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SINO Iron Project

Operational Environmental Management Plan

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2.1	02/08/2018		Revise S6.1 to reflect MS1066, S.45C: Increase in Authorised Extent of Pit Dewatering (DWER approved 18 July 2018)

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Related/referenced documents

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**SINO Iron Project
Operational Environmental Management Plan**



Document approval

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			19/02/2018

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In his seven years with Strategen, Jeremy Mitchell has developed considerable experience in mining environmental approvals (under both the Environmental Protection Act 1986 (Parts IV and V) and Environment Protection and Biodiversity Conservation Act 1999), impact assessments, including the preparation of environmental management plans. Furthermore he has gained considerable experience in community consultation, land development projects, land rehabilitation, compliance auditing (as a certified RABQSA International auditor) and ecological assessments.

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1 Introduction

CITIC Pacific Mining Management Pty Ltd (**CPM**) commenced development of an iron ore mine, downstream processing and associated port facilities at Cape Preston, approximately 70km southwest of Karratha (the Sino Iron Project [**the project**]).

The project has been assessed by the Environmental Protection Authority (**EPA**) pursuant to Part IV of the *Environmental Protection Act 1986* (**EP Act**) and was conditionally approved by the Minister for Environment under MS635 in October 2003. Five Section 45C's applications have been approved allowing amendment of MS 635. Furthermore, pursuant to Section 46 of the EP Act a change to conditions of MS 635 was approved in December 2009 resulting in the publication of MS 822.

In August 2016 the proponent was transferred from Mineralogy Pty Ltd to Sino Iron Pty Ltd (**Sino Iron**) and Korean Steel Pty Ltd (**Korean Steel**).

In accordance with Section 38 of the EP Act, the Sino Iron Mine Continuation Proposal (**MCP**) was submitted by CPM on behalf of Sino Iron and Korean Steel to the EPA in February 2017 and conditionally approved by the Minister for Environment under MS 1066 on the 20 October 2017. As prescribed by MS 1066, the implementation of the MCP is subject to the conditions of MS 635 and MS 822.

This revision of the Sino Iron Project Operational Environmental Management Plan (**OEMP**) has been prepared in response to MS 1066, Condition 17-1:

The proponent shall revise the versions most recently approved by the CEO of plans, reports, systems or programs, required by Ministerial Statement 635, which are applicable to the Sino Iron Mine Continuation Proposal, to include the Sino Iron Mine Continuation Proposal and to be consistent with contemporary standards, policies, guidelines and procedures.

This OEMP applies to all current and future operational activities associated with the Project and supersedes the previous version of the OEMP approved by the Office of the Environmental Protection Authority (**OEPA**) on 13 August 2014.

1.1 Purpose and Scope

The purpose of this OEMP is to ensure that conditions and commitments of MS 635 (as amended by MS 822 and MS 1066) under Part IV of the EP Act are satisfied throughout the operational phase of the project.

This OEMP is a consolidation of the Environmental Management Plans (**EMP's**) prepared for the construction phase of the project, which addressed specific conditions and commitments of MS 635 (as amended by MS 822 and MS 1066) and that remain relevant to the nature and scale of activities undertaken during the project's operational phase. As a result this OEMP will replace these construction EMP's and their respective construction and commissioning obligations.

This version of the OEMP has sought to revise only the aspects related to the MCP (as defined by MS 1066 Schedule 1) and address the requirements of Condition 17 of MS 1066. All other aspects of the OEMP remain unchanged from the previous version of the OEMP approved by the OEPA on 13 August 2014.

SINO Iron Project Operational Environmental Management Plan



The scope of this management plan is to meet statutory requirements, in a concise format that can be submitted to regulatory agencies for review, and used practically on-site by CPM personnel and contractors during the operational phase of the project.

This document has been specifically prepared to fulfil the operational phase requirements arising out Condition 2-1 of MS 635, which requires implementation of environmental management commitments as documented in Schedule 2. In addition, it addresses conditions of MS 635, where relevant as well as conditions of MS 822 and MS 1066. Furthermore, commitment 2 of Schedule 2 specifically requires the preparation, implementation and regular revision of an operations phase EMP prior to operations (this document).

Table 1 below provides further guidance on the fourteen environmental issues listed in commitment 2 and where these issues are addressed in this document. Decommissioning and closure aspects have been excluded from the scope of this OEMP. A separate Mine Closure Plan has been prepared and submitted to the OEPA in response to MS 1066 condition 16.

Table 1: MS 635, Schedule 2, Commitment 2 – Environmental Issues

Environmental Issue	Section in this document
Flora and fauna monitoring and management plans	6.2, 6.3, 7
Overburden storage	6.2
Pit dewatering and vegetation monitoring plan	6.1
Marine management plan	8
Spill contingency plan	Appendix C
Port management plan	Appendix C
Surface water (including flood) management	6.6
Groundwater management	6.7
Dust and noise	6.9, 6.10 and Appendix A and B
Gaseous emissions	6.8
Greenhouse gas emissions plan	6.8
Risks and hazards management plan	N/A ¹
Aboriginal sites management plan	6.11
Decommissioning and closure plan	N/A

1.2 Project Description

The Project is focussed on mining iron ore in the form of magnetite at the George Palmer Orebody located at Cape Preston, approximately 70 km south west of Karratha in the Pilbara Region of Western Australia. The mining and processing activities are expected to eventually achieve the approved mining rate of up to 95 million tonnes per annum (**Mtpa**) and magnetite concentrate production rates of up to 27.6 Mtpa.

The Project will necessitate no more than 10,100ha of terrestrial disturbance within a development envelope of 22,737ha.

Key characteristics of the Project (as defined within MS635 and MS1066) include:

- Mine:
 - Open pit within M08/123, M08/124 and M08/125 up to a depth of 400 metres (**m**);
 - Rate of mining up to 95 Mtpa; and
 - Waste rock landforms within M08/123, M08/124, M08/125, G08/54 and G08/63.
- Process Plant:

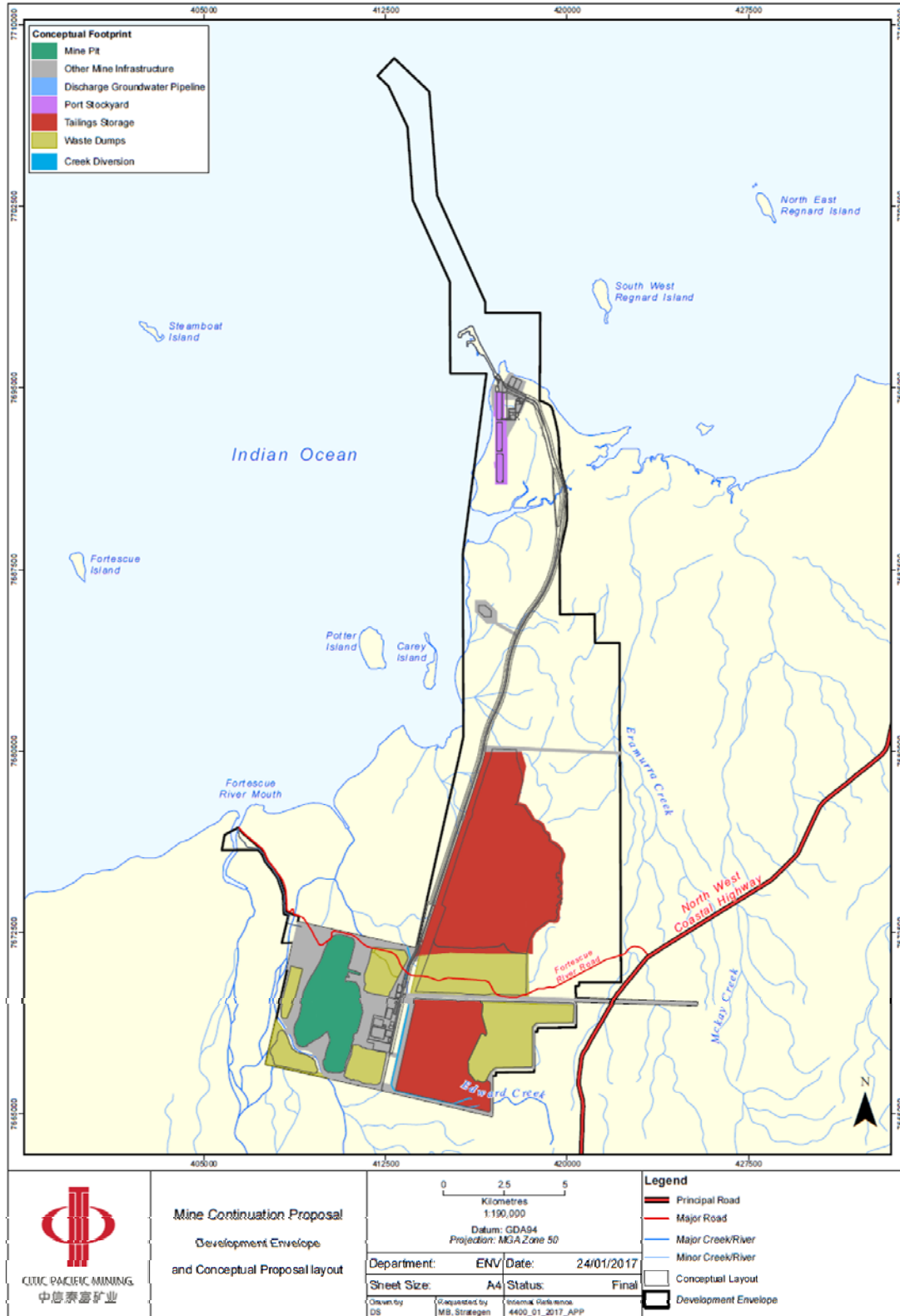
¹ Environmental risks and hazards were identified as part of the EPA's assessment process resulting in specific conditions and commitments imposed on the project, as outlined in MS 635 and 822. The process of risk and hazard management for the project is outlined in the operational Environmental Management System.

- Concentrator rate up to 27.6 Mtpa;
- Produced waste to tailings storage facilities (**TSF**) within M08/264, M08/265, M08/266, G08/53, G08/63 and G08/74 up to 67.4 Mtpa;
- Pellet production up to 13.8 Mtpa (yet to be constructed); and
- Direct reduced/hot briquetted iron up to 4.7 Mtpa (yet to be constructed).
- Infrastructure:
 - Power station capacity of 640MW;
 - North South infrastructure corridor including: access roads, power lines, buried magnetite concentrate slurry pipeline;
 - East West infrastructure corridor (L08/20) including Project access road and underground gas pipeline;
 - East West infrastructure corridor extending from the North South infrastructure corridor across tenement G08/53 and G08/74 to the aerodrome (located on tenure outside and east of the *Iron Ore Processing (Mineralogy Pty Ltd) Agreement Act 2002 (IOPA)* area), for the purposes of providing transport, power and water supply infrastructure to the aerodrome;
 - East West infrastructure corridor extending from the North South infrastructure corridor across G08/63 (broadly adjacent to L08/20), for the purpose of connecting existing Project power and water supplies to facilities located outside and to the east of the IOPA area;
 - Dewatering plant at the port;
 - Port iron ore product stockpiles and bulk ship loading facilities;
 - 44 gigalitres per annum (**GLpa**) Desalination plant and disposal of up to 57.8GLpa of brine per annum;
 - Accommodation villages;
 - Groundwater bore field; and
 - Pit dewatering and disposal of up to 8 GLpa to the Fortescue River.
- Port Terminal Facilities:
 - Product stockyard capacity of approximately 3 Mt;
 - Approximately 1.1 km, bridging structures or rock causeway to Preston Island and breakwater which allows for transshipment of magnetite concentrate; and
 - Trestle jetty and dredging of up to 4.5 million metres cubed to allow for direct ship loading (yet to be constructed and additional construction management plan to be submitted for these activities).

Figure 1 details the Project Development Envelope and Conceptual Footprint as described in MS 1066 Schedule 1. Figure 2 provides a schematic representation of the Project's operations.

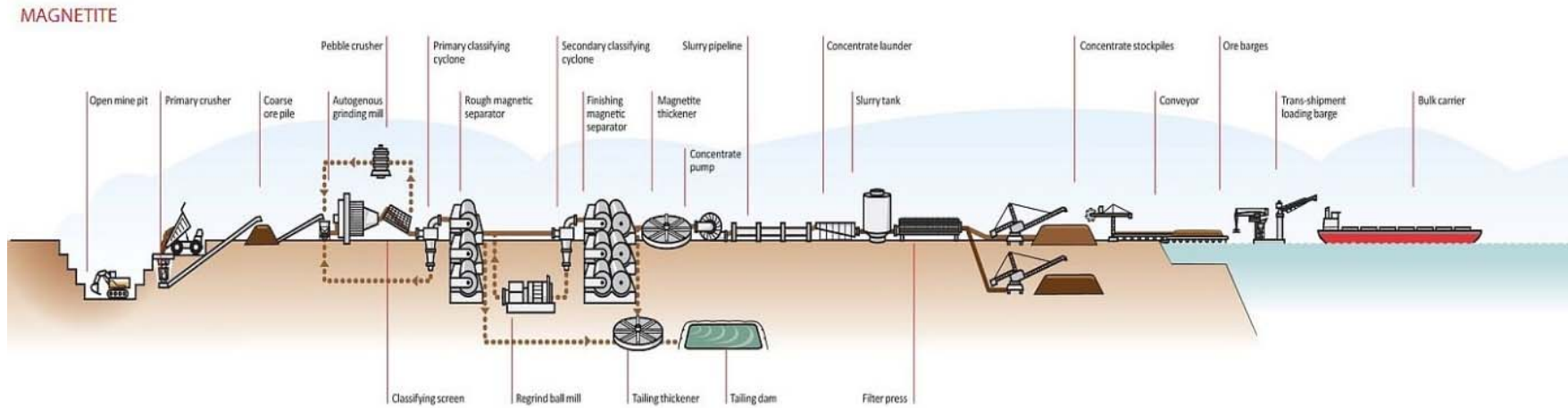
Figure 1: Sino Iron Project Development Envelope and Conceptual Footprint

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Figure 2: Schematic of the project's mining and beneficiation operations



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2 Environmental Management Framework

2.1 Environment Management System

CPM has established and is implementing an Environmental Management System (**EMS**) to ensure that it proactively manages its environmental risks, objectives and targets and meets statutory obligations during the operations phase.

The EMS framework includes the following components:

- Environmental Policy;
- EMS Document;
- Environmental Guidelines;
- Environmental Management Programs;
- Environmental Management Plans (**EMPs**);
- Environmental Procedures; and
- Environmental Registers.

The OEMP is the key component of the Environmental Management Program tier of the EMS framework for operations and should be read, understood and implemented in conjunction with the requirements of the overarching EMS.

Environmental procedures have also been developed as part of the requirements of the EMS and, where relevant, these procedures are referenced within the OEMP.

Figure 3 summarises the relationship between the OEMP and the overarching EMS.

Environmental Management System Structure

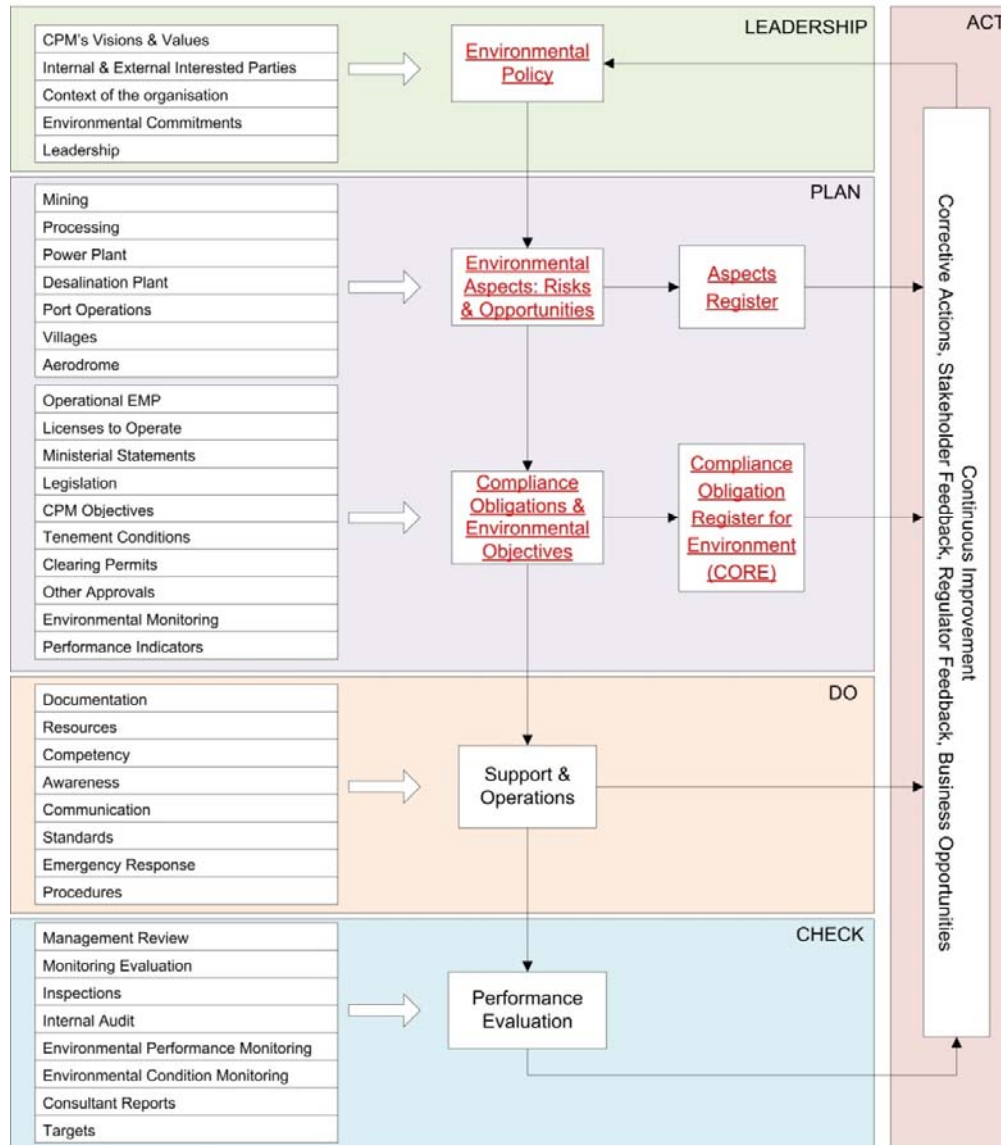


Figure 3: EMS Structure

2.2 Integration of this OEMP

Table 3 describes the key items within the EMS structure that support the OEMP. All of the items listed are accessible via CPM's Environment Department intranet portal.

