pilbara and therefore are not considered regionally significant.

No Threatened Ecological Communities or Declared Rare Flora were identified within the project area.

The project is also expected to impact on vegetation communities that are known to support Priority One species *Goodenia sp*. East Pilbara and Priority Three species *Phyllanthus aridus*. The Priority Three species has been recorded in a number of different areas throughout the Kimberley (Maunsell, 2008) and is not likely to be significantly impacted. The Priority One species is located outside the area of impact and is not expected to be impacted by the proposal.

Phreatophytic vegetation in the area is unlikely to be significantly impacted by groundwater drawdown as the flora are well represented outside the area of impact.

Two species of Declared Plants, *Prosopis pallida* (Mesquite) and *Datura leichhardtii* (Native Thornapple), were recorded in the project area. There is potential for weeds to spread, however, the proponent has proposed satisfactory control methods.

Terrestrial Fauna

The proposal is unlikely to have significant impacts on terrestrial fauna including the Rainbow Bee-eater (*Merops ornatus*), Pilbara Leaf-Nosed Bat, the Olive Python and the Mulgara.

Subterranean fauna associated with the BSIOP and cumulatively with the Central Block Project (CBP) is unlikely to be impacted as these species are expected to occur in the remaining habitat outside the impact zones.

Mangroves

Establishment of exclusion zones (condition 9) outside proposed disturbed areas will ensure that the impact to the mangroves and algal mat habitat can be managed in an environmentally acceptable manner.

Marine Ecosystem

It is expected that 157,000 m^3/day (57 GLpa) of brine will be discharged to the marine waters.

Brine discharge has the potential to impact on local marine water and sediment quality, marine biota within the vicinity of the outfall and potentially reduce the abundance of sensitive Benthic Primary Producer Habitat (BPPH), including coral communities. The proponent has proposed a Low Ecological Protection Area (LEPA) of 4 ha to allow for the appropriate number of dilutions which will ensure that a salinity level of no greater than 5% above ambient level will be met 99% of the time outside the LEPA.

Based on the proponent's modelling (GEMS, 2009) and additional information received during assessment (Oceanica, 2009), the EPA considers that conditions applied to the marine outfall should be consistent with both State and Commonwealth policy, in particular, *EPA Report 20 Environmental Quality Criteria Reference Document for Cockburn Sound* (2003-2004) and *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ, 2000). Consistent with the principles of these documents the EPA considers that a Low Ecological Protection Area (LEPA) of 70 m from all points on the diffuser should be applied and that a Moderate Ecological Protection Area (MEPA) should apply at the LEPA boundary and to a maximum distance of 250 m from all points on the port infrastructure. Beyond that a high level of ecological protection should apply. The EPA considers that condition 10 which requires location of the marine outfall at the port and defines a LEPA of 70 m from the diffuser would need to be implemented in order for its environmental objectives to be met.

Groundwater and Surface water

Design and construction of the Waste Disposal Facilities (WDFs) in this environment, close to a major river, will present challenges. With the use of best practice methods, it should be possible to construct WDFs which will be sustainable in the long term (including following mine closure) and which will ensure protection of ground and surface water. The detailed design of the WDFs will be vetted by technical specialists of the Department of Mines and Petroleum and the Department of State Development prior to construction.

Air Quality

Cumulative air dispersion modelling predicts compliance with the NEPM standard at camping areas and sensitive premises.

While the proponent considers that emissions of dioxin would be small, it would be prudent for the proponent to fully characterise all constituents in the stack emissions to confirm that emissions of dioxins and other toxics are negligible. As such condition 12 has been recommended.

Greenhouse Gas

The proposal will emit 2.7 Mtpa CO_2e. Over the 31 year project life, emissions are estimated to total 66.6 million tonnes.

The majority of greenhouse gas originates from the use of natural gas (in the power station and pellet plant). The proponent has selected combined cycle gas turbines for the power station and incorporated waste heat recovery from the process plant. The design of power stations represents best practice in maximising energy efficiencies.

Rehabilitation and Mine Closure

The proposed mine is located close to a major river. In addition there are some potentially acid forming materials (PAF) and asbestiform minerals associated with the ore body and these will require careful management. Sustainable closure and rehabilitation will therefore present substantial challenges.

Recommended condition 14 is a prescriptive condition requiring the preparation of a project-specific conceptual closure strategy prior to commencement of ground-disturbing activities. The requirement for an "up-front" project-specific conceptual closure strategy before mining commences is fully consistent with Australian and international mining industry best practice as set out in the Minerals Council of Australia's own policy on mine closure planning.

As the proposal relates to a State Agreement and not to Mining Leases managed by the Department of Mines and Petroleum, the application of a Performance Bond is not possible under the *Mining Act 1978*. Consequently, condition 15 has been included which provides for a Performance Bond as security for performance of condition 13 and 16.

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

6. Recommendations

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

1. That the Minister notes that the proposal being assessed is for develop and operate an open-cut iron ore mine with infrastructure and utilities;
2. That the Minister considers the report on the key environmental factors and principles 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
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Appendix 1

List of submitters

Government Departments:
Department of Environment and Conservation
Department of the Environment, Water, Heritage and the Arts
Department of Fisheries
Department of Health
Department of Indigenous Affairs
Department of Mines and Petroleum
Department of Water
Marine Parks and Reserves Authority
Main Roads Western Australia

Non-governmental Organisations:
Pilbara Native Title Service (Yamatji Marlpa Aboriginal Corporation)
Wildflower Society of Western Australia Inc

Appendix 2

References

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Appendix 3

Summary of identification of key environmental factors and principles

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
BIOPHYSICAL			
Flora and Vegetation	A total of 5,757 ha would be impacted by the proposal, including 5,297 ha from clearing and 460 ha from groundwater drawdown. The project area if located within the Fortescue Botanical district of the Pilbara Biogeographic region. Nine Land Systems (mapped by Department of Agriculture) were found to occur in the project area. A total of 500 vascular flora species, with two species being Declared Plants (Mesquite and Native Thornapple) were recorded during the five field surveys. Two Priority flora species, *Goodenia sp*. East Pilbara (P1) and *Phyllanthus aridus* (P3), were identified and one species, *Acacia victoriae*, was found to exhibit a range extension. No DRF or TEC's were identified within the project area.	Government Organisations • Further clarification for the purpose, design and construction details of the western infrastructure corridor and the need for two corridors is required; • Impact on the Fortescue River ecosystem, particularly the associated phreatophytic vegetation, needs to be defined with management, mitigation and monitoring measures; • Weed control management should incorporate baseline weed mapping and active weed control programs; • Dust issues can be managed though the works approval and licensing system under Part V of EP Act; and • Clarify whether there will be any direct or indirect impact on the *Acacia victoriae* or the two Priority species.	**Considered to be a relevant environmental factor and is discussed under Section 3.1 – Flora and Vegetation.**
Fauna and Habitat	Terrestrial The project area is located within the Roebourne subregion of the Pilbara IBRA which supports a number of fauna species that are afforded protection under the EPBC Act. In addition, three specially protected fauna are also reported to occur within the sub region. Of the Nationally Significant Threatened Species, a targeted survey for the Pilbara Leaf-Nosed bat, the Olive Python and the Mulgara yielded no recordings within the project area.	Government Organisations • Fauna access should be considered in the project design to remove barriers for movement of terrestrial fauna; and • Troglofauna sampling effort outside of impact zones and the presentation of geological data to support habitat-based risk assessment are insufficient.	**Considered to be a relevant environmental factor and is discussed under Section 3.2 – Fauna and Habitat.** **Short-range Endemics** The SRE species recorded in the BSIOP footprint, *Synothele* n. sp. *Pseudoidiomata* is also known to occur at Warramboo Outstation, located 52km SW of the cracking clay habitat and *Buddelundia* n.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	Two nationally significant migratory terrestrial bird species have been observed in the project area. The Rainbow Bee Eater (*Merops ornatus*) was found mostly along the river and creek lines and the White-bellied Sea-Eagle (*Haliaeetus leucogaster*) was sighted making opportunistic use of standing water in the Fortescue River. Ten species of conservation significant are reported by DEC database searches to occur in the area with on the Bustard (*Ardeotis australis*) being recorded in the project area during the field surveys. The Mulgara and the Night Parrot, Schedule 1 species, were not recorded during any of the field surveys. The Peregrine Falcon (Schedule 4) was also not recorded during any of the fauna surveys, however, the species may hunt, but is not likely to nest, in the Project area. The Priority 1 species, Little North-Western Mastiff Bat, was not recorded during the 2006 opportunistic field survey, however, was recorded in the 2000 and 2008 surveys in the mangrove vegetation community outside of the project area. It is considered that it is unlikely that the Project area supports colonies due to there being no caves or abandoned mines, no sightings during targeted searches. Spectacled Hair Wallaby (Priority 3) was not recorded during the field surveys. The Lakeland Downs Mouse, Kerakenga (*Leggadina lakedownsensis*), a Priority 4 species, was recorded in the 2000 field survey from the cracking clay habitat and low hills. This species is expected will occur in the project area.		sp.1.has been found south of the Project footprint. Therefore the EPA is of the view that the Project will not have a significant impact on this species and therefore is not considered a relevant factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	No evidence was encountered which would indicate that the Western Pebble Mouse (Priority 4 species) would occur in the project area. The other Priority 4 species (Bush stone Curlew and the Eastern Curlew) were also not recorded during the field surveys. However, the Bustard (*Ardeotis australis*) has been recorded to occur in four locations within the project area. <u>Subterranean</u> The surveys conducted for the project area, in particular the pit and the groundwater drawdown impact zone. 15 species of stygofauna (copepods, ostracods, emphipods, thermobaenacids, worms, mites and nematods) were identified and have all been recorded to occur elsewhere in the Cape Preston area beyond the zone of impact. Nine species of troglofauna were collected at the project area. Six of these were found to occur at the CBP. *Cryptos* sp B2 (nr *australis*) appears to be the same species as recorded in surface litter at Cape Preston outside impact zones. The only species found at Balmoral South but yet to be found elsewhere are the millipede *Polyxenidia* sp. B1 and silverfish *Trinemura* sp. B1 (nr *troglophila*). The recorded distributions of several species of troglofauna combined with the lack of major discontinuities between the ore-bodies in the Cape Preston area suggests that the Cape Preston troglofauna community extends through all ore-bodies in the area. The process of dewatering is not expected to change the		

