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Atlas Iron Limited

The Pardoo DSO Project

Public Environmental Review

Appendices Volume 1 - Appendix A

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Appendices

Volume 1

A Environmental Management Plan

Appendix A

Environmental Management Plan





December 2007
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Atlas Iron Limited

The Pardoo DSO Project

Environmental Management Plan

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Pardoo Direct Shipping Ore Project

Environmental Management Plan

December 2007
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1. Introduction

1.1 Project Background

The Pardoo Direct Shipping Ore (DSO) Project is located in the Pilbara region of Western Australia, with its minesite situated approximately 70 km east of Port Hedland (Figure 1.1). The project is based on an identified iron ore resource of approximately 7.4 million tonnes (Mt) and proposes an ore production rate of 1.5 Mtpa that results in a mining life of 5 to 6 years.

The Pardoo DSO Project involves the open cut mining of eight small pits to obtain direct-shipping quality hematite. The ore will be crushed, screened and stockpiled on site prior to being loaded into road trains for road haulage to the appropriate berth at Port Hedland. Ore will be stockpiled at the port until it is loaded onto Panamax-size (i.e., 65,000-t) ships for export to overseas customers.

Initially, ore will be exported via trial shipments through an existing Port Hedland Port Authority (PHPA) public access berth in Port Hedland. It is anticipated that exports through this berth will be between 390,000 tonnes per annum (tpa) and 500,000 tpa.

Atlas recently signed a memorandum of understanding (MoU) with Fortescue Metals Group Ltd (FMG) for access to FMG's Anderson Point berth. The MoU indicates that FMG and Atlas will negotiate in good faith the commercial terms by which Atlas can access the Anderson Point berth for the interim period of March 2008 to March 2009, and up to a rate of 1 Mtpa of project iron ore. This service will be provided for a period of approximately 12 months or continued until such time as the PHPA-proposed bulk commodities berth is commissioned at Utah Point.

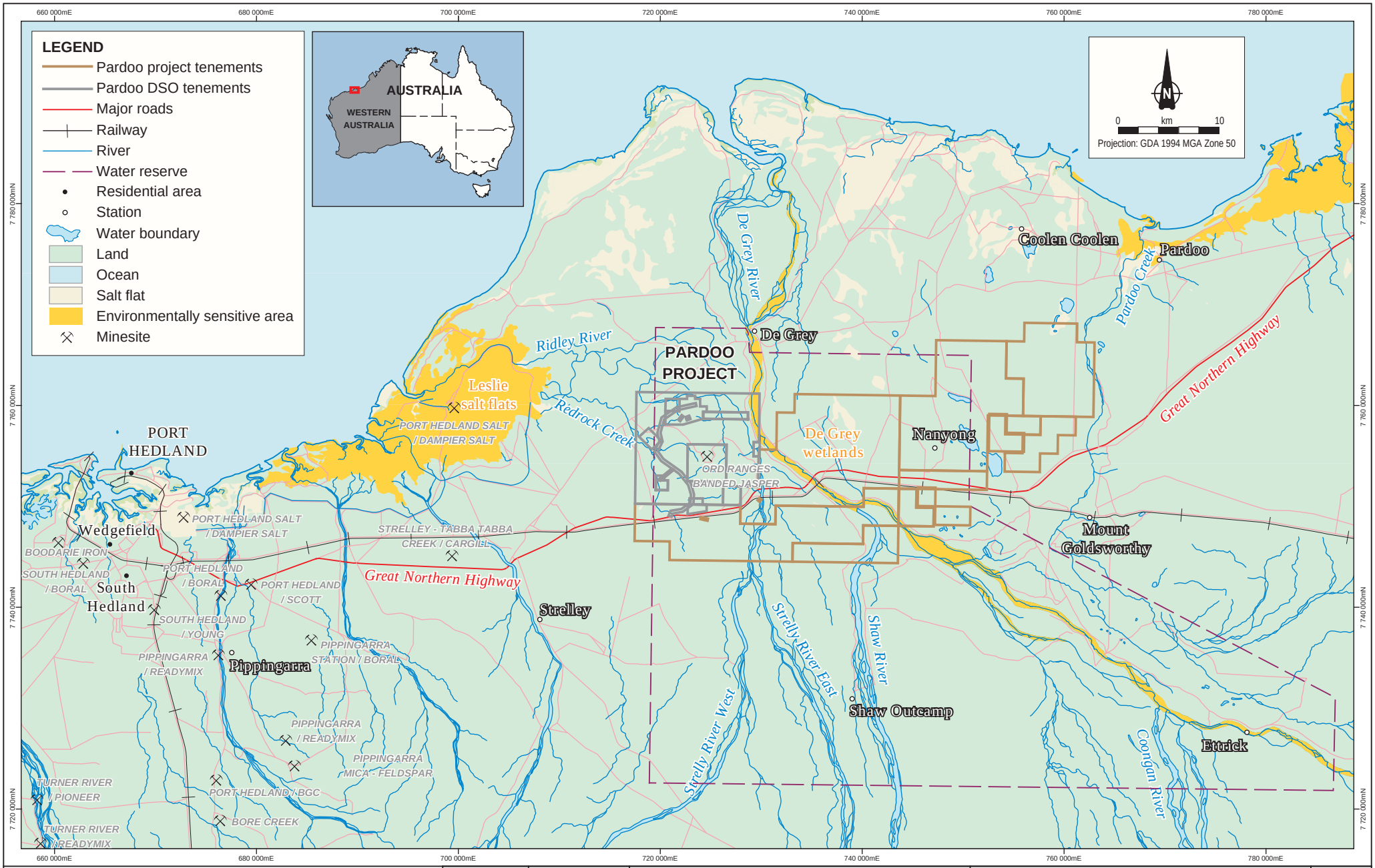
Atlas's environmentally and socially preferred option is access to the FMG berth facilities rather than interim access to the existing Port Hedland public access berth. Should FMG berth facilities become available in 2008, Atlas will reconsider the need to transport and export from the existing Port Hedland public access berth.

When the Utah Point bulk commodities berth becomes available in 2009, Atlas will cease exporting through the existing Port Hedland public access berth. Exports through the Utah Point berth are anticipated to be up to 1.5 Mtpa.

1.2 Existing Environment

1.2.1 Overview

The project is located within the Pilbara region, which covers a total area of 507,896 km^2 extending from the Indian Ocean to the Northern Territory border.



Source: Topography - Landgate - 2007
Tenements - DoIR - 2007
Requested: Coffey Natural Systems
Drawn: CAD Resources

Job No: we08030	Atlas Iron Limited	Figure No: 1.1
File No: g1410_EMP_f001	Pardoo DSO Project	Locality plan and regional setting

On a regional scale, the project is located within the Pilbara biogeographic zone, Pilbara 4 subregion, according to the Interim Biogeographic Regionalisation for Australia (IBRA) classification. The Pilbara 4 subregion covers an area of over two million hectares.

Locally, the minesite is located within the Ord Range, a small S-shaped range protruding from extensive floodplains approximately 80 m above the coastal plain of the De Grey River Basin. *Triodia* hummock grasslands, with occasional shrublands and open woodlands, dominate the area.

The De Grey River is located approximately 6 km east of the minesite (and intersects the northeast corner of the minesite exploration lease, E45/2330). The Ridley River is located approximately 700 m north, while Redrock Creek is located approximately 2 km west of the closest proposed minesite infrastructure.

The minesite is located within the De Grey River Water Reserve, which supplies scheme water to Port Hedland. It is also located within the one-million-hectare De Grey pastoral station.

No identified state or commonwealth conservation area overlaps the minesite or product transport route. The closest area of conservation significance is the De Grey River, which a wetland of national importance (WA065) from the confluence of the Oakover and Nullagine rivers to the Western Australia coast. The Leslie Salt Fields are also listed as wetlands of national importance (WA068) and are located adjacent to the Western Australia coast at the Ridley River outlet.

According to the Department of Industry and Resources (DoIR) State Geoheritage Register, the geoheritage sites nearest to the minesite are more than 100 km to the southwest.

The project will occur in the following three localities:

- Minesite – the minesite is defined by the proposed areas of disturbance within exploration lease E45/2330. This area is also referred to as the project area. An additional General Purpose lease will be applied for to accommodate the mining operations centre, which is mostly located outside the existing leases.
- Product transport route – from the minesite along the Great Northern Highway to the relevant berth at Port Hedland.
- Export port – either the existing public access berth in Port Hedland, FMG berth or proposed Utah Point bulk commodities berth as described in Section 1.1.

1.2.2 Key Environmental Issues

The key factors identified by the Environmental Protection Authority (EPA) that are relevant to this proposal and require detailed management are as follows:

- Groundwater and surface water.
- Subterranean fauna.

- Flora and vegetation.
- Rehabilitation and mine completion.
- Air quality (i.e., dust).

In addition to the above key factors, stakeholder consultation has also indicated that the following factors need to be considered:

- Traffic.
- Noise.

The management of these factors have been incorporated into the relevant management plans outlined in Sections 3.2 to 3.9.

1.3 Legislative, Approval and Atlas Requirements

Key legislation that is applicable to the Pardoo DSO Project is the Australian Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, and both the Western Australian *Environmental Protection Act 1986* and *Mining Act 1978*.

Should the project receive environmental approval under this key legislation, other Commonwealth and Western Australian legislation may apply to project approvals of operational aspects of the project. This legislation is listed below:

Commonwealth legislation:

- *Native Title Act 1993*.

Western Australian legislation:

- *Aboriginal Heritage Act 1972.*
- *Agriculture and Related Resources Protection Act 1976.*
- *Bush Fires Act 1954.*
- *Civil Aviation Act 1988.*
- *Conservation and Land Management Act 1984.*
- *Country Areas Water Supply Act 1947.*
- *Dangerous Goods Safety Act 2004.*
- *Dangerous Goods (Transport) Act 1998.*
- *Electricity Act 1945.*
- *Environmental Protection Act 1986.*
- Environmental Protection (Clearing of Native Vegetation) Regulations 2004.
- Environmental Protection (Noise) Regulations 1997.
- Environmental Protection Regulations 1987.
- *Explosives and Dangerous Goods Act 1961.*
- *Health Act 1911.*
- *Heritage of Western Australia Act 1990.*
- *Land Administration Act 1997.*
- *Local Government Act 1995.*
- *Main Roads Act 1930.*
- *Mine Safety and Inspection Act 1994.*
- *Mining Act 1978.*

- *Occupational Safety and Health Act 1984.*
- *Planning and Development Act 2005.*
- *Rail Safety Act 1998.*
- *Rights in Water and Irrigation Act 1914.*
- *Soil and Land Conservation Act 1945.*
- *Water Supply Sewerage and Drainage Act 1912.*
- *Waterways Conservation Act 1976.*
- *Wildlife Conservation Act 1950.*

In addition to legislative and approval requirements, Atlas's Integrated Management System (IMS) and overarching Environmental and Social Policy will govern the management of the Pardoo DSO Project. The IMS will provide a framework that coordinates emergency response, occupational health and hygiene, safety, and environment and social responsibility.

An outline of the IMS, along with Atlas's Environmental and Social Policy, is provided in Section 2 of this Environmental Management Plan (EMP). Specific legislative and approval requirements are also outlined within each management plan.

1.4 Purpose of this Document

The primary purpose of this EMP is to assist Atlas and its contractors to implement the appropriate management measures required to mine the Pardoo DSO Project. Where there is any conflict between the provisions of this EMP and a contractor's obligation, including various statutory requirements (i.e., licences, permits, consent conditions and relevant laws), the contract and statutory requirements are to take precedence.

This EMP has been prepared to satisfy commitments made in the Pardoo DSO Project Environmental Scoping Document to include project-specific management plans in the PER. This EMP has been submitted as an attachment to the Public Environmental Review (PER) document and therefore, once endorsed by the EPA, will be released along with the PER for public review. The public release of the EMP will provide the opportunity for stakeholders to comment the management measures presented throughout this document.

1.5 Environmental Management Commitments

Management commitments that relate to the operational aspects of this EMP are provided in Table 1.1.

Table 1.1 Summary of environmental management commitments

Topic	Commitment
Integrated Management System	Develop and implement an IMS.
Stakeholder consultation	Develop and implement a stakeholder consultation program, which aims to maintain ongoing consultation with the local community and relevant stakeholders.
Water	Develop and implement a Water Management Plan.

Table 1.1 Summary of environmental management commitments (cont'd)

Topic	Commitment
Flora and vegetation	Develop and implement a Flora and Vegetation Management Plan.
Fauna	Develop and implement a Fauna Management Plan.
Air quality and noise	Develop and implement an Air Quality and Noise Management Plan.
Waste	Develop and implement a Waste Management Plan.
Hydrocarbons	Develop and implement a Hydrocarbon and Dangerous Goods Management Plan.
Traffic	Develop and implement a Transport Management Plan.
Mine completion	Develop and implement a Conceptual Mine Completion and Rehabilitation Plan.

2. Environmental Management Framework

2.1 Overview

The environmental management framework for the Pardoo DSO Project will be developed from an Integrated Management System (IMS). The IMS will encompass environmental, health and safety management systems needed for achieving Atlas's objectives and for delivering a high standard of management for all aspects of the Pardoo DSO Project.

The IMS will provide a structured approach to managing the minesite's environmental, health and safety, and community consultation programs. For environmental and social aspects, the IMS will guide the:

- Development and implementation of environmental management procedures.
- Monitoring of environmental impacts and performance.
- Review of procedures to ensure continual improvement.

Atlas is committed to developing and implementing the relevant IMS elements prior to commencing construction activities. This document only examines the environmental aspects of the IMS. The structure of the environmental component of the IMS follows the principles of ISO 14001, and it contains the key elements as follows:

- Commitment and policy – the corporate Environmental and Social Policy defines Atlas's commitment to conduct business in all operations in an environmentally and socially responsible manner and with full legal compliance (Section 2.2).
- Planning – provides clearly stated project-specific objectives consistent with the policy (Section 2.3).
- Implementation – lists practical procedures to fulfil personnel responsibilities for environmental management, which clearly are defined, documented and communicated through inductions and training (Section 2.4).
- Checking and corrective action – regulates by regular inspection and auditing to assess compliance with environmental management objectives and commitments, and upholds a system for dealing with non-compliance, incidents and complaints, data recording and reporting (Section 2.5).
- Management review – requires an annual internal or peer review of the IMS with the aim of continual improvement (Section 2.6).

Implementation of these IMS elements is outlined in the following sections.

2.2 Commitment and Policy

Atlas is committed to managing its activities in an environmentally and socially responsible manner, as reflected in Atlas's Environmental and Social Policy (Box 2.1). The Environmental and Social Policy is the pinnacle document within the IMS, against which environmental performance is ultimately measured and reported.

Box 2.1 Environmental and Social Policy

ATLAS IRON LIMITED ENVIRONMENTAL AND SOCIAL POLICY

Atlas Iron Limited is an Australian owned mineral exploration and production company, which prides itself on its commitment to principles of environmental and social responsibility.

In accordance with this Environmental and Social Policy, the following operational-specific objectives have been established which represent the company's commitment:

1. We will operate an Integrated Management System, which accurately defines the environmental and social aspects and impacts of what we do, and build what we learn from this knowledge into clear and concise operational systems, to thus minimise the risk to the environment and the community.
2. We will employ, to the extent practicable, the principles of pollution prevention, efficient resource use and waste minimisation in all of our activities.
3. We will set environmental improvement targets based on established criteria and annually report our environmental performance publicly.
4. We will develop a mine closure and progressive rehabilitation plan that addresses regulatory requirements, risk minimisation, potential future land use and stakeholder issues.
5. We will identify, report, and remediate environmental incidents, and employ changes that reduce the likelihood and/or consequence of occurrences.
6. We will actively promote environmental awareness and training among all employees and contractors.
7. We will respect cultural and heritage values and facilitate cross-cultural awareness.
8. We will anticipate and respond to community concerns, aspirations and values regarding our activities and foster open dialogue with employees, contractors and the community.
9. We will strive for continual improvement in environmental and social awareness, and our performance.
10. We will comply with all legal and regulatory requirements as a minimum operating condition.
11. We will allocate sufficient resources to ensure these objectives can be achieved.

Atlas's Environmental and Social Policy is based on the recognition that all activities, including resource development and processing, impact on the environment. Since it is not possible to eliminate all impact, the Atlas policy is to engineer and conduct operations with the objective of achieving best practice so that adverse effects to the environment and any surrounding community are either avoided or kept to an acceptable level.

2.3 Planning

2.3.1 Legal and Other Obligations

Atlas recognises that developing an understanding of its own and its contractor's legal and other obligations is the first step towards achieving compliance with the relevant legal requirements.

At the project level, the identification and review of relevant legislation, regulations, policies, industry standards and protocols, and the determination of their implications for environmental management, commenced during the feasibility stage of the project and will continue through to mine completion.

Section 1.3 identifies key legislation applicable to the Pardoo DSO Project. An environmental compliance register will be established upon the receipt of project approvals to track compliance with legislation, commitments and procedural requirements.

2.3.2 Objectives and Targets

Objectives and targets will be set under the IMS. Project-specific measurable environmental objectives and targets will follow those set in each management plan (Section 3) and the project environmental management commitments (Section 1.5).

2.4 Implementation

2.4.1 Management Actions

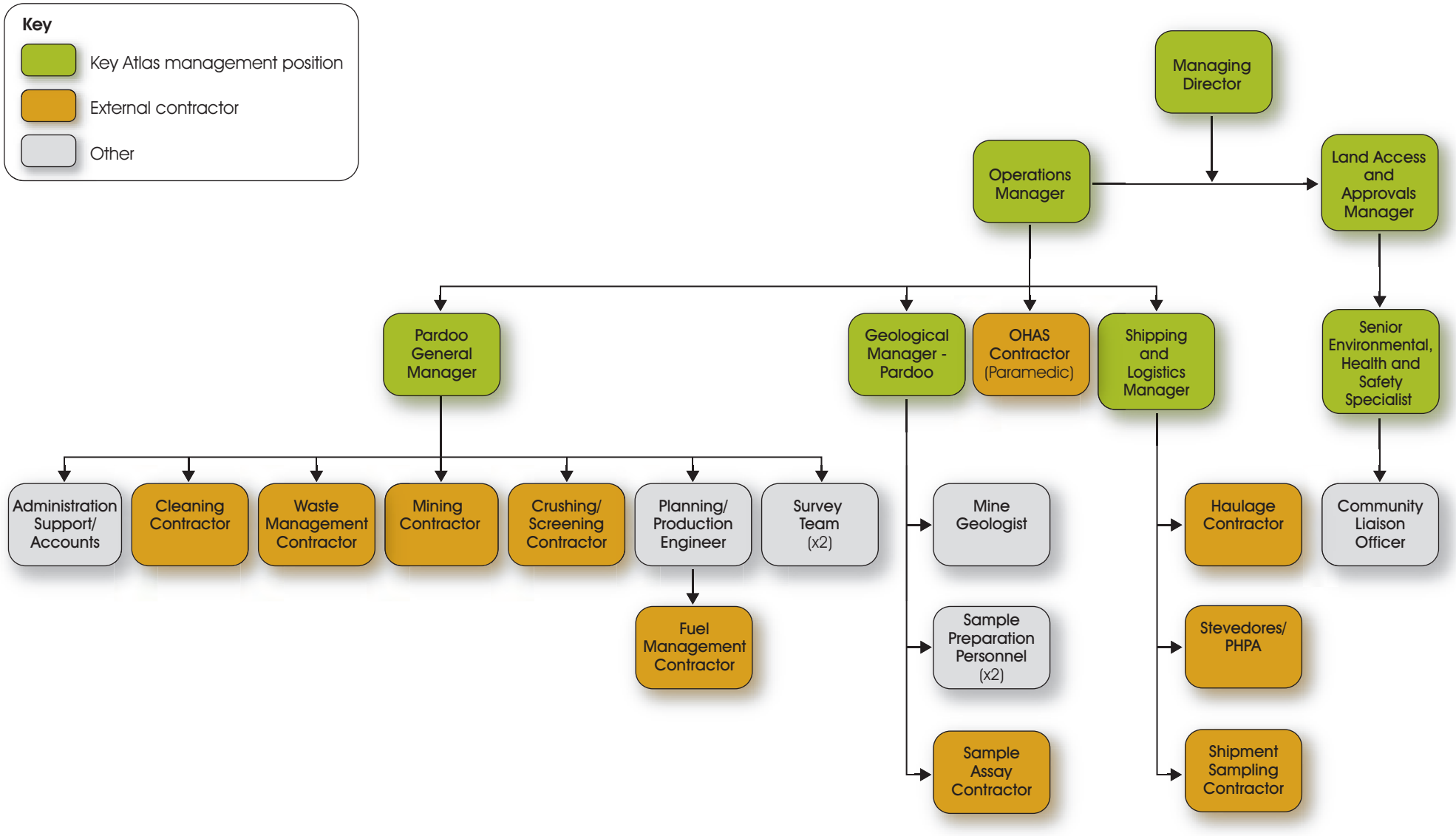
The management actions to be implemented to ensure effective environmental management of the project are set out within the individual environmental management plans provided in Section 3.

2.4.2 Responsibilities

The project is to be managed by Atlas. The Operations Manager will be responsible for ensuring that all activities associated with the project are undertaken in full compliance with statutory regulations and are consistent with Atlas's Environmental and Social Policy.

Atlas will ensure that the environmental approval conditions as specified in the Ministerial Statement and in other approvals (e.g., lease conditions, Works Approvals, Operating Licences, etc.) are accessible to senior management and other personnel at all times. All personnel are responsible for ensuring that their work complies with these conditions and the described environmental management measures. Individual accountability will be defined through conditions employment contracts.

Atlas will implement an organisational structure to ensure effective environmental management of the project, as shown in Figure 2.1. This organisational structure may be expanded or altered during development of the project.



Drawn: Coffey Natural Systems		Job No: we08030	Atlas Iron Limited	Figure No: 2.1
		File Name: 8030_06_EMP_F02.01 _HB	Pardoo DSO Project	**Pardoo DSO Project organisational chart**

Broad environmental management responsibilities that will apply to the various personnel involved in the project are outlined in Table 2.1.

Table 2.1 Environmental management responsibilities

Personnel	IMS Responsibilities
Managing Director	• Overall responsibility for the project.
Operations Manager	• Overall responsibility for site-specific implementation of environmental policy, systems and management measures.
Senior Environmental, Health and Safety Specialist	• Ensures IMS is prepared, implemented uniformly, revised and maintained. • Assesses the suitability and effectiveness of the IMS. • Ensures that contractors fulfil their contractual obligations in regards to environment, health and safety (EHS) requirements. • Implements induction procedures and appropriate training. • Ensures compliance with licence conditions and company policy via the establishment and maintenance of appropriate reporting systems and databases. • Participates with personnel to improve work practices on site. • Undertakes internal site environmental audits. • Provides EHS advice as required to other project personnel. • Liaises with stakeholders. • Ensures implementation and regular review of environmental management measures. • Assists with progressive rehabilitation and completion planning activities through detailed design and operational phases.
Other managers	• Ensures IMS is prepared, implemented uniformly, revised and maintained. • Ensures implementation and regular review of relevant environmental management measures. • Liases with environmental staff as required.
Contractors	• Fulfil contractual obligations and abide by Atlas's IMS.
Environmental Auditor/Reviewer	• Conducts regular independent environmental audits/reviews of the operations to ensure compliance with the IMS and statutory requirements.

2.4.3 Inductions and Training

Atlas will ensure that personnel have the appropriate knowledge and skills to meet the company's Environmental and Social Policy, and the objectives and targets outlined in the IMS. Environmental inductions will be conducted for employees and contractors to inform them of environmental issues and responsibilities, including:

- Obligations under Atlas's Environmental and Social Policy, the relevant sections of Atlas's IMS, the Ministerial Statement, conditions of approval and other project commitments.
- Site layout and areas of particular environmental or social significance.
- This Environmental Management Plan (EMP) and site documentation providing key environmental and social management procedures, including minimisation of impacts to flora and fauna, weed management, hydrocarbons and dangerous goods

management, water management, waste management, mine completion and rehabilitation and hazard prevention.

An appropriately qualified person, as appointed by the Senior Environmental, Health and Safety Specialist, will conduct the environmental inductions. All personnel will be required to undertake and pass a knowledge questionnaire based on the induction presentation, and records will be retained of all persons being inducted. Regular 'tool box' meetings will identify environmental issues that may arise during operations.

Additional specific environmental training will be provided to personnel involved in:

- Maintaining and operating pollution control and water management equipment or infrastructure.
- Storing and handling hydrocarbons and using spill kits.
- Responding to environmental incidents (e.g., fuel spills).

Further detail on specific induction and training requirements is provided in each relevant management plan.

Additional training will be undertaken on an as-needs basis; and if required, key personnel will be provided with support to explain management procedures to their staff. All personnel will have access to hard copies of the EMP and overarching IMS, which will be located in the minesite office.

2.5 Checking and Corrective Action

2.5.1 Supervision and Inspection

The Operations Manager (or delegate) will undertake regular supervision and inspections of activities to ensure that environmental management procedures are being implemented satisfactorily. The frequency of inspection will depend on the magnitude of risk associated with the particular hazard. Inspection results will be maintained by the Operations Manager and reported to Atlas staff periodically.

2.5.2 Compliance Audits and Reviews

Audits and reviews will be undertaken by an appropriately qualified person on a regular basis to assess compliance with the environmental and social management procedures, the conditions of approval and project commitments documented in a site compliance register. Auditing will be conducted twice during the construction phase and yearly during the operations.

Corrective action will be implemented within two months of the audit and a corrective action report (CAR) prepared for all non-conformances identified during the audit. Subsequent audits will review CARs to ensure they are adequately addressed.

2.5.3 Incidents

Environmental incidents that occur either as a result of an emergency, accident or equipment malfunction and which cause or threaten serious or material environmental harm, will be reported internally to the Operations Manager (or delegate) and also to relevant regulatory authorities (as relevant) within 24 hours of the event.

The incident will be registered in an Incident Register, investigated, and written up in a report. In addition to statutory reporting requirements, the incident report will detail any deficiencies in the IMS or its elements (e.g., EMP and standard operating procedures). Any such deficiencies will result in the revision of the relevant IMS element and appropriate additional training, as required.

The Incident Register will be maintained throughout construction and operations to record occupational health and safety and environmental incidents, and near misses.

2.5.4 Recording

Atlas will maintain a database for storage and retrieval of environmental data, records and other relevant information, including:

- Corporate IMS and project EMP, along with any management review of these documents.
- Regulatory documents (e.g., legislation, government policies, Compliance Register, permits and licences).
- EMP and standard operating procedures.
- Induction and training records.
- Environmental audit schedules and reports (including CARs).
- Environmental monitoring programs, schedules and data.
- Incident Register.
- Complaints received and actions taken (i.e., complaints reporting system).
- Consultation records, including meeting notes.

The above IMS documentation will be:

- Easily located and logically filed in hard copy and electronic copy form, including date of issue or revision.
- Available for all Atlas personnel, contractors and consultants.
- Periodically reviewed and revised as necessary (and clearly dated) by authorised personnel.
- Updated by removing or replacing obsolete sections from all points of issue as required.

The Operations Manager will be responsible for ensuring that feedback on records and record keeping is assessed, and implications for the IMS are acted upon.

2.5.5 Reporting

Atlas will employ the following environmental and social reporting systems:

- A report dealing specifically with environmental and social issues will be submitted to Atlas's Board on a quarterly basis. This will include a summary of non-compliance reports, corrective actions and major issues arising from daily supervision and inspections, and the compliance audits.
- An Annual Environmental Report (AER) will be prepared for submission to the Department of Industry and Resources (DoIR). This report will outline the mining activities that have occurred throughout the year (including new disturbance and rehabilitation) and the proposed activities in the coming year, and will address compliance with all environmental commitments and approval conditions. The AER will also be submitted to the Compliance Monitoring Section of the Department of Environment and Conservation (DEC) on request.
- The Department of Water will require annual reporting and/or auditing as a requirement of a 5C Licence operating strategy under the *Rights in Water and Irrigation Act 1914*.
- The DEC may require regular reporting under Part IV and Part V of the *Environmental Protection Act 1986*, depending on conditions of approval.
- Incident Reports will be submitted to the DoIR and DEC in the event of a significant environmental incident or non-compliance.
- The project will report greenhouse gas emissions to the National Pollutant Inventory (NPI) annually if reporting is triggered. The NPI emission estimation technique manuals will be used to calculate emissions from each of the project components.

Reporting requirements that are specific to performance indicators and targets are provided within each management topic of the EMP.

2.6 Management Review

Internal review of the IMS by senior management will help ensure continual improvement in levels of compliance and consistency across the organisation. For Atlas, this will include:

- A review of performance against objectives and targets.
- A summary of inspection, audits, complaints and incidents.
- Actions taken to correct or remedy non-conformances.
- An outline of planned activities for the forthcoming three months.
- Any revision or update to the IMS or EMP.
- Any revision of Atlas's Environmental and Social Policy.
- Any revision as a consequence of a change in circumstances of the project.

These reviews will be conducted at least annually and will also include planned activities for following year. All personnel will be encouraged to participate in the process through the reporting and close-out procedures of incidents, audits and monitoring.

2.7 Management Actions Summary

Key management actions for the environmental management framework component of the IMS are outlined in Table 2.2 with a timeframe for implementation.

Table 2.2 Integrated Management System management actions summary

Management Action	Timeframe
Establish an environmental compliance register upon receipt of project approvals, to track compliance with legislation, commitments and procedural requirements.	Within three months of project approval.
Conduct environmental inductions and specific environmental training for employees and contractors, to inform them of environmental issues and responsibilities.	At commencement of mining operations and as required (i.e., prior to employees and contractors commencing work at the minesite).
Engage an appropriately qualified person to undertake auditing.	Prior to construction; audits to be undertaken twice during the construction phase and yearly during operations.
Establish and maintain a database for storage and retrieval of environmental data, records and other relevant information.	At commencement of mining operations, with updates as required.
Review IMS and its elements.	One year from commencement of operations.

3. Environmental Management Plan

3.1 Overview

3.1.1 Application of Management Plans

Atlas will adopt a series of management plans to cover key aspects of the company's operations. Those that have been developed as part of the Environmental Management Plan (EMP) (and are therefore part of the Integrated Management System [IMS]) are the following:

- Water Management.
- Flora and Vegetation Management.
- Fauna Management.
- Air and Noise Management.
- Waste Management.
- Hydrocarbon and Dangerous Goods Management.
- Transport Management.
- Conceptual Mine Completion and Rehabilitation.

Where required, either through the formal Public Environmental Review (PER) process or regulatory requirements, additional management plans will be developed and incorporated into this EMP.

3.1.2 Related Documents

Atlas will develop a series of standard operating procedures (SOPs) to complement the management plans. These will provide environmental and other personnel with easily accessible information regarding the management of specific environmental issues. The contents of SOPs and other related documents are described within each relevant management plan.

3.2 Water Management

3.2.1 Objectives

For the Pardoo DSO Project minesite, Atlas will adopt best water management practices and ensure that project impacts to the regional water are mitigated.

The objectives for the Water Management Plan are to:

- Ensure that the quality of water returned to local surface water resources will not result in a deterioration of those resources.
- Minimise the short and long-term impacts on groundwater resources caused by mining operations and groundwater use.

- Minimise adverse impacts to surface-water- or groundwater-dependent ecosystems caused as a result of mining operations.

3.2.2 Existing Environment

Completed Studies

The surface water and groundwater assessments for the Pardoo DSO Project were undertaken by MWH Australia Pty Ltd (MWH) in late 2006 and early 2007 (MWH, 2007).

The work undertaken as part of the surface water assessment included a desktop review of all available hydrological reports and data, a site visit to assess local and regional drainage issues, and hydrological modelling to determine flood flows and peak flood levels.

Rainfall runoff modelling and rational methods were used to calculate design flood flows for 49 local catchments that intersect the proposed haul, minor access and access roads. The same methods were used to calculate design floods for five catchments draining proposed open pits, waste rock dumps, stockpiles and the mining operations centre.

The regional hydraulic model was developed and calibrated using measured water levels from piezometers and resource definition drill holes, rainfall data, and flood extent photos related to Cyclone George (Category 5 at the Pilbara coast) in March 2007. The model was used to generate flood extents maps for a range of events up to a 100-year average return interval (ARI) flood across the floodplain surrounding the proposed mining operations.

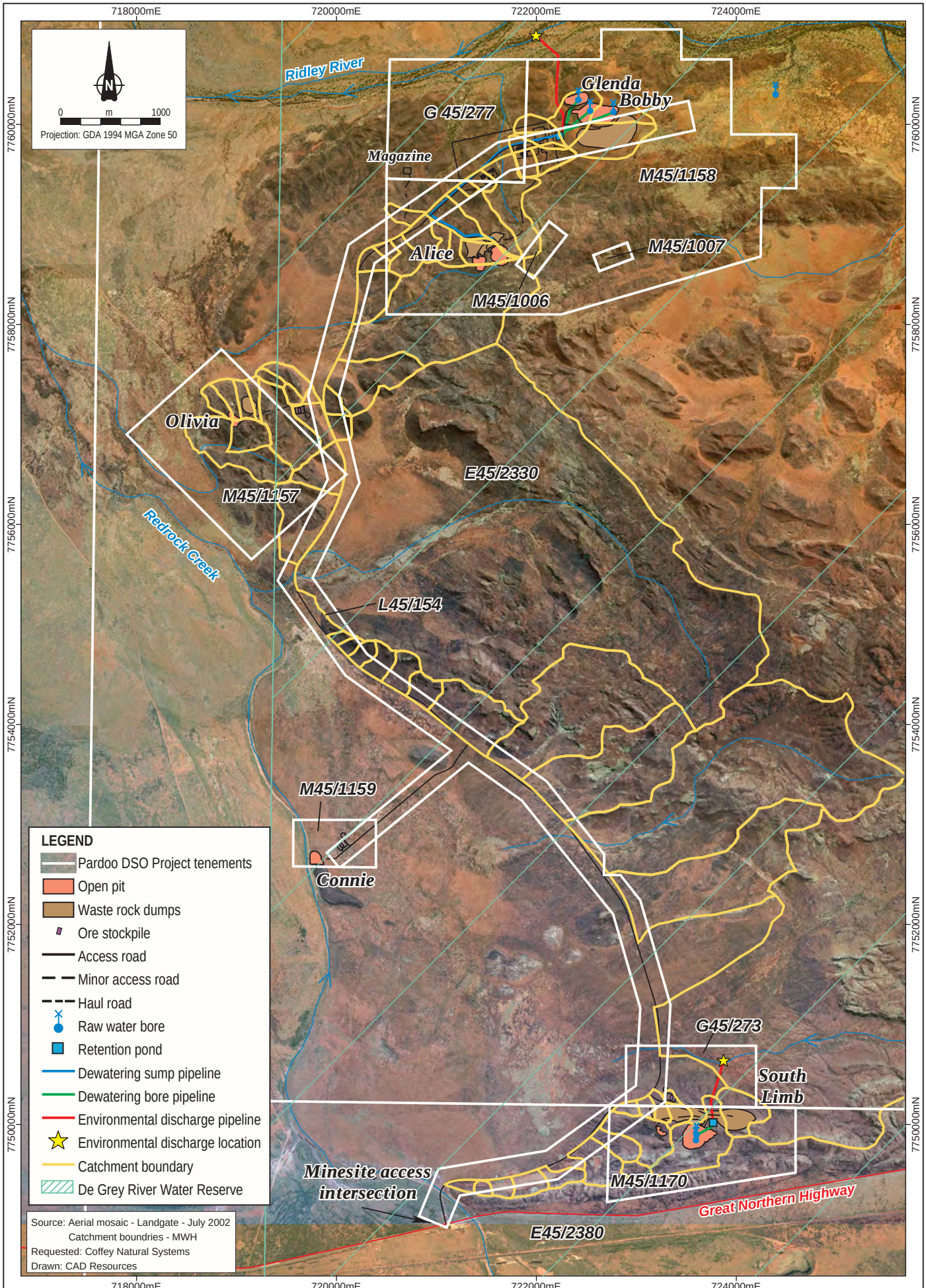
The work undertaken as part of the groundwater assessment included a desktop review of available hydrogeological reports and data, a site-based drilling and testing program, and numerical hydrogeological modelling to determine the feasibility of dewatering and assess potential impacts.

Surface Water Environment

The minesite is located within the Ord Range, approximately 80 m above the De Grey River Basin. The range is characterised by small catchments and ephemeral drainage lines approximately 20 to 30 m deep. Four watercourses bound the minesite: the Strelley and De Grey rivers to the east, the Ridley River to the north and Redrock Creek to the west (Figure 3.1).

Streamflow is completely dependent on rainfall and all the streams adjacent to the Pardoo DSO Project minesite are dry most of the year. High runoff conditions are expected at the minesite due to the exposed banded iron formation (BIF) and sparse vegetation cover on the slopes of the range.

Observed total dissolved solids (TDS) concentrations in the Ridley River range from 2,200 mg/L to 20,000 mg/L. The higher TDS values were observed in ponded water within the riverbed. Regular sampling of the De Drey River is conducted by the Department of Water (DoW) at the Coolenara Pool near the De Grey Bridge.



ATLAS IRON LIMITED	Job No: we08030	Atlas Iron Limited	Figure No: 3.1
	File No: g1410_EMP_f003	Pardoo DSO Project	Local catchment boundaries

This data provides background surface water concentrations upgradient of the project area concerning the De Grey River.

The critical storms affecting the drainage system within the Ord Range are short-duration events measured in hours, whereas the storms affecting the larger surrounding watercourses (De Grey and Ridley rivers, Redrock Creek) with their vast floodplains, are long-duration events measured in days. In March 2007, there were two significant rainfall events from cyclonic weather systems, Cyclone George and Cyclone Jacob. These systems generated significant flooding of rivers east of Port Hedland, and particularly of the De Grey River (Plate 3.1 and 3.2).

Groundwater Environment

Hydrogeology. The Pardoo DSO Project minesite comprises a number of distinct hydrogeological and geological units. The aquifers at the minesite include:

- Redrock Creek alluvials.
- Ridley River and De Grey River alluvials.
- Other alluvials.
- Channel iron deposits (CID).
- Canning basin sediments.
- Archaean mineralised bedrock.

Groundwater Levels. The regional watertable at the minesite mimics that of the topography, with water levels being as high as 62 m Australian height datum (AHD) in the highest parts of the range and the radial flow away from the high areas being down to 6 m AHD in the floodplain, immediately to the north of the Bobby deposit. Very steep hydraulic gradients exist in the steepest parts of the topography.

In the CID area, groundwater levels within the deposit appear to be perched several metres above the surrounding areas, with a radial groundwater flow away from the base of the CID.

Based on monitoring of data loggers within the minesite and data from the Water Corporation, annual groundwater level fluctuations are in the range of 1 to 2 m per annum.

Groundwater Quality. Groundwater quality varies from near potable to brackish. TDS range from 770 mg/L at the Connie deposit to 5,500 mg/L at the Olivia deposit. Water quality within the bedrock of the Ord Range is generally fresher in the higher in the groundwater system, with water quality becoming more brackish further down the groundwater-flow path. Water quality within the alluvial sequence associated with the minesite is highly variable (400 to 2,500 mg/L TDS) but predominantly brackish.

Water samples collected to date are all magnesium-sodium-chloride or sodium-chloride type water. No significant environmentally sensitive water quality elements or dominant ions have been observed in the results to date. Samples show a predominately neutral pH ranging from 7.2 to 8.2.

Photo credit: Ken Brinsden

Plate 3.1
Ridley River and surrounds (location approximately 5 km east of the proposed mining operations centre) after flooding caused by Cyclone George in March 2007.

Photo credit: Ken Brinsden

Plate 3.2
Redrock Creek (near South Limb pit) after flooding caused by Cyclone George in March 2007.

Water quality in the main alluvial paleochannel of the De Grey River Water Reserve borefield is generally between 400 and 800 mg/L TDS. Away from the main paleochannel and to the west-northwest, the TDS are reported to increase to as high as 4,000 mg/L.