Table 2: Key EMS items supporting OEMP

Item	Description
Environmental Policy	Provides a high-level leadership statement of intent and commitment. It is designed to guide decisions and behaviour across the business in order to manage risks and comply with legislative obligations.
Environmental Guidelines	Developed to set out performance expectations for key activities, which contribute to environmental outcomes.
Environmental Management Programs	High level document that provides environmental management requirements for significant environmental risks and compliance requirements. This Operational Management Plan aligns with the significant factors identified in the Ministerial Statements for the operation of the Sino Iron project.
EMPs	Detailed plans that address specific environmental aspects and impacts. Many of these are internal documents; however, some are maintained in accordance with external requirements (i.e. Oil Spill Contingency Plan (OSCP)).
Environmental Procedures	Succinct and detailed internal documents that address specific activities that may have an environmental impact.
Environmental Registers	Numerous registers exist to track and log relevant environmental information. These include: <ul style="list-style-type: none"> • Environmental Aspects and Impacts Register • Compliance Obligation Register for Environment (CORE) which is updated to include statutory requirements within approvals as they are obtained. • Risk Register

2.2.1 Project Phases and Management Areas

Due to the varying levels of project activities and subsequent environmental risks as a result of the magnitude and nature of works undertaken, environmental management has been divided into two phases. This reflects the different environmental aspects and impacts that occur during:

- Construction (the subject of the various construction-phase EMP’s previously approved by the Department of Environment Conservation (DEC) and Office of the Environmental Protection Authority (OEPA) [refer to Table 3 and Table 4 below]); and
- Operations (the subject of this EMP).

A number of key project activities, impacts and aspects are localised in terms of the project’s overall geographical extent. As such the project has been divided into three discrete management areas to accommodate differences in environmental management priorities. These areas have been defined as:

- Area 1: Mainland terrestrial (i.e. the mine area);
- Area 2: Cape Preston terrestrial (i.e. the onshore areas of the port); and
- Area 3: Cape Preston marine (i.e. the marine elements of the port).

2.2.1.1 Construction management

Environmental management during the construction phase was categorised by activities associated with these three different areas of the project, resulting in the development of three separate Construction EMP documents, under the Construction Environmental Management System.

In addition to and under the Construction EMP's, fourteen plans were developed to cover activities specific to the construction phase of the project and to meet the requirements of commitment 2 (and subsequent commitments 4, 6, 8, 9 and 12) and conditions 6, 7 and 10 to 16 of MS 635. These construction phase plans, as outlined below, were all approved by the Minister for the Environment.

Table 3: Construction Management Plans

MS 635 requirement	Management Plan
Condition 6	Pit Dewatering and Vegetation Monitoring Plan
Condition 7	Marine Management Plan
Condition 10	Dust Management Plan
Condition 11	Greenhouse Gas Emissions
Condition 12	Noise Management Plan
Condition 13	Recreational Use Management Plan
Condition 14	Audit Program
Condition 15	Conservation Estate
Condition 16	Decommissioning and Closure Plans
Commitment 2	Construction Phase EMP <ul style="list-style-type: none"> • Phase 1 Terrestrial Activities • Phase 2: Cape Preston Terrestrial • Phase 3: Cape Preston Marine
Commitment 4	Vegetation Monitoring Plan
Commitment 6	Fauna Management Plan
Commitment 8	Surface Water Management Plan
Commitment 9	Groundwater Management Plan
Commitment 12	Aboriginal Sites Management Plan

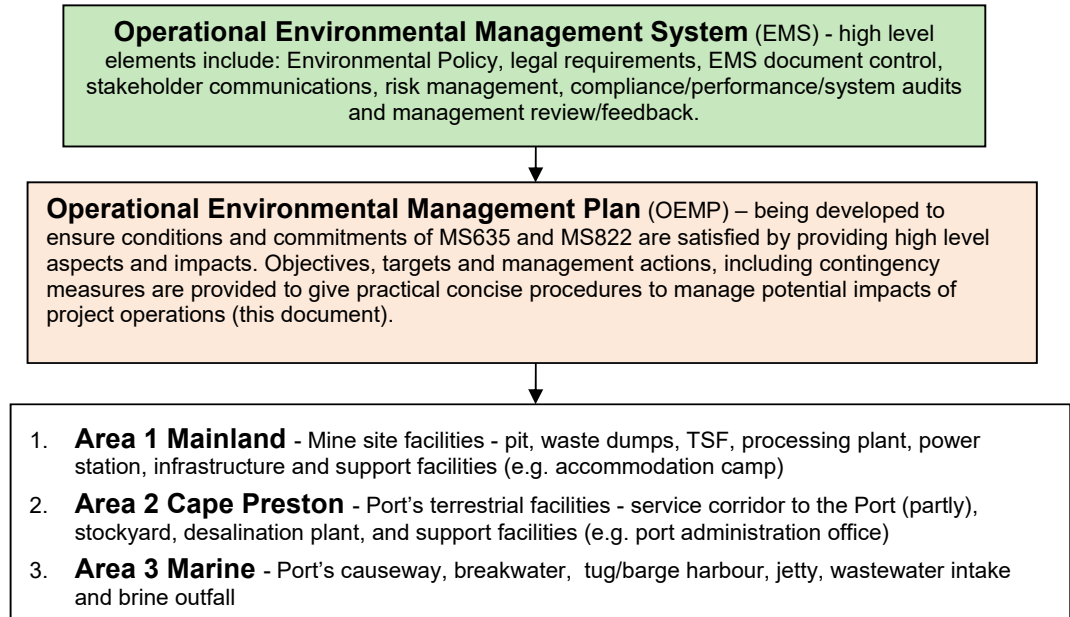
Note: the approved Port Environmental Management Plan, including Ballast Water Management and Spill Contingency Plan was developed for the port operations phase. As such, this plan has not been included in the above table and will not be addressed or superseded by this OEMP.

2.2.1.2 Operational management

Management of the operations phase will follow the same arrangement as applied for construction, being based on the three management areas as previously illustrated.

Figure 4 outlines the operational environmental structure.

Figure 4: Operational Environmental Structure



3 Project Obligations – Operations Phase

The following section describes the environmental management planning requirements of MS 635 (as amended by MS 822 and MS 1066) and explains what elements of these requirements:

- Were applied and/or completed during the construction phase and are not relevant to this OEMP; and
- Apply to the operations phase of the project and have been included in this OEMP.

Commitment 2 of MS 635 Schedule 2 specifically requires the preparation, implementation and regular revision of separate construction and operational phase EMP's as part of an EMS (commitment 1).

The objective of commitment 1 is to manage the relevant environmental factors and to fulfil the requirements of the conditions and procedures in MS 635 (and MS 822). To meet the objective of commitment 1 an operational EMS for the project has been prepared and implemented and includes:

- An environmental policy and corporate commitment to the EMS;
- Planning to meet environmental requirements;
- Specification and implementation of actions to meet environmental requirements;
- Measurement and evaluation of environmental performance; and
- Review and improvement of environmental outcomes.

The EMS framework has been described in Section 2.1 above.

As stated in Schedule 2 of MS 635 the objective of commitment 2 is to manage the potential impacts of the operations phase of the project. To meet this objective an OEMP (this document) needs to be prepared, implemented and regularly revised. The EMP consists of plans, guidelines and procedures to manage environmental issues associated with operation of the project (refer to Table 4 for further detail).

This OEMP supersedes the commitments and obligations of the construction EMS and EMP's, although these documents can still be utilised for reference purposes.

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Table 4: Operational Environmental Management Plan requirements of MS 635 as amended by MS 822 and MS 1066

Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
Conditions 1, 2, 3, 4 and 5	N/A	These conditions address matters pertaining to proposal implementation, implementation of commitments (including of management plans, but does not relate to management plan content), proponenty, commencement limitations and mine design with respect to surface water.	N/A
Condition 6: Pit Dewatering and Vegetation Monitoring Plan (PDVMP; also see pt 3 of commitment 2 and commitment 4) As revised by MS 1066 Condition 17: Amendment of Plans, Reports, Systems or Programs	6-1 Prior to the commencement of pit dewatering, the proponent shall prepare a Pit Dewatering and Vegetation Monitoring Plan for the pit and its surrounding groundwater depletion zone, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority. The objective of this plan is to allow deep-rooted vegetation, by extending their root systems, the maximum opportunity to adjust to the dropping water regime by dewatering the pit as slowly as possible, commensurate with the requirements of mining. This plan shall include monitoring of representative stands of creekline vegetation and other areas of conservation significance within the zone of groundwater depletion, to determine the extent of effects of groundwater drawdown on this vegetation.	A PDVMP was prepared by Maunsell and approved by the DEC (now OEPA) in October 2006. Key elements of the Maunsell plan have been included in this OEMP. The objective of the condition has been applied in this OEMP and includes requisite monitoring as indicated in the condition.	6.1
	6-2 The proponent shall implement the Pit Dewatering and Vegetation Monitoring Plan required by condition 6-1.	Relates to implementation of this OEMP.	N/A
	6-3 The proponent shall make the Pit Dewatering and Vegetation Monitoring Plan required by condition 6-1	This plan will be made publicly available.	10

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	publicly available, to the requirements of the Minister for the Environment on advice of the EPA.		
	17-1 The Proponent shall revise the versions most recently approved by the CEO of plans, reports, systems or programs, required by Ministerial Statement 635, which are applicable to the Sino Iron Mine Continuation Proposal, to include the Sino Iron Mine Continuation Proposal and to be consistent with contemporary standards, policies, guidelines and procedures.	The GDV monitoring program has been revised to incorporate the outcomes of the MCP groundwater modelling and environmental impact assessment.	6.1
	17-2 Within six months of the issue of this Statement, or as otherwise agreed in writing by the CEO, the Proponent shall revise and submit the plans, reports, systems or programs required by condition 17-1 to the requirements of the CEO.	This revision of the OEMP will be submitted to the CEO within six months of the issue of MS 1066.	N/A
	17-3 The proponents shall implement the latest revision of the plans, reports, systems or programs required by condition 17-1, which the CEO has confirmed by notice in writing, satisfies the requirements of condition 17-1.	Relates to implementation of this OEMP.	N/A
Condition 7: Marine Management Plan (MMP) [note condition 7-1(5) deleted and replaced by MS 822] (also see pt 4 of commitment 2 and, commitment 7)	7-1 Prior to the commencement of construction of the jetty or commencement of dredging (whichever happens first) at Cape Preston, the proponent shall prepare a Marine Management Plan, to the requirements of the Minister for the Environment on advice of the EPA. The objectives of this plan are: <ul style="list-style-type: none"> To accurately predict changes in coastal water movements, quality, residence times, bathymetry, 	This plan is essential as part of the design process for the project. A MMP plus a Construction Environmental Management Program (EMPgm) Phase 3 - marine activities were prepared by Le Provost Environmental and approved by the Environmental Protection Authority (EPA) in March 2009.	8

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	<p>sedimentology, beach alignment and habitat cover associated with the project; and</p> <ul style="list-style-type: none"> To allow for appropriate management measures to be identified and implemented. <p>This Plan shall address, as part of the design process for the project:</p> <ol style="list-style-type: none"> N/A; N/A; N/A; N/A; <i>deleted – replaced by Statement 822;</i> Coastal surveys to track changes, carried out for a sufficient period after construction and submitted to the Environmental Protection Authority, to monitor the effects of the bridging structure of rock causeway, and the wastewater outfall, together with other potential impacts from emissions and dust, impacts on mangroves, sandy beaches, or other coastal and marine ecosystems, including the corals off Preston Island; and Strategies to restore environmental quality to acceptable levels if survey referred to in (6) above demonstrate that significant impacts have occurred to mangroves, corals, beaches, nursery habitats or other sensitive coastal and marine ecosystems. 	<p>Three updates to the MMP to accommodate minor design changes were prepared in 2009 (two) and 2011 (one).</p> <p>The required plan relates for the most part (points 1-4) to the design and construction phases of the project in accordance with the detail of the condition (i.e. “<i>this Plan shall address, as part of the design process for the project</i>”) and are not considered relevant to this OEMP.</p> <p>Coastal surveys and strategies, as outlined in condition 7-1-6 and 7-1-7, which are still applicable, are included in this OEMP.</p>	
	7-2 The proponent shall implement the Marine Management Plan required by condition 7-1.	Relates to implementation of this OEMP.	N/A
	7-3 The proponent shall make the Marine Management Plan required by condition 7-1 publicly available, to the	This plan will be made publicly available.	10

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	requirements of the Minister for the Environment on advice of the EPA.		
Condition 8 Marine Wastewater Outfall (note conditions 8-1 to 8-4 of MS 635 deleted and replaced by conditions 8-1 to 8-8 of MS 822).	A Wastewater Outfall Management Plan is no longer required.	Condition 8 of MS 822 is addressed through the measures outlined in the Marine Wastewater Outfall section of this OEMP.	8.3
	8-1 N/A	Relates to the location of the waste water outfall.	N/A
	8-2 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.	Monitoring to assess compliance with this condition is included in this OEMP.	8.3
	8-3 The proponent shall ensure that within the 95 th percentile of bioaccumulation toxicant concentrations meets ANZECC and ARMCANZ 2000 <i>National Water Quality Management Strategy</i> 80% species protection guideline levels, and within the Moderate Ecological Protection Area the 95 th percentile of toxicants meets ANZECC and ARMCANZ 2000 <i>National Water Quality Management Strategy</i> 90% species protection levels.	Monitoring to assess compliance with this condition is included in this OEMP.	8.3
	8-4 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 95 th percentile of the natural salinity range over the	Monitoring to assess compliance with this condition is included in this OEMP.	8.3

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	<p>same period; or, (2) does not exceed the median salinity at a suitable reference site by more than 1.2 parts per thousand.</p> <p>2. The 95th percentile of toxicant concentrations meets the 90% species protection levels specified in ANZECC and ARMCANZ 2000 <i>National Water Quality Management Strategy</i>.</p> <p>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 dilutions 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.</p> <p>4. The ambient dissolved oxygen in bottom water samples is not below 80% saturation for more than six weeks and never below 60% saturation.</p> <p>5. The median temperature in any season does not exceed the 95th percentile of the natural temperature range over the same period.</p>		
	<p>8-5 The proponent shall verify diffuser performance in terms of achieving the required number of dilutions to meet the requirements of 8-2 to 8-4, 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.</p>	<p>Monitoring to assess compliance with this condition is included in this OEMP.</p>	<p>8.3</p>
	<p>8-6 The proponent shall use procedures contained in EPA 2005 <i>Manual of Operating Procedures for Environmental Monitoring Against the Cockburn Sound</i></p>	<p>Monitoring to assess compliance with this condition is included in this OEMP.</p>	<p>8.3</p>

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	<i>Environmental Quality Criteria</i> EPA report 21 for monitoring carried out to meet the requirements of 8-2 to 8-5.		
	8-7 Within 18 months of commissioning the proponent shall submit a report containing the results of the monitoring required by 8-2 to 8-5 and a discussion of the operating limitation necessary to ensure ongoing compliance with 8-2 to 8-4 to the Chief Executive Officer of the Department of Environment and Conservation.	Addressed in this OEMP.	10.1.3
	8-8 In the event that the monitoring required by 8-5 indicates that the requirements of 8-2 to 8-4 are not being met or are not likely to be met, the proponent shall immediately reports 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 8-2 to 8-4.	Addressed in this OEMP.	8.3
Condition 9: Port Environmental Management Plan (Port EMP) and see also pt 6 of commitment 2	9-1 Prior to the commencement of ground-disturbing activities at Cape Preston or Preston Island (whichever happens first), the proponent shall prepare a Port Environmental Management Plan to address emissions from the port berthing facility, product-handling facilities, desalination plant, and associated structures, to the requirements of the Minister for the Environment on advice of the EPA. The objectives of this plan are: <ul style="list-style-type: none"> To maintain an adequate level of water quality in waters surrounding the port; 	A Port EMP was prepared by CPM and approved by the OEPA in November 2011. The Port EMP covers the operational aspects of the port. To avoid repetition condition 9-1 is addressed in this OEMP by providing the Port EMP as an appendix.	Appendix C

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	<ul style="list-style-type: none"> • To minimise runoff and spills; • To avoid ballast water contamination and the introduction of exotic marine organisms from ships' hulls; and • To contain light spill so as to minimise impacts on turtles. <p><i>Further text from this part of the condition is not included as the condition has been addressed in the approved and current Port EMP.</i></p>		
	9-2 The proponent shall implement the Port EMP required by condition 9-1.	Relates to implementation of this OEMP.	N/A
	9-3 The proponent shall make the Port EMP required by condition 9-1 publicly available, to the requirements of the Minister for the Environment on advice of the EPA.	This plan will be made publicly available.	10
Condition 10 Air Emissions (also see pt 9 of commitment 2)	10-1 N/A	Relates to establishment of a meteorological station and to monitoring prior to construction.	N/A
	10-2 N/A	Relates to air emissions modelling prior to construction completion.	N/A
	10-3 N/A	Relates to investigation and implementation of NOx control measures prior to commencement of construction.	N/A
	10-4 Prior to commencement of construction of the DRI plant, the proponent shall prepare a Dust Management Plan which: <ol style="list-style-type: none"> 1. Incorporates baseline and ongoing monitoring; 2. Details management measures to minimise dust during construction; 	A Dust Management Plan was prepared by Maunsell in 2005 to the satisfaction of the EPA. Monitoring requirements as outlined in condition 10-4-1 and other conditions relevant to operations are incorporated into this OEMP.	6.9 Appendix A

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	3. Demonstrates best practice and details the methods to be used for all point and fugitive sources; 4. Incorporates monitoring to determine the size and composition of particulates; 5. Incorporates further investigations into reactive DRI dust and details measures to minimise impacts; 6. Provides for continuous improvements in dust management; and 7. Details complaint response procedures; To the requirements of the Minister for the Environment on advice of the EPA.	In addition, a Dust Management Plan for the operational phase of the project has also been developed and is provided as an appendix to this OEMP.	
	10-5 The proponent shall implement the Dust MP required by condition 10-4, to the requirements of the Minister for the Environment on advice of the EPA.	Relates to implementation of this OEMP.	N/A
Condition 11 Greenhouse Gas Emissions (also see pt 11 of commitment 2)	11-1 Prior to commencement of construction of the DRI plant or power station (whichever is the sooner), the proponent shall prepare a Greenhouse Gas Emissions Management Plan: <ul style="list-style-type: none"> • To ensure that “greenhouse gas” emissions from the project area adequately addressed and best available efficient technologies area used to minimise total net “greenhouse gas” emissions and / or “greenhouse gas” emissions per unit of product; and • To mitigate “greenhouse gas” emissions in accordance with the <i>Framework convention on Climate Change 1992</i>, and consistent with the National Greenhouse Strategy (subject to 	A Greenhouse Gas Management Plan was prepared by Maunsell and approved by the DEC in December 2006. The key components of that plan related to the design and construction phases of the project. As such, this OEMP includes only the relevant operational monitoring parameters of that plan. Monitoring results will be interpreted and reported to the relevant regulatory authorities in accordance with agreed timeframes.	6.8, 10