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	relative humidity of the troglofauna habitat and therefore the impacts from dewatering are expected to be minimal. <u>Short-range Endemics</u> The area contains few disjunct habitats and is relatively low-lying. The north-south orientation of the range also limits the number of south-facing slopes, which favour micro-climate formation and hence act as a refuge for historically isolated fauna species. Short-range endemic (SRE) surveys were undertaken within and externally to the proposed area of impact. The reference sites identified were generally considered to have a greater potential to facilitate short-range endemism. A total of 50 sites were surveyed. A total of nine families known to include SRE taxa were identified and were represented by 13 genera and 25 species. Nine of the 25 species are considered to be SRE. Two of the potential SRE species were recorded within the BSIOP footprint and these include: • Synothele n. sp. Pseudoidiomata (recorded from a single location in cracking clay habitat on the southern boundary of the main project footprint); and • Buddelundia n. sp.1 (recorded from the rocky outcrops and minor rocky slopes of the Rocklea Land System, two sites on Cape Preston and one on the mainland).		
Mangroves	A well developed and structurally complex mangrove system is associated with the major tidal creek and connective tidal flats that join Cape Preston to the mainland. Other areas of mangroves occur in the wider locality, including a generally	<u>Government Organisations</u> • The western infrastructure corridor is located in the middle of an important	**Considered to be a relevant environmental factor and is discussed under Section 3.3 – Mangroves.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	narrow zone of *Avicennia marina* which borders the western shoreline and embayments between the creek and the mouth of the Fortescue River (URS, 2009). The local occurrence of mangrove species and assemblages within the creek system exhibited similar patterns to those observed elsewhere in the region in relation to species distribution, local geomorphology and substrate. The most abundant and widespread species were *Avicennia marina* (dominant or co-dominant in most assemblages in the study area) and *Rhizophora stylosa* (which formed dense monospecific assemblages). *Ceriops australis* and *Aegiceras corniculatum* are also known to occur in the area (URS, 2009). The alignment of the eastern corridor is located as far east as possible and traverses high tidal flat areas that are largely devoid of mangroves. The creek crossing is in the upper reaches of a tidal creek system at a location where an approximately 30m wide band of mangroves fringe the creek channel. Construction of this corridor includes a solid filled structure. It is expected that 4.4 ha of mangroves and 6.3 ha of algal mat habitat will be impacted. The alignment of the western corridor traverses a broad creek at a downstream location of the river mouth. Construction of the corridor includes a solid fill structure in the high tidal flats areas and a trestle structure within the mangrove areas and the broad creek crossing. The impact on the mangrove area is expected to be 1.3 ha and 7.8 ha of algal mat habitat will be lost. Construction of the central corridor, located between the western and eastern corridors north of the creek channel, will	area of mangroves; and • The proponent should demonstrate that the cumulative mangrove and algal mat loss will not exceed 10% of these habitats within the management unit.	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	result in a loss of 9.2 ha of algal mat habitat. An additional 2.8 ha of mangroves will potentially be at risk as a result of reduced flushing from the construction of the solid fill causeway with culverts. This was based on modelling undertaken to simulate the effect on tidal levels upstream of the proposed solid fill causeway with culverts in the eastern corridor. The total area of mangrove habitat loss from both direct and indirect impacts is expected to be 8.5 ha.		
Marine Ecosystem	The discharge pipeline will be located approximately 1.6 km NE of Cape Preston in 7 m of water at Lowest Astronomical Tide. The intake pipeline will be located in 8 m of water at Lowest Astronomical Tide, approximately 1.9 km NNE of Cape Preston. The pipeline and diffuser is to be located in an area of low environmental value, mainly consisting of algal dominated limestone pavement and deep sand/silt. discharge outfall will traverse an area of shallow sand veneered or exposed limestone pavement. Pipes will be laid within trenches which will be 4 m wide by 3 m deep and require the removal of approximately 30,000m^3 of marine sediment. A total area of approximately 1 ha of seafloor will be disturbed through trenching. Excavation of trenches will be by barge mounted excavator, with spoil transported back to shore for sorting and potential use as selected backfill in the trench. The backfill used for the trench bottom and pipeline surrounds will be de-slimed engineered coarse material.	<u>Government Organisations</u> • Proposed Water Quality Management Framework should be provided; • Levels of acceptable change in water quality parameters for each zone of ecological protection be defined. • The proponent should assess the loss of BPPH from construction of the desalination pipeline • Management of potential impacts on marine turtles and shorebirds be considered and monitored throughout all aspects of development and operation of the project; • Need to comply with the 2004 Australian Drinking Water Guidelines where water is used for drinking water; • Providing drinking water quality management plan prior to construction and produce ongoing monitoring reports;	**Considered to be a relevant environmental factor and is discussed under Section 3.4 – Marine Ecosystem.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	Trenching and backfilling activities for the installation of the pipeline and diffuser will take approximately two to three months to complete. As a result, turbidity generated from trenching activities will be temporary and localised and intermittent given that it will be undertaken by backhoe excavator and will be interrupted by tide and weather. It is expected that turbidity generated from trenching activities and backfilling activities will be minor and will be restricted to the non-significant habitats in the immediate vicinity of the pipeline corridor, and as such it is deemed that there will be no significant impacts to the surrounding environment, including any sensitive coral habitats in the region. The brine outfall will be designed to manage a discharge of approximately 252,000 m^3/day (91 Glpa) for short durations during ramp-up either after break-down or start-up conditions. However under normal operating conditions 157,000 m^3/day (57 GLpa) will be discharged. The brine discharge will contain elevated concentrations of total dissolved solids, suspended solids and chemical additives used in the desalination process. The brine concentration will remain constant over various flow rates. The concentrated seawater discharge would have a salinity of up to 80 ppt at a temperature no greater than 2°C above the temperature of the intake seawater. Suspended solids concentration however will vary between 10 and 34 mg/L. The proponent has proposed that in order to achieve a salinity concentration of 5% of ambient salinity for at least 99% of the time, a Low Ecological Protection Area (LEPA) of 4 ha is required. The boundary of the proposed LEPA is located approximately 1.8 km away proposed Regnard Marine	• Consideration should be given to commercial fishing activities in the area; • Discussions with the Aquarium Specimen Collectors Association and Professional Shell Fishermen's Association is recommended; and • Management strategies pertaining to brine discharge and seawater intake are inadequate in detail and do not provide clear evidence of an effective adaptive management approach based on clear objectives.	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	Management Area. The proponent has proposed management measures for the wastewater outfall. These include: • Developing monitoring and feedback programs for the wastewater stream within the outfall to provide an early warning of potential risks to environmental quality; • Monitoring of ecosystem health in the receiving environment and select appropriate control sites for inclusion in the monitoring program; • Establishing Environmental Quality Objectives (EQOs) for uses and values and where they will be protected; • Establishing appropriate Environmental Quality Criteria (EQC) required to sustain each EQO; and • Providing a high level of ecological protection to waters in the region of Cape Preston, except for the LEPA surrounding the brine discharge and the moderate protection zone within the proposed port and surrounding operational areas. The proponent has also proposed measures to minimise impacts on turtles, migratory shorebirds and their habitats, including • installing lighting which is shielded/redirected/lowered/recessed; • installing lighting which is of low disruptive colour and/or long wavelengths; • limiting access to beaches; • post-construction assessment of light spill and effectiveness will be conducted, particularly during nesting season for turtle response to lighting; • establishing a fox baiting program and, if necessary, control programs for other feral animals;		