Groundwater Recharge and Discharge. Groundwater recharge rates are considered relatively low, and active recharge is principally limited to the creek and river lines, as well as to the mineralised iron ore units. Recharge to the alluvial aquifers of the Pardoo DSO Project area occurs mainly from flood events in the De Grey and Ridley rivers. As floodwaters swell the available drainages, overbank floodwater deepens and expands, covering a large part of the low-lying alluvial deposits in the project area.

The other source of groundwater in the Pardoo DSO Project area is recharge from direct rainfall. Direct rainfall averages 314 mm per annum and typically occurs in the form of smaller rainfall events during the winter months of June, July and August, and sporadic larger cyclonic storms in the summer months. Incidental rainfall is not a significant source of groundwater recharge to the mineralised aquifers, as evaporation rates in the area (8 mm per day) exceed the average annual rainfall total.

Groundwater- and Surface-water Dependant Ecosystems

A subterranean fauna assessment (of stygofauna and troglofauna) at the minesite has shown that the geological and hydrogeological units of the minesite support subterranean fauna, which is groundwater-dependent.

Woodman Environmental Consulting Pty Ltd conducted the flora and vegetation studies and a project impact assessment. The potential for significant impacts to flora and vegetation resulting from groundwater abstraction and then environmental discharge is considered unlikely (Woodman, 2007). It is likely that the overstorey of a number of vegetation types found on the minesite rely on local groundwater, for example, *Eucalyptus victrix*, *Corymbia flavescens*, *Bauhinia cunninghamii* and *Acacia inaequilatera*. These vegetation types, however, are not restricted to the minesite or to the zone of influence associated with the cone of depression.

Water Resource Users

The two main uses of groundwater within the local region are for pastoral activities and as a public drinking water supply (Water Corporation) for the Town of Port Hedland.

The majority of the proposed minesite is situated within the De Grey River Water Reserve, which is classified as a Priority 1 (P1) source protection area. Wellhead protection zones are also defined to protect groundwater sources from contamination in the immediate vicinity of production wells. Wellhead protection zones are usually circular, with a radius of 500 m in P1 areas. The existing Namagoorie and proposed Bulgarene wellfields are less than 25 km east and 5 km northeast of the minesite respectively.

The De Grey River pastoralist currently extracts groundwater from a borehole (Western Gates Well) approximately 8 to 10 km east of the proposed minesite. Limited data is available in respect to pastoral activities and the associated use of groundwater

resources. Stockwater with an electrical conductivity (EC_e) of less than 3,000 µS/cm is preferred.

Areas of Significance

The De Grey River is listed in the Directory of Important Wetlands in Australia. The Pardoo DSO Project minesite is some 6 km from the De Grey River and is not expected to cause any direct impacts to this system.

Makanykarra Pool and other significant semi-permanent and permanent pools are generally more than 10 km east of the nearest pit that requires dewatering. The numerical model prediction of the cone of depression does not impact on these areas.

3.2.3 Regulatory Requirements

The management measures contained in the Water Management Plan have been developed in general accordance with the provisions of the *Environmental Protection Act 1986* and the *Rights in Water and Irrigation Act 1914*. The Department of Environment and Conservation (DEC) and DoW are the administering authorities for these Acts respectively.

An overview of the relevant provisions of these Acts is provided below.

Environmental Protection Act 1986

Part IV Environmental Impact Assessment. Part IV of the Environmental Protection Act establishes provisions for the Environmental Protection Authority (EPA) to undertake formal environmental impact assessments on proposals that may have a significant impact on the environment and the setting of statutory conditions by the Minister for the Environment. The Pardoo DSO Project is currently undergoing a formal assessment under Part IV of the Environmental Protection Act, at a PER level of assessment. Should the proposal be approved, the Pardoo DSO Project will be managed in accordance with any regulatory conditions (within the Ministerial Statement) that are applied to the proposal at completion of the PER assessment.

Part V Licensing. Part V of the Environmental Protection Act requires that owners of 'prescribed premises' hold a works approval prior to construction and an operating licence prior to operations commencing. The Pardoo DSO Project will be classified as a prescribed premise as it exceeds the production and/or design capacity for the following categories listed under Schedule 1 of the Environmental Protection Regulations 1987:

- Category 05 – Processing or Beneficiation of Metallic or Non Metallic Ore.
- Category 06 – Mine Dewatering.
- Category 52 – Electric Power Generation.
- Category 85 – Sewage Facility.

Once issued, the licence will contain a number of general and specific conditions relating to the operation of the minesite. This licence is likely to include stringent conditions on discharge water quality in order to manage potential impacts to the De Grey River Water Reserve.

This Water Management Plan will be reviewed and revised if necessary to reflect any licence conditions that may affect the management of water resources at the Pardoo DSO Project minesite.

Rights in Water and Irrigation Act 1914

Overview. The DoW regulates the use of water in Western Australia through powers assigned to it under the Rights in Water and Irrigation Act. There are 52 groundwater and 22 surface water management areas proclaimed under the Rights in Water and Irrigation Act. These include the Pilbara region groundwater and surface water systems, including the aquifers and waterways present at the Pardoo DSO Project minesite.

Two types of licences and a permit constitute the regulatory system that the DoW uses to administer the use of water in Western Australia under the Rights in Water and Irrigation Act. These are:

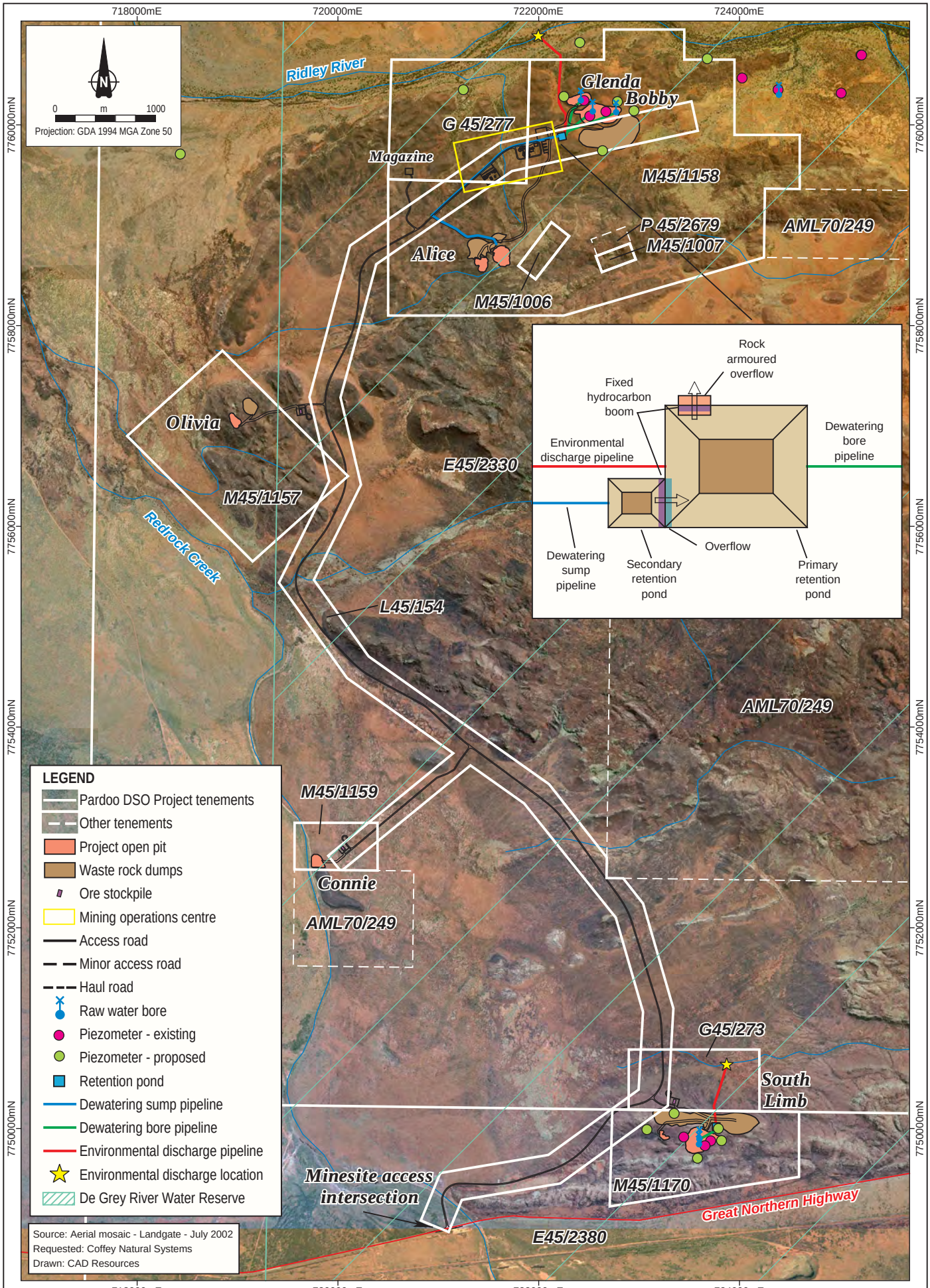
- Well licences – required under Section 26D of the Rights in Water and Irrigation Act to construct or alter any artesian well or non-artesian wells in proclaimed areas. A 26D well licence on its own does not give the holder right to take water from the well.
- Permits – are issued to allow the holder to construct or interfere with the bed or banks of a watercourse which is accessible by a public road or reserve. This permit also enables the holder to build or alter a dam on a proclaimed or prescribed watercourse or wetland. Similarly as with a 26D well licence, this permit does not give the holder the right to take any of the water collected by the activity authorised by the permit.
- Licences to take water – issued under 5C of the Rights in Water and Irrigation Act to allow holders to take water in proclaimed or prescribed areas.

The following provides a summary of the Rights in Water and Irrigation Act licences and permit currently held or likely to be required for the Pardoo DSO Project.

Well Licences. Atlas has some test bores under a 26D licence, which is set to expire on 30 November 2007. Atlas will obtain well licences for all mine dewatering (production) bores, potable bores and monitoring bores at the Pardoo DSO Project minesite under Section 26D of the Rights in Water and Irrigation Act. These licences will be sought from the DoW as required (i.e., as existing bores are decommissioned and new ones are required to dewater mining areas).

Bed and Banks Permits. Atlas has obtained bed and banks disturbance permits for construction of the exploration access track into the project area. However, further bed and banks permits will be required for the construction and operation of the two proposed environmental discharge points (Figure 3.2).

These permits will be sought from the DoW prior to disturbance of the defined drainage lines that might be used for access to construct or maintain the environmental discharge locations.



ATLAS IRON LIMITED	Job No: we08030	Atlas Iron Limited	Dewatering and monitoring infrastructure	Figure No: 3.2
	File No: g1410_EMP_f004	Pardoo DSO Project		

Licence to Take Water. A 5C licence will be required to allow dewatering activities to occur. As part of this licence, an operating strategy will also be required for the Pardoo DSO Project.

The Water Management Plan will be reviewed and revised if necessary to reflect any 5C licence conditions or elements of the operating strategy that may affect the management of water resources at the Pardoo DSO Project minesite.

3.2.4 Consultation

Stakeholder comments relating specifically to the management of water have been provided in Table 3.1.

The comments outlined in Table 3.1 have been considered in developing the management actions outlined in the Water Management Plan. Issues identified by ongoing consultation will be considered within subsequent reviews of this management plan.

Table 3.1 Water management issues identified during stakeholder consultation

Stakeholder	Issue/Comment
EPA	The implementation of a monitoring program for vegetation affected by changes in surface hydrology should be developed in consultation with DEC. Any monitoring program should identify trigger levels for changes in vegetation condition and the mitigation measures that will be implemented in the event that a trigger level is exceeded.
	In order to adequately manage the effects of brackish discharge water on the surrounding environment trigger levels should be established with detailed contingency plans in the event that monitoring identifies any adverse changes to the surrounding environment.
	Overflow of retention ponds does not allow for water quality and quantity monitoring prior to discharging into environment.
DoW	Groundwater resource impacts need to be assessed, including dewatering impacts (this may include vegetation impacts from drawdown of water table). Management/amelioration of predicted impacts needs to be discussed in detail.
	Detailed environmental management strategies are needed for protecting water resources.
	Need to refer to the Water Quality Protection Guidelines and apply their requirements to the project, particularly regarding chemical and hydrocarbon storage and use. Also refer to requirements for what activities are permitted on water reserves at various protection levels.
	Strict conditions will likely be imposed on discharge water quality and on possible environmental impacts of discharge.
	The project should commit to developing a Water Management Plan to describe the management of all surface and groundwater issues within the project. These issues can then be managed as per a DoW-approved Operating Strategy subject to annual audit. In such a case, an Operating Strategy will automatically be required.
	The proponent will need to demonstrate that the recycled wastewater has been treated to a level that its use for irrigation will not pose a threat to the water supply.
	If an explicit commitment to backfilling is not made, the DoW would require that the proponent sets up a more comprehensive monitoring program to monitor and manage the potential impacts.

Table 3.1 Water management issues identified during stakeholder consultation (cont'd)

Stakeholder	Issue/Comment
DEC	Detail water use efficiency management measures at the site and at the port.
	Management should address: • Avoidance of impact on significant areas and values where possible. • Minimising disturbance footprint. • Groundwater-dependent ecosystems. • Excess water creation and discharge impacts including location, quality and quantity. • Final void retention. • Water quality. • Weed hygiene and management – a weed management plan will be required.

3.2.5 Potential Impacts

Potential impacts and risks to surface water and groundwater that may arise as a consequence of the proposed Pardoo DSO Project include:

- Disturbance to natural groundwater levels, flow and quality as a consequence of mine dewatering, water discharge and through the creation of pit voids. This may have ecological impacts such as restricting the amount of or altering subterranean fauna habitat and reducing the amount of water available to groundwater-dependent vegetation.

- Increased sediment runoff from disturbed ground and stockpile materials associated with the mining operation.

- Modification and interruption of existing natural drainage channels resulting from the construction of the access and haul roads, and development of mine pits, waste rock dumps and infrastructure.

- Disturbance to natural surface-water levels, flow and quality as a consequence of mine dewatering discharges or accidental overflow of water retention ponds during extreme weather events. Such disturbance may temporarily alter existing vegetation communities.

- Degradation and contamination of groundwater sources caused as a consequence of hydrocarbon or chemical spills, waste rock stockpiles, and inappropriate waste management.

- Unacceptable impacts to the De Grey River Water Reserve water quality or quantity, or to other users of the groundwater resources.

- Formation of two pit lakes in two final voids (i.e., Bobby and South Limb) following mine completion. Preliminary solute modelling (MWH, 2007) indicates that the pit lakes are likely to become saline over time. Mine completion is further discussed in the Conceptual Mine Completion and Rehabilitation Plan (Section 3.9).

3.2.6 Management Practices

Mine Dewatering

Dewatering is proposed for Bobby, Glenda, Alice East and South Limb pits as the optimised pit shells extend below the water table. Dewatering will be undertaken primarily using dewatering bores inside the pits (Figure 3.2), apart from Alice East, which will be dewatered by an in-pit sump once mining reaches the depth of the water table. Bobby and Glenda combined, and the South Limb pits will contain three and two dewatering bores respectively, to maintain dewatering rates and ensure that monitoring of abstraction rates will continue if one of the bores within each pit is disturbed during mining activity.

As the dewatered pits are mined, the dewatering bores will be continually re-established as they are mined through. As the pits approach final depth, however, in-pit sumps will be used to dewater seepage and incidental rainfall. Water from the in-pit bores will be pumped to the primary retention pond for storage until it is either used in dust suppression and vehicle and mobile plant washdown, evaporates or is discharged into the secondary retention pond (Figure 3.2). The delay between the sump and the primary retention pond will allow for the settling of the sediment load in the sump water prior to the water entering the primary retention pond. The overflow from the secondary retention pond to the primary retention pond will be rock armoured, and a hydrocarbon boom will be fixed in position across the overflow to skim off any inadvertent hydrocarbon contamination arising from the pit machinery.

The dewatering strategy will involve the monitoring of flow rates, bore water levels, bore water quality, retention pond water levels and excess water discharge quality as detailed in Section 3.2.13. Monitoring bores (i.e., observation bores and compliance bores) will be used to register the drawdown of the water level and the recovery of water levels. The data obtained from regular measurement of the monitoring bores will provide validation of the numerical groundwater model as generated by MWH.

The pit voids of Glenda, Alice East and South Limb West, will be partially backfilled with waste rock from adjacent pits. The pits will be backfilled to at least 2 m above the pre-mining water level to eliminate any potential evapo-transpiration loss via capillary action.

Excess Water Discharge

There are two proposed excess water discharge points at the Pardoo DSO Project minesite. One discharge point is into a defined drainage channel to the north of the South Limb stockpile area from the southern retention pond, and the other into the defined channel of the Ridley River to the north of the Bobby pit, from the northern retention pond (see Figure 3.2).

The water discharged at these locations will be piped from the individual retention ponds and discharged on a continuous basis while there is excess water. The outlets of the environmental discharge pipes will be rock armoured to prevent scouring and fixed in position.

'Clean' water derived from the retention ponds will be used for dust suppression and washdown requirements at the crushing plant and on haul roads. This management action will reduce the quantity of water discharged from the environmental discharge points.

The Pardoo DSO Project will require licensing for mining operations under Part V of the Environmental Protection Act (Section 3.2.3). Strict conditions on discharge water quality are likely to be applied to this licence to manage the potential impacts to the De Grey River Water Reserve. Unless otherwise stated in the operating licence, Atlas proposes to monitor the discharge water on a regular basis to ensure that the discharge meets the water quality criteria required. Atlas intends to develop performance criteria and contingency actions for discharge water quality following the collection of further baseline data for both surface water and groundwater. Monitoring for the environmental discharge points is summarised in Section 3.2.7.

Management of discharge water quality will involve a tiered management approach. Management actions that will be undertaken, in the order presented below, in the event of an unacceptable and significant breach of identified trigger levels are:

1. Cease discharge of water.
2. Identify the source of contamination.
3. Remove the cause of contamination.
4. If cause of contamination cannot be determined or removed within a reasonable timeframe, investigate and initiate treatment of water discharge if environmentally acceptable.
5. If the cause of contamination cannot be determined or removed, water cannot be treated, and the retention pond reaches the freeboard level[1], cease dewatering until the above points are resolved.

The outcomes of any of the above actions will be reported to DEC and DoW.

To adequately manage any potential impacts of excess water discharge on vegetation that is in close proximity to water discharge points, vegetation condition will be monitored in such areas (refer to the section below regarding surface-water and groundwater-dependent ecosystems for further detail on management measures). This will allow for comparison between water quality parameters, discharge volume and vegetation condition.

As outlined in Section 3.2.5, there is potential for the water retention ponds to overflow during extreme weather events and therefore discharge to the environment without the

[1] The water retention ponds will be fitted with an automatic device to ensure that a freeboard of at least 1 m is maintained. Should the freeboard level be reached, the dewatering bores will stop automatically to avoid overfilling.

management measures that would be undertaken if the water were discharged via the excess water discharge points. The overflow water may potentially contain hydrocarbons (however the retention ponds have been designed with a hydrocarbon boom) or higher sediment loads.

Given that overflow of the retention ponds would involve extremely high volumes of rainfall, it is anticipated that any contaminant in the overflow water would be sufficiently diluted and that the sediment load would be similar to that of the remaining catchment runoff (Plate 3.1 and 3.2). Therefore, no contingency actions are proposed for overflow of the water retention ponds, however, the water retention ponds will be monitored as a component of the surface water monitoring program as outlined in Sections 3.2.7 and 3.2.12.

Catchment Disturbance

A number of management measures will be adopted during ground-disturbing activities to minimise sediment runoff from disturbed ground and stockpiled materials, and to minimise modification and/or interruption of existing natural drainage lines. These management measures include the following:

- Surface water from undisturbed upstream catchment areas will be directed around pit and waste rock dump perimeters by means of cut channels, fill bunds, and, where necessary, culverts. These structures have the potential to divert water away from the existing natural channel, however, since the pit and waste rock dump areas are small, the extent of any diversion will be minimal. In most cases, diverted water will be directed back into the original waterway within a short distance of the pit or waste rock dump. No drainage scheme has been repaired for Connie pit due to its small area and lack of drainage.

- Any internal silt-laden flows through waste rock dumps will be routed to a sediment pond, designed to allow 85% of suspended solids to settle, prior to flows entering the downstream receiving environment. Sediment ponds will also be located immediately downstream of the mining operations centre and water retention ponds to prevent surface water runoff from entering the environment. The sediment ponds will be inspected prior to and after extreme weather events such as cyclones.

- In the long term, waste rock dumps will be rock armoured to minimise erosion and sediment migration to the downstream environment. Dispersive material, such as shales and clay, will be encapsulated in the waste rock dumps and surrounded by more competent lithologies.

- Culverts, overflows and floodways will be incorporated into the road designs to maintain natural drainage patterns and carry extreme flows across road surfaces (at the approximate locations of the existing drainage lines).

- Nominated surface water sampling locations, such as permanent pools within the De Grey and Ridley rivers, will be monitored for field parameters (including turbidity), as outlined in Section 3.2.13.

Sewage Effluent

Sewage waste from the sewage treatment and storage facility (including liquor and sludge) will be produced on site, although in low volumes, due to the relatively small workforce and the lack of a minesite accommodation facility.

A licensed contractor will remove both sewage sludge and liquor off site. Management of sewage waste is further addressed in the Waste Management Plan (Section 3.6) and will not be considered further in this Water Management Plan.

Storage and Use of Potential Contaminants

All water from potentially contaminating areas (e.g., workshops and washdown areas) will be collected via a closed system. Water will pass through two retention ponds and hydrocarbon booms, where it may evaporate or be discharged to the environment.

The degradation and contamination of surface-water resources caused by hydrocarbon or chemical spills, waste rock dumps and waste, will be further prevented and managed in the following ways:

- Waste rock will be managed in accordance with the Conceptual Mine Completion and Rehabilitation Plan (Section 3.9).
- Other project-generated waste will be managed in accordance with the Waste Management Plan (Section 3.6).
- Hydrocarbons, chemicals and dangerous goods will be managed in accordance with the Hydrocarbons and Dangerous Goods Management Plan (Section 3.7).

As the management of potential contaminants is addressed in other sections of this EMP, they will not be discussed further within this Water Management Plan.

Groundwater- and Surface-water Dependent Ecosystems

During the environmental impact assessment and approvals process for the Pardoo DSO Project, stakeholders raised their concerns that the proposed drawdown of groundwater and the disposal of excess water could adversely affect vegetation. In addition, groundwater drawdown can also affect subterranean fauna.

To assess the impacts of groundwater drawdown and excess water discharge on vegetation, an integrated monitoring program will be developed following recommendations of specialist consultants and in consultation with the DEC. Groundwater monitoring will include monitoring of groundwater drawdown within plant community W7 (which is thought to be groundwater-dependent) (refer to Figure 3.3 of Flora and Vegetation Management Plan, Section 3.3) both inside and outside of the predicted cone of depression caused by dewatering the mine pits. Monitoring will be undertaken before, during and after dewatering of Bobby and Glenda pits. Corresponding permanent plots for monitoring vegetation condition will be established if considered necessary by specialist consultants.

Water from mine dewatering will be monitored at the points of discharge and compared

with vegetation condition in areas of close proximity to environmental discharge points (refer to Figure 3.3 of the Flora and Vegetation Management Plan, Section 3.3). Surface water discharge monitoring will occur throughout the duration of the discharge. Vegetation condition monitoring will occur throughout the duration of the discharge and after discharge ceases, continuing until the relevant performance indicators are met.

The monitoring program for groundwater and surface water is outlined in Section 3.2.13. Management of vegetation (including vegetation condition monitoring) and subterranean fauna is discussed within the Flora and Vegetation Management Plan (Section 3.3) and Fauna Management Plan (Section 3.4) respectively, and therefore, is not considered further in this management plan.

A summary of actions identified for the management of surface water and groundwater is provided in Section 3.2.12.

3.2.7 Monitoring

The monitoring activities proposed for Atlas to support its water management commitments are summarised in Table 3.2.

Table 3.2 Summary of water monitoring

Item	Parameter	Purpose
Excess water discharge	Water quality as per the water monitoring schedule (Section 3.2.13).	To monitor discharge impacts and ensure that environmental discharge is within relevant standards.
	Water discharge volume.	To monitor environmental discharge volumes and compare with groundwater levels and vegetation condition.
Mine dewatering	Groundwater level.	To monitor changes in groundwater levels and so determine if the conceptual and modelled understanding of the Pardoo DSO Project groundwater systems is still valid.
	Dewatering volume.	To ensure that dewatering volumes are optimised, and do not exceed the licensed amount.
Catchment disturbance	Inspection of sediment ponds.	To monitor changes in turbidity and so determine if and/or where further management of surface water is required.
	Monitoring of field parameters at nominated surface water locations as per water monitoring schedule (Section 3.2.13).	To establish regional baseline surface water quality and background variability.
Groundwater- and/or surface-water-dependent ecosystems	Groundwater level.	To monitor changes in groundwater levels and compare data with the monitoring of groundwater-dependent vegetation condition (Section 3.3.7 of Flora and Vegetation Management Plan).

A conceptual monitoring schedule is provided in Section 3.2.13. The monitoring locations are shown in Figure 3.2.

Results will be recorded in frequency, as indicated in Section 3.2.13, and will be reported annually in the Annual Environmental Report (AER), and as often as required by DoW under the 5C Licence of the Rights in Water and Irrigation Act. Reporting to DoW will occur in the event that water monitoring indicates that trigger levels for contingency actions (Section 3.2.8) have been exceeded.

3.2.8 Contingency Actions

Contingency actions that will be undertaken in the event of an actual or perceived exceedence of triggers are provided in Table 3.3.

Table 3.3 Contingency water management actions

Trigger for Action	Contingency Action Required
Discharge water quality triggers will be developed following analysis of further baseline monitoring and consultation with DoW (possible standards to be applied are the Australia and New Zealand Environment and Conservation Council (ANZECC) livestock drinking water standards).	• Cease discharge of water. • Identify the source of contamination. • Remove the cause of contamination. • If cause of contamination cannot be determined or removed within a reasonable timeframe, investigate and initiate treatment of water discharge if environmentally acceptable. • If the above points are not resolved, and the retention pond reaches the freeboard level, cease dewatering until the above points are resolved. • Report outcomes to DEC and DoW.
Sediment plumes are evident downstream of areas disturbed as a result of mining activity.	• Investigate cause of sediment increase. Check sediment traps, bunds and diversion drainage, and rectify cause as appropriate. • Undertake remediation and/or rehabilitation within the affected area.
Specific triggers for groundwater quality will be developed following the expansion of the baseline data collection program. Trigger levels will be based on location- and aquifer-specific data.	• Identify source of water quality change. • If the change is due to activity that can be modified, remove the cause as appropriate. This may include further optimising the rate of dewatering. • Treat water prior to discharge.
Observed groundwater levels divert from the modelled change.	• Investigate options to further optimise dewatering. • Recalibrate groundwater model. • If groundwater model indicates a greater than expected impact, report to DoW. • If observed in areas within or near groundwater dependent vegetation, implement measures to mitigate the impacts, as outlined in the Flora and Vegetation Management Plan (Section 3.3).
Dewatering flow rate indicates that licensed annual allocation of groundwater might be exceeded.	• Decrease dewatering rate. • Notify DoW.

3.2.9 Performance Indicators

Table 3.4 below illustrates the conceptual performance indicators and corresponding targets that will be used to track progress in achieving the water management objectives. Targets were developed with the intent of being achievable given the project constraints and to provide a measurement of success for each performance indicator, rather than providing project goals for each objective.

Table 3.4 Conceptual water management performance indicators

Item	Performance Indicator	Target
Objective 1. *To ensure that the quality of water returned to local surface water resources will not result in a deterioration of those resources.*		
Excess water discharge	Quality of water discharged from environmental discharge points	• Targets for water discharge will be developed following an analysis of further baseline monitoring and consultation with DoW (possible standards to be applied are the ANZECC livestock drinking water standards).
Catchment disturbance	Maintenance of sediment ponds.	• All sediment ponds are maintained regularly (as indicated by audits).
Objective 2. *To minimise the short and long-term impacts on groundwater resources caused by mining operations and groundwater use.*		
Mine dewatering	Groundwater levels	• No significant divergence from predicted pattern of groundwater drawdown as predicted by MWH (2007) model. • Specific targets for groundwater levels will be developed following the expansion of the baseline data collection program. Targets will be based on location - and aquifer-specific data.
Mine dewatering	Dewatering volume	• No exceedence of licensed amount during dewatering activities.
Mine dewatering	Groundwater quality	• Specific targets for groundwater quality will be developed following the expansion of the baseline data collection program. Targets will be based on location- and aquifer-specific data. • Long-term groundwater quality monitoring confirms water quality modelling.
Objective 3. *To minimise adverse impacts to surface-water or groundwater-dependent ecosystems caused as a result of mining operations.*		
Groundwater- and surface-water-dependent ecosystems	Groundwater levels	As above.
	Groundwater quality	As above.

Guidance on setting targets for excess water discharge quality has been taken from the ANZECC livestock drinking water guidelines (ANZECC & ARMCANZ, 2000). The ANZECC standards may be appropriate given that the receiving waters of the excess water discharge (i.e., the Ridley River and Redrock Creek) flow intermittently and contain

brackish water when flowing. Targets will be developed using the ANZECC standards as a guide, following analysis of further baseline sampling at nominated locations (Section 3.2.13) and consultation with DoW.

All other performance indicators are based on known baseline conditions at the minesite and variations from baseline levels.

3.2.10 Roles and Responsibilities

Operations Manager

The Operations Manager in charge of the project will ensure that appropriate resources are provided to implement the actions outlined in this Water Management Plan. The Operations Manager has the overall responsibility to ensure that all activities conducted regarding the Pardoo DSO Project are undertaken in accordance with the IMS, this Water Management Plan and the other regulatory requirements.

Pardoo General Manager

The Pardoo General Manager is responsible for ensuring that all personnel are working in accordance with this management plan. This includes ensuring that all personnel participate in the induction program and undertake relevant training.

Senior Environmental, Health and Safety Specialist

The Senior Environmental, Health and Safety Specialist will work with the Pardoo General Manager to ensure that all management actions contained in this Water Management Plan are implemented. The Senior Environmental Health and Safety Specialist will coordinate audits and monitor progress as outlined in Section 3.2.11 below.

Field Technician

The Field Technician will work with the Senior Environmental Health and Safety Specialist to ensure that the water monitoring requirements in this Water Management Plan are implemented, and to carry out the field work required under the routine monitoring program. The Field Technician will compile field information as well as laboratory analytical data, and report any potential non-compliance issues to the Senior Environmental Health and Safety Specialist.

Contractor Managers

The Contractor Managers will work with the Senior Environmental Health and Safety Specialist to ensure that management actions contained within this Water Management Plan are implemented. The Contractor Managers are responsible for supporting and promoting key issues regarding water management within the minesite and ensuring that personnel implement requirements of the Water Management Plan where relevant.

All Personnel and Contractors

All personnel and contractors are responsible for adhering to the procedures outlined in this Water Management Plan where relevant. All personnel will provide assistance in implementing this plan and report any non-compliance to their respective manager.

3.2.11 Records and Reporting

The Senior Environmental Health and Safety Specialist will coordinate or conduct regular audits (i.e., at least two per annum) of the minesite to ensure compliance with the water management objectives outlined in Section 3.2.1.

Induction records for all personnel working and visiting the minesite, will include a sign-off by inductees to confirm that water management was discussed. A database containing all induction records and compiled water monitoring results will be developed and maintained on site.

All complied water monitoring results will be reported annually through the AER process, along with any performance non-compliances. This information will also be reported as required under the Rights in Water and Irrigation Act to meet conditions of the 5C licence and Atlas's operating strategy.

3.2.12 Key Management Actions Table

The key management actions provided in Table 3.5 relate specifically to management of surface water and/or groundwater.

3.2.13 Water Monitoring Schedule

The water monitoring schedule provided in Table 3.6 will be used for monitoring of groundwater and surface water at the Pardoo DSO Project minesite. The schedule, in particular the frequency, will be reviewed following the initial collection of baseline data and revised where necessary. If baseline data demonstrates low variability, the frequency of the water monitoring may be reduced after consultation with DoW.

3.3 Flora and Vegetation Management

3.3.1 Objectives

The Flora and Vegetation Management Plan relates to the management of flora and vegetation on the Pardoo DSO Project minesite. The objectives of the Flora and Vegetation Management Plan are to:

- Protect significant flora and vegetation and minimise area of ground disturbance.
- Establish baseline health condition of vegetation.
- Monitor and assess any changes in the health of vegetation after mining and dewatering commences.

Table 3.5 Key water management actions

Reference	Item	Key Management Action	Timing	Reporting/Evidence	Status[1]
WAT01	Excess water discharge	Implement monitoring schedule as per Table 3.7. Compile data set.	Prior to dewatering commencing, ongoing.	AER, reporting under Rights in Water and Irrigation Act.	
WAT02	Excess water discharge	Revise monitoring schedule to reflect operating licence (Part V of the Environmental Protection Act) requirements.	Prior to dewatering commencing if required.	AER, compliance register.	
WAT03	Mine dewatering	Implement groundwater-monitoring schedule as per Table 3.6. Compile groundwater data set.	Prior to dewatering commencing.	AER, reporting under Rights in Water and Irrigation Act.	
WAT04	Catchment disturbance	Implement surface-water monitoring schedule as per Table 3.6. Compile surface-water data set.	Prior to ground disturbing activities.	AER, reporting under Rights in Water and Irrigation Act.	
WAT05	Catchment disturbance	Inspect all sediment ponds prior to and after cyclone season.	Mid December and April. As required (i.e., after cyclone activity).	Internal audits, AER.	
WAT06	Groundwater- and surface-water dependent ecosystems	Implement monitoring schedule as per Table 3.6. Compile groundwater data set and collate with vegetation condition monitoring data set (Flora and Vegetation Management Plan, Section 3.3).	Prior to dewatering commencing.	AER.	

[1] To be completed and updated once regulatory approvals are obtained.

Table 3.6 Conceptual water monitoring schedule

Area	Reason for Monitoring	Frequency	Measurements	Relevant Procedures
Dewatering bores	To ensure that dewatering volumes are optimised, and do not exceed the licensed amount.	Monthly/weekly EC	Water quality suite[1].	Standard water sampling SOP.
		Weekly	Water level.	Standard water sampling SOP.
		Weekly	Dewatering volume (run hours and flow).	None.
Observation bores	To monitor changes in groundwater levels and so determine if the conceptual and modelled understanding of the Pardoo DSO Project groundwater systems is still valid.	Monthly	Water level.	Standard water sampling SOP.
		Quarterly/monthly EC	Water quality suite.	Standard water sampling SOP.
Compliance bores	Groundwater levels in which compliance is compared to. Monitor changes in groundwater level and compare the data with monitoring of groundwater-dependent vegetation condition (Section 3.3.13 of Flora and Vegetation Management Plan).	Continuous logging	Water level.	Standard water sampling SOP.
		Quarterly/monthly EC	Water quality suite.	Standard water sampling SOP.
Nominated surface water locations[2]	To establish regional baseline surface water quality and baseline variability.	Quarterly/monthly EC	Water quality suite.	Standard water sampling SOP.
Excess water discharge	To monitor discharge volume and quality, and ensure that environmental discharge is within relevant standards.	Monthly/daily EC	Water quality suite.	Standard water sampling SOP.
Water balance calculations	To totalise abstraction and sump pumpage and differentiate between usage and discharge to environment.	Weekly	Requires volume totaliser readings from production bores, sump pumps, discharge lines and usage lines.	Abstraction + sump pumping = discharge + usage.

[1] Water quality suite: pH, electrical conductivity (EC), total dissolved solids (TDS), Na, Ca, Mg, K, Cl, SO_4, HCO_3, NO_3, Pb, Cu, Mn, Zn and Fe.

[2] Includes Makanykarra Pool (pending approval from the Ngarla people), Ridley Creek Crossing, Strelley Bridge and water retention ponds.

Objectives that relate to mine completion and rehabilitation are presented in the Conceptual Mine Completion and Rehabilitation Plan (Section 3.9).

3.3.2 Existing Environment

Completed Studies

Woodman Environmental Consulting Pty Ltd (Woodman) undertook a desktop review to identify potential flora species of conservation significance at the minesite. Information was gathered primarily from government databases, including the Department of Environment and Conservation (DEC) Threatened Flora Database, and the *Environmental Protection and Biodiversity Conservation Act 1999* Protected Matters Search Tool. This information was supplemented with species found in previous flora surveys around the Pilbara region, including a flora survey and vegetation mapping, as undertaken previously within exploration lease E45/2330 by Woodman in 2005 for Atlas's exploration activities.

Woodman then undertook a second survey of the minesite in April 2007, approximately six weeks after cyclonic rains. Survey recording sites and the resultant vegetation mapping are illustrated in Figure 3.3.

Vegetation

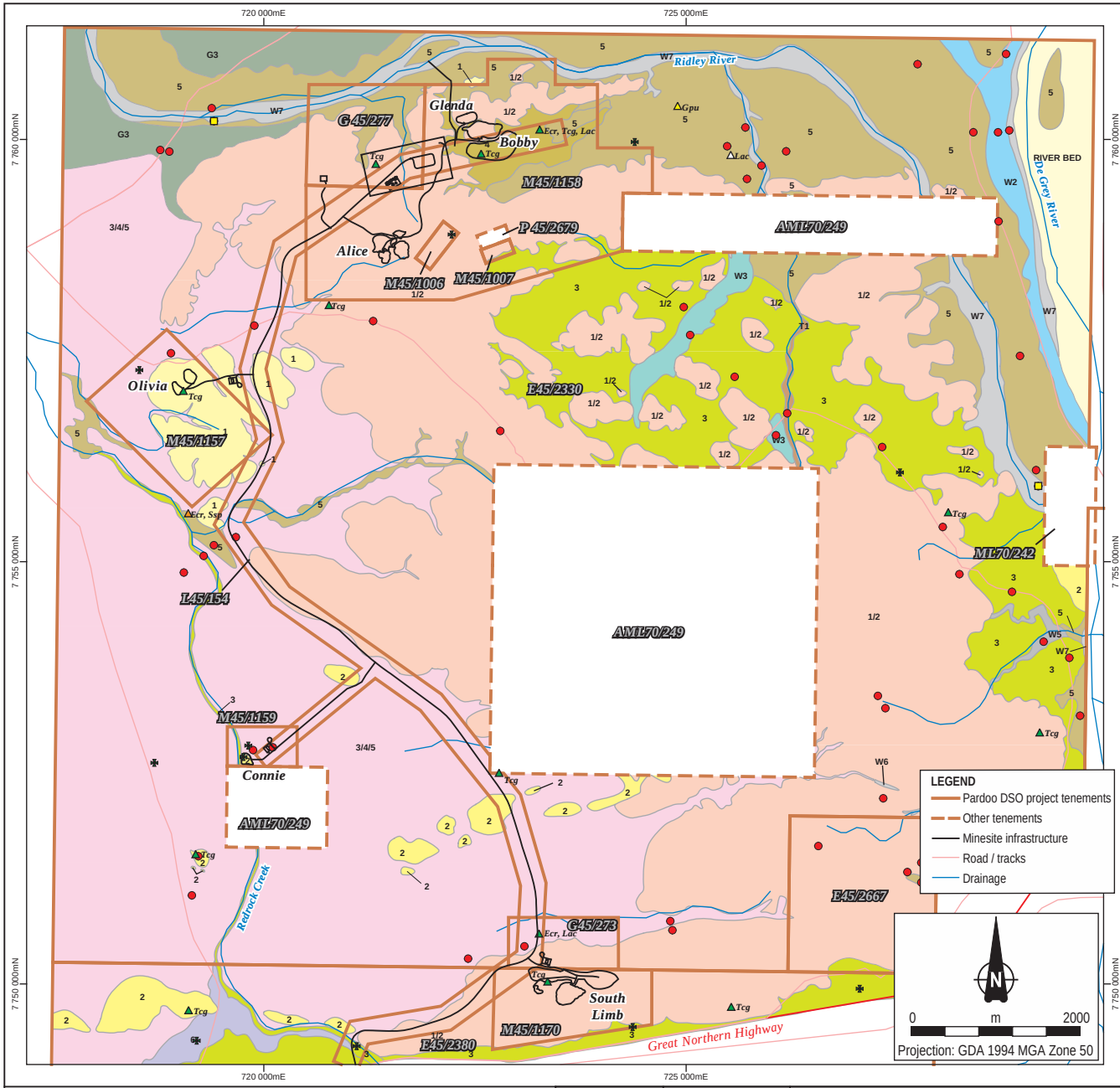
The majority of vegetation consisted of hummock grasslands dominated by *Triodia* species, with occasional shrublands and open woodlands. Figure 3.3 displays the plant communities, floristic community types (FCTs) and flora of conservation significance found within the minesite survey area.