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	<p>qualifications to those measures referred to at page 37 of EPA Bulletin 1056, July 2002: To the requirements of the Minister for the Environment on advice of the EPA. This Plan shall include:</p> <ol style="list-style-type: none"> 1. N/A; 2. N/A; 3. Monitoring of “greenhouse gases”; 4. N/A; 5. N/A; 6. A target set by the proponent for the reduction of total net “greenhouse gas” emissions and/or “greenhouse gas” emissions per unit of product over time, and annual reporting of progress in achieving this target. <p><i>Further text from this part of the condition is not included as it is a note regarding definitions of ‘no regrets’ and ‘beyond no regrets’ measures, applicable to the design and construction phase of the proposal.</i></p>		
	11-2 The proponent shall implement the Greenhouse Gas Emissions Management Plan required by condition 11-1.	Relates to implementation of this OEMP.	N/A
	11-3 The proponent shall make the Greenhouse Gas Emissions Management Plan required by condition 11-1 publicly available, to the requirements of the Minister for the Environment on advice of the EPA.	This plan will be made publicly available.	10

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
Condition 12 Noise Management Plan (see also pt 9 of commitment 2)	12-1 Prior to the commencement of ground-disturbing activities, the proponent shall prepare a Noise Management Plan to the requirements of the Minister for the Environment on advice of the EPA.	A Construction Phase Noise Management Plan was prepared by Maunsell and approved by the DEC in October 2006. The key components of that plan related to the construction phase of the project. A Noise Management Plan for the operational phase of the project has been developed and is included as an appendix to this OEMP.	6.10 Appendix B
	12-2 The proponent shall implement the Noise Management Plan required by 12-1.	Relates to implementation of this OEMP.	N/A
	12-3 The proponent shall make the Noise Management Plan required by 12-1 publicly available, to the requirements of the Minister for the Environment on advice of the EPA.	This plan will be made publicly available.	10
Condition 13 Recreational Use Management Plan	13-1 Prior to the commencement of ground-disturbing activities, the proponent shall prepare a Recreational Use Management Plan to the requirements of the Minister for the Environment on advice of the EPA.	A Recreational Use Management Plan was prepared by Maunsell and approved by the DEC in November 2006. The elements of the above plan relevant to operations have been taken and incorporated into this OEMP.	6.12
	13-2 The proponent shall implement the Recreational Use Management Plan required by condition 13-1, to the requirements of the Minister for the Environment on advice of the EPA.	Relates to implementation of this OEMP.	N/A
	13-3 The proponent shall make the Recreational Use Management Plan required by condition 13-1 publicly available, to the requirements of the Minister for the Environment on advice of the EPA.	This plan will be made publicly available.	10

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
Condition 14 Compliance Audit and Performance Review	14-1 The proponent shall prepare and audit plan and submit compliance reports to the Department of Environmental Protection which address: <ol style="list-style-type: none"> 1. N/A; 2. Evidence of compliance with the conditions and commitments; and 3. The performance of the environmental management plans and programs. <i>Further text from this part of the condition is not included as it is a note regarding the power of the (OEPA) to audit compliance.</i>	An Audit Program was prepared by CPM and approved by the OEPA in November 2009 with compliance reports submitted since 2009. Compliance auditing requirements are addressed in this OEMP.	10.1
	14-2 The proponent shall submit a performance review every six years after the start of the operations phase, to the requirements of the Minister for the Environment on advice of the EPA, which addresses: <ol style="list-style-type: none"> 1. The major environmental issues associated with the project; the targets for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those targets; 2. The level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable; 3. Significant improvements gained in environmental management, including the use of external peer reviews; 4. Stakeholder and community consultation about environmental performance and the outcomes of 	Performance review requirements are addressed in this OEMP.	10.1

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	<p>that consultation including a report any on-going concerns being expressed; and</p> <p>5. The proposed environmental targets over the next six years, including improvements in technology and management processes.</p>		
Condition 15 Conservation Estate	15-1 In the event that the port facilities at Preston Island are to be developed, the proponent, in consultation with the Department of Conservation and Land Management and the Conservation Commission of Western Australia, shall determine and report on appropriate mitigatory measures to aid the conservation effort in the vicinity of the project area, to the requirements of the Minister for the Environment on advice of the EPA.	A Conservation Estate Management Plan was prepared by Strategen and approved by the DEC in March 2009. The mitigatory measures of the above plan relevant to operations have been taken and incorporated into this OEMP.	9
	15-2 Prior to the construction of the port facility, the proponent shall incorporate the mitigatory measures referred to in condition 15-1 into a Conservation Estate Management Plan which addresses the following: 1. The effect of the port facility on the conservation values of the Great Sandy Island Nature Reserve, of which Preston Island is a part; 2. The potential effects of the port development, including dredging, spoil dumping and causeway / bridging structures on the Cape Preston area, which is a part of the proposed Dampier Archipelago / Cape Preston Marine Conservation Reserve; and 3. Mitigatory measures to address the above effects,	Refer above - the mitigatory measures of the above plan relevant to operations have been taken and incorporated into this OEMP.	9

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	To the requirements of the Minister for the Environment on advice of the EPA.		
	15-3 The proponent shall implement the Conservation Estate Management Plan required by condition 15-2 to the requirements of the Minister for the Environment on advice of the EPA.	Relates to implementation of this OEMP.	N/A
	15-4 The proponent shall make the Conservation Estate Management Plan required by condition 15-2 publicly available, to the requirements of the Minister for the Environment on advice of the EPA.	This plan will be made publicly available.	10

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<p>Condition 16 Decommissioning and Closure Plans (see also pt 14 of commitment 2) (Note conditions 16-1 to 16-4 of MS 635 deleted and replaced by Conditions 16-1 to 16-8 of MS 1066)</p>	<p>N/A</p>	<p>A separate Closure Plan has been developed to address the requirements of Conditions 16-1 to 16-8 of MS 1066. Decommissioning and closure aspects have been excluded from the scope of this OEMP.</p>	<p>N/A</p>
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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
Commitment 1 Environmental Management System	N/A	CPM has developed an EMS, of which this OEMP forms a key part.	2.1
Commitment 2: Environmental Management Programme	<p>Prepare, implement and regularly revise an Environmental Management Programme (EMP). The EMP will contain plans, guidelines and procedures to manage environmental issues associated with construction and operation of the project, including:</p> <ol style="list-style-type: none"> 1. Flora and Fauna Monitoring and Management Plans 2. Overburden Storage 3. Pit Dewatering and Vegetation Monitoring Plan 4. Marine Management Plan 5. Spill Contingency Plan 6. Port Management Plan 7. Surface Water (including flood) Management 8. Groundwater Management 9. Dust and Noise 10. Gaseous Emissions 11. Greenhouse Gas Emissions Plan 12. Risks and Hazards Management Plan 13. Aboriginal Sites Management Plan 14. Decommissioning and Closure Plan 	<p>The environmental issues listed (with the exception of Item 2) relate to other conditions and commitments and are also addressed elsewhere in this table as indicated:</p> <ol style="list-style-type: none"> 1. Flora and Fauna Monitoring and Management Plans (addressed also by commitments 3, 5, 6 and 16) 2. Overburden storage (N/A) 3. Pit Dewatering and Vegetation Monitoring Plan (addressed also by commitment 4) 4. Marine Management Plan (addressed also by commitment 7) 5. Spill Contingency Plan (addressed also by commitment 10) 6. Port Management Plan is addressed also by condition 9 7. Surface Water (including flood) Management (addressed also by commitment 8) 8. Groundwater Management (addressed also by commitment 9) 9. Dust and noise are also addressed by condition 10 and 12. 	<p>6.2, 6.3, 7</p> <p>6.2</p> <p>6.1</p> <p>8</p> <p>Appendix C</p> <p>Appendix C</p> <p>6.6</p> <p>6.7</p> <p>6.9, 6.10 and Appendix A, B</p>

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
		<p>10. Gaseous emissions are also addressed by condition 10 and 11.</p> <p>11. Greenhouse Gas Emissions Plan is also addressed by condition 11.</p> <p>12. Risks and hazards management are addressed by the Operational EMS.</p> <p>13. Aboriginal Sites Management Plan (commitment 12)</p> <p>14. A separate Mine Closure Plan has been developed in response to Conditions 16-1 to 16-8 of MS 1066</p>	<p>6.8</p> <p>6.8</p> <p>N/A</p> <p>6.11</p> <p>N/A</p>
Commitment 3: Flora survey (see also pt 1 of commitment 2)	Undertake a flora survey – in particular in the cracking clay environment. If any specimens of the Priority 1 species <i>Goodenia pallida</i> are identified, a management strategy will be developed with CALM (now Department of Biodiversity, Conservation and Attractions-).	<p>The timing of this commitment is prior to ground disturbance and after significant rains. Floristic surveys have been conducted since 2001 by various parties.</p> <p>As part of the MCP Environmental Review, Matisse Consulting Pty Ltd was commissioned in Dec-16 to conduct a review of all historic surveys. The peer review concluded:</p> <p><i>The survey effort fulfils the Level 1 needs and in the view of the depth of experience of the specialists, the extent of the coverage and with some desktop integration and alignment of known values on the flora and vegetation into the impact assessment report the coverage should then be accepted as addressing the Level 2 needs of the EPA process for the Cape Preston area.</i></p>	N/A

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
Commitment 4: Vegetation Monitoring Plan (see also pt 1 of commitment 2)	Prepare a Vegetation Monitoring Plan to determine the extent of creekline vegetation loss. Establish transects across the drawdown zone and compare health of vegetation with control transects. Establish vegetation monitoring at other sensitive locations (such as the infrastructure corridor crossing of the mangrove creek). [Timing: prior to and during pit dewatering].	A Vegetation Monitoring Plan was prepared by Maunsell and approved by the DEC in October 2006. The elements of the above plan relevant to operations have been taken and incorporated into this OEMP. Refer to requirements of condition 6 above regarding vegetation monitoring within this OEMP.	6.1, 7.2
Commitment 5: Mesquite (<i>Prosopis pallida</i> hybrid) Control Plan	Undertake Mesquite control as an active member of the Mesquite Control Committee, such activities as determined with the Mesquite Control Committee. [Timing: once the proponent has established a permanent presence in the area – during construction].	A mesquite control program is included in the Conservation Estate Management Plan, which was prepared by Strategen and approved by the DEC in March 2009. The mesquite elements of the above plan relevant to operations have been taken and incorporated in the weed control section of this OEMP.	6.3
Commitment 6: Fauna Management Plan (see also pt 1 of commitment 2)	Prepare a Fauna Management Plan which will include: 1. Fauna counts at appropriate times of the year; and 2. Results from the turtle baseline survey to develop strategies that protect nesting areas and minimise effects of lighting.	A Fauna Management Plan was prepared by Strategen and approved by the DEC in March 2009. The elements of the above plan relevant to operations have been taken and incorporated in the fauna management section of this OEMP.	7.1
Commitment 7: Ballast Water Management	Prepare a Ballast Water Management Plan which will contain plans, guidelines and procedures on the methods to be employed to minimise the potential release of exotic organisms. The plan will be provided to all shippers.	A Ballast Water Management Plan is included in the Port EMP, which is attached to this OEMP. Note: the Port EMP was prepared by CPM and approved by the OEPA in November 2011.	Appendix C
Commitment 8: Surface Water Management Plan	Prepare a Surface Water Management Plan to cover: 1. Normal surface runoff;	A Surface Water Management Plan was prepared by Strategen and approved by the DEC in March 2009.	6.6

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
(see also pt 7 of commitment 2)	2. Armouring of the waste dump; and 3. Flood diversions works, and will use and contain plans, updated cross sections of the floodplain, updated modelling of streamflows from WRC guidelines and procedures to manage environmental issues relating to the potential effects of operations on the surface water regimes across the Fortescue River Floodplain.	The elements of the above plan relevant to operations have been taken and incorporated in the surface water management section of this OEMP.	
Commitment 9: Prepare a Groundwater Management Plan (see also pt 8 of commitment 2)	Prepare a Groundwater Management Plan addressing: 1. The effects of the operations on groundwater quantity and quality; 2. Maintenance of the existing pastoral camp stock water supplies and the bore used by the Mesquite control camp; and 3. Establishment and locations for groundwater quality monitoring bores.	A Groundwater Management Plan was prepared by Aquaterra and approved by the DEC in June 2007. The elements of the above plan relevant to operations have been taken and incorporated in the groundwater management section of this OEMP.	6.7
Commitment 10: Spill Contingency Plan (see also pt 5 of commitment 2)	Prepare and implement (as necessary) a Spill Contingency Plan. The Spill Contingency Plan will contain plans guidelines and procedures to manage any spillage. [Timing: Prior to operations].	An Oil Spill Contingency Plan is included in the Port EMP, which is attached to this OEMP. Note: the Port EMP was prepared by CPM and approved by the OEPA in November 2011.	Appendix C
Commitment 11: Final project layout	N/A	Relates to project design.	N/A
Commitment 12: Aboriginal Sites Management Plan (see also pt 13 of commitment 2)	Prepare an Aboriginal Sites Management Plan. This will include: 1. Consultation with traditional owners in respect of additional Aboriginal site surveys in area not already surveyed;	An Aboriginal Sites Management Plan was prepared by Mineralogy and approved by the DEC in October 2006. Most consultation and all surveys required under this commitment have been undertaken prior to	6.11

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Statement 635 Condition / Commitment	Management Plan Requirement (N.B. for brevity parts of conditions not directly applicable to operational environmental management have been excluded)	Comment	Section in this document
	2. Further consultation with representative claimant groups; 3. Additional surveys in areas not already surveyed within the project area that likely to be disturbed or otherwise affected by mining operations, downstream processing or export operations and associated infrastructure; 4. Delineation of sites with respect to project components with adjustments where appropriate to the location of those components; and 5. Abiding by the recommendations made in the project ethnographic survey (O'Connor 2001).	construction. Ongoing consultation with Traditional Owners will continue throughout the operations phase of the project under stakeholder engagement processes managed separately to this OEMP. Management of Aboriginal Heritage, including abiding by the recommendations made in the project ethnographic survey (O'Connor 2001), for the operations phase is addressed in the Aboriginal Heritage section of this OEMP.	
Commitments 13, 14, 15, 16 and 17	N/A	These commitments do not relate to OEMP requirements.	N/A

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4 Existing Environment

The project is located approximately 80 km south-west of Karratha and lies within the Mardie Station pastoral lease, an active pastoral station producing beef cattle.

A more detailed description of the project area's baseline environmental characteristics can be found in Section 2.4 of the Sino Iron Mine Continuation Proposal Environmental Review (Strategen, 2017).

Climate

The Pilbara region is characterised by a hot arid climate, daily maximum temperatures ranging from 28°C to 38°C, daily minimum temperatures ranging from 12°C to 25°C and an annual rainfall of about 270 mm. The prevailing wind pattern is for winds from the southeast in the morning changing to stronger winds from the northwest in the afternoon.

Occasional heavy rainfall events occur because of cyclonic activity. The Pilbara coast experiences more cyclones than any other part of Australia. On average about five tropical cyclones occur during each cyclone season over the warm ocean waters off the northwest coast between 105 and 125°E. On average about two cyclones cross the coast, one of which is severe. Along the central Pilbara coast, the cyclone season runs from mid-December to April, peaking in February and March. Apart from the high winds, flooding and storm surges are other potential high risk factors.

Topography

The south-eastern side of the project is dominated by two ridges running north to south. The western series of ridges comprise the Northern, George Palmer and Southern ore bodies. The Du Boulay Creek and then the Fortescue River floodplain lay to the west of the ore bodies. Edward Creek and Du Boulay Creek flow in a north-westerly direction through the project area with the Du Boulay Creek extending up the western side of the ore body, parallel to the Fortescue River. Edward Creek is a tributary to the Du Boulay Creek, which discharges into the ocean adjacent to the mouth of the Fortescue River.

Vegetation

The vegetation of the project area is described as clayey plains with low hills and slopes and is predominantly part of the Horseflats, Rocklea and Paraburdoo Land Systems (Astron, 2011). There are mangrove regions at the mouth of rivers and at Cape Preston.

Soils

In most areas of the project, and particularly on the upper slopes, the soil surface is weathered sheets of gravels and stones. Topsoil is generally thin (2-10 cm), easily broken, and with a gravel content typically more than 50%. The subsoil is comprised of an approximately 2 m thick layer of gravelly sandy clay/gravelly clayey sand overlying basalt/shale/chert bedrock.

Due to the high gravel content, soil materials occupy a small volume of the profile matrix, with little potential for the development of soil structure. The soils have low nutrient status, are neutral to slightly alkaline and generally have low salinity levels.

5 Structure of sub-plans

This OEMP contains plans, guidelines and procedures, referred to as sub-plans, as required by commitment 2 of MS 635. These sub-plans generally follow this structure:

1. Objectives and targets;
2. Management actions and control measures;
3. Monitoring and performance indicators; and
4. Contingency actions.

Objectives and targets

The objectives and targets align with those described in the Operational EMS register and with EPA objectives. These define the ultimate outcome of successful implementation of management actions.

Management actions and control measures

These are the actions and measures required to be undertaken to meet relevant objectives and targets. In most cases these include timing requirements and responsibilities for the actions and control measures.

Monitoring and performance indicators

This section describes the monitoring required to check management actions are tracking towards, or are meeting, the objectives and targets, and the performance indicator, or trigger, which provides a measure against which the achievement of the target can be assessed.

The monitoring regimes within this OEMP are generally based on the following structure:

- Activity – the type of monitoring to be undertaken;
- Performance indicator – provides a measure against which the achievement of the target can be assessed when the monitoring results are available;
- Corrective actions – initial response where performance indicators suggest targets are not being met (also aligns with contingency actions, below, and not always included in this section – and vice versa);
- Frequency – how often the monitoring action should be undertaken; and
- Role / responsibility – who is responsible for implementing the monitoring action.

Contingency actions

This section provides an action plan to be implemented in the event monitoring results indicate that the objectives and targets are not being met and the project is at risk of breaching compliance obligations.

Contingency actions should follow this general framework process:

- Investigate cause;
- Plan response to remedy issue;
- Implement action(s); and
- Monitor results and return to step one if performance indicators continue to be exceeded.

Incident reporting is required to be undertaken in the event contingency actions are triggered.

6 Operational Activities – Mainland Terrestrial

6.1 Pit dewatering and vegetation monitoring plan

The indicative pit depth is to extend to 400 m below natural surface with a total project disturbance area of approximately 10,100 ha. Groundwater Dependent Ecosystems (**GDEs**) are anticipated to be impacted by dewatering activities at the Project. GDEs are reliant on groundwater for survival and as such mine pit dewatering can result in indirect impacts to these species. Pit dewatering is expected to eventually result in a large groundwater cone of depression around the pit area.

GDEs within and adjacent to the Project area corresponds with vegetation dominated by the following indicator tree species:

- *Melaleuca argentea*: occurs over shallow water tables and adjacent to pools and is highly dependent on groundwater (obligate phreatophyte);
- *Eucalyptus camaldulensis*: partially dependent on groundwater (facultative phreatophyte), i.e. trees are dependent on groundwater periodically (seasonally or in some years); and
- *Eucalyptus victrix*: generally the least groundwater dependent of the three species and depending on setting, trees may develop without a dependence on groundwater (vadophyte) or as facultative phreatophytes.

