Yandicoogina Iron Ore Operations

Environmental Management Program

Prepared for
Rio Tinto
by Strategen

March 2011

Yandicoogina Iron Ore Operations

Environmental Management Program

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Client: Rio Tinto

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PART 1 – FRAMEWORK

Hamersley Iron Pty Ltd is proposing to develop new iron ore mines at the Junction South West (JSW) and Oxbow deposits at Yandicoogina. The company already operates mines at the adjacent Junction Central (JC) and Junction South East (JSE) deposits, which are expected to be mined to their maximum extent by approximately 2014 and 2020 respectively. New mines at JSW and Oxbow will enable production to be sustained from the overall Yandicoogina operation.

The EPA has set the level of assessment for the proposed mine operations at JSW and Oxbow at Public Environmental Review (PER). The proposal will also be referred to the Commonwealth Department of the Environment, Water, Heritage and the Arts under the Environment Protection and Biodiversity Conservation Act 1999.

This Environmental Management Plan (EMP) has been completed to outline the management of environmental impacts within standard operating practices and procedures. It complies with previously granted Ministerial approvals (417, 523 and 695) (Appendix 1), commitments and licences and is consistent with current reporting requirements. It has also been prepared in accordance with the commitments made in the Environmental Scoping Document and current PER document for JSW and Oxbow.

Ministerial requirements for the Yandicoogina operations are summarised in Table 1 below.

Table 1 Summary of Ministerial conditions

Condition #	Requirements
Statement 417 and 523 – Junction Central	
1: Proponent Commitments	Implement the consolidated environmental management commitments documented in schedules 2 and 3
2: Implementation	-
3: Proponent	-
4: Environmental Management Program	A detailed Environmental Management Program including • Groundwater monitoring and management • Surface water monitoring and management • Sheet and gully drainage along the railway • Pollution prevention measures (inc noise and dust) • Waste management • Flora and fauna protection, including fire and weed management • Rehabilitation • Comprehensive monitoring management and reporting program (requirements specified)
5: Decommissioning	Decommissioning and rehabilitation plan (see 5-1 for details)
6: Time Limit on Approval	None relevant
7: Compliance Auditing	Periodic Performance and Compliance Reports, in accordance with an audit program prepared by the Department of Environmental Protection in consultation with the proponent

Condition #	Requirements
8: Environmental Management System	Develop and implement an Environmental Management System which includes • Environmental policy and corporate commitment to it • Mechanisms and processes to ensure planning and implementation to meet environmental requirements, and measurements and evaluation of environmental performance • Review and improvement of environmental outcomes
Schedule 1: Key Project Characteristics	-
Schedule 2: Proponents Environmental Management Commitments (April 1996)	• Comply with legislation • Refer significant project amendments for assessment • Evaluate and understand hydrogeological systems • Monitor groundwater in the Marillana Creek alluvium (report annually to the state) • Collect further hydrogeological data to develop a model for the final void (water levels and quality). Report on this model and the final outcome to DEP before finalising the decommissioning plan • Conduct regular environmental reviews (every 6 months during construction and annually during operations) • Prepare reports on environmental management and monitoring (annual and triennial, to be issued to the state) • Prepare and implement an EMP in consultation with DEP, covering groundwater, surface water, sheet and gully drainage, dust and noise emissions, waste management, flora and fauna protection, fire and weed management, environmental inductions for construction and operation personnel, rehabilitation of disturbed areas and monitoring programs. • Minimise impacts on riverine vegetation by undertaking monitoring, and implementing management for unacceptable impacts of dewatering. Results of monitoring to be submitted to state on a triennial basis • Manage wastes in an appropriate manner • Ensure sewage treatment plans are approved • Appropriate storage of hydrocarbons (bunding for hydrocarbon storage areas in accordance with the requirements of AS 1940 • Ensure contaminated surface runoff does not enter natural drainage • Minimise dust • Minimise potential disruption to pastoral activities (negotiation with the Marillana pastoral station manager) • Obtain archaeological and ethnographic clearance for the railway corridor (involve Aboriginal people ion site survey process) • Comply with Aboriginal Heritage Act • Ensure disturbed areas are rehabilitated • Prepare Decommissioning Plan
Statement 695 – Junction South East	
1: Implementation	-
2: Proponent Nomination and Contact Details	-
3: Commencement and Time Limit of Approval	-
4: Compliance Audit and Performance Review	Prepare an audit program and submit compliance reports to the DEP Submit performance review report every 5 years to address 5 main areas (see 4-2)
5: Decommissioning and Rehabilitation	Review and revise the existing Yandicoogina Decommissioning and Rehabilitation Plan to include the JSE Mine (see objectives and procedures listed in 5-1), implement, review and revise every 5 years, make publically available

Condition #	Requirements
6: Post-closure Backfill Source	Ethnographic and archaeological surveys and vegetation, flora and fauna surveys of the preferred backfill source, "Backfill Hill" Prepare Backfill Hill Management Plan (see 6-2 for procedures, inclusions and conditions)
7: Groundwater	Prepare Groundwater Management Plan (see 7-1 for objectives and procedures), implement, review and revise every 5 years, make publically available
8: Riparian Vegetation	Prepare a Riparian Vegetation Management Plan (see 8-1 for objectives and procedures), implement, review and revise every 5 years, make publically available
9: Conservation of Significant Flora and Fauna	Pre-land clearing surveys of the areas to be disturbed for conservation significant flora and fauna species, provide summary of results to EPA and DEC Prepare Significant Species Management Plan for any significant flora or fauna species recorded (see 9-2 for objectives and inclusions), implement, review and revise every 5 years, make publically available
10: Weeds	Prepare Weed Management Plan (see 10-1 for objectives and procedures), implement, review and revise every 5 years, make publically available
11: Subterranean Fauna	Prepare a Subterranean Fauna Management Plan (see 11-1 for objectives and procedures), implement, make publically available
12: Liaison with Adjacent Leaseholders	During mining and decommissioning liaise with adjacent mining leaseholders

Additional commitments

The ministerial statements in Table 1 refer to the Junction Central and Junction south east iron ore mines. New mines at Junction Southwest and Oxbow deposits are currently being assessed under the Environmental Protection Act 1986 and a Public Environmental Review document (PER) is being prepared. It is preferred that environmental management is consistent across the site and therefore commitments made in the PER documentation regarding management of environmental aspects of the project have been included in this document.

These commitments for flora and vegetation include:

- avoidance of species and ecological communities with conservation significance wherever practicable
- adaption of the current Yandicoogina JSE Weed Management Plan to provide the basis for preventing the introduction and spread of weed species - addressing weed identification, mapping and management for all activities associated with the project
- adaptation of the current JSE Riparian Vegetation Management Plan to provide the basis for protecting riparian vegetation
- development of rehabilitation completion criteria to provide the basis for preserving vegetation values (biodiversity, structural and functional attributes, land use attributes) post mining
- consideration of cumulative impacts and the development of strategies and controls to minimise these.

Commitments for Fauna include:

- avoidance of species and ecological communities with conservation significance wherever practicable
- protection of uncleared habitat from threats and disturbance

- development of rehabilitation completion criteria to provide the basis for reinstating fauna habitat values post mining
- hydrogeological modelling and monitoring will be used in conjunction with survey results to assess any potential impacts to subterranean fauna and habitat from dewatering
- excavation activities will be designed to minimise disturbance to subterranean fauna habitat wherever practicable.

Commitments for ground and surface water include:

- evaluation of water use and alternative management options for the purposes of minimising discharge to creek systems
- studies to address the potential extent and impact of increased surface water volumes in the Marillana Creek and Weeli Wolli Creek systems; this will include consideration of the RTIO Yandicoogina, BHPBIO Yandicoogina and Hope Downs mining areas
- development of a Groundwater and Surface Water Monitoring and Management Plan
- adaptation of the Yandicoogina JSE Riparian Vegetation Management Plan for application to the proposed mining areas at JSW and Oxbow
- prevention of sedimentation and contamination of creek systems
- use of improved models to predict impacts to groundwater systems, under a variety of possible dewatering and surface water discharge scenarios
- ongoing monitoring of aquifers to enable impacts to be detected

- Other commitments include:
- RTIO has well developed operating practices and procedures for the prevention of environmental contamination, which are used at existing operations at Yandicoogina. This includes the appropriate handling and management of non-mineral waste. These practices and procedures will be updated and applied to the project
- RTIO has well developed operating practices and procedures for noise management, which are used at existing operations at Yandicoogina. This will be updated and applied to the project
- Monitor and report greenhouse gas emissions deriving from the Project. Minimise greenhouse gas emissions where practicable, based on implementation of selected emissions reduction options
- RTIO has well developed practices and procedures for protecting Aboriginal heritage sites including a Cultural Heritage Management Plan (CHMP) for the Yandicoogina project area, which includes JSW and Oxbow
- ongoing consultation with heritage stakeholders
- any proposal to disturb Aboriginal heritage sites will be assessed under Section 18 of the *Aboriginal Heritage Act 1972*
- RTIO has well developed practices and procedures for protecting human safety and welfare where associated with company operations
- A conceptual Decommissioning and Rehabilitation Plan will be developed, which establishes mines closure objectives and criteria. The plan will address final landforms, surface water quality, aquifer water quality, revegetation techniques, post-closure land use options and surface water

routing. It will also include specific monitoring programs addressing landform stability monitoring, revegetation monitoring and water quality monitoring.

1. ENVIRONMENTAL POLICY AND CORPORATE COMMITMENT

Condition 8 of Statement 523 requires the following:

In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to mining within the extended mining area, the proponent shall demonstrate to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection that there is in place an environmental management system which includes the following elements:

1. *An Environmental policy and corporate commitment to it*
2. *Mechanisms and processes to ensure:*
    - *planning to meet environmental requirements*
    - *implementation and operation of actions to meet environmental requirements*
    - *measurements and evaluation of environmental performance.*
3. *Review and improvement of environmental outcomes.*

The Hamersley Iron environmental policy and environmental management systems are discussed in Sections 1.1 and 1.2 respectively. The Mechanisms and processes are discussed in Section 2. Part 2 presents the environmental management program, and Part 3 sets out the specific management plans for the various factors.

As an international mining company, Rio Tinto has established corporate-wide requirements, which may go beyond legislative and statutory requirements. Similarly, as a business unit within Rio Tinto, Hamersley Iron has established business-wide requirements for its operations.

Hamersley Iron operates under the Rio Tinto Iron Ore Health, Safety and Environmental Policy. This policy aims to maintain and protect the value and integrity of the environment around its operations through effective management practices to minimise adverse impacts its activities may have on the environment. It applies to all aspects of Hamersley Iron activities, including exploration, planning, construction and operations. These activities are to be undertaken in accordance with the principles of the policy. All Hamersley Iron employees, and those of contractors, will be responsible for and involved in environmental management.

Hamersley Iron aims to conduct business in an efficient and environmentally responsible manner that is compatible with the expectations of their shareholders, the government and the community. Hamersley Iron also recognises that environmental responsibilities go beyond those required under statutory regulations and encompass social obligations, leadership in sustainable development and minimising environmental impacts.

1.1 ENVIRONMENTAL POLICY

To demonstrate this commitment, Hamersley Iron endorsed a Iron Ore Health, Safety, Environment and Quality Policy for all its minesites in 2009. This new policy reflects the recent growth and structural changes in the business. The HSEQ Policy is the guiding document for driving environmental management and provides context and specific direction for continuous improvement.

Signing the new policy has renewed the commitment to care for the environment using the well-established approach of '*Protect– Restore – Do it Better*'.

The Hamersley Iron goal is to create long-term value as a responsible iron ore mining company, and to care for the environment, with aims including:

- efficient use of natural resources to meet legal and other obligations along with the targets set
- minimisation of pollution and rapid clean up of any spills
- leaving areas as close as practical to how they were found
- continually improving performance
- ensuring employees know their environmental accountabilities and act on them
- being proactive to better understand the impact of operations now and for the future
- providing opportunities for communities and others to communicate their views.

- To achieve this, the Hamersley Iron actions will involve:
- managing environmental issues through its EMS and business systems
- developing annual environmental improvement plans for priorities identified in review of systems and performance
- improving ability to measure water, energy use and greenhouse gas emissions
- minimising waste and spills of hydrocarbons
- improving the efficiency of use of natural resources
- updating plans for disturbance and closure, progressively rehabilitate and measure success
- recognising good environmental performance
- training staff and contractors in environmental requirements of their work
- seeking, respecting and considering community views
- regular reporting to stakeholders on performance
- aligning with the Rio Tinto Iron Ore Health, Safety and Environmental Policy.

1.2 HAMERSLEY IRON ENVIRONMENTAL MANAGEMENT SYSTEMS

Hamersley Iron operates under an ISO14001 framework using its Iron Environmental Management System (or 'IEMS'). ISO14001 is an internationally recognised continuous improvement model that has been adopted, implemented and added value to thousands of organisations worldwide. Its basis lies in management commitment and the allocation of resources to establish systems based on reducing environmental risk. The key elements of ISO14001 include assessing environmental risk and legal requirements, developing objectives and targets for improvement, training, operational control, communication, emergency response, corrective actions, audits and review. In 2009, all Rio Tinto Iron Ore sites successfully maintained their certification to ISO14001, first achieved in October 2003, through external audits by NCS International Pty Ltd (NCSI) and more recently DNV (Det Norske Veritas).

One of the key components of IEMS is ensuring that environmental planning processes are integrated fully with the overall business planning process. This ensures that objectives and targets are both realistic and resourced. Environmental Improvement Plans (EIPs) are established annually and reflect how environmental objectives and targets are achieved.

An improved system for tracking corrective actions has recently been developed with the Health, Safety, Environment and Community (HSEC) module. This has enabled all corrective actions from audits, inspections and incidents to be tracked and reported by sites on a regular basis.

Each year management within Hamersley Iron review IEMS to ensure its continuing suitability, adequacy and effectiveness.

2. MECHANISMS AND PROCESSES

Referred to in Ministerial requirement - condition 8 of Statement 523.

2.1 COMMUNICATIONS AND TRAINING

Internal communications

Internal communications methods may include the following, as applicable:

- meetings
- proposal reports
- performance assessments reports
- notice boards
- onsite personnel inductions, training and toolbox sessions (as required)
- sub-contractor coordination meetings.

These mechanisms will be used to address concerns and questions raised by mining personnel and any incidents (environmental and general) that may have occurred. In addition, these mechanisms will be used to communicate any new environmental management procedures or information to ensure effective implementation.

External communications

External communications may include the following, as applicable:

- meetings and correspondence with appropriate regulatory authorities and stakeholders
- discussions and consultation with adjoining landowners
- handling of, and responding to, complaints or requests.

Inductions and training

All employees (including contractors) will receive suitable environmental training, to ensure they are aware of their responsibilities and are competent to carry out their work in an environmentally acceptable manner. Environmental requirements will be explained to all onsite personnel during a site induction. Ongoing instruction will be provided via toolbox meetings etc. Inductions and ongoing instruction will be recorded.

The environmental induction will include the following items:

- explanation of the purpose and objectives of the Environmental Management Plans (EMP)
- roles and functions of personnel onsite in relation to environmental management
- brief explanation of their responsibilities under the environmental management procedures contained within this EMP

- potential consequences of departure from procedures
- emergency procedures and responses
- identification of their legal obligations.

2.2 ENVIRONMENTAL INCIDENT REPORTING

Environmental Incidents are events or occurrences that result in, or have the potential to result in, unacceptable impacts to the environment, for example:

- unauthorised clearing of vegetation
- spill of hydrocarbons.

All incidents will be reported on an Incident Report form and/or registered in an electronic database. Incidents will be tracked to ensure that the appropriate corrective actions and measures are taken to prevent the incident from reoccurring. Environmental Incidents will be reviewed on a regular basis to determine incident trends. This will enable targeting of areas that require further management and will assist in preventing future incidents.

All incidents will be reviewed immediately to determine if they require reporting to the appropriate authority. If reporting is required, it will be carried out in writing to the appropriate authority within 24 hours of the incident occurring.

The Yandicoogina Emergency Management Plan will be implemented to deal with any major environmental incidents.

2.3 PERFORMANCE REPORTING AND AUDITING

Performance reporting will be implemented to produce systematic, comprehensive and informative reports on the environmental management and monitoring activities at the Yandicoogina Project. Hamersley Iron will also undertake annual internal audits of compliance with environmental management commitments and conditions required as part of the Proposal.

Environmental performance and compliance with commitments and conditions are reported in Annual Environmental Reports.

Where auditing finds environmental management actions are not being effective, the audits may recommend changes to procedures. The Department of Environment and Conservation (DEC) Audit Branch may undertake regular audits to assess compliance with all relevant conditions and commitments.

2.4 RESPONSIBILITIES

During operations the environmental accountabilities will be as follows:

- General Manager Operations (GMO) – responsible for overall environmental performance and implementation of the EMP
- Superintendent Environment – East Pilbara – responsible for achieving consistency in the development and implementation of the EMPs across the east inland Hamersley Iron sites

- Site Environmental Advisor (SEA) - responsible for day to day verification that the environmental performance of the site complies with the intent of the EMP.

- During construction and upgrades, the environmental accountabilities will include a Project Manager responsible for environmental performance and implementation of the EMP for the duration of the construction/upgrade. A separate Construction EMP may be developed where necessary.

2.5 REVIEW AND IMPROVEMENT OF ENVIRONMENTAL OUTCOMES

2.5.1 Review and revision

Referred to in Ministerial requirement - condition 8 of Statement 523.

This EMP will be reviewed as required throughout the duration of the Yandicoogina Project. Upon review, the document will be revised and re-issued where appropriate. In addition, continued review and revision of the plan will occur in response to environmental incident resolutions, audit findings, monitoring results, continuous improvement and changes in regulatory and corporate requirements. The objective of the reviews and revision will be to improve the environmental outcomes.

DEC will be advised of any minor changes to the plan and provided with the revised document if necessary. Major changes will not be undertaken without consultation with DEC.

2.6 COMPLIANCE AUDIT AND PERFORMANCE REVIEW

Referred to in Ministerial requirement - condition 4 of Statement 695.

Compliance auditing is required to help determine environmental performance and compliance with the conditions. Regular reports are to be submitted in accordance with an audit program prepared by the Department of Environmental Protection (now DEC) in consultation with Hamersley Iron.

In addition RTIO is to submit a performance review every five years which addresses:

- environmental performance against key objective for the major environmental issues
- the progress of sound environmental performance measured against industry benchmarking
- significant improvements gained in environmental management including the use of external peer reviews
- the outcomes of community consultation including ongoing concerns
- the proposed environmental objectives for the next five years including improvements in technology and management processes.

PART 2 – ENVIRONMENTAL MANAGEMENT PROGRAM

1. INTRODUCTION

It is intended that all the Yandicoogina projects will be managed under the one framework, and be effectively managed as part of the same mining operation. This EMP presents that framework and comprises modular components with each management plan presented for use as a discrete plan.

The Yandicoogina operation has an Environmental Management Program (EMP) in place developed in compliance with condition 4 of Ministerial Statement 417 and amended to incorporate management of the expanded mine as per Ministerial Statement 523. The EMP was approved by the DoE (now DEC) and included the following plans:

- Riparian Vegetation Management Plan (June 2006)
- Weed Management Plan (June 2006)
- Groundwater Management Plan (June 2006)
- Decommissioning and Rehabilitation Plan (February 1999) – covering all non-hydrogeological aspects
- Closure Plan (October 2003) – first review and update covering non-hydrogeological aspects only
- Water Management Plan – Yandicoogina (April 2006)
- Yandicoogina Environmental Management Program (November 2001)
- Operating Strategy (GWL107422) and a draft Yandicoogina JSE Operating Strategy that forms part of the GMP.

Existing Iron Environmental Management Systems (IEMS) procedures, plans and guidelines include:

- Spill Response (July 2007)
- Soil Resource Management (April 2010)
- Landform Design Guidelines (July 2006)
- Weed Management Plan (March 2010)
- Landfill Management Plan (June 2010)
- Waste Management (Feb 2008)
- Lead Acid Battery Management (March 2006)
- Land Farm Management Plan (June 2010)
- Refrigeration and air-conditioning gas management (February 2006)
- Ground disturbance approvals process and procedures (March 2006).

- Ministerial Statement 695, issued for the approval of Yandicoogina Junction South-east Mine, carried additional conditions 5 – 11 referring to additional management planning. These conditions included requirements for individual management plans for:

- decommissioning and rehabilitation
- post closure backfill source
- groundwater
- riparian vegetation

- conservation of significant flora and fauna
- weeds
- subterranean fauna.

1.1 BACKGROUND

In September 1995, Hamersley Iron referred a proposal to the Environmental Protection Authority (EPA). The proposal was for development of an iron ore mine at the Hamersley Iron Yandicoogina Junction Deposit (in the Eastern Hamersley Range, located about 90 km north-west of Newman) and an extension to the existing Central Pilbara Railway (Figure 1). An extension to double the size of the mined area, known as Junction Central East, was assessed under Section 46 of the *Environmental Protection Act 1986* and was approved in 1999. An additional mining area, known as Junction South East was approved in 2005 with the release of Ministerial Statement 695.

The key environmental issues considered by the EPA for the current mining operations were:

Junction Central (JC) and Junction Central Extension (JCE):

- impacts on local and regional groundwater systems
- impact on surface water systems
- landforms/closure and rehabilitation
- vegetation
- flora and fauna.

Junction South East (JSE):

- groundwater
- riparian vegetation
- flora and fauna.

1.2 LOCATION

The Yandicoogina Mine area is located 90 km north-west of Newman and 300 km south-east of Dampier in the Central Pilbara (Figure 1). The Hamersley Iron operation is situated about 10 km downstream of the BHP Billiton (BHPB) Yandicoogina Operation adjacent to Marillana Creek. The Yandicoogina Mine area is covered by Mining Lease ML274SA established under the *Iron Ore (Yandicoogina) Agreement Act 1996*.

1.3 PURPOSE AND SCOPE

The purpose of this document is to:

- consolidate the various management plans prepared for the Yandicoogina projects separate deposits into one main management program that can be applied consistently across the project
- provide a document that is easy to apply and review
- provide a document that the EPA can easily audit

- provide sufficient details to ensure the Minister that the conditions from all relevant Statements are being met.