No threatened ecological communities or known ecosystems at risk within the Pilbara 4 subregion (Kendrick and Stanley, 2001) are present within the minesite. Furthermore, vegetation associations found at the minesite, as mapped and defined by Shepherd et al (2002), are at nearly 100 % of the pre-European extent (Woodman, 2007).

Vegetation communities located along the Ridley River and Redrock Creek contain species such *Eucalyptus victrix*, *Corymbia flavescens*, *Bauhinia cunninghamii* and *Acacia inaequilatera* (Figure 3.4). Such species may be dependant on groundwater.

Flora

No Declared Rare Flora (DRF) was recorded within the project area. Three Priority Flora and two unidentified flora species were found within the project area. These flora, along with the number of locations impacted, are summarised in Table 3.7, and their locations depicted in Figure 3.3.



LEGEND

PLANT COMMUNITY MAPPING

Woodlands

W2: Open Low Woodland of *Bauhinia cunninghamii* and *Atalaya hemiglauca* with occasional *Corymbia flavescens* over a Low Grassland of **Cenchrus ciliaris* on brown and red-brown sand on low dunes

W3: Open Low Woodland of *Corymbia flavescens* over Shrubland of *Acacia inaequilatera* and *Pluchea tetranthera* over Grassland of *Triodia epactia* and *Cymbopogon ambiguus* on red-brown loam and silt on drainage flat

W5: Open Low Woodland of *Eucalyptus victrix* over Open Shrubland of *Acacia elachantha* over an Open Tall Grassland of *Chrysopogon fallax* and Open Tall Sedgeland of *Cyperus vaginatus* on red and brown silts, sands and loams in minor drainage lines

W6: Open Low Woodland of *Eucalyptus victrix* over an Open Low Shrubland of *Acacia bivenosa* over a Very Open Tall Grassland of *Cymbopogon ambiguus* and Open Hummock Grassland of *Triodia pungens* and/or *T. epactia* on clays in a creekline

W7: Open Low Woodland of *Eucalyptus* sp. North Pilbara (D. Nicolle 4258), *Eucalyptus victrix* and *Acacia ampliceps* with occasional *Bauhinia cunninghamii*, *Melaleuca leucadendra* and *Atalaya hemiglauca* over an Open Grassland of mixed *Cyperus vaginatus* and **Cenchrus ciliaris* on red and brown sandy loams and silts in major creeklines, the De Grey river banks and in the Ridley River

Thickets

T1: Dense Thicket of *Acacia inaequilatera* with occasional *Corymbia lenziana* and *C. flavescens* over a Very Open Low Grassland of **Cenchrus ciliaris* and an Open Hummock Grassland of *Triodia epactia* on loam in a minor creekline

Grasslands

G3: Dense Grassland of ?*Aristida latifolia* and *Eriachne helmsii* with Open Shrubland of *Acacia ampliceps* in minor creeklines on red cracking clays

FLORISTIC COMMUNITY TYPES

1: Hummock Grassland of *Triodia epactia* on skeletal silt on massive ironstone or ironstone gravels on crests, upperslopes and occasionally lowerslope positions; indicator species include *Portulaca oleracea*, *Indigastrum parviflorum*, *Triumfetta clementii* and *Trianthema triquetra*

2: Hummock Grassland dominated by *Triodia epactia* with occasional *Triodia bitextura* on usually skeletal silt on massive ironstone or quartz on crests and upperslope positions; indicator species include *Gomphrena cunninghamii* and *Triodia bitextura*

3: Hummock Grassland dominated by *Triodia epactia* and *Eragrostis eriopoda*, with occasional Open Shrubland of *Acacia stellaticeps* or *Acacia ?cowleana* on sandy-loam or sandy-clay on undulating plains or drainage areas; indicator species include *Bonamia rosea*, *Eragrostis eriopoda* and *Mollugo molluginea*

4: Hummock Grassland dominated by *Triodia epactia* with **Cenchrus ciliaris* and *Chrysopogon fallax* on sandy-silt to clay-loam soils on lowerslopes, plains and drainage flats; indicator species include *Eragrostis cumingii*, *Euphorbia schultizii*, *Goodenia microptera* and *Pluchea ?tetranthera*

5: Grassland dominated by *Triodia epactia* and **Cenchrus ciliaris* over mixed herb and sedge species with occasional Shrubland of *Acacia synchronicia* on silty-clay soils on drainage flats; indicator species include *Gomphrena* affinis subsp. *pilbarensis*, *Neptunia dimorphantha*, *Ptilotus gomphrenoides* var. *gomphrenoides*, *Acacia synchronicia* and *Cyperus iria*

6: Hummock Grassland dominated by *Triodia secunda* on sandy-loam on seasonally wet floodplain

Mosaics

1/2: Mosaic of Floristic Community Types 1 and 2

3/4/5: Mosaic of Floristic Community Types 3, 4 and 5

SIGNIFICANT FLORA SPECIES

	Species	Priority	WEC
Ecr	*Eragrostis crateriformis* (P3)	Rare	▲
Gpu	*Gomphrena pusilla* (P2)	1	△
Lac	*Lotus* affin. *cruentus*	2	△
Ssp	*Sauropus* sp.	3	▲
Tcg	*Tephrosia* sp. Cathedral Gorge (F.H. Mollemans 2420) (P3)	4	▲
		Other	△
■	**Parkinsonia aculeata*	●	Detailed Recording Sites (2005)
		✠	Permanent Quadrats (2007)

Source: Floristic mapping - WEC

Requested: Coffey Natural Systems

Drawn: CAD Resources

Job No: we08030

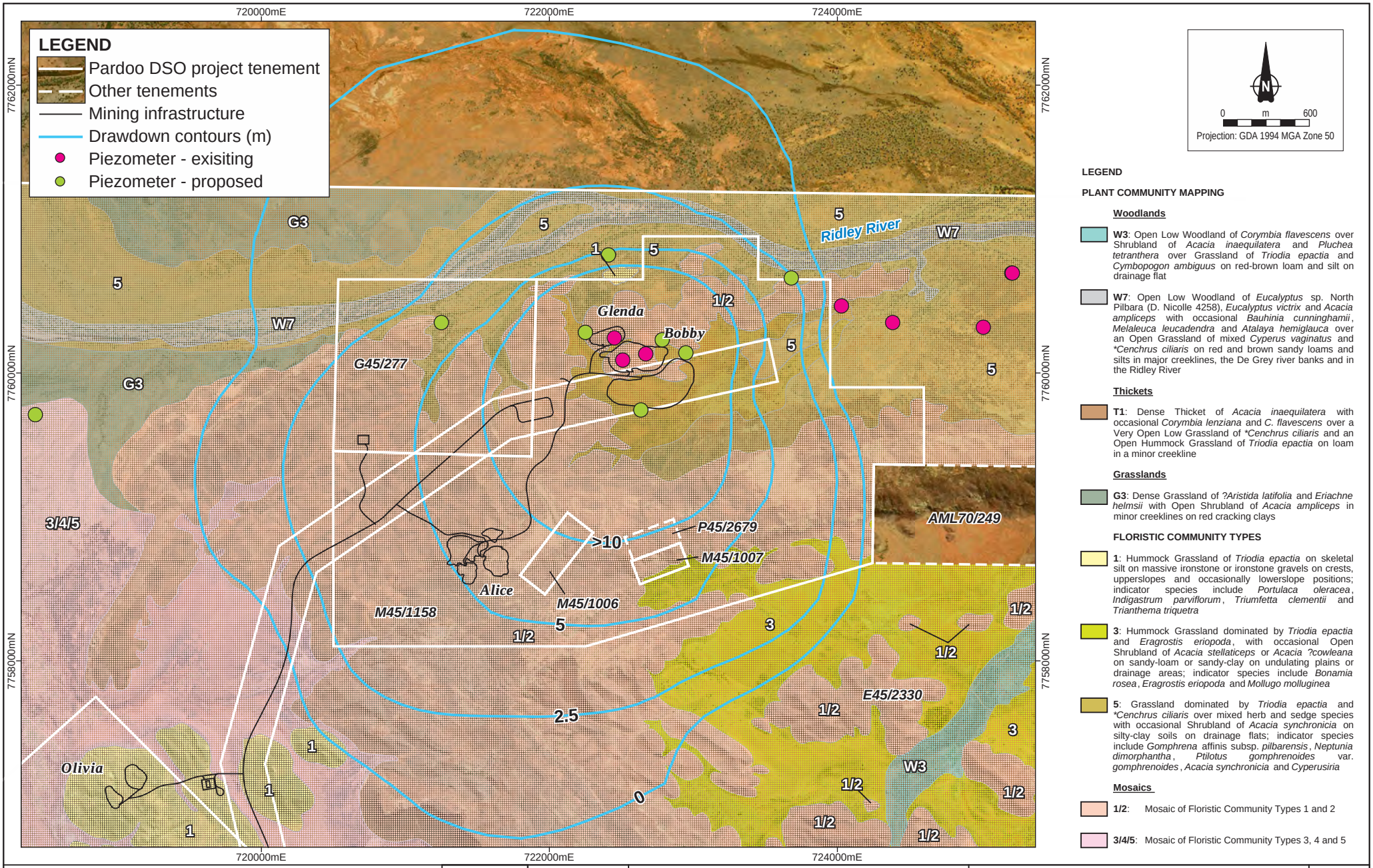
File No: g1410_EMP_f005

Atlas Iron Limited

Pardoo DSO Project

Floristic community types and significant flora species

Figure No: **3.3**



LEGEND

PLANT COMMUNITY MAPPING

Woodlands

W3: Open Low Woodland of *Corymbia flavescens* over Shrubland of *Acacia inaequilatera* and *Pluchea tetranthera* over Grassland of *Triodia epactia* and *Cymbopogon ambiguus* on red-brown loam and silt on drainage flat

W7: Open Low Woodland of *Eucalyptus* sp. North Pilbara (D. Nicolle 4258), *Eucalyptus victrix* and *Acacia ampliceps* with occasional *Bauhinia cunninghamii*, *Melaleuca leucadendra* and *Atalaya hemiglauca* over an Open Grassland of mixed *Cyperus vaginatus* and **Cenchrus ciliaris* on red and brown sandy loams and silts in major creeklines, the De Grey river banks and in the Ridley River

Thickets

T1: Dense Thicket of *Acacia inaequilatera* with occasional *Corymbia lenziana* and *C. flavescens* over a Very Open Low Grassland of **Cenchrus ciliaris* and an Open Hummock Grassland of *Triodia epactia* on loam in a minor creekline

Grasslands

G3: Dense Grassland of ?*Aristida latifolia* and *Eriachne helmsii* with Open Shrubland of *Acacia ampliceps* in minor creeklines on red cracking clays

FLORISTIC COMMUNITY TYPES

1: Hummock Grassland of *Triodia epactia* on skeletal silt on massive ironstone or ironstone gravels on crests, upperslopes and occasionally lowerslope positions; indicator species include *Portulaca oleracea*, *Indigastrum parviflorum*, *Triumfetta clementii* and *Trianthema triquetra*

3: Hummock Grassland dominated by *Triodia epactia* and *Eragrostis eriopoda*, with occasional Open Shrubland of *Acacia stellaticeps* or *Acacia ?cowleana* on sandy-loam or sandy-clay on undulating plains or drainage areas; indicator species include *Bonamia rosea*, *Eragrostis eriopoda* and *Mollugo molluginea*

5: Grassland dominated by *Triodia epactia* and **Cenchrus ciliaris* over mixed herb and sedge species with occasional Shrubland of *Acacia synchronicia* on silty-clay soils on drainage flats; indicator species include *Gomphrena* affinis subsp. *pilbarensis*, *Neptunia dimorphantha*, *Ptilotus gomphrenoides* var. *gomphrenoides*, *Acacia synchronicia* and *Cyperusiria*

Mosaics

1/2: Mosaic of Floristic Community Types 1 and 2

3/4/5: Mosaic of Floristic Community Types 3, 4 and 5

Source: Drawdown contours - MWH - 2007
Aerial mosaic - Landgate - July 2002
Floristic mapping - WEC
Requested: Coffey Natural Systems, Drawn: CAD Resources

Job No: we08030	Atlas Iron Limited	Figure No: 3.4
File No: g1410_EMP_f006	Pardoo DSO Project	

Potential drawdown influence on vegetation communities

Table 3.7 Significant and unidentified flora taxa recorded within the minesite and surrounds

Significant Flora Species	Conservation Code[1]	Number of Locations in Survey Area	Number of Locations Impacted	Found in FCTs[2]	Density within Quadrats (2007)
Eragrostis crateriformis	P3	3	2	4, 5	0.1% – 10%
Gomphrena pusilla	P2	1	None	5	0.1%
Lotus affin. *cruentus*	-	3	1	4, 5	
Tephrosia sp. Cathedral Gorge (F.H. Mollemans 2420)	P3	12	4	1, 2, 4,	0.1% – 0.5%
Sauropus sp.	-	1	None	5	

1 Priority 2 (P2) – Poorly Known Taxa. That is, taxa which are known from one or a few (generally <5) population, at least some of which are not believed to be under immediate threat.
Priority 3 (P3) - Poorly Known Taxa. That is, taxa which are known from several populations, at least some of which are not believed to be under immediate threat.

2 FCTs – Floristic Community Types.

The DEC database (Threatened Flora Database, Western Australian Herbarium) interrogation indicated that known populations of the Priority Flora did not extend into the survey area, as their presence within the survey area was previously unknown.

The two unidentified flora species were both uncommon within the project survey area. *Lotus* affin. *cruentus*, from the Papilionaceae (pea) family, was recorded in three locations within FCTs 4 and 5, approximately 15 km apart from both the northern and southern extremities of the minesite. The taxon was collected on expansive hummock grasslands dominated by *Triodia*, and is not considered to be associated with any unique landform or plant community. *Lotus* affin. *cruentus* is not currently listed as DRF or Priority Flora. Atlas undertakes to avoid impacting the three known locations of this taxa until taxonomic uncertainty is resolved.

Sauropus sp., from the Euphorbiaceae family, was recorded (following rainfall) in expansive hummock grasslands flats dominated by *Triodia* and is not considered to be associated with any unique landform or plant community. *Sauropus* sp. is not currently listed as DRF or Priority Flora. Furthermore, Atlas has designed the proposed minesite to avoid impacts to the known location of this taxon.

Atlas is committed to conducting additional flora surveys in 2008 (or following the next relevant rainfall event) to resolve taxonomic uncertainties with the *Lotus* affin. *cruentus* and *Sauropus* sp.

Weeds

Parkinsonia aculeata (parkinsonia) a declared plant under the *Agriculture and Related Resources Act 1976* was recorded in two locations on the Ridley River (see Figure 3.3) outside the minesite area of disturbance.

The majority of introduced species identified within the project survey area were from the family Poaceae (grasses), including *Cenchrus ciliaris*, which was the most dominant introduced species recorded and especially prevalent on flat areas near creeklines. This species is used as a fodder crop by pastoralists and has become a naturalised species. Other introduced species included *Citrullus* spp. (paddymelons) (widespread throughout Western Australia), *Passiflora foetida* var. *hispida* (stinking passion flower) (widespread throughout Western Australia), *Indigofera* spp. (known from near Port Hedland), and *Trianthema portulacastrum* (giant pigweed) (known from Port Hedland).

3.3.3 Regulatory Requirements

The management measures contained in the Flora and Vegetation Management Plan have been developed in general accordance with the provisions of the Commonwealth Environmental Protection and Biodiversity Conservation Act, and the Western Australian *Environmental Protection Act 1986*, *Wildlife Conservation Act 1950* and Agricultural and Related Resources Act. The Commonwealth Department of Environment and Water Resources (DEWR), DEC and Department of Agriculture and Food (DAF) are the administering authorities for these Acts respectively.

An overview of the relevant provisions of these Acts is provided below.

Environmental Protection and Biodiversity Conservation Act 1999. The Environmental Protection and Biodiversity Conservation Act contains a list of flora species that are nominated as being of national environmental significance. The list is divided into groups according to conservation status (i.e., critically endangered, endangered, vulnerable, extinct, extinct in the wild and conservation dependant). No flora of national environmental significance was located within the minesite.

Environmental Protection Act 1986. The Pardoo DSO Project is currently undergoing a formal assessment under Part IV of the Environmental Protection Act, at a PER level of assessment. Should the proposal be approved, the Pardoo DSO Project will be managed in accordance with any Ministerial conditions applied to the proposal at completion of the PER assessment.

Wildlife Conservation Act 1950. The Wildlife Conservation Act provides for the protection of flora and fauna species of conservation significance. Protected flora species are identified as DRF. DRF are plant species that are extant and considered likely to become extinct or rare and are therefore in need of special protection. They are listed in the Wildlife Conservation (Rare Flora) Notice 2006. No DRF was located within the minesite.

The DEC also maintains a list of four priority codes for flora. Priority Flora are either poorly known, believed to be uncommon, rare or under threat, but have not been designated DRF under the Wildlife Conservation Act. The Wildlife Conservation Act does not provide specific protection for priority species, however, the potential impacts of new proposals on priority species is generally considered as part of the environmental impact assessment process under the Environmental Protection Act. Priority Flora found within the project area are described in Section 3.3.2.

Agriculture and Related Resources Act 1976. The Agricultural and Related Resources Act protects agriculture and related resources. Management control measures are determined according to the classification levels under the Act. As described in Section 3.3.2, parkinsonia, a 'declared' plant under the Act was located in two areas along the Ridley River, at least 1.5 km from the nearest area of disturbance. This species is classed as a Priority 1 (P1) and Priority (P2) species under the Agricultural and Related Resources Act for the Port Hedland/East Pilbara region.

A P1 classification prohibits movement of the plants or their seeds through the state (including movement of contaminated machinery or produce), and a P2 classification aims at eradication of the species, issuing the onus on the property manager or owner to treat all plants to destroy and prevent propagation each year until no plants remain.

3.3.4 Consultation

Stakeholder comments relating specifically to the management of flora and vegetation have been provided in Table 3.8.

Table 3.8 Flora and vegetation management issues identified during stakeholder consultation

Stakeholder	Issue/Comment
EPA	Monitoring of groundwater-dependent vegetation for impacts of dewatering and discharge is supported. The monitoring program for inclusion in the PER should be developed in consultation with DEC and include a framework that addresses key values, management and mitigation measures, trigger values and corrective actions.
	The implementation of a monitoring program for vegetation affected by changes in surface hydrology should be developed in consultation with DEC. Any monitoring program should identify trigger levels for changes in vegetation condition and the mitigation measures that will be implemented in the event that a trigger level is exceeded.
	It is recommended that strategies be developed in the Flora and Vegetation Management Plan to effectively manage weeds. The Flora and Vegetation Management Plan should include a discussion on the weed species that are present within the disturbance zone, discuss the causal factors for weed vectoring and identify priority management measures.
	The regional distribution of *Lotus* affin. *cruentus* is still to be investigated – unknown impacts of this species regionally if significance is not yet known.
DoW	Groundwater resource impacts need to be assessed, including dewatering impacts (this may include vegetation impacts from drawdown of water table). Management/amelioration of predicted impacts needs to be discussed in detail.
	Management should address: • Avoidance of impact on significant areas and values where possible. • Minimising disturbance footprint. • Groundwater-dependent ecosystems. • Excess water creation and discharge impacts including location, quality and quantity. • Final void retention. • Water quality. • Weed hygiene and management – a weed management plan will be required.

The above comments have been considered in developing the management actions outlined in the Flora and Vegetation Management Plan. Issues identified by ongoing consultation will be considered within subsequent reviews of this management plan.

3.3.5 Potential Impacts

Ground Disturbance

Clearing and ground-disturbing operations will remove up to 278 hectares of vegetation.

Flora Species of Conservation Significance

Some Priority Flora will be impacted by project-related ground disturbance, however, all species that may be impacted also occur outside of the area of disturbance.

Unidentified Flora Taxa

One-out-of-three known populations of unidentified flora taxa *Lotus* affin. *cruentus* is adjacent to the proposed access road (classified as an impact site in the PER), however, Atlas undertakes not to disturb any known occurrences of this taxon without further identification and taxonomic resolution. The other two locations of this taxon occurs outside of the area of disturbance.

No known locations of *Sauropus* sp. will be impacted by ground disturbance.

Land Degradation

Ground disturbance, vehicle movement and presence of cattle within the project area have the potential to increase land degradation if not managed appropriately.

Dewatering and Discharge

The lowering of local groundwater levels from dewatering at the Bobby and Glenda pits has the potential to cause impacts to riverine vegetation along the Ridley River. Groundwater modelling has indicated that the cone of depression during dewatering is likely to range between 1 to 5 m (a conservative prediction) beneath the Ridley River and plant community W7 (see Figure 3.4). Given that annual groundwater level fluctuations are in the range of 1 to 2 m per annum, the groundwater-dependent vegetation within the cone of depression is likely to be resilient to a short-term lowering of the water table. However, in the unlikely event that localised impacts to groundwater-dependent vegetation occurs, such impacts are unlikely to be considered significant, given that these vegetation types are widely distributed along the Ridley River and are not restricted to the potential area of impact associated with the cone of depression.

The potential impact of groundwater abstraction and the associated cone of depression surrounding the South Limb pit are likely to be less than that estimated for the Bobby and Glenda pits. This southern cone of depression extends primarily under the mosaic of FCT 1 and FCT 2, which is not considered a groundwater-dependant system (i.e., depth to groundwater at South limb is approximately 28 m). There may be some localised impacts to tree species in FCT 3 to the south of South Limb (see Figure 3.3), however,

this vegetation community is widely distributed across the survey area. Vegetation within the cone of depression will be monitored to validate the impact assessment and management measures will be revised, should monitoring detect significant impacts to ground-dependent vegetation.

Environmental discharge of surface water is expected to create a local surface saturation zone and groundwater mounding. The maximum surface saturation zone, based on constant discharge volumes and surrounding the environmental discharge outlets in the Ridley River and Redrock Creek, is predicted to be 14 and 9.3 hectares respectively.

The release of excess water from the mine dewatering into Ridley River and Redrock Creek has the potential to cause localised changes to the composition and/or density of riverine vegetation at the discharge point, due to the increased availability of water. Although the impacts of excess water supply to vegetation are likely to be low given the short time of dewatering (e.g., approximately three years) and natural variability in surface water flow, possible related impacts may occur, including:

- Death/decline of selected species that are not tolerant to a continuous supply of water.
- Death/decline of selected species following the cessation of water discharge, due to the vegetation becoming adapted to a wetter environment, and consequently being unable to cope with a dramatic decline in water availability.

Weeds

Ground disturbance and vehicle movement across the minesite has potential to introduce and/or exacerbate the spread of weed species.

Fire

The project may increase or decrease the fire risk at the minesite, depending on fire management and control measures undertaken at the minesite. Changes to the local fire regime, such as a change in the frequency and intensity of fires, may alter vegetation communities.

Dust

Dust generated during mining operations and vehicle movement can smother vegetation in close proximity to the dust source. This may lead to a decline in the vegetation condition where affected, although no dust-sensitive vegetation has been identified within the minesite.

3.3.6 Management Practices

Practices that will be undertaken for the management of the flora and vegetation at the Pardoo DSO Project minesite are outlined below.

Ground Disturbance

Management measures relating to vegetation clearing and stockpiling activities include:

- A ground disturbance SOP will be developed and implemented. The procedure will involve the following:
  - All ground clearance will follow maps of all ground disturbance (clearing and soil stripping) areas and associated soil and vegetation stockpile areas that have been created using global positioning system coordinates. Vegetation and soil stockpile areas will be located as close to the source areas as possible, with a preference for already disturbed/cleared areas, for future use in progressive or final rehabilitation.
  - Ground disturbance and stockpile areas will be clearly defined in the field with pegs. Such areas will be determined from the above-mentioned maps.
  - Precautions to prevent damage to stockpiled vegetation and soil, such as fencing and/or signage, will be undertaken.
  - Topsoil (if available) will be stockpiled to a height of less than 1 m to maintain soil biota.
- Vegetation clearing will be kept to the minimum necessary for safe construction and operation, with the preferential use of previously disturbed or degraded areas where possible. The Operations Manager will plan land clearing such that only the area of land required for immediate use is cleared.
- Clearing of riparian vegetation and linear vegetation types, such as along ephemeral drainage lines, will be minimised.
- The removal or fragmentation of minor areas of vegetation associated with watercourses will be avoided where possible.
- Visual inspections for any impacts to flora and vegetation adjacent to project infrastructure, caused by a change in the hydrological regime (e.g., sheet flow) will be undertaken regularly.
- Audits of the predicted area of ground disturbance against actual area of ground disturbance will be undertaken regularly and contingency actions undertaken if necessary.

Flora Species of Conservation Significance

Management actions specific to the management of Priority Flora include the following:

- Known locations of Priority Flora, as well as other areas that require protection outside of the disturbance area, will be entered into a minesite database for planning purposes, and will be clearly delineated on the ground to avoid disturbance.
- Remaining locations of Priority Flora will be inspected every three months to determine if further management actions are required to protect the populations.
- Remaining populations of Priority Flora and unidentified flora will be monitored on an annual basis, with the remaining population *Eragrostis crateriformis* (P3) targeted for protection.

Unidentified Flora Taxa

One-out-of-three known populations of the unidentified flora taxon *Lotus* affin. *cruentus* is adjacent to the proposed access road (classified as an impact site in the PER). The other two locations of this species occur well outside of the area of disturbance. Atlas undertakes to not disturb any known occurrences of this taxon without further identification and taxonomic resolution.

No known locations of *Sauropus* sp. will be impacted by ground disturbance.

Atlas has made the commitment to undertake additional surveys on populations of unidentified flora taxa to resolve the taxonomic uncertainty, provide additional mapping of the local distribution of these entities and undertake population counts following rains in 2008 (or the next relevant rainfall event).

Until the taxonomy of the unidentified flora taxa is resolved the following management measures will be undertaken:

- Known locations of unidentified flora, will be entered into a minesite database for planning purposes, and will be clearly delineated on the ground to avoid disturbance.
- Remaining locations of unidentified taxa will be inspected every three months to determine if further management actions are required to protect the populations.

Land Degradation

In addition to management measures that minimise the amount of area of ground disturbance, measures to further reduce the risk of land degradation following vegetation clearing will include the following:

- Progressive rehabilitation of disturbed areas will be undertaken where the mining schedule allows, and unnecessary future disturbance of rehabilitated areas will be avoided.
- Vehicle access outside of designated operational areas will be prohibited except where approved by the Pardoo General Manager (after consulting the Senior Environmental Heath and Safety Specialist or delegate).
- Cattle and other introduced animals within the project area will be discouraged from entering the minesite wherever possible by, for example, strategic placement of fences.

Dewatering and Discharge

To assess the impacts of groundwater drawdown and excess water disposal on vegetation, a strategic water-monitoring program will be initiated in conjunction with a vegetation condition-monitoring program. This will allow comparison between vegetation condition and groundwater levels, and detection of changes to vegetation associated with mine water discharge.

The monitoring program will include monitoring of groundwater drawdown in areas of

phreatophytic vegetation along the Ridley River, which occurs within the potential dewatering zone of influence. Environmental discharge will also be monitored for comparison with vegetation condition in areas of close proximity to environmental discharge points. Monitoring of groundwater and water discharge are detailed in the Water Management Plan.

Requirements for vegetation condition monitoring will be developed following recommendations of specialist consultants and in consultation with the DEC. Vegetation condition monitoring concepts are described below:

- Establishment of permanent plots within plant community W7, inside and outside of the predicted cone of depression (see Figure 3.4).
- The permanent plots will be located in areas corresponding to the location of monitoring bores where relevant; however, additional reference sites (i.e., monitoring plots outside of the cone of depression) may be established without corresponding monitoring bores.
- Monitoring will be undertaken before, during and after dewatering of mine pits.

Vegetation condition monitoring for environmental discharge may involve:

- Establishment of permanent plots within FCT 4 (see Figure 3.4), inside and outside of the defined drainage line into which excess mine dewater will be discharged.
- Monitoring will be undertaken before, during and after environmental discharge commences and finishes.

Weed Management and Control

Management measures to minimise the risk of introducing and/or spreading weeds within the minesite include the following:

- Project vehicles and equipment will arrive on the minesite clean and free of soil, seeds and vegetative matter. To ensure that this occurs, a hygiene station will be established on the bitumen section of the access road at the minesite access intersection. A hygiene inspection and maintenance SOP will be developed and will include:
  - Instructions on the correct use of hygiene station.
  - Maintenance of hygiene logbooks.
  - Filling out of incident reports in the event of a hygiene breach.
- Management of the declared weed species, *Parkinsonia aculeate*, or any new weed outbreaks, will be undertaken in consultation with the DEC, DAF and the pastoralist.
- Monitoring of areas with high potential for or susceptibility to weed invasion, such as along roadsides, recently cleared areas and ephemeral drainage lines, will be undertaken at regular intervals, and particularly after rainfall events.
- Weed infestations on surface soil stockpiles will be controlled to minimise the likelihood of weed introduction during respreading of topsoil at mine

decommissioning. Soil stockpiles left for longer than one year will be monitored for revegetation to ensure that local native species from the area have established.

- Opportunistic rehabilitation of disturbed areas will be undertaken to minimise potential for weeds to become established in these areas.

Fire Prevention and Control

A fire prevention and control strategy will be prepared and implemented to avoid and manage fires caused as a consequence of the project, and to protect project infrastructure. The fire prevention and control strategy will consider the following:

- Provision of fire hazard awareness and management training to Atlas personnel and contractors.
- Restriction of vehicle access to designated access and haul roads where possible.
- Training in the use of spark shields and diesel vehicles where appropriate.
- Provision, regular inspection and maintenance of fire-fighting equipment in work areas relative to the fire hazard.
- Implementation of fire restrictions, including smoking in designated areas only.
- Maintenance of a resources inventory that details fire management staff, contacts and equipment lists.
- Appropriate storage and handling, disposal and transport of dangerous goods (refer to Hydrocarbons and Dangerous Goods Management Plan, Section 3.7).
- Establishment of fire breaks around vegetation stockpiles.
- Development and implementation of an emergency response plan, which will include the provision of safety and emergency response equipment.
- Undertaking prescribed burns, where necessary, in consultation with relevant government agencies (i.e., Fire and Emergency Services Association of Western Australia and DEC) in order to reduce local fuel loads.

Generation of Dust

Dust at the minesite will be minimised by adopting measures outlined in the Air and Noise Management Plan (Section 3.5). Visual inspections for any impacts to flora and vegetation adjacent to project infrastructure that may be caused by dust will be undertaken regularly. If visual inspections indicate that dust is significantly impacting on vegetation, contingency actions such as the use of the dust suppression watering truck will be implemented (Section 3.3.8).

3.3.7 Monitoring

The monitoring proposed for Atlas to support its management commitments is summarised in Table 3.9.

Table 3.9 Summary of flora and vegetation monitoring

Item	Parameter	Purpose
Dewatering and discharge	Vegetation condition monitoring parameters to be developed by specialist consultants.	To monitor and detect changes in vegetation health as a result of groundwater drawdown and water discharge.
Flora species of conservation significance	Known locations of Priority Flora and unidentified flora will be monitored for plant density and percentage cover.	• To monitor and detect whether or not performance indicators have been met. • To monitor remaining population of *Eragrostis crateriformis* (P3) and determine if further management measures are required to protect the population.
Unidentified flora taxa	Baseline data collection including taxonomic research, species abundance and distribution.	To research taxonomic status of unidentified flora taxa found within the project area and identify potential impacts of the project on these species.
Weed management and control	Presence and/or abundance of weed species within the following areas: • Soil stockpiles. • Roadsides. • Drainage lines. • Recently cleared areas.	To monitor and detect the distribution and abundance of weed species.

Results will be recorded to the frequency as indicated in Section 3.3.13, and will be reported annually in the AER submitted to the DoIR or sooner, if monitoring indicates that trigger levels for contingency actions (Section 3.3.8) have been exceeded.

3.3.8 Contingency Actions

Contingency actions for key issues relating to flora and vegetation that will be undertaken in the event of an actual or perceived exceedence of triggers are provided in Table 3.10.

Table 3.10 Contingency flora and vegetation management actions

Trigger for Action	Contingency Action Required
Vegetation condition declines in areas of groundwater drawdown. Specific triggers will be based on vegetation condition parameters that will be developed in consultation with specialist consultants.	• Compare vegetation condition parameters with groundwater level monitoring data. • Investigate supplying vegetation with water until the groundwater level returns to background levels. • Increase vegetation-monitoring frequency to weekly to detect if vegetation condition is within natural fluctuation or is further declining. • Undertake rehabilitation activities in affected area (e.g., revegetation with local provenance species).
Vegetation condition significantly declines in environmental discharge locations. Specific triggers will be based on vegetation condition parameters that will be developed in consultation with specialist consultants.	• Compare vegetation condition parameters with excess water discharge monitoring data. • Investigate relocating environmental discharge point to alternative drainage line that is upstream of the affected vegetation. • Reduce the rate of dewatering (if feasible). • Investigate relocating environmental discharge point to alternative drainage line. • Increase vegetation-monitoring frequency to weekly to detect if vegetation condition is within natural fluctuation or is further declining.
Monitoring indicates that a known species of conservation significance are in decline. Specific triggers will be based on parameters developed in consultation with specialist consultants.	• Investigate cause of decline (i.e., vehicle access, cattle degradation, seasonal effects). If the cause can be corrected, undertake corrective actions such as more signage, fencing the area (etc.).
A weed outbreak occurs within the minesite.	• Review weed hygiene management procedures. • Develop and implement weed management control in consultation with the DEC and DAF.
Actual area of ground disturbance is greater than or outside of the approved area.	• Review the ground clearance SOP and revise as necessary. • Report the incident to the DEC. • Initiate rehabilitation of the area.
Visual inspections of vegetation in project areas susceptible to dust impacts indicate that the dust impacts to vegetation condition are significant.	• Relocate the watering truck used for dust suppression to the relevant site and spray vegetation to remove dust particles.

3.3.9 Performance Indicators

Table 3.11 below illustrates the conceptual performance indicators and corresponding targets that will be used to track progress in achieving the flora and vegetation management objectives. Targets were developed with the intent of being achievable given the project constraints and to provide a measurement of success for each performance indicator, rather than providing project goals for each objective.

Table 3.11 Conceptual flora and vegetation management performance indicators

Item	Performance Indicator	Target
Objective 1. *To protect significant flora and vegetation and minimise area of ground disturbance*		
Ground disturbance	Area of disturbance.	No greater than 278 hectares.
	Ground disturbance standard operating procedure.	Developed and implemented prior to the commencement of ground-disturbing activities.
Flora species of conservation significance	Known Priority Flora locations disturbed.	No impact to known locations of *Gomphrena pusilla* (P2). No more than the following known locations are impacted: • 2 out of 3 populations of *Eragrostis crateriformis* (P3) (with remaining population to be targeted for conservation management) • 4 out of 12 populations of *Tephrosia* sp. (P2).
Unidentified flora taxa	Known locations of unidentified flora taxa disturbed.	• No impact to known locations of *Sauropsus* sp. • No more than 1 out of 3 populations of *Lotus* affin. *cruentus* disturbed.
Weed management and control	Hygiene inspection and maintenance standard operating procedure.	Developed and implemented prior to the commencement of ground-disturbing activities.
Land degradation	Progressive rehabilitation.	Rehabilitation is initiated as soon as practicable as disturbed area becomes available.
Fire prevention and control	Fire prevention and control strategy.	Developed and implemented prior to the commencement of ground-disturbing activities.
Objective 2. *Establish baseline health condition of vegetation.* ***Objective 3.*** *Monitor and assess any changes in the health of vegetation after mining and dewatering commences.*		
Dewatering and discharge	Vegetation condition of groundwater-dependent vegetation.	Targets will be developed by specialist consultants in consultation with the DEC.
	Vegetation condition surrounding water discharge locations.	Targets will be developed by specialist consultants in consultation with the DEC.

No relevant standards for performance indicators for the management of flora and vegetation during operations were identified at the time of developing this management plan. Instead, performance indicators and targets are based on environmental baseline conditions and worst-case environmental impacts, as presented in the Pardoo DSO Project's PER document.

3.3.10 Roles and Responsibilities

Operations Manager

The Operations Manager in charge of the Pardoo DSO Project will ensure that appropriate resources are provided to implement the actions outlined in the Flora and Vegetation Management Plan. The Operations Manager has overall responsibility to ensure that all mining activities are undertaken according to the IMS, this Flora and Vegetation Management Plan and other regulatory requirements.

Pardoo General Manager

The Pardoo General Manager is responsible for ensuring that all personnel are working in accordance with this management plan. This includes ensuring that all personnel participate in the induction program and undertake relevant training.

Senior Environmental, Health and Safety Specialist

The Senior Environmental Health and Safety Specialist is responsible for ensuring that the management actions contained within the Flora and Vegetation Management Plan are implemented. The Senior Environmental Health and Safety Specialist is also responsible for the coordination of monitoring activities, audits, and reporting of monitoring results relevant to government agencies.

Contractor Managers

The Contractor Managers will work with the Senior Environmental Health and Safety Specialist to ensure that management actions contained within the Flora and Vegetation Management Plan are implemented. The Contractor Managers are responsible for supporting and promoting key conservation issues within the minesite and ensuring that personnel implement requirements of the Flora and Vegetation Management Plan.

All Personnel and Contractors

All personnel and contractors are responsible to adhering to the procedures outlined in Flora and Vegetation Management Plan. All personnel and contractors will provide assistance in implementing this management plan and will report any non-compliance to the relevant manager.

3.3.11 Records and Reporting

The environmental component of the induction will educate the workforce on flora and vegetation issues. Induction records will include sign-off by inductees to indicate that flora and vegetation management has been discussed.

Inspection and clean-down activities will be recorded at the hygiene station and inspection point (i.e., bitumised entry to minesite) in a hygiene logbook. All staff are responsible for correct use of the maintenance of hygiene logbook. The Contractor Managers will ensure that the hygiene station is supplied with the appropriate equipment at all times. The Operations Manager will check that the hygiene logbooks have been completed on a regular basis.

Hygiene station registers will be filled in and completed by all personnel. Any breach of these procedures will be reported to the respective Contractor Manager and an incident report completed.

The actual area of ground clearance will be regularly audited against the approved clearance area as detailed on the maps of all ground disturbance that will be created using global positioning system coordinates. Should the audits indicate that actual clearing is greater than or outside of the approved area, contingency actions will be undertaken as detailed in Section 3.3.8.

Vegetation condition monitoring reports will record any change in vegetation condition over time. Any exceedance of triggers for contingency actions will be reported to the Senior Environmental, Health and Safety Specialist.

3.3.12 Key Management Actions Table

The key management actions provided in Table 3.12 relate specifically to management of flora and vegetation.

3.3.13 Flora and Vegetation Monitoring Schedule

The monitoring schedule provided in Table 3.13 outlines monitoring of flora and vegetation only. Monitoring of other factors (e.g., groundwater and environmental discharge) is provided within the relevant plans.