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	• finalising the turtle monitoring program with DEC and implement as soon as possible; and • noise management.		
Groundwater and Surface water	<u>Pit dewatering</u> Dewatering of the Central and Balmoral South ore bodies will produce a "cone of depression" in the regional groundwater table which will be elongated along a strike, with the predicted impacts extending up to 14 km to the north, 5km to the south, 7km to the east and 2 km to the west of the Balmoral South pit. The proponent predicts that inflows peaking at around 1.7 ML/d and reducing to around 0.9 ML/d in the long term could be expected from basement lithologies throughout the development of the mine. In addition, inflows of around 0.35 ML/d and 1.9 ML/d may be expected once the Stage 2 and Stage 3 pits, respectively, breach the saturated Du Boulay Creek alluvium. Some groundwater through flow in the Fortescue River alluvium will also be captured by the dewatering cone of depression and diverted towards the pit. Modelling has also indicated that the pit will be a sink for groundwater and it will also remain dry at the cessation of mining due to the evaporation rate being greater than the predicted inflows into the pit (Aquaterra 2008). Du Boulay Creek passes between the proposed pit and the processing plants. The pit will be protected by an armoured bund to prevent surface water from entering the pit. <u>Waste Disposal facility</u> Mine waste rock and dewatered tailings will be co-disposed in the designated disposal areas. These include the WDF1 area	<u>Government Organisations</u> • Further details on construction water supply are required including volumes and contingency options. • The proposed regional groundwater monitoring is a minimum acceptable program; • Potential for greater drawdowns to the west if hydrological concept of the boundary being very impermeable; • Recommendation of minimum habitable floor levels of 0.5m above the adjacent ARI flood level to ensure adequate flood protection; • Development should be located a suitable distance away from any flood protection bunds to minimise damage from erosive flows in the event of failure; • The monitoring program should be sufficient to detect potential impacts early • Details of design of the WDFs should be provided, in particular how materials will be encapsulated; and • Geophysical characteristics of all waste encountered should be assessed to ensure materials prone to dispersion are not deposited on the outer batters of the	**Considered to be a relevant environmental factor and is discussed under Section 3.5 – Groundwater and Surface Water.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	to the west of the pit which encroaches slightly into the floodplain of the Fortescue River. The WDF2, to the east of the pit, does not encroach into the floodplain of the Du Boulay Creek. The tails will be dewatered by pressure filtering and conveyed to the Waste Disposal Facility (WDF) by conveyors and stackers, or truck haulage, to either co-dispose with waste rock or dispose in specific areas allocated to dry tails within the WDF disturbance area. The toe of the disposal facilities will be protected by armour rock to resist erosion by the river. Drainage structures will be constructed within the WDF's to handle runoff from a 100 year ARI storm event. The ultimate height for the WDF is 90 m above ground level and the outer layers will be constructed with inert coarse mine waste, and only material suitable to form a long term stable slope will be used. In areas that may be exposed to frequent water action, rip-rap over size material will be used to rock armour the WDF. <u>Plant and Accommodation Village</u> The site level for the processing plants has been set above the 100 year ARI flood level in Du Boulay Creek. Run-off from the plant site will be directed to a retention pond which has the capacity to contain a 1 in 5 year rainfall event. The proposed accommodation village lies within the flood fringe of the Fortescue River so there is a risk of flooding of the village. In addition Du Boulay Creek located 2 km to the North East of the Fortescue River also has the potential to break out west towards the Fortescue River and impact on the village.	WDFs.	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	Discharge to the environment of excess water will only occur under extreme flood conditions, where water from surface run-off cannot be retained safely. <u>Acid and Metalliferous Drainage</u> An acid and metalliferous drainage (AMD) test work program was commissioned to investigate the potential for acid formation from the waste material encountered within the Balmoral South pit. Initial AMD sampling did not include all lithologies that may be exposed during mining, but instead focused towards high sulphur lithologies. Analysis of these formations indicates that on a 0.5% total sulphur cut-off, approximately 1% of the Banded Iron Formation, 21% of the Shale and 6% of the remaining material has acid generating potential. Accounting for the total volumes of each of these units, only 5% of the total material being mined has some acid generating potential. If any potential AMD waste is encountered it will be separately encapsulated in the waste disposal area, surrounded by low permeability material or blended with neutralising waste. Monitoring bores will be installed around to the WDF's to ensure performance of the AMD management actions.		
POLLUTION			
Air Quality	The main emissions sources listed in the PER are: • Pellet plants: two 7Mtpa • Power station: two 240MW combined cycle gas turbines. The main pollutants from these sources include; carbon	<u>Government Organisations</u> • The expected GHG emissions is significant and will add to WA's emissions considerably; • The proposal is expected to be fully covered under the Carbon Pollution	**Considered to be a relevant environmental factor for process emissions and greenhouse gases and is discussed under Section 3.6 – Air Quality.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	dioxide (CO_2), oxides of nitrogen (NO_X), carbon monoxide (CO), sulphur dioxide (SO_2), particulates (PM_{10}), along with trace amounts of volatile organic hydrocarbons (VOCs). Carbon dioxide is addressed in the section on greenhouse gas and is not considered further in this section. The proponent considers that any emissions of dioxins would be minimal due to the absence of chlorine in potable water and natural gas. Earthworks and mining activities also have the potential to generate fugitive dust emissions if not appropriately managed. The proponent used the USEPA regulatory model AERMOD to predict local ground level concentrations (GLCs) and the CSIRO's Atmospheric Research air dispersion model TAPM to predict the regional formation of photochemical smog. The air dispersion modelling for BSIOP predicted compliance with the NEPM standard for the key pollutants (NO_2, SO_2, PM_{10}) across the modelled area. The cumulative (BSIOP and CBP) modelling predicted compliance across the modelled area, with the exception of PM_{10}, however the PM_{10} exceedances do not occur near camping areas or other sensitive premises. The proponent has developed a Project Environmental Management Plan and proposed measures to minimise dust such as: • Keeping the area of exposed surfaces to the minimum required for construction activities; • Using water trucks and chemical suppressants on the access and site roads and enforcing speed limits to minimise dust generation; • Prohibit the use of dry, dust prone areas by vehicles	Reduction Scheme; • It is recommended that an independent review be undertaken to ensure that best practice technology and strategies are adopted; • DEC recommends that the emissions from the pellet plant and power station be managed under Part V of the EP Act; and • Dust issues can be managed though the works approval and licensing system under Part V of EP Act.	Dust impacts on vegetation is discussed under Section 3.1 – Flora and Vegetation. Given that dust emissions do not exceed the NEPM ambient air quality standard, it is not considered to be a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	unless sufficient water has been applied; • Applying water spray to exposed soil during potentially dust open activities such as loading and unloading material in dust prone conditions; • Applying water to exposed stockpiles when there is potential for dust lift off • Rehabilitate disturbed areas progressively to reduce the potential for windborne dust generation; • Conducting blasting only under appropriate wind and weather conditions; and • Implementation of a monitoring programme that examines the performance of the dust management actions.		
Greenhouse Gas	The TAPM modelling predicts that the proposal is unlikely to cause the formation of photochemical smog in the region. The project would be developed in two stages. Stage 1 would cater for 12Mtpa of product and include a 7 Mtpa pellet plant and a 300W power station. Stage 2 would double the capacity to 24 Mtpa with the addition of a second pellet plant and a second power station. Initially, with stage 1 operational, the proponent estimates greenhouse gas emissions to be around 1.4 Mtpa of CO_2e (carbon dioxide equivalent). When stage 2 becomes operational, greenhouse gas emissions would jump to 2.7 Mtpa of CO_2e. Over the 31 year project life, emissions are estimated to total 66.6 million tonnes.		
Noise and Vibration	The nearest sensitive receptors for noise are: • the miners camp located 9 km to the NE or proposed mine;	<u>Government Organisations</u> • Works approval assessment under Part V of the EP Act will ensure that best	The EPA considers this factor can be managed under the *Environmental Protection (Noise)*