Vegetation dominated by these three species is referred to as GDV. The GDV located to the west of the mining area is heavily infested with mesquite, a weed of national significance, greatly reducing the ecological value of the GDV located in the lower Fortescue.

The GDV monitoring program is based on biannual monitoring of the aforementioned GDE indicator tree species (*Eucalyptus victrix*, *Eucalyptus camaldulensis* and *Melaleuca argentea*) at monitoring sites along three catchments near the project area (Edwards Creek, Du Boulay Creek and Fortescue River). The program includes reference sites (outside the drawdown zone) and potential impact sites (inside the drawdown zone) for on ground monitoring. High resolution remote sensing imagery (captured annually) enabling monitoring of all trees within the project area and beyond. The monitoring program commenced in 2009 with measurements taken across an extended baseline period (4 years). Further detail on the monitoring program is contained in the *Groundwater Dependent Vegetation Monitoring Plan* (Astron 2017).

The depth to groundwater in the GDE area ranges from 5 m to 20 m and fluctuates seasonally by up to 3 m. Groundwater dependent vegetation is generally found at sites where groundwater is within approximately 10 m of the surface (Eamus et al. 2006, Loomes 2010, Barron and Emelyanova 2015). Beyond 10 m, there is uncertainty about whether trees or other components of the vegetation is likely to be groundwater dependent, with a lower likelihood of groundwater use (or reliance) with increasing depth. Drawdown is likely to have greater impact on the vegetation where groundwater is closer to the surface and where vegetation is therefore likely to be more groundwater dependent (Froend et al. 2004).

Based on a risk assessment informed by groundwater drawdown modelling, vegetation mapping and knowledge of species' ecological water requirements, loss of GDV are expected where groundwater drawdown exceeds 5 m (Strategen 2017). Loss is defined as mortality of the indicator species within an area of vegetation. A total of 585.5 ha of GDV is present within the extent of the >5m drawdown zone and is expected to be lost from drawdown due to pit dewatering (CPM 2018). The requirement is that GDV losses from Project activities beyond both the 5 m drawdown contour and areas approved for clearing are avoided. A zone extending out from the 5 m drawdown contour to approximately 1 km, is delineated as the GDV Management Zone in order to frame monitoring and management of GDV in such a way as to evaluate performance against the management target.

On ground GDV monitoring sites will be replicated across reference and potential drawdown areas and focus on areas with highly dependent GDV. Four sites from the original monitoring program will be retained and a further four site will be established. The extent of the remote sensing capture will also be expanded to account for the updated prediction of the drawdown extent. Monitoring across these new areas using on ground and remote methods will occur two years in advance of potential impacts so that a multi-year baseline data set can be collected. The time of commencement for potential drawdown within the GDV Management Zone is 2020.

6.1.1 Project Specific Objective

The overall environmental objective of this sub-plan is to allow deep-rooted vegetation, by extending their root systems, the maximum opportunity to adjust to dropping water regime by dewatering the pit as slowly as possible, commensurate with the requirements of mining.

The plan includes actions to monitor the health and response of groundwater dependent ecosystems (GDEs) to mine dewatering operations.

6.1.2 Management Actions and Targets

The key general action to undertake is to control the rate of dewatering commensurate with the mining rate.

To measure performance against the management target, the extent of GDV loss due to groundwater drawdown will be monitored using data from the ten on ground monitoring sites and high resolution remote sensing with on ground verification. The management target criterion is no loss of GDV from Project activities outside of areas approved for clearing within the GDV Management Zone (Table 5).

In order that the stated management target is met and the possibility of management target exceedance is minimised, a range of triggers have been set for the area outside of the 5 m drawdown contour (Zone 1) where impacts are not predicted, but if detected, can be managed to prevent GDV loss in this area.

Table 5: Flora and Vegetation (GDV) Monitoring Activity and Target

Management Target	Monitoring activity	Responsibility	Timing
No loss of GDV from Project activities outside of areas	Analysis of high resolution multispectral remote sensing imagery	Environment Department	Annually – remote sensing

Management Target	Monitoring activity	Responsibility	Timing
approved from clearing within the GDV Management Zone.	with verification provided by on ground monitoring and targeted inspections.		Biannually – on ground monitoring and verification of remote sensing analysis

6.1.3 Monitoring, Trigger Criteria and Response Actions

A monitoring program will determine the rate and degree of groundwater drawdown in relation to groundwater dependent vegetation and investigate the effects of drawdown on phreatophytic vegetation located within the anticipated zone of impact.

Table 6: Flora and Vegetation (GDV) Monitoring Triggers and Response Actions: GDV Management Zone

Monitoring parameter	Trigger criteria	Response action	Responsibility
Area of GDV decline since baseline as measured using high resolution multispectral remote sensing imagery.	Mean value of vegetation condition index for GDV tree canopy falls below 2 standard deviations of the baseline mean.	<p>The first level of response will be to investigate. This will involve reviewing and evaluating the quality of the data, additional analyses and if necessary, the collection of additional data. The purpose of this review and analysis will be to assess whether the impact is related to dewatering, some other Project activity or is not Project related. If a dewatering related impact is confirmed, one or more of the following management measures will be implemented within a period of 6 months:</p> <ul style="list-style-type: none"> • Modification of dewatering practices; • Irrigation; • Revegetation; and • Offsetting – protection of an equivalent area of GDV within the predicted impact zone. <p>The chosen measure or measures will be dependent on location, extent and severity of impact and the species affected. In order to assess their effectiveness,</p>	Environment Department
Leaf water potential – predawn leaf water potential using the pressure chamber technique.	<p>Mean values at sites are significantly lower than reference sites and lower than:</p> <ul style="list-style-type: none"> - 1.5 MPa (Ma) - 3.0 MPa (Ec) - 3.6 MPa (Ev) 		Environment Department Hydrology Department Mining Department
Tree visual health assessment (based on Souter et al. 2009).	Median decline in values for crown condition score significantly greater than reference sites and median value lower than two standard deviations from the long term mean for the site.		
Project foliar cover (visual	Mean decline significantly		

Monitoring parameter	Trigger criteria	Response action	Responsibility
estimate by tree).	greater than reference sites and more than 50% of foliage has been lost since monitoring commenced.	an increased frequency of monitoring (quarterly) will be conducted at the affected area and at a suitable reference location for a selection of the most appropriate parameters (for example, if irrigation is applied, water potential and tree health to be measured.	

6.1.4 Reporting and Contingency Actions

6.1.4.1 Trigger level and Management Target Actions

In order that the stated management target is met and the possibility of management target exceedance is minimised, multiple monitoring triggers indicative of GDV decline within the drawdown zone but beyond the 5 m drawdown contour have been devised (Table 6). Within this zone (GDV Management Zone) impacts are not predicted, but if detected, can be managed to prevent GDV loss. Trigger responses were outlined in Table 6.

If unanticipated GDV loss occur and the management target is exceeded, CPM will develop an action plan with the following considered:

- Modification of dewatering practices;
- Irrigation;
- Revegetation; and
- Offsetting – protection of an equivalent area of GDV within the predicted impact zone.

If trigger criteria outlined in Table 6 are exceeded, the response actions identified in this plan will be implemented to avoid reaching the management target and bring the impact back below the trigger criteria. The trigger criteria monitoring results and outcomes resulting from implementation of the response actions will be reported to Department of Water and Environmental Regulation – Environmental Protection Authority (DWER-EPA) in the annual compliance report.

In the unlikely event the management target outlined in Table 5 is exceeded, the DWER-EPA will be notified immediately and an action plan developed in consultation with DWER-EPA to bring the impact back below the management target and trigger criteria quickly.

6.1.4.2 Annual Compliance Report

The following information will be reported externally in the annual compliance report:

- GDV monitoring summary, including details of exceedance of the management target and any monitoring triggers and implemented response actions.

6.2 Vegetation, overburden and topsoil management

Environmental aspects relevant to vegetation management are the disturbance of land and vegetation. The potential impacts from these activities include:

- Species extinction;
- Habitat destruction;
- Habitat fragmentation;
- Soil conservation; and
- Land degradation.

Operation of the project results in vehicle and heavy vehicle movements which may compact topsoil. Topsoil is the most important factor in rehabilitating disturbed areas as it contains the majority of seeds and other plant propagules (rhizomes, lignotubers and roots), soil micro-organisms and organic matter. Topsoil management procedures will be implemented to maximise the effectiveness of rehabilitation.

6.2.1 Objective and Targets

The EPA environmental objective for vegetation is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.

CPM vegetation, overburden and topsoil management broad environmental management objectives are identified in Table 7 below.

Table 7: Vegetation, overburden and topsoil objectives, targets and indicators

Objective	Target	Indicator
<ol style="list-style-type: none"> 1. Maintain the abundance, species diversity, geographical distribution and productivity of vegetation communities. 2. Minimise the area of vegetation to be cleared. 3. Avoid the disturbance to sites of Aboriginal heritage significance. 4. Ensure that vegetation is protected from the irrigation of water (e.g. treated wastewater, salt water). 	<ol style="list-style-type: none"> 1. No loss of declared and priority flora. 2. All land clearing activities are assessed and authorised by ground disturbance staff (environmental and heritage personnel). 3. No overall exceedances of approved disturbance footprint. 4. All areas to be disturbed are surveyed and managed in accordance with the Aboriginal Heritage Act 1972. 	<ol style="list-style-type: none"> 1. Hectares disturbed/year. 2. Non-conformances with ground disturbance permit conditions. 3. Number of incidents/year.

6.2.2 Management Actions and Control Measures

Management actions or controls have been developed to reduce the potential impact of operational activities on the vegetation of the area and are provided in Table 8 below.

Table 8: Vegetation management actions and control measures

Action / Control Measure	Timing	Responsibility
Clearing is controlled through the internal Ground Disturbance Permit (GDP) process. A GDP application must be submitted, reviewed and approved prior to clearing.	Ongoing.	GDP Applicant. HSE Approvals Department.
Each GDP is reviewed by heritage and environment personnel to ensure it complies with statutory approval(s).	Prior to commencement of clearing.	HSE Approvals Department. Environment Department.
An area to clear for the first time is flagged/pegged and an observer is present during removal of vegetation.	During clearing.	HSE Approvals Department.
Database to track GDP status is maintained.	Ongoing.	HSE Approvals Department.
Induction shall emphasise the need to minimise the disturbance of vegetation.	Ongoing.	Training Department. Environment Department.
Control weed infestation in accordance with regulatory requirements.	Ongoing.	Operations Manager. Environment Department.
Vehicles and machinery shall only use designated tracks and roads, and shall be parked only in designated locations unless otherwise authorised by the Operations Manager.	Ongoing.	Area Supervisor. Environment Department.
Clearly mark topsoil stockpiles in the field and identify them on a site plan including their volume estimates, where possible.	Ongoing.	Survey Department. Contractor. Environment Department.
Inspect regularly disturbed areas and erosion control measures and maintain a record of inspections.	Ongoing.	Environment Department.

6.2.3 Monitoring & Performance Indicators

Operational areas will be subject to regular inspections by the Site Environment Officer. Inspection checklists are to be utilised during these inspections.

Relevant documentation to be inspected includes Environmental Incident Reports and previous inspection sheets to check whether problems or non-conformance with these vegetation management procedures have been rectified.

Monitoring and performance indicators are given in Table 9 below.

Table 9: Vegetation monitoring and performance indicators

Activity	Performance Indicator or Trigger	Corrective actions	Frequency	Responsibility
Visually monitor site for excessive land disturbance.	Vegetation is not degraded in areas of no disturbance.	Check and re-mark clearing perimeter. Commence rehabilitation, where practicable.	Ongoing, as land disturbance occurs.	HSE Approvals Department. Environment Department.
Visually monitor for erosion and sedimentation.	Cleared or rehabilitated areas show no sign of erosion.	Implement soil stabilising techniques. Establish drain networks.	Ongoing, after significant rainfall.	Environment Department.

6.2.4 Contingency Action

Contingency actions will be initiated if monitoring indicates that targets are not being met. Contingency actions are identified in Table 10 below.

Table 10: Vegetation contingency actions

Trigger	Action	Responsibility
Unauthorised access beyond clearing boundaries.	1. Investigate cause.	HSE Approvals Department.
	2. Remark boundaries if due to inadequate boundary marking.	Survey Department.
	3. Reinforce all personnel of access restrictions beyond clearing boundaries.	HSE Approvals Department. Environment Department. Contractors.
	4. If disturbance requires mitigation: <ul style="list-style-type: none"> Rehabilitate appropriately; Plant only local species seed/seedlings; Apply a selective herbicide for significant Mesquite infestation. 	Area Supervisor. Contractor. Environment Department.
	5. Complete an Incident Report.	Environment Department.
Clearing outside of clearing boundaries.	Implement actions 1 to 5 above.	As above.

6.3 Weed Control

Thirteen species of introduced flora were recorded from the project area. Most of these weeds are common throughout the Pilbara. One of these, Mesquite, is listed as a Declared Plant under the *Agriculture and Related Resources Protection Act 1999*.

Weed control procedures developed contain the controls proposed to minimise the environmental impacts due to the potential spread of weeds during the development of the project.

The environmental aspect is the introduction of weeds. Potential environmental impacts can result in:

- Competition with native species in rehabilitation;
- Displacement of native vegetation; and
- Altered ecological systems.

6.3.1 Objective and Targets

The EPA environmental objective for introduced species of vegetation is to minimise their spread. Specific objectives for weed control during the operational phase of the development are identified in Table 11 below.

Table 11: Weed control objectives, targets and indicators

Objective	Target	Indicator
1. Ensure project activities do not introduce new weeds or exacerbate the spread of mesquite.	<ol style="list-style-type: none"> 1. No establishment of new weed species in cleared or rehabilitated areas. 2. No increase in the mesquite population in rehabilitated areas. 3. All ground clearing activities are undertaken in accordance with ground disturbance permit conditions. 4. All ground engaging machinery has a current weed hygiene certificate. 5. No unauthorised off-road driving. 	<ol style="list-style-type: none"> 1. Non-conformances with ground disturbance permit conditions. 2. Number of weed related incident reports/year. 3. Presence/absence of mesquite in rehabilitated areas.

6.3.2 Management Actions and Control Measures

Management actions have been developed to reduce the potential for operational activities to increase the spread of weeds and to minimise the establishment of weeds. Management actions are identified in Table 12 below.

Table 12: Weed control management actions

Action / Control Measure	Timing	Responsibility

Restrict all movements of machinery and vehicles to within marked areas.	Ongoing.	Area Supervisor. Environment Department.
Inform all site operational personnel of the boundaries defined in the above action as part of their inductions.	Ongoing.	Training Department. Environment Department.
Inspect the site for the presence of Mesquite prior to any machinery being moved to a site for clearing purposes. Record the results of the inspection.	Prior to machinery mobilisation.	HSE Approvals Department. Environment Department.
All ground engaging equipment will be inspected prior to entry to site.	Ongoing.	Site Security. Environment Department.
Any ground engaging equipment not arriving clean shall be assessed and either cleaned at a dedicated wash bay or turned away.	Ongoing.	Site Security. Environment Department. Contractor.
Control the infestation of Mesquite by applying herbicide spraying within project boundaries.	Ongoing.	Environment Department. Contractor.

6.3.3 Monitoring & Performance Indicators

Operational activities will be subject to inspections. Monitoring and performance indicators are given in Table 13 below.

Table 13: Weed control monitoring and performance indicators

Activity	Performance Indicator or Trigger	Corrective actions	Frequency	Responsibility
Visually monitor for spread of weeds.	Mesquite monitoring sites, control practices follow plans and procedure.	Amend mesquite monitoring procedure.	Ongoing, as part of inspection program.	Environment Department.
Periodic monitoring of operational areas.	No significant new weed infestations.	Weed eradication program.	Ongoing, as part of inspection program.	Environment Department.
Visually monitor areas subject to weed control.	Reduction in size/density of (Mesquite) infestation.	Additional or different control measures.	Annually, after control measure applied.	Environment Department.

6.3.4 Contingency Action

Contingency actions will be initiated if monitoring indicates that significant weed infestations have established in previously weed-free areas or new Mesquite infestations are discovered. Contingency actions are identified in Table 14 below.

Table 14: Weed control contingency actions

Trigger	Action	Responsibility
Significant new weed infestations on cleared and/or rehabilitated areas previously weed-free.	1. Investigate cause.	Environment Department.
	2. Amend weed spraying procedure and where applicable, apply corrective actions to minimise potential for reoccurrence.	Environment Department. Contractor.
	3. Apply selective herbicides to the weed infestations.	Environment Department. Contractor.
	4. Spot spray weeds where there is not a selective herbicide available for the new weed species.	Environment Department. Contractor.
	5. Monitor infested areas on a regular basis (at least quarterly).	Environment Department.

6.4 Spill management

The use and storage of hydrocarbons and chemicals during the operations phase of the project poses a risk to the environment.

Spill management procedures are developed to minimise the environmental impacts due to hydrocarbons and other hazardous materials utilised during the life of the mine.

The environmental aspect is spill and/or release of (hazardous) materials, while potential impacts include:

- Soil contamination; and
- Ground and/or Surface water contamination.

6.4.1 Objective and Targets

Environmental targets based on management objectives for prevention and management of hydrocarbon and chemical spills and performance criteria in assessing the achievement of these targets are identified in Table 15 below.

Table 15: Spill management objectives and Targets for spill management

Objective	Target	Indicator
1. To minimise the risk of spillage or escape of (hazardous) materials to the environment. 2. Spillages or escapes of (hazardous) materials do not pose a risk to the environment.	1. All spills or escape of hazardous materials are controlled, contained, cleaned and reported. 2. No impact to environmentally sensitive receptors (e.g. marine environment, mangroves). 3. Storage and handling of hazardous materials is in accordance with regulatory requirements (e.g. <i>Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007</i>), guidelines and internal standards.	1. Number of incidents/ year. 2. Non-compliances/ year.

6.4.2 Management Actions and Control Measures

Management actions will be implemented to minimise the risk of spills during:

- Storage and handling of hydrocarbons and chemicals;
- Disposal of waste storage containers, hydrocarbons and chemicals;
- Transfer of fuel to mobile fuel tankers (if local storage tank is established by contractors);
- Refuelling of vehicles and machinery from mobile tanker; and
- Maintenance of vehicles and machinery.

Management actions are identified in Table 16 below.

Table 16: Spill management actions and control measures

Action /Control	Timing	Responsibility
Prepare and maintain a Hazardous Materials Register, standard and procedures for all hazardous materials kept onsite. Include in the Register descriptions of materials and their uses, handling procedures, storage regulations and standards, quantities stored onsite and Material Safety Data Sheets (MSDSs) for all materials. Locate the Register onsite and accessible to all personnel.	Ongoing.	Health and Safety Department.
Maintain a fuel register to record fuel deliveries to the site.	Ongoing.	Procurement and Warehouse Department.
Include in inductions for all personnel information on: <ul style="list-style-type: none"> • Procedures for handling and storage of fuels and chemicals; • Transferring of fuel and the refuelling of vehicles and machinery; • Vehicle maintenance; 	Ongoing.	Training Department. Environment Department.