Each individual management plan includes:

- an action plan detailing prevention, minimisation and mitigation measures for each issue including timing and responsibility
- a monitoring plan for each action plan to provide evidence that management is meeting targets
- a contingency plan should monitoring reveal deficiencies in current management.

The EMP is a continually evolving document and will be revised regularly, particularly in response to monitoring and internal audit feedback and to reflect changes in objectives and commitments.

1.3.1 Related plans and programs

The Yandicoogina Mine has a current Operational Environmental Management Program which relates to the minesite operation. Additional management plans have been produced to comply with specific Ministerial conditions or commitments. These include the Yandicoogina JSE Riparian Vegetation Management Plan, Yandicoogina Subterranean Fauna Management Plan, Yandicoogina Groundwater Management Plan, Surface Water Monitoring and Management Plan, Yandicoogina Decommissioning and Rehabilitation Plan, Yandicoogina Cultural Heritage Management Plan, Yandicoogina JSE Weed Management Plan and Yandicoogina Operations Groundwater Operating Strategy.

1.4 STRUCTURE OF THE EMP

This EMP includes two key parts:

Part 1 – A discussion on the overall environmental policy and framework within which the EMP operates, the mechanisms and processes under which it is implemented and how the EMP relates to previous documents and overarching company policy.

Part 2 – The EMP describing the Yandicoogina environmental issues, the ministerial conditions, relevant legislation, objectives, actions and monitoring. This part contains the environmental background relevant to the Yandicoogina operation.

Individual management plans are self-contained modules which can be used on a stand-alone basis for implementation. Action measures, monitoring and contingency, responsibility and timing are included within each management plan.

The following Table 2 outlines the relationship between the existing management plans and this new combined management program. All actions listed in previously approved management plans have been included as listed in the table. Additional actions relevant to the new JSW and Oxbow mines have been included in the relevant management plans.

Table 2 Changes to existing management plans

Aspect	Current Management plan	Updates made in 2010 EMP (this plan)
Groundwater	Yandi Groundwater and Surface water monitoring and management plan	Used original operational EMP as basis
	Yandi Operations groundwater operating strategy	Added in information from JSW and Oxbow scoping

	Yandi operational Environmental Management Program (EMP)	study for 2010 PER Separated groundwater from surface water Made monitoring points consistent with the Groundwater operating strategy
Surface water	Yandi Groundwater and surface water monitoring and management plan	Used surface water section from Riparian management plan as basis
	Riparian Vegetation Management Plan	Added in information from original EMP and Yandi groundwater and surface water monitoring and management plan Added in information from JSW and oxbow scoping study for 2010 PER Added actions from dewatering licence where relevant
	Yandi operational Environmental Management Program (EMP)	
Flora and Vegetation and weeds	Yandi Riparian Vegetation Management Plan	Kept riparian vegetation section in here, and included relevant parts of surface water section, but transferred much of surface water section to surface water Added in information from original EMP and the JSW and Oxbow scoping study for 2010 PER. Cross-referenced to riparian veg management plan and weed management plan Modified threshold triggers to match Hope Downs 1 triggers along Weeli Wolli Creek Included selective thinning of saplings Updated monitoring process for tree health condition – removed shoot water potential, leaf osmotic potential and isotope abundance
	Yandi Weed management plan	Combined weed info from these two plans into new plan
	Yandi operational Environmental Management Program (EMP)	
Fauna	Yandi operational Environmental Management Program (EMP)	Used EMP as basis, added in info from JSW and Oxbow scoping study for 2010 PER
Subterranean fauna	Yandi Groundwater and surface water monitoring and management plan	Combined these two subfauna reports and referred to the operating strategy as it is updated every 12 months
	Yandi Operations groundwater operating strategy	
Aboriginal Heritage	Yandi operational Environmental Management Program (EMP)	Used this report and added other actions and added reference to cultural heritage management plan
	Yandi Cultural heritage management plan	
Closure and Rehabilitation	Yandi decommissioning and rehabilitation plan	This report remains a separate document
	Yandi operational Environmental Management Program (EMP)	Used this report and added other actions
Waste Hydrocarbon Dust and noise Fire Contaminated sites	Yandi operational Environmental Management Program (EMP)	Used this report and added other actions
Induction, incidents and awareness	Yandi operational Environmental Management Program (EMP)	Used this report and added other actions

1.5 RELEVANT LEGISLATION AND POLICY

The Project is covered by a State Agreement other regulatory legislation, and Hamersley Iron commitments:

- *Iron Ore (Yandicoogina) Agreement Act 1996*
- *Environmental Protection Act 1986* and conditions from Statements 417, 523 and 695 (Appendix 1)
- *Environmental Protection Act 1986* Works Approval (construction) and Licence (operation) (L7340/1997/9) issued by the DEC
- *Rights in Water and Irrigation Act 1914* groundwater construction and extraction licences
- other relevant legislation
- Rio Tinto Environmental Standards.

2. PROJECT DESCRIPTION AND THE LOCAL ENVIRONMENT

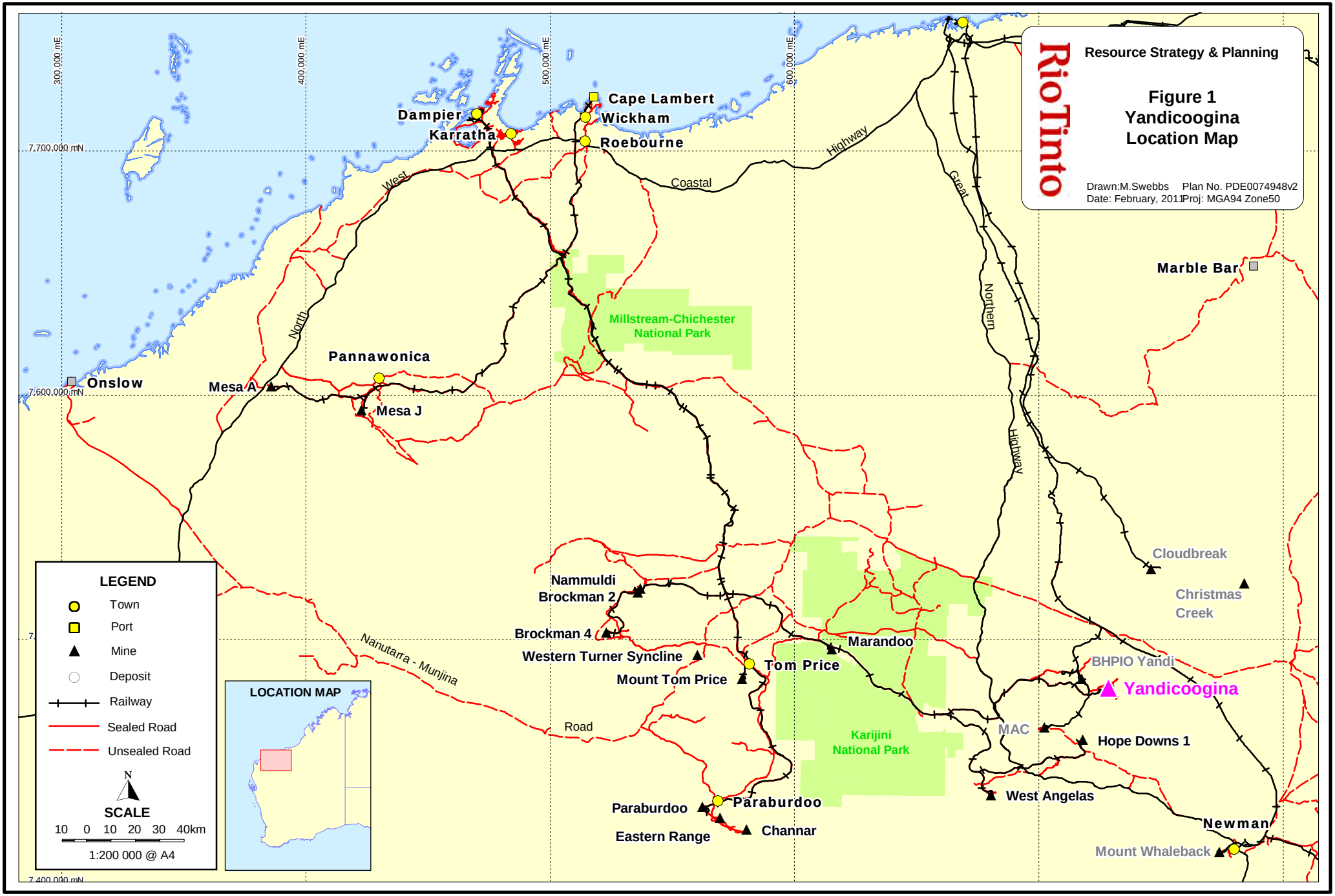
2.1 ENVIRONMENTAL SETTING

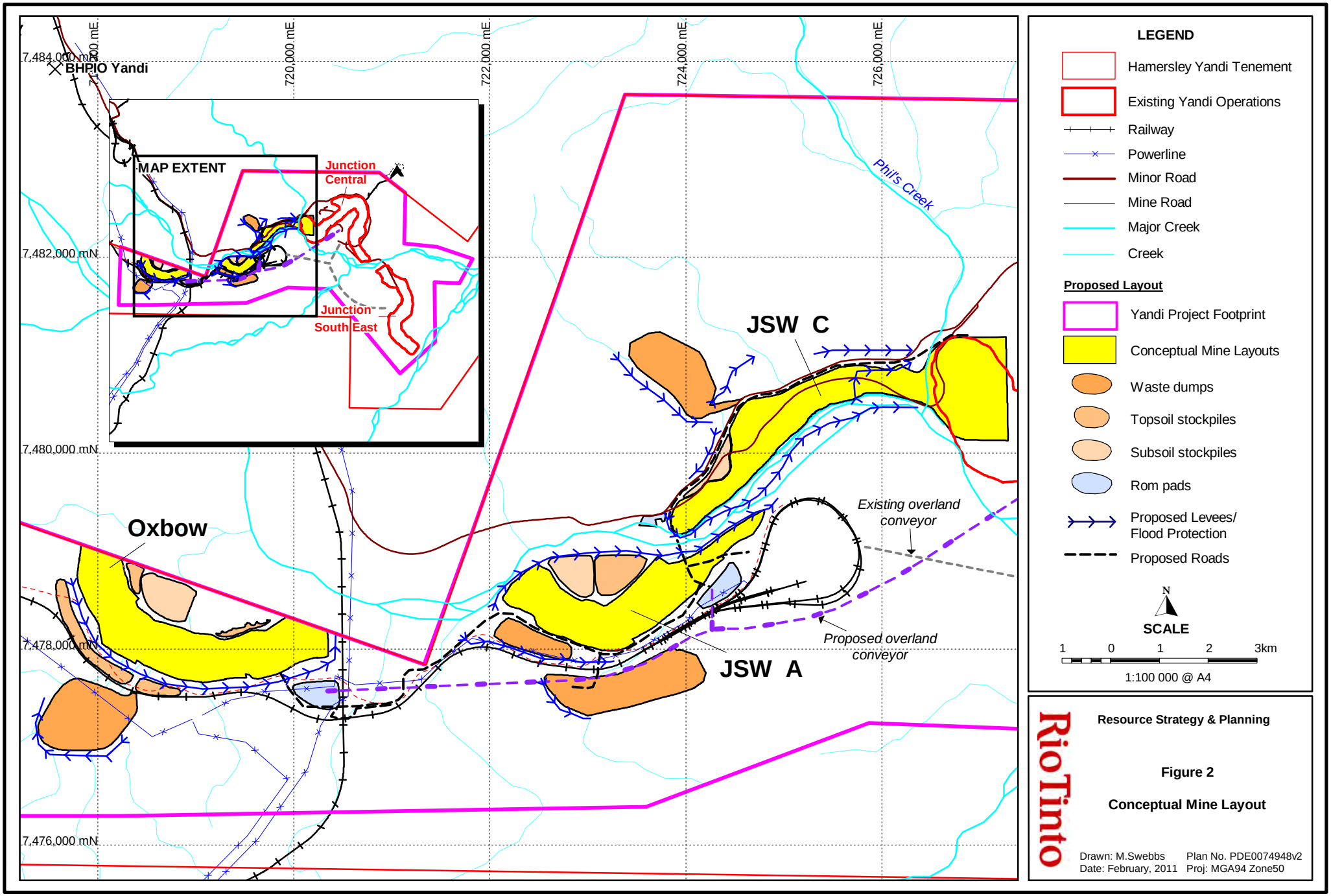
The general location of the Yandicoogina Mine area is shown in Figure 1 of the PER, with a more detailed map of the area shown in Figure 2. There are four main areas of current and future operations. Junction Central is currently operating, and has been since its approval in 1996. Junction South east (JSE) was approved in 2005, and is also currently operating. Junction South west (JSW) and Oxbow are planned for future operations, and a PER is in preparation for these two areas.

The Channel Iron Deposit (CID) lies in the central part of a broad, east-trending drainage basin with the Hamersley Range to the north and an un-named range to the south. The topography at Yandicoogina has been shaped by alluvial processes. The CID outcrops as a series of mesas above the surrounding alluvial plain.

Rainfall in the area is highly variable and results from both cyclonic and thunderstorm activity with about 55% of rain falling in January to March. Streamflow is completely dependent on rainfall and in normal circumstances streams are dry for most of the year, except for occasional pools. Annual potential evaporation is estimated at 3600 to 4800 mm, well in excess of annual rainfall. Easterly winds are prevalent throughout the year, with generally higher wind speeds in summer.

The Yandicoogina Mine area is within the Fortescue Botanical District of the Eremaean Botanical Province, as defined by Beard (1975), and is located near the boundary of the Hamersley and Fortescue sub-regions of the Pilbara Biogeographic Region as defined by the Interim Biogeographic Regionalisation for Australia (Environment Australia 2000). The majority of the Yandicoogina Mine area is typical of the Hamersley sub-region where the major creek systems (Marillana, Yandicoogina and Weeli Wolli Creek) form part of the Fortescue sub-region (Biota 2004a).


Resource Strategy & Planning
Figure 1
Yandicoogina
Location Map
Drawn:M.Swebbs Plan No. PDE0074948v2
Date: February, 2011 Proj: MGA94 Zone50
300 000 mE
400 000 mE
500 000 mE
600 000 mE
7 700 000 mN
7 600 000 mN
7 400 000 mN
Dampier
Karratha
Cape Lambert
Wickham
Roebourne
West Coastal Highway
Great Northern Highway
North West Coastal Highway
Marble Bar
Millstream-Chichester National Park
Onslow
Mesa A
Pannawonica
Mesa J
Nammuldi
Brockman 2
Brockman 4
Western Turner Syncline
Mount Tom Price
Marandoo
Tom Price
Nanutarra - Munjina Road
Karijini National Park
Cloudbreak
Christmas Creek
BHPIO Yandi
Yandicoogina
MAC
Hope Downs 1
West Angelas
Paraburdoo
Paraburdoo
Eastern Range
Channar
Newman
Mount Whaleback
LEGEND
Town
Port
Mine
Deposit
Railway
Sealed Road
Unsealed Road
N
SCALE
10 0 10 20 30 40km
1:200 000 @ A4
LOCATION MAP


7,484,000 mN
7,482,000 mN
7,480,000 mN
7,478,000 mN
7,476,000 mN
718,000 mE
720,000 mE
722,000 mE
724,000 mE
726,000 mE
BHPIO Yandi
MAP EXTENT
Junction Central
Junction South East
Phil's Creek
JSW C
JSW A
Oxbow
Existing overland conveyor
Proposed overland conveyor
LEGEND
Hamersley Yandi Tenement
Existing Yandi Operations
Railway
Powerline
Minor Road
Mine Road
Major Creek
Creek
Proposed Layout
Yandi Project Footprint
Conceptual Mine Layouts
Waste dumps
Topsoil stockpiles
Subsoil stockpiles
Rom pads
Proposed Levees/ Flood Protection
Proposed Roads
N
SCALE
1 0 1 2 3km
1:100 000 @ A4
RioTinto
Resource Strategy & Planning
Figure 2
Conceptual Mine Layout
Drawn: M.Swebbs
Date: February, 2011
Plan No. PDE0074948v2
Proj: MGA94 Zone50

2.1.1 Physical environment

The CID is roughly aligned with the present day Marillana Creek which is joined by the Yandicoogina Creek before feeding into the Weeli Wolli Creek (Figure 3). The Marillana and Weeli Wolli Creeks, both of which are ephemeral (seasonal flow) have catchment areas of 2250 km^2 and 1750 km^2 respectively, above their confluence. In the vicinity of Hamersley Iron Yandicoogina operations, a smaller creek system (Phil's Creek) drains into Marillana Creek just upstream of the Marillana-Yandicoogina confluence. There is also a dense network of drainage lines formed by erosion from high intensity rainfall on the sparse vegetation cover and shallow soils– there is little sheet flow drainage within the Yandicoogina area. All surface drainage in the area eventually feeds into the Fortescue River system north of the Hamersley Range.

Streamflow is completely dependent on rainfall and in normal circumstances streams are dry for most of the year, except for occasional pools. Drainage is provided by two major creek systems: Marillana Creek and Weeli Wolli Creek. Two smaller creek systems, Yandicoogina Creek and Phil's Creek, drain into Marillana Creek. Flow direction is from Marillana Creek to Weeli Wolli Creek and ultimately to the Fortescue River on the northern side of the Hamersley Range.

2.1.2 Biological environment

Vegetation and flora

The alluvial aquifers underlying the major creek systems of the Yandicoogina, Marillana and Weeli Wolli Creeks support significant stands of riparian vegetation. Various combinations of *Melaleuca argentea*, *Eucalyptus camaldulensis* and *E. victrix* occur in these creek systems. Minor drainage lines in upper hills differ very little from the vegetation type surrounding them and are usually species poor.

The vegetation of the Yandicoogina area is typical of the Central Pilbara comprising of spinifex hummock grasslands on low stony hills and ranges, with open Eucalypt woodlands and *Acacia* shrublands over spinifex on plains, and Eucalypt woodlands in major creeks.

These vegetation types fall into three main vegetation groups, related to topography:

- Low stony hills: Low stony hills generally comprise a scattered overstorey of Eucalypts and Acacias over moderately dense spinifex.
- Valleys (Mosaic communities): Undulating low stony plains in valleys typically comprise Bloodwoods over sparse mixed shrubs and spinifex. Alluvial flats are dominated by *Acacia* communities over a moderately rich understorey of shrubs, herbs and tussock grasses.
- Creeks: Drainage lines vary from small gullies in upper hills to more major creeklines. Minor drainage lines differ very little from the vegetation type surrounding them and are usually species poor. Major creeklines comprise typically of woodlands and forests of Eucalypts and other tree species over mixed understorey of shrubs and grasses.

Fauna

The fauna of the area are relatively well known through a series of biological surveys undertaken for proposed resource developments (Biota 2010b). Most terrestrial fauna species known to or expected to occur in the Yandicoogina area are widely distributed throughout the Pilbara and the Eyrean

Subregion. The fauna is typified by arid-adapted vertebrates with a number of wide ranging species, especially birds, whose distribution extends beyond the Eyrean Subregion.

A desktop review indicated 70 species of birds, three species of amphibians, 56 species of reptiles, and 13 native mammals as occurring within the general area of the Yandicoogina JSE project (Biota 2004b). The JSW/Oxbow survey yielded a total of 72 vertebrate fauna species across 38 families: including 46 six species of avifauna, 12 species of mammals and 14 species of herpetofauna. The mammal assemblage included 6 species of bats and 2 non-native species (the cow and donkey respectively). The recorded assemblage was considered to represent a subset of the vertebrate taxa that might be expected to occur in the Yandicoogina locality, which has previously been estimated at 147 species across 51 families (Biota 2010b).

Table 3 shows the results of an *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) Protected Matters search (2010) for the mine and immediate surrounds. There are six threatened species and eight migratory species that have the potential to occur within the project area.

There are no Wetlands of International Significance (Ramsar sites), Commonwealth Marine Areas, or Threatened Ecological Communities within the project area or immediate surrounds.

Table 3 EPBC Protected Matters search results (2010)

Threatened Species	Status	Type of Presence
Birds		
Pezoporus occidentalis Night Parrot	Endangered	Species or species habitat likely to occur within area
Mammals		
Dasyurus hallucatus Northern Quoll	Endangered	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby	Vulnerable	Species or species habitat likely to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Liasis olivaceus barroni Olive Python (Pilbara subspecies)	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Birds		
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot	Migratory	Species or species habitat likely to occur within area
Migratory Wetland Birds		
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel	Migratory	Species or species habitat may occur within area
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

A diverse and abundant range of stygofauna exists in the Yandicoogina area, with most stygofauna species represented in both Marillana and Weeli Wolli Creeks and the region. Ten higher-level taxa have been recorded in the Yandicoogina area (Biota 2011): *Amphipoda, Bathynellacea, Cyclopoida, Harpacticoida, Hydrachnidia, Isopoda, Ostracoda, Oligochaeta, Nematoda* and *Platyhelminthes*.

Historical surveys associated with earlier mining approvals did not target troglofauna, however, recent surveys have included a troglofauna sampling component (Biota 2011). The proposed ore body to be mined is below the watertable in an area that is regularly inundated with high stream-flow events following heavy rain or cyclonic activity. The watertable is approximately 10 m below surface. As such troglofauna habitat is considered to be restricted.

2.1.3 Social environment

Yandicoogina is within the Shire of East Pilbara. Main Pilbara regional centres are Tom Price, Paraburdoo, Roebourne, Karratha and Port Hedland. These centres provide services to the pastoral, natural gas, salt, iron ore and other mining industries within the Pilbara.

The Hamersley Iron Yandicoogina Mine is situated on the Marillana Station pastoral lease, held by a BHPBIO related company. In addition to the traditional use of land by Aboriginal groups, other land uses in the region include tourism, conservation and other mining operations.