3.4 Fauna Management

3.4.1 Objectives

For the Pardoo DSO Project minesite, Atlas will adopt best management practices for the management of fauna and ensure that project impacts to the abundance and distribution of fauna of conservation significance are minimised as much as possible.

The objectives for the Fauna Management Plan are:

- Minimise the impact of mining operations on fauna habitat.
- Ensure that species of conservation significance (including vertebrates, terrestrial invertebrates, and subterranean fauna) are not threatened by mining operations.

3.4.2 Existing Environment

Completed Studies

M.J. and A.R. Bamford Consulting Ecologists (Bamford) conducted an assessment of the terrestrial vertebrate and invertebrate fauna values of the Pardoo DSO Project area.

Table 3.12 Key flora and vegetation management actions

Reference	Item	Key Management Action	Timing	Reporting/Evidence	Status[1]
FV01	Ground disturbance	Develop and implement ground disturbance standard operating procedure.	Prior to commencement of ground-disturbing activities.	AER.	
FV02	Ground disturbance	Undertake visual inspections of flora and vegetation adjacent to project infrastructure to assess impacts that may be caused by dust or a change in hydrological regime.	Opportunistic.	Internal audits, AER.	
FV03	Land degradation; weed management and control	Plan and undertake progressive rehabilitation.	Opportunistic.	Internal audits, AER.	
FV05	Flora species of conservation significance Unidentified flora taxa	Delineate known locations of Priority Flora and unidentified species and implement monitoring program as outlined in Table 3.13.	Prior to ground-disturbing activities in vicinity of known location.	Ground clearance maps. Internal audits, AER.	
FV06	Unidentified flora taxa	Implement monitoring of unidentified flora species as per Table 3.13.	Prior to commencement of ground-disturbing activities.	AER.	
FV07	Dewatering and discharge	Develop requirements for vegetation condition monitoring according to recommendations by specialist consultants and in consultation with DEC.	Prior to pit dewatering.	This EMP.	
FV08	Dewatering and discharge	Implement vegetation condition monitoring program as developed in item VF05.	Prior to pit dewatering.	Internal audits, AER.	

Table 3.12 Key flora and vegetation management actions (cont'd)

Reference	Item	Key Management Action	Timing	DEC Reporting/Evidence	Status[1]
FV09	Weed management and control	Ensure that project vehicles and equipment will arrive on the minesite clean and free of soil, seeds and vegetative matter.	Prior to vehicle/equipment arrival at the minesite.	Company hygiene procedure. Internal audits of hygiene station (including registers). Hygiene logbooks. Hygiene breaches reported within AER.	
FV10	Weed management and control	Implement monitoring of weeds as per Table 3.13.	Commencement of ground-disturbing activities.	Internal audits; AER.	
FV11	Weed management and control	Monitor revegetation on the surface of soil stockpiles to ensure local flora species are establishing.	One year from creation of stockpile.	Internal audits; AER.	
FV12	Fire prevention and control	Prepare and implement fire prevention and control strategy for the minesite.	Prior to vehicle/equipment arrival at the minesite.	Internal audits; AER.	

[1] To be completed and updated once regulatory approvals are obtained.

Table 3.13 Conceptual flora and vegetation monitoring schedule

Area	Reason for Monitoring	Frequency	Measurements	Relevant Procedures
Vegetation condition of phreatophytic trees within plant community W7 along Ridley River (see Figure 3.4).	To detect if dewatering activities are affecting phreatophytic tree health.	To be developed by specialist consultants.	To be developed by specialist consultants.	To be developed by specialist consultants.
Vegetation condition within FCT 4 in drainage line – designated environmental discharge point (see Figure 3.4).	To detect if environmental discharge is changing the vegetation community within drainage lines.	To be developed by specialist consultants.	To be developed by specialist consultants.	To be developed by specialist consultants.
Known locations of Priority Flora and unidentified flora species.	To detect whether or not known populations of flora of conservation significance have been over cleared. To conserve the remaining population of *Eragrostis crateriformis.*	Quarterly.	To be developed by specialist consultants.	To be developed by specialist consultants.
Unidentified flora species.	To research taxonomic status of unidentified flora taxa found within the project area. To identify potential impacts of the project on these species.	To be developed by specialist consultants.	To be developed by specialist consultants. Measurements will include specimen collection and population counts (following rains in 2008 or after a significant rainfall event).	To be developed by specialist consultants.
Weed monitoring in the following areas: • Soil stockpiles. • Roadsides. • Drainage lines. • Recently cleared areas.	To monitor whether an increase or decrease in abundance and/or spread in weeds has occurred as a result of minesite disturbance. To identify areas for targeted weed control.	At least quarterly; and opportunistically after rainfall events.	Presence and/or abundance of weed species over time.	None.

The assessment included a desktop review and a field investigation of the project area in April 2007.

Ecowise Environmental (Ecowise) and Subterranean Ecology conducted an assessment of stygofauna and troglofauna at the project area, respectively.

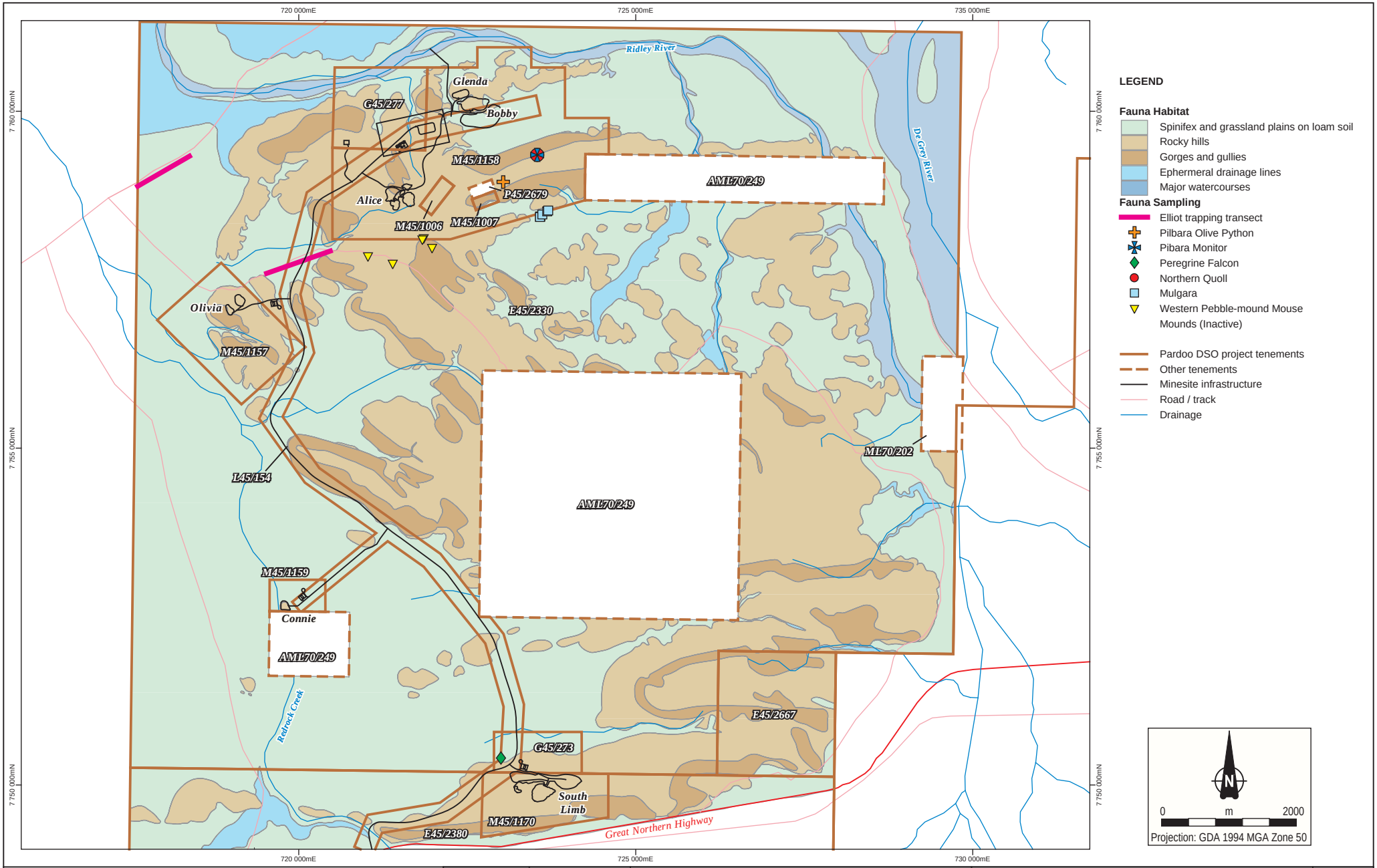
Comprehensive field sampling for stygofauna was undertaken in December 2006 and April to May 2007. A total of 49 samples were collected (across two sampling events) from within and outside of the disturbance area, using a combination of standard methods including netting and pumping. In-situ water quality was also measured. A third phase sampling program was developed in consultation with DEC and commissioned in December of 2007.

The troglofauna study involved a desktop habitat assessment and a comprehensive field survey undertaken during February, May and September 2007. A total of 215 traps were deployed in drill holes. This management plan will be reviewed once results if the survey are available.

Terrestrial Fauna Habitat

Bamford identified five major fauna habitats within the minesite, which are shown in Figure 3.5 and are discussed below:

- Spinifex and grassland plains on loam soil occur within and to the west of the minesite and are extensive on the Roebourne Plains. These plains support rich reptile fauna and may have populations of a number of significant mammal species.
- Rocky hills, which are typical of the Pilbara region, occur throughout the Ord Range and are dissected by minor gorges and gullies. These hills are generally vegetated by low grasslands and sparse shrublands.
- Gullies and some minor ‘gorge’ areas occur throughout the Ord Range. These provide a habitat resource that is ideally suited to several species of conservation significance, such as the Pilbara olive python and the northern quoll. These landforms are vegetated by taller shrubs and, in some cases, trees.
- Numerous ephemeral drainage lines exist within the Ord Range and surrounding flats. These drainage systems occur on upland areas and across the plains, where they channel water into the major watercourses. Ephemeral drainage lines are often more densely vegetated and therefore, act as refugia for some animals such as birds, that may forage the surrounding habitats.
- Major watercourses include the Ridley, Strelley and De Grey rivers, which either pass through or abut the minesite. These systems are typified by tall vegetation, such as Eucalyptus and Acacia spp. The water resource for these systems attracts fauna, acting as a major concentration point for many animals, including birds and mammals. Consequently, major watercourses are of ecological significance.



Source: Habitat mapping - Bamford Consulting Pty Ltd - 2007

Requested: Coffey Natural Systems

Drawn: CAD Resources

Job No: we08030

File No: g1410_EMP_f007

Atlas Iron Limited

Pardoo DSO Project

Habitat types and significant fauna species

Figure No: 3.5

A worst-case estimate of project-related habitat disturbance within the project area is provided in Table 3.14.

Table 3.14 Habitat types found within the project area

Habitat Type	Total Habitat Area within the Minesite (ha)	Disturbance Area (ha)	Proportion of Total Habitat Area Disturbed (%)
Spinifex and grassland plains	6,560	89	1.4
Rocky hills	3,730	170	4.6
Gullies and minor gorges	906	14	1.5
Ephemeral drainage lines	475	0.2	0.1
Major ephemeral watercourses	0	0	0

Ha: hectares.

Terrestrial Fauna of Conservation Significance

A number of fauna species of conservation significance were found, or have the potential to occur, within the minesite or its surrounds. Table 3.15 outlines fauna species of conservation significance that are either present or could potentially occur within the vicinity of the minesite.

Table 3.15 Terrestrial fauna of conservation significance present or with the potential to occur within the minesite vicinity

Species Name	Pardoo[1]	Specific Conservation Status
CS1[2]		
Fork-tailed swift *(Apus pacificus)*	**?**	Mig., EPBC Act
Great egret *(Ardea alba)*	**?**	Mig., EPBC Act
Woma or Ramsay's python *(Aspidites ramsayi)*	**?**	Sch. 4, WC Notice
Northern quoll *(Dasyurus hallucatus* (evidence of tracks)	✓	Vuln, EPBC Act
Mulgara *(Dasycercus cristicauda)* (evidence of burrows)	✓	Vuln, EPBC Act; Sch. 1, WC Notice
Peregrine falcon *(Falco peregrinus)*	✓	Sch. 4, WC Notice
Oriental pratincole *(Glareola maldivarum)*	**?**	Mig., EPBC Act
Pilbara olive python *(Liasis olivaceus barroni)*	✓	Vuln, EPBC Act; Sch. 1, WC Notice
Bilby *(Macrotis lagotis)*	**?**	Vuln, EPBC Act; Sch. 1, WC Notice
Rainbow bee-eater *(Merops ornatus)*	✓	Mig., EPBC Act
Night parrot *(Pezoporus occidentalis)*	**?**	End, EPBC Act; Sch. 1, WC Notice
Glossy ibis *(Plegadis falcinellus)*	**?**	Mig., EPBC Act
Orange leaf-nosed bat *(Rhinonicteris aurantius)*	**?**	Vuln, EPBC Act; Sch. 1, WC Notice
Marsh sandpiper *(Tringa stagnatalis)*	**?**	Mig., EPBC Act
Common greenshank *(Tringa nebularia)*	**?**	Mig., EPBC Act
Wood sandpiper *(Tringa glareola)*	**?**	Mig., EPBC Act
Common sandpiper *(Tringa hypoleucos)*	**?**	Mig., EPBC Act

Table 3.15 Terrestrial fauna of conservation significance present or with the potential to occur within the minesite vicinity (cont'd)

Species Name	Pardoo[1]	Specific Conservation Status
CS2[3]		
Australian bustard *(Ardeotis australis)*	**?**	P4
Bush stone-curlew *(Burhinus grallarius)*	**?**	P4
Grey falcon *(Falco hypoleucos)*	**?**	P4
Lakeland Down's mouse or kerakenga *(Leggadina lakedownensis)*	**?**	P4
Spectacled hare-wallaby *(Lagorchestes conspicillatus)*	**?**	P3
Ghost bat *(Macroderma gigas)*	**?**	P4
Star finch (western) (*Neochmia ruficauda subclarenscens)*	**?**	P4
A skink *(Notoscincus butleri)*	**?**	P4
Western pebble-mound mouse or ngadgi *(Pseudomys chapmani)* (evidence of mounds)	✓	P4
Long-tailed dunnart *(Sminthopsis longicaudata)*	**?**	P3
CS3[4]		
A skink lizard *(Ctenotus rufescens)*	**?**	None
Spiny-tailed skink *(Egernia depressa)*	✓	None
Rothschild's rock-wallaby *(Petrogale rothschildi)*	**?**	None
A blind snake *(Ramphotyphlops pilbarensis)*	**?**	Local significance
Glandular toadlet *(Uperoleia glandulosa)*	**?**	None
Pilbara monitor *(Varanus pilbarensis)*	✓	None

[1] ?: Potential to occur. ✓: evidence or individual/s located.

[2] CS1: Sch. 1, WC Notice – Fauna that is rare or likely to become extinct.
Sch. 2, WC Notice – Fauna presumed to be extinct.
Sch. 3, WC Notice – Birds protected under an international agreement.
Sch. 4, WC Notice – Other specially protected fauna.
Vuln, EPBC Act – Listed as 'Vulnerable' under the Environmental Protection and Biodiversity Conservation Act (EPBC Act).
Mig., EPBC Act – Listed as 'Migratory' under the EPBC Act.
End, EPBC Act – Listed as 'Endangered' under the EPBC Act.

[3] CS2: P1 – Taxa with few, poorly known populations on threatened lands.
P2 – Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.
P3 – Taxa with several, poorly known populations, some on conservation lands.
P4 – Taxa in need of monitoring as they could be threatened or in need of special protection should present circumstances change.
P5 – Taxa in need of monitoring as they are subject to a specific conservation program; the cessation of which would result in the species becoming threatened within five years.

[4] CS3: Local significance – Fauna not listed in legislation or other publications but considered to be of local significance (at least) because of their pattern of distribution.

None of the habitats within the minesite is listed as threatened ecological communities as defined under the provisions of the Environmental Protection and Biodiversity Conservation Act or as listed under the DEC's Threatened Ecological Community Database.

Short-range Endemic Terrestrial Invertebrates

The Ord Range, with its rocky isolated ridges and broad lowlands of spinifex flats, is potentially conducive to the evolution of short-range endemic terrestrial invertebrates. Such species are often associated with mesic refugia, such as locations within gullies and minor ‘gorges’ where moisture is concentrated.

The only potential short-range endemic terrestrial invertebrate recorded during the field investigation was a land snail, represented by a single broken shell, despite intensive microhabitat searching (i.e., over 30 hours). The species of the land snail could not be identified due to the poor condition of the specimen and a lack of identifiable morphological characteristics. Given the extensive search effort of the area, short-range endemic terrestrial invertebrates are not considered to be present within the project area.

Non-indigenous Fauna

Tracks of the European red fox (*Vulpes vulpes*) and feral cat (*Felis catus*) were observed within the project area during the investigation. The house mouse (*Mus musculus*) and feral goat (*Capra hircus*) are also expected to occur within the project area.

No introduced amphibian species is known from the region, however, the De Grey River system is the most northerly major river of the Pilbara and therefore, may be the first to be colonised by the cane toad (*Bufo marinus*), as this species spreads across the Kimberley and down the coast.

No introduced bird species is known for the region and none was observed during the field investigation.

The Asian house gecko (*Hemidactylus frenatus*) may be present and may colonise buildings and infrastructure associated with the project.

Subterranean Fauna

Subterranean fauna consists of small animals and microbes that live below the earth's surface in groundwater and caves or voids. Communities of subterranean fauna that live in groundwater aquifers are called 'stygofauna'. Communities of subterranean fauna that live within voids above the watertable are called ‘troglofauna’.

Table 3.16 presents the subterranean fauna found within the minesite and surrounds, and a brief description of the predicted impact to each taxon considering the sampling data and habitat distribution.

Table 3.16 Subterranean fauna found within the minesite and surrounds

Taxa	Location[1, 2]	Impact
Stygofauna		
Copepoda- *Halicyclops (Rochacyclops) calm* (Karanovic, 2006)	**Glenda**, **Bobby** Clare, Floyd.	Species impacted by mining. Both regional and locally distributed.
Copepoda- *Mesocyclops holynskae (*Karanovic, 2006) (copepod)	Floyd.	Species not impacted by mining. Both regional and locally distributed.
Copepoda- *Diacyclops humphreysi humphreysi* (Pesce & De Laurentiis, 1996)	**Bobby**, **Alice Connie**, **Olivia**, **South Limb**, Clare.	Species impacted by mining. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Both regional and locally distributed.
Copepoda- *Diacyclops scanloni* (Karanovic, 2006)	**Bobby**, Clare, Floyd.	Species impacted by mining. Both regional and locally distributed.
Copepoda- *Metacyclops pilbaricus* (Karanovic, 2004)	**Alice**, **Bobby**.	Species impacted by mining. Both regional and locally distributed.
Copepoda- *Stygonitocrella trispinosa* (Karanovic, 2006)	**Bobby**, **South Limb**, **Alice**, **Glenda**, **Olivia** Clare, Floyd.	Species impacted by mining. Both regional and locally distributed.
Amphipoda (*Nedsia sp*.)	**South Limb**, Clare.	Taxon impacted by mining. Locally distributed, including a non-impact site.
Amphipoda sp. 1	**Bobby**, **Connie**.	Taxon impacted by mining. Locally distributed, but restricted to impact area. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Impacts unlikely to cause significant risk to taxa.
Amphipoda sp. 2	Clare.	Taxon not impacted by mining.
Amphipoda with eyes	**Bobby**.	Taxon not impacted by mining.
Ostracoda- *Areacandona iuno* (Karanovic, 2007)	**Alice**, **Connie Glenda**, Clare.	Species impacted by mining. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Both regional and locally distributed.
Bathynellacea- *Atopobathynella sp.*	**Connie**.	Taxon within mining impact area. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Possible regional distribution. Impacts unlikely to cause extinction of taxa.
Bathynellacea- *Bathynella* sp.	**Connie**.	Taxon within mining impact area. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Possible regional distribution. Impacts unlikely to cause extinction of taxa.
Oligochaeta	**Bobby**, **Connie South Limb**, Clare, Floyd.	Taxon impacted by mining. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Both regional and locally distributed.

Table 3.16 Subterranean fauna found within the minesite and surrounds (cont'd)

Taxa	Location[1, 2]	Impact
Troglofauna		
Araneae sp. 2	**South Limb, Alice**, Monty.	Species not impacted by mining.
Lagynochthonius n sp.	Monty.	Species impacted by mining and found outside the impact zone.
Ideobrothrus n. sp.	**South Limb**.	Species habitat occurs outside impact zone.
Diplopoda sp. 1	**South Limb**, **Alice**, Monty.	Species impacted by mining and found outside the impact zone.
Scolopendrida sp. 1	**Alice**, **Olivia.**	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Pauropoda sp. 1	**Bobby**.	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Diplura sp. 1	**South Limb**, **Connie**.	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Diplura sp. 2	**Olivia**.	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Projapygidae sp. 1	**Alice**, Lena.	Species impacted by mining and found outside the impact zone.
Nicoletiidae sp. 1	**South Limb**, **Alice**, **Connie**.	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Coleoptera sp.	Monty.	Species not impacted by mining.
Oniscidea sp. 2	**South Limb**, **Alice**, **Connie**, Ridley, Monty.	Species impacted by mining and found outside the impact zone.

[1] Project areas to be mined are in bold.

[2] Dewatering of Bobby, Glenda, Alice East and South Limb pits will occur. Alice West pit will not be mined below the water table, however will be affected by groundwater drawdown from dewatering of the surrounding pits.

3.4.3 Regulatory Requirements

The management measures contained in the Fauna Management Plan have been developed in accordance with the provisions of the *Environmental Protection and Biodiversity Conservation Act 1999*, *Environmental Protection Act 1986* and the *Wildlife Conservation Act 1950*. The Commonwealth DEWR and the Western Australian DEC are the administering authorities for these Acts respectively.

An overview of the relevant provisions of these Acts is provided below.

Environmental Protection and Biodiversity Conservation Act 1999

The Environmental Protection and Biodiversity Conservation Act provides for the protection of fauna species that are nominated as being of 'national environmental significance'. The list is divided into groups according to conservation status (refer to Table 3.15 for conservation codes).

The Environmental Protection and Biodiversity Conservation Act also provides for the protection of migratory bird species listed in the Bonn Convention (i.e., Convention on

the Conservation of Migratory Species of Wild Animals), the Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (known as CAMBA), and the Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (known as JAMBA).

The Pardoo DSO Project was referred to the Commonwealth DEWR for assessment under the Environmental Protection and Biodiversity Conservation Act, as some fauna species of national environmental significance were located at the minesite. After assessment by the DEWR, it was determined that the project should not be a controlled action.

Environmental Protection Act 1986

Part IV of the Environmental Protection Act establishes provisions for the EPA to carry out environmental impact assessments in Western Australia. Where relevant, the EPA issues and directs proponents to comply with Guidance Statements that contain the EPA's minimum requirements for the protection of elements of the environment such as fauna. Guidance Statement 56 – Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, requires proponents to assess flora and fauna of conservation significance in their environmental impact assessment.

The Pardoo DSO Project is currently undergoing a formal assessment under Part IV of the Environmental Protection Act, at a PER level of assessment. Should the proposal be approved, the Pardoo DSO Project will be managed in accordance with any regulatory conditions (within the Ministerial Statement) that are applied to the proposal at completion of the PER assessment.

Wildlife Conservation Act 1950

The Wildlife Conservation Act provides for the protection of flora and fauna species of conservation significance. Protected fauna species are identified as Scheduled Fauna, which are listed in the Wildlife Conservation (Specially Protected Fauna) Notice, 2006. There are four levels of Scheduled Fauna.

DEC also maintains a list of five Priority Fauna conservation codes that includes fauna removed from the Scheduled Fauna list and other species known from only a few populations or in need of monitoring. The Wildlife Conservation Act does not provide specific protection for Priority Fauna, however, the potential impacts of new proposals on Priority Fauna is generally considered as part of the environmental impact assessment process under the Environmental Protection Act (see above).

A description of each of the conservation levels of fauna of conservation significance found at the minesite is provided in Table 3.15.

3.4.4 Consultation

Stakeholder comments relating specifically to fauna management are provided in Table 3.17.

Table 3.17 Fauna management issues identified during stakeholder consultation

Stakeholder	Issue/Comment
EPA	Outline measures that will be implemented to protect locally/regionally significant fauna habitat.
	The DEC supports the following recommendations provided in Metcalf *et al.* (2007): • Where roads, mining or other infrastructure cross linear habitats, consideration should be given to facilitating movement of fauna so that the infrastructure does not form a barrier. • Infrastructure and roads should be located so as to minimize the fragmentation of important habitats.
	Management should address: • Avoidance of impact on significant areas and values where possible. • Minimising the disturbance footprint. • Groundwater-dependent ecosystems. • Excess water creation and discharge impacts, including location, quality and quantity. • Final void retention. • Water quality. • Weed hygiene and management – a Weed Management Plan will be required.
	Troglofauna survey work and the regional significance of troglofauna species should be clearly identified and discussed.
	Impacts on troglofauna habitat from mining should be clearly detailed.

The above comments have been considered in developing the management actions outlined in this Fauna Management Plan. Issues identified by ongoing consultation will be considered within subsequent reviews of this management plan.

3.4.5 Potential Impacts

Terrestrial Fauna Habitat

Up to 278 hectares of vegetation will be cleared or disturbed. This may reduce or fragment fauna habitat in the project area, consequently reducing species abundance and distribution.

Fauna Injury or Mortality

Collisions between fauna and minesite vehicles may occur along the access road, haul roads or minor access tracks, resulting in injury or death of fauna. Some fauna species may be more susceptible than others.

Non-indigenous Fauna

The project may result in an increased abundance and distribution of non-indigenous fauna, due to a potential increase in food and water resources on the minesite and attraction to the minesite area due to water source changes.

Noise, Vibration and Light

Noise, vibration and light generated by minesite activities may impact upon fauna in the local area surrounding the minesite.

Subterranean Fauna Habitat

Little research has been conducted into the effect of mining on subterranean fauna habitat. Potential impacts and risks to subterranean fauna that may arise as a consequence of the Pardoo DSO Project, primarily involve the direct or indirect disturbance of habitat. The potential direct and indirect impacts are outlined below:

- Direct disturbance to subterranean fauna habitat may be caused by:
  - Creation of mine pits.
  - Lowering the groundwater table as a consequence of mine dewatering.
  - Contamination or compaction from minesite equipment and infrastructure.
- Indirect disturbance to subterranean fauna habitat may be caused by:
  - Increased exposure to air.
  - Reduction in organic inputs beneath areas of cleared vegetation or waste rock dumps.
  - Vibration.
  - Changes to water quality parameters, such as pH, salinity and turbidity.

3.4.6 Management Practices

Terrestrial Fauna Habitat

During the design phase, the minesite footprint has been located and minimised to avoid disturbance to key habitats as much as possible. In addition to planning and designing initiatives, further operational management measures that will be implemented during the life of the mine include the following:

- A ground clearance SOP will be developed and implemented as outlined in the Flora and Vegetation Management Plan (Section 3.3) with a focus on minimising vegetation clearing.
- The removal or fragmentation of vegetation communities associated with watercourses and significant fauna habitat, such as trees and rocky outcrops, will be avoided where possible. This will be managed through the ground clearance SOP.
- A fire prevention and control strategy will be prepared and implemented (refer to the Flora and Vegetation Management Plan, Section 3.3). This will include an objective to prevent fires burning across *Triodia* grasslands.
- The relocation of species of conservation significance will be investigated in consultation with the DEC if individuals or populations are at significant risk of impact from mining activities. The risk of impact in each area to be disturbed will be determined through consultation with the DEC and specialist consultants.
- Impacts to surface water and groundwater will be minimised and managed in accordance with the Water Management Plan (Section 3.2).

- Off-road driving will be prohibited, unless approved for necessary operations. Movement of personnel outside of the disturbance footprint will also be prohibited.
- Signage will be provided to identify significant fauna habitats at risk from minesite-related impacts.
- Dust will be managed as outlined in Air and Noise Management Plan (Section 3.5).
- Rehabilitation and decommissioning of the minesite will be conducted as outlined in the Conceptual Mine Completion and Rehabilitation Plan (Section 3.5).
- Further survey work for species of conservation significance, such as the Pilbara olive python and northern quoll, may be undertaken, if it is determined that their range and movement are impacted significantly (due to impacts on habitat) by mining operations.
- Environmental education and training of staff will be conducted prior to their commencement of work at the minesite.
- Impacts to habitat favourable to short-range endemic terrestrial invertebrate species, such as rocky gullies, will be minimised where possible.

Fauna Injury or Mortality

Management measures to either prevent or mitigate impacts associated with fauna injury or mortality:

- A speed limit of 50 kph will be imposed and enforced in areas of high wildlife activity within the minesite. Vehicle traffic will be restricted to the minesite access and haul roads as far as practicable.
- Any fauna injured or killed as a result of a vehicle collision will be reported to the Pardoo General Manager and the Senior Environmental, Health and Safety Specialist, and recorded through the incident reporting system. Any fauna suspected as being of conservation significance will be reported to the Karratha DEC office. Should repeated mortalities of species of conservation significance occur on the access track or haul road, mitigation measures (such as fauna crossings) will be investigated after consultation with the DEC.
- Excess water discharge locations will be located well away from the mining operations centre and areas of vehicular movement, to discourage terrestrial fauna from approaching areas of mining activity.

Non-indigenous Fauna

Management measures to minimise the risk of increasing the abundance of non-indigenous fauna within the minesite are provided below:

- Existing non-indigenous species populations within the minesite will be managed using methods approved by the DEC and the pastoralist. Methods may include baiting and trapping.

- Waste management procedures as outlined in the Waste Management Plan (Section 3.5) will be followed to minimise availability of potential resources to non-indigenous fauna.
- Areas with a high potential for, or susceptibility to, an increase in the abundance of non-indigenous species (e.g., administration facilities, waste storage areas and around water sources), will be inspected regularly for the presence of these species.

Noise, Vibration and Light

Noise and vibration control measures will be implemented to ensure that the project presents a safe working environment and minimises impacts to fauna where practical.

Light spill from the minesite infrastructure will be minimised as far as practicable through design and operational initiatives, which may include directional lighting, light shields, lighting frequency, timing devices and personnel education.

Subterranean Fauna Habitat

The direct removal of some subterranean fauna habitat will be minimal given the small size of the Pardoo DSO Project.

Waste dumps have been designed to minimise the disturbance footprint without compromising landform stability, thereby minimising the potential to alter the microclimate in which potential troglofauna habitat occurs. Increased sedimentation will be minimised through measures outlined in the Water Management Plan (Section 3.2).

Ground clearance will be kept to the minimum necessary for safe construction and operation.

The pit voids of Glenda, Alice East and South Limb West, will be partially backfilled with waste rock from adjacent pits. The pits will be backfilled to at least 2 m above the pre-mining water level to eliminate any potential evapo-transpirational loss via capillary action.

Dewatering bores and in-pit sumps will be used to dewater the Bobby, Glenda, Alice East and South Limb pits ahead of mining operations. Although Alice West will not be mined below the water table, the pit will be affected by groundwater drawdown from dewatering of the surrounding pits. Management measures to mitigate the potential impacts associated with lowering or altering the water table are discussed in the Water Management Plan (Section 3.2). It is proposed that dewatering is optimised so that only the minimum amount required for undertaking dry mining is abstracted.

The dewatering strategy (which includes a groundwater monitoring program) will provide validation of the numerical groundwater model as generated by MWH to ensure impacts to subterranean fauna habitat occur as predicted. The monitoring requirements, contingency actions and performance indicators for groundwater and surface water monitoring are detailed in the Water Management Plan (Section 3.2) and will not be considered further within this Fauna Management Plan.

A supplementary stygofauna sampling program has been developed in consultation with the DEC in accordance with relevant EPA guidance statements. The outcomes of the sampling program will be reported to DEC, and be made publicly available, before commencement of construction at the minesite.

A troglofauna habitat monitoring program, measuring key habitat parameters such as humidity and temperature, will be developed and implemented in consultation with the DEC and relevant specialists.

The potential for contamination will be minimised through measures outlined in the Waste Management Plan (Section 3.6) and the Hydrocarbons and Dangerous Goods Management Plan (Section 3.7).

3.4.7 Monitoring

Given that monitoring of terrestrial fauna is not required to support the management practices outlined in Section 3.4.6, no monitoring is proposed for the management of terrestrial fauna. Management of terrestrial fauna will instead focus upon minimising the Pardoo DSO Project's impacts to terrestrial fauna habitat, managing the minesite activities to minimise fauna injury or mortality and management of non-indigenous fauna.

The monitoring proposed for Atlas to support its management commitments regarding subterranean fauna is summarised in Table 3.18.

Table 3.18 Summary of fauna monitoring

Item	Parameter	Purpose
Subterranean fauna habitat	Key troglofauna habitat parameters to be developed in consultation with the DEC and relevant specialists.	To monitor and detect changes in troglofauna habitat conditions to gain a better understanding of actual mining impacts.

A monitoring schedule for troglofauna habitat (detailing parameters, sampling frequency, etc.) will be developed in consultation with the DEC and relevant specialists, and included in subsequent versions of this Fauna Management Plan.

3.4.8 Contingency Actions

Contingency actions for key issues relating to fauna that will be undertaken in the event of an actual or perceived exceedence of triggers are provided in Table 3.19.

Table 3.19 Contingency fauna management actions

Trigger for Action	Contingency Action Required
More than one incidence of death or injury to same species of fauna of conservation significance occurs within one year.	Investigate mitigation measures (such as fauna crossings) in consultation with the DEC.
Individuals or populations of species of conservation significance are at significant risk from mining activities.	Investigate relocation of populations and species in consultation with the DEC.

3.4.9 Performance Indicators

Table 3.20 below illustrates the conceptual performance indicators and corresponding targets that will be used to track progress in achieving the fauna management objectives. Targets were developed with the intent of being achievable given the project constraints and to provide a measurement of success for each performance indicator, rather than providing project goals for each objective.

No relevant standards for performance indicators for fauna management were identified at the time of preparing this Fauna Management Plan. Instead, performance indicators and targets are based on environmental baseline conditions and worst-case environmental impacts, as presented in the Pardoo DSO Project's PER document.

Table 3.20 Conceptual fauna management performance indicators

Item	Performance Indicator	Target
***Objective 1**. To minimise the impact of mining operations on fauna habitat.*		
Terrestrial fauna habitat	Area of disturbance.	No greater than 278 ha.
	Removal or fragmentation of vegetation communities associated with watercourses.	No removal or fragmentation of habitat type 'major watercourses', as shown in Figure 3.5.
Subterranean fauna habitat	Area of disturbance.	No greater than 278 ha.
	Subterranean fauna monitoring habitat program.	Developed and implemented in consultation with DEC prior to commencement of dewatering or ground-disturbing activities.
***Objective 2**. To ensure that species of conservation status (including vertebrates, terrestrial invertebrates, and subterranean fauna) are not threatened by mining operations.*		
Fauna injury or mortality	Vehicle restrictions.	• No vehicles exceed 50 km/h within the minesite area. • No unapproved vehicle traffic outside of the minesite area of disturbance.
	Number of fauna mortalities.	• No mortalities of terrestrial fauna of conservation significance. • If mortalities occur, mitigation measures are initiated after the incident.
Non-indigenous fauna	Evidence/sightings of non-indigenous fauna.	No observed increase in non-indigenous fauna.
	Non-indigenous fauna control.	Methods for non-indigenous fauna control are developed in consultation with the DEC and pastoralist if required.

3.4.10 Roles and Responsibilities

Operations Manager

The Operations Manager in charge of the project will ensure that appropriate resources are provided to implement the actions outlined in this Fauna Management Plan. The Operations Manager has overall responsibility to ensure that all mining activities are

undertaken according to the IMS, this Fauna Management Plan and other regulatory requirements.

Pardoo General Manager

The Pardoo General Manager is responsible for ensuring that all personnel are working in accordance with this management plan. This includes ensuring that all personnel participate in the induction program and undertake relevant training.

Senior Environmental Health and Safety Specialist

The Senior Environmental Health and Safety Specialist is responsible for ensuring that the management actions contained within this Fauna Management Plan are implemented. The Senior Environmental Health and Safety Specialist is also responsible for the coordination of reporting to government agencies.

Mining Contractor

The Mining Contractor will work with the Senior Environmental Health and Safety Specialist to ensure that management actions contained within the Fauna Management Plan are implemented. The Mining Contractor is responsible for supporting and promoting key conservation issues within the minesite and ensuring that personnel implement requirements of the Fauna Management Plan.

All Personnel and Contractors

All personnel and contractors are responsible to adhering to the procedures outlined in this Fauna Management Plan. All personnel will provide assistance in implementing this management plan and will report any non-compliance to the Mining Contractor.

3.4.11 Records and Reporting

The environmental component of the induction will educate the workforce on faunal issues. Induction records will include sign-off by inductees to indicate that fauna management was discussed in their induction program.

Incident reports will be used to track any fauna injury or mortality. Any fauna injured or killed as a result of a vehicle collision will be recorded and reported to the Pardoo General Manager through the incident reporting system. The Karratha DEC office will be informed if the fauna is suspected to be of conservation significance. All staff are responsible for the correct use of the incident reporting system.

If required, control methods for non-indigenous fauna will be developed in consultation with the DEC and pastoralist. The outcomes of any non-indigenous fauna control programs will be recorded and reported in the AER.

3.4.12 Key Management Actions Table

The following key management actions (Table 3.21) relate specifically to management of fauna.

Table 3.21 Key fauna management actions

Reference	Item	Key Management Action	Timing	Reporting/Evidence	Status[1]
F01	Terrestrial fauna habitat	Avoid the removal or fragmentation of vegetation communities associated with watercourses and significant fauna habitat, such as trees and rocky outcrops, where possible. Incorporate the above requirement into the ground clearance SOP.	Prior to commencement of ground-disturbing activities.	This EMP, internal audits, AER.	
F02	Terrestrial fauna habitat	Prohibit off-road driving and movement of personnel outside of the area of disturbance, unless approved for necessary operations.	Prior to commissioning.	Internal audits.	
F03	Terrestrial fauna habitat	Provide signage to identify significant fauna habitats at risk from minesite-related impacts.	During construction.	Internal audits.	
F04	Terrestrial fauna habitat	Initiate further survey work for species of conservation significance, such as the Pilbara olive python and northern quoll, if species' range and movement are significantly impacted by mining operations.	Prior to commencement of ground-disturbing activities.	AER.	
F05	Terrestrial fauna habitat	Review the risk of mining impacts to individuals or populations of fauna of conservation significance through consultation with the DEC and specialist consultants. Investigate relocation of species of conservation significance if the risk is considered significant.	Prior to commencement of ground-disturbing activities in each relevant area.	AER.	
F06	Fauna injury or mortality	Impose and enforce speed limit of 50 kph. Prohibit off-road driving and movement of personnel outside of the area of disturbance, unless approved for necessary operations.	Prior to commissioning; ongoing.	Internal audits.	

Table 3.21 Key fauna management actions (cont'd)

Reference	Item	Key Management Action	Timing	Reporting/Evidence	Status[1]
F07	Fauna injury or mortality	Develop and implement the reporting system for fauna injured or killed as a result of a vehicle collision.	Prior to commencement of ground-disturbing activities; ongoing.	This EMP, internal audits.	
F08	Non-indigenous fauna	Develop methods for non-indigenous fauna control, if required, with consultation with the DEC and the pastoralist. Include non-indigenous fauna control methods in subsequent versions of this EMP.	Within one year of commencement of mining.	This EMP.	
F09	Noise, vibration and light	Minimise light spill from the minesite infrastructure as far as practicable through design and operational initiatives, which may include directional lighting, light shields, lighting frequency, timing devices and personnel education.	Ongoing during construction, mining and mine completion.	Internal audits, AER.	
F10	Subterranean fauna habitat	Develop and implement troglofauna habitat monitoring program in consultation with the DEC and relevant specialists. Include monitoring schedule is subsequent versions of this EMP.	Prior to commencement of ground-disturbing or dewatering activities.	This EMP, AER.	
F11	Subterranean fauna habitat	Report to DEC and make publicly available the outcomes of the Phase 3 stygofauna sampling program.	Prior to construction.	Phase 3 stygofauna sampling program report.	