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Action /Control	Timing	Responsibility
<ul style="list-style-type: none"> Spill response; Use and location of the Hazardous Materials Register. 		
<p>Comply with relevant legislation, regulations and Australian Standards for the storage and handling of fuels and chemicals, such as:</p> <ul style="list-style-type: none"> <i>Explosives and Dangerous Goods Act 1961;</i> <i>Explosive and Dangerous Goods (Explosive) Regulations 1963;</i> <i>Explosive and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992;</i> <i>Dangerous Goods (Transport Road and Rail) Regulations 1999;</i> <i>AS 1940 – The storage and handling of flammable and combustible liquids;</i> <i>AS 3780 - The storage and handling of corrosive substances;</i> <i>AS 4452 – The storage and handling of toxic substances;</i> <i>AS 4681 – The storage and handling of class 9 (miscellaneous) dangerous goods and articles.</i> 	Ongoing.	Area Supervisor. Contractor. Environment Department. Health and Safety Department.
Use self-bunded storage vessels and pallets wherever practicable.	Ongoing.	Area Supervisor. Contractor.
Drain accumulated water from containment facilities whenever present. Engage licensed operator to collect water that is visibly contaminated or suspected to be contaminated for disposal at a waste management facility licensed to accept the waste. Alternatively treat accumulated water through an oil-water separator and dispose collected oil off-site via a licensed operator.	Ongoing.	Area Supervisor. Contractor. Ancillary Services Department. Environment Department.
All storage vessels, including valves and associated pipework, shall be tested and labelled as required by legislation.	Ongoing.	Area Supervisor. Contractor.
Ensure that spill response kits are available at defined locations, adequately stocked and that personnel are informed of these locations and instructed in the use of these materials.	Ongoing.	Area Supervisor. Contractor.
Handle chemicals/fuels in areas where there is limited potential for runoff to reach the marine environment, undisturbed areas or to contaminate surface water and groundwater.	Ongoing.	All personnel.
Conduct regular preventative maintenance of vehicles and machinery. These works will be undertaken on hardstands and drip trays are to be utilised.	Ongoing.	Heavy Machinery Equipment Department. Contractor.

Uncontrolled When Printed

6.4.3 Monitoring & Performance Indicators

Operational activities shall be subject to regular inspections by the Site Environment Officer. Inspection checklists are to be utilised during these inspections and shall include assessment of spill prevention actions.

Relevant documentation to be inspected includes Incident Reports and previous inspection sheets to check whether problems or non-adherences to the spill management procedures have been rectified.

Monitoring and performance indicators are given in Table 17 below.

Table 17: Spill management monitoring and performance indicators

Activity	Performance indicator	Corrective Action	Frequency	Responsibility
Review hazardous materials management.	All hazardous materials stored and used onsite along with procedures for handling, storage and emergency response. procedures are recorded.	Update the register and procedures. Undertake a site audit if there is reason to suspect persistent omissions.	Whenever new materials are brought on site.	Health and Safety Department. Area Supervisor. Contractor.
Check integrity and capacity of bunds and other containment facilities.	Bunds and other containment facilities are in good condition and continue to meet applicable standards and regulations.	Bund to be repaired within 24 hours.	Monthly, and in response to reported incident. Pre- and post-cyclone / rain events.	Area Supervisor. Contractor.
	Accumulated water is not present.	Water to be removed or cause of water accumulation to be rectified.		Area Supervisor. Contractor.
Check provision and maintenance of spill containment facilities.	Spill containment stations, which are fully stocked, are located near all major hydrocarbon facilities.	Provide suitable spill containment facility and stock adequately.	Monthly.	Area Supervisor. Contractor.
Fuel register.	Record all fuel deliveries and fuel dispensed to detect unaccounted loss.	Audit fuel usage.	Monthly.	Procurement and Warehouse Department. Contractor.

6.4.4 Contingency Action

Contingency actions will be initiated in the event of a hydrocarbon or chemical spill as detailed in the table below. These actions will also be implemented if monitoring programs detect leaks from hydrocarbon or chemical storage facilities or transfer equipment. These contingency actions, given in Table 18 shall be implemented concurrently with environmental incident procedures.

Table 18: Spill management contingency actions

Trigger	Action	Responsibility
Spill incident.	1. Control the source, contain and subsequent clean-up of spilled and contaminated material.	All personnel.
	2. Person(s) involved in the incident (or witness to) shall notify their Area Supervisor who shall notify the Environment Department if not already aware of the incident.	All personnel. Area Supervisor.
	3. Report and investigate spill in accordance with the Hazardous Chemical Spill Response Procedure for land based spills.	Area Supervisor.
	4. Implement corrective actions and management measures based on investigation outcomes.	Area Supervisor. Environment Department.
	5. Investigate and determination of reporting requirements to regulatory agencies.	Environment Department.

6.5 Waste management

Waste and rubbish generation (e.g. general solid wastes) from the operation phase of the project has the potential to adversely affect the environmental values of the area.

Waste management procedures developed contain the controls proposed to minimise the environmental impacts due to solid waste and rubbish generation during operation of the project.

The environmental aspect is the generation and disposal of (hazardous) wastes, while potential impacts include:

- Land degradation;
- Littering; and
- Gas and leachate generation.

6.5.1 Objective and Targets

Table 19: Waste management objectives, targets and indicators

Objective	Target	Indicator
<ol style="list-style-type: none"> 1. Minimise the volume of waste generated through reduce, reuse and recycle processes. 2. Disposal of (hazardous) waste in a manner that ensures waste streams are contained and isolated from the surrounding environment, and that treatment or collection does not result in long term adverse environmental impacts. 	<ol style="list-style-type: none"> 1. Recyclable waste streams are segregated and transported off site for recycling. 2. To only use licensed waste contractors for off-site (hazardous) waste disposal. 3. No undocumented disposal of hazardous waste. 4. Waste disposal at the on-site landfill will be in accordance with licence conditions. 	<ol style="list-style-type: none"> 1. Number of incidents and/or complaints/year. 2. Non-compliances/year. 3. Waste disposal and transfer records. 4. Groundwater quality data.

6.5.2 Management Actions and Control Measures

Management actions as outlined in Table 20 below are intended to reduce the potential impact of operation rubbish and waste generation on the environmental and aesthetic values of the area.

Table 20: Waste management actions and control measures

Action	Timing	Responsibility
Instruct all personnel of individual responsibilities in regards to waste management with an emphasis on avoidance, reuse and recycling, such that all personal rubbish and incidental rubbish generated is properly disposed of in designated disposal facilities.	Ongoing.	Training Department. Environment Department.
Separate solid waste for reuse or recycling and disposal in accordance with waste management procedures.	Ongoing.	All personnel.
Operate the landfill in accordance with licence conditions and waste management procedures.	Ongoing.	Ancillary Services Department. Contractor.
In the event of cyclonic activity prepare work areas in accordance with directions given (e.g. empty bunds and cover waste bins).	Ongoing.	Area Supervisor. Contractor.
Classify all hazardous waste materials prior to disposal.	Ongoing.	Area Supervisor. Contractor.

Action	Timing	Responsibility
		Ancillary Services Department.
Contractors must record the presence of Low Hazard, Hazardous, Special and Intractable Wastes at the site. Contractors shall maintain records (chain of custody) regarding the disposal of such materials and these records shall be available upon request.	Ongoing.	Contractor. Area Supervisor. Ancillary Services Department.
Utilise a licensed waste operator for the disposal of waste hydrocarbons or chemicals (e.g. paint, solvent). Obtain the relevant regulatory documentation (e.g. waste docket).	Ongoing.	Ancillary Services Department. Contractor. Facility Maintenance Department.

6.5.3 Monitoring & Performance Indicators

Operational areas shall be subject to regular inspection by the Site Environment Officer. Inspection checklists shall be used and shall include assessment of waste management actions.

Relevant documentation to be inspected includes Incident Reports and previous inspection sheets to check whether problems or non-adherences to the waste management procedures have been rectified.

Monitoring and performance indicators are given in Table 21 below.

Table 21: Waste monitoring and performance indicators

Activity	Performance Indicator	Corrective action	Frequency	Responsibility
Inspect waste management practices.	All waste is being disposed of in designated disposal facilities.	Inappropriately disposed waste to be collected and segregated.	Monthly.	Area Supervisor.
Inspect waste disposal facilities (bins, skips etc.).	Waste disposal facilities are properly containing waste and the frequency of collection/emptying is sufficient.	Additional waste bins/skips are acquired, as necessary.	Monthly.	Area Supervisor. Ancillary Services Department. Contractors.
	Encourage recycling.	Consultation with relevant working groups to proactively encourage recycling.	Ongoing.	Environment Department. Ancillary Services.

Activity	Performance Indicator	Corrective action	Frequency	Responsibility
Inspect adjacent areas beyond operational activity.	To ensure waste generated from operation is not accumulating offsite.	Wind-blown or inappropriately disposed waste to be collected.	Monthly or in response to reported incident.	Area Supervisor Contractor. Environment Department.

6.5.4 Contingency Action

Contingency actions will be initiated if monitoring shows that criteria may have been breached and may result in a level of environmental impact that requires mitigation. These contingency actions shall be implemented concurrently with environmental incident procedures and are given in Table 22 below.

Table 22: Contingency actions for waste management

Trigger	Action	Responsibility
Waste not being disposed of in designated disposal facilities.	1. Investigate cause.	Ancillary Services Department. Environment Department.
	2. Alter management actions accordingly (e.g. relocated disposal facilities).	Ancillary Services Department. Area Supervisor. Contractor. Environment Department.
	3. Reinforce all personnel of waste management responsibilities.	Area Supervisor. Environment Department.
Disposal facilities (e.g. bins and landfill) not properly containing waste.	1. Investigate cause.	Ancillary Services Department. Environment Department.
	2. Reinforce all personnel of proper use of facilities if due to misuse.	Area Supervisor. Ancillary Services Department. Environment Department.
	3. Mitigate improper waste disposal as soon as practicable.	Area Supervisor. Contractor.
Frequency of collection/emptying of disposal facilities not sufficient.	Instruct work areas to amend frequency of waste collection.	Ancillary Services Department.

Trigger	Action	Responsibility
Contamination of soil, water or groundwater (e.g. resulting from an unauthorised release)	1. Investigate cause.	Environment Department.
	2. Implement clean-up procedures.	Environment Department. Area Supervisor.
	3. Conduct a review of procedures and/or implement further education of staff/contractors to ensure that all possible steps are taken to prevent any reoccurrence.	Area Supervisor. Contractor. Environment Department.
	4. Complete an Incident Report.	Environment Department.
Offsite waste accumulation or dumping.	1. Investigate cause.	Environment Department.
	2. Mitigate by altering management actions.	Environment Department. Area Supervisor. Contractor.
	3. Promptly collect the waste if waste has accumulated offsite.	Ancillary Services Department. Environment Department.
	4. Complete an Incident Report.	Environment Department.

6.6 Surface water management

Surface water management is specific to the waterways of the Fortescue River floodplain that will be disturbed by the development of the project. The area is subject to surface runoff and under extreme rainfall events, such as cyclones, flooding.

Environmental aspects related to surface water are the release of contaminants onto land and the disturbance of the natural surface water regime. Potential environmental impacts related to these aspects include:

- Soil erosion;
- Soil contamination;
- Increased turbidity of streams; and
- Deposition of eroded soil.

6.6.1 Objective and Targets

Table 23: Surface water objectives, targets and indicators

Objective	Target	Indicator
1. Maintain a normal surface water regime (e.g. catchment, flow paths, volumes) that allows for protection of environmental values. 2. Ensure that mine facilities are protected from erosion, sedimentation and flooding.	1. Unrestricted surface water flow in rivers/creeks and catchment areas within project boundaries. 2. No flooding and/or unnatural erosion of facilities or drainage structures. 3. No non-compliances with applicable licences and/or permits.	1. Incidents/per year. 2. Flood/erosion damage to mine facilities. 3. Non-compliances per year.

6.6.2 Management Actions and Control Measures

Management actions have been developed to re-establish the normal surface water flow regime, where practicable, and to minimise the potential for discharge of contaminants into the environment. Management actions are given in Table 24 below.

Table 24: Surface water management actions and control measures

Action	Timing	Responsibility
Divert surface water discharge over spreader mechanisms to slow and disperse flows where ecosystem sensitive sheet flow zones are located immediately downstream.	Ongoing.	Area Supervisor. Contractor.
Direct sediment laden surface water runoff from disturbed areas, waste dumps and stockpiles through sediment traps, prior to discharge to the downstream environment.	Ongoing.	Area Supervisor. Contractor.
Direct any potentially polluted runoff to ponds fitted with outflow baffles to prevent the discharge of oil and grease products.	Ongoing.	Area Supervisor. Contractor.
Manage acid rock (e.g. encapsulate) in accordance with the waste rock management plan and relevant procedures.	Ongoing.	Mining Department.
Dispose of waste water treatment plant effluent in accordance with licence conditions.	Ongoing.	Village Services Department. Environment Department.
Prepare for cyclone season by undertaking routine maintenance of drainage infrastructure to clear obstructions.	Annually (Oct-Nov).	Area Supervisor. Contractor.

6.6.3 Monitoring & Performance Indicators

A monitoring program will be established to monitor for water quality (turbidity, hydrocarbon concentration), water flow (vegetation health assessment) and the integrity of drainage structures. However, it should be noted that monitoring is constrained by safety requirements and local government road closures. When deemed unsafe and/or road closures are in place, monitoring will not take place. Monitoring and performance indicators are given in Table 25 below.

Table 25: Surface water monitoring and performance indicators

Activity	Performance indicator	Corrective action	Frequency	Responsibility
Visual monitoring of the Du Boulay and Edward Creeks for scouring, excessive sedimentation and contamination, where safe to do so.	No ponding or erosion of waterways as a direct result of project infrastructure (e.g. roads). Sedimentation does not obstruct natural water flow. No hydrocarbon slick on water surface.	Remove obstruction or install culvert. Rehabilitate eroding area. Investigate cause and take corrective and preventative action as necessary. Determine source of hydrocarbon, take samples for analysis, take corrective action at source and perform clean-up as required.	After significant rainfall, when considered a safe practice.	Environment Department.
Visual monitoring of project facilities and drainage structure.	No erosion of facilities or drainage structures. No obstruction of drainage structures.	Take photographic record of erosion. Install erosion control mechanism (e.g. rock armour). Remove obstruction.	Annually prior to cyclone season (Oct-Nov). After significant rainfall, when considered a safe practice.	Environment Department. Area Supervisor.
Visual inspection of sediment for hydrocarbons in Du Boulay Creek and Edward Creek at selected sites upstream	No visible contamination of sediments by hydrocarbons.	Investigate cause and source of the visual presence of hydrocarbon and take corrective	Annually unless guideline levels are exceeded.	Environment Department.

Activity	Performance indicator	Corrective action	Frequency	Responsibility
and downstream of project facilities, where safe to do so.		action as necessary. Sample sediment for hydrocarbons. Clean-up contamination of sediments by hydrocarbons to soil ecological investigation levels.		
Visual inspection of vegetation adjacent to stream lines.	No significant deterioration in vigour.	Re-instate surface water flows.	After significant rainfall, when considered a safe practice.	Environment Department.

6.6.4 Contingency Action

Refer to the corrective actions in the above table for contingency actions relevant to surface water management. Contingency actions are given in Table 26 below.

Table 26: Surface water contingency actions

Trigger	Action	Responsibility
Visual observation detects damming of stream lines.	1. Investigate cause.	Environment Department.
	2. Monitor situation if cause is short term and rectify as soon as practicable.	Environment Department.
	3. Complete an Incident Report.	Environment Department.
Visual observation detects excessive erosion.	1. Implement actions 1 to 3 above.	As above.
Inspection detects deterioration in vigour of stream-line vegetation.	1. Investigate cause.	Environment Department.
	2. If cause is reduction in surface water flow, action shall be taken to reinstate flow.	Environment Department.
	3. Complete an Incident Report.	Environment Department.

6.7 Groundwater management

Environmental aspects relevant to groundwater management include the discharge of contaminants to groundwater and an increase of salinity levels. As a result potential environmental impacts can include:

- Groundwater pollution;
- Groundwater level drawdown; and
- Saline intrusion.

6.7.1 Objective and Targets

Table 27: Groundwater objectives, targets and indicators

Objective	Target	Indicator
1. Prevent adverse impacts to groundwater quality and quantity for groundwater users.	1. No exceedances of water quantity and quality trigger levels as stipulated in project licences. 2. No complaints are received from other groundwater users.	1. Number of non-compliances. 2. Number of complaints.

6.7.2 Management Actions and Control Measures

Management actions have been developed to reduce the potential impact of operational activities on groundwater. These are identified in Table 28 below.

Table 28: Groundwater management actions and control measures

Action	Timing	Responsibility
Provide alternative water supply to pastoralists in the event that drawdown results in loss of practical use of pastoral wells.	As required.	Hydro-geologist. Environment Department.
Use tailings return water, where practicable, to reduce potential impact to groundwater from TSF.	Ongoing.	Processing Department.

6.7.3 Monitoring & Performance Indicators

A groundwater monitoring network, implemented during construction, will be maintained throughout operation. Three main areas of monitoring will be carried out including:

- Monitoring in the Fortescue River alluvium;
- Monitoring in the ore body and basement lithologies; and
- Monitoring in the vicinity of the TSF and landfill.

Monitoring will be carried out to assess regional drawdown and groundwater quality impacts of dewatering and to provide data for refinement of predicted future impacts.

Monitoring and performance indicators are given in Table 29 below.

Table 29: Groundwater monitoring and performance indicators

Activity	Performance indicator	Corrective action	Frequency	Responsibility
Monitoring bores near the coast to monitor for potential saline intrusion.	Salinity (EC).	Investigate cause and consult with appropriate regulatory authority on best course of action.	Annual.	Hydro-geologist.
Groundwater monitoring - TSF monitoring bores.	Monitor in accordance with licence conditions.	Investigate exceedance and undertake risk assessment of likely impacts associated with groundwater conditions.	As required by licence conditions.	Environment Department.
Groundwater monitoring - alluvial monitoring bores.	Salinity (EC) and pH.	Undertake risk assessment of likely impacts associated with groundwater conditions in consultation with relevant regulatory authority.	Annually.	Hydro-geologist.
	Hydro-chemistry.		Annually.	
	Water levels.		Monthly.	
Groundwater monitoring - landfill monitoring wells.	Monitor in accordance with licence conditions.	Investigate exceedance and undertake risk assessment of likely impacts associated with groundwater conditions.	Six monthly.	Environment Department.
Groundwater monitoring – flow meter on production bores.	Water quantity.	Undertake risk assessment of likely impacts associated with groundwater conditions in consultation with relevant regulatory authority.	Monthly.	Hydro-geologist.
Groundwater monitoring – basement monitoring bores.	Salinity (EC) and pH.	Undertake risk assessment of likely impacts associated with groundwater conditions in	Annually.	Hydro-geologist.
	Water levels.		Monthly.	