Karijini National Park lies approximately 70 km to the west of the Hamersley Iron Yandicoogina operation and Millstream-Chichester National Park approximately 190 km to the north-west

The nearest mining development is the BHPBIO Yandi operation, located approximately 12 km to the west, upstream of the Hamersley Iron Yandicoogina operation on Marillana Creek. Hamersley Iron and BHPBIO share the existing access road and aerodrome under agreed arrangements.

The Bunjima, Niapaili and Innnawonga language groups lodged a native title claim over the Yandicoogina area in June 1996. The claim is managed by the Gumala Aboriginal Corporation (Gumala). In March 1997, Hamersley Iron entered into the Yandicoogina Land Use Agreement with the Aboriginal parties which facilitated the granting of tenure for the Yandicoogina Project. The agreement provides benefits to the Aboriginal parties over 20 years for education, training, employment, business and community development.

Several archaeological sites have been identified within the Yandicoogina area. Consultation with Aboriginal representatives has indicated that no sites of ethnographic significance are present in the Yandicoogina JSE project area. Refer to Section 9 for a detailed description of Aboriginal heritage values.

No sites of European heritage significance are known within the Yandicoogina project area, and a search of matters protected under the EPBC Act found no World Heritages Properties or National Heritage Places within or surrounding the area.

2.2 INFRASTRUCTURE AND OPERATIONS

The Yandicoogina Project is a conventional open cut iron ore mine on a section of Channel Iron Deposit (CID) associated with the Marillana-Yandicoogina-Weeli Wolli creek system.

Components of the project include:

- open cut iron ore mines within a Channel Iron Deposit (CID) at Junction Central, Junction SE
- proposed open cut mines at JSW and Oxbow
- dewatering to lower the watertable and to allow mining of the ore body
- discharge of surplus dewatering water to Marillana and Weeli Wolli creeklines

- conventional drill/blast, load and haulage of ore from the mine to the mine plant
- out-of-pit waste dump until progressive backfilling of mined areas can occur
- crushing and screening, conveying, ore stacking and train loading facilities
- extension of the Central Pilbara Railway to the Yandicoogina mine, terminating with a rail loop
- railing product to the port of Dampier for shipping to markets

The key characteristics of the current project (including subsequent updates) are summarised in Table 4.

Table 4 Key characteristics of the approved project

Aspect	Approved Project 523 inc extension	Approved Project 695
Mining rate	36Mt/a	22Mt/a
Length of CID to be mined	SL 12.2km to SL 19.75km	5.8km
Area of CID to be mined	600ha	980ha
Ore reserve to be mined	300Mt	280Mt
Estimated mine life	25 – 30 years	16 years
Mine pit characteristics	About 65m deep; 40m below pre-mine watertable	About 65m deep; 40m below pre-mine watertable
Dewatering requirements	12GL/a (combined total of 35GL/a from JC & JSE)	23GL/a (combined total of 35GL/a from JC & JSE)
Volume of dewatering water used	5ML/d	3ML/d
Number of dewatering borefields	Three: ¨ The existing permanent borefield ¨ A new permanent borefield on Phil's Creek CID ¨ A new sacrificial borefield in the main CID	Initially 2 clusters of wells and a sacrificial well. Three additional cluster wellfields and sumps as mining progresses
Proportion of overburden backfilled	100% (after first 3 years all waste reports as backfill, with out-of-pit waste used as backfill upon mine closure)	100% after some material used for constructing drainage embankments
Associated transport infrastructure	90km section of railway from rail loadout to Juna Downs 3km conveyor from mine site to rail loadout	Ore to be transported along Central Pilbara Railway to Dampier Port and Cape Lambert
Associated minesite infrastructure	Mine accommodation village Airstrip Offices and workshop Explosives stores Communications hut	Mine accommodation village Airstrip Offices and workshop Explosives stores Communications hut

PART 3 – MANAGEMENT PLANS

1. GROUNDWATER MANAGEMENT PLAN

1.1 DESCRIPTION

The Yandicoogina Iron Ore Mine targets a channel iron deposit (CID), which also forms a major aquifer in the area with approximately 80% of the ore body situated below the natural watertable. As a consequence, dewatering is a major focus of mining activity at the Yandicoogina Operations. Dewatering conditions are also found in Licence L7340/1997/9.

The following aquifer systems exist in the Yandi area:

- Alluvium aquifer: is an unconfined aquifer that responds strongly to rainfall and stream flow events. It overlies both the CID and the basement aquifers.
- CID: is a relatively narrow heterogeneous aquifer that demonstrates a variable but generally increasing permeability with depth. The CID consists of pisolitic deposits which have subsequently been cemented in a goethite matrix. Zones of higher permeability correlate with secondary porosity features such as fractures, vugs/cavities and lithological contacts. The development of solution features has largely superseded the primary porosity of the interstitial pore space, with further secondary porosity resulting from extensive fracturing. Permeability is generally lowest within the main ore zone, particularly the upper zone and highest in sections of the limonite-goethite clay zone where large voids are often encountered. However the LGC is highly variable and may exhibit very low permeability in clay zones. The CID is bounded by lower permeability bedrock. Water levels in the CID are influenced by rainfall events, dewatering abstraction and dewatering discharge.
- Basement aquifer: is a fractured rock aquifer which underlies and surrounds the CID aquifer. This aquifer is of variable extent largely dependent on the development of structural features. Monitoring bores screened in basement lithologies demonstrate hydraulic connection with the CID following dewatering abstraction.

Based on the information obtained from recent drilling and test pumping, the conceptual model for the groundwater flow system underlying the flood plains of Marillana Creek has recently been updated. The new conceptual model comprises a CID that is surrounded by relatively transmissive alluvium/in situ weathered material that is in direct connection with the CID. The river gravel underlying Marillana Creek and overlying the alluvium contributes a significant volume of water to the CID aquifer. The combined width of the CID and alluvium aquifers range from ~1000 to ~2000 m. The maximum depth is 110 m in the middle of the CID channel diminishing towards the flanks of the flood plain (Kirkpatrick & Dogramaci, 2009).

The natural depth to groundwater varies from 3 to 20 m below surface with the groundwater flow direction to the east and south east. Groundwater flow within the CID is preferential due to higher permeability materials and generally represents a gaining system.

Following the decommissioning of Phil's Creek Borefield in June 2010 the potable water supply will be sourced from Phil's Creek Cutback Borefield.

The water supply for the operations, which includes a wet processing circuit (wet plant), is drawn from the dewatering discharge. Water discharged as slurry from the wet plant to the waste fines storage cell, located in a mined out area of the open cut, is recovered and reused in the wet process circuit.

Water for local expansion construction projects and dust suppression is sourced primarily from dewatering discharge. A component of dewatering discharge from JSE is reinjected back into the CID aquifer via the Billiards Re-injection Borefield. This scheme is unique in the Pilbara and reduces potential cumulative impacts associated with discharge to creeks.

Approval has been granted by the Environmental Protection Authority on 16/07/2009 for the increase of the groundwater abstraction volumes from 24.5 GL/a to 35GL/a for the Groundwater Licence 166205(1) (EPA, 16/07/2009, RTIO-HSE-0057586). The increased volumes for the individual pits are as follows:

- Junction Central: 12 GL/a
- Junction South East: 23 GL/a.

This document is consistent with the Groundwater Operating Strategy (Rio Tinto 2009) for all borefields and individual water supply bores at the Yandicoogina Operations, and covers dewatering, re-injection, potable, water supply bores and borefields and includes the pumping of groundwater from sumps within the active pit areas for the all the Yandicoogina Operations. Detailed information about each of the borefields can be found in the Yandicoogina Groundwater Operating Strategy 2009.

Relevant ministerial conditions are listed in Table 5.

Table 5 Ministerial conditions relevant to groundwater

Relevant document	Requirements	Addressed
Ministerial statement 695: Junction South-East	Prepare and implement a Groundwater Management Plan, and review and revise the plan every 5 years Objectives of the plan: • Monitor the impacts of the proposal on key water parameters • Maintain the quantity and quality of water so that existing and potential environmental values, including ecosystem maintenance, are protected This Plan shall set out procedures to: 1. Model the short term hydrogeological impacts. 2. Establish baseline data on groundwater levels, quality and through-flow at the downstream boundary of mining lease 274A, and at appropriate locations along the channel iron deposit aquifer. 3. Monitor the groundwater levels, quality and through-flow at appropriate locations along he channel iron deposit and along Weeli Wolli Creek during all phases of mining. 4. Monitor the dewatering and discharge rates (both cumulative and direct). 5. Re-inject surplus water from dewatering into the Billiards channel iron deposit aquifer if investigation studies indicate that it is feasible. 6. Manage and minimise impacts on groundwater. 7. Report on the management actions and monitoring results.	This section

Relevant document	Requirements	Addressed
Ministerial statements 417 and 523: Junction Central	A detailed Environmental Management Program including: • Groundwater monitoring and management • Schedule 2: Proponents Environmental Management Commitments (April 1996): • evaluate and understand hydrogeological systems • monitor groundwater in the Marillana Creek alluvium (report annually to the state) • collect further hydrogeological data to develop a model for the final void (water levels and quality). Report on this model and the final outcome to DEP before finalising the decommissioning plan.	

1.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

Environmental impacts on groundwater are generally as a result of dewatering, and may occur within the project site and the zone of hydrogeological influence. Potential impacts are assessed through the existing groundwater monitoring program.

Potential impacts of dewatering include changes to both groundwater levels and flows, and surface water levels and flows. Groundwater drawdown from abstraction may cause long-term effects on the palaeochannel aquifer by reducing aquifer storage. Changes to groundwater chemistry may also result from the post mining landform.

1.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

This Groundwater Management Plan has been prepared to fulfil the conditions and commitments prescribed under the Ministerial Statements (Appendix1).

The objectives of this plan are to:

- Minimise the impacts of the proposal on key water parameters
- Maintain the quantity and quality of water so that existing and potential values, including ecosystem maintenance, are protected.

This Plan shall set out procedures to:

- model the short term hydrogeological impacts
- establish baseline data on groundwater levels, quality and through-flow at the downstream boundary of Mining Lease 274SA and at appropriate locations along the CID aquifer
- monitor the groundwater levels, quality and through-flow at appropriate locations along the CID aquifer and along Weeli Wolli Creek during all phases of mining
- monitor the dewatering and discharge rates (both cumulative and direct)
- re-inject surplus water from dewatering into the Billiards CID aquifer where feasible
- manage and minimise impacts on groundwater
- report on the management actions and monitoring results.

The specific environmental objectives for groundwater are presented in Table 6.

Table 6 Environmental objectives, targets and indicators for groundwater management

Management objective	Target	Key performance indicators
Use of improved models to predict impacts to groundwater systems, under a variety of possible dewatering and surface water discharge scenarios.	Groundwater model developed based on monitoring data.	Development and documentation of the model.
Ongoing monitoring of aquifers to enable impacts to be detected.	Collect data at the downstream boundary of mining lease 274SA, and at appropriate locations along the channel iron deposit aquifer.	Records of groundwater levels, quality and through-flow at specified locations.
To manage and minimise the impacts in groundwater and the environmental impacts associated with dewatering and discharge of groundwater.	No unacceptable changes in the groundwater quality.	Monitoring data shows no unacceptable changes in groundwater quality.
	No unacceptable changes in the regional aquifer levels.	Monitoring data shows no unacceptable changes in the regional aquifer levels.
Dewatering occurs as per Licence L7340/1997/9.	Licence conditions W8 –W10.	Monitoring records to be presented in AER.
Re-inject surplus water into aquifer	Re-inject a portion of the total dewatering volume into aquifer.	Implementation of the applicable version of the Operating Strategy.

The estimated maximum pumping rates and recommended pump settings for each bore in the Yandicoogina Operations borefields are presented in the Groundwater Operating Strategy. The individual bore pumping rates have been derived from analytical modelling to optimise the total borefield discharge rate whilst taking into account both individual well loss and aquifer interference effects.

1.4 IMPLEMENTATION STRATEGY

Comprehensive monitoring programs for groundwater allow for continual improvement and adaptive management practices.

1.4.1 Management actions

Detailed management actions specific to each dewatering operation can be found in the Groundwater Operating Strategy. Strategic actions are listed in Table 7. Discharge outlets are shown in Figure 5.

Table 7 Management actions for groundwater

Parameter	Action	Timing
Infrastructure	Maintenance personnel visually check the condition of the pipelines and infrastructure associated with transporting water from the borefields for potential leaks and ruptures.	Biweekly
Sacrificial Borefield Relocations	Plan sacrificial borefield relocations with consideration of hydrogeological and environmental aspects.	Prior to sacrificial borefield relocation
Burial of Dewatering Pipeline	Sections of the dewatering pipeline are buried in areas of heavy traffic.	During sacrificial borefield relocation
Dewatering Discharge Points:	Natural rock and/or engineering structures are utilised at dewatering discharge points to minimise erosion Condition W9 of L7340/1997/9. Groundwater abstracted to allow the mining of ore (dewatering) is discharged to the environment through the approved discharge points as per licence L7340/1997/9 W8	During sacrificial borefield relocation

Parameter	Action	Timing
Groundwater Modelling	Data from the monitoring program to be incorporated into models describing the functioning of local and regional aquifers and use to improve understanding of hydrogeological systems.	Ongoing
	Use of improved models to predict impacts to groundwater systems, under a variety of possible dewatering and surface water discharge scenarios	Ongoing
Water use efficiency	Dewatering discharge is used as process water in the wet plant circuit.	Ongoing
	Excess water is discharged via discharge outlets where into local drainage lines, but is kept to a minimum.	
	Water is to be recovered from the waste fines cell and recycled into the wet plant or used for dust suppression.	
	Use discharge in the potable water supply if suitable.	
	Re-injection bores are to be used to reduce the environmental impacts from discharge.	
Water quantity	Extraction is currently 35GL/a for the Groundwater Licence 166205(1)	Ongoing

1.5 MONITORING AND REPORTING

Ongoing monitoring of aquifers is crucial to enable impacts to be detected. Full details of groundwater monitoring for Yandicoogina are provided in section 5 of the Groundwater Operating Strategy (2009). Data is collected according to the Groundwater Monitoring Procedure. Monitoring data is reviewed and evaluated for its integrity prior to entry into the RTIO local site data base. All data is migrated and stored/accessed via a central database (Envirosys). All data is frequently reviewed to determine the potential for developing trends. Data and interpretation of trends are reported to the DoW as part of the Annual (Triennial) Aquifer Review process required as condition of licence.

Borefield operation is optimised through continual monitoring of water levels within pumping bores to ensure minimum available drawdown is maintained to effect maximum discharge rates. Drawdown within the CID is limited by the relatively shallow saturated thickness of the productive aquifer and the depth of the production bore completions. The regional impact of dewatering is dependent on the hydraulic connection exhibited between the CID and alluvium and basement lithologies. Regional impacts are limited by the poor permeability exhibited by the bedrock lithologies.

The data derived from both the borefield operation and monitoring network will be periodically utilised to validate the RTIO Yandicoogina groundwater model. This model will provide the basis for assessing actual versus predicted dewatering performance and as a result provides an advanced tool for predicting future dewatering requirements and impacts of the operation.

In order to monitor the regional impacts of dewatering and re-injection at the Yandicoogina Operations, additional monitoring bores have been constructed in the CID, alluvial and basement aquifers at locations estimated to be outside of the immediate zone of influence of the dewatering borefields.

The operation of the dewatering production bores will be monitored regularly to ensure the discharge rates and pumping water levels are within the required design specifications. Adjustment of the bore discharge rates will be made, by utilising a control valve system within the bore head works, to ensure the individual production bores do not under or over pump, thus avoiding pump damage or failure to meet dewatering requirements. Production bores are generally equipped with two dip tubes to allow access for monitoring water levels, however, in some cases a single dip tube is installed. Water levels

are monitored using transducers and manual dip meters. Monitoring actions for groundwater are listed in Table 8 and locations are on Figure 4.

Table 8 Monitoring actions for groundwater

Topic	Parameter	Frequency	Location	Purpose
Pumping and re-injection bores	Pumps run hours and flows will be collected either via telemetry using magflow meters or manually via mechanical flow meters where these are installed	Monthly	All pumps	To track instantaneous and cumulative flow volumes.
Groundwater levels	Depth to water levels - manual measurement	Monthly	Dewatering production bores and CID, alluvial, and basement monitoring bores.	To track changes in groundwater levels
	Depth to water measurements – automatic data loggers	Every 24 hours (data will be downloaded and maintained on a quarterly basis).	Twenty-five monitoring bores that are equipped with data loggers	To track changes in groundwater levels
Groundwater quality W10(b) and W10(c)	Groundwater sampling for sites listed in the Part V operating licence	As per licence L7340/1997/9	Alluvium Bores As per the part V operating licence	To ensure alluvial groundwater quality is not compromised
	Field measurement of parameters to be tested as per the Groundwater Abstraction Licence (reported through the Groundwater Operating Strategy)	As per the Groundwater Abstraction Licence	As per the Groundwater Abstraction Licence	To ensure groundwater quality is not compromised
Dewatering and discharge	Monitor the water quality and volume of water discharged at the dewatering discharge outlets as per the part V operating licence. Report through the AER/TER.	As per the part V operating licence	Approved discharge points	To ensure water quality and flow rates remain at required levels
Regional monitoring	Water levels additional monitoring bores have been constructed		In the CID, alluvial and basement aquifers at locations estimated to be outside of the immediate zone of influence of the dewatering borefields.	

Reporting

Monitoring data is reviewed and evaluated for its integrity prior to entry into the RTIO central database (Envirosys). All data is frequently reviewed to determine the potential for developing trends. Data and interpretation of trends are reported to the regulatory agencies as part of the Annual (Triennial) Aquifer Review (AAR) process and the Annual (Triennial) Environmental Reporting (AER).

1.5.1 Contingency actions

Given that the Yandicoogina mine is an operation where groundwater levels are being deliberately drawn down to facilitate mining, the focus of contingency is on optimising the dewatering volume to ensure that water levels are sufficiently ahead of the mine plan. This is achieved by maximising the local impact but minimising the regional impact.

To date, aquifer performances have not justified major shifts in abstraction approaches, nor has the DoW or the DEC directed that such changes in abstraction be implemented. The results of environmental monitoring are provided to the DEC through the existing Annual Environmental Review process.

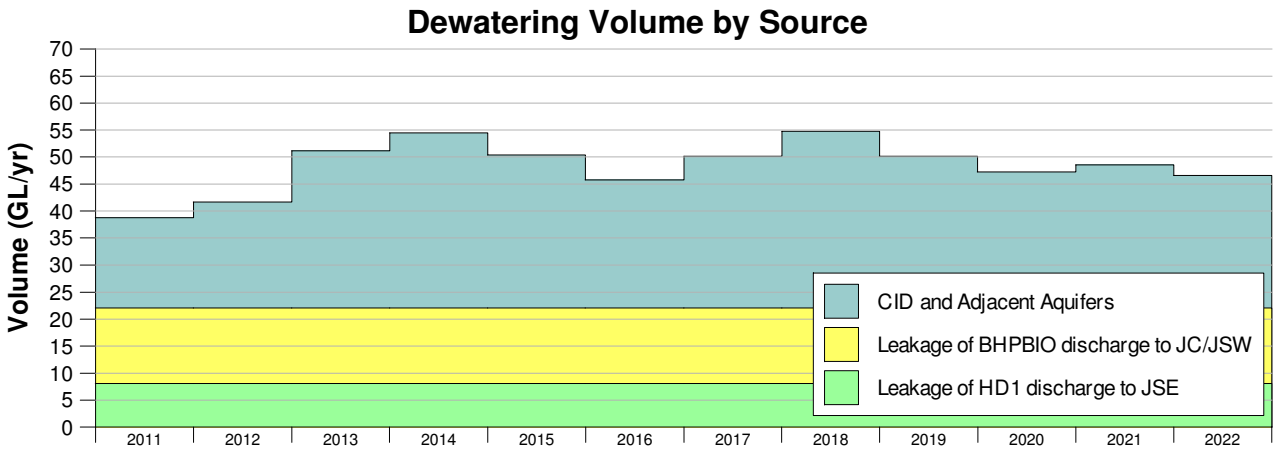
The extensive monitoring program and enhanced database (Envirosys) allows the impact of dewatering to be regularly assessed and investigated as required.