[1] To be completed and updated once regulatory approvals are obtained.

3.5 Air and Noise Management

3.5.1 Objectives

The Air and Noise Management Plan has been developed with the intention of minimising Atlas's impact to air quality (i.e., particulate matter and greenhouse gas emissions) and noise levels within the minesite, along the product transport route and at the relevant port in Port Hedland.

The objectives for the Air and Noise Management Plan are to:

- Minimise noise and dust generated during mining operations, product transport and exporting activities at the port.
- Minimise project-related greenhouse gas emissions and continually improve greenhouse gas efficiency.

3.5.2 Existing Environment

Completed Studies

The air quality impact assessment was undertaken by Air Assessments Pty Ltd. This study encompassed the minesite, product transport route and port, and included estimates of greenhouse gas emissions based on a production rate of up to 1.5 Mtpa. Particulate matter levels in this study were modelled using the Ausplume dispersion model.

Lloyd Acoustics Pty Ltd conducted the noise and vibration impact assessment. Noise impacts from mining operations (including blasting), product transport and exporting operations were modelled.

Particulate Matter

Minesite. The existing concentration of particulate matter[2] (i.e., dust) at the proposed minesite is currently unknown yet it is most likely representative of the natural levels or levels associated with pastoral activities.

Product Transport Route. The existing concentration of particulate matter along the proposed product transport route is currently unknown and likely to be highly variable. Particulate matter levels along the product transport route are most likely to be representative of the natural levels or slightly elevated as a consequence of existing traffic movement.

[2] Particulate matter includes the following: Total suspended particles (TSP), particulate matter (PM) measured with a sampler with 50 % cut point at 10 µm (PM_{10}) , particulate matter measured with a sampler with 50 % cut point at 2.5 µm ($PM_{2.5}$).

Port. It is thought that most fugitive dust in Port Hedland is generated through wind erosion or material handling during mineral export of crustal material. This source of dust is predominately of a larger particle size and therefore contributes primarily to total suspended particulates (TSP) and to a lesser extent PM_{10}. Particulate matter from crustal sources has little $PM_{2.5}$, with an estimated 10 to 15 % of PM_{10} dust from crustal sources in the $PM_{2.5}$ size range.

Data from BHP Billiton has shown that dust concentrations in Port Hedland are relatively high and are cause for concern. Annual average TSP concentrations monitored at the Port Hedland Hospital varied between about 85 and 110 $\mu g/m^3$ in 2005. The annual average PM_{10} concentration at the Hospital monitor for 2005 varied approximately between 35 and 42 $\mu g/m^3$. Annual-average $PM_{2.5}$ concentrations from BHP Billiton data show a clear downward trend in the last few years, although the trend may also be due to improvements in the sampling methodology.

Greenhouse Gases

The six greenhouses gases that are regulated under the Kyoto protocol are carbon dioxide (CO_2), methane (CH_4), perfluorocarbons (CFx), hydrofluorocarbons (HCFs), sulphur hexafluoride (SF_6) and nitrous oxide (N_2O). To compare the warming potential of the different gases, their impact is usually expressed in terms of CO_2 equivalents (CO_2e), in which the potential of each gas to heat the atmosphere is expressed in terms of carbon dioxide.

For contextual information, the Australian and Western Australian greenhouse gas emissions were 547 and 62.8 Mt CO_2e in 1990 respectively.

Noise

Minesite. Ambient noise levels at the minesite are generally low, given the pastoral land use, with some audible traffic noise from the Great Northern Highway. There are two potential sensitive receivers in the proximity of the mine site, which are the De Grey Station homestead and the Strelley Pump Station, located 10 km north-northeast and 7 km east of the minesite and minesite access intersection respectively.

Product Transport Route. Sensitive receivers along the product transport route are currently exposed to rail and road traffic noise.

The Goldsworthy railway runs adjacent to the Great Northern Highway from BHP Billiton's Yarrie mine to the Nelson Point Port at Port Hedland. BHP Billiton operates the line and currently a train travels every 30 minutes.

Traffic on the Great Northern Highway and other major roads is a significant source of noise to sensitive receivers within Port Hedland. There are up to 10,600 vehicles per day on the most heavily trafficked sections of the Great Northern Highway. Up to 15.7 % of the existing highway traffic is heavy vehicles (Ausroad Class 3 and above).

Port. Recent noise monitoring data has provided ambient noise levels close to the Esplanade Hotel, which is the nearest sensitive receiver to all three potential export

berths (i.e., existing public access berth, proposed Utah Point bulk commodities berth and the approved Fortescue Metals Group (FMG) berth at Anderson Point). Recent long-term monitoring undertaken at the Port Hedland Port Authority (PHPA) building (approximately 200 m northwest of the Esplanade Hotel), showed that the existing noise level throughout the day and night ranges from between L_{A90} 57 to 62 dB. Hence, the noise levels recorded in the vicinity of the Esplanade Hotel currently exceed noise regulations.

Noise measurements undertaken in June 2004 for the proposed FMG port facility showed night-time noise levels of approximately L_{A10} 53 dB(A) at Kingsmill Street and Simpson Street (Lloyd Acoustics, 2007), which are located approximately 600 m and 2.4 km northeast and east-northeast of the Esplanade Hotel respectively.

3.5.3 Regulatory Requirements

Environmental Protection Act 1986

Part IV Environmental Impact Assessment. Part IV of the *Environmental Protection Act 1986* establishes provisions for the EPA to carry out formal environmental impact assessments of proposals that may have a significant impact on the environment and the setting of statutory conditions by the Minister for the Environment. The Pardoo DSO Project is currently undergoing a formal assessment under Part IV of the Environmental Protection Act, at a PER level of assessment. Should the proposal be approved, the Pardoo DSO Project will be managed in accordance with any regulatory conditions (within the Ministerial Statement) that are applied to the proposal at completion of the PER assessment.

In the event that Atlas successfully negotiates access to the approved FMG berth at Anderson Point, air and noise will be managed in accordance with the Dust Management Plan and Operations Noise Management Plan required by Ministerial Statement 000690.

The proposed Utah Point bulk commodities berth is currently undergoing a PER approvals process and is expected to be approved, constructed and commissioned by 2009. In the event that Atlas transports to and exports from Utah Point, it is expected that air and noise will be managed in accordance with the relevant Ministerial Statement.

Part V Licensing. Part V of the Environmental Protection Act requires that owners of 'prescribed premises' hold a works approval prior to construction and an operating licence prior to operations commencing. The Pardoo DSO Project minesite will be classified as a prescribed premise as it exceeds the production and/or design capacity for the following categories listed under Schedule 1 of the Environmental Protection Regulations 1987:

- Category 05 – Processing or Beneficiation of Metallic or Non Metallic Ore.
- Category 06 – Mine Dewatering.
- Category 52 – Electric Power Generation.
- Category 85 – Sewage Facility.

Once issued, the licence will contain a number of general and specific conditions relating to the operation of the minesite. This Air and Noise Management Plan will be reviewed

and revised if necessary to reflect any licence conditions that may affect air and noise management at the Pardoo DSO Project minesite.

Atlas's designated export berth in Port Hedland will be classified as a prescribed premise (Category 58 - Bulk material loading or unloading), requiring an operating licence as issued by the DEC. It is likely that air and noise will be managed (and monitored) at the prescribed premises as per the conditions attached to the operating licence. The licensee will have a legal obligation to ensure that potential air and noise impacts are managed in accordance with the licence conditions. Atlas will not be the licensee at the designated export berth, however, will enter into a commercial contract with a third party who will be legally responsible for managing product stockpiling and ship loading at the port facilities in Port Hedland. Atlas will ensure that dust management is considered within this contract.

Environmental Protection (Noise) Regulations

Environmental noise in Western Australia is governed by the Environmental Protection Act, through the Environmental Protection (Noise) Regulations 1997 (noise regulations). The noise regulations govern noise through three primary criteria: operational, construction and blasting.

Operational noise criteria require that noise is free of tonality, impulsiveness and modulation, and does not significantly contribute to the existing noise levels (i.e., must not exceed a value that is 5 dB above the assigned level).

National Environmental Protection Measures

The Western Australian Government has committed to the National Environmental Protection Measure (NEPM) for Air Quality, which details emission criteria for PM_{10} and $PM_{2.5}$. The DEC has indicated its intention to adopt the NEPM standards and goals through the development of a State Air Environmental Protection Policy (EPP). The State Air EPP is scheduled for release before 2008. It is understood that this EPP will include environmental standards for Port Hedland, which will consider the results of the various studies that are currently being conducted.

3.5.4 Consultation

Stakeholder comments relating specifically to the management of air and noise are provided in Table 3.22.

Table 3.22 Air and noise management issues identified during stakeholder consultation

Stakeholder	Comment
EPA	There may be other ship-loading systems with quieter equipment and machines than the front loaders. It is recommended that the proponent investigate the practicability of other quieter alternatives in the PER document.
	It is recommended that the proponent set the compliance with the Noise Regulations as the design objective for its port operation at Utah Point.

Table 3.22 Air and noise management issues identified during stakeholder consultation (cont'd)

Stakeholder	Comment
EPA (cont'd)	Given the high levels of dust recorded in Port Hedland and that dust is a cumulative impact issue, it would be inappropriate for Atlas not to engage in dust monitoring. Best practise dust management is unlikely to be achieved / assessed without monitoring.
	The Dust Management Plan needs to provide more comprehensive performance management targets such as trigger events, management strategies and response times.
DEC	Stockpile management within the port area needs to be addressed.
	The project will require a Dust Management Plan that covers transport, stockpiling at the port, crushing and screening activities, and commits to minimising handling.
	Water use efficiency management measures at the site and at the port are needed.
PHPA[1]	Dust and water management measures, including the design of the site process (e.g., moisture content of product leaving site), are needed to minimise dust in town from product transport and stockpiling.
PHCC[2] CHEA[3] PHPA[4]	Dust management measures for the town and Port Hedland are needed.

[1] PHPA – Port Hedland Port Authority.

[2] PHCC – Port Hedland Chamber of Commerce.

[3] CHEA – Care for Hedland Environmental Association.

[4] PHPA – Port Hedland Progress Association.

3.5.5 Potential Impacts

Particulate Matter

Mining operations will generate dust at the minesite, through ground disturbance, mining, stockpiling and vehicle movement along the access road, and other haul roads and tracks. Given that the minesite is isolated from sensitive receivers and there is not likely any dust-sensitive vegetation at the minesite, the primary issue relating to dust at the minesite is that of employee and contractor health and safety. Occupational health and safety matters will be considered elsewhere within the IMS, hence it is not considered further in this Air and Noise Management Plan.

The project has the potential to increase dust along the product transport route as particular matter may be generated from the product and truck wheels during transportation to the port.

The project will also contribute to dust in Port Hedland due to stockpiling and ship loading activities undertaken at the port.

Greenhouse Gas Emissions

The project, through mining, product transport and export, will result in the release of greenhouse gas emissions. Initial estimates indicate that the project will release approximately 23,250 to 25,880 t CO_2e per annum. This estimate is based on Atlas's

vehicle use, diesel generators, explosives, land clearing, product transport, and use of port equipment.

Noise

The project will also increase noise at the minesite through mining and blasting activities. Product transport and export activities at the port will contribute to existing noise levels within the Port Hedland residential area, although modelling indicates that existing noise at the port is likely to mask Atlas's contribution.

3.5.6 Management Practices

General

The following general measures will be implemented to manage air and noise emissions:

- All machinery and mobile equipment will be maintained in accordance with manufacturers' requirements and operated appropriately by competent and trained operators to minimise noise emissions.
- Standard noise abatement devices, such as mufflers, will be installed on machinery and vehicles.
- All mobile equipment to be used for the project will be selected to ensure that sound power levels are equal to or lower than those values used in the noise impact assessment.
- Atlas will employ a Community Liaison Officer, whose role will be to identify and address project-related issues within the Port Hedland community.
- Atlas will maintain a complaints reporting system, which will allow the community to interact directly with Atlas about various aspects of Atlas's operations.

Particulate Matter

The following management measures will be undertaken to minimise dust generation at the minesite:

- Vegetation clearing will be minimised (refer to Flora and Vegetation Management Plan, Section 3.3) and rehabilitated progressively (refer to Conceptual Mine Completion and Rehabilitation Plan, Section 3.8).
- One or two water carts will be continuously employed around the minesite for dust suppression on haul roads and access roads, and around areas of activity.
- Dust suppression within the crushing, screening and stockpiling area will be in the form of sprays installed at strategic transfer points within the process, such as the discharge point of the radial stackers and sprinklers directed at product stockpiles.

The following management measures will be employed to minimise the amount of dust generated during product transport and stockpiling, and ship-loading activities at the port.

- Ore will be pre-conditioned to the required 4 to 5 % moisture content prior to road transport.
- Although it is not expected to be present at the minesite, Atlas will test for the presence of asbestos in its ore, and will manage appropriately any asbestos with respect to its environmental and health responsibilities.
- All trailers attached to the product transport road trains will be fitted with covers to minimise dust emissions during product transport along the public road network. Contractors responsible for product transport will be trained in fitting, maintaining and inspecting these covers as part of their induction process.
- Existing dust control on the hopper at the public access berth will be improved (pending an agreement with the PHPA and stevedores).
- Atlas will operate in accordance with the existing and future Environmental Protection Act Part IV and Part V conditions of approval for the relevant export berth in Port Hedland. Atlas will engage in discussions with the relevant berth operator (proponent/licensee) to ensure that appropriate management measures have been implemented to mitigate particulate matter emissions.

Greenhouse Gas Emissions

Given that the Pardoo DSO Project is small in comparison to its existing and approved counterparts, options for minimising greenhouse gas emissions are limited. The following management measures, however, will be employed to minimise greenhouse gas emissions as far as possible:

- Atlas will consider the selection of the most energy-efficient technology available and the use of renewable energy sources where appropriate.
- An ongoing emissions monitoring and a reporting program will be implemented, and opportunities to reduce greenhouse gas emissions over time will be identified.
- Atlas will conduct a comprehensive analysis to identify and implement an appropriate greenhouse gas offset program in consultation with the Western Australian Government. The aim of the greenhouse gas offset program is to provide a benefit to the Port Hedland local community or local areas influenced by the Pardoo DSO Project.
- Vegetation clearing will be minimised (refer to Flora and Vegetation Management Plan, Section 3.3) and rehabilitated progressively (refer to Conceptual Mine Completion and Rehabilitation Plan, Section 3.8).

Noise

The following management measures will be employed at the minesite to minimise noise emissions:

- Blasting procedures will be strictly managed, including complying with ground vibration and overpressure limits, to ensure the comfort of employees and to protect mine infrastructure.

- Each blast will be designed by a suitably qualified person, with initial blasts being conservatively designed.
- Staff will be made aware of overall noise constraints during the construction and operational phases of the project.

The following management measures will be undertaken to minimise Atlas's contribution to noise along the product transport route and at the port.

- A Code of Conduct will be developed and implemented as outlined in the Transport Management Plan (Section 3.8). This Code of Conduct will include the requirement to limit compression braking in areas close to sensitive receivers.
- A project-related exclusion will be applied to product transport between 4.00 p.m. and 6.00 p.m. where no road trains will truck within the local Port Hedland area (refer to Transport Management Plan, Section 3.8).
- The feasibility of installing exhaust silencers on front-end loaders at the port will be investigated in consultation with the relevant port operator.
- The feasibility of installing non-intrusive reversing beepers on front-end loaders, while still meeting health and safety requirements, at the port will be, investigated in consultation with the relevant port operator.
- Atlas will operate in accordance with the existing and future Environmental Protection Act Part IV and Part V conditions of approval for the relevant export berth in Port Hedland. Atlas will engage in discussions with the relevant berth operator (proponent/licensee) to ensure that appropriate management measures have been implemented to mitigate noise impacts.

3.5.7 Monitoring

Atlas will be subject to the stockpiling and ship loading management practices and regulatory requirements of its chosen port operator, e.g., FMG or P & O Ports Limited (the stevedores at the existing public access berth. As such, it is envisaged that both dust and noise monitoring will be undertaken in accordance with the Environmental Protection Act Part IV and Part V requirements for the existing Port Hedland public access berth, proposed Utah Point bulk commodities berth and approved FMG berth at Anderson Point. For this reason, Atlas does not propose to monitor dust or noise level at the relevant export berth. Atlas will engage in discussions with the relevant berth operator (proponent/licensee) and DEC to ensure that appropriate ambient and site-monitoring programs have been implemented.

Management of air and noise will instead focus upon minimising the Pardoo DSO Project's contribution to ambient air quality and noise levels throughout it's mining activities, product transport and export activities. Should the requirement for monitoring be identified, either through ongoing stakeholder consultation, the outcomes of management measures outlined in Section 3.5.6, or as a requirement of Atlas's operating licence under Part V of the Environmental Protection Act (Section 3.5.3) a monitoring program will be included within subsequent versions of this Air and Noise Management Plan.

3.5.8 Contingency Actions

Contingency actions and corresponding triggers for key issues relating to air and noise management are provided in Table 3.23.

Table 3.23 Contingency air and noise management actions

Trigger for Action	Contingency Action Required
Complaint is received regarding Atlas's contribution to noise or dust in Port Hedland through product transport and exporting activities.	Investigate reason for complaint, undertake additional training and implement further management measures if the cause can be altered.

3.5.9 Performance Indicators

Table 3.24 below illustrates the conceptual performance indicators and corresponding targets that will be used to track progress in achieving the air and noise management objectives. Targets were developed with the intent of being achievable given the project constraints and to provide a measurement of success for each performance indicator, rather than providing project goals for each objective.

A brief rationale for each management item is provided below.

Table 3.24 Conceptual air and noise management performance indicators

Item	Performance Indicator	Target
Objective 1. *Minimise noise and dust generated during mining operations, product transport and exporting activities at the port.*		
General	Community complaints received.	No complaints received regarding dust or noise generation from product transport.
Particulate matter	Fitting of truck covers.	No incidences of transporting ore product without or inadequately secured truck covers.
	Percentage moisture in ore.	No less than 5 %.
	Improvements to dust hopper at the port.	Negotiations initiated with PHPA and stevedores prior to commencing stockpiling activities at the port.
Noise	Community complaints received.	As above.
	Exhaust silencers.	Negotiations regarding the feasibility of installing exhaust silencers on front-end loaders at the port are initiated with PHPA and stevedores prior to commencing stockpiling activities at the port.
	Non-intrusive reverse beepers on front-end loaders.	
	Incident reports.	As above.
Objective 2. *Minimise project-related greenhouse gas emissions and continually improve greenhouse gas efficiency.*		
Greenhouse gas emissions	Greenhouse gas efficiency (kg CO_2e/t ore).	Improvement in efficiency in each progressive year of operation.

Air quality targets that are relevant to the ambient dust levels at Port Hedland include the NEPM ambient air standards and goals, and the particulate air quality targets adopted by BHP Billiton for management of its export operations. Atlas's chosen port operator (e.g., FMG or P & O Ports Limited) will be responsible for ensuring that there bulk material stockpiling and ship loading activities are managed in accordance with relevant air quality targets (e.g., NEPM).

Given that Atlas does not propose to monitor dust at the port, performance indicators in this management plan have not been based on the above mentioned air quality targets. Instead, performance indicators are based on minimising Atlas's contribution to dust levels during product transport, and stockpiling and ship loading activities at the port.

Performance indicators and targets for greenhouse gas emissions are based on achieving continual improvement in greenhouse gas efficiency in each successive year of project operation.

Given that air and noise monitoring is not proposed at the minesite, performance indicators and targets are based instead on effective management of conditions or mining operations that result in increased dust and noise emissions.

Performance indicators for noise generated during product transport, and during stockpiling and ship-loading activities at the port, are based on minimising Atlas's contribution to existing noise levels in Port Hedland, which in many locations, exceed the noise regulations.

3.5.10 Roles and Responsibilities

The roles and responsibilities of personnel responsible for the development and implementation of the Air and Noise Management Plan at the Pardoo DSO Project minesite are discussed below.

Operations Manager

The Operations Manager in charge of the project will ensure that appropriate resources are provided to implement the actions outlined in this Air and Noise Management Plan. The Operations Manager has overall responsibility to ensure that all activities conducted in relation to mining operations are carried out in accordance with the IMS, this Air and Noise Management Plan and the other regulatory requirements.

Pardoo General Manager

The Pardoo General Manager is responsible for ensuring that all personnel and contractors work in accordance with this Air and Noise Management Plan, including the participation of all personnel in the induction program and relevant training.

Senior Environmental Health and Safety Specialist

The Senior Environmental Health and Safety Specialist is responsible for ensuring that the management actions contained within the Air and Noise Management Plan are

implemented. The Senior Environmental Health and Safety Specialist is also responsible for the coordination of reporting to government agencies.

Community Liaison Officer

The Community Liaison Officer will work with the Senior Environmental Health and Safety Specialist and Pardoo General Manager to ensure that any community complaints received through the complaints reporting system are investigated and that corrective actions are initiated within an appropriate amount of time. The Community Liaison Officer is responsible for recording and collating any complaints.

Contractor Manager

The Contractor Manager will work with the Senior Environmental Health and Safety Specialist to ensure that management actions contained within the Air and Noise Management Plan are implemented. The Contractor Manager is responsible for supporting and promoting key air and noise issues within the community and ensuring that personnel implement requirements of the Air and Noise Management Plan.

All Personnel and Contractors

All personnel and contractors are responsible to adhering to the procedures outlined in Air and Noise Management Plan. All personnel will provide assistance in implementing this Air and Noise Management Plan and will report any non-compliance to their respective manager.

3.5.11 Records and Reporting

The environmental component of the induction will educate the workforce on air and noise issues. Induction records will include sign-off by inductees to indicate that air and noise management was discussed at induction.

Incident reports will be used to track any non-compliance with air and noise issues (e.g., inappropriate blasting procedures, failure of truck covers). Any incident will be recorded and reported to the Pardoo General Manager through the incident reporting system. All staff are responsible for the correct use of the incident reporting system.

The Community Liaison Officer will record any complaints regarding air and noise and report these to the Senior Environmental, Health and Safety Specialist or Pardoo General Manager to ensure that all complaints are investigated and that corrective actions are initiated within an appropriate amount of time.

3.5.12 Key Management Actions Table

The following key management actions (Table 3.25) relate specifically to management of air and noise at the minesite, along the product transport route and the relevant port.

Table 3.25 Key air and noise management actions

Reference	Item	Key Management Action	Timing	Reporting/ Evidence	Status[1]
AN01	General	Develop and maintain a complaints reporting system.	Prior to commencement of operations.	Atlas website.	
AN02	Particulate matter	Pre-condition ore to the required 4 to 5 % moisture content.	Prior to product transport to the relevant port.	Internal records, PHPA records.	
AN03	Particulate matter	Test for the presence of asbestos in the ore.	Prior to product transport to the relevant port.	Internal report.	
AN04	Particulate matter	Ensure that all trailers attached to the product transport road trains are fitted with covers to minimise dust emissions during product transport along the public road network.	Prior to product transport to the relevant port.	Internal records, internal audit.	
AN05	Particulate matter	Arrange training for fitting and inspecting trailer covers as part of product transport contractors' induction.	Prior to product transport to the relevant port.	This EMP (to contain induction in revised versions).	
AN06	Particulate matter	Initiate negotiation with PHPA regarding improvement to dust controls at the existing hopper.	Prior to product transport to the relevant port.	Atlas consultation records.	
AN07	Greenhouse gas emissions	Select the most energy-efficient technology available and the use of renewable energy sources where possible.	During commissioning, ongoing.	Internal records.	
AN08	Greenhouse gas emissions	Implement emissions monitoring and a reporting program, and identify opportunities to reduce greenhouse gas emissions over time.	Ongoing.	AER.	
AN09	Greenhouse gas emissions	Conduct comprehensive analysis to identify and implement an appropriate greenhouse gas offset program in consultation with the Western Australian Government.	Ongoing.	Greenhouse gas offset report, AER.	
AN10	Noise	Investigate the feasibility of installing exhaust silencers on front-end loaders at the existing public access berth.	Prior to product transport to the relevant port.	Atlas consultation records.	

[1] To be completed and updated once regulatory approvals are obtained.

3.6 Waste Management

3.6.1 Objectives

The Waste Management Plan relates to the management of waste on the Pardoo DSO Project minesite. The objectives of the Waste Management Plan are to:

- Minimise the generation of waste from the minesite by reducing waste streams and recycling material wherever practicable.
- Dispose of waste in an environmentally acceptable manner and in compliance with all regulatory and Atlas requirements.

3.6.2 Significant Aspects of the Existing Environment

The proposed minesite lies predominantly within the De Grey River Water Reserve, which contains the current and future domestic water supply for Port Hedland. The De Grey River Water Reserve is afforded the highest level of management and is classified as a Priority 1 (P1) water source protection area.

The project is bound by three main ephemeral water bodies: Redrock creek to the west, Ridley River to the north and the De Grey River to the east, all of which lie within the De Grey River catchment area.

The closest area of conservation significance to the project is the De Grey River. The river is designated a wetland of national importance from the confluence of the Oakover and Nullagine rivers to the Western Australia coast. The river intersects the northeast corner of the minesite exploration lease (E45/2330), and is approximately 6 km from the nearest proposed operation. The Leslie Salt Flats, which are located adjacent to the coast at the outlet of the Ridley River, 25 km from the project area, are also listed as wetlands of national importance.

3.6.3 Regulatory Requirements and Standards

The management measures contained in the Waste Management Plan have been developed in accordance with the provisions of the State *Environmental Protection Act 1986*, *Contaminated Sites Act 2003* and Environmental Protection (Controlled Waste) Regulations 2004. The DEC is the administering authority for this legislation. The Australian Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice 1996 has also been considered in the development of the Waste Management Plan.

An overview of the relevant provisions of these Acts, regulation and the APPEA Code is provided below. The regulations for the storage, handling and transport of non-waste hydrocarbons and dangerous goods are detailed further in Section 3.7.3.

Environmental Protection Act 1986

Part IV Environmental Impact Assessment. Part IV of the Environmental Protection Act establishes provisions for the EPA to undertake formal environmental impact

assessments on proposals that may have a significant impact on the environment and the setting of statutory conditions by the Minister for the Environment. The Pardoo DSO Project is currently undergoing a formal assessment under Part IV of the Environmental Protection Act, at a PER level of assessment. Should the proposal be approved, the Pardoo DSO Project will be managed in accordance with any regulatory conditions (within the Ministerial Statement) that are applied to the proposal at completion of the PER assessment.

The Principle of Waste Minimisation. The minimisation of waste is a policy developed by the EPA to assist with achieving their objectives, which include:

- The prevention, control and abatement of pollution and environmental harm.
- The conservation, preservation, protection, enhancement and management of the environment (including water resources).

The principle of waste minimisation is the concept that all reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment. Atlas is committed to developing a 'reduce, reuse and recycle' approach to waste management for all components and phases of the project, consistent with the waste minimisation principle which is also recommended in:

- Enduring Value – the Australian Minerals Industry Framework for Sustainable Development (MCA, 2005).
- Hope for the Future: the Western Australian State Sustainability Strategy (Government of WA, 2003).
- Statement of Strategic Direction for Waste Management in Western Australia (DoE, 2004a).

Where waste generation is unavoidable, Atlas will ensure that such waste is disposed of appropriately.

Environmental Protection (Controlled Waste) Regulations 2004

Tyres and sewage are both classed as controlled waste under the Environmental Protection (Controlled Waste) Regulations 2001. In accordance with the requirements of the Environmental Protection (Controlled Waste) Regulations all controlled goods will be removed from site for recycling and/or disposal by a licensed contractor.

Should the number of unused tyres on site reach or exceed 100, consultation with DEC will be required to determine the necessity for amendment of the projects Part V operating licence.

The Contaminated Sites Act 2003

According to the Contaminated Sites Act, a site is contaminated when there are substances present on that site (including land or water), at above background concentrations. Such substances present or have the potential to present, a risk to human health, the environment or an environmental value. The Contaminated Sites Act

has established a scheme for determining when sites must be remediated and who will be responsible (EDOWA, 2007).

The mining industry engages in a number of activities that are all listed as potentially contaminating activities (DoE, 2004b), including explosive production/bulk storage, mechanical workshops, fuel storage and sewage treatment. Contaminants from such activities are often the result of poor management controls.

The Contaminated Sites Act does not propose that all minesites are to be reported to DEC as contaminated sites. Contamination reporting by Atlas however, may be required when there are grounds to suspect contamination or when there is known contamination on a particular site. If required, expert advice will be sought to identify the necessity for reporting (DEC, 2007a).

This Waste Management Plan will ensure that the project complies with the provisions of the Contaminated Sites Act in the event that contamination is identified and requires reporting to the DEC.

Australian Petroleum Production and Exploration Association Code of Environmental Practice 1996

The APPEA Code provides guidance on effective and responsible waste management methods, and the development of sound waste management strategies, consistent with the ISO14000 Environmental Management Standards and Best Practice.

3.6.4 Consultation

Stakeholder comments relating specifically to the management of waste are provided in Table 3.26.

Table 3.26 Waste management issues identified during stakeholder consultation

Stakeholder	Issue/Comment
DoW	The proponent will need to demonstrate that the recycled wastewater has been treated to a level that its use for irrigation will not pose a threat to the water supply. This should be addressed in the Waste Management Plan.

Irrigation of sewage liquor is no longer proposed for the Pardoo DSO Project, so this comment has not been actioned within the Waste Management Plan. Should future approval be sought for the discharge of recycled wastewater, this comment will be addressed.

3.6.5 Potential Impacts

Wastes that are generated during the life of the mine have the potential to degrade the quality of surface and groundwater through the leaching of contaminants. In addition, waste has the potential to generate odour and attract vermin, depending on the type of waste. The key potential impacts associated with waste generation at the minesite are as follows:

- Land contamination.
- Contamination of surface water and groundwater.
- Food source for non-indigenous fauna and/or native animals.
- Fire risk.
- Excessive waste generation or inefficient use of resources.
- Litter.

During construction and operation of the mine, waste generated from daily activities will include:

- Waste rock (management described in the Conceptual Mine Completion and Rehabilitation Plan, Section 3.9).
- Sewage wastes from the sewage treatment plant.
- Industrial waste.
- Domestic waste.

Specific waste materials generated at the minesite will include:

- Sewage liquor.
- Sewage sludge.
- Store/office cardboard.
- Scrap metal.
- Tyres.
- Plastic (recyclable).
- Plastic (non-recyclable).
- Pallets.
- Solid and liquid waste hydrocarbons and hydrocarbon-contaminated material (i.e., rags, filters, spill kits, washdown water).
- General domestic waste (i.e., food scraps, non-recyclable crib room waste, non-recyclable office waste).
- Recyclable domestic waste (i.e., office paper, glass).

3.6.6 Management Practices

Practices that will be undertaken for the management of waste in all Atlas projects and those specific to the Pardoo DSO Project minesite are outlined below. A summary of the management that will be employed for each waste type at the Pardoo DSO Project minesite has been provided in Table 3.27. Any other waste produced on site will be either returned to the supplier or disposed of at the Class II landfill at the South Hedland waste management facility.

Table 3.27 Management for each waste type

Waste Type	Storage	Disposal	Other
Sewage liquor and sludge	Stored within the anaerobic treatment system.	Collected as required by qualified contractor for off-site licensed disposal.	On site employee training will occur upon installation of the treatment system. Regular routine maintenance activities will occur monthly or in accordance with the treatment system's operating procedures. Regular overhauls of the treatment system will occur quarterly or in accordance with the treatment system's operating procedures. The waste disposal register will be maintained ongoingly.
Liquid hydrocarbons and hydrocarbon-contaminated material	Stored in sealed containers on a designated and appropriately-sized bunded pallet within the covered oil and lube store, or within the covered workshop area.	A suitable waste management contractor will regularly remove these wastes off-site for licensed disposal or recycling.	The waste disposal register will be maintained ongoingly. Should a spill occur, it must be reported and responded to in accordance with the Emergency Spill Response Procedure (ESRP).
Solid hydrocarbons and hydrocarbon contaminated material	Solid wastes such as oily rags, filters and used batteries will be contained and stored on a bunded pallet within a covered area.	Periodic collection by a suitable waste management contractor for licensed off-site disposal or recycling.	The waste disposal register will be maintained ongoingly. Should a spill occur, it must be reported and responded to in accordance with the ESRP.
Store/office cardboard	Collected in dedicated bins.	Transported to the South Hedland waste management facility as required.	The waste disposal register will be maintained ongoingly.
Scrap steel	Collected in a dedicated area in the contractors' laydown yard.	Collected by a scrap steel merchant as required.	The waste disposal register will be maintained ongoingly.
Tyres	Stockpiled in a suitable area.	Ensure that the number of unused tyres (inc. spares) does not meet/exceed 100. Either returned to the supplier or disposed of at the South Hedland waste management facility for a fee, as required.	The waste disposal register will be maintained ongoingly.
Plastic (recyclable)	Collected in dedicated bins.	Transported to the South Hedland waste management facility as required.	The waste disposal register will be maintained ongoingly.
Plastic (non-recyclable)	Mixed with general domestic waste.	Transported to the South Hedland waste management facility as required.	The waste disposal register will be maintained ongoingly.

Table 3.27 Management for each waste type (cont'd)

Waste Type	Storage	Disposal	Other
Pallets	Stockpiled in a suitable area.	Returned to supplier where possible and if unbroken. Buried in a dedicated cell in a waste rock dump if broken.	The waste disposal register will be maintained ongoingly.
General domestic waste (i.e., food scraps, non-recyclable crib room waste, non-recyclable office waste)	Collected in appropriately sealed in on site bins.	Transported to the South Hedland waste management facility as required.	The waste disposal register will be maintained ongoingly.
Recyclable domestic waste (i.e., office paper, glass)	Collected in dedicated bins.	Transported to the South Hedland waste management facility as required.	The waste disposal register will be maintained ongoingly.

General Management

As part of this Waste Management Plan, a waste management SOP will be established, with the following objectives for the Atlas mining operations:

- Adhere to the waste management hierarchy of elimination, reduction, reuse, recycling, treatment and disposal where possible. Disposal should only be considered as a last resort.
- Manage all waste generated in a manner which minimises any potential impacts to the environment.
- Ensure that Atlas mining operations comply with regulatory requirements, licence conditions and commitments at all times.

Site-specific Management

The following management practices will be implemented at the Pardoo DSO Project minesite in order to achieve the management objectives, as discussed in Section 3.6.1. A waste management SOP will be developed and implemented in conjunction with these management practices prior to mining activities.

Awareness and Training. Personnel will be required to participate in the minesite induction program and relevant training prior to commencing mining activities on site. Staff inductions and training will be developed to include:

- An induction program with an environmental component, which identifies the risks and impacts associated with wastes.
- Correct handling and storage procedures for waste.
- Correct transport and disposal procedures for waste.
- Emergency Spill Response Procedure (ERSP) (refer to Section 3.7.8).

- Reporting requirements (refer to Section 3.6.10).
- Principles of waste minimisation and recycling.
- Maintenance of anaerobic sewage treatment system.

Management processes will be reiterated during daily toolbox meetings and a copy of the Waste Management Plan will be made available in each administrative facility.

Handling, Storage, Transport and Disposal. General management practices for the storage, disposal and transport of wastes for the Pardoo DSO Project include the following:

- Suppliers will be encouraged to take responsibility for unwanted waste packaging.
- Materials to be recycled will be sorted into dedicated bins and neatly stored in a designated area until their removal.
- All non-recyclable domestic waste will be collected and stored in appropriately sealed containers to discourage fauna, and be transported to the South Hedland waste management facility when necessary.
- Used tyres are to be stockpiled in an appropriate area and either returned to the supplier or disposed of at the South Hedland waste management facility.
- Scrap metal is to be stockpiled within the contractors' laydown yard and collected by a scrap steel merchant as required.
- Pallets are to be stockpiled in an appropriate area and either returned to the supplier or buried in a dedicated cell in the waste rock dump if broken.

The following practices will be undertaken specifically for the management of sewage waste:

- Sewage waste will be treated through a proprietary above-ground anaerobic treatment system and separated into sewage liquor and sewage sludge.
- The anaerobic treatment system will be installed by a qualified contractor and meet approval and operational requirements from the Town of Port Hedland, and the Department of Health and DoW.
- The anaerobic treatment system will be operated in accordance with the manufactures operating procedures and management will also include:
  - The removal/disposal of sewage sludge and liquor as required by a suitable qualified contractor for licensed disposal.
  - Regular routine maintenance activities by an external maintenance contractor be established prior to installation and commissioning of the unit.
  - Regular overhauling of the anaerobic treatment system and appropriate storage of parts on site by an external maintenance contractor.

  - Training of selected employees on site by the external maintenance contractor, for the maintenance of the anaerobic treatment system, to ensure that any issues that arise can be promptly addressed.

The following practices will be undertaken specifically for the management of waste hydrocarbons and hydrocarbon-contaminated material:

- Waste liquid hydrocarbons (such as oil and grease) will be stored in sealed containers on a designated and appropriately-sized bunded pallet within the covered oil and lube store, or within the covered workshop area. A suitable waste management contractor will regularly remove these wastes off-site for licensed disposal or recycling.
- Solid wastes such as oily rags, spent spill kits, filters and used batteries will be contained and stored on a bunded pallet within a covered area for periodic collection and the licensed off-site disposal or recycling by a suitable waste management contractor.
- The washdown water from the workshop will be reused through a recycled water sediment basin sized to contain a 1-in-20 year return frequency, 72-hour storm event.
- Hazardous waste materials will be separated from the general waste stream (and managed as described in Section 3.6).
- All contractors responsible for the transport and/or disposal of hydrocarbons and dangerous goods will have the appropriate licences and spill response equipment within their vehicles prior to their undertaking such actions/activities.
- Hazardous material will be clearly labelled and transported and disposed of in accordance with material safety data sheets (MSDS), which will be available on site.
- In the case of a hydrocarbon or dangerous goods spill, site personnel will implement the ESPR, which will be developed in accordance with the framework outlined in Section 3.7.8 of the Hydrocarbons and Dangerous Goods Management Plan.

Management Reporting and Auditing. Management practices for wastes at the Pardoo DSO Project minesite include the development and implementation of recording and reporting requirements (refer to Section 3.6.11 for further information) and include:

- Induction records.
- Incident and accident reporting.
- Waste Disposal Registers.
- Internal Quarterly Performance Report.
- AER.

An internal audit inspection program will also be developed and implemented to measure the utilisation and effectiveness of management procedures adopted to meet the waste management objectives. The results of an audit inspection program will be reviewed and the appropriate remedial actions will be implemented. These results and findings will be included in the AER.

3.6.7 Monitoring

The proposed water monitoring program to be implemented at the minesite, as outlined in the Water Management Plan (Section 3.2), will identify the presence of potential contaminants (e.g., an increase in nutrient levels relating to sewage). Therefore monitoring for contaminants is not considered further within the Waste Management Plan.

3.6.8 Contingency Actions

The triggers and corresponding contingency actions for key issues relating to waste management when an actual and/or apparent non-conformance is identified are provided in Table 3.28.