Activity	Performance indicator	Corrective action	Frequency	Responsibility
		consultation with relevant regulatory authority.		
Groundwater monitoring – dewatering bores and sumps.	Salinity (EC) and pH (sumps only).	Undertake risk assessment of likely impacts associated with groundwater conditions in consultation with relevant regulatory authority.	Monthly.	Hydro-geologist.
	Hydro-chemistry.		Annually.	

6.7.4 Contingency Action

Contingency actions will be initiated if groundwater targets are not met. These are given in Table 30 below.

Table 30: Groundwater contingency actions

Trigger	Action	Responsibility
Exceedance of water level triggers set by groundwater licence operating strategies.	1. Investigate cause.	Hydro-geologist.
	2. Review dewatering activities and monitoring data.	Hydro-geologist. Area Supervisor. Contractor
	3. Take appropriate action to rectify.	Hydro-geologist. Area Supervisor. Contractor.
	4. Complete an Incident Report.	Hydro-geologist.
Any persistent increasing or decreasing trend in salinity, pH or other parameter outside of expected conditions.	1. Investigate cause.	Hydro-geologist.
	2. Review dewatering and monitoring data.	Hydro-geologist.
	3. Take action to rectify.	Hydro-geologist. Area Supervisor. Contractor.

	4. Complete an Incident Report.	Hydro-geologist.
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6.8 Greenhouse gas management and gaseous emissions

Greenhouse gas emissions are produced by the combustion of fuels and contribute to human-induced climate change. Similarly, consumption of other forms of energy, and resources, including land clearing, carry similar potential.

The key components of managing greenhouse gas emissions under the previous Greenhouse Gas Management plan related to the design and construction phases of the project (i.e. no application to the operational phase). As part of project development CPM constructed a combined-cycle gas fired power station (480 MW), which results in an energy use reduction of approximately 40% compared to conventional open-cycle power stations. The installed 480 MW combined-cycle power station results in significantly less emissions than the 640 MW open-cycle power station approved via MS 635.

The Sino Iron Mine Continuation Proposal (as detailed within MS 1066 Schedule 1) does not seek to increase the capacity of the existing 480 MW power station nor seek an increase in its approved greenhouse gas emission profile. Changes to greenhouse gas emissions as a result of the Mine Continuation Proposal are expected to be minimal and within the savings already made by implementing a combined-cycle power station.

Other notable point sources of greenhouse gases emissions approved under MS635 include:

- Pellet plant (up to 13.8 Mtpa); and
- Direct reduced / hot briquetted iron (DRI) plant (up to 4.7 Mtpa).

To date, construction of the pellet plant or DRI plant has not commenced.

As no management actions apply to the operational phase of the project, this operational Greenhouse Gas Management and Gaseous Emissions section only includes monitoring parameters where relevant.

Furthermore, gaseous emission modelling was conducted prior to the operation of the power station. The air quality assessments indicated that in comparison to human health criteria the predicted gaseous emission concentrations are all below their respective criteria. In addition, CPM reports on greenhouse gas management and gaseous emissions as required by legislative requirements, as outlined in Table 31.

6.8.1 Objectives and targets

The EPA objectives for greenhouse gas are:

- To minimise emissions to a level as low as practicable on an ongoing basis and consider offsets to further reduce cumulative emissions; and
- To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

Objectives and targets for the project are identified in Table 31 below.

Table 31: Greenhouse emissions objectives, targets and indicators

Objective	Target	Indicator
1. Minimise greenhouse gas emission in absolute terms and reduce emissions per unit product to as low as reasonably practicable.	1. No non-compliances with relevant legislation (e.g. <i>National Greenhouse and Energy Reporting Act 2007</i>) 2. Emission monitoring data is within a 5% accuracy.	1. Number of non-compliances. 2. Emission per unit.

6.8.2 Monitoring and performance indicators

The gaseous air emissions that will be monitored are carbon monoxide (CO), sulphur dioxide (SO₂) and nitrogen oxides (NO_x). Stack monitoring will be conducted at three sites to measure the gaseous emissions as follows:

- Power Station – CO and NO_x
- Pellet Plant – NO_x
- Direct Reduced Iron Plant – CO, SO₂ and NO_x.

Although modern power station emissions are well known and stable in relation to load continuous emissions monitoring system equipment located in the gas stream vent of the power station will be used to monitor CO and NO_x emissions released from the stacks. This will be done for a period of two years following commissioning to full capacity. Once it can be confirmed that these emissions are stable and predictable to load than these in-stack systems may be removed. Monitoring and performance indicators are given in Table 32 below.

Table 32: Gaseous emission monitoring and performance indicators

Activity	Performance indicator	Frequency	Responsibility
Greenhouse gas emission review.	<i>National Greenhouse and Energy Reporting Act 2007</i>	Annually.	Power Station Department. Environment Department.
Ambient air monitoring.	NEPM standards for ambient air.	Ongoing.	Power Station Department. Environment Department.
Continuous emissions monitoring system.	Relevant regulatory authorities approved emission outputs.	Ongoing.	Power Station Department. Environment Department.
Stack testing.	Relevant regulatory authorities approved emission outputs.	Once, to verify the accuracy of the continuous emissions monitoring system.	Power Station Department.

6.8.3 Contingency action

Greenhouse gas emissions as determined by monitoring will be periodically reviewed to enable the identification of opportunities to further reduce greenhouse gas emissions over time and to verify performance against manufactures operating manuals.

Once actual emission rates are being monitored and quantified, actual CO₂-e emissions will be determined that reflect the technological constraints of the facility within its unique setting. Once actual emissions are clearly understood, realistic and achievable CO₂-e targets can be established for implementation and monitoring against.

6.9 Dust management

During the operational phase of the project, dust is likely to be generated as a result of mining operations (e.g. drilling, blasting), vehicle and heavy machinery movements on unsealed tracks, clearing of vegetation and processing of ore.

The environmental aspect of the project is the emission of dust particles, which could result in the following potential environmental impacts:

- Air pollution; and
- Land degradation.

6.9.1 Objective and Targets

The EPA environmental objectives for dust are to protect the surrounding land users, such that dust emissions will not adversely affect their welfare and amenity or cause health problems.

Specific objectives for dust management are:

- Implement all reasonable and practicable measures to ensure the prevention or minimisation of dust from operational activities;
- Ensure that dust emissions do not adversely affect environmental values or the health, welfare and amenity of people and adjacent land uses by meeting statutory requirements and acceptable standards;
- Monitor the effectiveness of controls; and
- Adaptively respond to results of the monitoring program.

Table 33: Dust management objectives, targets and indicators

Objective	Target	Indicator
1. To ensure that environmental; values are not adversely affected (e.g. vegetation smothering) by minimising dust emissions.	1. Monitor PM ₁₀ dust level and utilise an internal trigger limit of 250µg/m ³ over a 1-hour period to facilitate managing the average daily PM ₁₀ dust guideline of 70µg/m ³ .	1. Exceedances/year.
2. Ensure that nuisance dust levels are not experienced by neighbouring land users.	2. No excessive dust levels are leaving project tenement boundaries.	2. Number of complaints/year.

6.9.2 Management Actions and Control Measures

Management actions have been developed and reported in an Operational Dust Management Plan, which is provided as Appendix A to this report. An overview of generic dust management actions to reduce dust emissions is provided in Table 34. For more detailed management actions for each of the project areas, including the responsible person(s) for ensuring operational compliance with the management actions refer to appendix A.

Table 34: Dust management actions

Action	Timing	Responsibility
Maximise efficiency of loads when transporting ore or concentrate (including haul trucks and conveyers).	Ongoing.	Mining Department.
Use dust covers on machinery and water suppressants on exposed areas wherever required.	Ongoing.	Mining Department. Area Supervisor.
Minimise open area footprint and rehabilitate or cover (using vegetation, rock, water and/or dust suppressant) exposed areas as soon as practicable.	Ongoing.	Mining Department. Area Supervisor. HSE Approvals Department. Environment Department.
Implement good housekeeping practices including ensuring that product spills are cleaned up as soon as possible, and water sprays and emissions control equipment is properly maintained.	Ongoing.	All personnel.
Reduce vehicle traffic on unsealed roads and other exposed areas, where practicable.	Ongoing.	All personnel.
Restrict vehicle speeds on unsealed roads to 70 km/h within project boundaries, directed by signage or road conditions (e.g. wet weather).	Ongoing.	Health and Safety Department.
Use real time ambient monitoring to respond to elevated dust emissions associated with the project.	Ongoing.	Environment Department.
Ensure that the project's workforce is aware of the importance of appropriate dust management controls and reporting/actions required when elevated dust emissions are observed.	Ongoing.	Training Department. Environment Department.

6.9.3 Monitoring & Performance Indicators

A monitoring program that implements the performance of the dust management actions for the operational phase will be implemented. As outlined in the Operational Dust Management Plan (Appendix A) its effectiveness will be reviewed against the following performance indicators:

- Number of exceedances of the hourly internal action trigger PM₁₀ level of 250 µg/m³;
- Number of exceedances of daily average PM₁₀ guideline of 70 µg/m³;
- Review results annually and look at developing a reduction in the number of exceedances recorded per year; and
- The number of internal and external complaints and incident reports received and their resolution.

Operational areas shall be subject to regular inspections and inspection checklists shall be used, which includes an assessment of dust management actions.

6.9.4 Contingency Action

The hourly internal action trigger of 250 µg/m³ is utilised to identify possible source areas and activities within this area and to rectify the situation and adequately manage dust levels.

Any daily average PM₁₀ guideline of 70 µg/m³ exceedance is reported as an internal incident and investigated. This involves identifying the source, the proportion above background levels and the potential for additional dust control measures.

In the event that dust levels continue to be above the daily guideline, or visible dust is seen crossing project boundaries detailed investigations and evaluations will be undertaken as outlined in the Operational Dust Management Plan.

6.10 Noise management

6.10.1 Operational noise criteria

During the operational phase of the project, various activities will generate noise emissions which have the potential to extend into the surrounding environment. MS 635 focuses on managing the potential effects of project-related noise emissions on humans. In this regard, environmental noise is governed by the *Environmental Protection (Noise) Regulations 1997*, which prescribes noise levels that must be complied with during specified times of the day. An Operational Noise Management Plan has been developed for the project which provides guidance as to ongoing procedures for noise management. The Operational Noise Management Plan is included as Appendix B to this OEMP.

6.10.2 Objective and Targets

The overall objective for operational noise management is to minimise project related noise impacts on public receptors.

Table 35: Noise objectives, targets and indicators

Objective	Target	Indicator
1. Minimise project related noise impacts on public receptors.	1. Average monitored noise levels at public receptors are less than the statutory average noise limits.	1. Exceedances/year in accordance with the Regulatory criteria i.e. the assigned noise level. 2. Number of complaints per year.

6.10.3 Management Actions and Control Measures

Management actions have been developed and reported in the Operational Noise Management Plan (Appendix B). This plan includes detailed management actions for each of the project areas, including the responsible person(s) for ensuring operational compliance with the management actions. All operational work will be

carried out in accordance with *Environmental Protection (Noise) Regulations 1997* and to ensure the assigned noise level is not exceeded.

Table 36: Noise management actions and control measures

Action	Timing	Responsibility
All equipment, machines and vehicles to be used on site during operation will be routinely maintained to ensure the effectiveness of noise suppression systems and equipment.	Ongoing.	Heavy Machinery Equipment Department.
Regularly maintain and replace if necessary any noise control options on haul trucks, and other heavy machinery.	Ongoing.	Heavy Machinery Equipment Department.
Where possible tracking of dozers between mine areas to be conducted during day time periods, or utilise a float for longer distances.	Ongoing.	Mining Department.
Limit use of horns by operators of diggers/face shovels/excavators to alert drivers.	Ongoing.	Mining Department.
Limit use of horn blasts and sirens at barge loading facility.	Ongoing.	Port Operations Department.
Enclose overland conveyors including transfer and moving parts, where practicable.	Ongoing.	Area Supervisor.
Regularly inspect and routinely maintain processing infrastructure (e.g. crusher, concentrator, conveyors etc.).	Ongoing.	Processing Department.
Through induction programs, all personnel including contractors will be informed of their responsibilities and the importance of managing noise levels during the operational phase of the project.	Ongoing.	Training Department. Environment Department.

6.10.4 Monitoring & Performance Indicators

The operational noise modelling assessment (see Appendix B), calculated that for the worst-case project scenario noise levels at Mardie Station Homestead would not be audible and near to background levels at the Fortescue River Mouth. As a result, no continuous noise monitoring will be undertaken. Noise monitoring may be initiated in the event that a member of the community lodges a complaint to allow for an assessment of the validity of the complaint.

All realistic, best practice noise management measures will be implemented for the duration of the project. The performance of the Operational Noise Management Plan will be reviewed against the number of complaints received and registered.

6.10.5 Contingency Action

Contingency actions will be initiated if the noise management actions are not complied with or there are repeated complaints regarding noise from community members. The contingency actions identified in Table 37 shall be implemented concurrently with environmental incident procedures.

Table 37: Noise contingency actions

Trigger	Action	Responsibility
Complaints relating to noise.	Notify CPM Corporate Affairs.	Complainant and/or receiver of complaint.
	Investigate cause of complaint, obtain following details from complainant: <ul style="list-style-type: none"> • Time and location of noise resulting in complaint; • Community member(s) concerns; • Description of the noise. 	Corporate Affairs Department.
	Review noise management measures and rectify if needed.	Environment Department.
	Assess the validity of the complaint lodged (e.g. is it related to project noise). If confirmed, undertake appropriate noise monitoring.	Environment Department. Contractor.
	Complete a Community Complaint Form.	Corporate Affairs Department.
	Prepare and implement remedial action plan and monitor outcome.	Corporate Affairs Department.
Noise control measures not in good working order.	Replace equipment or undertake the necessary repairs or maintenance.	Heavy Machinery Equipment Department. Area Supervisor.

6.11 Aboriginal heritage management

6.11.1 Aboriginal heritage management

Aboriginal heritage surveys, Section 18 (of the *Aboriginal Heritage Act 1972*) consultation, salvage and monitoring works are carried out in accordance with this Aboriginal heritage management sub-plan and applicable regulations. Management of Aboriginal sites is conducted in such a manner to protect and preserve existing known Aboriginal sites. Where required, the disturbance of Aboriginal sites is carried out in strict accordance with the provisions of the relevant legislation.

6.11.2 Objective and Targets

The EPA environmental objectives for Aboriginal heritage are to ensure that the project complies with the requirements of the *Aboriginal Heritage Act 1972* (AHA) and ensure that changes to the biological and physical environment resulting from the project does not adversely affect cultural associations with the area.

Specific management objectives for Aboriginal heritage sites are identified in Table 38 below.

Table 38: Aboriginal heritage objectives, targets and indicators

Objective	Target	Indicator
1. To ensure that changes to the biophysical environment comply with relevant heritage legislation	1. No unauthorised disturbance to known Aboriginal heritage sites.	1. Disturbance to known sites observed during site inspections.
2. To monitor effectiveness of measures.	2. All uncovered sites are managed in accordance with the <i>Aboriginal Heritage Act 1972</i> and agreements established with local Aboriginal representatives.	2. Environmental incidents involving disturbance of known sites.
3. To adaptively respond to inadequacies in measures.		3. Condition of known Aboriginal sites.
		4. Adherence to heritage legislation.
		5. Occasional assessment of performance of controls.

6.11.3 Management Actions and Control Measures

Management actions have been developed and approved by DWER-EPA to reduce the potential impact of operational activities on existing and undiscovered Aboriginal heritage sites within the project area.

Archaeological surveys will be conducted prior to any land disturbance and Aboriginal community representatives will be consulted in the event that any heritage material is discovered with a view to determining an appropriate course of action.

Management actions and control measures are given in Table 39 below.

Table 39: Aboriginal heritage management actions and control measures

Action	Timing	Responsibility
Inform personnel through inductions about the presence and how to avoid damage to Aboriginal heritage sites and other material which may be of Aboriginal heritage significance.	On engagement of personnel.	Training Department. Appropriate consultant.
Engage a qualified archaeologist who shall obtain a Section 16 permit under the AHA to conduct monitoring of ground disturbing works.	Prior to any ground disturbing works.	HSE Approvals Department.
Implement Aboriginal heritage contingency actions should any potential Aboriginal heritage site, artefact or skeletal remains be discovered during operation.	Ongoing.	Superintendent Heritage and Indigenous Affairs. Contractor.
Three persons will be appointed: • Heritage Superintendent;	Ongoing.	HSE Approvals Department.

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Action	Timing	Responsibility
<ul style="list-style-type: none"> Project Archaeologist; Project Anthropologist. 		
Arrange and supervise Aboriginal monitors from relevant groups.	Ongoing.	Superintendent Heritage and Indigenous Affairs.
Contain operational activities within defined areas and do not encroach on other areas where Aboriginal heritage sites exist.	Ongoing.	Area Supervisor.
Apply for, arrange and hold permits under Section 16 of the AHA.	Ongoing.	HSE Approvals Department.
Develop research, recording and mitigative salvage strategies, which include establishment of: <ul style="list-style-type: none"> Excavation, recovery, transportation and temporary storage techniques; Methods for permanent relocation or storage of cultural material. 	If Aboriginal cultural material is uncovered during operation.	Superintendent Heritage and Indigenous Affairs.
Prepare reports on all archaeological duties.	As required.	Archaeologist. Superintendent Heritage and Indigenous Affairs.
For sites not within the vicinity of the three ore bodies or the section of Cape Preston adjacent to Preston Island: <ol style="list-style-type: none"> Avoid/minimise disturbance to areas of known high Aboriginal heritage site potential, especially; <ol style="list-style-type: none"> Along major creek lines that pass through the project area; The eastern range of hills that runs from North West Coastal Highway to Cape Preston; The dunal systems at the coast. Identified Aboriginal heritage sites near to, but outside, ultimate disturbance areas will be suitably delineated to prevent disturbance or damage. 	Ongoing.	Area Supervisor. HSE Approvals Department. Superintendent Heritage and Indigenous Affairs.
Establish a cultural awareness programme and carry out appropriate cultural awareness training sessions with all site personnel, informing them: <ul style="list-style-type: none"> Of their obligations under the AHA; Of the broad aspects of Aboriginal culture and traditional land-use in the West Pilbara; 	Ongoing.	HSE Approvals Department. Training Department. Contractor.