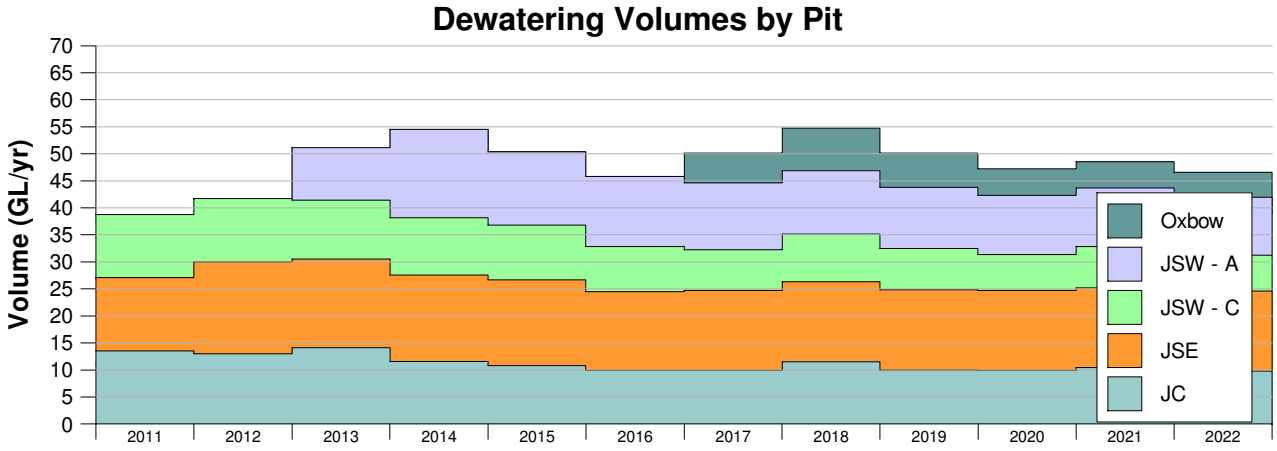
Table 9 Contingency actions for groundwater

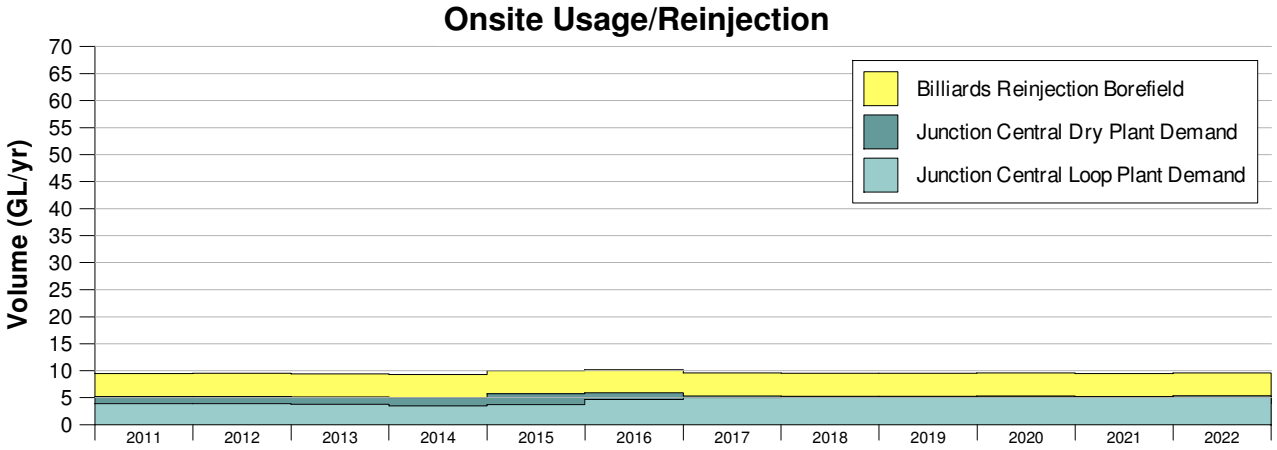
Trigger	Action
Inefficient Borefield Operation	Investigate individual bore performance efficiency and optimise through balancing discharge from borefields. If still insufficient drawdown for dry mining to continue bore pumps can be replaced with larger capacity pump units to maximise drawdown in production bores. If still insufficient drawdown additional dewatering production bores would be drilled, constructed, tested and licensed.
Unpredicted and/or Excessive Production Bore Water Levels Operating water levels in the dewatering production bores should not drawdown to within 5 m of the recommended pump inlet setting	Low level cut out devices are fitted to all the dewatering production bores. Should the cut out devices trigger pumping stoppages, a review of the historical data and the conceptual understanding will be undertaken.
Unpredicted and/or Excessive Monitoring Bore Water Levels	Reassess historical data and current local conditions, review conceptual model (modify if necessary) and conduct modelling using the RTIO Yandicoogina Groundwater Model to determine likely ultimate potential impact of water level observations. Report in accordance with Environmental Management Plan.
Higher than Anticipated Draw Up Water Levels in Re-Injection Bores Water levels within the re-injection bores should not rise above 3mbgl to avoid discharge to the environment	Should this occur injection flow rates for affected bores will be reduced and re-injection rates increased in other bores if possible. Thereafter re-evaluate the injection rate of the re-injection bore and adjust to maintain a constant head level. If necessary, conduct development of the re-injection bore to flush built-up sediments and clear clogging. If still excess water to the capacity of the re-injection borefield, then discharge will be directed to DO6.
Poor water quality from monitoring	Investigate possible cause. Make changes to improve water quality as per licence.
Infrastructure failure of any component to the re-injection borefield	Discharge to the Weeli Wolli drainage via DO6 will be undertaken.

Life of Mine Water Balance

BHPBIO and Hope Downs 1 Discharge at Licence Limits







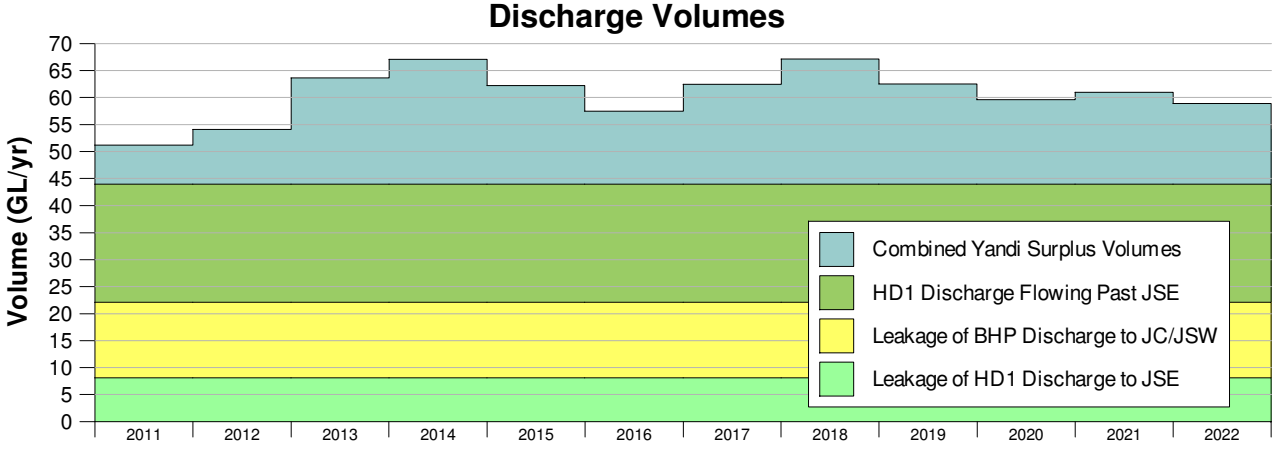
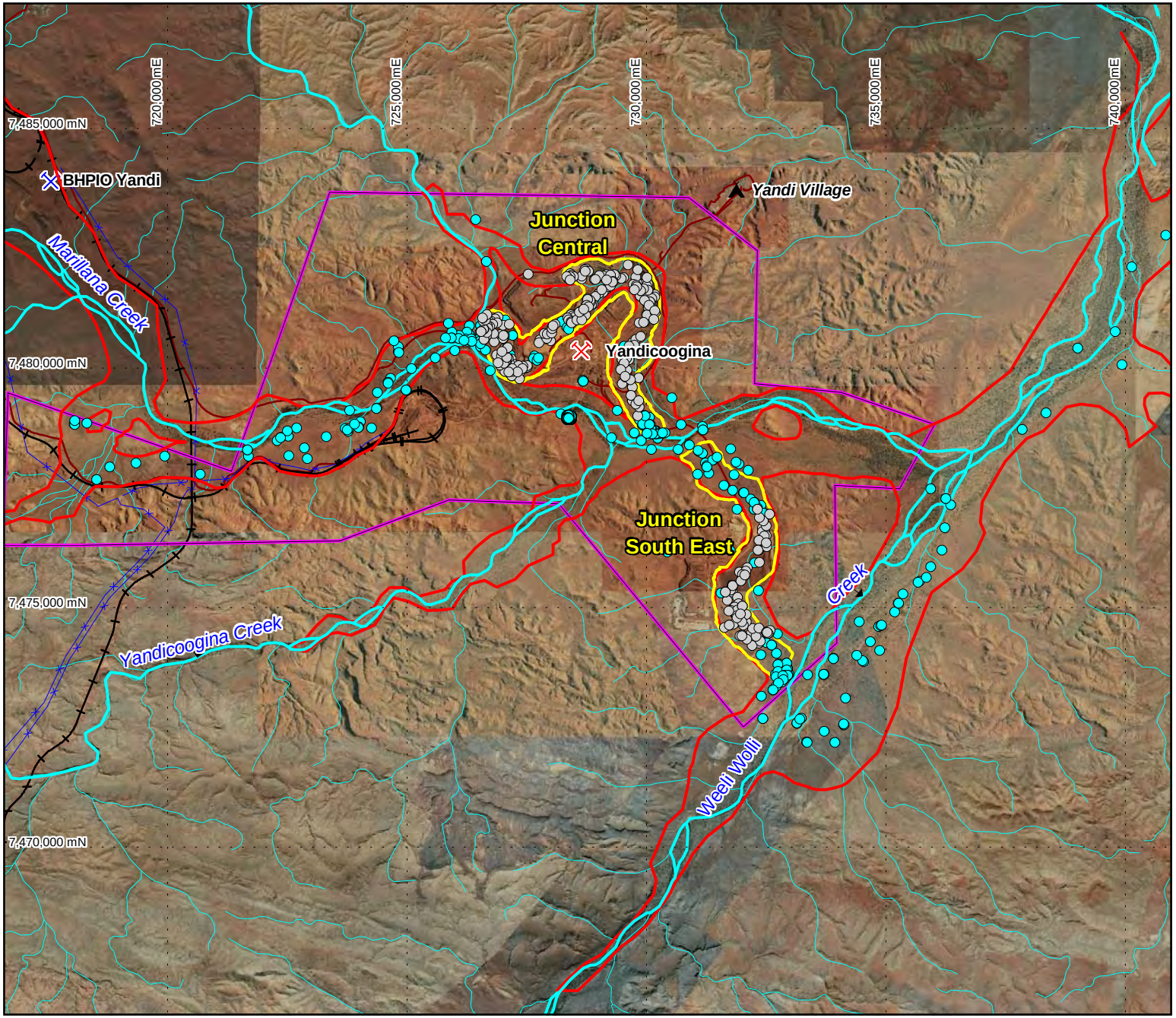


Figure 3: Life of Mine Water Balance



LEGEND

- Yandi Project Footprint
- Current Yandi mining
- Alluvium outline
- Groundwater Monitoring points - active
- Pre-mining Groundwater Monitoring points (mined out)
- Railway
- Powerline
- Road
- Major Creek
- Minor Creek

N

SCALE

0 2 4km

1:120 000 @ A4

RioTinto

Resource Strategy & Planning

Figure 4

Groundwater Monitoring Points

Drawn: M.Swebbs Plan No. PDE0074948v2
Date: February, 2011 Proj: MGA94 Zone50

2. SURFACE WATER MANAGEMENT PLAN

2.1 DESCRIPTION

The Yandicoogina Operations are located in the Marillana Creek regional catchment. Three significant creeks systems, Marillana Creek (Catchment 2250 km^2), Yandicoogina Creek and Phil's Creek, flow past the mine area contributing to the Marillana Creek catchment.

The Marillana Creek runs roughly east-west, with Junction Central north of the creek, Junction South-West spanning the creek, and Oxbow and Junction South-East south of Marillana Creek. Yandicoogina Creek flows from the south-west to the north-east, joining Marillana Creek adjacent to the mine, and Marillana then flows in to Weeli Wolli Creek (catchment 1750 km^2) east of the mine operations.

All creeks are prone to flooding during the wet season, but the annual average evaporation for the area (1783 mm) substantially exceeds the average annual rainfall (407 mm). Streamflow in Marillana Creek is ephemeral, usually with flow for over 200 days per year. There is a very wide range of natural streamflow from month to month, and from year to year. At present, BHPBIO Yandi discharges create continuous flow in the lower Marillana Creek. Studies completed address the potential wetting front of the cumulative discharge volumes in the Marillana Creek and Weeli Wolli Creek systems due to the dewatering from JSW and Oxbow. This includes consideration of the RTIO Yandicoogina, BHPBIO Yandicoogina and Hope Downs mining areas.

Flood Diversion

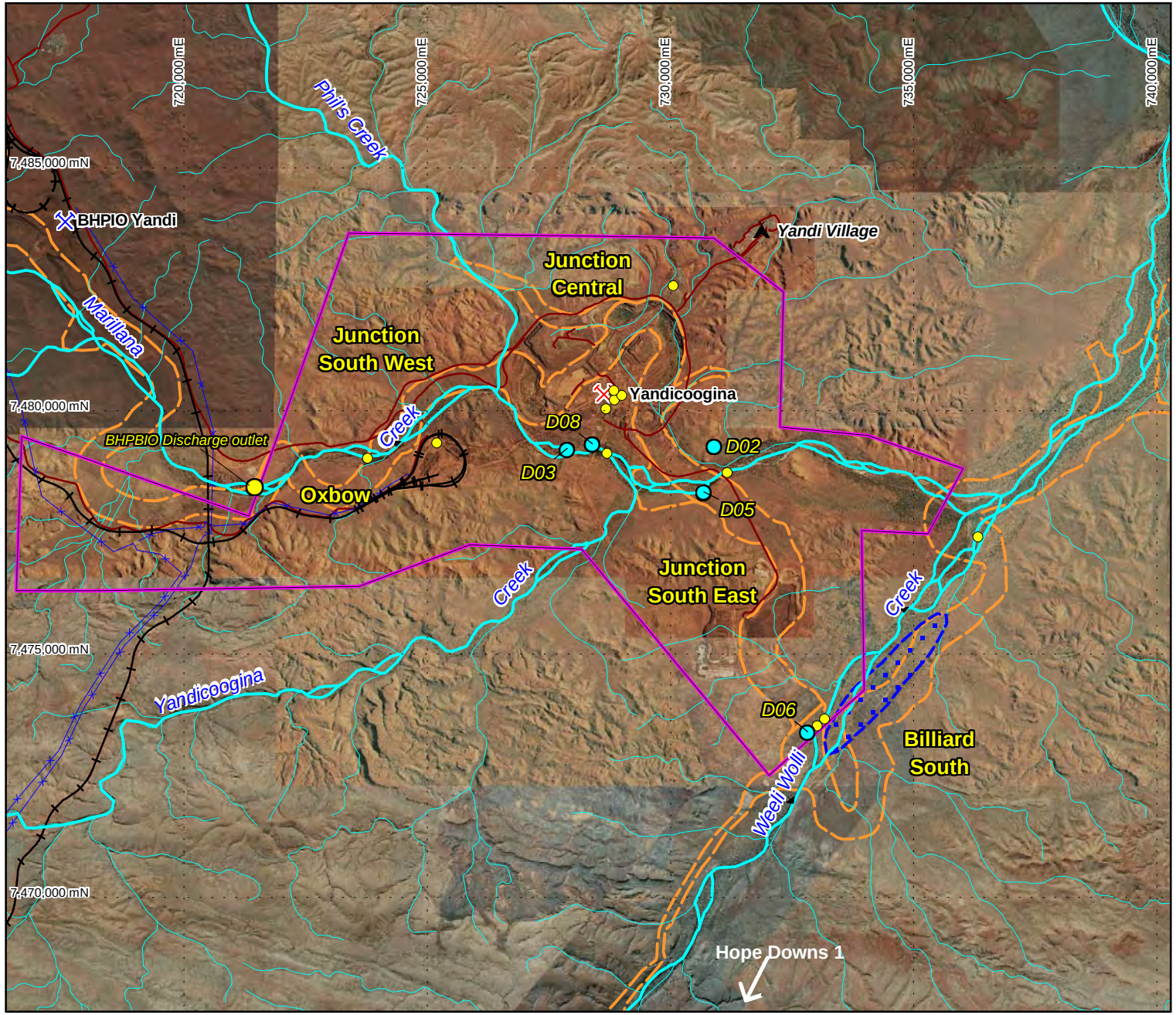
Bund walls (levees) have been constructed along the southern perimeters of the Junction Central mine site and plant area to prevent floodwater from Marillana Creek from diverting into the mine area. The northern Junction Central perimeter diversion channel is used to divert local catchment runoff away from the mine area, returning the clean water directly into a tributary to Marillana Creek.

Similar diversion levee and channels systems are in place along the pit edge of the southern half of the Junction South East deposit, to divert local catchment runoff back to Weeli Wolli Creek and prevent flood water from Weeli Wolli Creek from diverting into the mine area.

Phil's Creek Diversion

At Junction South West, the confluence of Phil's Creek with Marillana Creek will be temporarily diverted using levees to facilitate the expansion of the dewatered Junction Central pit towards the Junction South West deposit. The confluence will be reconstructed by back filling a portion of the Junction Central pit to the surface, re-diverting the flows back over an engineered channel then rehabilitating the new creekline for closure.

Diversion levees and channel systems will also be used north of Junction South West - C, south of Junction South – A, and southwest of Oxbow to manage flows from local tributaries to Marillana Creek.



LEGEND

- Yandi Project Footprint
- CID Boundary
- Billiard Re-injection borefield
- Surface Water Monitoring points
- DO5 Discharge Outlets
- Railway
- Powerline
- Road
- Major Creek
- Minor Creek

N

SCALE

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Rio Tinto

Resource Strategy & Planning

Figure 5

Location of Yandi discharge and monitoring points

Drawn: M.Swebbs
Date: February, 2011

Plan No. PDE0074948v2
Proj: MGA94 Zone50

Stormwater runoff from pit surrounds and flood protection

Within the Junction Central process area there are three separate drains, which drain towards the plant levee, two drains from the crushing/ore handling facilities and a third which drains the areas of the associated infrastructure (workshops, vehicle washdown facility, administration buildings and power station). These drains are used to control and discharge surplus water and general rainfall runoff. On reaching the levee the water is impounded in two sediment retention basins. The levee has pipe culverts allowing discharge of surface water runoff towards Marillana Creek. These culverts incorporate floodgates to prevent backflow when the Marillana Creek is in flood (for an approximately 500 year flood event).

Within the Junction South East process area, local catchment flows are diverted around infrastructure using local drains and culverts to transfer runoff to the larger southern diversion levee and channel system, returning water to Weeli Wolli Creek.

All wash waters from the vehicle washdown facility pass through a sediment trap and then through a triple plate oil/water separator. Only quick-break detergents are used on site for the washing down of equipment and around the plant, which aids in the performance of the separator.

Plate oil/water separators treat water from the power station, bulk fuel offloading point behind the power station and the Loco refuelling and diesel offloading facilities in the rail loop. There is also a sedimentation dam at the loadout facility that receives washdown waters from the load out tunnel.

Culverts under the rail and rail loop maintain flow from local drainage under the rail and through the rail loop. Water entering the rail loop is diverted through the load out area and returned to Marillana Creek via the loadout sedimentation dam.

There is a small concrete hardstand area at the ANFO facility that the auger/hopper is placed upon and there are drainage structures in place to capture any spillages from the facility.

Any waters that accumulated in the bottom of an active pit after a rainfall event is incorporated into the groundwater dewatering network then subsequently monitored and discharged as required by the Environmental Licence.

Creek Crossings

Crossings between the deposits over Marillana Creek are strictly controlled. Haul and access road crossings are designed to convey small flows under the road using culverts with inlet and outlet controls to minimise erosion. Larger flood events over top the road and the subsequent damage is repaired once conditions are safe to approach the creek.

Relevant ministerial conditions are listed in Table 10.

Table 10 Ministerial conditions relevant to surface water

Relevant document	Requirements	Addressed
Ministerial statement 695: Junction South-East	Prepare and implement a Riparian Vegetation Management Plan, and review and revise the plan every 5 years Objectives of the plan: 1. Maintain the flow paths, quantity and quality of water within Marillana, Yandicoogina and Weeli Wolli Creeks and the underlying aquifers to protect surface water and groundwater dependent ecological systems 2. See also Riparian Vegetation Management Plan Section 6	This section
Ministerial statements 417 and 523: Junction Central	A detailed Environmental Management Program including • Surface water monitoring and management, including measures for the protection of the integrity of Marillana Creek • Sheet and drainage management along the railway • Schedule 2: Proponents Environmental Management Commitments (April 1996): • Evaluate and understand hydrogeological systems	

2.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

Yandicoogina Mine Operations have the potential to affect the flow paths, quantity and quality of water within the major creeklines through:

- diversion structures/levees and creek crossings altering natural surface flow (can affect downstream vegetation or cause ponding upstream)
- temporary diversion of Phil's creek
- increased erosion associated with earthworks
- runoff/surface water contamination
- release of discharge water to creeks.

Discharges into Marillana Creek system from surplus water produced from dewatering at the existing Hamersley Iron Yandicoogina operation and the BHPBIO operation upstream have maintained artificially high water levels in the creek alluvials. Marillana creek subsequently feeds into Weeli Wolli Creek where Hope Downs 1 Mining Operations currently discharges into. HI Yandi operations more recently in 2010 have commenced a portion of discharge into Weeli Wolli Creek. These discharges have resulted in some changes in the composition of creek vegetation along sections of the creeks due to the increased water availability, with sustained high recruitment densities of riverine species downstream of the discharge areas. Vegetation in the Pilbara region is well adapted to the highly variable Pilbara climate, and the creek vegetation is expected to adapt back to drier conditions once the flow is reduced.

Excess dewatering water is utilised by the local mine processes where possible amounting to ~30% of the total volume and the excess directed to either the Marillana Creek upstream of the JSE pits through four discharge outlets; a fifth outlet, one in Weeli Wolli creek or into a purpose built re-injection borefield screened within the Weeli Wolli CID semi-confined aquifer downstream of mining.

Other than the discharge of surplus water into creeks, there is unlikely to be any other change in the quantity of water entering the creeklines as flows are ephemeral and derived from surface runoff. The

mine operations will cause no change in runoff other than the loss of surface catchment area associated with the approved mine pit.

2.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The objectives of this plan are to:

- minimise discharge into the creek systems to minimise impact to Weeli Wolli, Marillana and Yandicoogina creeks
- maintain flow paths and quantity in the creeks.

The plan sets out procedures to:

- minimise volume of run-off impounded by structures
- maintain the flow paths, quantity and quality of water within Marillana, Yandicoogina and Weeli Wolli Creeks and the underlying aquifers to protect surface and groundwater dependent ecological systems
- minimise requirement for discharge
- maintain a 200m mine pit buffer around Weeli Wolli, Marillana and Yandicoogina creeks (with the exception of Marillana creek in the vicinity of JSW pits)
- report on the management actions and monitoring results.