Table 3.28 Contingency waste management actions

Trigger for Action	Contingency Action Required
The volume of non-recyclable wastes disposed (following the first year of operation) has exceeded that of the previous year.	Investigate the cause of not achieving a reduction in volume disposed of non-recyclable wastes. If the change was not met due to activity that can be modified, remove the cause where appropriate and identify additional measures by which this target can be met in the coming year.
The volume of waste returned back to the suppliers (i.e., pallets, tyres) decreases from the previous year.	Investigate the cause of not meeting the required improvement in rate of waste returned to suppliers from the following year. If the change was not met due to activity that can be modified, remove the cause where appropriate and identify additional measures by which this target can be met in the coming year.
Complaints from relevant regulatory bodies are received regarding the disposal of waste in an environmentally unacceptable manner.	Investigate and consult with the relevant government body to identify the deficiencies in the management of waste and the appropriate means of rectifying the issue.
Number of unused tyres (inc. spares) stored at the minesite reaches or exceeds 100.	Organise immediate disposal of waste tyres. Consult with DEC regarding the necessity to amend Part V licence.
Leak or spill of hydrocarbon waste or hydrocarbon-contaminated material occurs at the minesite.	Implement ESRP (refer to Section 3.7.8).
Leak or spill of sewage waste occurs at the minesite.	Implement ESRP (refer to Section 3.7.8) where relevant.

3.6.9 Performance Indicators

Table 3.29 below illustrates the conceptual performance indicators and corresponding targets that will be used to track progress in achieving the waste management objectives. Targets were developed with the intent of being achievable given the project constraints and to provide a measurement of success for each performance indicator rather than providing project goals for each objective.

Table 3.29 Conceptual waste management performance indicators

Item	Performance Indicator	Target
***Objective 1**. Minimise the generation of waste from the minesite by reducing waste streams and recycling material wherever practicable.*		
Storage, handling, transport and disposal	Proportion of non-recyclable waste.	Proportion of non-recyclable wastes disposed decreases in each progressive year of operation.
	Proportion of waste returned to supplier.	Proportion of waste returned back to the appropriate suppliers (i.e., pallets tyres) increases in each progressive year of operation.
***Objective 2**. Dispose of waste in an environmentally acceptable manner and in compliance with all regulatory and Atlas requirements.*		
Storage, handling, transport and disposal	Number of complaints from local or State authorities.	No complaints received through complaints reporting system or other means regarding waste management. If received, all complaints are investigated.
	Management plan compliance.	The project operates in full compliance with the Waste Management Plan.
	Investigation of incidences regarding transport and disposal of dangerous good wastes.	All incidences are investigated as soon as possible after the event and appropriate contingency actions are taken depending on the nature of the incident.
	Amount of waste left at minesite.	No waste is left at the minesite upon decommissioning of the mine.
	Number of accidental spills of sewage, waste and hydrocarbon-contaminated material.	No uncontained spills or leaks.

3.6.10 Roles and Responsibilities

The roles and responsibilities of personnel responsible for the development and implementation of the Waste Management Plan at the Pardoo DSO Project minesite are discussed below.

Operations Manager

The Operations Manager will ensure that appropriate resources are provided to implement the actions outlined in this Waste Management Plan. The Operations Manager has the overall responsibility to ensure that all activities conducted in relation to the Pardoo DSO Project are carried out in accordance with the IMS, this management plan and other regulatory requirements.

Pardoo General Manager

The Pardoo General Manager is responsible for ensuring that all contractors work in accordance with this Waste Management Plan, including the participation of all personnel and contractors in the induction program and relevant training.

Senior Environmental, Health and Safety Specialist

The Senior Environmental, Health and Safety Specialist is responsible for overseeing the development and maintenance of this Waste Management Plan, and is responsible for the coordination of monitoring activities, internal audits and reporting to government agencies.

Waste Management Contractor

The Waste Management Contractor is responsible for providing the necessary equipment for the storage of wastes, operating in accordance with the relevant legislation and organising the licensed disposal of waste off-site.

Emergency Response Manager

The Emergency Response Manager (ERM) is responsible for the implementation and maintenance of the ESRP, should waste hydrocarbons or hydrocarbon-contaminated material be spilt.

ESRP Support Staff

Two support staff (exclusive of the ERM) trained in the ESRP will be required on site during all operational hours.

Anaerobic Treatment System Support Staff

One support staff, trained in the maintenance of the anaerobic treatment system by the external maintenance contractor, must be on site during all operational hours.

All Personnel and Contractors

All personnel and contractors are responsible for adhering to the procedures outlined within this Waste Management Plan and will report any non-compliance to the relevant manager.

3.6.11 Records and Reporting

Table 3.30 summarises the recording and reporting requirements for the management of waste within the Pardoo DSO Project minesite.

3.6.12 Key Management Actions Table

The following key management actions (Table 3.31) relate specifically to management of waste.

Table 3.30 Waste management records and reporting requirements

Record/Report	Parameter	Frequency/ Schedule	Purpose
Induction records	Inductions. Training.	Prior to operation/ commencement of mine work.	Introduces staff to the requirements of the Waste Management Plan and provides the necessary training required for their roles and responsibilities.
Incident and accident reporting	All accidents and near misses.	As they occur.	Provides a useful tool for identifying the trends and facilitating the identification of emergency response, reporting requirements, maintenance and necessary amendments to the Waste Management Plan.
Waste Disposal Registers	Type of wastes. Volume of wastes. Method of disposal. Rate of disposal.	Ongoing from the beginning of operation.	To monitor and record the types and volumes of waste, along with their method and rate of disposal. To ensure that the number of unused tyres (inc. spares) does not meet or exceed 100.
Internal Quarterly Performance Report	Tabulation of baseline data; results obtained from the waste disposal registers.	Quarterly from date of operation commencing.	To identify changes in waste type, volume, method and rate of disposal in identifying the progress of the project towards its performance criteria.
Contaminated sites reporting to DEC	Known or suspected contamination from sewage or hydrocarbon spill/leak.	As required.	Requirement under the Contaminated Sites Act.
AER	A consolidated summary of the findings from the year's quarterly performance report and any contaminated sites reporting and internal auditing.	Yearly from date of operation commencing.	To assess compliance with and performance of this Waste Management Plan and identify any necessary amendments.

Table 3.31 Key waste management actions

Reference	Item	Key Management Action	Timing	Reporting/ Evidence	Status[1]
WAS01	General management	Develop and implement the waste management SOP and include within this Waste Management Plan.	Prior to construction.	Auditing records, AER, this EMP.	
WAS02	Awareness and training	Implement the necessary inductions and training for all personnel and contractors.	Ongoing.	Induction records.	
WAS03	Storage, handling, transport and disposal	Ensure that storage, handling, transport and disposal of all wastes are conducted in accordance with the management practices set out in this Waste Management Plan.	Ongoing.	Waste disposal registers, irrigation maintenance register, quarterly performance report, auditing records, AER.	
WAS04	Records and reporting	Develop, implement and maintain all records and reporting documents (Section 3.6.10).	Prior to construction, ongoing.	Auditing records, AER.	
WAS05	Management reporting and auditing	Develop and implement an audit inspection program.	Prior to construction, biannually.	Auditing records, AER.	

[1] To be completed and updated once regulatory approvals are obtained.

3.7 Hydrocarbons and Dangerous Goods Management

3.7.1 Objectives

The Hydrocarbon and Dangerous Goods Management Plan relates to the management of hydrocarbons, chemicals and other dangerous goods on the Pardoo DSO Project minesite. The objectives of the Hydrocarbon and Dangerous Goods Management Plan are to:

- Ensure that the transport, disposal, handling and storage of hydrocarbons and dangerous goods are conducted in accordance with the relevant legislation, guidelines and standards.
- Minimise the potential adverse effects, risk and liability associated with dangerous goods at the minesite.

3.7.2 Significant Aspects of the Existing Environment

The proposed minesite lies predominantly within the De Grey River Water Reserve, which contains the current and future domestic water supply for Port Hedland. The De Grey River Water Reserve is afforded the highest level of management and is classified as a Priority 1 water source protection area.

The project is bound by three main ephemeral water bodies: Redrock creek to the west, Ridley River to the north and the De Grey River to the east, all of which lie within the De Grey River catchment area.

The closest area of conservation significance to the project is the De Grey River. The river is designated a wetland of national importance from the confluence of the Oakover and Nullagine rivers to the Western Australia coast. The river intersects the northeast corner of the minesite exploration lease (E45/2330), and is approximately 6 km from the nearest proposed operation. The Leslie Salt Fields, which are located adjacent to the coast at the outlet of the Ridley River, 25 km from the project area, are also listed as wetlands of national importance.

3.7.3 Regulatory Requirements and Standards

The management, mitigation, reporting and contingency measures contained within this Hydrocarbon and Dangerous Goods Management Plan have been developed in general accordance with the provisions of the following legislation, regulations and guidance material:

- *Environmental Protection Act 1986.*
- *Contaminated Sites Act 2003.*
- *Dangerous Goods Safety Act 2004.*
- *Road Traffic Act 1974.*
- Explosives and Dangerous Goods Regulations 1992.

- Explosives and Dangerous Goods (Explosives) Regulations 1992.
- Mines Safety and Inspection Regulations 1995.
- Dangerous Goods (Transport) (Road & Rail) Regulations 1999.
- Management of Hazardous Substances on Minesites Guideline.
- Storage of Dangerous Goods – General Requirements for Licensed Premises (Guidance Note S303 Rev 8).
- Australian Code for the Transport of Dangerous Goods by Road or Rail.
- Water Protection Guideline for Mining and Mineral Processing – Mechanical Servicing and Workshop Facilities.
- Water Protection Guideline for Mining and Mineral Processing – Above-ground Fuel and Chemical Storage.
- Water Quality Protection Note – Toxic and hazardous substances (storage and use).
- Water Quality Protection Note – Containment spills emergency response.
- Australian Standard (AS) 1940-1993 The Storage and Handling of Flammable and Combustible Liquids.
- Australian Standard (AS) 2187-1998 Explosives – Storage, Transport and Use.

An overview of the relevant provisions of these Acts, regulations, guidelines and standards is provided below.

Legislation

Environmental Protection Act 1986. The Pardoo DSO Project is currently undergoing a formal assessment under Part IV of the Environmental Protection Act, at a PER level of assessment. Should the proposal be approved, the Pardoo DSO Project will be managed in accordance with any regulatory conditions (within the Ministerial Statement) that are applied to the proposal at completion of the PER assessment.

The Contaminated Sites Act 2003. According to the Contaminated Sites Act, a site is contaminated when there are substances present on that site (including land or water), at above background concentrations. The substance presents or has the potential to present, a risk to human health, the environment or an environmental value. The Contaminated Sites Act has established a scheme for determining when sites must be remediated and who will be responsible (EDOWA, 2007).

The mining industry engages in a number of activities that are all listed as potentially contaminating activities (DoE, 2004b), including explosive production/bulk storage, mechanical workshops, fuel storage and sewage treatment. Contaminants from such activities are often the result of poor management controls.

The Contaminated Sites Act does not require that all minesites are to be reported to DEC as contaminated sites, although Atlas may be required to report when there are grounds to suspect contamination, or when there is known contamination on a particular site. If required, expert advice will be sought to identify the necessity for reporting (DEC, 2007a).

This Hydrocarbons and Dangerous Goods Management Plan will ensure that the project complies with the conditions of the Contaminated Sites Act in the event that contamination is identified and needs reporting to the DEC.

Dangerous Goods Safety Act 2004. The Dangerous Goods Safety Act cannot be proclaimed (come into effect) until all supporting regulations are completed. The annual review of this Hydrocarbons and Dangerous Goods Management Plan will involve the revision and amendment of the plan in accordance with this Act and supporting regulations (EDOWA, 2007).

Road Traffic Act 1974. The Road Traffic Act consolidates and amends the law relating to road traffic. The Department of Planning and Infrastructure is the administering authority of the Act, and is responsible for all vehicle licensing as well as for the prosecution of non-compliance matters that are referred by MRWA. Specific to this Hydrocarbons and Dangerous Goods Management Plan is the licensing requirements for transport vehicles.

Regulations

Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992. The Explosives and Dangerous Goods Regulations 1992 outline the requirements for packaging, labelling, storage and handling requirements of dangerous goods.

Explosives and Dangerous Goods (Explosives) Regulations 1963. The Explosives and Dangerous Goods (Explosives) Regulations 1963 outline the requirements for storing and keeping explosives.

Mines Safety and Inspection Regulations 1995. These regulations are concerned with the safety, inspection and regulation of mines and mining operations. Part 7 provides guidelines for hazardous substances and Part 8 provides guidelines for explosives.

Dangerous Goods (Transport) (Road and Rail) Regulations 1999. These regulations set out the requirements and guidelines for the transport of dangerous goods by road and rail in the endeavour to reduce as far as practicable, the risks of personal injury, property damage and environmental harm which may arise from the transport of dangerous goods by road or rail. Such regulations give effect to the standards, requirements and procedures of the Australian Code for the Transport of Dangerous Goods by Road or Rail (ADG Code) (refer to guidelines below).

Guidelines

Management of Hazardous Substances on Minesites Guideline. This guideline by the DoIR has been developed to assist mines in establishing their hazardous substances management programs (DoIR, 1997a).

Storage of Dangerous Goods – General Requirements for Licensed Premises (Guidance Note S303 Rev 8). This guidance note provides direction on the requirements of premises licensed under the Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992 (DoCEP, 2006).

Water Protection Guideline for Mining and Mineral Processing – Mechanical Servicing and Workshop Facilities. Project design and management concerning the operation and disposal of waste from mechanical servicing facilities within this Hydrocarbons and Dangerous Goods Management Plan has been developed in accordance with this guideline (WRC, 2000a) to minimise project-related risk to the quality of the region's water resources.

Water Protection Guideline for Mining and Mineral Processing – Above Ground Fuel and Chemical Storage. Project design and management concerning the design operation and maintenance of the above-ground fuel storage and refuelling facility within this Hydrocarbons and Dangerous Goods Management Plan has been developed from this guideline (WRC, 2000b) to minimise project-related risk to the quality of the region's water resources.

Water Quality Protection Note – Toxic and Hazardous Substances (Storage and Use). This Water Quality Protection Note provides general guidance on the storage and use of hazardous substances that may contaminate water resources if released to the environment (WRC, 2002a).

Water Quality Protection Note – Containment Spills- Emergency Response. This Water Quality Protection Note supports the development of procedures which will help prevent accidental spills, leaks and emergencies, and reduce environmental impacts, to thus minimise the cost and frequency of production downtime, aid site clean-up and reduce occupational health and safety incidents (WRC, 2002b).

Australian Code for the Transport of Dangerous Goods by Road or Rail. The ADG Code sets out the technical requirements and guidelines for the transport of dangerous goods by road and rail and is implemented by State legislation (refer to the Dangerous Goods (Transport) (Road & Rail) Regulations 1999).

Standards

Australian Standard (AS) 1940-1993 The Storage and Handling of Flammable and Combustible Liquids. This standard sets out the requirements and recommendations for the safe storage and handling of Class 3 dangerous goods (flammable liquids) and combustible liquids in Australia (Standards Australia, 2004).

Australian Standard (AS) 2187-1998 Explosives – Storage, Transport and Use. This standard sets out the requirements and recommendations for the safe storage, transport and use of explosives in Australia.

3.7.4 Consultation

Stakeholder comments relating specifically to the management of hydrocarbons, chemicals and other dangerous goods are provided in Table 3.32.

Table 3.32 Hydrocarbons and dangerous goods management issues identified during stakeholder consultation

Stakeholder	Issue/Comment
DoW	Need to refer to the Water Quality Protection guidelines and apply their requirements to the project, particularly in relation to chemical and hydrocarbon storage and use. Also need to refer to the requirements for what activities are permitted on water reserves at various protection levels.
	Need to include contingency plans for hydrocarbon spillages, product spillages from trucks etc., for all project areas (i.e., requirements under Water Quality Protection guidelines above).
	The Hydrocarbon and Dangerous Goods Management Plan will need to include contingency plans for hydrocarbon and chemical spillages for all project areas. This should include identifying the risks to the water supply and water source protection area, how the risks will be reduced and what will be the procedure in the event of a spillage (including remediation and follow up).

The above comments have been considered in developing the management actions outlined in this Hydrocarbon and Dangerous Goods Management Plan. Issues identified by ongoing consultation will be considered within subsequent reviews of this Hydrocarbons and Dangerous Goods Management Plan.

3.7.5 Potential Impacts

Hydrocarbons, chemicals and other dangerous goods (i.e., explosives) will be stored and handled appropriately during the construction and operation of the mine. Dangerous goods will be predominantly used and stored within the fuel storage and refuelling facility, workshop and washdown area, and the magazine.

The release of these materials into the environment may have significant impacts on the surrounding environment through atmospheric, ground and/or water contamination. The potential for surface water and groundwater contamination from hydrocarbons and dangerous goods is considered to be low, however, due to the limited volumes that will be stored and used on site, and the implementation of mitigation and management measures discussed within this Hydrocarbons and Dangerous Goods Management Plan. Groundwater contamination poses a potentially significant risk at the site due to the project's location within the De Grey River Water Reserve. Dangerous goods may also present a significant occupational health and safety risk.

A variety of hydrocarbons, chemicals and other dangerous goods (i.e., explosives) are used by the mine which include but are not limited to:

- Diesel fuel (210,000 L).
- Solvents, lubricants and metals from degreasing engines.
- Oils, brake fluid, coolants and lubricants.
- Cleaning products.
- Ammonia nitrate fuel oil.

These substances may escape from these facilities through the following means:

- Accidental release.
- Absence of containment facilities.
- Poor construction or deterioration of containment facilities.
- Inappropriate equipment maintenance.
- Poor 'house keeping' management control practices.
- Accidental damage.
- Deliberate vandalism.

3.7.6 Design Mitigation Measures

Project design is a key management tool in the development and planning stages. It needs to take into consideration not only the practicability and feasibility of a project or project components, but also ensure that the project meets the requirements of the relevant regulations, as outlined above. The following design measures have been generated to assist in the mitigation of the potential environmental impacts.

Fuel Storage and Refuelling Area

The fuel storage and refuelling area has been designed in accordance with AS 1940-1993, along with the requirements and recommendations of the other regulations and guidance material listed in Section 3.7.3 (i.e., Water Protection Guideline for Mining and Mineral Processing – Above Ground Fuel and Chemical Storage). Design features of the fuel storage and refuelling area are listed below:

- An impervious containment structure (i.e., concrete pad) will be constructed around the fuel storage tanks and all associated connections.

- The fuel storage containment structure will be graded to an internal sump adequate to store a 20-year ARI, 48-hour rainfall event.

- The containment structure will be a sand filled pit and lined with a welded high density Polyethylene sheet to prevent soil contamination.

- Four steel bollards will be strategically located to protect the fuel storage tanks from rupture associated with vehicle collision.

- Fuel will be stored in two double-skinned, 105,000-L tanks comprised of an internal fuel storage tank surrounded by an external tank capable of containing leaks. A visual indication system is provided to monitor the interstitial space between the internal and external walls for leaking from the internal tank.

- Each tank will contain a 50 mm venting system, dust protection filter, fluid level dipstick and a tank overfill protection system.
- The refuelling area will be covered with a concrete slab with a perimeter lip graded to a sump containing an oil-water separator, with the whole area sized to capture 110 % of the largest mobile equipment tank.
- Daily inspections of sump and separator to ensure they are emptied as required.
- The bowsers will have a discharge limit of 10,000 L and will automatically shut off at this volume.
- The fast-fill point is designed for ease of use and minimisation of spillages.
- The refuelling truck for on site transport will have a maximum capacity of 10,000 L.
- The refuelling truck will operate in accordance with all hydrocarbons and dangerous goods procedures, including regular maintenance and inspection of the vehicle and maintenance of the vehicles spill kit which must be kept on board at all times.
- Couplings for the refuelling truck will be 'snap-on, fast-fill' type for large mobile plant and auto shut-off for small plant or equivalent.
- All generators/stand-alone diesel pumps will be located within a lined earthen bund sized to contain 110 % of the diesel tank volume.
- Generators will be located on topographic highs where possible, to minimise the potential for flood inundation.
- Any fuel storage tanks associated with these generators will be double-skinned and will also be located within the associated lined earthen bund.

Workshop and Washdown Area

The workshop and washdown area has been designed in accordance with the relevant regulations and other guidance material in Section 3.7.3, including the Water Protection Guideline for Mining and Mineral Processing – Mechanical Servicing and Workshop Facilities. Design features of the workshop and washdown area are listed below:

- The workshop and washdown area will be located on a concrete pad that will be suitable for heavy and light vehicles and graded to an internal sump that is adequate to store a 20-year ARI, 48-hour rainfall event and contained within a low, drive-over bund.
- The main workshop area will be covered to minimise rainwater ingress and prevent potential contamination of stormwater.
- Roof stormwater will be directed to tank storage, away from the potentially contaminated workshop and washdown water drainage system.
- Workshop area sumps will be directed to an oil-water separator with a retention capacity of at least one-hour peak flow to maximise the settling of solids and grit.

- Protection devices like well-graded ramps, safety bollards and floor markings will be utilised where necessary.
- The washdown water will be reused through a recycled water sediment basin sized to contain a 1-in-20 year return frequency 72-hour storm event.

Magazine

The magazine will be designed in accordance with the relevant standards and regulatory requirements, including AS 2187-1998 and the Mines Safety and Inspection Regulations 1995. The magazine is located in high topography, and will be surrounded by water diversion structures as required to minimise ingress of uncontaminated surface water.

3.7.7 Management Practices

The management practices outlined below have been developed to ensure that the project meets the objectives of the Hydrocarbon and Dangerous Goods Management Plan.

Awareness and Training

Staff will be required to participate in the induction program and relevant training prior to commencing any mining activities on site. Induction and training records will be maintained and a copy kept in the Atlas administrative facility at the minesite. Management processes will be reiterated during daily toolbox meetings. A copy of the Hydrocarbon and Dangerous Goods Management Plan will be made available at each administrative facility upon construction of the mining operation centre to allow access to the plan by all personnel and contractors.

Staff induction and training will be developed and implemented to include:

- An induction program with an environmental component, which identifies the risks and impacts associated with hydrocarbons, chemicals and dangerous goods.
- Correct handling, storage, transport and disposal procedures for hydrocarbons, chemicals and dangerous goods.
- Typical signs for identifying contamination (DEC 2007b).
- The ESRP (Section 3.7.8).
- Reporting requirements (Section 3.7.13).

Storage and Handling

The storage and handling of hydrocarbons and dangerous goods will be conducted in accordance with the relevant regulations, guidelines and standards (Section 3.7.3). This will include the following management measures:

- The development and implementation of the daily inspection and maintenance checklist, dangerous good procurement procedure and dangerous good materials manifest (Section 3.7.13).
- The development and implementation of an internal audit inspection program to ensure the utilisation and effectiveness of management procedures adopted to meet the objectives. The results of the audit inspection program will be reviewed and the appropriate remedial actions will be implemented. These results and findings will be included in the AER.
- Development and implementation of an ESRP, which will be maintained in accordance with the relevant regulations, guidelines and standards (Section 3.7.2).
- Clear labelling of all hydrocarbons and dangerous goods with a weather-resistant notice detailing the types and quantities of all dangerous goods stored within each container.
- Placarding of the premises.
- Segregation of incompatible dangerous goods.
- Use of current MSDSs covering all stored dangerous goods, which will be available on site and will be adhered to in regards to their references in dealing with storage and handling.
- Suitable security requirements for all dedicated premises containing hydrocarbons and dangerous goods (i.e., the fuel storage area, workshop and washdown area, and magazine) to prevent unauthorised access and the deliberate release of dangerous goods.
- Provision of adequate and appropriate fire protection equipment, emergency spill response equipment (including a site plan detailing the types of equipment and their location) and personal protection equipment.
- Provision of a safety information board on all dangerous good storage facilities.
- Maintenance of the area within and surrounding these compounds within a safe condition (i.e., entries/exits and access points are to be kept clear at all times plus the removal of vegetation that has potential to become a fire hazard).
- Use of appropriately-sized drip trays and absorbent material beneath all hydrocarbon or dangerous goods containers and during the filling of all tanks.
- Presence of personnel during all refuelling at the fuel storage and refuelling area.
- The requirement to carry a well-maintained and regularly-inspected spill kit within each refuelling truck.
- The requirement to conduct all activities associated with vehicle repairs and maintenance within the workshop area.
- Use of ‘environmentally friendly’ degreasing and cleaning products where available.

- Storage of absorbent materials (i.e., sawdust or proprietary adsorbent litter) within the workshop and washdown area to absorb any spill of waste on site.
- Storage of smaller volumes of hydrocarbons such as oils and greases in bulk pods where possible, within the concrete pad of the workshop and on purpose-built facilities. All other dangerous goods, including batteries, will be stored on bunded pallets or in appropriate dangerous goods storage cabinets.

Transport and Disposal

The transport and disposal of hydrocarbons and dangerous goods will be conducted in accordance with the relevant regulations, guidelines and standards (Section 3.7.3). This will include the following management measures:

- The development and implementation of the consignment and delivery record (Section 3.7.13).
- Ensuring that all hazardous material is clearly labelled and is transported in accordance with MSDSs, which will be available on site.
- Ensuring all contractors responsible for the transport of hydrocarbons and dangerous goods have the appropriate licenses and spill equipment on their vehicles prior to their undertaking such actions/activities.
- Disposal of waste hydrocarbons and other dangerous goods will be managed in accordance with relevant legislation and the Waste Management Plan (Section 3.6).

3.7.8 Emergency Spill Response Procedure Framework

Introduction

Although highly undesirable, accidental spills could occur during the storage, handling and transport of hydrocarbons within the project area. As this plan suggests, Atlas is aware of its responsibilities to ensure that all reasonable steps are taken to minimise the risks of spills occurring through appropriate planning, design and maintenance. An ESRP is a contingency measure which will be developed to ensure the implementation of appropriate response and remedial actions in the event of a spill.

The ESRP Framework has been developed to ensure that an appropriate ESRP is initiated prior to the construction phase of the project, including ongoing maintenance and use by ESRP teams in the event of spill. The ESRP will be developed and maintained in consultation with the DoW and the DoIR.

The ESRP will be developed in accordance with:

- Water Quality Protection Note (No. 10), Contaminant Spills - Emergency Response, 2006.
- Code of Environmental Practice, APPEA, 1996.
- Guidance Note S310 REV5, Guidelines for the Preparation of an Emergency Plan and Manifests (DoIR, 2003).

The following recommendations are recognised:

- Establish any necessary links between site emergency response protocols and the State's emergency management structures and advisory committees, such as the WESTPLAN-HAZMAT coordinating committee.
- The ESRP should ensure that the user is able to quickly and effectively respond in the event of a spill.
- The ESRP should be periodically reviewed (at least every 5 years) to ensure that it remains up to date and efficient.
- The most important concern after making the site safe will be to contain and then recover as much of the spilt material as practicable prior to any escape of residues into the environment.

Aim

The aim of the ESRP is for the effective and efficient response to and remediation of any accidental spills or leaks, thus ensuring the safety of personnel and minimising the impacts to the receiving/surrounding environment.

The objectives of the ESRP are:

- To protect human life and property.
- To shut off the source of the spillage/ halt the release.
- To prevent hydrocarbon contamination of surface water, groundwater or land.
- To recover any free product.
- To rehabilitate the disturbed area.
- To monitor impacts and recovery.
- To review emergency spill response procedures.
- To implement corrective action programs as necessary.

Contents

The ESRP will include:

- The purpose of the procedure including aim, objective, application and extent.
- A contaminant inventory and/or inclusion of the Dangerous Goods Materials Manifest.
- A site layout diagram, identifying areas of dangerous goods storage, emergency equipment, access ways, escape paths and assembly points.
- A risk assessment to determine the potential emergencies and the necessary response. The risk assessment will involve defining incident triggers, probable frequencies of a spill occurrence, probable scale of an incident, knowledge of the spilt contaminant (movement/ fate) and likely impacts, thereby utilising the three-tier impact classification system. The risk assessment will be used as the basis for an action plan for each potential scenario, including the identification of the relevant response, clean-up, and rehabilitation options and strategies for each scenario.

- Relevant safety information including safety priorities for personnel, fire prevention and safely shutting off spill sources.
- The role and responsibility for the emergency response manager and all support staff (ESRP team) (Section 3.7.12).
- An outline of the communication system to be implemented, which will operate around-the-clock and include individual action cards for all members of the ESRP team.
- The backup resources available at the minesite, which will ensure that trained staff and equipment are readily available for emergency response.
- Procedures for conducting emergency drills, which will be developed to test the ESRP regularly to ensure that it works effectively.
- The protocol for notifying authorities, which will include procedures for contacting emergency services and regulatory agencies in the event of significant emergencies.
- The protocol for notifying neighbours of an emergency, which will include a contact list of neighbours and the circumstances under which they are to be notified.
- An evacuation response plan for the event that personnel health or well-being is at risk.
- A process for incident investigation, which will be followed up regularly with an incident review to assess and correct any procedural defects discovered during the emergency. These defects will be reported in the AER.

3.7.9 Monitoring

Given the high level of management that will be adopted for Hydrocarbons and Dangerous Goods at the minesite, including regular inspections and auditing of the storage, handling and transport procedures involved, monitoring for contaminants is not considered necessary for effective management. However, should a spill of hydrocarbons or other dangerous goods occur at the minesite, monitoring would be undertaken if required under the Contaminated Sites Act.

Currently, monitoring requirements are not considered further within this Hydrocarbons and Dangerous Goods Management Plan. However, this requirement will be reviewed and revised regularly during mining operations.

3.7.10 Contingency Actions

The triggers and contingency actions for key issues relating to hydrocarbons and dangerous goods management when an actual or apparent non-conformance is identified are provided in Table 3.33.

Table 3.33 Contingency hydrocarbons and dangerous goods management actions

Trigger	Contingency Action Required
A spill occurs within the fuel storage and refuelling area or workshop and washdown areas, or a predicted rainfall event occurs.	• Pump spill from fuel storage and refuelling interceptor sump into the waste hydrocarbon tank at the workshop. • Ensure that a qualified contractor performs licensed disposal as soon as possible, to maintain high storage capacities for contaminated stormwater runoff or any other spills that may occur.
Leak or spill of hydrocarbons or dangerous goods occurs outside of controlled areas[1] at the minesite.	Implement ESRP (refer to Section 3.7.8).
Complaints from relevant regulatory bodies are received regarding the disposal of waste in an environmentally unacceptable manner.	Investigate and consult with the relevant Government body to identify the deficiencies in the management of waste and the appropriate means of rectifying the issue.

[1]Controlled areas include the fuels storage and refuelling area and workshop and washdown area, where design mitigation measures are in place to control spills and leaks.

3.7.11 Performance Indicators

Table 3.34 below illustrates the conceptual performance indicators and corresponding targets that will be used to track progress in achieving the hydrocarbons and dangerous goods management objectives. Targets were developed with the intent of being achievable given the project constraints and to provide a measurement of success for each performance indicator, rather than providing project goals for each objective.

Table 3.34 Conceptual hydrocarbon and dangerous goods management performance indicators

Item	Performance Indicator	Target
***Objective 1**. Ensure that the transport, disposal, handling and storage of hydrocarbons and dangerous goods are conducted in accordance with the relevant legislation, guidelines and standards.*		
Storage and handling. Transport and disposal.	Dangerous goods storage, handling, transportation and disposal.	In accordance with regulatory and statutory requirements and each relevant MSDS, as determined by internal audits.
	Contaminated sites.	Any sites that are considered contaminated under the Contaminated Sites Act are remediated to an acceptable level.
	Number of community or stakeholder complaints.	No complaints received through complaints reporting system regarding hydrocarbons and dangerous goods management. If received, all complaints are investigated.
	Investigation of incidences regarding storage, handling, transportation and disposal.	All incidences are investigated as soon as possible after the event and appropriate contingency actions are taken depending on the nature of the incident.

Table 3.34 Conceptual hydrocarbon and dangerous goods management performance indicators (cont'd)

Item	Performance Indicator	Target
Awareness and training.	Records of employee and contractor induction.	The minesite has copies of induction records for every employee and contractor at the minesite.
***Objective 2**. Minimise the potential adverse effects, risk and liability associated with dangerous goods at the minesite.*		
Storage and handling. Transport and disposal.	Dangerous goods storage, handling, transportation and disposal.	As above.
	Contaminated sites.	As above.
	Number of community or stakeholder complaints.	As above.
	Non-compliances with regulatory and statutory requirements.	No non-compliances. Any actual or perceived non-compliance are investigated and addressed as soon as possible after the event.
Awareness and training.	Records of employee and contractor induction.	As above.

3.7.12 Roles and Responsibilities

The roles and responsibilities of personnel responsible for the development and implementation of the Hydrocarbons and Dangerous Goods Management Plan at the Pardoo DSO Project minesite are discussed below.

Operations Manager

The Operations Manager will ensure that appropriate resources are provided to implement the actions outlined in this Hydrocarbons and Dangerous Goods Management Plan. The Operations Manager has overall responsibility to ensure that all activities conducted in relation to the project are carried out in accordance with the IMS, this management plan and other regulatory requirements.

Pardoo General Manager

The Pardoo General Manager is responsible for ensuring that all contractors work in accordance with this Hydrocarbons and Dangerous Goods Management Plan, including the participation of all personnel and contractors in the induction program and relevant training.

Senior Environmental, Health and Safety Specialist

The Senior Environmental, Health and Safety Specialist is responsible for over seeing the development and maintenance of this Hydrocarbons and Dangerous Goods Management Plan and is responsible for the coordination of monitoring activities, internal audits and reporting to government agencies.

Emergency Response Manager

The ERM is responsible for the implementation and maintenance of the ESRP should hydrocarbons or other dangerous goods be spilt.

ESRP Support Staff

Two support staff (exclusive of the ERM) trained in the ESRP will be required on site during all operational hours.

All Personnel and Contractors

All personnel and contractors are responsible for adhering to the procedures outlined within this Hydrocarbons and Dangerous Goods Management Plan and will report any non-compliance to the relevant manager.

3.7.13 Records and Reporting

Incident and Accident Reporting

All accidents and near misses must be reported to the appropriate manager and will be entered into an incident reporting system. The entering of these reports into an incident reporting system provides a useful tool for identifying trends and facilitates the identification of emergency response and reporting requirements, maintenance requirements and any necessary amendments to the Hydrocarbons and Dangerous Goods Management Plan.

Induction Records

The induction records will contain all personnel induction and training records along with any identified training requirements for their roles and responsibilities.

Daily Inspection and Maintenance Checklist

This checklist requires the inspection, identification and a record of maintenance to ensure that all infrastructure involved in the handling, storage, transport and disposal of dangerous goods is maintained at an appropriate level. The following is a list of the components that need to be inspected and maintained:

- Fuel storage and refuelling area: containment structure, associated connections, pipes, bunds, sump and oil-water separator, tanks (i.e., visual indication systems) and security system/measures.
- Workshop and washdown area: pipes, grates, sumps, oil-water separator, roof/gutter and rainwater tank, waste storage areas, containment structure and security system/measures.
- Magazine: storage facility, water diversion structures, and security system/measures.
- Other: refuelling trucks, on-site generators, safety equipment and spill equipment.

Dangerous Good Procurement Procedure

This procedure ensures that all dangerous goods required on site are requested (along with the provision of the relevant MSDS) and reviewed prior to their procurement to determine whether the goods are approved, approved with conditions or rejected on site, dependent on:

- The level of risk.
- The availability of acceptable alternatives.
- The necessity of the dangerous good on site.

Dangerous Goods Materials Manifest

The Dangerous Goods Materials Manifest lists all the dangerous goods on site and their maximum volumes, associated MSDS, duties or operations that may lead to exposure to these materials, and any outcomes from the Dangerous Good Procurement Procedure including conditions of approval.

Consignment and Delivery Record

The consignment and delivery record provides a consolidated list of all dangerous goods brought on site, including the type of good, volumes, method of transport/delivery and the relevant MSDS.

Annual Environmental Report

The purpose of reporting within the AER under this Hydrocarbons and Dangerous Goods Management Plan is to report on the outcomes of internal audits and to examine the effectiveness of this management plan and any necessary amendments. It will therefore summarise:

- Any major accidents/incidents, and trends in incident and accident reporting.
- Any known or suspected contaminated sites under the Contaminated Sites Act.
- Total volumes of dangerous goods disposed.
- Effectiveness of the Hydrocarbons and Dangerous Goods Management Plan (i.e., management procedures – ESRP).
- Any necessary amendments to the Hydrocarbons and Dangerous Goods Management Plan to assist the project in meeting its management objectives.

Reporting Requirements Under the Contaminated Sites Act 2003

Should a spill occur and contamination be reported (as per the requirements identified in Section 3.7.2) Atlas will begin a staged site assessment in compliance with the Contaminated Sites Act (i.e., monitoring using the Draft Assessment Levels for Soil, Sediment and Water Guideline; Contaminated Site Series, (DEP, 2003)). Any contaminated sites will also be recorded in the AER.

3.7.14 Key Management Actions Table

The following key management actions (Table 3.35) relate specifically to management of hydrocarbons, chemicals and other dangerous goods.

3.8 Transport Management

3.8.1 Objectives

This Transport Management Plan applies to the product transport route from the minesite access intersection of the Great Northern Highway to the relevant berth in Port Hedland for export.

The objectives of the Transport Management Plan are to:

- Minimise the Pardoo DSO Project's contribution to traffic congestion in Port Hedland.
- Ensure that the Pardoo DSO Project does not increase safety risk on roads within Port Hedland.
- Ensure compliance with all relevant transport statutory requirements and government guidelines.

3.8.2 Existing Environment

Completed Studies

A traffic impact assessment was prepared by Sinclair Knight Mertz (SKM) in accordance with the Western Australian Planning Commission's guidelines. The assessment included modelling of key road sections and intersections along the product transport route to the existing Port Hedland public access berth and proposed Utah Point bulk commodities berth (and the FMG berth) (refer to Section 1.1 for further information).

Product Transport Route

The proposed product transport route from the Pardoo DSO Project minesite to the existing Port Hedland public access berth and the proposed Utah Point bulk commodities berth consists of two main roads (i.e., Great Northern Highway and Port Hedland Road/ Wilson Street) and three local roads (i.e., Pinga Street, Cajarina Road and Finucane Road).

The proposed product transport route to the existing Port Hedland public access berth is as follows:

- South on the Great Northern Highway (from the Pardoo DSO Project minesite to Port Hedland Road.
- Right into Port Hedland Road, which becomes Wilson Street after McGregor Street.
- Left into Wedge Street and straight ahead into the Port Hedland public access berth.

Table 3.35 Key hydrocarbons and dangerous goods management actions

Reference	Item	Key Management Action	Timing	Reporting/ Evidence	Status[1]
DG01	Design mitigation measures	Implement design mitigation measures outlined in Section 3.7.5.	During construction.	Auditing records, AER.	
DG02	Awareness and training	Implement awareness and training program (Section 3.7.6).	Prior to operation/ commencement of work on the minesite.	Induction records, auditing records, AER.	
DG03	Storage and handling	Develop and implement storage and handling procedures.	Prior to construction, ongoing.	Auditing records, AER.	
DG04	Transport and disposal	Develop and implement transport and disposal procedures.	Prior to construction, ongoing	Auditing records, AER.	
DG05	ESRP framework	Develop and implement of ESRP following the framework in Section 3.7.8.	Prior to construction, as required.	Auditing records, AER.	
DG06	Storage and handling	Develop and implement an audit inspection program (Section 3.7.7.).	Prior to operation, biannually.	Auditing records, AER.	
DG07	Records and reporting	Develop and implement record and reporting documents (Section 3.7.13).	Prior to construction, ongoing.	Auditing records, AER.	

[1] To be completed and updated once regulatory approvals are obtained.

The proposed product transport route to the FMG berth or the proposed Utah Point bulk commodities berth is as follows:

- South on the Great Northern Highway (from the Pardoo DSO Project to Port Hedland Road).
- Left into Great Northern Highway.
- Right into Great Northern Highway at its intersection with Wallwork Road (i.e., straight ahead).
- Straight ahead into Pinga Street (where the Great Northern Highway turns off to the left).
- Left into Cajarina Road.
- Right into the proposed FMG access/Finucane Island Public Access Road.
- Either right to the approved FMG berth, or right to the proposed Utah Point bulk commodities berth.