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	• the miners camp located 7 km to the south of the proposed mine; • the public camping area at the Fortescue River located 11km NW of the mine. Noise modelling has predicted that noise from a worst case scenario including both CBP and BSIOP will below the *Environmental Protection (Noise) Regulations 1997* prescribed limit at all sensitive receptors. Management procedures include: • using quietest reasonably available equipment, machines and vehicles; • ensuring equipment, machines and vehicles are maintained on a regular basis to ensure effectiveness of noise suppression systems; and • maintaining a register of any noise related complaints and modifying practices in response to complaint if required.	available technology noise control is used and the implementation of a reasonable noise monitoring program	*Regulations 1997.* Not considered to be a relevant environmental factor.
Waste Materials	Project activities that will generate waste include: • dewatered tailing (inert); • industrial waste including oil filters, hydraulic hose, workshop waste, waste oil, tyres, etc; • putrescibles (general domestic waste); • inert waste including asphalt, concrete, etc; • wastewater including sewerage, grey water and wash down water; • hazardous waste including hydrocarbons; and • recyclable waste including aluminium products, scrap metals, wire, etc.	<u>Government Organisations</u> • Proposed landfill sites will need assessment under Part V of the EP Act. Standard conditions exist for the operation of landfills.	Management procedures include: • educate personnel regarding avoidance, re-use and recycling, such that all rubbish is properly disposed of; • providing appropriate waste collection facilities in strategic locations on-site; • providing a recycling area for on-site storage of recyclable materials prior to transferring material off-site; • storing hydrocarbon products

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
			in approved bunded facilities located in the workshop compound at the mine site; • collecting and disposing putrescibles, non-recyclable domestic and industrial waste to an on-site landfill constructed to the *Environmental Protection (Rural Landfill) Regulations 2002*; • treating sewerage and grey water via package treatment plants which will be established to service the mine, processing plant and camp; and • discharging process water from the processing plant to a process water pond for recycling (to the process water circuit). The EPA considers that this factor can be appropriately managed under Part V of the EP Act. **Not considered to be a relevant environmental factor.**
SOCIAL SURROUNDINGS			
Aboriginal Heritage	Archaeological and ethnographic studies have previously been conducted in the Cape Preston region. The studies identified the Aboriginal Heritage values of the area and the	<u>Government Organisations</u> • Site identification level Aboriginal heritage surveys of the entire project;	The proponent has met with all Claimant Groups. The proponent is committed to the protection of

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	presence of a number of sites of heritage significance.	• It is recommended that a condition be imposed requiring the proponent to develop a Cultural Heritage Management Plan in collaboration with the relevant Indigenous stakeholders. <u>Non-Government Organisations</u> • Recommendation that the EPA set conditions as to conduct future adequate heritage surveys within the area of the Balmoral South project.	Aboriginal heritage sites and commits to finalising Heritage Agreements, management plans or other agreements following further consultation with the Claimant Groups and Department of Indigenous Affairs. The proponent has outlined measures for the management of Indigenous sites in the PEMP. These measures include: • Education of personnel; • Engage a qualified archaeologist to conduct monitoring of ground disturbance; • Implementing Aboriginal heritage contingency actions should any potential Aboriginal heritage site, artefact or skeletal remains be discovered; • Arrange for Aboriginal monitors from relevant groups to be present during ground disturbing activities; • Avoiding known Aboriginal sites, and if avoidance is not possible, the sites will be salvaged and/or relocated on advice from the local Aboriginal groups and in accordance within section 18 of

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
			the *Aboriginal Heritage Act 1972*; • Keeping the local Aboriginal groups and the various interest groups informed of the progress of the Balmoral South Project; • Undertaking a pre-disturbance site inspection; and • Undertaking site inspections during clearing or earth works. **Not considered to be a relevant environmental factor**
Recreational Values	The main recreational node in the area is the camping ground at the mouth of the Fortescue River. This area is used locally by day trippers and for longer term camping. A boat ramp has been constructed and the area is generally maintained by the Roebourne Shire. Islands of the Great Sandy Island Nature reserve contain areas used by birds for nesting. The islands are closed to access during nesting periods. Human activities, such as night time presence on beaches, can impose significant pressure of nesting turtles. This can result in nesting females shifting their nesting sites, sometime being forced to use less suitable beaches, or aborting or delaying egg laying. For wheel drive activity and overfishing can also cause decline in health of vegetations, in particular mangroves and soil structure.	There were no submissions for this factor.	Not considered to be a relevant environmental factor

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	The management measures include: • providing a map of the marine environment around Cape Preston, indicating no-take zones, conservation status of the various marine management and location of other industries and any associated exclusion zones; • providing a map of the terrestrial environment, including visitor locations, access tracks and any prohibited areas; • providing guidance of appropriate behaviour at visitor nodes and advice regarding minimising impacts; • advising of appropriate behaviour around large marine organisms including (but not limited to) whales, dugongs and turtles; • providing clear guidance on regulations regarding boat handling within nature reserves, such as moorings and anchorages; • advising of the rules and regulations governing access to islands within the Great Sandy Island Nature Reserve and the Regnard Marine Management Area; • advising of 'good' neighbour' behaviour with regards to other land users, including pastoralism, tourism and aquaculture; • advising of appropriate 4WD behaviour with regard to the protection of mangroves and native vegetation; • Providing clear information of bag and size limits for recreational fishing, including netting, spearfishing, coral collecting, shell fishing and aquarium fish collecting; and • Encourage record keeping with regards to fish catches, marine mammal, turtle and bird sightings.		
Mine Closure & Rehabilitation	Open cut mining would be used to mine the Balmoral South deposit. The proposed mine is expected to operate for at least 28 years after the first three years of construction and	<u>Government Organisations</u> • Further information be required for the closure and rehabilitation of the pit	**Considered to be a relevant environmental factor and is discussed under Section 3.7 –**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	commissioning. The total disturbance, including both direct and indirect impacts, during the project is expected to be approximately 5,757 ha. There is the potential for unstable landforms, erosion, contamination, altered groundwater and surface water regimes, and the unsuccessful return of vegetation to result. The proponent has committed to rehabilitating 4,927 ha. The post mining land use for the project area is proposed to replicate current vegetation and support the post-project land-use of pastoralism. The proponent has stated that progressive backfilling of the pit may be considered in the future and this may prove to be an effective way to reducing mining costs over the life of mine, provided it can be achieved without sterilisation of potential ore resources. Aquaterra (2008) has confirmed that the pit void would remain a sink for groundwater, based on mass-balance calculations. Based on that modelling, at the completion of mining and the cessation of pumping, pits will fill with water to a level defined by the long-term balance between inflows and outflows. However Aquaterra consider that the pit will remain dry at the cessation of mining due to the evaporation rate being greater than the predicted inflows into the pit. Approximately 80 Mtpa of waste rock would be produced during the mine life. It is proposed that the waste would be distributed to the two waste disposal facilities (WDF) located to the west and east of the pit. Tailings material would also be disposed of to the two WDFs (i.e. there will be no separate tailings storage facility).	void as this has potential for long-term impacts on water quality and conservation of native fauna in the area;	**Mine Closure and Rehabilitation.**