The specific environmental objectives for surface water are provided in Table 11:

Table 11 Environmental objectives, targets and indicators for surface water management

Management objective	Target	Key performance indicators
Evaluate water use and alternative management options for the purposes of minimising discharge to creek systems	Minimise discharge and therefore impact to the Weeli Wolli, Yandicoogina and Marillana Creeks.	Visual inspection and monitoring of creek lines. Alternative strategies to be investigated.
Maintain flow paths and quantity in creeks	No diversion structures built across the catchment boundaries of the major creeks or within creek lines during mine life with the exception of a levee to facilitate realignment of the low-flow line at JSW.	Visual inspection of creek line
	Diversion structure in place to prevent surface flows (other than direct rainfall) entering the mine pit.	Review of drainage plan Visual inspection of water flows
	Minimise structures required to be built within major creek lines during mine life.	Review of drainage plan Visual inspection of creek line
	Use or dispose of surplus water generated from mine dewatering other than into creeks where possible.	Review of discharge volumes into creeks
	Maintain low-flow line in Marillana Creek.	Review of drainage plan Visual inspection of water flows.
Maintain the quality of water in creeks	No significant change in creek water quality parameters.	Water Quality data
Evaluate alternative discharge locations and methodologies	Continually research the best alternative for discharge of surface water.	The existence of up to date options and information
To minimise the environmental impact of runoff from the mine area	Quality of water discharged exceeds criteria in Environmental licence.	Quality of water discharged meets criteria in Environmental licence

2.4 IMPLEMENTATION STRATEGY AND MANAGEMENT ACTIONS

The management actions in Table 12 aim to provide a mechanism to achieve the objectives and targets.

Table 12 Management actions for surface water

Parameter	Action	Timing	Location
Maintain flow paths in creeks	Minimise volume of runoff impounded by structures.	During design and Construction	Marillana and Yandicoogina Creeks
	Road crossings over Marillana Creek floodplain will be designed to convey small flood events under the cross and larger events over the crossing, employing inlet/outlet culvert and embankment protection suitable for large flood events. This will minimise impact of the crossing on larger flood events as well as minimising the damage to the crossing. Minimising damage to the crossing will minimise the amount of debris released to the creek and minimise the amount of additional disturbance to the creek required to rebuild the crossing.	During construction	Yandicoogina and Marillana Creek crossings
	Divert tributaries around pits to maintain creek flow	During mining	JSW and Oxbow
Maintain flow paths towards creeks	Avoid construction of diversion structures across the major creek catchment boundaries.	During design and construction	Marillana, Yandicoogina and Weeli Wolli Creek catchments
Minimise changes to flow in creeks	Design drainage structures to ensure that the destination of surface flows to the major creeks remains the same.	During design and construction	Yandi Mine area
	Continue to investigate viable and practical options as alternatives to disposal of surplus mine dewater to creeks.	During dewatering	Yandi Mine area
	Implement re-injection of dewater into the Billiards CID aquifer.	During dewatering at Yandicoogina JSE	Billiards CID aquifer
	Use dewatering and sump water throughout the operation, wherever practicable.	During dewatering	Yandicoogina Mine area
	Alternate, existing braided channels within the Marillana Creek floodplain will be utilised to receive the Marilanna Creek low flow water. This will minimise the disturbance to the creek ecosystem by mimicking a natural migration of the Marillana Creek low flow channel.	During dewatering	Discharge sites
Maintain acceptable water quality discharge into creeks	Ensure surplus water discharged to creeks meets the licensed discharge criteria set out in the relevant DEC licences.	During dewatering	Discharge sites
	Site discharge points and manage the discharge of surplus water to minimise erosion and scouring impacts.	During construction of discharge sites and during dewatering	Discharge sites
	Design drainage and levee structures using rock armouring and velocity dissipation structures to minimise erosion and resulting sedimentation.	During construction and operation	Yandicoogina Mine area
	Design and maintain creek crossings to minimise erosion.	During construction and operation	Creek crossings
	Maintain surface water drainage and treatment structures – all sedimentation basins, hydrocarbon treatment facilities and drainage structures to be inspected and maintained on a regular basis.	Ongoing	Creek lines
	Accidental Spills: Spillages of chemicals, hydrocarbons and explosives are contained and cleaned up immediately to minimise contamination of surface waters. Concentration of recoverable hydrocarbons in waters discharged from the premises (with the exception of dewatering effluent) does not exceed 30 mg/l. Licence condition W2.	Ongoing	Creek lines Discharge point
	Water quality parameters will be monitored for off-site discharge (as per schedule) to identify contamination.		

Parameter	Action	Timing	Location
Minimise requirement for discharge	Use dewater where possible in mining operations (e.g. dust suppression).	During dewatering	Yandicoogina Mine area
Buffer	Maintain a 200 m distance (no mining) between the mine pit and the Marillana, Yandicoogina and Weeli Wolli Creeks, with the exception of JSW and levees required for flood protection.	During mining	Yandicoogina JSE, Marillana, Weeli Wolli and Yandicoogina Creeks
Clearing	Clearing to be carried out consistent with the Rio Tinto Iron Ore Approvals Coordination procedures and any Government approvals and permits.	During construction and mining	Creek crossings
Stormwater	Contaminated stormwater is retained on the premises to allow treatment for sediment and total hydrocarbons prior to discharge off the premises. (Licence L7340/1997/9 condition W1(a)). Sedimentation basins are to be maintained at each point of discharge (with the exception of dewatering discharge) from the premises such that there is sufficient retention time within the basin to reduce suspended solids prior to discharge of waters offsite. Condition W1(b).	During construction and mining	Across site

2.5 MONITORING AND REPORTING

The monitoring program of surface water will focus on the quality and quantity of surface flows in the major creeks (Table 13).

Table 13 Monitoring actions for surface water

Topic	Parameter	Frequency	Location	Purpose
Discharge water quality	As per Part V operating licence	As per Part V operating licence	End of pipe at approved discharge sites	To determine that discharge water meets the water quality criteria to be defined in the Environmental licence. See also section 1.5.
Discharge water quality and volume	As per Part V operating licence	As per Part V operating licence	Levee Bank	
Discharge Water quality	As required	As required / Opportunistically	Process water discharge JSE OWS HV/LV wash pad Rail Loop OWS MEM OWS	To ensure discharge water meets the internal water quality criteria as specified by Rio Tinto.

2.5.1 Contingency actions

Contingency actions will be initiated in the event that surface water environmental targets are not being achieved.

Table 14 Contingency actions for surface water

Trigger	Action
Discharge water quality does not meet licensed discharge criteria	1. Identify source of contamination. 2. Remove cause of contamination or treat water prior to discharge
Creek water quality significantly different from expected baseline quality	1. Investigate cause of water quality change 2. If the change is due to mining, remove cause as required
Discharge volumes exceed licence limits	Evaluate reasons for exceedance and report finding to the DEC.

3. VEGETATION AND FLORA MANAGEMENT PLAN

In most circumstances, including this assessment, the EPA applies the following management objective for the protection of vegetation and flora:

To maintain the abundance, species diversity, geographic distribution and productivity of flora and fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

3.1 DESCRIPTION

This section complies with:

- Condition 4 of Ministerial Statement 417
- Condition 9 of Ministerial Statement 695.

The physical, biological and social environments of the Yandicoogina Mine area are described in the Yandicoogina Iron Ore Mine and Railway Project Consultative Environmental Review (Hamersley Iron 1995) and the Yandicoogina Junction South East Expansion Project Environmental Protection Statement (Strategen 2005) and the scoping document for the JSW and Oxbow mines (MWH 2010).

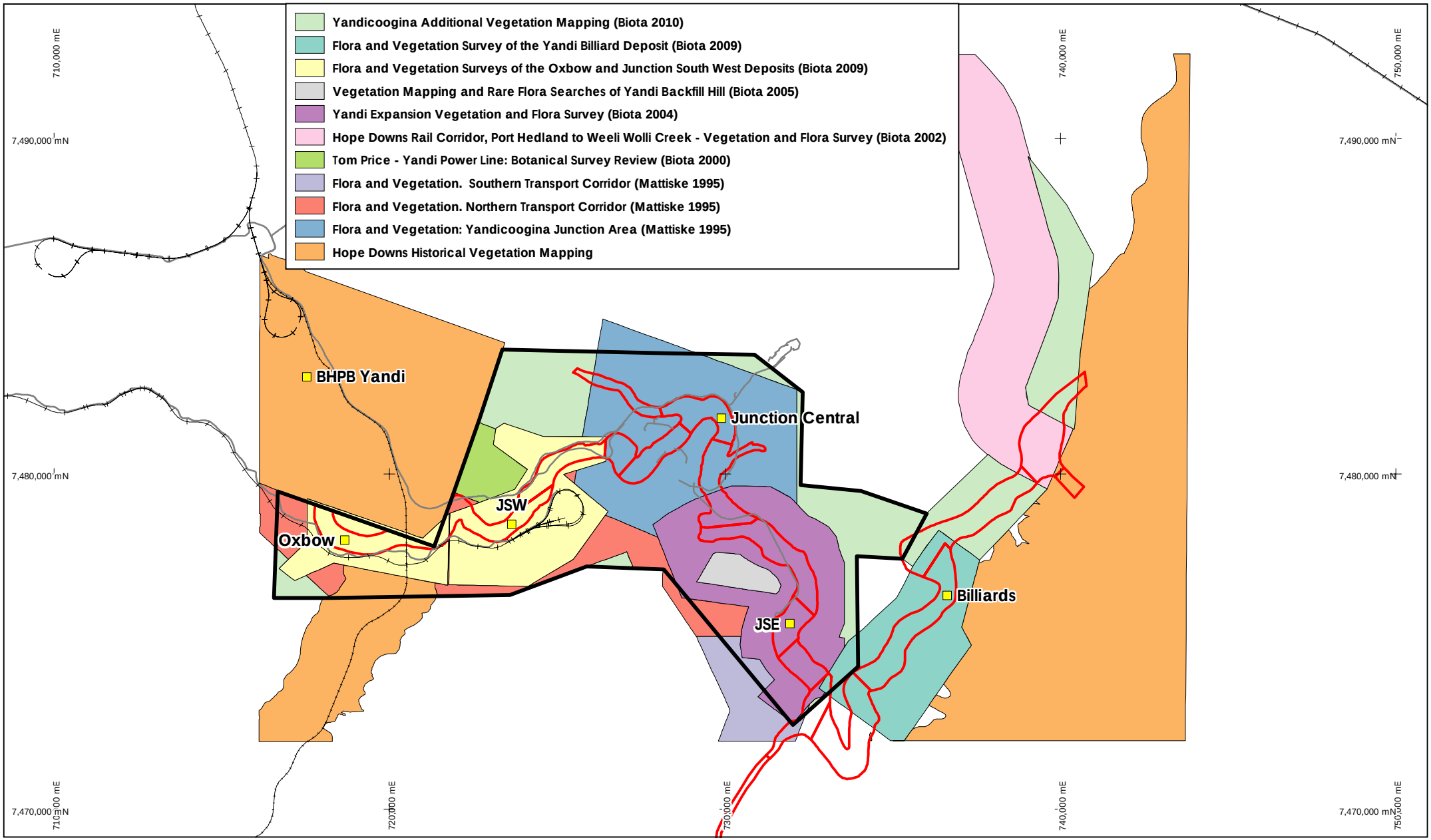
A number of flora and vegetation surveys have been undertaken in the Yandicoogina Mine area including a series of surveys undertaken by Mattiske and Associates in 1995 for the project area. The most recent flora and vegetation survey in the Yandicoogina Mine area was undertaken for the Yandicoogina JSW & Oxbow area (Biota 2010a) (Figure 6).

The vegetation in the Yandicoogina locality is dominated by the following plant families:

- *Poaceae* (grasses)
- *Malvaceae* (hibiscus)
- *Mimosaceae* (wattles)
- *Papillonaceae* (peas)
- *Asteraceae* (daisy's)
- *Amaranthaceae* (Mulla-mulla).

Although *Eucalyptus* species appear prominent as emergents in the hummock grasslands, they are dominant only in the creeks and river beds. Many of the vegetation communities have been influenced by past activities and events such as grazing and fire. The effect of these factors on plant communities has been to restrict certain components of those communities; for example, grazing by introduced animals has led to the selective removal or reduction of some palatable understorey species along the main drainage lines and on the flats (Mattiske 1995).

Most of the plant communities occurring in the Yandicoogina Mine area are considered common in the Pilbara (Biota 2004a). The vegetation types fall into three main vegetation groups, related to topography (Table 15).



Location Map

Yandi PER boundary

RTIO resource boundary

Railway

Road

N

0 2.5 5

kilometres

Biota Environmental Sciences

Figure 6
Yandi
Location of Vegetation and Flora Surveys

Author: Biota | Drawn: A Brown | Dwg No.: 595 | Date: 03 Feb 2011 | Revised: | Projection: MGA Z50 (GDA94) | Scale: 1:150,000

No Threatened Ecological Communities listed under the *Environmental Protection and Biodiversity Conservation Act* 1999 or by DEC are known to occur in the Yandicoogina Mine area (Protected Matters Search 2010). The vegetation types occurring in the major creeks in the Yandicoogina Mine area, particularly in the section of Yandicoogina Creek west of the Marillana Creek junction, are of conservation significance at the level of the Hamersley Range sub-region.

Table 15 Description of vegetation types (adapted from Biota 2004)

Vegetation group	General description
Low stony hills	Low stony hills generally with a scattered overstorey of *Eucalyptus leucophloia* (Snappy Gum), *Corymbia hamersleyana* (Bloodwood), *Acacia inaequilatera* (Kanji) and/or *Hakea chordophylla* over moderately dense spinifex, predominantly *Triodia* aff. *basedowii*, with some *T. wiseana* on slopes.
Valleys (Mosaic communities)	Undulating, low stony plains in valleys generally comprising of *Corymbia hamersleyana* (Bloodwood) over sparse mixed shrubs and various species of spinifex. Alluvial flats are dominated by *Acacia aneura* (Mulga) and other *Acacia* communities over moderately rich assemblages of shrubs, herbs and tussock grasses, as well as spinifex, *Triodia wiseana* and *T. pungens*.
Creeks	Drainage lines vary from small gullies in upper hills to more major creeklines in the Hamersley Ranges (Weeli Wolli, Yandicoogina and Marillana Creeks). Small, stony creeks in hills differ very little from the vegetation type surrounding them, and are usually species poor with occasional Eucalypts over *Triodia* aff. *basedowii* and *T. wiseana*. Lower in the landscape, they become more densely vegetated and species rich, including Eucalypt and Bloodwood species, shrubs, annual and perennial tussock grasses and herbs. Major creeklines comprise of woodlands and forests of *Eucalyptus camaldulensis* (River Red Gum), *E. victrix* (Coolibah) and other tree species over mixed shrublands, grasslands and herbs. Spinifex (usually *T. pungens* or *T. longiceps*) is comparatively sparse in drainage lines. Typical shrubs in drainage lines include *Acacia coriacea* subsp. *pendens* (major creeks only), *A. ancistrocarpa* (mainly in minor creeks), *A. bivenosa*, *A. pyrifolia*, *A. tumida* var. *pilbarensis*, *Gossypium robinsonii* and *Petalostylis labicheoides*. Major creeks sometimes have areas of apparent permanent or persistent water, that support specialised water plants.

Large creek systems that have persistent available water do not occur extensively within the Hamersley Range. These typically have relatively high species richness and support numerous flora (and fauna) species that are restricted to and reliant on such habitat (Biota 2004a). All ephemeral watercourses of the Hamersley Range sub-region are considered to be at risk, as they are frequently subject to threatening processes, particularly heavy grazing pressure and weed infestation (Kendrick 2001).

3.2 SIGNIFICANT FLORA

The suite of flora species recorded from the Yandicoogina Mine area is largely typical of that expected for this part of the Hamersley Ranges. The area has moderate conservation value for both general flora and significant flora species.

While all native flora are protected under the *Wildlife Conservation Act 1950,* some plant species are assigned an additional level of conservation significance based on the limited number of known populations and the perceived threats to these populations (Table 16). Species of the highest conservation significance are designated Declared Rare Flora (DRF), either extant or presumed extinct. Species that appear to be rare or threatened, but for which there is either insufficient information to properly evaluate their conservation significance or they are variously threatened to a lesser degree than DRF, are assigned to one of four Priority Flora categories.

Table 16 Categories of conservation significance for flora species

Category	Description
Declared Rare Flora	
Extant taxa	Taxa that have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction or otherwise in need of special protection
Presumed extinct	Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently
Poorly Known Taxa	
Priority 1 (P1)	Taxa which are known from one or a few (generally <5) populations which are under threat
Priority 2 (P2)	Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under threat
Priority 3 (P3)	Taxa which are known from several populations, at least some of which are not believed to be under threat
Rare Taxa	
Priority 4	Taxa which are considered to have been adequately surveyed and which whilst being rare, are not currently threatened by any identifiable factors

One plant listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* is listed as 'species or species habitat likely to occur within area' (EPBC Protected Matters Search 2010). This plant is the Hamersley Lepidium or Hamersley Catapycnon (*Lepidium catapycnon*), an open woody perennial herb or shrub, 0.2 – 0.3 m high which is generally found on skeletal soils and hillsides. This species is also a Declared Rare Flora species on a state level.

DRF populations of *Lepidium catapycnon* have been found by Hamersley and Biota surveys around the rail loop; near the overland conveyor and on the margins of the Marillana creek floodplain south of JC; near JSE; and on a hilltop area south of Oxbow. Several species of Priority Flora were found (Figure 7). These are listed in Table 17.

Table 17 Priority flora recorded within the Yandicoogina Mine area

Species	Status	Description
Lepidium catapycnon	DRF (WA) Vulnerable (Cth)	Perennial, woody herb or shrub that characteristically occurs on stony hillslopes. It has been recorded to the south of the JC deposit around Marillana creek, the rail loop and existing conveyor areas, and near the JSE deposit.
Goodenia nuda	Priority 4	An erect, ascending slender herb occurs near creeklines and wet areas. It has been recorded from the edge of the Marillana creek flood plain near the rail loop and north-west of the JC pit.
Sida sp. Barlee Range (S van Leeuwen 1642)	Priority 3	Low shrub recorded from a single site on the bank of Yandicoogina creek in the JSE location.
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Priority 3	Perennial tussock grass recorded from one site in the JSE location.
Rostellularia adscendens var. latifolia	Priority 3	Annual herb, up to 30 cm high, recorded on the edge of Marillana creek near JSW-C
Rhynchosia bungarensis	Priority 4	Compact, prostrate shrub, to 50 cm high, recorded within the Junction Central Operations footprint

Reference source Priority Flora species were recorded by Biota (2010a) and Biota (2011b).

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7,485,000 mN
7,480,000 mN
7,475,000 mN
BHPB Yandi
Junction Central
Oxbow
JSW
JSE
Billiards
Refer to Fig 3-7b
Refer to Fig 3-7c

Location Map

- Yandi PER boundary
- Conceptual pit outline
- Conceptual waste dump outline
- Conceptual topsoil stockpile areas

Vegetation Groups

- Disturbed
- Hills/Ridges/Breakaways
- Major Creekline and Tributary
- Minor Creeklines, Flowlines and Valleys
- Plain/ low undulating hills
- Plains
- Volcanics

Flora

DRF

- *Lepidium catapycnon*

Priority 3

- *Sida* sp. Barlee Range
- *Themeda* sp. Hamersley Range
- *Rostellularia adscendens* var. *latifolia*

Priority 4

- *Goodenia nuda*
- *Rhynchosia bungarensis*

Other

- *Themeda* sp.
- *Rhodanthe frenchii*
- *Indigofera* sp.
- *Eriachne* sp.
- *Eucalyptus* sp.
- Weed

N

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kilometres

Author: R Warner | Drawn: A Brown | Job No.: 595
Date: 16 Feb 2011 | Revised: 13 June 2011
Projection: MGA Z50 (GDA94) | Scale: 1:80,000

Rio Tinto

Figure 7
Vegetation and Flora Conservation Values in the Project Area

Datum: GDA 94
Date: March, 2011

*Map Adapted from Biota Environmental Sciences

3.3 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following aspects of the Proposal have been identified as requiring management to ensure protection of flora and vegetation/habitat values:

- **clearing of vegetation** for mining areas, product and overburden stockpiles, and associated infrastructure (such as access/haul roads, camps and the crushing facility) will lead to the direct disturbance of vegetation/habitat and has the potential to affect significant flora species and lead to vegetation/habitat fragmentation
- **vehicle and earth movements** could potentially introduce and/or spread weeds.

Management of other aspects of the Proposal that may affect flora and vegetation is addressed in the Surface Water Management Plan – Section 2, Emissions Management Plan (dust, noise, greenhouse) – Section 12, and Fire Management Plan – Section 13.

3.4 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The objective for vegetation and flora is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities. Environmental targets and key performance indicators have been developed based on flora and vegetation/habitat management objectives for the Proposal (Table 18).

Table 18 Environmental objectives, targets and indicators for vegetation and flora management.

Management objective	Target	Key performance indicators
Ensure that clearing is as approved and is kept within the approved Proposal footprint.	No clearing or disturbance outside pre-defined boundaries of the approved Proposal footprint throughout the duration of the Proposal.	Visual observations of clearing operations. Environmental Incident Reports.
Minimise the clearing of vegetation/habitat within the approved Proposal footprint.	Opportunities to reduce the area of vegetation cleared within approved Proposal footprint are investigated and documented.	Aerial photographs. Mine Clearing Plan.
Avoid species and ecological communities with conservation significance wherever practicable.	Flag and avoid any conservation significant species and communities.	Monitoring results
Protect riparian vegetation (Section 6)	Impact to riparian vegetation is minimised.	Monitoring results and audits.
Consideration of cumulative impacts.	The development of strategies and controls to minimise these.	Monitoring results.

3.5 IMPLEMENTATION STRATEGY AND MANAGEMENT ACTIONS

Specific management actions have been identified to assist in achieving the flora and vegetation/habitat management objectives (Table 19).