The product transport route will intersect a number of rail lines. The existing rail network is owned and operated by BHP Billiton and incorporates the Goldsworthy line, which runs east-west to Finucane Island, and the Newman line, which runs north-south to Nelson Point. Additionally, FMG has approval to construct and operate a 310-km rail line linking mining operations at Cloud Break to two new berths at Anderson Point. Hope Downs and Rio Tinto are also currently conducting feasibility studies for additional rail lines into the Port Hedland area.

Existing Traffic

Average weekday traffic volumes within Port Hedland are as high 10,600 as vehicles per day on the Great Northern Hwy (south of Port Hedland Road).

Approximately 90 % of the vehicles close to the Port Hedland residential area are classed as light vehicles, decreasing to approximately 74 % closer to the minesite. The proportion of long vehicles and road trains (Ausroad Class 10 and above), is lowest on the Great Northern Highway south of Port Hedland Road (i.e., between Port Hedland and South Hedland) at approximately 2 % and increasing to approximately 14 % on the Great Northern Highway closer to the minesite.

BHP Billiton operates a number of private buses for employees, which all use the same road sections as both proposed product transport routes. There are four public bus routes in the Port Hedland region, two of which use sections of the product transport route.

The two peak periods for traffic in Port Hedland are from 6.00 a.m. to 7.00 a.m. and from 4.00 p.m. to 5.00 p.m. Both of these peak periods are outside the school zone hours of 7.30 a.m. to 9.00 a.m. and 2:30 p.m. to 4.00 p.m.

The two busiest intersections along the product transport route to the existing Port Hedland public access berth are the Cooke Point Drive/Port Hedland Road and Great Northern Highway/Port Hedland Road intersections. Both intersections experience their busiest period in the afternoon peak hour. Port Hedland Road (which becomes Wilson Street) is the only distributor road servicing the existing public access berth and the town centre of Port Hedland. As a result during morning and afternoon peak hours, traffic can be restricted to some extent.

There are four intersections along the product transport route to the proposed Utah Point bulk commodities berth and the FMG berth. The busiest intersection is the Great Northern Highway/Port Hedland Road intersection, which also experiences its busiest period during the afternoon peak hour.

A review by SKM (2007) of intersection crash data and crashes resulting in injury or death indicates that accidents involving trucks and road trains are not currently over represented within Port Hedland.

3.8.3 Regulatory Requirements

The management measures contained in the Transport Management Plan have been developed in accordance with the provisions of the *Environmental Protection Act 1986* and the *Road Traffic Act 1950*. The DEC and MRWA are the administering authorities for these Acts respectively.

An overview of the relevant provisions of these Acts is provided below.

Environmental Protection Act 1986

Part IV of the Environmental Protection Act establishes provisions for the EPA to undertake formal environmental impact assessments on proposals that may have a significant impact on the environment and the setting of statutory conditions by the Minister for the Environment. The Pardoo DSO Project is currently undergoing a formal assessment under Part IV of the Environmental Protection Act, at a PER level of assessment. Should the proposal be approved, the Pardoo DSO Project will be managed in accordance with any regulatory conditions (within the Ministerial Statement) that are applied to the proposal at completion of the PER assessment.

Road Traffic Act 1974

The Road Traffic Act consolidates and amends the law relating to road traffic. The Department of Planning and Infrastructure is the administering authority of the Act, and is responsible for all vehicle licensing as well as for the prosecution of non-compliance matters that are referred by MRWA. While the haulage contractor will be responsible for vehicle licensing and maintenance, Atlas will be responsible for obtaining heavy vehicle access to the road network along the product transport route (i.e., concessional loading approval).

The Transport Management Plan will be managed in accordance with any relevant requirements under the Road Traffic Act.

3.8.4 Potential Impacts

Atlas proposes to use quad-configuration road trains for product transport. The maximum number of predicted truck movements to the existing public access berth is between three and five trucks per hour, depending on whether the product is transported in a two or three week campaign. The maximum number of predicted truck movements to the Utah Point bulk commodities berth or FMG berth is predicted at four per hour. In addition to this truck traffic, the proportion of light vehicle traffic may increase due to employees commuting from Port Hedland residential areas to the minesite each day.

The potential impacts on traffic within Port Hedland from the Pardoo DSO Project are outlined below:

- Increase in traffic volumes and percentage of heavy truck traffic resulting in a decrease in the existing level of service for intersections and the road network in general.
- Increased truck traffic resulting in increased noise impact for adjacent residents, which is described in the Air and Noise Management Plan (Section 3.5).

3.8.5 Management Practices

Equipment

Atlas will employ haulage contractors to transport product from the minesite to the relevant berth. These contractors will have well-maintained, roadworthy trucks and operate in compliance with the requirements of the concessional loading approval.

Atlas proposes to use quad-configuration road trains for product transport. These trucks tend to be newer than a triple-configuration road train fleet and as such, are better maintained. Additionally, the larger capacity of the quad-configuration trucks will result in fewer trucks movements between the minesite and the relevant berth at Port Hedland.

Atlas has committed to using covered trucks, which will prevent rocks from dislodging from trucks onto the road or other vehicles, and minimise potential for dust emissions during product transport.

Code of Conduct

Atlas has committed to imposing a Code of Conduct on all contractors responsible for product transport to the port. This Code of Conduct will consist of a number of commitments such as:

- Travelling within the required speed limit.
- Limiting the use of air brakes near residential areas.
- Being aware of bus routes and schedules and minimising their interaction where possible.
- Ensuring that each truck is well-maintained and roadworthy at all times.

All truck drivers will sign this Code of Conduct. Any confirmed breach of these conditions will result in disciplinary action by the employer. The Code of Conduct will be developed prior to operations commencing and made available to the public.

Product Transport Timing

To reduce the impact of Atlas's contribution on traffic congestion within the Port Hedland residential area, Atlas has agreed to impose a project-related restriction to product transport through the Port Hedland town. No product transport will occur within Port Hedland during the afternoon peak period, that is, 4.00 p.m. to 6.00 p.m. (i.e., the time identified as the most critical for potential impact). Trucks will still transport along the Great Northern Highway outside of the town area during this time.

Employee Transport

Atlas will encourage its contractors to use buses to transport their employees to the minesite, thereby minimising the number of cars on the road. Shift hours will also be reduced to account for the travel time to and from the minesite and thus combat fatigue.

Complaints Reporting System

Regular communications will be instigated with the Port Hedland community and a complaints management system, including investigation, action, feedback and reporting, will be implemented. A complaints line will be made available to members of the public in order for them to report inappropriate conduct of Atlas's product transport trucks.

3.8.6 Monitoring

Given that monitoring is not required to support the management practises outlined in Section 3.8.5), no monitoring is proposed for this Transport Management Plan. Management of transport will instead focus upon minimising the Pardoo DSO Project's impacts from its transport activities, implementing appropriate induction and training programs, equipment maintenance and management of complaints.

3.8.7 Contingency Actions

Contingency actions for key issues relating to transport that will be undertaken in the event of an actual or perceived exceedence of triggers are provided in Table 3.36.

Table 3.36 Contingency transport management actions

Trigger for Action	Contingency Action Required
Complaint is received regarding Atlas's product transport trucks or driver conduct.	Investigate reason for complaint, undertake additional training and implement further management measures if the cause can be altered.

3.8.8 Performance Indicators

Table 3.37 below illustrates the conceptual performance indicators and corresponding targets that will be used to track progress in achieving the transport management objectives. Targets were developed with the intent of being achievable given the project constraints and to provide a measurement of success for each performance indicator, rather than providing project goals for each objective.

No relevant standards for performance criteria for transport management were identified at the time of developing this management plan. Instead, performance indicators and targets are based on best practise and company targets.

Table 3.37 Conceptual transport management performance indicators

Item	Performance Indicator	Target
Objective 1. *To minimise the Pardoo DSO Project's contribution to traffic congestion in the Port Hedland area.*		
Product transport timing.	Truck logs.	No truck movements recorded between 4.00 p.m. and 6.00 p.m.
Objective 2*. To ensure that the Pardoo DSO Project does not increase safety risk on Port Hedland's roads.*		
Code of Conduct.	Atlas copies of contractors signed Code of Conduct.	Every product transport driver has signed Code of Conduct prior to undertaking product transport activities.
Complaints reporting system.	Complaints reporting system records.	No confirmed complaints relating to product transport driver's road activities.
Employee transport.	Shift length of Atlas employees and contractors.	No longer than 10.5 hrs.
Equipment, complaints reporting system.	Vehicle inspection and complaints line records.	No trucks with outstanding maintenance requirements and no confirmed complaints relating to truck condition.
Objective 3. *To ensure compliance with all relevant transport statutory requirements and government guidelines.*		
Records and reporting.	Compliance register[1].	No transport non-compliance incidents.

[1] Compliance register to be developed for the Pardoo DSO Project prior to the commencement of operations.

3.8.9 Roles and Responsibilities

The roles and responsibilities of personnel responsible for the development and implementation of the Transport Management Plan for the Pardoo DSO Project are discussed below.

Operations Manager

The Operations Manager will ensure that appropriate resources are provided to implement the actions outlined in this Transport Management Plan. The Operations Manager has overall responsibility to ensure that all activities conducted in relation to the project are carried out in accordance with the IMS, this Transport Management Plan and the other regulatory requirements.

Pardoo General Manager

The Pardoo General Manager is responsible for ensuring that all contractors work in accordance with this Transport Management Plan, including the participation of all personnel and contractors in the induction program and relevant training (including Code of Conduct requirements).

Senior Environmental, Health and Safety Specialist

The Senior Environmental, Health and Safety Specialist is responsible for overseeing the development and maintenance of this Transport Management Plan and is responsible for the coordination of relevant records and reporting to government agencies.

Community Liaison Officer

The Community Liaison Officer will work with the Senior Environmental Health and Safety Specialist and Pardoo General Manager to ensure that any community complaints received through the complaints reporting system are investigated and that corrective actions are initiated within an appropriate amount of time. The Community Liaison Officer is responsible for recording and collating any complaints.

Contractor Managers

The Contractor Managers will work with the Senior Environmental Health and Safety Specialist to ensure that management actions contained within the Transport Management Plan are implemented. The Contractor Managers are responsible for supporting and promoting community issues in Port Hedland and ensuring that all contractors implement requirements of the Transport Management Plan.

All Personnel and Contractors

All personnel and contractors are responsible for adhering to the procedures outlined within this Transport Management Plan and will report any non-compliance to the relevant manager.

3.8.10 Records and Reporting

Induction records for all personnel working and visiting the minesite will include sign-off by inductees to confirm that transport management has been discussed. Signed copies of the Code of Conduct for each product transport truck driver will be kept at site administration.

Incident reports will be used to track any non-compliance with product transport issues (e.g., inappropriate truck driver conduct, product transport within afternoon peak hour). Any incident will be recorded and reported to the Pardoo General Manager through the incident reporting system. All staff are responsible for the correct use of the incident reporting system.

The Community Liaison Officer will record any complaints regarding product transport and report these to the Senior Environmental, Health and Safety Specialist or Pardoo

General Manager to ensure that all complaints are investigated and that corrective actions are initiated within an appropriate amount of time. The complaints reporting system will contain records of all complaints received and the progress of corrective action taken.

A compliance register will be developed and implemented to track compliance with all regulatory requirements including transport requirements. Any perceived or actual non-compliance will be rectified as soon as possible.

3.8.11 Key Management Actions Table

The following key management actions (Table 3.38) relate specifically to management of transport.

3.9 Conceptual Mine Completion and Rehabilitation

3.9.1 Introduction

This Conceptual Mine Completion and Rehabilitation Plan is part of an overall EMP provided to the Western Australian Government to inform regulators of the potential risks and impacts of the Pardoo DSO Project. In conjunction with the PER process, Mining Proposal and IMS, this document is the initial foundation of government assessment and approval of the project. Once environmental approval has been obtained, this EMP will become a source document for environmental procedures and environmental management throughout the mine's operational life.

The purpose of the Conceptual Mine Completion and Rehabilitation Plan is to focus on the decommissioning, rehabilitation and closure of mine infrastructure components including pits, waste rock dumps, stockpiles, crushing and screening plant, bores, pipelines, workshops and administration area, access and haul roads, and other ancillaries.

The Conceptual Mine Completion and Rehabilitation Plan is focused solely on the minesite as all land use outside will remain unchanged during and after its operational life. This is also relevant given that the impact of planned change to the existing land use and environment of the minesite is greater than that of the product transport route and port.

Most of the concepts contained in this document are already outlined in the PER, but have been expanded upon where possible. The plan also establishes a basic concept for mine completion and rehabilitation in the event that unforeseen events (such as a natural disaster or significant downturn in the market), result in a premature or temporary closure of the project.

Table 3.38 Key transport management actions

Reference	Item	Key Management Action	Timing	Reporting/Evidence	Status[1]
T01	Equipment	Ensure that trucks are well maintained and roadworthy. Commission quad-configuration road trains with covered trailers.	Commencement of transporting product to Port Hedland.	AER.	
T02	Code of Conduct	Develop a Code of Conduct and ensure sign-off by all relevant drivers.	Prior to commencement of product transport to Port Hedland, ongoing.	Code of Conduct records.	
T03	Product transport timing	Ensure that product transport is undertaken so that no Atlas trucks are driving within the Port Hedland residential area between 4.00 p.m. and 6.00 p.m.	Commencement of stockpiling activities at the relevant port.	Driving log.	
T04	Complaints reporting system	Develop and implement a complaints reporting system between Atlas and the Port Hedland Community.	Prior to commencement of transporting product to Port Hedland.	Communication and complaints line records.	
T05	Employee transport	Provide and encourage employees to use buses. Ensure that shift hours are designed to account for the travel time.	Commencement of operations.	AER.	

[1] To be completed and updated once regulatory approvals are obtained.

The intention of this plan is to consider the current project context, establish general goals and identify conceptual completion objectives and criteria. The completion and rehabilitation concepts presented in this management plan have been based on recommendations made by various specialist consultants.

Within two years of commencing ground disturbing works at the mine site, Atlas will prepare a Detailed Mine Completion and Rehabilitation Plan, expressing a commitment to review that document every year until the project's completion. These reviews will allow the future incorporation of experience accumulated in progressive rehabilitation and research undertaken since the start of the project.

3.9.2 Completion Obligations

Legislative Requirements

In Western Australia, the most relevant regulatory powers to mine closure are the *Mining Act 1978*, *Mines Regulation Act 1946* and Mines Safety and Inspection Regulations 1995, administered by the DoIR.

In addition to this, the *Environmental Protection Act 1986* (administered by the DEC on behalf of the Environmental Protection Authority (EPA)) has overriding powers over most other Acts, including the Mining Act. Therefore, any environmental factor governed by that Act (and its associated regulations) that may influence closure activities, must be addressed.

The regulation of mine completion in Western Australia is typically enforced through either conditions on the mining lease applied at the time approval to mine is granted or via Section 84 of the Mining Act, which enables the Minister for Mines to impose conditions for the purpose of preventing, reducing, or 'make good' injury to the land. Conceptual closure plans are being included as attachments to PER documents, and subsequently, it is likely that mine closure will be regulated through establishment of Ministerial conditions under Part IV of the Environmental Protection Act.

Future updates of the Conceptual Mine Completion and Rehabilitation Plan will address any further conditions of operation associated with the mining lease documents and Ministerial conditions arising from the assessment under Part IV of the Environmental Protection Act.

Other legislation that may be relevant in the preparation of this plan are:

- *Aboriginal Heritage Act 1972.*
- *Country Areas Water Supply Act 1947.*
- *Contaminated Sites Act 2003.*
- *Soil and Land Conservation Act 1945.*
- *Waterways Conservation Act 1976.*
- *Wildlife Conservation Act 1950.*

Environmental Principles, Policy and Guidelines

There are a variety of government policies and guidelines relevant to mine closure that have guided both the structure and content of the Conceptual Mine Completion and Rehabilitation Plan.

At the strategic level, the Minerals Council of Australia's 'Enduring value – the Australian minerals industry framework for sustainable development' contains several principles and elements relating to mine completion.

Of a more specific nature, are the guidelines prepared by various agencies on matters relating to mine closure, mine void water and rehabilitation of terrestrial ecosystems. This section considers the relevant aspects from a number of guideline documents including:

- Rehabilitation of Terrestrial Ecosystems, EPA Guidance Statement No. 6 (EPA, 2006) – provides guidance on the use of rehabilitation objectives and the completion criteria for the rehabilitation of natural ecosystems and restoration of biodiversity. It acknowledges the importance of scientific research and monitored trials.
- Guidelines for Mining Proposals in Western Australia (DoIR, 2006a) – sets out the expectations of the DoIR in regard to rehabilitation and mine closure planning.
- Mine Void Water Resource Issues in Western Australia (Johnson & Wright, 2003) – describes potential impacts associated with mine void water, such as salinity and acidification of groundwater. Includes objectives for closure planning for mine voids and presents several case studies from Western Australia and Queensland.
- Mining Environmental Management Guidelines – Mining in Arid Environments (DoIR, 2006b) – describes arid zone environments and presents a practical approach to operation management, land rehabilitation and monitoring.
- Strategic Framework for Mine Closure (ANZMEC & MCA, 2000) – provides a framework for mine closure in Australia and outlines strategies for stakeholder involvement, planning, financial provisions and closure implementation.
- Mine Rehabilitation (DITR, 2006a) – provides a framework for leading practice mine rehabilitation planning. It covers sustainable development and mine rehabilitation, planning, operations and closure and includes a number of case studies.
- Mine Closure and Completion (DITR, 2006b) – describes leading practice in a whole-of-mine approach to mine closure covering exploration, planning and design, operations and decommissioning. It uses case studies to highlight leading practice.
- De Grey River Water Reserve Water Source Protection Plan (WRC, 2000c) – Details the management objectives for the De Grey River Water Reserve.
- Mine Closure Guideline for Minerals Operations in Western Australia (Chamber of Minerals and Energy, 2000) – provides a framework for closing a range of mineral operations.

Stakeholder Requirements

Consultation undertaken to date has identified the following completion requirements from the relevant stakeholders.

- EPA – Creation of long-term safe and stable landforms and mine voids, with all landforms designed to optimise progressive rehabilitation during the life of the project.
- DoIR – Creation of long-term safe and stable landforms and relinquishment of a site with no or minimal long-term maintenance requirements and liabilities.
- DoW – Creation of long-term safe and stable landforms and mine voids (including pit lakes Bobby and South Limb), and relinquishment of a site that poses no risk to the quality or quantity of the De Grey River Water Reserve water source.
- Ngarla people and their representatives – Relinquishment of a site that poses no risk to identified and recorded sites of heritage value, and creation of long-term landforms that are sympathetic to the inherent Indigenous values associated with the area.
- De Grey Pastoral Station – Relinquishment of a site that is usable for cattle grazing, poses no risk to the pastoral activities or stock water quality or quantity, and requires no ongoing maintenance.

3.9.3 Objectives of Project Completion

Post-mining Land Use

It is anticipated that the post-mining land use will revert to the existing pastoral activities. Given the low quality feedstock and the rugged terrain of the ranges, the De Grey Station is sparsely stocked with cattle. It is not anticipated that the area will be heavily stocked post mining. However, to achieve a stable post mining landform, waste rock dumps will be fenced off to prevent cattle grazing. The open pits will be surrounded by abandonment bunds to minimise the risk to public and pastoralist safety and will likely not be suitable for further land use.

As the minesite lies within an exploration lease, it is likely that mineral exploration will also continue in the area post mining. Any exploration work post-project would be subject to additional approvals.

In addition, ongoing consultation with the Ngarla people may identify other indigenous land uses of interest within the vicinity of the minesite.

The post-mining land use for each of the minesite component areas is identified in Section 3.9.7.

Conceptual Completion Objectives

Given the likely post-mining land use, Atlas has developed a set of completion objectives for achieving acceptable outcomes for completion and rehabilitation of the minesite. These objectives are:

- Ensure that minesite completion and rehabilitation meets appropriate regulator requirements and conditions of project approval.
- Construct waste rock dumps and landforms that are stable and minimise their impacts to the surrounding environment.
- Progressively rehabilitate disturbance areas as they become available for rehabilitation.
- Create landforms and conduct rehabilitation so that in the long-term flora and vegetation is comparable and compatible with the surrounding environment and land use.
- Mitigate closure safety risks as far as reasonably practicable.
- Ensure that management and monitoring continues until retirement of the DoIR unconditional performance bond and lease relinquishment.

These objectives provide the basis for conceptual completion criteria presented within this management plan (Section 3.9.4).

3.9.4 Conceptual Completion Criteria

Specific targets (as defined by measurable outcomes or targets) are required for monitoring and reporting. These targets are usually called completion criteria. Guidelines published by ANZMEC & MCA (2000) state that completion criteria should:

- Be specific enough to reflect a unique set of environmental, social and economic circumstances.
- Include environmental indicators suitable for demonstrating rehabilitation success.
- Undergo periodic review resulting in modification, if required, due to changed circumstances or improved knowledge.

A number of conceptual completion criteria are provided in Table 3.39. These criteria will be reviewed and updated following further consultation with stakeholders and according to regulatory requirements.

The approved set of completion criteria will assess whether or not completion objectives have been achieved. Atlas will need to be in compliance with the specified criteria before the leases can be relinquished. As a commitment to continuous improvement, the completion criteria will be reviewed annually and the Conceptual Mine Completion and Rehabilitation Plan updated to include results of research into rehabilitation methods and ongoing baseline monitoring. Additional requirements imposed by the regulatory authorities will also be included in the annual review and plan update.

Table 3.39 Conceptual completion criteria

Objective	Completion Criteria
Objective 1. Ensure that minesite completion and rehabilitation meets appropriate regulator requirements, conditions of project approval and agreed completion criteria.	Completion criteria will be developed following project approval under the Environmental Protection Act and Mining Act.
Objective 2. Construct waste rock dumps and landforms that are stable and that minimise impacts to the surrounding environment.	• Glenda, Alice East and South Limb West pits have been backfilled (Alice East and Glenda to at least 2 m above the water table). • The final rehabilitated waste rock dumps: - Have been ripped (if compacted) and contoured to resemble the surrounding landscape. - Has been contoured to allow natural drainage patterns to be re-established. - Are both physically and geochemically stable and non-erosive. - Have a soil profile that is similar to the pre-mining profile and can support plant growth. • All landforms spread with growth media to minimum 300 mm depth (where available), seeded (or revegetated using an appropriate method as identified in ongoing revegetation trials), and are geophysically stable.
Objective 3. Progressively rehabilitate disturbance areas as they become available for rehabilitation.	Rehabilitation of unused disturbance areas over one hectare is initiated within one year of becoming available.
Objective 4. Create landforms and conduct rehabilitation so that in the long-term flora and vegetation is comparable and compatible with the surrounding environment and land use.	A suitable monitoring program, pertinent to the region will be developed and implemented to demonstrate that rehabilitation has been successful.
Objective 5. Mitigate closure safety risks as far as reasonably practicable.	• All plant and infrastructure post mining is removed and disposed of in an environmentally responsible manner. • The minesite is remediated to an acceptable level under the Contaminated Sites Act. • Abandonment bunds have been constructed around the pit voids.
Objective 6. Ensure that management and monitoring continues until performance bond and lease relinquishment.	• Monitoring shows that that disturbed areas within minesite area are resilient. • Monitoring of groundwater demonstrates that the open pits act as a groundwater sink. • The DoIR's requirements for mine closure have been met and bonds and lease relinquishment has occurred.

3.9.5 Existing Environment

The project is located within the semi-arid region of Australia, characterised by high temperatures, low, variable rainfall and high evaporation. The wet season occurs over summer and coincides generally with the cyclone season.

Annual average rainfall for the Pilbara region ranges from 180 mm to over 400 mm (Beard, 1975) with the Bureau of Meteorology data indicating an annual rainfall average of 324 mm at Goldsworthy and 313 mm at Port Hedland. Average maximum summer

temperatures are generally between 36°C and 40°C while winter maximum temperatures are generally between 27°C and 31°C. Maximum temperatures at the minesite are expected to be generally 1 to 3°C hotter in summer and winter. In this climate, annual evaporation rates greatly exceed the mean annual rainfall.

The minesite is located within the Fortescue Botanical District (Pilbara region) of the Eremaean Province, as defined and mapped by Beard (Beard, 1975; Beard, 1990). The vegetation of this province is typically open, and frequently dominated by spinifex, wattles and occasional eucalypts (Beard, 1975).

The minesite also falls within the Pilbara biogeographic zone, Pilbara 4 subregion, according to the Interim Biogeographic Regionalisation for Australia (IBRA).

Vegetation at the minesite consists of several FCTs, plant communities and mosaics of these types. The South Limb, Alice and Glenda deposits are characterised by a mosaic of FCTs containing hummock grassland, dominated by *Triodia epactia* with occasional *Triodia bitextura*. The Connie deposit is characterised by a FCT of hummock grassland dominated by *Triodia epactia* with occasional *Triodia bitextura*, and a mosaic of FCTs, again dominated by *Triodia epactia* and containing *Eragrostis eriopoda*, *Acacia stellaticeps* or *Acacia cowleana*, *Chrysopogon fallax*, *Cenchrus cilaris* and *Acacia synchronicia*. The Bobby deposit is characterised by a mosaic of FCTs containing hummock grassland dominated by *Triodia epactia* and *Chrysopogon fallax* and *Cenchrus cilaris*, with occasional *Triodia bitextura.*

Vegetation communities located along the Ridley River and Redrock Creek contain species such *Eucalyptus victrix*, *Corymbia flavescens*, *Bauhinia cunninghamii* and *Acacia inaequilatera* (refer to Figure 3.4 in the Flora and Vegetation Management Plan (Section 3.3)). Such species may be dependant on groundwater (i.e., are phreatophytic). These vegetation communities are not restricted to the minesite or to the zone of influence associated with the cone of depression, which will be created as a result of pit dewatering.

No DRF has been identified within or in close proximity to the minesite. One Priority 2 (P2) and two Priority 3 (P3) flora were identified within the project survey area as shown in Figure 3.3 of the Flora and Vegetation Management Plan (Section 3.3). Two unidentified taxa, which have not yet been identified to species level, were also located. Priority Flora and unidentified taxa within and near the minesite are summarised in Table 3.40.

Table 3.40 Significant and unidentified flora taxa recorded within and surrounding the minesite

Significant Flora Species	Conservation Code[1]	Number of Locations in Survey Area	Number of Locations Impacted	Found in FCTs[2]	Density within Quadrats (2007)
Eragrostis crateriformis	P3	3	2	4, 5	0.1% - 10%
Gomphrena pusilla	P2	1	None	5	0.1%
Lotus affin. *cruentus*	-	3	1	4, 5	

Table 3.40 Significant and unidentified flora taxa recorded within and surrounding the minesite (cont'd)

Significant Flora Species	Conservation Code[1]	Number of Locations in Survey Area	Number of Locations Impacted	Found in FCTs[2]	Density within Quadrats (2007)
Tephrosia sp. Cathedral Gorge (F.H. Mollemans 2420)	P3	12	4	1, 2, 4,	0.1% - 0.5%
Sauropus sp.	-	1	None	5	

[1] P2 – Poorly Known Taxa. That is, taxa which are known from one or a few (generally <5) population, at least some of which are not believed to be under immediate threat.
P3 - Poorly Known Taxa. That is, taxa which are known from several populations, at least some of which are not believed to be under immediate threat.

[2] FCTs – Floristic community types.

No declared plants, as listed under the *Agriculture and Related Resources Act 1976*, were recorded in the project survey area in the 2007 survey. However, *Parkinsonia aculeata* (parkinsonia) was recorded in two locations on the Ridley River (refer to Figure 3.3 in the Flora and Vegetation Management Plan (Section 3.3)) during the initial survey in 2005. This species is classed as a Priority 1 (P1) and P2 species for the Port Hedland/East Pilbara region. A P1 classification prohibits movement of the plants or their seeds through the state (including movement of contaminated machinery or produce), and a P2 classification aims at eradication of the species, including the onus (on the property manager or owner) to destroy and prevent propagation each year until no plants remain.

The majority of introduced species identified during the surveys were from the family Poaceae (grasses), including *Cenchrus ciliaris*, which was the dominant introduced species recorded in the area and was especially prevalent on flat areas near creeklines. This species is used as a fodder crop by pastoralists and has become a naturalised species. Other introduced species included *Citrullus* spp. (paddymelons) (widespread throughout Western Australia), *Passiflora foetida* var. *hispida* (stinking passion flower) (widespread throughout Western Australia), *Indigofera* spp. (known from near Port Hedland), and *Trianthema portulacastrum* (giant pigweed) (known from Port Hedland).

A number of subterranean fauna taxa have been found within the minesite or its surrounds. Subterranean fauna are small animals and microbes that live below the earth's surface in groundwater and caves or voids. Communities of subterranean fauna that live in groundwater aquifers are called 'stygofauna'. Communities of subterranean fauna that live within voids above the watertable are called 'troglofauna'.

Table 3.41 presents the subterranean fauna found within the minesite and surrounds, and a brief description of the predicted impact to each taxon considering the sampling data and habitat distribution.

Table 3.41 Subterranean fauna found within the minesite and surrounds

Taxa	Location[1, 2]	Impact
Stygofauna		
Copepoda- *Halicyclops (Rochacyclops) calm* (Karanovic, 2006).	**Glenda**, **Bobby** Clare, Floyd.	Species impacted by mining. Both regional and locally distributed.
Copepoda- *Mesocyclops holynskae (*Karanovic, 2006) (copepod).	Floyd.	Species not impacted by mining. Both regional and locally distributed.
Copepoda- *Diacyclops humphreysi humphreysi* (Pesce & De Laurentiis, 1996).	**Bobby**, **Alice Connie**, **Olivia**, **South Limb**, Clare.	Species impacted by mining. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Both regional and locally distributed.
Copepoda- *Diacyclops scanloni* (Karanovic, 2006).	**Bobby**, Clare, Floyd.	Species impacted by mining. Both regional and locally distributed.
Copepoda- *Metacyclops pilbaricus* (Karanovic, 2004).	**Alice**, **Bobby**.	Species impacted by mining. Both regional and locally distributed.
Copepoda- *Stygonitocrella trispinosa* (Karanovic, 2006).	**Bobby**, **South Limb**, **Alice**, **Glenda**, **Olivia** Clare, Floyd.	Species impacted by mining. Both regional and locally distributed.
Amphipoda (*Nedsia sp.*).	**South Limb**, Clare.	Taxon impacted by mining. Locally distributed, including a non-impact site.
Amphipoda sp. 1	**Bobby**, **Connie**.	Taxon impacted by mining. Locally distributed, but restricted to impact area. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Impacts unlikely to cause significant risk to taxa.
Amphipoda sp. 2	Clare.	Taxon not impacted by mining.
Amphipoda with eyes	**Bobby**.	Taxon not impacted by mining.
Ostracoda- *Areacandona iuno* (Karanovic, 2007).	**Alice**, **Connie Glenda**, Clare.	Species impacted by mining. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Both regional and locally distributed.
Bathynellacea- *Atopobathynella sp.*	**Connie**.	Taxon within mining impact area. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Possible regional distribution. Impacts unlikely to cause extinction of taxa.
Bathynellacea- *Bathynella* sp.	**Connie**.	Taxon within mining impact area. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Possible regional distribution. Impacts unlikely to cause extinction of taxa.
Oligochaeta	**Bobby**, **Connie South Limb**, Clare, Floyd.	Taxon impacted by mining. Connie will not be mined below the water table and therefore unlikely to cause significant risk to taxa. Both regional and locally distributed.

Table 3.41 Subterranean fauna found within the minesite and surrounds (cont'd)

Taxa	Location[1, 2]	Impact
Troglofauna		
Araneae sp. 2	**South Limb, Alice**, Monty.	Species not impacted by mining.
Lagynochthonius n sp.	Monty.	Species impacted by mining and found outside the impact zone.
Ideobrothrus n. sp.	**South Limb**.	Species habitat occurs outside impact zone.
Diplopoda sp. 1	**South Limb**, **Alice**, Monty.	Species impacted by mining and found outside the impact zone.
Scolopendrida sp. 1	**Alice**, **Olivia.**	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Pauropoda sp. 1	**Bobby**.	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Diplura sp. 1	**South Limb**, **Connie**.	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Diplura sp. 2	**Olivia**.	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Projapygidae sp. 1	**Alice**, Lena.	Species impacted by mining and found outside the impact zone.
Nicoletiidae sp. 1	**South Limb**, **Alice**, **Connie**.	Species occurs outside direct impact zone and habitat occurs outside impact zone.
Coleoptera sp.	Monty.	Species not impacted by mining.
Oniscidea sp. 2	**South Limb**, **Alice**, **Connie**, Ridley, Monty.	Species impacted by mining and found outside the impact zone.

1 Project areas to be mined are in bold.

2 Dewatering of Bobby, Glenda, Alice East and South Limb pits will occur. Alice West pit will not be mined below the water table, however will be affected by groundwater drawdown from dewatering of the surrounding pits.

A number of fauna species of conservation significance have been found or have potential to occur within the minesite or its surrounds. Table 3.42 outlines fauna species of conservation significance that are either present or potentially occur within the vicinity of the minesite.

Table 3.42 Vertebrate fauna of conservation significance present or with potential to occur within the minesite vicinity

Species Name	Pardoo[1]	Specific Conservation Status
CS1[2]		
Fork-tailed swift *(Apus pacificus)*	**?**	Mig., EPBC Act
Great egret *(Ardea alba)*	**?**	Mig., EPBC Act
Woma or Ramsay's python *(Aspidites ramsayi)*	**?**	Sch. 4, WC Notice
Northern quoll *(Dasyurus hallucatus)*	✓	Vuln, EPBC Act
Mulgara *(Dasycercus cristicauda)*	✓	Vuln, EPBC Act; Sch. 1, WC Notice
Peregrine falcon *(Falco peregrinus)*	✓	Sch. 4, WC Notice
Oriental pratincole *(Glareola maldivarum)*	**?**	Mig, EPBC Act
Pilbara olive python *(Liasis olivaceus barroni)*	✓	Vuln, EPBC Act; Sch. 1, WC Notice

Table 3.42 Vertebrate fauna of conservation significance present or with potential to occur within the minesite vicinity (cont'd)

Species Name	Pardoo[1]	Specific Conservation Status
CS1[2] (cont'd)		
Bilby *(Macrotis lagotis)*	**?**	Vuln, EPBC Act; Sch. 1, WC Notice
Rainbow bee-eater *(Merops ornatus)*	✓	Mig., EPBC Act
Night parrot *(Pezoporus occidentalis)*	**?**	End, EPBC Act; Sch. 1, WC Notice
Glossy ibis *(Plegadis falcinellus)*	**?**	Mig., EPBC Act
Orange leaf-nosed bat *(Rhinonicteris aurantius)*	**?**	Vuln, EPBC Act; Sch. 1, WC Notice
Marsh sandpiper *(Tringa stagnatalis)*	**?**	Mig., EPBC Act
Common greenshank *(Tringa nebularia)*	**?**	Mig., EPBC Act
Wood sandpiper *(Tringa glareola)*	**?**	Mig., EPBC Act
Common sandpiper *(Tringa hypoleucos)*	**?**	Mig., EPBC Act
CS2[3]		
Australian bustard *(Ardeotis australis)*	**?**	P4
Bush stone-curlew *(Burhinus grallarius)*	**?**	P4
Grey falcon *(Falco hypoleucos)*	**?**	P4
Lakeland Down's mouse or kerakenga *(Leggadina lakedownensis)*	**?**	P4
Spectacled hare-wallaby *(Lagorchestes conspicillatus)*	**?**	P3
Ghost bat *(Macroderma gigas)*	**?**	P4
Star finch (western) (*Neochmia ruficauda subclarenscens)*	**?**	P4
A skink *(Notoscincus butleri)*	**?**	P4
Western pebble-mound mouse or ngadgi *(Pseudomys chapmani)*	✓	P4
Long-tailed dunnart *(Sminthopsis longicaudata)*	**?**	P4
CS3[4]		
A skink lizard *(Ctenotus rufescens)*	**?**	None
Spiny-tailed skink *(Egernia depressa)*	✓	None
Rothschild's rock-wallaby *(Petrogale rothschildi)*	**?**	None
A blind snake *(Ramphotyphlops pilbarensis)*	**?**	Local significance
Glandular toadlet *(Uperoleia glandulosa)*	**?**	None
Pilbara monitor *(Varanus pilbarensis)*	✓	None

[1] ?: Potential to occur. ✓: evidence or individual/s located.

[2] CS1: Sch. 1, WC Notice – Fauna that is rare or likely to become extinct.
Sch. 2, WC Notice – Fauna presumed to be extinct.
Sch. 3, WC Notice – Birds protected under an international agreement.
Sch. 4, WC Notice – Other specially protected fauna.
Vuln, EPBC Act – Listed as 'Vulnerable' under the EPBC Act.
Mig., EPBC Act – Listed as 'Migratory' under the EPBC Act.
End, EPBC Act – Listed as 'Endangered' under the EPBC Act.

[3] CS2: P1 – Taxa with few, poorly known populations on threatened lands.
P2 – Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.
P3 – Taxa with several, poorly known populations; some on conservation lands.
P4 – Taxa in need of monitoring as they could be threatened or in need of special protection should present circumstances change.
P5 – Taxa in need of monitoring as they are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

[4] CS3: Local significance – Fauna not listed in legislation or other publications but considered to be of at least local significance because of their pattern of distribution.

The topography of the minesite is dominated by the Ord Range, a small S-shaped range protruding from extensive floodplains approximately 80 m above the coastal plain of the De Grey River Basin. Soils within the Ord Range are scarce and shallow.

Surface water features include the De Grey River located approximately 6 km east, the Ridley River located 700 m north, and Redrock Creek located 2 km west of the closest proposed minesite infrastructure.

The Pardoo DSO Project minesite comprises a number of distinct hydrogeological and geological units:

- The dominant Archaean bedrock of the Ord Range.
- Alluvial aquifers of Redrock Creek, Ridley River and De Grey River.
- To a lesser extent, the groundwater systems of the channel iron deposits (CID) and Canning Basin sediments.

In general, the water table throughout the region is a subdued reflection of the topography, with water levels as high as 62 m AHD in the highest parts of the range and radial flow away from the high areas down to 6 m AHD in the floodplain, immediately to the north of the Bobby deposit. Very steep hydraulic gradients exist in the steepest parts of the topography.

3.9.6 Planning for Project Completion

Overview

Careful planning for project completion is critical to successful decommissioning and rehabilitation with respect to achieving stakeholder, environmental and economic objectives.

Stakeholder Involvement

The primary stakeholders relevant to the completion of the Pardoo DSO Project are:

- DoIR: The regulatory government agency that will approve the relinquishment of leases on successful completion of the project.
- Town of Port Hedland: The local government area in which the minesite, product transport route and port is located.
- DoW: The minesite is located within the De Grey River Water Reserve, governed by the department.
- Ngarla people and their representatives, the Pilbara Native Title Service (PNTS): The Ngarla people are the Native Title holders whose traditional land covers the project minesite. Atlas has a signed deed of agreement with this group and regularly consults with the group and/or their representatives.
- De Grey Pastoral Station owners: The minesite is located within the De Grey pastoral station and the land will revert to pastoral use following mine completion.

The above stakeholders have been consulted throughout the preparation of the PER document and Mining Proposal, and will continue to be consulted throughout the mining operation. Consultation that is related specifically to mine completion will be undertaken throughout the AER process and as part of the regular review of the EMP.

Risk Assessment

A risk and opportunity assessment is required to ensure a consistent approach to the identification and management of issues associated with mine completion. The assessment needs to consider environmental, safety, social, economic and regulatory risks, external and internal factors, and should evaluate opportunities that sustainable mine closure options might present.