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	Rehabilitation of the WDFs will occur progressively. The outer layer will be constructed within inert mine waste with rip-rap over size (boulders >1 tonne) being placed in areas exposed to frequent water action. The top of the dump will be covered in scree and raked out of waste so that the surface is dust free. The proponent has proposed a number of rehabilitation management measures including: • retaineing topsoil, vegetation debris, logs and leaf litter to use during rehabilitation; • applying topsoil as soon as practicable; • ensuring reshaped land is stable and adequately drained; • developing and implementing rehabilitation trials throughout the operational life of mine to develop appropriate site specific methodology; • investigating and testing the use of various WDF profiles to determine the best placement of topsoil, minimise long-term erosion, and assist in revegetating with local native plant growth; • ensuring compacted surfaces are ripped and seeded; • ensuring natural drainage is restored as far as practicable to minimise erosion at the time of closure; and • developing a final decommissioning and closure plan. The proponent has indicated that there is some potentially acid forming (PAF) material associated with the ore body. There is also some asbestiform material associated with the orebody. The proponent has indicated that both will be disposed of to the WDFs using best practice methods. Decommissioning of infrastructure will be in accordance with the *Iron Ore Processing (Mineralogy Pty Ltd) Agreement Act*		

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	2002.		

PRINCIPLES		
Principle	**Relevant Yes/No**	**If yes, Consideration**
1. The precautionary principle		
Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. *In application of this precautionary principle, decisions should be guided by –* *(a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* *(b) an assessment of the risk-weighted consequences of various options.*	Yes	In considering this principle, the EPA notes the following: • Investigations of the biological and physical environments provided background information to assess risks and identify measures to avoid or minimise impacts. • The assessment of the adequacy of these impacts and management is provided in Section 3 of this report. • Conditions have been recommended where considered necessary.
2. The principle of intergenerational equity		
The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.	No	
3. The principle of the conservation of biological diversity and ecological integrity		
Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Yes	In considering this principle, the EPA notes the following: • Scientific studies have contributes to the understanding and management of impacts of mining operations on biodiversity and ecological integrity of the area. • The above impacts have been assessed and provided in Section 3 of this

PRINCIPLES		
Principle	**Relevant Yes/No**	**If yes, Consideration**
		report.
4. Principles relating to improved valuation, pricing and incentive mechanisms		
(1) Environmental factors should be included in the valuation of assets and services. *(2) The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.* *(3) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.* *(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximize benefits and/or minimize costs to develop their own solution and responses to environmental problems.*	No	
5. The principle of waste minimisation		
All reasonable and practicable measures should be taken to minimize the generation of waste and its discharge into the environment.	Yes	In considering this principle, the EPA notes the following: • The proposal would generate brine. • Potentially acid forming waste will be encapsulated in the waste disposal facilities. • Other waste products will created as a result of implementation of the proposal. • Impacts from brine and acid forming waste has been discussed in Section 3 of this report.

Appendix 4

Identified Decision-Making Authorities
and
Recommended Environmental Conditions

Relevant Decision-Making Authorities

Section 44(2) of the *Environmental Protection Act 1986* (EP Act) specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This Appendix contains the EPA's recommended conditions and procedures.

Section 45(1) requires the Minister for Environment to consult with decision-making authorities, and if possible, agree on whether or not the proposal may be implemented, and if so, to what conditions and procedures, if any, that implementation should be subject.

The following decision-making authorities have been identified for this consultation:

Decision-making Authority (DMA)	Approval
1. Department of Water	Rights in Water and Irrigation act - water abstraction licences
2. Department of Indigenous Affairs	Aboriginal Heritage Act - s18 clearances.
3. Department of Mines and Petroleum	*Mining Act 1978*
4. Department of Environment and Conservation	Works Approval and Licence (Part V *Environmental Protection Act 1986*)
5. Shire of Roebourne	Decision maker for permits and development approvals
6. Minister for Water	Rights in Water and Irrigation act - water abstraction licences
7. Minister for Indigenous Affairs	Aboriginal Heritage Act – section 18 clearances.
8. Minister for State Development	Approvals under Iron Ore Processing (Mineralogy Pty Ltd) Agreement Act 2002.

Note: In this instance, agreement is only required with DMA's 6-8 since these DMAs are Ministerial DMAs.

RECOMMENDED ENVIRONMENTAL CONDITIONS

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

BALMORAL SOUTH IRON ORE PROJECT, CAPE PRESTON, SHIRE OF ROEBOURNE

Proposal: The construction and operation of 80 million tonne per annum iron ore mine, power station, desalination plant, processing plant, pellet plants and accommodation in the Southern Block orebody of the Cape Preston area.

The proposal is further documented in schedule 1 of this statement.

Proponent: Mineralogy Pty Ltd

Proponent Address: Level 2, 9 Ouyan Street, Bundall QLD 4217

Assessment Number: 1677

Report of the Environmental Protection Authority: Report 1340

The proposal referred to in the above report of the Environmental Protection Authority may be implemented. The implementation of that proposal is subject to the following conditions and procedures:

1 Proposal Implementation

1-1 The proponent shall implement the proposal as assessed by the Environmental Protection Authority and described in schedule 1 of this statement subject to the condition and procedures of this statement.

2 Proponent Nomination and Contact Details

2-1 The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.

2-2 The proponent shall notify the Chief Executive Officer of the Department of Environment and Conservation of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.

3 Time Limit of Authorisation

3-1 The authorisation to implement the proposal provided for in this statement shall lapse and be void within five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.

3-2 The proponent shall provide the Chief Executive Officer of the Department of Environment and Conservation with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement.

4 Compliance Reporting

4-1 The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the Chief Executive Officer of the Department of Environment and Conservation.

4-2 The proponent shall submit to the Chief Executive Officer of the Department of Environment and Conservation, the compliance assessment plan required by condition 4-1 at least 6 months prior to the first compliance report required by condition 4-6. The compliance assessment plan shall indicate:

1 the frequency of compliance reporting;

2 the approach and timing of compliance assessments;

3 the retention of compliance assessments;

4 reporting of potential non-compliances and corrective actions taken;

5 the table of contents of compliance reports; and

6 public availability of compliance reports.

4-3 The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.

4-4 The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the Chief Executive Officer of the Department of Environment and Conservation.

4-5 The proponent shall advise the Chief Executive Officer of the Department of Environment and Conservation of any potential non-compliance within two business days of that non-compliance being known.

4-6 The proponent shall submit a compliance assessment report annually from the date of issue of this Implementation Statement addressing the previous twelve month period or other period as agreed by the Chief Executive Officer of the Department of Environment and Conservation. The compliance assessment report shall:

1 be endorsed by the proponent's Managing Director or a person, approved in writing by the Department of Environment and Conservation, delegated to sign on the Managing Director's behalf;

2 include a statement as to whether the proponent has complied with the conditions;

3 identify all potential non-compliances and describe corrective and preventative actions taken;

4 be made publicly available in accordance with the approved compliance assessment plan; and

5 indicate any proposed changes to the compliance assessment plan required by condition 4-1.

5 Performance Review and Reporting

5-1 The proponent shall submit to the Chief Executive Officer of the Department of Environment and Conservation Performance Review Reports at the conclusion of the first, second, third and fifth years after the commencement of productive mining and then, at such intervals as the Chief Executive Officer of the Department of Environment and Conservation may regard as reasonable, which addresses:

1 the major environmental risks and impacts; the performance objectives, standards and criteria related to these; the success of risk reduction/impact mitigation measures and results of monitoring related to management of the major risks and impacts;

2 the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable; and

3 improvements gained in environmental management which could be applied to this and other similar projects.

6 Groundwater-dependent and riparian vegetation

6-1 The proponent shall ensure that groundwater abstraction and dewatering required to implement the proposal does not adversely affect native vegetation to be retained in the project area or in adjacent areas.

6-2 To verify that the requirements of condition 6-1 are met the proponent shall:

- undertake baseline monitoring of native vegetation health and abundance in the project area and adjacent areas prior to dewatering;
- monitor groundwater levels, including in the vicinity of riparian groundwater-dependent vegetation; and

- monitor the health and cover of riparian and groundwater dependent vegetation to be retained in the proposal area and in adjacent areas.