3.5.1 Management actions

Table 19 Management actions for flora and vegetation

Parameter	Action	Timing	Location
Induction	1. The induction program will include information on: • the requirement to stay within clearing boundaries • reporting of incidents of clearing occurring outside the pre-defined boundaries • procedures to minimise the introduction and/or spread of weeds.	Prior to personnel commencing work on site.	
General	2. Access to non-operational areas will be restricted to authorised personnel and only on designated access roads, unless in case of emergency.	Ongoing.	Areas beyond the minesite
Clearing and earthworks	3. The approved clearing footprint will be documented on mining plans and made available to persons involved in clearing operations.	Prior to ground disturbance.	Site
	4. Opportunities to further reduce the clearing of vegetation within approved footprint will be investigated and documented on mining plans, such as using established access tracks and roads as far as practicable	Prior to ground disturbance.	Site
	5. The boundaries of vegetation to be cleared will be delineated in the field with pegs, flagging tape and/or as GPS coordinates in earthmoving equipment. Access beyond these boundaries will be restricted.	Prior to ground disturbance.	Site
	6. Priority 1 and Priority 2 Flora species will be flagged in the field and recorded as GPS coordinates in earthmoving equipment to prevent disturbance.	Prior to ground disturbance.	Areas beyond the minesite
	7. Where clearing of vegetation is unavoidable, the following will be undertaken: • areas will be rehabilitated progressively following disturbance to re-establish native vegetation • seed and plant species used in rehabilitation will be native to the Pilbara	Prior to ground disturbance.	Site
	8. Surveys will be undertaken to identify any significant species or communities for any new projects/expansions • investigate ways to minimise or avoid the clearing of significant species if identified • riparian vegetation will be managed as per the Riparian vegetation management plan section 6.	Prior to ground disturbance.	Site
	9. Cleared vegetative products will be utilised in rehabilitation areas (if practicable) to provide habitat and to provide a seed source in accordance with the Conceptual Closure and Rehabilitation Management Plan (Section 15).	Throughout clearing.	Site
Weed management See detailed weed management plan section 8	10. The distribution within the Proposal area of target weed species will be internally reported, recorded, mapped (GIS) and monitored.	Ongoing.	Site
	11. Weed control will be undertaken in areas to be disturbed	Prior to initial ground disturbance and ongoing	Site
	12. Weed hygiene measures for mobilisation and demobilisation of mining equipment entering and leaving the Proposal area will be implemented including procedures for: • inspecting the equipment • cleaning the equipment at the nearest wash-down facility, as required.	Prior to initial ground disturbance.	Site

Parameter	Action	Timing	Location
	13. Weed control will be undertaken in and around the Proposal area as part of an annual weed control program and as otherwise required.	Annually and as required.	Site

3.6 MONITORING AND REPORTING

The monitoring program for flora and vegetation/habitat (Table 20) has been designed to enable an assessment of the effectiveness of the flora and vegetation/habitat management actions in place.

Table 20 Monitoring actions for flora and vegetation

Purpose	Parameter	Frequency	Location
To ensure no unauthorised access beyond clearing boundaries.	Ensure that clearing boundaries are clearly marked. Clearing lines and marks and/or GPS co-ordinates in earth-moving equipment.	Monthly throughout duration of ground-disturbance to undisturbed areas.	Along clearing boundaries.
To ensure weed controls are adequately enforced.	See weed management plan section 8.		

3.7 CONTINGENCY ACTIONS

Table 21 identifies the appropriate contingency actions to be initiated in the event that the objectives for flora and vegetation are not met.

Table 21 Contingency actions for flora and vegetation

Trigger	Action
Unauthorised access beyond or breach of clearing boundaries.	1. Investigate cause. 2. Redefine boundaries if due to inadequate boundary marking. 3. Reinform all personnel of access restrictions beyond clearing boundaries. 4. Rehabilitate disturbed area in accordance with the Conceptual Closure and Rehabilitation Management Plan (Section 15). 5. Complete Environmental Incident Report.
Population(s) of conservation significant flora species, not previously recorded are found within the operational area.	1. Investigate opportunities to prevent or minimise the impact to the newly recorded flora. 2. Indicate individual plants to be protected in the site plans.
Introduction of new weed species and/or spread of existing weed species.	1. See weed management plan section 8.

4. FAUNA MANAGEMENT PLAN

4.1 DESCRIPTION

This section complies with:

- Condition 4 of Ministerial Statement 417
- Condition 9 of Ministerial Statement 695.

Existing environment

An extensive amount of fauna survey work has been undertaken in the Yandicoogina locality, largely in connection with previous mining approvals since the 1990's (Biota 2010). A review of this work in 2004 included the statement "*the region is one of the best collected in the State in terms of herpetofauna and mammals*" (Biota 2004a).

Some of the key surveys that have been completed include:

- Yandi (HI) biological survey (Ninox Wildlife Consulting 1995)
- BHPIO Yandi Stage II biological survey (Ecologia 1995)
- Weeli Wolli Springs biological survey (Ecologia 1998a)
- BHPIO Marillana Creek biological surveys (summarised in Halpern Glick Maunsell 1999)
- BHPIO Marillana Creek rare fauna survey (Bamford and Associates 2003)
- Yandi Expansion Desktop Fauna Assessment and Targeted Invertebrate Survey (Biota 2004b)
- JSW and Oxbow targeted survey (Biota 2010).

The latest survey yielded a total of 72 vertebrate fauna species across 38 families: including 46 six species of avifauna, 12 species of mammals and 14 species of herpetofauna. The mammal assemblage included 6 species of bats and 2 non-native species (the cow and donkey respectively). The recorded assemblage was considered to represent a subset of the vertebrate taxa that might be expected to occur in the Yandicoogina locality, which has previously been estimated at 147 species across 51 families (Biota 2004b).

A number of species with conservation significance were recorded or were assessed as having the potential to occur in the mining disturbance footprint and immediate surrounds (Figure 8) (Table 22).

None of these species have been assessed as having a special reliance on the habitats within the mining disturbance area.

7,490,000 mN

7,485,000 mN

ML274SA

Junction Central

L47/00108

7,480,000 mN

AM70/00274

JSW

Oxbow

Junction South East

7,475,000 mN

720,000 mE

725,000 mE

730,000 mE

735,000 mE

740,000 mE

7,470,000 mN

183

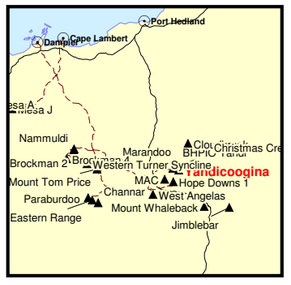
LEGEND

Tenure boundary

Pit outlines

Fauna Survey Areas

LOCATION MAP



SCALE

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RioTinto

Figure 8

Yandi
Location of Fauna Surveys

Drawn: MB
Date: 14/02/11

Plan No:
Proj:

Table 22 Species with conservation significance recorded or considered likely to occur

Species	State Level	Federal Level	Distribution
Species recorded in project area surveys (Biota 2010)			
Merops ornatus (Rainbow Bee-eater)	N/A	Migratory	Widespread throughout much of Western Australia.
Neochmia ruficauda subclarescens (Star Finch)	Priority 4	Vulnerable	Regarded as a Pilbara endemic. This species is typically confined to reed beds and adjacent vegetation communities along permanent waterways in the Pilbara.
Pseudomys chapmani (Western Pebble-mound Mouse)	Priority 4	N/A	Common to very common in suitable habitat with the Hamersley and Chichester sub-regions of the Pilbara.
Not recorded in project area surveys – but assessed as having a reasonable likelihood of occurrence			
Liasis olivaceus barroni (Pilbara Olive Python)	Schedule 1 - Vulnerable	Vulnerable	Regarded as a Pilbara endemic, this subspecies has a known distribution that coincides roughly with the Pilbara bioregion.
Falco hypoleucos (Grey Falcon)	Priority 4	N/A	Widespread but rare throughout the arid zone of Australia.
Falco peregrinus (Peregrine Falcon)	Schedule 4	N/A	This species occurs across much of the Australian continent.
Ramphotyphlops ganei (blind snake)	Priority 1	N/A	There is insufficient data known about the ecology of this species to determine whether it may occur within the habitats available within the study area.
Ardeotis australis (Australian Bustard)	Priority 4	N/A	This species occurs over much of Western Australia, with the exception of the more heavily wooded southern portions of the state.
Burhinus grallarius (Bush Stone-curlew)	Priority 4	N/A	This species occurs across much of the Australian continent.
Species known from the central Pilbara region but assessed as having a low likelihood of occurrence (on the basis of habitat and ecological preferences)			
Pezoporus occidentalis (Night Parrot)	Schedule 1 – Critically Endangered	Endangered	Night Parrots have been reported from every state on the Australia mainland. Most records come from hummock grasslands with spinifex (Triodia), from areas dominated by samphire, or particularly, where these two habitats are juxtaposed.
Dasyurus hallucatus (Northern Quoll)	Schedule 1 - Endangered	Endangered	Restricted to several disjunct areas across Northern Australia, including the northwest Kimberley and Pilbara regions of Western Australia.
Macrotis lagotis (Bilby)	Schedule 1 - Vulnerable	Vulnerable	Confined to Triodia hummock grassland and Acacia scrub across parts of northern Australia.
Leggadina lakedownensis (Short-tailed Mouse)	Priority 4	N/A	This species is known to occur in the Pilbara and Kimberley regions of Western Australia.
Macroderma gigas (Ghost Bat)	Priority 4	N/A	Restricted to the tropical north of the Australian continent.
Rhinonicteris aurantius (Pilbara Orange Leaf-nosed Bat)	Schedule 1 - Vulnerable	Vulnerable	It occurs in the Pilbara region of Western Australia, through the Kimberley and across the Top End into north-western Queensland

4.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

Clearing within the Mining Area will cause loss of habitat reducing the amount of habitat available to fauna species that occur in the area to be mined. These habitats are common in a local and regional context and the impact of this loss on fauna species will be minimal.

The increased period for dewatering associated with the additional Mining Areas will extend the duration of surface pools around the discharge points, especially in Marillana Creek. This is likely to increase abundance of some water-dependent fauna species until dewatering ceases and the artificial ecosystem will revert back to its more 'natural' state.

The few Threatened and Priority fauna species observed or expected to occur in and around the Mining Area Extension are unlikely to be significantly impacted due to their widespread distribution, and in many cases, their high mobility.

The following aspects of the Proposal have been identified as requiring management to ensure protection of fauna values:

- **loss of habitat** could potentially lead to the death of some fauna
- **habitat fragmentation** due to clearing and the presence of linear infrastructure such as roads
- **habitat alteration** due to dewatering and discharge into creeklines
- **vehicle and earth movements** during construction and operation could potentially lead to the occasional death of individual fauna, particularly less mobile species or slow moving species
- **human activity and obstructions** could affect fauna behaviour and distribution, and could create conditions favourable for feral animals (introduction of predators such as cats and foxes)
- **mining operations** may disturb fauna in nearby areas from light and noise.

Management of other aspects of the Proposal that may affect fauna values is addressed in Section 3 (Vegetation and Flora Management Plan), Section 3 (Surface Water Management Plan) and Section 2 (Fire Management Plan) in this EMP.

4.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

This management plan complies with:

- Condition 4 of Ministerial Statement 417
- Condition 9 of Ministerial Statement 695.

The environmental objectives, targets and indicators for fauna management are detailed in Table 23.

Table 23 Environmental objectives, targets and indicators for fauna management.

Objective	Target	Key performance indicator
Protect native fauna.	Maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts	Fauna deaths reported. Area of habitat protected.
Avoid species and ecological communities with conservation significance wherever practicable	Mark out areas of significant habitat that are to be avoided.	Visual observations.
Protect uncleared habitat from threats and disturbance	Areas of uncleared habitat around the minesite remain as viable fauna habitat.	Visual observations.

Objective	Target	Key performance indicator
Develop rehabilitation completion criteria to provide the basis for reinstating fauna habitat values post mining	Clear criteria available for rehabilitation and closure.	Monitoring data
Minimise the effect of feral animals on native terrestrial fauna	All domestic rubbish (which may attract feral fauna) disposed of into covered rubbish bins.	Visual observations. Environmental Incident Reports.

4.4 IMPLEMENTATION STRATEGY AND MANAGEMENT ACTIONS

4.4.1 Management actions

Specific management actions have been identified to assist in achieving the fauna management objectives as detailed in Table 24.

Table 24 Management actions for fauna protection

Parameter	Action	Timing	Location
Induction	The induction program will contain information on: • potential for mining activities to affect fauna and fauna habitat • fauna encounter procedures • important fauna habitat, such as rocky areas near water courses • feral animal controls.	Induction.	Site
Native fauna protection	The feeding of fauna, hunting, or keeping of firearms or pets onsite will be prohibited.	Ongoing.	On and off site
	All vehicles will remain on designated roads and will not be permitted off designated roads unless in the case of emergency. Vehicle "no-entry" sites will be designated and communicated to project personnel.	Ongoing.	On and off site
	Appropriate speed limits for both mining equipment and light vehicles will be implemented, sign-posted and enforced; all personnel will observe onsite vehicle speed limits to prevent the likelihood of road kill.	Ongoing.	On and off site
Native fauna encounter	Native animals encountered onsite will be given the opportunity to move on if there is no threat to personnel safety in doing so. All animal strikes by vehicles will be recorded and documented.	Ongoing.	All areas
Feral animal species	Feral animal control measures will be implemented, including: • prohibiting the feeding of animals • prohibiting the keeping of pets • food scraps and other waste will be appropriately disposed of to onsite waste disposal bins • regular trapping programs.	Ongoing.	On and off site
Habitat protection	Clearing areas are well defined and demarcated on the ground to ensure that operators clear only what is necessary.	Prior to ground disturbance	Site
	New tracks will not be constructed without permission	Ongoing	
New projects /extensions	Surveys for significant species will be undertaken when planning new projects or extensions to the mine.	During planning	
	If significant species are identified, a management plan will be developed to avoid or minimise impact to the species.	During planning	

Parameter	Action	Timing	Location
Habitat restoration	Completion criteria will be developed as part of the Closure and Rehabilitation plan to provide the basis for functioning habitat post mining.	During closure planning	

4.5 MONITORING AND REPORTING

Table 25 provides monitoring actions to enable an assessment of the effectiveness of the terrestrial fauna management actions in place.

Table 25 Monitoring actions for terrestrial fauna management

Purpose	Parameter	Frequency	Location
To ensure that no domestic waste is left where animals may access it.	Waste disposal area/s are not being accessed by animals	Monthly and opportunistically throughout duration of mining operations.	Waste disposal areas.
To ensure Fauna populations are adequately protected	Review fauna death and injury data	Annually	Across site, particularly haul roads

4.5.1 Contingency actions

Table 26 identifies the appropriate contingency actions to be initiated in the event that the objectives for terrestrial fauna management are not met.

Table 26 Contingency actions for fauna management

Trigger	Action
Fauna killed or injured	1. Investigate cause. 2. Review travel arrangements. 3. Reinform all personnel of care whilst driving. 4. Complete Environmental Incident Report.
Population(s) of conservation significant fauna species not previously recorded are found within the operational area.	1. Investigate opportunities to prevent or minimise the impact to the newly recorded species. 2. Indicate specific habitat to be protected in the site plans.
Introduction of new feral species.	1. Undertake pest control.

5. SIGNIFICANT SPECIES MANAGEMENT PLAN

5.1 DESCRIPTION

Condition 9 of Statement 695 requires staged flora and fauna surveys to determine the presence/absence of any conservation significant species. If these species are located then the requirement for a significant species management plan is triggered.

The key objective for a significant species management plan would be to:

- maintain the abundance, diversity, geographic distribution, conservation status and productivity of flora and fauna species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

The plan would include procedures to:

- demarcate identified populations and/or individuals of conservation significant, identified species of flora and fauna, vegetation associations and habits areas
- modify land clearing plans and evaluate alternative mine plans to minimise or avoid impacts on the conservation significant, identified species of fauna and flora, vegetation associations and habitat areas
- minimise impacts where proposed mining activities are likely to impact on conservation significant, identified species of flora and fauna, vegetation associations and habitat areas
- monitor and record impacts on conservation significant, identified species of flora and fauna, vegetation associations and habitat areas
- implement appropriate contingency measures where impacts on conservation significant, identified species of flora and fauna, vegetation associations and habitat areas are identified.

This condition has not yet been triggered and there are no Specific Species Management Plans.

6. RIPARIAN VEGETATION MANAGEMENT PLAN

6.1 DESCRIPTION

Condition 8 of Ministerial Statement 695 (for the extension known as Yandicoogina Junction South-east) requires Hamersley Iron to prepare a Riparian Vegetation Management Plan (RVMP) prior to dewatering, implement the plan, and review and revise the plan at intervals not exceeding five years. This revised RVMP has been prepared to satisfy the requirements of Ministerial Statement 695 and to address current and expected future effects of the approved mining activities on the riparian vegetation in the Yandicoogina Mine area.

This section complies with condition 8-1: Prior to commencement of dewatering, the proponent shall prepare a Riparian Vegetation Management plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management (now DEC). Condition 8 also states:

- 8-2 The proponent shall review and revise the RVMP required by conditions 8-1 at intervals not exceeding five years.
- 8-3 The proponent shall implement the RVMP required by condition 8-1.
- 8-4 The proponent shall make the RVMP required by condition 8-1 publicly available.

The objectives of this plan are to:

- minimise impact on riparian vegetation from dewatering and discharge and
- maintain the abundance, diversity, geographical distribution and productivity of vegetation communities through the avoidance or management of adverse impacts and improvement in knowledge.

This Plan shall set out procedures to:

- maintain the flow paths, quantity and quality of water within Marillana, Yandicoogina and Weeli Wolli Creeks and the underlying aquifers to protect surface water and groundwater dependent ecosystems.
- monitor the effects of dewatering on riparian vegetation communities in areas where the water table is predicted to be lowered by at least two metres (during and after mining), and to implement remedial measures if impacts are detected.
- manage and minimise potential impacts on riparian vegetation associated with dewatering and at the discharge point.
- evaluate alternative discharge locations and methodologies, including the reinjection of surplus water from dewatering into the Billiards channel iron deposit aquifer.
- avoid disturbance and weed introduction to vegetation in creeklines, particularly vegetation which is currently in good or excellent condition.
- maintain a riparian vegetation buffer of not less than 200metres around Marrillana, Yandicoogina and Weeli Wolli Creeks to protect riparian vegetation and the habitat for fauna associated with the creeks with the exception of JSW and levees required for flood protection. (Note: the buffer does not apply at two creek crossings. See figure 2 of Schedule 1).

This revised RVMP has been prepared to satisfy the requirements of Ministerial Statement 695 and to address current and expected future effects of the approved mining activities on the riparian vegetation in the Yandicoogina Mine area.

The majority of the ore deposits at Yandicoogina JC, JSE, JSW and Oxbow are below the watertable and removal of groundwater by pumping is necessary to access the ore. Pumping lowers the watertable in immediately surrounding ecosystems and raises it near points of discharge. These activities may impact nearby vegetation, especially riparian trees such as Eucalyptus *camaldulensis, E. victrix* and *Melaleuca argentea*. Such impacts have been observed immediately surrounding the current mining at JC and at JSE.

Hamersley Iron commissioned Mark Adams of Advanced Ecological Consultants (now University of Sydney) to develop a *Monitoring plan for the impacts on tree health in riparian ecosystems surrounding Pilbara Iron's Yandicoogina operations* (Adams 2005). The monitoring plan is designed as part of a research project to better understand tree water relations and water requirements. Whilst leaf water potential is used to monitor vegetation stress in the Pilbara very little is known about what measurements actually equate to "stress". Similarly the science behind isotope abundance is not advanced enough for it to be used as a routine monitoring technique. The results of this research will be used to inform the routine monitoring on the impact of dewatering on the health of the major tree species (e.g. *Eucalyptus victrix* and *E. camaldulensis*) in riparian ecosystems adjacent to and downstream of the mine site. The monitoring plan will be adaptive as the current state of scientific knowledge is insufficient to accurately predict the responses of these trees to changing water level. Information generated by the monitoring will be used to improve monitoring methods and/or alter management strategies.

Pilbara Iron has prepared a Regional plan for managing riparian zones in the Pilbara (Pilbara Iron 2005), which outlines the Pilbara Iron regional approach to management of riparian / riverine vegetation and associated water resources, with specific reference to water regimes and the long-term health of riparian vegetation. Pilbara Iron has adopted a continual improvement approach to managing riparian zones in the Pilbara.

The riparian vegetation of the major creeklines surrounding Yandicoogina comprise of woodlands and forests of *Eucalyptus camaldulensis* (River Red Gum), *E. victrix* (Coolibah) and other tree species over mixed shrublands, grasslands and herbs. Spinifex (usually *Triodia pungens* or *T. longiceps*) is comparatively sparse in drainage lines. Typical shrubs in drainage lines include *Acacia coriacea* subsp. *pendens* (major creeks only), *A. ancistrocarpa* (mainly in minor creeks), *A. bivenosa*, *A. pyrifolia*, *A. tumida* var. *pilbarensis*, *Gossypium robinsonii* and *Petalostylis labicheoides*. Major creeks sometimes have areas of permanent water that support specialised water plants (Biota 2004).

Creek habitat is considered significant at a sub-region scale as it would support a range of species not typically recorded from other habitats in the area. This habitat type is also considered to be at risk in the Pilbara, as it is frequently subject to threatening processes, particularly heavy grazing pressure (mainly cattle and donkeys) and weed infestation (particularly Buffel grass, *Cenchrus ciliaris*) (Biota 2004a).

6.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following aspects of the Yandicoogina Mine Operation have the potential to affect riparian vegetation if not properly managed:

- **clearing operations** associated with creek crossings over the Yandicoogina and Marillana Creeks for the mining fleet
- **changes in water availability** through pit dewatering and discharge
- **construction of bunds and drains** around pit edge
- **general increase in access to riparian areas** by personnel
- **weed invasion** from vehicle movements and other disturbances.