The significant limitations to rehabilitation for the mine completion, for which necessary mitigation measures are being investigated and will be closely monitored during the Pardoo DSO Project, include:

- Altered hydrology.
- Landform stability.
- Altered soils and soil profile.
- Climatic unpredictability.
- Weeds.
- Grazing by livestock.
- Hydrocarbon management.
- Decommissioning of plant.

Consideration and management of these issues are discussed in Section 3.9.7.

Financial Provisions and Responsibilities

Financial Provision. In accordance with the Mining Act, Atlas will be required to calculate the cost of mine completion and to lodge a project bond with the DoIR. This amount will be returned to Atlas on successful completion of the project, although the bond may be reduced throughout the life of the project where it can be demonstrated that progressive rehabilitation has achieved closure objectives and criteria.

In addition to the project bond held by DoIR, Atlas will establish a rehabilitation provision fund on commissioning the minesite that will set aside a fixed amount per tonne of product for the rehabilitation and closure of the minesite. Atlas will conduct an annual review of the closure liabilities associated with the mining activities in accordance with generally accepted accounting practices and ensure that the financial provisioning is appropriate to adequately cover the costs of rehabilitation and decommissioning.

Responsibilities. The organisational structure to be implemented by Atlas to ensure effective management of the project is outlined in Section 2.4.2.

Ultimate responsibility for the successful completion and closure of the project, including adequate provisioning, lies with the Operations Manager.

Direct responsibility for the management of progressive rehabilitation and completion planning, through the detailed design and operational phases of the project, will be with the Pardoo General Manager. The Pardoo General Manager will liaise with relevant staff, and specialist advice will be sought as required.

During the post-mining period, mine decommissioning, rehabilitation and monitoring will be the responsibility of Atlas until all completion criteria are met.

3.9.7 Decommissioning and Rehabilitation Plan

Open Pits

Description. Eight open pits will be developed as part of the project. These include Glenda, Bobby, Alice East, Alice West, Olivia, Connie, South Limb and South Limb West. The open pits are described briefly below and are shown in Figure 3.6.

Glenda

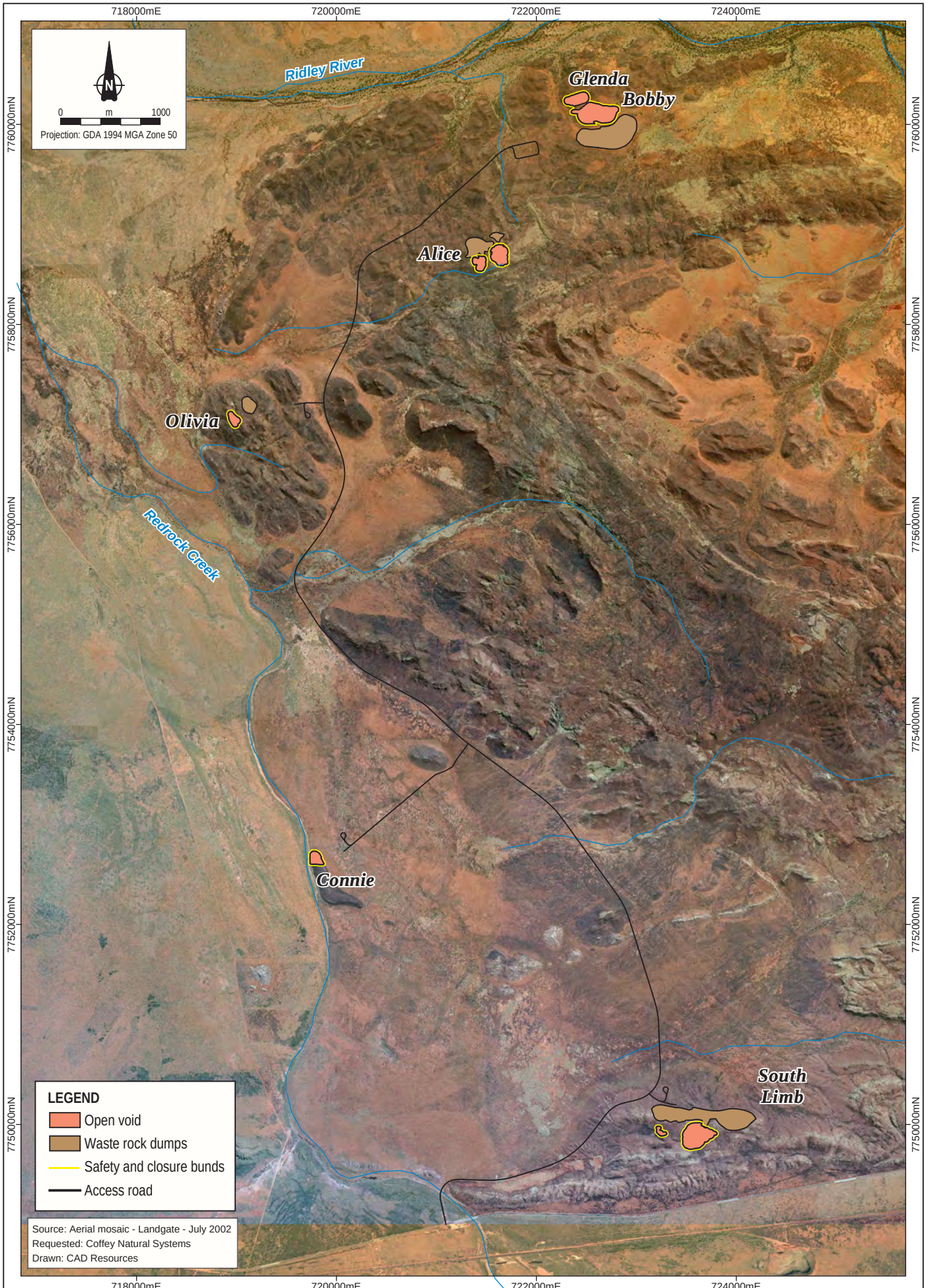
- Dewatering – dewatering will use a combination of dewatering bores and in-pit sumps.
- Backfill options – waste material from Bobby will be used to backfill the Glenda pit to at least 2 m above the water table.
- Modelling predictions – not relevant as the pit will be backfilled.
- Potentially acid forming (PAF) material description – no PAF material occurrence.

Bobby

- Dewatering – dewatering will use a combination of dewatering bores and in-pit sumps.
- Backfill options – backfilling is not considered feasible.
- Modelling predictions – groundwater modelling indicates that the final pit void will form a pit lake, eventually become saline and become a groundwater sink. Modelling also indicates that due to the hydrogeology (i.e., tight, low-permeable nature of the unmineralised rock), lateral migration of water from the pit voids will be limited.
- PAF material description – geochemical testing indicates that components of black shales, which are characterised as PAF material, may occur below the base of this pit. It is not expected that PAF material will be intercepted, however, further investigations into the presence and exact location of PAF material will be undertaken progressively during grade control drilling, in advance of the mining.

Alice East

- Dewatering – dewatering will use an in-pit sump.
- Backfill options – waste material from Alice West will be used to backfill the Alice East pit to at least 2 m above the water table.



ATLAS IRON LIMITED	Job No: we08030	Atlas Iron Limited	Conceptual post mining landform	Figure No: 3.6
	File No: g1410_EMP_f008	Pardoo DSO Project		

- Modelling predictions – not relevant as the pit will be backfilled.
- PAF material description – no PAF material occurrence.

Alice West

- Dewatering – dewatering not required as mining does not extend below the water table.
- Backfill options – backfilling is not considered feasible.
- Modelling predictions – groundwater modelling indicates that this pit void will not form a pit lake.
- PAF material description – no PAF material occurrence.

Olivia

- Dewatering – dewatering not required as mining does not extend below the water table.
- Backfill options – backfilling is not considered feasible.
- Modelling predictions – not relevant as the pit will not be dewatered.
- PAF material description – no PAF material occurrence.

Connie

- Dewatering – dewatering not required as mining does not extend below the water table.
- Backfill options – backfilling is not considered feasible.
- Modelling predictions – not relevant as the pit will not be dewatered.
- PAF material description – no PAF material occurrence.

South Limb

- Dewatering – dewatering will use a combination of dewatering bores and in-pit sumps.
- Backfill options – backfilling is not considered feasible.
- Modelling predictions – groundwater modelling indicates that the final pit void will form a pit lake, eventually become saline and become a groundwater sink. Modelling also indicates that due to the hydrogeology (i.e., tight, low-permeable nature of the unmineralised rock), lateral migration of water from the pit voids will be limited.
- PAF material description – geochemical testing indicates that components of black shales, which are characterised as PAF material may occur below the base of this pit. It is not expected that PAF material will be intercepted, however, further investigations into the presence and exact location of PAF material will be undertaken progressively during grade control drilling, in advance of the mining.

South Limb West

- Dewatering – dewatering not required as mining does not extend below the water table.
- Backfill options – waste from South Limb will be used to backfill this pit.
- Modelling predictions – not relevant as the pit will not be dewatered.
- PAF material description – no PAF material occurrence.

Indicative pit parameters are outlined in Table 3.43.

Table 3.43 Indicative pit parameters

Open Pit	Area of Disturbance (ha)	Maximum Pit Depth (m)	Average Depth to Groundwater (m)	Mining Depth Below Water Table (average m)	Strip Ratio (waste:ore)
Bobby	7	79	24	55	1.8:1
Glenda	3	42	22	20	3.7:1
Alice East	3	63	50	13	0.8:1
Alice West	2	35	50	Not applicable	1.2:1
Olivia	2	32	32	Not applicable	1.8:1
Connie	2	11	13	Not applicable	0.4:1
South Limb	6	97	22	75	1.7:1
South Limb West	1	23	50	Not applicable	1.5:1

Ha = hectare; m = metre.

Mine Completion Considerations. The key issues associated with mine completion and rehabilitation of mine voids are discussed under separate headings below.

Groundwater

It is predicted that the water levels of the two pit lakes, Bobby and South Limb, will stabilise around 10 m below the pre-mining water levels. The pit lakes will act as groundwater sinks, with the inflows to the pits lakes in pseudo-equilibrium with the evaporation loss from the lakes. Preliminary solute modelling indicates that the pit lakes will become increasingly brackish to saline with time. After 100 years, water quality in the pit lakes is anticipated to be around 9,000 mg/L total dissolved salts.

There is minimal risk that the surrounding groundwater will increase in solute concentration due to the net influx of water into the pit. There is likely to be also groundwater drawdown surrounding pit voids, due to this influx of water. However, due to the tight, low-permeability nature of the unmineralised rock mass surrounding the mineralised ore bodies, and with radial groundwater flow continuing towards the pit voids, any significant lateral migration of saline water from the surrounding pit voids will be limited. Movement of the saline water from the pit lakes as a result of density-driven processes may occur, however, this movement is also likely to be limited in lateral extent due to the above-mentioned reasons.

Contamination

There is potential for groundwater contamination from hydrocarbons potentially arising from machinery use within the mine voids. It is anticipated that this risk will be minimised with the use of in-pit sumps during mining operations and implementation of the Hydrocarbon and Dangerous Goods Management Plan.

Groundwater contamination may also occur if PAF material located below the pit floor of the Bobby and South Limb pits is exposed to air (either through excavation or pit dewatering). This potential will be closely monitored during operations and procedures have been developed to ensure that if PAF material is intercepted, it will be managed appropriately. Furthermore, dewatering activities will be conducted so that only the minimal amount is taken to undertake dry mining (thus limiting the area and duration of PAF exposure to air), and thereby minimising risk of PAF oxidation.

Public Safety

Given that the post-mining land use will remain as pastoral land, a public safety risk exists.

Proposed Approach. To ensure that the public cannot gain inadvertent access to the pit, abandonment bunds will be constructed around all open pit voids (including those partially backfilled), in accordance with Safety Bund Walls Around Abandoned Open Pit Mines (DoIR, 1997b).

Pits and waste rock dumps will be fenced to exclude livestock.

A groundwater monitoring program has been developed and is outlined in the Water Management Plan (Section 3.2). It is proposed that monitoring of groundwater quality and levels be undertaken in all compliance bores until results are consistent with the predicted results of the groundwater modelling conducted by MWH (2007). The groundwater model may be recalibrated and refined over time as more monitoring data is collected during mining operations. This will provide an early indication on whether the effects of dewatering (and remaining pit lakes during upon mine completion) are different to those predicted by the model. Potential impacts can then be managed appropriately and any contingency actions implemented.

Waste Rock Dumps

Description. All open pits will have an associated out-of-pit waste rock dump apart from Connie, where the small volume of waste rock produced will be used in the construction of the pit safety bund and for other minesite infrastructure and rehabilitation.

There are four waste rock dump areas in total. Descriptions of waste rock dumps for each of the prospects are provided below:

- Bobby/Glenda: One freestanding waste rock dump will be constructed.
- Alice East/Alice West: Two freestanding waste rock dumps (one large, one small) will be constructed.

- Olivia: One waste rock dump will be constructed onto existing ridgeline.
- South Limb/South Limb West: One waste rock dump will be constructed onto existing ridgeline.

The waste rock dump locations are shown in Figure 3.6. Photographs of proposed waste rock dump locations are provided in Plates 3.3 to 3.6.

Mine Completion Considerations. The waste rock dumps will constitute the most significant feature upon mine completion within the landscape, and the largest overall area of disturbance requiring rehabilitation. The key issues for the waste rock dumps at minesite completion are:

- Stability of the outer batter slopes.
- Design of waste rock dumps to consider existing surrounds.
- Management of surface water runoff from the top surface and batters.
- Providing conditions conductive to the re-establishment of vegetation.
- A restriction on future land uses to ensure successful rehabilitation.

Proposed Approach. It is proposed that waste rock dump batters are constructed to a linear or curvilinear slope with an average batter angle of 20°. Physical and chemical waste rock characterisation indicates 20° is stable for the type of waste rock material present. The waste rock dumps have been designed to blend with the adjacent ridge landscape and therefore, will be height-limited to the height of the adjacent range, which is approximately 80 m above the surrounding floodplains at its highest point.

It is proposed to create rock-armoured waste rock dumps to minimise sediment creation and inhibit erosion. Rock armouring the waste rock dumps will mimic the surface of the surrounding range and also optimise conditions for revegetation. Waste rock dump construction will ensure that appropriate encapsulation of material with undesirable characteristics (e.g., dispersive) is undertaken. The construction method will also facilitate progressive rehabilitation while the waste rock dump remains active.

Waste rock dump construction will follow the following pattern for Bobby/Glenda and Alice East/Alice West waste rock dumps.

- Placement of a basement layer (at least 2 m to 5 m thickness) of blocky competent rock.
- Placement of blocky competent rock on the outer faces of the landform (to provide at least 2 m thickness after final profiling), including any parts of a constructed landform in contact with existing natural ridges.
- Placement of softer lithologies in the centre of the landform.
- Disposal of available clay materials by use in site infrastructure, return to pits or placement so that the clay is encapsulated, to some degree, by compacted shale and siltstone.
- Capping the waste rock dump with a layer of at least 2 m thickness of coarse blocky material.

Photo credit: Sarah Edgar (Atlas Iron Limited)

Plate 3.3
Bobby/Glenda waste rock dump location.

Photo credit: Sarah Edgar (Atlas Iron Limited)

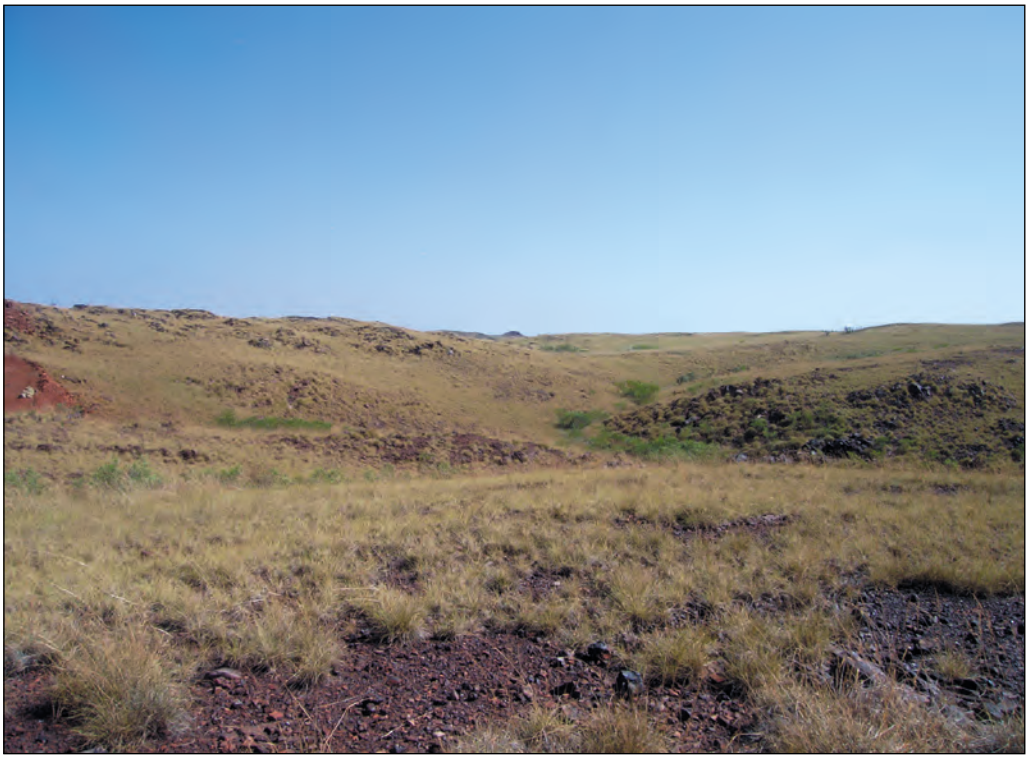


Plate 3.4
Alice East/Alice West waste rock dump location.

Photo credit: Kellie Lambert (Atlas Iron Limited)

Plate 3.5
Olivia waste rock dump location.

Photo credit: Kellie Lambert (Atlas Iron Limited)

Plate 3.6
South Limb/South Limb West waste rock dump location.

Specialist studies indicate that available quantities of competent blocky waste (banded ironstone formation (BIF), chert and jasperlite) at Olivia and South Limb prospects will not be sufficient to provide the proportions of competent waste to follow the pattern outlined above for Bobby/Glenda and Alice East/Alice West waste rock dumps. Olivia and South Limb waste rock dumps will instead follow the following construction method:

- Additional competent rock will be sourced from the mineralised waste.
- The depth of the capping layer on the top of the dumps will be reduced to 1 m thickness.
- Strategic placement of competent rock to form the basal layer will be undertaken, with competent rock placed to 2 m thickness only in depressions and flow lines, and in a zone 5 m wide and 2 m deep along the outer edge of the waste rock landforms.
- Only waste from softer lithologies will be used for backfilling South Limb West pit.

Each lift of the waste rock dumps will have appropriate set back from the one below to achieve the waste rock dump design, especially the required thickness of competent rocky waste on the outer batters, and to minimise costs of final profiling. Where waste rock dumps are being constructed on natural ridgelines, the construction of each lift will commence by placing competent rock around the perimeter of the lift to filter sediment from runoff that may develop from the working surface. The batters will then be profiled to a linear or curvilinear shape.

Surface water runoff will be diverted from upstream the waste rock dumps using cut channels or fill bunds, depending on site-specific topography. Any runoff from the waste rock dump will be diverted to a dedicated sediment pond designed to capture the volume of a 5-year ARI, 30-minute duration rainfall event, with an additional 50% volume storage. A weir overflow will be constructed in each sediment pond to allow the overflow of a 100-year ARI event. The sediment ponds will be constructed to have a decant system that draws water down slowly giving the captured runoff time to settle out approximately 85% of suspended solids. The sediment ponds will be regularly maintained to retain capacity and the excavated silt will be disposed of in-pit or encapsulated within waste rock dumps.

Infrastructure

Description. Infrastructure is concentrated mainly within the mining operations centre (MOC). This MOC will comprise the following:

- Administration area.
- Fuel storage and refuelling area.
- Power station.
- Crushing and screening plant.
- Run of mine (ROM) ore pad and product stockpiling area.
- Parking areas.
- Sewage storage and treatment plant.
- Laydown areas.

Final Land Use. The MOC area will be revegetated to hummock grassland and will revert to a pastoral land use.

Mine Completion Considerations. Disturbance in the form of buildings, workshops and crushing and screening plant will occur. The majority of this will be removed following mine completion. Key issues for the rehabilitation of infrastructure areas include:

- Identification and removal of contamination from hydrocarbons or chemicals.
- Demolition and removal of equipment.
- Management of surface water.
- Re-establishment of the hummock grassland community.

Proposed Approach. On completion of the project, all equipment will be removed from the minesite and all infrastructure will be dismantled and removed from the MOC. Depending on their condition, major items (e.g., crusher, conveyors and modular buildings), will be sold for re-use on other projects. The remaining items will be sold as scrap metal. Infrastructure associated with the sewage storage and treatment plant will be removed when the mine is decommissioned.

Upon mine completion, the two 105,000-L self-bunded tanks will be removed from the refuelling area. Concrete footings and foundations will be buried in-situ or removed to an appropriate disposal area.

Any contaminated material will be disposed of appropriately and the site remediated, if required, to acceptable levels in accordance with the *Contaminated Sites Act 2003* and the Hydrocarbon and Dangerous Goods Management Plan.

Any stockpiled topsoil available and vegetation will then be respread and the surface ripped on the contour and revegetation implemented and monitored. If control of weed species and management of plants introduced for amenity is managed appropriately, it is unlikely that there would be any significant impediment to rehabilitation success.

Other Disturbance Areas

Description. Other disturbance areas include:

- Production bores and pipelines.
- Northern and southern raw water retention ponds.
- Access road, access tracks and haul roads.
- Explosive magazine.

Final Land Use. Should ongoing stakeholder consultation identify future land uses for components of disturbance areas, these components may remain on site following closure. For example, the pastoralist has expressed interest is retaining the access road following mine completion. Retaining the access road will also provide access to enable monitoring and maintenance activities to be undertaken. All areas of disturbance not required for future use will have revegetation monitored to ensure that the relevant vegetation type for each respective area is established.

Mine Completion Considerations. The main mine completion consideration is the revegetation of disturbance areas to their relevant vegetation type.

Proposed Approach. Proposed decommissioning and rehabilitation activities are outlined in separate sections below.

Production Bores and Pipelines

Production bores and pipeline infrastructure will be removed dependent on stakeholder consultation, with the recovered material to be either sold for recycling, reused or buried within waste rock dumps (as a final option).

Once ongoing groundwater-monitoring requirements are reached, production bores will be capped below ground level and the upper casing removed. A permanent concrete marker may be placed, to allow the bores to be re-established if required in the future.

Retention Ponds

The retention ponds will be rehabilitated after hydrocarbon residues within the ponds are assessed to determine any contamination or risk. If present, contaminated soil will be removed and disposed of after consultation with DEC, DoIR and DoW.

All pipework and infrastructure relating to the retention ponds will be removed. The pond walls will be reformed to be consistent with local topography, covered with appropriate waste material, sheeted with topsoil (where available), ripped and revegetated.

Access Road, Access Tracks and Haul Roads

Vegetation and any topsoil present will be stripped from the roads and tracks during construction and stockpiled for respreading on completion of the project. Dependent on consultation with the pastoralist, it is expected that ripping of the roads will be required to break the compacted surface and enable rainwater infiltration and root penetration during rehabilitation. In some circumstances, however, it may not be appropriate to undertake ripping. For example, roads and tracks that are on steep slopes will not be ripped as this can encourage gully formation and enhance erosion. Similarly, if appropriate vegetation regrowth has already occurred on a road or track, then ripping may not be neccesary.

When ripping is undertaken a number of measures will be utilised to ensure maximum efficiency with minimal disturbance. Any ripping that occurs along slopes may have regular contour banks built across the tracks or the application of another appropriate erosion control technique to prevent erosion from water runoff. Ripping of roads and tracks will be performed to create an undulating broken surface in which seeds can become trapped and germinate in uncompacted soil. Vegetation that was stockpiled to the side of the track during initial clearing will be replaced over the ripped tracks to promote seed germination, if practicable.

Roads and tracks that close during the life of the mine will make ideal sites for testing revegetation strategies.

When a track or road has been rehabilitated, it will be appropriately signed to prevent traffic using the area. Roads and tracks will be monitored to determine the success of the rehabilitation and revegetation program.

A procedure for the rehabilitation of roads and tracks will be developed and included in subsequent revisions of the EMP and the Detailed Mine Completion and Rehabilitation Plan.

Explosives Magazine

On completion of mining, magazine compounds will be dismantled and all infrastructure will be removed from site for reuse elsewhere or recycling. Concrete pads will be buried in-situ or disposed of in an appropriate manner. Topsoil will be replaced on the disturbed area (where available), which will then be ripped and revegetated.

Mine Completion and Rehabilitation Management

Clearing. The area to be cleared will be kept to a minimum based on safety and operational constraints. All clearing activities will be undertaken in accordance with the ground clearance SOP. Each area to be cleared will be authorised by the minesite's Senior Environmental, Health and Safety Specialist and the Operations Manager (refer to the Flora and Vegetation Management Plan (Section 3.3) for further detail).

Areas that are to be cleared will be defined with markings such a pegs to prevent over-clearing.

Cleared vegetation will not be deliberately burnt. Cleared vegetation will be stockpiled in close proximity to the area from which it was cleared. Vegetation stockpiles will later be used as mulch, a seed source or as habitat for fauna during rehabilitation and revegetation.

A ground clearance SOP will be developed to manage clearing operations, as outlined in the Flora and Vegetation Management Plan (Section 3.3).

Waste Rock Management. Waste rock will be managed according to the different chemical and physical characteristics of the waste rock types. A waste rock management SOP will be developed prior to commencement of mining operations. General waste rock management concepts are described below.

Initial waste, provided it is competent material, from each pit will be used in the construction of minesite infrastructure and perimeter safety bunds.

Where out-of-pit waste rock dumps are created, waste will be excavated from the pit by free digging or excavation following drill and blast. Waste rock will be loaded into haul trucks and transported to the active dumping face of the waste rock dump. The base of each waste rock dump will be constructed by paddock dumping, with subsequent lifts constructed through end dumping over the active face. Waste rock dumps will be constructed at angle of rill (approximately 37°). Progressive rehabilitation will be undertaken as areas become available.

Selective placement of waste rock, according to the physical and chemical characteristics of each waste rock type, will be undertaken to achieve greater landform stability of the final waste rock dump landform.

As the mining operation will be a truck-shovel operation, wastes can be separated and selectively placed in waste rock dumps. The materials to be excavated from the open pits will be divided into:

- Competent lithologies likely to produce hard blocky wastes (BIF, chert and jasperlite).
- Softer lithologies likely to produce finer particles and that will rapidly weather (shale and siltstone).
- Sodic clays that have potential to generate dispersed clay in seepage or runoff.
- Uneconomic mineralised waste, which may include competent goethite, but also shales that would be susceptible to weathering. Due to uncertainties regarding it's competence, uneconomic mineralised waste has generally been regarded as of low competence and not considered suitable for stabilisation of outer batter slopes.

A PAF identification and management procedures will be developed and implemented prior to commencement of the mining operation. The procedures will aim to ensure that PAF material present at the base of Bobby and South Limb pits is identified and excavation is avoided. The procedures will also include contingency measures such as in-pit encapsulation for the event that PAF material is exposed.

Soil Management. Given that all waste rock dumps will be rock-armoured, revegetation of the waste rock dumps is not vital for stabilisation. Nevertheless, surface soil and growth media will be managed with the objective of establishing similar vegetation to that of the rocky outcrops. Given that topsoil and growth media is sparse at the minesite, diligent soil handling and management will be required.

A waste rock management SOP will be developed prior to commencement of mining operations, to address the handling of soil and growth media from individual pits, and will be included in subsequent versions of this management plan.

Soil management concepts are described below.

Topsoil and Growth Media Removal

Topsoil and growth media is often the most important factor in the success of a rehabilitation program. Site surveys at the Pardoo DSO Project minesite indicate that the presence of topsoil is skeletal at best due to the rocky nature of the environment.

Soil will be stripped in two layers: a topsoil of approximately 0.1 m depth and a growth medium layer to a depth of up to 1 m if the soil profile allows.

If the soil stripping is undertaken during dry weather, soil will first be watered prior to stripping to minimise dust generation. The soil will be stripped using bulldozers or

excavators and trucks, rather than scrapers, as the latter can cause damage to the soil structure. Topsoil will be either directly returned to the available rehabilitation areas or stockpiled.

Stockpiling

Where direct return of soil is not possible, the topsoil will be stockpiled in layers 0.5 to 1 m thick and the growth medium layer will be stored in layers of 2 to 4 m thickness.

Stockpiled topsoil will be used as soon as operationally possible. During the start-up phase of an area, however, it may be necessary to stockpile topsoil until rehabilitation begins. The amount of time that the soil is stockpiled will be minimised to maintain soil biota and maximise the return of the native flora species from the seed resource within the topsoil.

Stockpiles will be located as close as possible to the rehabilitation area to limit transportation requirements. Stockpiles will not be placed in areas where there will be prolonged ponding of water to avoid surface soil degradation.

Where possible, dust control on the soil stockpiles will be achieved by natural revegetation, rather than the use of dust suppression spray or water (which maybe slightly saline) to maximise soil biota. Long-term stockpiles (i.e., over one year) will be monitored to ensure revegetation of local native species is occurring to prevent wind erosion and maintain biological viability of the resource. Site traffic will not be permitted on any topsoil stockpiles and all stockpiles will be clearly sign posted.

Timing of Soil Stripping

Areas that contain topsoil and growth medium will be cleared and harvested progressively as the source areas are required for mining development.

Atlas will also investigate the viability of stripping soil following the period when the native plants set their seeds, to maximise the seed store in the soil.

Replacement

Due to the natural rocky environment of the minesite, topsoil is in extremely short supply. It is planned that waste rock dumps will be rock-armoured rather than revegetated as the primary source of stability. As recommended by Landloch (2007), a minimum of 300 mm of growth medium will be placed on the waste dumps, with 50 to 100 mm of topsoil spread over the growth medium. Where limited growth medium is available, the material will be placed preferentially in scattered depressions to achieve the required thickness, rather than being placed in extremely shallow layers (50 to 100 mm thick, for example).

Fertiliser may be added to compensate for the loss of nutrients in plant biomass (during soil stripping) and encourage relatively rapid establishment of plant ecosystems. As recommended by Landloch (2007), fertiliser will be applied at a rate of:

- 100 kg/ha di-ammonium phosphate (DAP).
- 50 kg/ha urea.

For soils sourced from the Connie prospect, the DAP may require boron to be added as a trace element blend, as soil surveys indicated that this area is deficient in boron.

Revegetation. Revegetation of the rock-armoured waste rock dumps will be limited on the batters given the lack of topsoil. However, areas with scattered soil and growth media, particularly the top surface of the waste rock dump will be revegetated on mine completion, as will other areas of disturbance.

The revegetation technique that is adopted for an area must be based on site-specific trials and experience. Conceptual techniques that will be adopted are outlined below. These techniques will be modified progressively according to the results of revegetation trials throughout the life of the mine.

Species Selection

The species selection will be based on the flora surveys that were carried out by Woodman Consultants Pty Ltd during preparation of the PER document.

As can be seen from Section 3.9.4, the majority of the areas to be disturbed are dominated by *Triodia* species (spinifex). *Triodia* is potentially a difficult species to propagate successfully on waste landform, except where fresh topsoil has been available for repreading. Studies on the regeneration of *Triodia pungens* communities within the Pilbara region indicate that the rate of regeneration is dependent on cumulative rainfall (DoIR, 2006b).

Atlas will trial a range of methods to rehabilitate disturbed areas. Where possible, seed from local species will be collected and stored for rehabilitation. Where local species are not available and a seed mix is purchased, the mix will be selected in consultation with a botanical consultant and contain the keystone species for the relevant local vegetation communities.

Vegetation Establishment

The initial establishment of the native vegetation will be from the topsoil seed bank. The topsoil management procedures outlined within this plan have been developed to maximise retention of seed within the topsoil.

If local species do not establish successfully, however, trials of directly seeding the areas with a local provenance seed mix may be undertaken depending on the results of the above mentioned trials.

Seed Collection, Processing and Storage

Seed collection will be undertaken if the establishment of native vegetation from the topsoil is not successful. Seed used to revegetate an area will be sourced from the general location of the rehabilitation works. The collection, processing and storage methods implemented will be species specific, and based on recommendations by specialist consultants.

Weed Control. As described in Section 3.9.4, a number of weed species, including the declared weed parkinsonia, occur within the minesite. Given the well-established nature of these species (particularly along watercourses) and the ongoing pastoral activities, eradication of existing weeds within the minesite is not possible.

Instead, effort will be focused on preventing the establishment of previously unrecorded weeds and preventing the spread of existing weeds within the minesite. Management measures specifically relating to mine rehabilitation and completion include the following:

- Weed infestations on topsoil stockpiles will be controlled to minimise the likelihood of weed introduction and/or spread during respreading of topsoil upon decommissioning of the mine.
- Opportunistic rehabilitation of disturbed areas will be undertaken to minimise potential for weeds to become established in these areas.
- Monitoring of rehabilitated areas will be undertaken to determine whether or not disturbed areas are becoming established with weeds. If so, appropriate management actions will be developed in consultation with the DEC and the DAF.

The above and other weed hygiene and management measures are further detailed in the Flora and Vegetation Management Plan (Section 3.3).

3.9.8 Post-completion Monitoring and Maintenance

Following the completion of rehabilitation works, there will be a period of post-completion monitoring and maintenance before the agreed completion criteria is satisfied, the bond is returned and the leases relinquished. During this time, monitoring will be undertaken across the minesite and targeted at quantifying those parameters relating directly to the completion criteria. There also may be some maintenance or corrective activities required for rehabilitation works.

Methods to monitor and maintain or correct rehabilitated and revegetated areas will include:

- Ensuring that the monitoring program reflects the agreed completion criteria.
- Establishing 360°-photo-monitoring points throughout the minesite area, primarily concentrating on rehabilitated areas, although some reference points will also be established.
- Regularly inspecting the outer batter slopes and top surface of waste rock dumps for evidence of mass rock movement, and observing the ground surface at the base of the waste rock dumps to determine whether or not there is any significant movement of clay- or silt-sized material out of the dumps.
- Monitoring water quality to quantify the success of rehabilitation works and to provide compliance data with the completion criteria. Water quality monitoring is further detailed in the Water Management Plan (Section 3.2).
- Where monitoring has identified unacceptable levels of erosion, sedimentation, weed invasion or an unacceptable water quality impact, maintenance and corrective action

activities will be implemented to ensure these impacts are rectified. These actions may include:

– Repairing eroded areas.
– Water management structure rework.
– Weed control.
– Feral animal or cattle control.
– Enrichment planting, spot seeding or reseeding.

Ongoing sampling and monitoring of groundwater bores (for water level and quality), selected surface water sampling locations and final void water (where present), will continue for an agreed period of time following the cessation of active operations. This is further detailed in the Water Management Plan (Section 3.2).

3.9.9 Unplanned Mine Completion

In the event of unplanned mine completion, the strategy outlined in previous sections would be implemented and depending on timing, some modifications to this conceptual plan would be required. It is anticipated that the following activities would occur:

- Stakeholder consultation.
- Unless otherwise agreed with the pastoralist, all above ground infrastructure, including pipelines, will be removed and either scrapped or sold.
- Concrete footings will be buried in a waste rock dump or within an open pit.
- Areas of disturbance will be reshaped to blend with the surrounding landform and soil replaced over the area (where available). Disturbed areas will then be contour ripped and revegetation monitored to ensure the establishment of appropriate local provenance species.
- Waste rock dumps will be reformed in their current state to blend with the surrounding landform to the extent possible, and competent material will be placed over the waste rock dumps in the general pattern described in this plan.
- Abandonment bunds will be constructed around all open pit voids, in accordance with Safety Bund Walls Around Abandoned Open Pit Mines (DoIR, 1997b).

3.9.10 Mine Completion Action Plan and Scheduling

Once the project plan and the scheduling of both mining and waste rock dump construction are confirmed, each area of disturbance will be categorised according to its environmental and mine completion risk. A list of actions, in order of priority, will be compiled, along with any updates regarding the expected date of completion.

The progress of mine completion planning will be reported on an annual basis as part of the AER. The mine completion action plan will be drafted and established following the required additional waste characterisation and mine scheduling work, and prior to commencement of mining. It is envisaged that this will be an active document that will be

reviewed and updated on an annual/biannual basis or when significant changes to the mine plan occur.

3.9.11 Continued Documentation

This Conceptual Mine Completion and Rehabilitation Plan is an active document that will be regularly reviewed and updated throughout the life of the project. At the very least, the document and associated strategy will be reviewed at the following events:

- During preparation of the AER for the project. The AER is required for submission to the DoIR and reports on rehabilitation and completion related works undertaken in the preceding 12 months and that planned for the coming 12-month period.
- In the event of any approved expansions, operational changes or similar that may influence the completion works and strategy.

As completion of the project nears, this document will outline mine completion strategies and provide documentation to support these strategies. Most importantly, this document will detail the consultation that has been undertaken throughout mining operations and mine completion and rehabilitation.

3.9.12 Key Management Actions Table

Key management actions associated with mine completion and rehabilitation are outlined in Table 3.44. Key management actions that are covered under alternative management plans within this EMP have not been included in the table.

Table 3.44 Key mine completion and rehabilitation management actions

Reference	Item	Key Management Action	Timing	Reporting/ Evidence	Status[1]
MCR01	Stakeholder involvement	Continue consultation with key stakeholders.	Ongoing.	Consultation records.	
MCR02	Financial provisions	Establish a rehabilitation provision fund on commissioning of the minesite that will set aside a fixed amount per tonne of product for the rehabilitation and mine completion.	Prior to commencement of mining operations.	AER.	
MCR03	Financial provisions	Conduct an annual review of the mine completion liabilities associated with the mining activities in accordance with generally-accepted accounting practices and ensure that the financial provisioning is appropriate to adequately cover the costs of rehabilitation and decommissioning.	One year from commencement of mining operations; annually.	AER.	
MCR04	Open pits	Conduct further investigations into the presence and exact location of PAF material within the Bobby and South Limb pits.	Prior to commencement of mining.	AER.	
MCR05	Waste rock management / Soil management	Develop and implement a waste rock management SOP. This SOP is to address the handling of soil and growth media from individual pits.	Prior to commencement of mining operations.	This EMP.	
MCR06	Waste rock management	Develop and implement procedures for PAF identification and management.	Prior to commencement of mining operations	This EMP.	
MCR07	Revegetation	Trial a range of methods to rehabilitate disturbed areas, with inclusion of trialling the collection and storage of seed from local species for rehabilitation purposes.	During the life of the mine.	AER, internal reports.	

Table 3.44 Key mine completion and rehabilitation management actions (cont'd)

Reference	Item	Key Management Action	Timing	Reporting/ Evidence	Status[1]
MCR08	Post completion monitoring and maintenance	Establish 360°-photo-monitoring points throughout the minesite area, primarily concentrating on rehabilitated areas, but to include some reference points.	Prior to ground disturbance of the location.	AER, internal reports.	
MCR09	Post completion monitoring and maintenance	Undertake inspections of the outer batter slopes and top surface of waste rock dumps for evidence of mass rock movement, and inspect the ground surface at the base of the waste rock dumps to determine whether or not there is any movement of clay- or silt-sized material out of the dumps.	Quarterly; opportunistically after cyclone events.	AER.	
MCR10	Mine completion action plan and scheduling	Draft mine completion action plan following required additional waste characterisation and mine scheduling work.	Prior to commencement of mining.	This EMP.	
MCR11	Mine completion action plan and scheduling	Categorise each area of disturbance according to the environmental and mine completion risk, and compile a list of actions that are required to be completed, along with any updates to the expected date of completion.	Prior to development of the Detailed Mine Completion and Rehabilitation Plan.	This EMP.	

[1] To be completed and updated once regulatory approvals are obtained.

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