This monitoring is to be carried out to the satisfaction of the Chief Executive Officer of the Department of Environment and Conservation, and is to be carried out in such a way that, should a significant decline in health or cover of native vegetation be detected, it will be possible to determine whether the decline is attributable to the implementation of the proposal or to other causes.

6-3 The proponent shall submit annually the results of monitoring required by condition 6-2 and 6-3 to the Chief Executive Officer of the Department of Environment and Conservation.

6-4 In the event that monitoring required by condition 6-2 and 6-3 indicates a decline in the health and condition of the riparian and groundwater dependent vegetation:

1. the proponent shall report such findings to the Chief Executive Officer of the Department of Environment and Conservation within 21 days of the decline being identified;
2. provide evidence which allows determination of the cause of the decline;
3. if determined by the Chief Executive Officer of the Department of Environment and Conservation to be a result of activities undertaken in implementing the proposal, the proponent shall submit actions to be taken to remediate the decline within 21 days of the determination being made to the Chief Executive Officer of the Department of Environment and Conservation; and
4. the proponent shall implement actions to remediate the decline of riparian and groundwater dependent vegetation upon approval of the Chief Executive Officer of the Department of Environment and Conservation and shall continue until such time the Chief Executive Officer of the Department of Environment and Conservation determines that the remedial actions may cease.

6-5 The proponent shall make the monitoring reports required by conditions 6-2, 6-3 and 6-5 publicly available in a manner approved by the Chief Executive Officer of the Department of Environment and Conservation.

7 Removal of fauna from open trenches

7-1 Trapped fauna within open trenches shall be cleared and recorded by a suitably trained fauna-rescue officer no later than three hours after sunrise. The clearing and recording shall be repeated before sunset.

The open trenches shall also be cleared and recorded by a suitably trained fauna-rescue officer no more than one hour prior to backfilling of trenches.

Note: “fauna-rescue officer” means an employee of the proponent whose responsibility it is to walk the open trench to recover and record fauna found within the trench.

7-2 The fauna-rescue officer shall be experienced in the following, to the requirements of the Department of Environment and Conservation:

1. fauna identification, capture and handling (including venomous snakes);

2. identification of tracks, scats, burrows and nests of conservation-significant species;

3. fauna vouchering;

4. assessing injured fauna for suitability for release, rehabilitation or euthanasia;

5. familiarity with the ecology of the species which may be encountered in order to be able to appropriately translocate fauna encountered; and

6. performing euthanasia.

7-3 Open trench lengths shall not exceed a length capable of being inspected and cleared by the fauna-clearing person within the required times as set out in condition 7-1.

7-4 Ramps providing egress points and/or fauna refuges providing suitable shelter from the sun and predators for trapped fauna are to be placed in the trench at intervals not exceeding 50 metres.

7-5 The proponent shall produce a report on fauna management within the gas pipeline lateral easement at the completion of pipeline construction.

The report shall include the following:

1. details of all fauna inspections;

2. the number of fauna cleared from trenches;

3. fauna interactions;

4. fauna mortalities; and

5. all actions taken.

The report shall be provided to the Chief Executive Officer no later than 14 days after the completion of pipeline installation, and shall be made publicly available in a manner approved by the Chief Executive Officer.

8 Mangroves

8-1 The proponent shall ensure that the implementation of the proposal does not result (through either direct or indirect impacts) in a loss of more than 8.5 ha of mangroves.

8-2 To verify that the requirements of 8-1 are met, the proponent shall monitor the abundance, canopy cover, and growth rates of mangroves located within the management unit as shown in Figure 4.

8-3 Monitoring to be carried out to the satisfaction of the Chief Executive Officer of the Department of Environment and Conservation and shall be carried out in such a way that, if a decline in mangrove canopy cover , growth rates or abundance is detected, it will be possible to determine whether the decline is likely to have been caused by the implementation of the proposal or is likely to have been caused by other factors.

8-4 Monitoring shall be carried out not less than once each year and shall commence before commencement of ground disturbing activities and shall continue until such time as the Chief Executive Officer of the Department of Environment and Conservation determines that monitoring may cease.

8-5 The proponent shall submit annually the results of monitoring required by conditions 8-2 to 8-4 to the Chief Executive Officer of the Department of Environment and Conservation.

8-6 In the event that monitoring required by condition 8-2 to 8-4 indicates a decline in the abundance, canopy cover, or growth rates of mangroves outside the 8.5 ha:

1. the proponent shall report such findings to the Chief Executive Officer of the Department of Environment and Conservation within 21 days of the decline being identified;

2. provide evidence which allows determination of the cause of the decline;

3. if determined by the Chief Executive Officer of the Department of Environment and Conservation that the decline is likely to be a result of activities undertaken in implementing the proposal, the proponent shall submit actions to be taken to remediate the decline within 21 days of the determination being made to the Chief Executive Officer of the Department of Environment and Conservation; and

4. the proponent shall undertake actions to remediate the decline of mangroves upon approval of the Chief Executive Officer of the Department of Environment and Conservation and shall continue to undertake such actions until such time as the Chief Executive Officer of the Department of Environment and Conservation determines that the remedial actions may cease.

8-7 The proponent shall make the monitoring reports required by condition 8-5 publicly available in a manner approved by the Chief Executive Officer of the Department of Environment and Conservation.

9 Marine Wastewater Outfall

9-1 The proponent must locate the waste water outfall in the port area within a Moderate Ecological Protection Area which is confined to 250 metres from all points of the port structures.

9-2 The proponent shall ensure that the Moderate Ecological Protection Area is maintained in the port area, except for a Low Ecological Protection Area at the

wastewater outfall. The boundary of the Low Ecological Protection Area must not exceed 70 metres from all points of the diffuser structure. At the outer boundary of the Moderate Ecological Protection Area a high level of ecological protection shall be maintained.

9-3 The proponent shall ensure that within the Low Ecological Protection Area the 95th percentile of bioaccumulating toxicant concentrations meets ANZECC and ARMCANZ 2000 *National Water Quality Management Strategy* 80% species protection guideline levels, and within the Moderate Ecological Protection Area the 95th percentile of toxicants meets ANZECC and ARMCANZ 2000 *National Water Quality Management Strategy* 90% species protection levels.

9-4 The proponent shall ensure that the following conditions are met at the boundary between the Low Ecological Protection Area and the Moderate Ecological Protection Area:

1. The median salinity resulting from discharge at the wastewater diffuser either, (1) does not exceed the 95th percentile of the natural salinity range over the same period; or, (2) does not exceed the median salinity at a suitable reference site by more than 1.2 parts per thousand.

2. The 95th percentile of toxicant concentrations meets the 90% species protection levels specified in ANZECC and ARMCANZ 2000 *National Water Quality Management Strategy*.

3. The results of Whole Effluent Toxicity testing undertaken using a minimum of five species as per ANZECC and ARMCANZ (2000) protocols demonstrate that sufficient dilution is occurring such that a moderate level of ecological protection (90% species protection) is met for at least 95% of wastewater flow and oceanographic conditions.

4. The ambient dissolved oxygen in bottom water samples is not below 80% saturation for more than six weeks and never below 60% saturation.

5. The median temperature in any season does not exceed the 95th percentile of the natural temperature range over the same period.

9-5 The proponent shall verify diffuser performance in terms of achieving the required number of dilutions to meet the requirements of 9-2 to 9-4, under a range of flow rates, meteorological and sea state conditions for a period of at least 12 months immediately following commissioning, by use of continuous loggers or at least weekly sampling.

9-6 The proponent shall use procedures contained in EPA 2005 *Manual of Operating Procedures for Environmental Monitoring Against the Cockburn Sound Environmental Quality Criteria* EPA Report 21 for monitoring carried out to meet the requirements of 9-2 to 9-5.

9-7 Within 18 months of commissioning the proponent shall submit a report containing the results of the monitoring required by 9-2 to 9-5 and a discussion of the operating

limitations necessary to ensure ongoing compliance with 9-2 to 9-4 to the Chief Executive Officer of the Department of Environment and Conservation.