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Action	Timing	Responsibility
<ul style="list-style-type: none"> How to recognise human skeletal material; How to recognise Aboriginal cultural material in the form of stone or wooden artefacts, scarred trees or other visible signs of Aboriginal usage and former presence. 		
<p>If skeletal material is encountered, all work will cease immediately at the site of the discovery (required by law).</p>	Ongoing.	Area Supervisor.
<p>Any person(s) or a member of a monitoring team locating skeletal material will:</p> <p>(a) Immediately notify the Registered Mine Manager and senior Company officer on site at the time;</p> <p>(b) The Registered Mine Manager will immediately notify the Karratha Police Station and the Perth Department of Planning Lands and Heritage (DPLH) office of the discovery and inform them that all work has ceased at the discovery site.</p>	Ongoing.	All personnel.
<p>Work will not recommence at the discovery site until approval has been obtained from the Police and the Department of Indigenous Affairs (DIA).</p> <p>If the monitors are in agreement and if development plans permit, then, after approval received from the Police and DPLH, the disturbed burial site may be refilled and/or the relevant Project component resited or another appropriate solution found.</p> <p>If this outcome cannot be achieved, a process of Aboriginal community consultation will be initiated by the Aboriginal Community Liaison Officer to arrange the reinterment, in a suitable location, of the skeletal material by the PA and relevant Aboriginal representatives.</p>	Ongoing.	<p>Area Supervisor. HSE Approvals Department. Superintendent Heritage and Indigenous Affairs.</p>
<p>If any further Aboriginal sites (apart from human skeletal remains) are located, work will cease in the area and the project component resited.</p> <p>If this is not feasible, all ground disturbance at the site will cease temporarily.</p> <p>If the Project Archaeologist (PA) and Aboriginal monitors decide the site warrants recording and mitigative salvage, they will develop and undertake the required methodology and report to the DPLH.</p> <p>If the PA holds a valid Section 16 Permit, providing the Aboriginal monitors are in</p>	Ongoing.	<p>HSE Approvals Department. Superintendent Heritage and Indigenous Affairs.</p>

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Action	Timing	Responsibility
agreement, the work can continue once the archaeological material has been processed.		
<p>Disputes dealing with day-to-day administrative matters shall be resolved at the level of the work site.</p> <p>If dispute not resolved, a suitably qualified mediator may be appointed to assist.</p> <p>If dispute still not resolved, the parties to the dispute will accept the decision of the mediator if it is lawful and reasonable.</p>	Ongoing.	Superintendent Heritage and Indigenous Affairs.
<p>Complaints regarding Aboriginal heritage that are raised by Aboriginal monitors will be entered into an Incident Register, which will:</p> <ul style="list-style-type: none"> • Detail the nature of the complaint and the date and time on which it was made; • Be signed by the monitor(s) making the complaint and witnessed by the Superintendent Heritage and Indigenous Affairs. 	Ongoing.	Superintendent Heritage and Indigenous Affairs.
<p>For complaints concerning unlawful interference with, or desecration of, an Aboriginal heritage site, the DPLH will be advised and all ground disturbance at the site will be terminated until the matter has been investigated.</p>	Ongoing.	HSE Approvals Department. Superintendent Heritage and Indigenous Affairs.
<p>For complaints concerning archaeological material or significant Aboriginal areas, the complaint will be investigated and reported in writing to the Company and the DPLH.</p>	Ongoing.	HSE Approvals Department. Superintendent Heritage and Indigenous Affairs.
<p>Upon resolution of a complaint, an entry will be made into the Incident Register detailing:</p> <ul style="list-style-type: none"> • The investigation; • Results of the investigation; • The date of submission of the report; • Any recommendations made by the PA, Company Anthropologist or the DPLH to the Company regarding the complaint. <p>The Company will endeavour to ensure that any recommendations are followed.</p> <p>The Complaints Register will then be closed off, signed and dated with the date of closure.</p>	Ongoing.	Superintendent Heritage and Indigenous Affairs.
<p>Liase with Aboriginal groups to minimise potential delays to the project.</p>	Ongoing.	HSE Approvals Department.

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Action	Timing	Responsibility
		Superintendent Heritage and Indigenous Affairs.
Keep the local Aboriginal community and the various interest groups informed of the progress of the project.	Ongoing.	HSE Approvals Department. Superintendent Heritage and Indigenous Affairs. Corporate Affairs Department.

6.11.4 Monitoring & Performance Indicators

Operational areas shall be subject to regular inspections. Inspection checklists shall be utilised during these inspections and shall include assessment of Aboriginal heritage management actions.

Relevant documentation to be inspected includes Incident Reports and previous inspection sheets to check whether problems or non-adherences to this Aboriginal Heritage Management Sub-Plan have been rectified.

Monitoring and performance indicators are given in Table 40 below.

Table 40: Aboriginal heritage monitoring and performance indicators

Activity	Performance indicator	Corrective action	Frequency	Responsibility
Pre-disturbance site inspection.	Heritage sites or artefacts are located.	Re-survey.	Prior to disturbance.	Archaeologist. Superintendent Heritage and Indigenous Affairs.
Site inspections during operations.	Heritage sites or artefacts are not disturbed or destroyed by operational activities in the contravention of the Aboriginal Heritage Act.	Halt operations activity pending detailed assessment and agreement on further action.	As required.	Archaeologist. Superintendent Heritage and Indigenous Affairs.

6.11.5 Contingency Action

Contingency actions are required in the event of disturbance of existing Aboriginal heritage sites or on discovery of any potential new material of Aboriginal heritage significance. These contingency actions shall be implemented concurrently with (environmental) incident procedures. The contingency actions identified in Table 41 align with the approved Aboriginal Heritage Management Plan.

Table 41: Aboriginal heritage contingency actions

Trigger	Action	Responsibility
Uncovering of material of potential Aboriginal significance.	1. Cease all work in the immediate area.	All personnel.
	2. Clearly identify and erect marker to delineate the site.	Archaeologist. Superintendent Heritage and Indigenous Affairs.
	3. Contact the Heritage Department, the DPLH office and the Police, in the instance of skeletal remains.	Archaeologist. Superintendent Heritage and Indigenous Affairs.
	4. If required organise and conduct a site meeting as soon as practicable between the Heritage Superintendent, Archaeologist, and a local Aboriginal community representative.	Archaeologist. Superintendent Heritage and Indigenous Affairs.
	5. Determine in a timely manner the authenticity of the site or material.	Archaeologist. Superintendent Heritage and Indigenous Affairs. Aboriginal representative.
	6. Notify the DPLH of any discovery of skeletal remains (legal requirement under the <i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i> - Section 20(1)).	HSE Approvals Department. Superintendent Heritage and Indigenous Affairs.
	7. Do not disturb skeletal material of Aboriginal origin. Erect a marker to reduce the chances of inadvertent interference with the site. The remains shall be dealt with in a manner negotiated between affected parties.	Archaeologist. Superintendent Heritage and Indigenous Affairs. HSE Approvals Department. DPLH. Aboriginal representative.
	8. Do not re-commence operational activities until the material has been dealt with to the satisfaction of affected parties.	Archaeologist. Superintendent Heritage and Indigenous Affairs.
Disturbance of known Aboriginal heritage site	1. Cease all work in the immediate area and investigate the cause of disturbance.	All personnel.
	2. Report in detail to DPLH.	HSE Approvals Department.

Trigger	Action	Responsibility
		Superintendent Heritage and Indigenous Affairs.
	3. Implement necessary actions to prevent disturbance from reoccurring (e.g. fencing site or re-informing personnel).	Superintendent Heritage and Indigenous Affairs. Area Supervisor. Contractor.
	4. Consult with local Aboriginal representative to determine actions required to repair/restore the site.	Archaeologist. HSE Approvals Department. Superintendent Heritage and Indigenous Affairs.

6.12 Recreational Use Management

Recreational use management actions applicable to the operational phase of the project are described in the following sections. These actions have been derived from the approved Recreational Use Management Plan.

The environmental aspect of the project relevant to recreational use is the disturbance of terrestrial and marine habitats. Relevant potential environmental impacts as a result of this aspect can include:

- Marine pollution;
- Noise pollution;
- Air pollution; and
- Littering.

6.12.1 Objective and targets

The EPA environmental objectives for recreation are to ensure that existing and planned recreational uses are not compromised.

Specific management objectives for recreation are:

- To minimise the impact of project personnel (employees and contractors) on the 'visitor locations' within the vicinity of the project;
- To ensure that access to popular 'visitor locations' is maintained for the use of the general public;
- To ensure that employees and contractors are educated in appropriate fishing practices;
- To limit the impact on the surrounding environment of all recreational activities undertaken by employees and contractors; and
- To ensure that any activities which are deemed to be adversely affecting the surrounding environment are modified and addressed.

Table 42: Recreational use objectives, targets and indicators

Objective	Target	Indicator
1. Ensure that the impact of recreational activities by project personnel on the surrounding environment is minimised. 2. Maintain public access to recreational areas used by the general public.	1. All project personnel are inducted, aware and comply with project recreational activities guidelines and procedures, when recreating off-site. 2. No complaints are received from the public.	1. Induction records. 2. Infringement notices issued. 3. Number of public complaints.

6.12.2 Management actions and control measures

Management actions have been developed and approved by the DWER-EPA to reduce the potential impact of operational activities on surrounding recreational environments and visitor locations. Management actions are identified in Table 43 below.

Table 43: Recreational use management actions and control measures

Action	Timing	Responsibility
Include the following in staff Inductions: <ul style="list-style-type: none"> All staff will be informed of the impacts that their actions may have on (nesting) turtles; Information regarding bag limits, no take zones and netting restrictions as applicable under relevant guidelines will be made available; Information regarding sensitivity of mangroves to disturbance; Importance of removal of litter; Impacts resulting from oil spills and dust; Importance of remaining on established tracks wherever possible; Respect for popular visitor nodes; Guidance on appropriate behaviour around neighbouring land users and the potential impact that their behaviour may have. 	Ongoing.	Training Department. Environment Department.
Encourage responsible fishing practices including waste disposal.	Ongoing.	Training Department. Environment Department.
Encourage project personnel to avoid public camp sites.	Ongoing.	Training Department. Environment Department.
Remove all waste from recreational sites and return to mine camp for disposal.	Ongoing.	All personnel recreating.

6.12.3 Monitoring and performance indicators

Table 44: Recreational use monitoring and performance indicators

Activity	Performance Indicator	Frequency	Responsibility
Visual monitoring.	Recreational activities by project personnel.	Ongoing.	Environment Department.

6.12.4 Contingency actions

Contingency actions will be initiated if recreational use targets are not met.

Table 45: Recreational use contingency actions

Trigger	Action	Responsibility
Non-conformance with Workforce Recreational Management protocols.	1. Investigate cause.	Environment Department.
	2. Rectify immediately if the cause is non-compliance with recreational use management procedures.	Environment Department.
	3. Revise recreational management protocols to rectify the situation, if required.	Corporate Affairs Department. Environment Department.
	4. Complete an Incident Report.	Environment Department. Corporate Affairs Department.

7 Operational Activities - Cape Preston Terrestrial

All relevant sub-plans described in Chapter 6 remain applicable to the Cape Preston terrestrial operational activities. However, with operational terrestrial activities undertaken at Cape Preston a number of additional elements are applicable, which are outlined in more detail in the following sections:

7.1 Fauna management

The environmental aspect of the project relevant to fauna is the loss of fauna and the increase of feral animals. Relevant potential environmental impacts as a result of these aspects can include:

- Loss of biodiversity; and
- Invasive species.

7.1.1 Objectives and Targets

The overall environmental objective is to protect specific areas for wading birds and turtles in the Cape Preston terrestrial area, to avoid sensitive areas and to prevent project-related impacts. The following management objectives apply to:

- Turtles and nesting beaches; and
- Migratory shorebirds and coastal habitat.

Management objectives for fauna are given in Table 46 below.

Table 46: Fauna management objectives, targets and indicators

Objective	Target	Indicator
1. Protect turtle nesting beaches and associated habitat from project activities.	1. No loss of threatened fauna and/or fauna of conservation significance as a result of project operations.	1. Fauna deaths/year.
2. Protect migratory shorebirds and associated coastal habitat from project activities.	2. Clearing and disturbance of land complies with ground disturbance permit (GDP) process and conditions.	2. GDP incidents/year.
3. Non-proliferation of feral animals.	3. No increase in feral animal sightings across the project area.	3. Number of feral animals.

7.1.2 Management Actions and Control Measures

The following management actions have been developed in consultation with the DWER-EPA.

Table 47: Fauna management actions and control measures

Action	Timing	Responsibility
Install/maintain lighting which is: <ul style="list-style-type: none"> Shielded/redirected/lowered/recessed to avoid/minimise light spill towards the southern and eastern beaches; Of low disruptive colour (yellow and red)/long wavelength (e.g. low-pressure sodium vapour lights, or yellow filters/bug lights for larger areas/roads, or red LED lights for paths). 	Ongoing.	Area Supervisor. Contractor.
There will be authorised access only to beaches utilised by marine turtles between September to April. All interaction is to be in accordance with the DEC Code of Conduct for interaction with turtles.	Ongoing.	Environment Department.
A light spill assessment and its effectiveness will be conducted, particularly during nesting season and hatching periods, for turtle response to lighting.	Annually in October.	Environment Department.
Restrict recreational activities by employees in mangrove creeks, beaches and near-shore waters used by turtles and migratory shorebirds, through education and induction programmes.	Ongoing.	Training Department. Environment Department.
Conduct fox baiting and, if necessary, control programs for other feral animals.	Ongoing.	Environment Department.

7.1.2.1 Monitoring & Performance Indicators

The monitoring program will include activities to be performed throughout the life of the project.

Table 48: Fauna monitoring and performance indicators

Activity, location	Frequency	Target	Corrective action	Responsibility
Observe light spill on nesting beaches and coastal habitats.	Annual light audit at beginning of nesting and migratory season (October).	Nesting turtles and turtle hatchlings are not disturbed or disoriented by project activities. No excessive light spill on beaches or coastal habitat.	Identify cause of disturbance. Light audit surveys. Manage the light source. Compile Incident Report and if needed, develop further contingency actions (e.g. manual intervention).	Environment Department. Area Supervisor.
Check for evidence of	During execution of	No significant predation	Review feral animal control	Contractor.

Activity, location	Frequency	Target	Corrective action	Responsibility
predation on nesting beaches and coastal habitat.	feral animal control program.	increase of turtle nests by non-native predators. No evidence of migratory shorebird predation.	program, including trapping. Protect nests using grids.	Environment Department.
Check for evidence of unauthorised access to nesting beaches and coastal habitat.	Monthly during nesting/hatching periods and shorebird migration (September – April).	No unauthorised access.	Compile Incident Report. Develop contingency action, which may include barricades to prevent access, improve signage, review and improve educational activities, training and inductions.	Environment Department.

7.1.2.2 Contingency Action

The contingency actions for turtles, nesting beaches, migratory shorebirds and coastal habitat are the same corrective actions as described in the above monitoring program Table 48.

7.2 Mangrove ecosystems

The service corridor links the mine and port area and crosses a tidal creek south of Cape Preston. The point at which the service corridor crosses the main tidal creek has been located as far to the east as possible to minimise the impact on mangrove habitat and the extent of tidal flats to be traversed. There are no mangrove habitats within the immediate vicinity of the port and none along the western coast of Cape Preston, being the area primarily affected by port infrastructure.

7.2.1 Objective and Targets

The environmental objectives for operation of the service corridor are identified in Table 49 below.

Table 49: Mangrove ecosystems, objectives, targets and indicators

Objective	Target	Indicator
1. Maintain the ecological function, abundance, species diversity and geographical distribution of marine biota and habitat.	1. No indirect disturbance of mangroves adjacent to areas of project activity.	1. Decrease in mangrove health.

7.2.2 Management Actions and Control Measures

Management actions are intended to reduce the potential impact of operational activities on the mangroves and other sensitive habitats in the service corridor area.

Table 50: Mangrove ecosystem management actions and control measures

Action	Timing	Responsibility
Workforce inductions will include environmental awareness training on the ecological importance of sensitive mangrove habitats and the measures undertaken to protect mangrove areas.	Ongoing.	Training Department. Environment Department.
Refuelling and maintenance of vehicles will not be carried out in the tidal flats zone. Any spillages of fuel, hydraulic fluids etc. will be appropriately cleaned up.	Ongoing.	Area supervisor.
Dust deposition from operational activities will be managed through the use of water carts on unsealed roads, with attention to mangrove communities.	Ongoing.	Area supervisor.

7.2.3 Monitoring & Performance Indicators

The monitoring regime is intended to detect impacts to mangroves and/or the onset of changes to the processes and conditions required for mangrove survival so that practicable mitigation measures can be taken. The mangrove habitat in the immediate vicinity of the service corridor shall be subject to regular inspection. Monitoring and performance indicators are given in

Table 51 below.

Table 51: Mangrove ecosystem monitoring and performance indicators

Activity	Performance Indicator	Corrective action	Frequency	Responsibility
Visual inspection of sedimentation within and near culverts.	To ensure tidal flow is not restricted.	Remove excessive sedimentation or obstructing materials. Modify water flow path causing erosion or reduce flow velocity. Provide physical protection along eroding surface (e.g. matting, rubble or rock armour).	Annually, prior to wet season.	Environment Department.
Visual inspection of	To ensure excessive dust is not adversely	Take immediate short term measures to	Annually, prior to wet season.	Environment Department.

Activity	Performance Indicator	Corrective action	Frequency	Responsibility
dust deposition on foliage.	affecting mangrove condition.	reduce impact (e.g. increase dust suppression activities). Investigate measures to reduce impact on affected mangroves. Review and improve dust control measures.	Ongoing, in the event of earthworks near mangrove assemblage.	

7.2.4 Contingency Action

The need for implementation of contingency measures to mitigate impacts to mangroves will be assessed following implementation of above-mentioned corrective actions.

Should this assessment indicate the need for further management actions or control measures to mitigate impacts or prevent future potential impacts, then a range of potential contingency measures will be considered and implemented as required.

8 Operational Activities - Cape Preston Marine

8.1 Port Environmental Management

A Port Environmental Management Plan (CPM, November 2011) was developed to cover the operational aspects of the port of Cape Preston. The Port Environmental Management Plan addresses the terrestrial and marine impacts of port operational activities and includes the operation of the transshipment facility.

The objectives of the Port Environmental Management Plan are to:

- Maintain an adequate level of water quality in waters surrounding the port;
- Minimise runoff and spills;
- Avoid ballast water contamination and the introduction of exotic marine organisms from ships' hulls; and
- Contain light spill so as to minimise impacts on turtles.

To meet the above objectives environmental management actions and control measures have been included in the plan for the management of:

- Sediment and aesthetic water quality;
- Light spill;
- Runoff and spills, including product, stormwater and hydrocarbon;
- Ballast water, including introducing invasive marine pest; and
- Biofouling.

Except for light spill, these management measures are in addition to those described in Chapters 6 and 7.

The Port Environmental Management Plan includes detailed environmental baseline information and also provides a thorough description of port operations. Furthermore, it provides management actions for the potential impacts described above, including monitoring programs. To avoid undue duplication and repetition, the Port Environmental Management Plan is included as Appendix C to this report and should be utilised for the management of environmental matters relating to port operational activities.