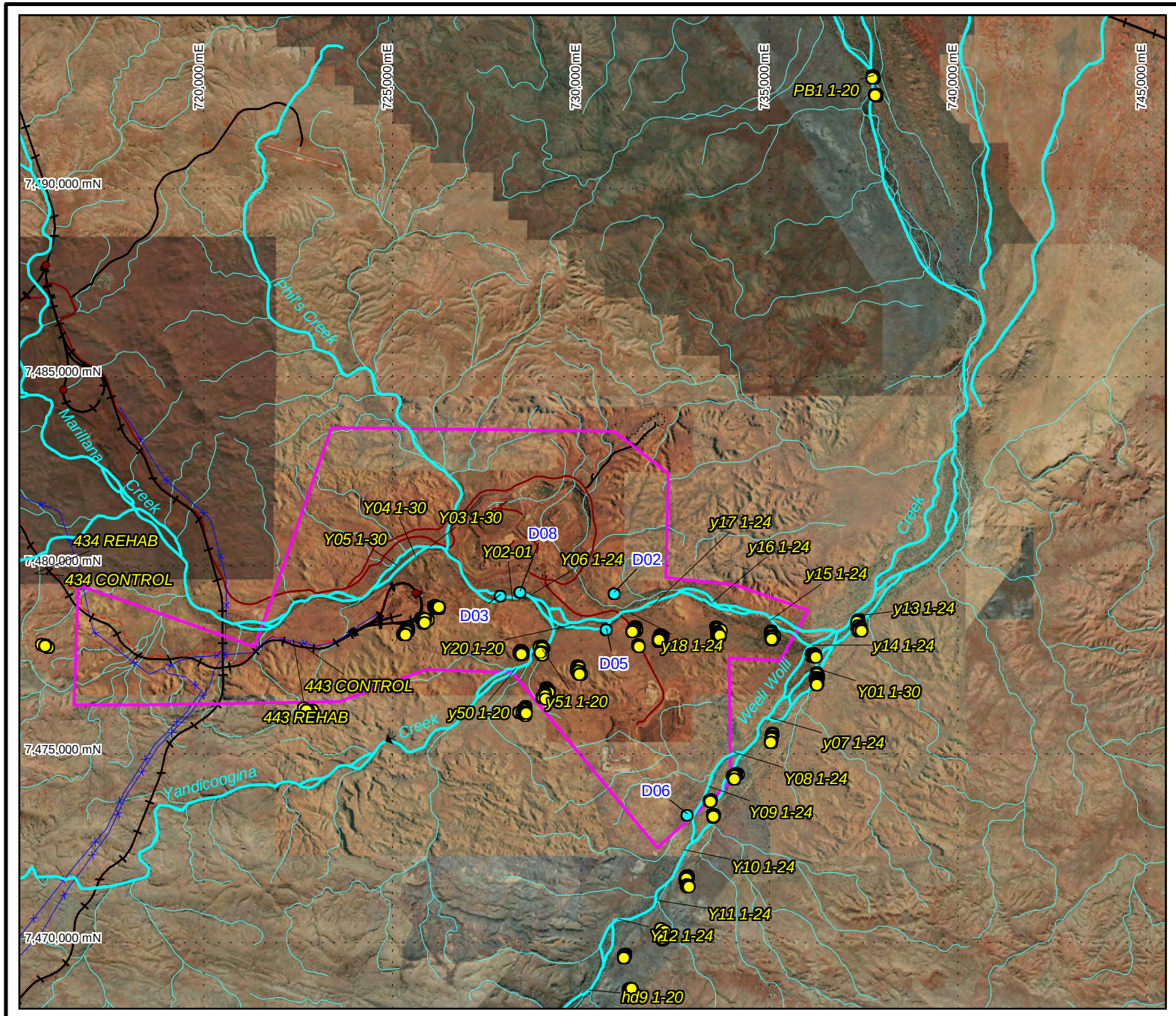
6.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The objectives of this Plan are to minimise impact on riparian vegetation from dewatering and discharge, and to maintain the abundance, diversity, geographical distribution and productivity of vegetation communities through the avoidance or management of adverse impacts and improvement in knowledge.

Environmental targets and key performance indicators have been set for the protection of surface water and riparian vegetation (Table 27).

Table 27 Environmental targets and performance indicators for riparian vegetation management

Management objective	Target	Performance indicator
Maintain a 200 m buffer between the JSE mine pit and the Weeli Wolli, Yandicoogina and Marillana Creeks to protect riparian vegetation and the habitat for fauna associated with the creeks (excluding intrusion into this buffer associated with flood protection levees and heavy/light vehicle road crossings.	No mining at JSE within 200 m of the Weeli Wolli, Yandicoogina and Marillana Creeks, with the exception of JSW ands levees required for flood protection.	Distance between mine pits and the creek.
Minimise disturbance to vegetation in creek lines	No disturbance outside of defined clearing boundaries.	Visual inspections. Incident reporting.
Environmental targets and performance indicators for dewatering management		
To ensure there are no significant long-term changes in riparian vegetation due to dewatering	No irreversible change in riparian vegetation diversity and condition	Alluvial groundwater levels Tree health
To monitor the effects of dewatering on riparian vegetation	A specific monitoring program in place to enable changes in vegetation to be identified and quantified	Monitoring program implemented as per this plan Flora and vegetation/habitat condition
To adaptively respond to significant changes in riparian vegetation that are due to dewatering	Monitoring enables management action prior to significant long-term changes in riparian vegetation health as per contingencies	Tree health – including DMSI
Surface water discharge		
Minimise potential impacts on riparian vegetation associated with discharge.	Vegetation changes are generally within the amplitude of the naturally produced variation of the system at the landscape scale	Alluvial groundwater levels Tree health Seedling recruitment
To monitor the effects of surplus water discharge on riparian vegetation	Above target is met	Monitoring program implemented as per this plan



LEGEND

- Yandi Project Footprint
- Tree Health Monitoring Sites
- Discharge Points
- Railway
- Powerline
- Mine Road
- Rail Access Road

N

SCALE

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RioTinto

Resource Strategy & Planning

Figure 9

Tree Health Monitoring Sites

Drawn: M.Swebbs Plan No. PDE0074948v2
Date: February, 2011 Proj: MGA94 Zone50

6.4 IMPLEMENTATION STRATEGY AND MANAGEMENT ACTIONS

6.4.1 Management actions

The relevant management action items are provided in Table 28. The Yandicoogina Mine Operation has been designed to minimise the disturbance to riparian vegetation. However, some approved project infrastructure has been installed, or will be located within 200 m of the creeks at Yandicoogina JSE, JSW, and Oxbow, specifically:

- creek crossings for light vehicle and for heavy vehicle traffic
- dewatering and re-injection bores, temporary pipelines and other infrastructure necessary for dewatering, discharge and re-injection
- drains and levees for mine flood prevention
- access tracks and fire breaks.

The management of weeds in riparian zones is more specifically dealt with in the Weed Management Plan that has been prepared in accordance with Condition 695: M10. Refer to Surface water, Section 2, and Groundwater Management Plans, Section 1, for additional actions that avoid or minimise impact on riparian vegetation.

Table 28 Riparian vegetation disturbance management measures

Topic	Action	Timing	Location
Buffer	Maintain a 200 m distance (no mining) between the mine pit and the Marillana, Yandicoogina and Weeli Wolli Creeks, with the exception of JSW and levees required for flood protection.	During mining at Yandicoogina	Marillana, Weeli Wolli and Yandicoogina Creeks
	Infrastructure near creeks (creek crossings, dewatering bores, levees, pipelines) will be located to minimise clearing of native vegetation.	During construction	Creek riparian zones
	Control access by segregating adjacent riparian areas from operational activities (e.g. signage, fencing, barricading off).	During mining	Creek riparian zones
Clearing	Clearing to be carried out consistent with the Pilbara Iron Approvals Request procedures and any Government approvals and permits	During construction and mining	Creek crossings
Weeds	Implement the Weed Management Plan in accordance with Condition 695: M10. See section 8.		
Dewatering management measures			
Maintain riparian vegetation	Maintain tree health monitoring sites	Ongoing	Along the Weeli Wolli, Yandicoogina and Marillana Creeks
	Maintain a baseline dataset of tree health	Ongoing	Along the Weeli Wolli, Yandicoogina and Marillana Creeks
	Maintain a 200 metre non-mining buffer between the mine pits and the Weeli Wolli, Yandicoogina and Marillana Creeks with the exception of JSW and levees required for flood protection..	During dewatering	Along the Weeli Wolli, Yandicoogina and Marillana Creeks

Topic	Action	Timing	Location
	Continue to support research programs in assessing plant-water relationships and developing better predictive models of drawdown impacts.	Ongoing	Pilbara
Discharge management measures			
Maintain riparian vegetation	Establish tree health monitoring sites(Figure 9)	Within 3 months of dewatering	Downstream of discharge
	Establish a baseline dataset of tree health	Within 3 months of dewatering	Downstream of discharge
Riparian vegetation disturbance management measures			
Buffer	Maintain a 200 m distance (no mining) between the mine pits and the Marillana, Yandicoogina and Weeli Wolli Creeks with the exception of JSW and levees required for flood protection.	During mining at Yandi JSE	Marillana, Weeli Wolli and Yandicoogina Creeks adjacent to the Yandi JSE mine pit
	Infrastructure near creeks (creek crossings, dewatering bores, levees, pipelines) shall be located to minimise clearing of native vegetation.	During construction	Creek riparian zones
	Control access by segregating adjacent riparian areas from operational activities (e.g. signage, fencing, barricading off).	During mining	Creek riparian zones
Clearing	Clearing to be carried out consistent with the Pilbara Iron Ground Disturbance procedures and any Government approvals and permits	During construction and mining	Creek crossings

6.5 MONITORING AND REPORTING

The monitoring of riparian vegetation in relation to disturbance is described in Table 29. Refer to the Monitoring Plan (Adams 2005) for details of monitoring actions at tree health and groundwater monitoring sites.

Table 29 Riparian vegetation disturbance monitoring program

Topic	Parameter	Frequency	Location	Purpose
Clearing	Site inspections	Weekly during construction	Creek crossings	To ensure that no unauthorised clearing of riparian vegetation occurs
Separation distance between mining and creeks	Site inspection	Once during and at the end of construction	Creek buffer area	To ensure that no unauthorised disturbance occurs within the buffer area
Establish and maintain Tree health monitoring sites	Site inspection	Quarterly	Sites as per the Riparian Vegetation Management Plan (Strategen 2006)	Early warning in changes to tree health and/or adverse impacts in change of flow regimes
Establish and maintain Groundwater monitoring sites	Site inspection	Twice yearly	Sites as per the Riparian Vegetation Management Plan (Strategen 2006)	Early warning in changes to tree health and/or adverse impacts in change of flow regimes
Selective thinning of saplings	Site inspections	Annually	Downstream of discharge points	To reduce artificial recruitment due to increased water availability in riparian areas To emulate tree densities in control areas
Dewatering monitoring program				

Topic	Parameter	Frequency	Location	Purpose
Remote sensing data	Aerial photography DMSV	Annual (6-12 months)	5-10 km downstream of mine site	Obtain qualitative or semi-quantitative measures of leaf area and tree health (dead or alive)
Tree health condition	Tree leaf area Visual inspection	Quarterly	Sites along the Marillana Creek at approximately 1 km intervals	Identify changes in tree health that are likely to be related to hydrological changes
Surplus discharge monitoring program				
Tree health	Tree leaf area Visual inspection	Quarterly Quarterly	Downstream of discharge sites	To identify changes in tree health that are likely to be related to hydrological changes
Riparian vegetation disturbance monitoring program				
Clearing	Site inspections	Weekly during construction	Creek crossings	To ensure that no unauthorised clearing of riparian vegetation occurs
Separation distance between mining and creeks	Site inspection	Once during and at the end of construction	Creek buffer area	To ensure that no unauthorised disturbance occurs within the buffer area

Table 30 Location of Tree Health Monitoring Sites

Study site	Easting	Northing	System
hd0-01	721568	7455274	Weeli Wolli
hd1-01	722229	7457714	Weeli Wolli
hd2-01	721391	7459918	Weeli Wolli
hd3-01	722042	7461592	Weeli Wolli
hd4-01	720328	7461145	Weeli Wolli
hd5-01	723268	7462256	Weeli Wolli
hd6-01	724937	7462935	Weeli Wolli
hd6a-01	726161	7464139	Weeli Wolli
hd7-01	727639	7465713	Weeli Wolli
hd8-01	728646	7467402	Weeli Wolli
hd9-01	730207	7468735	Weeli Wolli
Y5	736255	7477263	Yandicoogina
Y6	734992	7475926	Yandicoogina
Y7	734069	7475045	Yandicoogina
Y8	733416	7474099	Yandicoogina
Y9	732720	7472440	Yandicoogina
Y10	732023	7471149	Yandicoogina
Y11	731016	7470626	Yandicoogina
Y12	737308	7478682	Yandicoogina
Y13	736127	7477889	Yandicoogina
Y14	735030	7478522	Yandicoogina
Y15	733503	7479040	Yandicoogina
Y16	731991	7478941	Yandicoogina
Y17	731411	7478836	Yandicoogina
Y19	729751	7478436	Yandicoogina
Y20	728765	7479102	Yandicoogina

Reporting

The reporting requirements outlined under Ministerial Statement 695: M8-4 will be met through the existing reporting framework and mechanisms established for Yandicoogina. Reporting on the monitoring and riparian vegetation management actions undertaken in the Yandicoogina Mine area will be undertaken in the Annual Environmental Report.

6.5.1 Contingency actions

Contingency actions will be initiated if unauthorised disturbance of riparian vegetation is identified during site inspections.

Table 31 Riparian vegetation contingency actions

Trigger	Action
Maintain groundwater dependant and riparian vegetation health	
Disturbance within 200m buffer or to vegetation in creeklines (with the exception of JSW mine pit and associated infrastructure)	Cessation of clearance works and rehabilitation of areas disturbed outside of clearing boundaries if required and report findings to DEC
Mean of 15% change in indicator tree species foliage cover over two successive monitoring seasons	Context decline in foliage cover with regional tree health monitoring results (whilst considering events such as fire and regional changes) Review occurrence of fire and other perturbations Review discharge fluctuations from discharge points
Mean of 25% decline in indicator tree species foliage cover over two successive monitoring seasons	Determine cause of decline in tree health based on control sites Review operation of discharge timing and locations if change is localised at impact sites
Mean of >40% decline in indicator tree species foliage cover over two successive monitoring seasons in localised area only	Review operation of discharge timing and locations if change is localised at impact sites Review hydrological model Notify stakeholders Undertake rehabilitation works as required
Significant change in vegetation community composition from reference sites including dominance of weed species over local species	Control invasive species Notify stakeholders Undertake rehabilitation works as required
Maintain groundwater quality	
Discharged water quality above ANZECC guideline or 10% change from background levels	Investigate possible contamination Resample to confirm results
Discharged water quality above ANZECC guideline or 10% change from background levels for successive monitoring events with no reversible trend	Notify stakeholders Remove source of contamination Evaluate water treatment options

7. SUBTERRANEAN FAUNA MANAGEMENT PLAN

A subterranean Fauna Management Plan was prepared by Biota in 2006 in accordance with, and with the intention of meeting, the requirements of Ministerial Statement 695:M11.

Prior to commissioning, the proponent will prepare a Subterranean Fauna Management Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Department of Conservation and Land Management (now Department of Environment and Conservation) and the Western Australian Museum.

The objective of the plan is to:

- maintain the abundance, diversity, geographic distribution, conservation status and productivity of subterranean fauna species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

The Plan will set out the procedures to:

- avoid and/or manage impacts on subterranean fauna species, communities and their habitats where the long-term survival of those species and communities may be at risk as a result of project operations
- establish additional data on the distribution of existing stygofauna species and communities, particularly the ostracod *Gomphodella sp.* and water mite *Recifella sp.*, to demonstrate there is no threat to these species
- take timely remedial action in the event that additional data indicates that project operations may compromise the long-term survival of subterranean fauna species and/or communities
- report on the survey results and management actions.

The other plans of direct relevance to subterranean fauna are the Groundwater Management Plan and Surface Water Management Plans, Section 1.

7.1 DESCRIPTION

There are two kinds of subterranean fauna: stygofauna and troglofauna. Stygofauna are aquatic and occur in groundwater, whereas troglofauna are air-breathing and occur in underground cavities and small fissures above the watertable. The Pilbara is regarded as a hotspot for subterranean fauna, particularly stygofauna (EPA 2007). A number of geological formations within the Pilbara, including Channel Iron Deposits which occur above the water table have been identified as potential habitats for troglofauna. Sampling for troglofauna and stygofauna was initially carried out prior to preparation of the (draft) EPA Guidance Statement No. 54a (EPA 2007), utilising existing bores within the proposed mining area and surrounds. Now it is carried out as per Guidance Statement 54 Sampling for subterranean fauna in groundwater and caves.

A Subterranean Fauna Management was produced in 2006 (Biota), but does not refer to Troglofauna. This EMP includes management of Troglofauna and Stygofauna populations. Refer to the Biota report (2006) for sampling methodology for future studies.

The data available from surveys (Biota 2005), (Biota 2010c) and (Biota 2011) indicate that almost all taxa recorded from the areas to be affected by groundwater drawdown occur elsewhere in the locality. The long-term survival of these species is therefore not at risk and as such additional measures to avoid or manage impacts consistent with Condition 695:M11-1, item 1 will not be required.

Several taxa, identified as significant to compliance requirements in the Ministerial Statement 695 and subsequent Styogofauna Management Plan, were previously thought to be restricted to the Marillana Creek system, including *Recifella* sp.1 (Hydrachnidia) and *Gomphodella* sp. *A.* (*ostracoda*) (BOS200). Eleven specimens of the undescribed *Gomphodella* sp. "yandi" were collected from site Mar01 and *Recifella* sp.1 was recently collected from the Weeli Wolli creek system during 2010, a range extension that reflects the high level of connectivity as evidenced by the alluvial deposits of the two creek systems (Biota 2010c) (Figure 10).

A total of eight troglobitic specimens have been collected from the Yandi project area, two of which represent new species Specimens were collected predominantly from three sites adjacent to the Billiards prospect as well as the JSW deposit (Biota 2011).

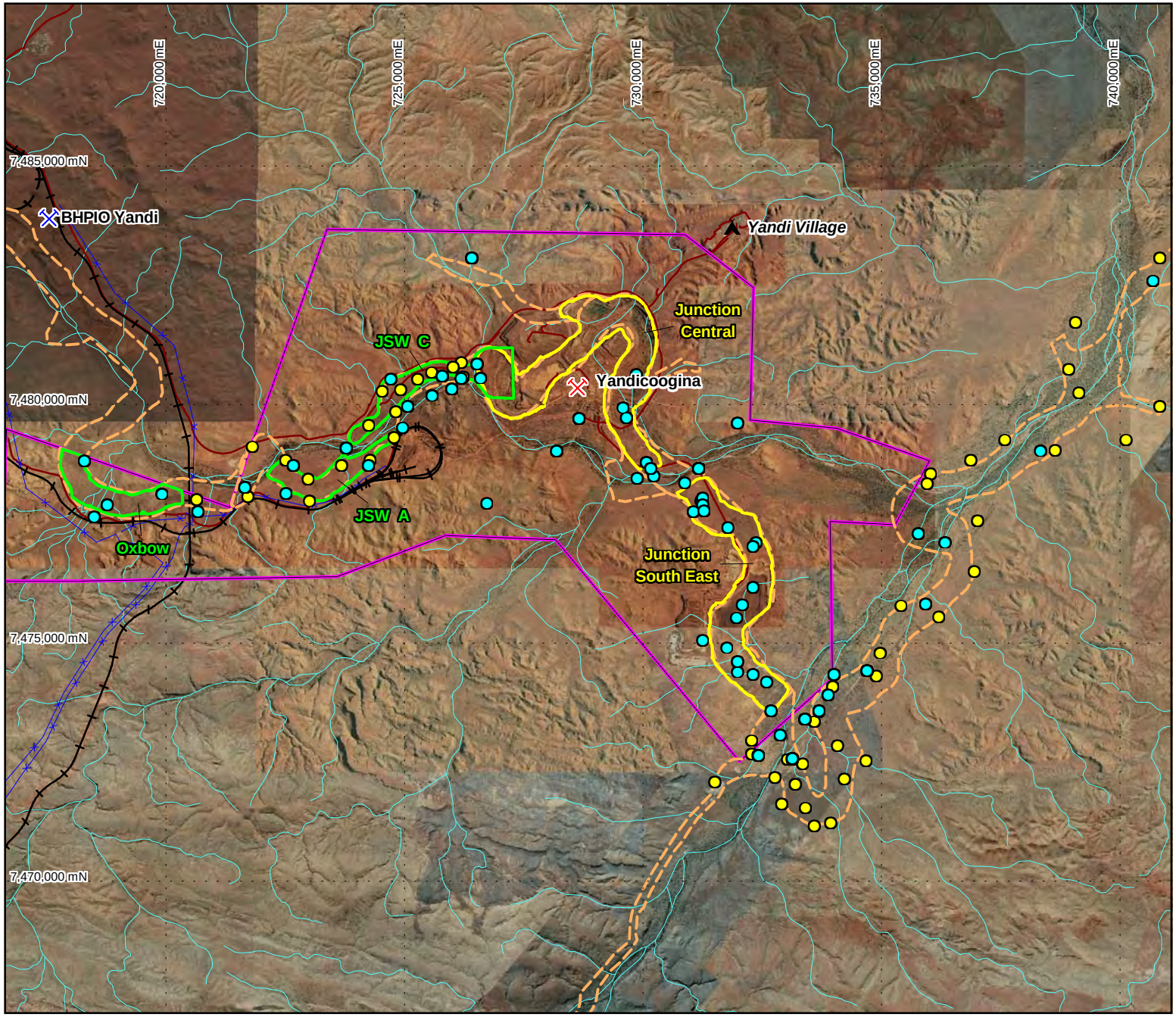
Given this, no detailed procedures have currently been developed to '*…avoid and/or manage impacts…'* on stygal taxa in the area beyond those built into the design of the project and the GMP (MWH Australia 2006). In the event that additional survey work and subsequent analyses do indicate some taxa are at risk of long-term survival, then management procedures or project amendments specific to the issue will be developed in consultation with DEC.

7.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following aspects of the Yandicoogina Mine have been identified as requiring management to ensure protection of subterranean fauna values:

- **direct troglofauna habitat disturbance** through removal of topsoil, overburden and ore will result in the loss of troglofauna habitat and the deaths of some individuals of troglofauna
- **groundwater drawdown** from groundwater abstraction may lower the watertable sufficiently to dry the zone in which some stygofauna species live
- **surface and groundwater contamination** through spills of hydrocarbons or wastewater has the potential to degrade the subterranean environment
- **changes to surface hydrology**, particularly in regards to sealing of recharge areas and increased surface water runoff, leading to a reduction in habitat suitability
- **salinisation of pit voids,** where long-term exposure of the aquifer in completed mine pits can result in salinisation of groundwater due to evaporative processes.