9-8 In the event that the monitoring required by 9-5 indicates that the requirements of 10-2 to 10-4 are not being met or are not likely to be met, the proponent shall immediately report such findings to the Chief Executive Officer of the Department of Environment and Conservation along with a description of the management actions to be taken to meet the requirements of 9-2 to 9-4.

10 Surface Water and Groundwater Quality

10-1 The proponent shall ensure that run-off and/or seepage from the waste disposal facilities do not cause the quality of surface water or groundwater within or leaving the proposal area to exceed ANZECC/ARMCANZ* default criteria for a slightly to moderately disturbed ecosystem, taking into consideration natural background water quality, so that existing and potential uses, including ecosystem maintenance, are protected.

* Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, *Australian Water Quality Guidelines for Fresh and Marine Waters* and its updates.

10-2 The proponent shall monitor the quality of any run-off and/or seepage from the waste disposal facilities entering surface water and groundwater on or in proximity to the proposal area to ensure that requirements of condition 10-1 are met. This monitoring is to be carried out using methods consistent with Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, *Australian Guidelines for Water Quality Monitoring and Reporting* (and its updates) and to the satisfaction of the Chief Executive Officer of the Department of Environment and Conservation.

10-3 The proponent shall commence the water quality monitoring required by 10-1 before ground disturbing activities in order to collect baseline data.

10-4 The proponent shall submit annually the results of monitoring required by condition 10-2 to the Chief Executive Officer of the Department of Environment and Conservation.

10-5 In the event that monitoring required by condition 10-2 indicates that the requirements of conditions 10-1 are not being met:

1. the proponent shall report such findings to the Chief Executive Officer of the Department of Environment and Conservation within 21 days of the decline in water quality standards being identified;

2. provide evidence which allows determination of the cause of the decline in water quality standards;

3. if determined by the Chief Executive Officer of the Department of Environment and Conservation to be a result of activities undertaken in implementing the

proposal, the proponent shall submit actions to be taken to remediate the decline in water quality standards within 21 days of the determination being made to the Chief Executive Officer of the Department of Environment and Conservation; and

4. the proponent shall implement actions to remediate the decline in water quality standards upon approval of the Chief Executive Officer of the Department of Environment and Conservation and shall continue to implement such actions until such time the Chief Executive Officer of the Department of Environment and Conservation determines that the remedial actions may cease.

10-6 The proponent shall make the monitoring reports required by condition 10-2 publicly available in a manner approved by the Chief Executive Officer of the Department of Environment and Conservation.

11 Stack Emissions

11-1 The proponent shall characterise the emissions from the pellet plant stack during commissioning to the satisfaction of the Chief Executive Officer of the Department of Environment and Conservation.

11-2 The characterisation required by condition 11-1 shall include all constituents including minor emissions such as Polyaromatic hydrocarbons, Volatile organic compounds and dioxins/furans.

11-3 The proponent shall submit annually the results of monitoring required by condition 11-2 to the Chief Executive Officer of the Department of Environment and Conservation.

12 Greenhouse Gas Abatement

12-1 Prior to commencement of the Commonwealth Government's Emissions Trading Scheme, the proponent shall prepare and submit to the Minister for Environment a Greenhouse Gas Abatement Report which meets the objectives set out in condition 12-2, as determined by the Minister for Environment.

12-2 The objectives of the Greenhouse Gas Abatement Report required by condition 12-1 are to:

1. Demonstrate that maximising energy efficiency and opportunities for future energy recovery have been given due consideration in the design of proposal;

2. Ensure that the "greenhouse gas" intensity ("greenhouse gas" per tonne of pellets produced) is equivalent to, or better than benchmarked best practice; and

3. Achieve continuous improvement in "greenhouse gas" intensity through an annual review, and if practicable, adoption of advances in technology and process management.

13 Rehabilitation

13-1 The proponent shall undertaken rehabilitation to achieve the following outcomes:

1. The waste dump(s) and tailings storage facilities shall be non-polluting and shall be constructed so that their final shape, stability, surface drainage, resistance to erosion and ability to support local native vegetation are comparable to natural landforms in the area.

2. Waste dumps, tailings storage facilities and other areas disturbed through implementation of the proposal (excluding mine pits), shall be progressively rehabilitated with vegetation composed of native plant species of local provenance (defined as seed or plant material collected within 10 kilometres of the proposal).

3. The percentage cover of living vegetation in all rehabilitation areas shall be comparable with that of similar natural landforms in the area.

4. No new species of weeds (including both declared weeds and environmental weeds) shall be introduced into the area as a result of the implementation of the proposal.

5. The coverage of weeds (including both declared weeds and environmental weeds) within the rehabilitation areas shall be no greater than 10 %.

13-2 Rehabilitation activities shall continue as necessary until such time as the requirements of condition 13-1 are met, and are demonstrated by inspections and reports to be met, for a minimum of five years to the satisfaction of the Chief Executive Officer of the Department of Environment and Conservation, on advice of the Department of Mines and Petroleum.

14 Conceptual Closure Strategy

14-1 Prior to commencing ground-disturbing activity, the proponent shall submit a detailed and project-specific Conceptual Closure Strategy to the requirements of the Chief Executive Officer of the Department of Environment and Conservation, on advice of the Department of Mines and Petroleum.

14-2 The Conceptual Closure Strategy shall include detailed results of geochemical and geophysical characterisation of materials, in particular the potential for acid drainage, metalliferous drainage, and of the occurrence of dispersive materials and asbestiform minerals. Testing for materials with potential to cause acid and/or metalliferous drainage shall include static and kinetic testing carried out using techniques and timeframes consistent with national and international standards (Leading Practice Sustainable Development Program for the Mining Industry – Managing Acid and Metalliferous Drainage 2009 – Department of Industry, Tourism and Resources; The Global Acid Rock Drainage Guide 2009 – International Network for Acid Prevention).

14-3 The Conceptual Closure Strategy shall provide detailed technical information on proposed management measures to prevent pollution, environmental harm or human

health impacts during implementation of the proposal and after mine completion and closure.

14-4 The Conceptual Closure Strategy shall include maps and diagrams showing the proposed placement, dimensions, design and proposed methods of construction and closure of waste disposal facilities and mine pits.

14-5 The Conceptual Closure Strategy shall demonstrate that waste dumps and tailings storage facilities will be located, designed and constructed to ensure that they are non-polluting and so that their final shape, height, stability, surface drainage, resistance to erosion and ability to support native vegetation are comparable to natural landforms in the area.

14-6 The Conceptual Closure Strategy shall provide the results of additional detailed groundwater modelling to verify that a lake will not form in the pit void(s) following completion and closure.

14-7 The Conceptual Closure Strategy shall provide detailed technical information demonstrating that sufficient quantities of suitable materials are available on site for the implementation and closure (including unplanned or temporary closure) of the proposal.

14-8 The Conceptual Closure Strategy shall include specific practicable procedures to ensure the protection of the environment in the event of unplanned or temporary mine closure.

14-9 The proponent shall implement the proposal consistent with the Conceptual Closure Strategy referred to in conditions 14-1 to 14-8.

15 Performance Bond

15-1 As security for the due and punctual observance and performance by the proponent of the requirements of conditions 13 and 16, the proponent shall, prior to ground-disturbing activities, provide to the Chief Executive Officer of the Department of Environment and Conservation, to be replaced every five years in accordance with 15-2, an irrevocable Performance Bond for the benefit of both the Minister and the Chief Executive Officer of the Department of Environment and Conservation and which is in the form acceptable to the Chief Executive Officer of the Department of Environment and Conservation.

15-2 The Performance Bond shall be for an initial amount of AU$45,550,000 and shall be substituted every five years after the provision of the first Performance Bond with the fixed initial amount of each successive Performance Bond being indexed to inflation (being the Consumer Price Index, Perth).

15-3 The Chief Executive Officer of the Department of Environment and Conservation will hold the Performance Bond as security for the due and punctual observance and performance by the proponent of the requirements of conditions 13 and 16, in an interest bearing account nominated by the Chief Executive Officer of the Department of Environment and Conservation, with the interest occurring for the benefit of the

Minister and the Chief Executive Officer of the Department of Environment and Conservation.

15-4 The Performance Bond may be called on or used in accordance with section 86E of the *Environmental Protection Act 1986* if the proponent fails to satisfactorily comply with condition 13.