8.2 Coastal and Coral Management

This section relates to the marine monitoring of the effects of the port structure on:

- Coastal stability and shore alignment of the western beach at Cape Preston; and
- Coral habitat condition within and adjacent to the port and at regionally significant reefs, plus coral recruitment to breakwaters.

The physical presence of the port is predicted to cause local changes to the sediment transport regime and affect the beaches to the west of Cape Preston. A local reversal of sediment transport is expected to occur, causing erosion to the existing southern beach and deposition on the northern beach. The scale and rate of shoreline re-alignment from the presence of the port is not large in comparison to the scale of natural changes that have occurred on the western beach in the last 42 years. The mixed pattern of depositional beach ridges that occur landward of

the western beach, the Preston Spit and the adjacent beach is highly dynamic and has experienced episodes of both erosion and deposition.

In the long term, accumulation on the south side of the causeway is likely to result in extension of the available beach and dune area suitable for turtle nesting. In the short term, potential erosion of the southern beach may result in the extension of scarping already present along the northern section of the beach.

The port layout is situated on habitat types that are widespread in the region. Up to 2.2 ha of low to high coral cover habitat (10 to >25%) is anticipated to be lost as a result of port development. This is expected to be offset in the medium to long term (10 to 25 years) by development of new coral habitat on the outer slopes of the breakwater.

8.2.1 Objectives and Targets

The following objectives and targets are relevant to coastal and coral management as a result of port presence.

Table 52: Port presence objective, target and indicator

Objective	Target	Indicator
1. Maintain the ecological function, abundance, species diversity and geographical distribution of marine biota and habitat.	1. Marine impacts are minimised such that unapproved impacts to coral are avoided. 2. Coastal stability and shore alignment is within predicted trigger levels.	1. Coral health (mortality rate, bleaching). 2. Percentage of scarping. 3. Number of incident reports.

8.2.2 Monitoring and Performance Indicators

Monitoring and performance indicators are described for both coastal stability and coral habitats in the vicinity of the port, in respectively Table 53 and Table 54.

Table 53: Coastal stability monitoring and performance indicators

Activity	Performance Indicator	Frequency	Responsibility
Maintain long term beach profile monitoring stations along the west coast of Cape Preston.	Shoreline coordinates and levels along a number of transects.	Six monthly during first five years after commencement of construction and annually thereafter.	Environment Department.
Re-survey beaches if measurable cyclone-induced changes occur.	Shoreline coordinates and levels along a number of transects, to determine the scale of effect on coastal stability produced by cyclonic events.	Where practicable, on an opportunistic basis after cyclones.	Environment Department.

Activity	Performance Indicator	Frequency	Responsibility
Evaluate an area to the northern side of the breakwater causeway to determine if appreciable volumes of sediment are being transported.	Shoreline coordinates and levels along a number of transects.	Six monthly during first five years after commencement of construction and annually thereafter.	Environment Department.
Review all data (e.g. coastal stability and imagery) five years after commencement of construction.	Shoreline coordinates.	Once, five and a half years after commencement of construction of causeway.	Environment Department.

Table 54: Coral habitat monitoring and performance indicators

Activity	Performance indicator	Frequency	Responsibility
Monitor coral cover and species diversity at established impact and reference sites.	Coral health and abundance.	Annually around May each year.	Environment Department.
Monitor coral cover and species diversity at all impact and reference sites after passage of severe cyclone.	Coral health and abundance.	On an opportunistic basis after cyclones.	Environment Department.
Review success of achieving objectives and targets after five years of monitoring data is collected.	Coral health and abundance.	Six months after completion of fifth annual coral habitat survey.	Environment Department.

8.2.3 Contingency actions

If monitoring demonstrates that significant impacts have occurred to coastal stability or coral health the contingency actions identified in Table 55 and Table 56 will be implemented.

Table 55: Coastal stability contingency actions

Trigger	Action	Responsibility
Scarping has occurred to such an extent that 20% by length of the available turtle nesting habitat along the west coast of Cape Preston is no longer accessible to sea turtles in	1. Review monitoring results to identify cause of scarping.	Environment Department.
	2. Amend monitoring and contingency actions if required.	Environment Department.

Trigger	Action	Responsibility
comparison to pre-construction habitat cover.		
Scarping has occurred to such an extent that 30% by length of the available turtle nesting habitat along the west coast of Cape Preston is no longer accessible to sea turtles in comparison to pre-construction habitat cover.	1. Submit a proposal to DWER-EPA Conservation Branch for either use of earthmoving machinery to reshape the fore dune to make it more accessible to turtles.	Environment Department.
	2. Construct a small groyne/headland near the northern end of western beach.	Environment Department.

Table 56: Coral health contingency actions

Trigger	Action	Responsibility
Coral mortality outside of designated project impact zone.	Identify cause of coral mortality.	Environment Department.
	If coral mortality is determined to be related to port operations, undertake appropriate remedial action required to stop cause.	Environment Department.

8.3 Marine Wastewater Outfall Management

MS 822 amended the requirements of condition 8 of MS 635 with respect to the preparation and implementation of a Wastewater Outfall Management Plan. The sections below are primarily a direct result of MS 822.

8.3.1 Objective and Targets

The overall environmental objective for operation of the desalination plant is to ensure a high level of protection to the waters in the region of Cape Preston to protect sensitive habitats and social values, and is further defined in Table 57 below.

Table 57: Marine wastewater outfall objectives, targets and indicators

Objective	Target	Indicator
1. Maintain the ecological function, abundance, species diversity and geographical distribution of marine biota and habitat.	1. No exceedance of marine water quality limits.	1. Coral health (e.g. mortality rate, bleaching).
2. Maintain an adequate level of water quality in waters surrounding the port.	2. No non-compliances with MS 822 conditions.	2. Number of water quality non-compliances.
		3. Number of incident reports.

8.3.2 Management Actions and Control Measures

Table 58: Marine wastewater outfall management actions and control measures

Action	Timing	Responsibility
Implement a marine water quality monitoring program to ensure requirements of MS 822 are met.	Ongoing, for a period of at least 12 months immediately following commissioning.	Environment Department.
Regularly inspect and maintain diffuser to ensure adequate performance.	Ongoing.	Desalination Department.

8.3.3 Monitoring & Performance Indicators

Monitoring shall be conducted using procedures contained in the EPA *Manual of Operating Procedures for Environmental Monitoring Against the Cockburn Sound Environmental Quality Criteria*, EPA Report 21 (EPA 2005).

Table 59: Marine wastewater outfall monitoring and performance indicators

Activity	Performance indicator	Corrective action	Frequency	Responsibility
Monitor diffuser performance in achieving required number of dilutions for at least 12 months following commissioning in accordance with MS 822.	The Moderate Ecological Protection Area (MEPA) is maintained in the port area except for the Low Ecological Protection Area (LEPA) at the wastewater outfall. The boundary of the LEPA must not exceed 70 m from all points of the diffuser structure.	Increase/improve dilution rates.	Continuously (by loggers) or at least weekly (sampling), for a period of 12 months immediately following commissioning.	Environment Department. Desalination Department.
	Within the LEPA, the 95 th percentile of bioaccumulating toxicant concentrations meets the ANZECC and ARMCANZ 80% species protection level. Within the MEPA the 95 th percentile of bioaccumulating toxicant concentrations meets the ANZECC and ARMCANZ 90% species protection level.	Increase/improve dilution rates.	Continuously or at least weekly, for a period of 12 months immediately following commissioning.	Environment Department. Desalination Department.

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Activity	Performance indicator	Corrective action	Frequency	Responsibility
Monitor water quality at the boundary between the LEPA and the MEPA.	The median salinity from discharge at the wastewater diffuser either does not exceed the 95 th percentile of the natural salinity range or does not exceed the median salinity at a suitable reference site by more than 1.2 parts per thousand.	Increase/improve dilution rates.	Continuously or at least weekly, for a period of 12 months immediately following commissioning.	Environment Department. Desalination Department.
	The 95 th percentile of toxicant concentrations meets the 90% species protection levels specified in ANZECC and ARMCANZ 2000 <i>National Water Quality Management Strategy</i> .	Increase/improve dilution rates.	Continuously or at least weekly, for a period of 12 months immediately following commissioning.	Environment Department. Desalination Department.
	The results of Whole Effluent Toxicity testing undertaken using a minimum of 5 species 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.	Increase/improve dilution rates.	Continuously or at least weekly, for a period of 12 months immediately following commissioning.	Environment Department. Desalination Department.
	Ambient dissolved oxygen (DO) in bottom water samples is not below 80% saturation for more than 6 weeks and never below 60% saturation.	Increase/improve dilution rates.	Continuously or at least weekly, for a period of 12 months immediately following commissioning.	Environment Department. Desalination Department.
	The median temperature in any season does not exceed the 95 th	Increase/improve dilution rates.	Continuously or at least weekly, for a period of 12 months	Environment Department. Desalination Department.

Uncontrolled When Printed

Activity	Performance indicator	Corrective action	Frequency	Responsibility
	percentile of the natural temperature range over the same period.		immediately following commissioning.	

8.3.4 Contingency Action

Contingency actions will be initiated if monitoring shows that criteria may have been breached and may result in a level of environmental impact that requires mitigation. The contingency actions identified in **Table 60** below shall be implemented concurrently with environmental incident procedures.

Table 60: Marine wastewater outfall contingency actions

Trigger	Action	Responsibility
Marine water quality monitoring indicates insufficient dilution rates.	1. Investigate cause.	Desalination Department. Environment Department.
	2. If cause is diffuser failure, action to rectify will be taken immediately.	Desalination Department. Environment Department.
	3. If diffuser performance is not the cause, revise marine water quality management actions.	Environment Department.
	4. Complete an Incident Report.	Desalination Department. Environment Department.
	5. Immediately report findings to the CEO of the DWER-EPA with description of management actions to be taken.	Environment Department.
Inspection of diffuser indicates equipment failure.	Investigate cause.	Desalination Department. Environment Department.
	Take immediate action to rectify diffuser failure.	Desalination Department.
	Complete an Incident Report.	Desalination Department. Environment Department.

9 Conservation Estate Management Plan

9.1 Mitigatory management measures

Potential impacts of the port facility on the gazetted Great Sandy Island Nature Reserve (GSINR), particularly Preston Island, will be addressed by mitigation measures outlined in this section.

The GSINR protects more than 30 islands off the Pilbara coast between Cape Preston and Onslow. The GSINR extends to the high water mark of each island in the area and therefore does not include the surrounding marine waters. As Preston Island is part of the GSINR, the port facilities on Preston Island will directly impact upon the GSINR.

The proposed Regnard Marine Management Area (RMMA) extends to the low water mark, and includes the South West Regnard Island Conservation Area, South Eaglehawk Conservation Area and Maitland Conservation Area. The proposed western boundary of the RMMA is approximately 3.5 km east of Cape Preston and as such, the project will not impact upon the proposed RMMA.

The offsets package to address residual effects on the gazetted and proposed marine conservation estate include two direct offsets, a terrestrial conservation estate initiative and Mesquite control program, and two contributory offsets, tree plantation and biodiversity restoration initiative and a marine conservation estate education program.

9.1.1 Objectives and Targets

Table 61: Conservation Estate, objectives, targets and indicators

Objective	Target	Indicator
1. Ensure that the impact of project activities on the gazetted and proposed marine conservation estates is minimised.	1. No unauthorised access to marine conservation areas.	1. Number of non-compliances.
2. Implementation of offsets package (e.g. terrestrial conservation estate initiative and community education program).	2. All personnel attend induction program and successfully complete induction assessment prior to recreating off-site.	2. Number of personnel inducted.
	3. Control of mesquite (weed of national significance on Mardie Station).	3. Extent of infestation(s).

9.1.2 Impacts on the Marine Conservation Estate

Impacts from the project on the habitats, fauna and water quality of the marine conservation estate may arise from:

- The project causeway near Preston Island and laydown area on the Island;
- Shipping operations;
- Desalination plant operations (seawater intake and brine disposal); and
- Uncontrolled or unauthorized activities by project personnel.

Port infrastructure includes a rock causeway between Cape Preston and the eastern edge of Preston Island and a breakwater to the north.

9.1.3 Management Actions and Control Measures

Table 62: Conservation Estate management actions and control measures

Action	Timing	Responsibility
Restrict access to high value environmental areas (e.g. mangroves, turtle nesting and migratory bird roosting beaches).	Ongoing.	Environment Department.
Employee inductions include information on environmental procedures and incidents.	Ongoing.	Training Department. Environment Department.
Inspection and incident reporting to rectify disturbance beyond project boundaries.	Ongoing.	Environment Department. Corporate Affairs Department.
Permanent presence of on-site environmental personnel to implement environmental monitoring regime and procedures.	Ongoing.	Environment Department. Human Resources Department.
Implement terrestrial conservation estate initiative including: <ul style="list-style-type: none"> • Selective destocking; • Remove watering points and construct a stock proof fence around proposed conservation area. 	Ongoing.	Environment Department.
Implement Mesquite Control Program including: <ul style="list-style-type: none"> • Workforce induction program includes awareness on Mesquite; • Regular monitoring for new infestations; • Eradication of new infestations; • Monitoring of infestations to assess effectiveness of control measures; • Research into viable uses for mesquite products; • Rehabilitation of areas cleared of mesquite. 	For 10 years (2009 – 2018).	Environment Department.
Implement Education Program including:	Ongoing.	Environment Department.

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Action	Timing	Responsibility
<ul style="list-style-type: none"> • Providing appropriate signage adjoining sensitive areas; • Developing community education materials. 		
<p>Implement the Tree Plantation and Biodiversity Restoration Initiative including:</p> <ul style="list-style-type: none"> • Restoration of sensitive habitat areas and buffer zones with native flora species; • Establishment of plantation crops at Mardie Station and in south west agricultural region. 	<p>Commencing no later than 12 months after production commences from the 3 modules of the Direct Reduced Iron plant.</p>	<p>Environment Department.</p>

10 Reporting

This section describes internal and/or statutory reporting requirements with respect to the OEMP.

10.1 Part IV - Environmental Protection Act 1986

The implementation of the project is subject to the conditions and commitments prescribed in MS 635, MS 822 and MS 1066.

10.1.1 Compliance Audit

Condition 14-1 of MS 635 requires the proponent to implement an audit program and to submit compliance reports to the DWER-EPA which address the following:

- The implementation of the proposal as defined in schedule 1 of the statement;
- Evidence of compliance with the conditions and commitments; and
- The performance of the environmental management plans and program.

As part of the Annual Compliance Report, results of the monitoring programs will be presented as evidence of compliance with conditions and commitments of MS 635 and MS 822.

It should be noted that the Annual Compliance Report is not intended to contain information on individual management actions, control measures and monitoring and performance indicators including contingency actions as outlined in this document. If further management actions are required the proponent will review and update this document in consultation with DWER-EPA.

In accordance with the approved Audit Program, Annual Compliance Reports will be submitted on an annual basis until 2013, and afterward as agreed upon with DWER-EPA.

10.1.2 Performance Review

Condition 14-2 of MS 635 requires the proponent to submit a Performance Review report every six years after the commencement of operations, to the requirements of the Minister for the Environment, on advice of the DWER-EPA, which addresses:

- Major environmental issues associated with the project; targets for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those targets
- The level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable
- Significant improvements gained in environmental management, including the use of external peer reviews
- Stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any ongoing concerns being expressed
- The proposed environmental targets over the next six years, including improvements in technology and management processes

If conditions have been met under all circumstances in the preceding years of operation and the risk of any future exceedance is considered low, the proponent may propose a reduced monitoring program to the DWER-EPA for consideration in the Performance Review report.

10.1.3 Water quality monitoring report

To meet condition 8-7 of MS 822, a report containing the results of the monitoring required by conditions 8-2 to 8-5 and a discussion of the operating limitations necessary to ensure ongoing compliance with conditions 8-2 to 8-4 shall be submitted to the CEO of DWER-EPA within 18 months of commissioning of the waste water outfall in the port area (refer to Section 8.3).

10.1.4 Public availability

This OEMP will be made publicly available as required by conditions 6-3, 7-3, 9-3, 11-3, 12-3, 13-3 and 15-4 of MS 635, in accordance with the OEPA *Post Assessment Guideline for Making Information Publicly Available* (OEPA, August 2012).

10.2 Other Reports

In accordance with regulatory requirements CPM will report on project activities as required, such as, but not limited to:

- EP Act, Part V Licences to Operate Annual Environmental Reports – DWER-DER;
- Annual Environmental Report required by tenement conditions to the Department of Jobs, Tourism, Science and Innovation in accordance with clause 10.4a of the *Iron Ore Processing (Mineralogy Pty. Ltd.) Agreement Act 2002*.
- TSF Audit and Review Report required by tenement conditions – Department of Mines, Industry Regulation and Safety ;
- National Pollution Inventory – Department of the Environment and Energy; and
- National Greenhouse Energy Reporting System – Clean Energy Regulator.

10.3 Incident Reports

Incidents are defined as breaches or non-adherences to objectives and procedures applied to the project and prescribed in this OEMP. Incidents are to be reported to the Environment department by the person responsible for the incident or the first person at the site of an incident.

The Environment department will assess the type and severity of the incident in accordance with internal procedures. Relevant personnel shall be notified and consulted whether the incident requires notification to regulatory agencies.

The actions to follow in the event of environmental incidents are listed below (Table 63) and vary depending on the level of incident occurring. The Incident Report system can be used as a mechanism for reporting conformance to this plan, as required.

Table 63: Incident reporting actions and responsibilities

Action	Responsibility
If an incident is caused the area is to be made safe, and measures put in place to control or stop the incident, if safe to do so.	Person responsible or first on the scene.
All incidents that result in, or had the potential to result in damage to the environment shall in the first instance be reported to their Supervisor, and subsequently to the Environment department.	Person responsible or first on the scene.
Technical advice is requested from the Environment department, where required.	Person responsible or first on the scene.
Incident notification form is completed.	Person responsible or first on the scene.
Ensure all incidents are recorded into Cintellate (incident reporting database) and check the correctness and quality of the information provided (e.g. causes, effects and preventative actions).	Environment Department.
Ensure an Environment and Heritage Impact Form is completed and an Investigation and Close Out Form.	Person responsible or first on the scene.
Determine the potential environmental harm and consult with the Environment Manager regarding notification to relevant regulatory agencies.	Environment Department.
Sign-off the Incident Report after agreement on new practices to prevent re-occurrence of the incident.	Environment Department.
Provide feedback to staff and contractors regarding the resolution of the incident.	Area Supervisor.
Ensure recommendations and preventative actions are implemented, as soon as practicable.	Person leading the incident investigation. Environment Department.
Issue any new procedures or update existing procedures and work practices arising from the Environmental Incident process.	Area Supervisor.
Communicate these new/revised procedures to personnel via toolbox meetings.	Area Supervisor.