15-5 The Performance Bond shall be discharged by the Chief Executive Officer of the Department of Environment and Conservation and the Minister when the Chief Executive Officer of the Department of Environment and Conservation has given the proponent written notice pursuant to section 86F(1) of the *Environmental Protection Act 1986*.

16 Final Closure and Decommissioning Plan

16-1 At least 5 years prior to mine completion, the proponent shall prepare and submit a Final Closure and Decommissioning Plan to the requirement of the Chief Executive Officer of the Department of Environment and Conservation, on advice of the Department of Mining and Petroleum.

16-2 The Final Closure and Decommissioning Plan shall be prepared consistent with:

- ANZMEC/MCA 2000, *Strategic Framework for Mine Closure Planning* and
- Department of Industry Tourism and Resources 2006 *Mine Closure and Completion* (Leading Practice Sustainable Development Program for the Mining Industry), Commonwealth Government, Canberra;

and shall provide detailed technical information on the following:

- Final closure of all areas disturbed through implementation of the proposal so that they are safe, stable and non-polluting;
- Decommissioning of all plant and equipment;
- Disposal of waste materials;
- Final Rehabilitation of waste dumps; tailings storage facilities and other areas (outside the mine pit(s));
- Management and monitoring following mine completion; and
- Inventory of all contaminated sites and proposed management.

16-3 The proponent shall close, decommission and rehabilitate the proposal consistent with the approved Final Closure and Decommissioning Plan.

16-4 The proponent shall make the Final Closure and Decommissioning Plan required by 16-1 and 16-2 publicly available in a manner acceptable to the Chief Executive Officer of the Department of Environment and Conservation.

Procedures

1. Where a condition states “on advice of the Environmental Protection Authority”, the Environmental Protection Authority will provide that advice to the Department of Environment and Conservation for the preparation of written notice to the proponent.

2. The Environmental Protection Authority may seek advice from other agencies or organisations, as required, in order to provide its advice to the Department of Environment and Conservation.

3. The Minister for Environment will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environment and Conservation over the fulfilment of the requirements of the conditions.

4. The proponent is required to apply for a Works Approval Licence for this project under the provisions of Part V of the *Environmental Protection Act 1986.*

Schedule 1

The Proposal (Assessment No. 1677)

General Description

The proposal is to develop and operate an 80 million tonne per annum iron ore mine, power station, desalination plant, processing plant, pellet plants and accommodation, located in the Cape Preston region, 80 km south-west of Karratha.

The proposal is described in the following document – *Balmoral South Iron Project Public Environmental Review, February 2009.*

Summary Description
A summary of the key proposal characteristics is presented in Table 1.

Table 1: Summary of key proposal characteristics

Element	Description
General	
Project Life	Project Development - Approximately 3 years Operation - Approximately 28 years
Mining and Processing	
Ore resources	Up to 2 billion tonnes
Ore mining rate	Up to 80 Mtpa
Pit depth (ultimate)	300 m
Overburden and waste	Approximately 80 Mtpa
Materials handling	Conventional drill, blast, load and haul
Dewatering rate	Up to 4 GLpa
Dewatering disposal	Used in the process water stream and for dust suppression
Concentrator production	Approximately 24 Mtpa
Pelletising production	Approximately 14 Mtpa
Infrastructure	
Power	Up to 600 MW installed capacity gas fired combined cycle power station
Conveyor/slurry pipeline	Approximately 30 km in length between process plant site and Cape Preston stockyard
Gas supply	Up to 34, 000 Tjpa
Water supply	40 GLpa desalination plant and 4 GLpa pit dewatering
Port stockyard	2 Mt storage capacity
Disturbance Areas	
Areas of disturbance	Total disturbance during project not more than 5,297 ha comprising: • Pit – not more than 355 ha • Waste Disposal Facilities – not more than 2,450 ha • Eastern corridor – not more than 1450 ha • Central corridor – not more than 150 ha • Western corridor – not more than 160 ha • Desalination plant – not more than 15 ha • Stockpiles – not more than 85 ha • Process plant – not more than 130 ha • Accommodation village – not more than 90 ha • Other infrastructure – not more than 460 ha

Figures:
Figure 1: Regional location of mine site (see fig 1 above)
Figure 2: Project footprint and layout of key components (see fig 2 above)
Figure 3: Mangrove Management Unit

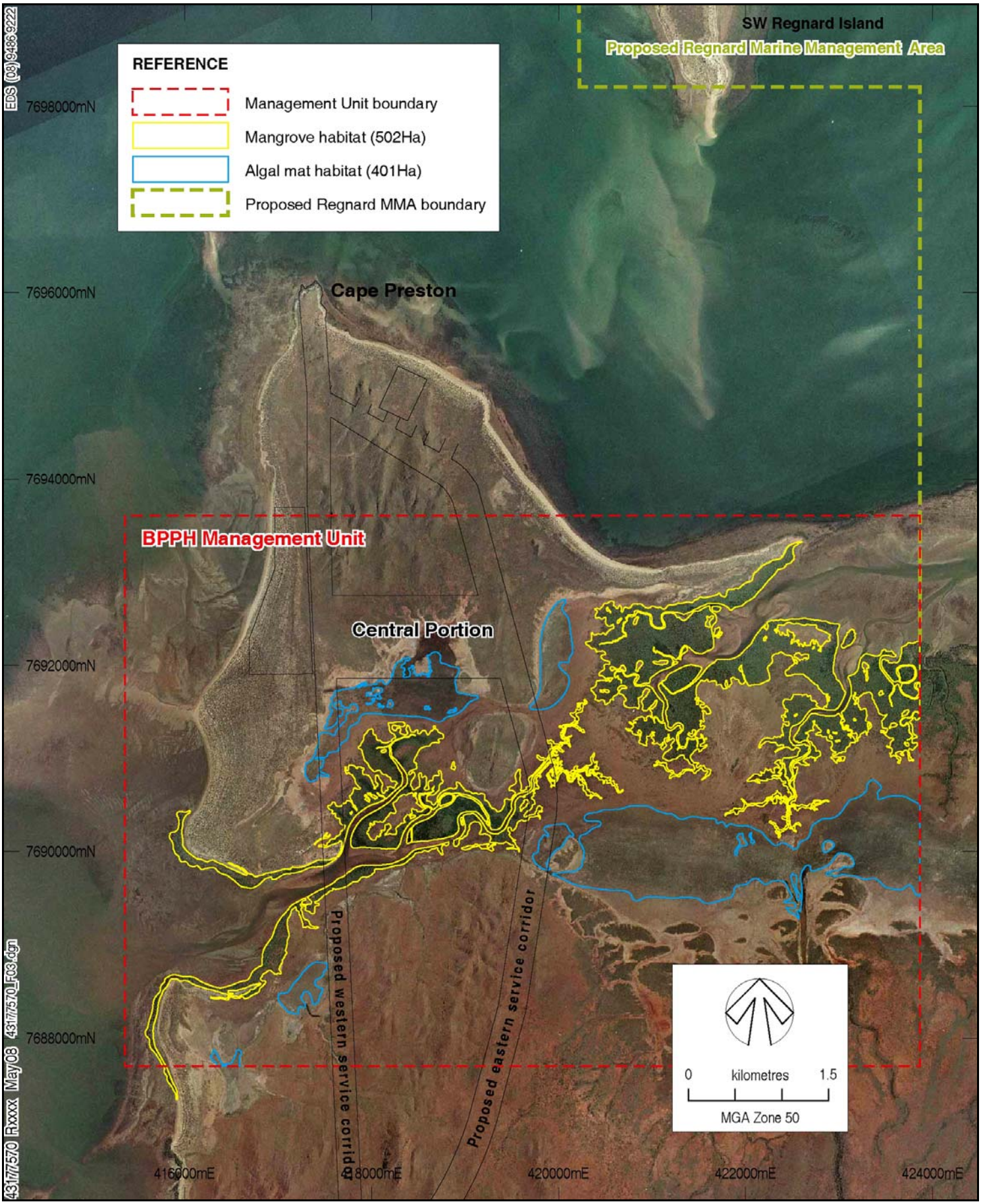

Figure 3: Mangrove Management Unit

Appendix 5

Summary of Submissions and
Proponent's Response to Submissions
(On attached CD)