The management of Surface Water is addressed in Section 2, Hydrocarbon management in Section 11 and Waste management in Section 10.



LEGEND

- Yandi Project Footprint
- Proposed Pits
- Existing Yandi Operations
- CID Outline
- Stygofauna Sampling Sites
- Troglofauna Sampling Sites
- Railway
- Powerline
- Road
- Creek

N

SCALE

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Rio Tinto

Resource Strategy & Planning

Figure 10

Location of Subfauna Surveys in the Area

Drawn: M.Swebbs
Date: February, 2011

Plan No. PDE0074948v1
Proj: MGA94 Zone50

7.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The objective of this Plan is to maintain the abundance, diversity, geographic distribution and productivity of stygofauna at species and ecosystem levels through the avoidance or management of adverse impacts and through improvements in knowledge.

The environmental objectives, targets and indicators for subterranean fauna management are detailed in Table 32.

Table 32 Environmental objectives, targets and indicators for subterranean fauna management.

Objective	Target	Key performance indicator
Protect stygofauna and troglofauna habitat not approved to be disturbed.	Key ecological processes are maintained in subterranean ecosystems.	Environmental Incident Report.
Protect Stygofauna and troglofauna species	No reduction in distribution and diversity of species as a result of the mining operation.	Monitoring results.
Excavation activities to be designed to avoid areas of subterranean fauna habitat wherever practicable.	Impact on subterranean fauna is minimised as far as practicable.	Monitoring results.
Add to knowledge of subterranean fauna	Undertake surveys to understand taxonomy, population morphology and life history cycles in the Yandicoogina project area.	Reports produced based on data collected.
Hydrogeological modelling and monitoring to be used in conjunction with survey results to assess any potential impacts to subterranean fauna and habitat from dewatering.	Have sufficient data to understand the impact of the project on subterranean fauna and to undertake required actions to minimise this impact.	Collecting, monitoring, collating and interpreting data Maintain water in the alluvial gravels in the vicinity of areas of groundwater drawdown.

7.4 IMPLEMENTATION STRATEGY AND MANAGEMENT ACTIONS

7.4.1 Management actions

Specific management actions have been identified to assist in achieving the subterranean fauna management objectives as detailed in Table 33.

Table 33 Management actions for subterranean fauna protection.

Parameter	Action	Timing	Responsibility
Induction	1. The induction will include information on: • the general ecology and conservation significance of subterranean fauna • potential of mining activities to affect subterranean fauna and their habitat • location of areas not to be disturbed in order to protect subterranean fauna and their habitat.	Induction.	Site Environmental and Induction staff

Parameter	Action	Timing	Responsibility
Stygofauna and troglofauna habitat protection	2. Develop procedures to avoid/minimise impacts on species at risk of long-term survival (should data indicate they exist) in liaison with DEC.	As required	Mine Manager
	3. Carry out additional sampling for stygofauna in the Yandicoogina area.	Annually	SEA or Consultant
	4. Complete morphological analysis of all collected specimens to determine distributions and assess risk to taxon long-term survival.	Annually	SEA or Consultant
	5. Complete taxonomic descriptions of the undescribed *Gomphodella* and *Recifella* specimens from Marillana Creek.	Once-off event	Western Australian Museum

7.5 MONITORING AND REPORTING

Table 34 provides monitoring actions to enable an assessment of the effectiveness of the subterranean fauna management actions in place.

Table 34 Monitoring actions for subterranean habitat management.

Purpose	Parameter	Frequency	Location
To prevent deterioration of trogloobitic and stygobitic fauna habitat conditions and ensure adequate protection.	Review results of sampling work to determine if any species are at risk of long-term survival	Annual	Representative drill holes of areas disturbed by mining and undisturbed areas where subterranean fauna are present.

7.5.1 Contingency actions

Table 35 identifies the appropriate contingency actions to be initiated in the event that the objectives for subterranean fauna management are not met.

Table 35 Contingency actions for subterranean fauna management.

Trigger	Action
Mining within areas not approved for disturbance.	1. Report as Environmental Incident and initiate Incident Response Procedure, including: • investigating cause; and • implementing corrective actions, including rehabilitating disturbed area.
Monitoring indicates risks to stygofauna and troglofauna populations are increasing as a result of the Proposal.	1. Develop and implement mitigation measures to reduce the risk to stygofauna and troglofauna populations.

8. WEED MANAGEMENT PLAN

8.1 DESCRIPTION

The Weed Management Plan has been prepared to satisfy elements of Condition 10 of Ministerial Statement 695.

The most recent flora and vegetation survey was undertaken for the Yandicoogina JSW & Oxbow areas area (Biota 2010a). Biota surveys since 2004 have recorded 13 introduced (weed) flora species (Table 36). Mesic habitats such as creeklines and floodplains are particularly susceptible to weed invasion. The main areas within the Yandicoogina area supporting significant weed infestations are within Weeli Wolli Creek, and to a lesser extent areas of Marillana Creek and the section of the Yandicoogina Creek downstream from the junction with Marillana Creek.

Mattiske (1995) recorded the presence of weeds at 113 vegetation survey sites across the Yandicoogina Mine area. During this survey, six weed species were recorded throughout the site (Table 36).

Buffel grass (*Cenchrus ciliaris*) was widespread and abundant in the Yandicoogina JSE area as a result of pastoral activities (Biota 2004a). The remaining species generally occurred as scattered individuals or in isolated patches. Mexican poppy is listed as a Declared Plant under the *Agriculture and Related Resources Protection Act* 1976, however there are no specific requirements for its control in the Pilbara region. It is listed as P1 (movement of plants or their seeds is prohibited) for the whole of the State, *except* the municipal districts of Ashburton, East Pilbara, Port Hedland and Roebourne (Biota 2004).

With the exception of *Sisymbrium irio* (London rocket), which appears to be a new record for the Pilbara, all of the species are considered common weeds in the region and could be expected to be found throughout the Yandicoogina Mine area.

Table 36 Introduced flora recorded in the Yandicoogina Mine area

Species	Reference	Distribution	Described feature
Acetosa vesicaria (Ruby dock)	Biota (2004) GHD (2009)	Scattered individuals at two sites (Marillana Creek and Yandicoogina Creek)	Readily occurs in disturbed areas and transport corridors after rain
Aerva javanica	GHD (2009)	Older areas of the mine and offices	Highly invasive
Argemone ochroleuca subsp. *ochroleuca* (Mexican poppy)	Biota (2004), Mattiske (1995) GHD (2009)	Scattered individuals at Marillana Creek (one site) and Yandicoogina Creek (three sites)	Priority 1 except in East Pilbara
Bidens bipinnata (Beggars ticks)	Biota (2004), Mattiske (1995) GHD (2009)	Recorded at Marillana Creek (one site), Yandicoogina Creek (one site) and a floodplain associated with a tributary of Weeli Wolli Creek	Common weed of creek line and Mulga habitats
Cenchrus ciliaris (Buffel grass)	Biota (2004), Mattiske (1995) GHD (2009)	Total cover in the section of Weeli Wolli Creek within study area. Also recorded in the Marillana Creek and Yandicoogina Creek	Introduced as fodder species. Highly invasive
Chloris virgata (Feathertop Rhodes Grass)	GHD (2009)	Seasonally wet areas	Minor weed

Species	Reference	Distribution	Described feature
Conyza bonariensis (Flaxleaf fleabane)	Biota (2004) GHD (2009)	Two sites associated with the Yandicoogina Creek system	Occasional weed of drainage areas
Cynodon dactylon (Couch)	GHD (2009) Biota (2004)	Yandicoogina Creek (one site)	Very occasional weed of inland drainage areas
Cucumis melo subsp. Agrestis (Ulcardo melon)			
Datura leichhardtii (Native thornapple)	Biota (2004a)	Yandicoogina Creek (one site)	
Malvastrum americanum (Spike malvastrum)	Biota (2004a) GHD (2009)	Scattered individuals from nine sites all located within the Yandicoogina, Marillana or Weeli Wolli Creek systems	Can be abundant in creek line or Mulga habitats, particularly in good seasons
Pseudognaphalium luteoalbum (Jersey cudweed)	Biota (2004a)	Three sites associated with Yandicoogina Creek system	Occasional weed of drainage areas
Setaria verticillata (Whorled pigeon grass)	Biota (2004a)	Scattered individuals in Yandicoogina Creek (three sites), one site in Marillana Creek and one site in tributary of Weeli Wolli Creek	Can be abundant in certain habitats in good seasons
Sisymbrium irio (London rocket)	Biota (2004a)	Scattered individuals at two sites in Yandicoogina Creek	
Solanum nigrum (Black berry nightshade)	Biota (2004a) GHD (2009)	Scattered individuals at two sites in Yandicoogina Creek	Minor weed
Sonchus oleraceus (Common sowthistle)	Biota (2004a) GHD (2009)	Scattered individuals at three sites in Yandicoogina Creek	Common weed of creek habitat but is rarely abundant
Emex australis	Mattiske (1995)		
Aerva javanica	Mattiske (1995)		
Sigesbeckia orientalis	Mattiske (1995)		
Vachellia farnesiana (Mimosa bush)	GHD (2009)	Floodplain areas	Woody weed

Although not recorded at Yandicoogina, additional weeds are relevant and may be highlighted for awareness and induction purposes. These weeds include:

- Calotropis, *Calotropis procera*, (present in the DeGrey River catchment)
- Prickly acacia, *Acacia nilotica*, (not recorded in the Pilbara)
- Chinese Apple, *Ziziphus mauritiana* (one infestation) and
- Prickly Pear, *Opuntia sp.* (recorded in some Pilbara town sites).

8.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

Creek line vegetation has been identified as being particularly susceptible to weed invasion. Several factors have the potential to introduce additional weeds to the Yandicoogina Mine area and to spread existing populations of introduced flora within development areas. These include:

- artificial discharge of water to Marillana and Weeli Wolli Creeks from dewatering operations will increase the availability and flow of water in the receiving environment, potentially increasing the spread and distribution of any weed species present in the receiving environment
- disturbance and clearing of vegetation for associated mining activities (including clearing of riparian vegetation for crossing Yandicoogina & Marillana Creeks)

- unrestricted vehicle movement
- cattle movement along the creeklines (through trampling and selective grazing of native grasses compared to Buffel grass)
- other factors such as presence and movement patterns of fauna, frequency and pattern of creek flow events.

Measures are required to be implemented to ensure activities that may result in the potential introduction or spread of weed species is avoided or minimised, particularly in the vicinity of creek lines. As the Marillana Creek system within the Pilbara Iron operational area only has minor weed infestations, it is the highest priority area for implementation of measures to control the spread of weed species.

Adjacent land uses

The management of land uses within the broader environs of the Yandicoogina Mine area can influence both the type and distribution of weeds. The following nearby land users have been identified as potentially influencing the success of weed control programs within the Yandicoogina Mine area:

- pastoral stations in the vicinity not owned or operated by Pilbara Iron, including Prairie Downs and Marillana stations
- Juna Downs pastoral station owned and operated by Hamersley Iron
- mining companies such as BHP Billiton that operate a nearby mine upstream of the Hamersley Iron Yandicoogina Mine.

8.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The objectives of the plan are to:

- minimise the spread of weed species
- prevent the introduction of new weeds
- control and/or eradicate both noxious and environmental weeds in the project area.

This plan sets out procedures to:

- identify target weeds having regard for weed species outside of the project area
- control and eradicate target weeds
- monitor the success of weed control
- report on the weed management actions and monitoring results.

Environmental targets and key performance indicators have been set to meet the objectives of the Weed Management Plan (Table 37).

Table 37 Environmental targets and key performance indicators

Management objective	Target	Key Performance Indicator
To minimise the spread of weed species within the Yandicoogina Mine area (ML274SA).	No significant[1] increase in the amount of weeds (weed density and/or cover depending on weed species) in project area over life of mine.	Weed density or weed cover (depending on weed species) in monitoring transects.
	No significant change in the distribution and extent of identified weed species in the project area.	Weed distribution or extent in monitoring transects.
To prevent the introduction of new weeds into the Yandicoogina Mine area.	No new weed species observed or recorded in ML274SA.	Presence of weed species other than those previously identified in ML 274SA.
	All relevant staff to participate in weed education and awareness program.	Number of staff completed environmental induction.
Control &/or eradicate both noxious and environmental weeds in the project area.	'High Priority' weed species (Table 38) are eradicated where possible, or contained over the life of the mine.	Presence of 'High Priority' weed species or distribution and extent of these species.
	The distribution of 'High Priority' and 'Priority' weed species (Table 38) identified in the high conservation areas including Marillana Creek and Yandicoogina Creek (west of the junction with Marillana Creek) is significantly reduced (controlled) at the end of the life of the mine.	Distribution of 'High Priority' and 'Priority' weed species in monitoring transects located in high conservation areas.
	No significant increase in the density and/or cover (depending on species) of weed species (Table 38) throughout the Yandicoogina Mine area.	Density or cover (depending on species) of weeds in monitoring transects.

[1]Significant – for the purposes of this table, 'significant' refers to a statistical measure of significance using data obtained from the monitoring transects

8.4 IMPLEMENTATION STRATEGY

The weed species recorded by Biota (2004a) and Mattiske (1995) in the Yandicoogina Mine area have been prioritised for management purposes (Table 38). Recorded weed species have been categorised as either 'High Priority' or 'Priority'. 'High Priority' weed species were classified using the following criteria:

- listed as a Declared Plant under the *Agriculture and Related Resources Protection Act 1976*
- recognised environmental weed of concern across Pilbara Iron operations (as identified in the IEMS Weed Management Plan)
- environmental weed with very limited distribution in the Yandicoogina Mine area.

Table 38 Weed species prioritised for management

Management classification	Species
High Priority	*Acetosa vesicaria* (Ruby dock)
	Argemone ochroleuca subsp. *ochroleuca* (Mexican poppy)
	Sisymbrium irio (London rocket)
Priority	*Bidens bipinnata* (Beggars ticks)
	Conyza bonariensis (Flaxleaf fleabane)
	Cynodon dactylon (Couch)
	Datura leichhardtii (Native thornapple)
	Malvastrum americanum (Spike malvastrum)

Management classification	Species
	Pseudognaphalium luteoalbum (Jersey cudweed)
	Setaria verticillata (Whorled pigeon grass)
	Solanum nigrum (Black berry nightshade)
	Sonchus oleraceus (Common sowthistle)
	Emex australis
	Aerva javanica
	Sigesbeckia orientalis
	Cenchrus ciliaris (Buffel grass)*

*Buffel grass is a highly valued by the pastoral community and the Department of Agriculture and Food as a pasture species. However, it is recognised that it can be a highly invasive weed in conservation areas. The Department of Agriculture and Food advises that it is impractical for Pilbara Iron to undertake any form of control of this species unless in conservation areas.

Weed control programs and resources will be targeted for those weeds identified as 'High Priority'. New weed species that may be located within the Yandicoogina Mine area will be assigned to one of the management classifications and a treatment program planned accordingly.

This Plan shall set out the procedures to:

1. *identify target weeds having regard for weed species outside the project area*
2. *control and eradicate target weeds*
3. *monitor the success of weed control*
4. *report on the weed management actions and monitoring results.*

8.4.1 Management actions

This Weed Management Plan outlines the overall approach to managing weeds at the Yandicoogina Mine area. Specific weed control measures, such as the timing of weed control operations are not discussed in this Weed Management Plan as a framework has already been established through the IEMS for identifying the administrative responsibilities and requirements of appropriate weed management treatments for individual weed species. This includes choosing a method of treatment for each identified weed species in consultation with the weed control contractor and government departments such as DAFWA (for noxious weeds) or DEC (for environmental weeds) as required.

The IEMS Weed Management Plan outlines a number of factors for consideration in planning a weed control program. Weeds that are in the early stages of invasion may be candidates for eradication. However, in many cases, eradication of an identified weed within the project area may not be realistic (Natural Heritage Trust 2004). Controlling or containing weed species to prevent new infestations or to reduce the impact of a weed species in a particular area is the likely management approach if the weed is widespread with well established populations.

Weed Management Map

Whilst vegetation and flora surveys have been undertaken across the entire Yandicoogina Mine area, which included recording the presence of weed species, a targeted weed mapping exercise is considered necessary to provide baseline data for weed control. The Weed Management Map will focus on recording the distribution of 'High Priority' weed species as well as identifying significant populations of weed species in and around operational activities and areas of high conservation value (e.g. the Yandicoogina and Marillana Creek systems).

The existing Yandicoogina EMP ensures that a weed control and weed assessment program is undertaken on an annual basis at Yandicoogina Mine. The generic IEMS Weed Management Plan provides a plan for weed management across Pilbara Iron mine, rail and port operations. As part of this program, standard weed field inventory sheets and weed awareness posters, have been developed. To ensure consistency across operations, these are used at the Yandicoogina Mine.

Specific management actions have been identified to assist in meeting the objectives of the Weed Management Plan (Table 39). The management actions are aimed at:

- minimising the potential sources of weed infestations
- containing, controlling and/or eradicating target weed species from the Yandicoogina Mine area.

Table 39 Weed management actions identified for the Yandicoogina Mine area

Topic	Action	Timing	Location
Minimise the spread of weed species	**Weed Management Map** - Map the extent and distribution of target weed species occurring within ML247SA on a Weed Management Map. Continue to update weed mapping..	Annually or as required	Entire project area with focus on drainage systems and operational areas
	Review weed management classification - Review and update the weed management classification (Table 38) based on the information collected in the Weed Management Map.	Annually or as required	Entire project area with focus on drainage systems and operational areas
	Monitoring - Establish weed monitoring transects to monitor weed control and treatment methods.	Annually or as required	Refer to Table 40
	Weed inventory –In accordance with the existing IEMS procedures, maintain a weed inventory recording location of weed species.	During operation and closure	Entire project area
	Site inspections – Opportunistic site inspections to record new observations of weed infestations in the weed inventory in accordance with Section 9 of the IEMS Weed Management Plan.	During construction and operation	Entire project area
	Site inspections (weed presence near DRF) – Undertake regular site inspections to record new observations of weed infestations or changes in weed distribution near known populations of DRF.	During construction and operation	Fenced area containing DRF species
	Site inspections (weed presence in Borrow pits) – Undertake site inspections (as necessary) in Borrow pits prior to any earth-moving activities to determine the presence/absence of weed species.	During construction and operation	Borrow pits
	Site inspections (weed presence at water discharge points in Marillana Creek) - Undertake site inspections along Marillana Creek near the mine de-watering discharge point to determine the presence/absence of weed species and any significant changes in the distribution/extent of weed species.	During construction and operation	Discharge points at Marillana Creek
	Staff inductions – Staff inductions to include information on weed identification, reporting of weeds and procedures to prevent the spread of weeds.	During construction and operation	Entire project area
Prevent the introduction of new weeds	**Weed hygiene (construction)** –all earth-moving equipment coming onto the site must submit a completed 'Application to bring equipment onto site' form to the construction site superintendent prior to mobilisation.	During construction	Construction area
	Weed hygiene (exiting equipment) - Implement and undertake appropriate washdown and weed hygiene measures for vehicles, earth-moving machines or construction machines leaving the Yandicoogina project area in accordance with the existing IEMS Weed Hygiene Procedure.	As required	Operational activities within the entire project area

Topic	Action	Timing	Location
	Weed hygiene (between sites within the Yandicoogina Mine area) – Implement and undertake appropriate washdown and weed hygiene measures for vehicles, earth-moving machines or construction machines that have been operating in areas identified as containing high priority weed species.	As required	Operational activities within areas containing high priority weed species
	Weed hygiene (contaminated machines/vehicles) – Where machinery is contaminated with soil or vegetation suspected to contain weed material, a washdown will be undertaken in a designated area and the material collected for burial. The washdown area will be monitored regularly for weed germination and weed plants and weed control undertaken as necessary.	As required	Designated weed hygiene wash down area
	Minimise disturbance - Minimise site disturbance by avoiding unnecessary clearance of vegetation during construction (e.g. construction of creek crossings) and operation. Areas subject to disturbance from mining activities should be surveyed (prior to disturbance) and segregated where necessary.	Construction, Operation, Closure	Entire project area
	Use local provenance species – If seeding is necessary, use only local provenance seed during rehabilitation work .	During rehabilitation	Disturbed areas within ML247SA
Control and/or eradicate both noxious and environmental weeds in the project area	**Weed control/treatment program for 'High Priority' species**- Undertake weed control and eradication program for 'High Priority' weed species (Table 38) in accordance with Section 9 of the IEMS Weed Management Plan.	As determined in Section 9 of the IEMS Weed Management Plan	Entire project area
	Weed control/treatment program for 'Priority' weed species[1]- Undertake weed control programs for 'Priority' weed species (Table 38) in accordance with Section 9 of the IEMS Weed Management Plan.	As determined in Section 9 of the IEMS Weed Management Plan	Throughout project area
	Weed control/treatment near pit de-watering locations - Undertake weed control for any weed species that has significantly increased in density and/or distribution as a direct result of pit de-watering. Weed control to be undertaken in accordance with Section 9 of the IEMS Weed Management Plan.	As required and determined in Section 9 of the IEMS Weed Management Plan	Discharge points

8.5 MONITORING AND REPORTING

Ministerial Statement 695:M10-1(3) requires that the success of weed control measures is monitored as part of this Weed Management Plan. Monitoring across the Yandicoogina Mine area will be undertaken according to the program outlined in Table 40 below. The monitoring program focuses on establishing permanent transects to assess the effectiveness of the annual weed control programs. The exact location of transects will be determined after completion of the Weed Management Map (see Table 39 and section. The monitoring will determine the effectiveness of weed control measures in those areas mapped with significant weed infestations. Up to 20 monitoring sites will be established, including five control sites to determine the success of weed control measures.

The monitoring transects will be 100 m in length and weed assessment will be undertaken in the 10 m zone either side of the transect (i.e. total area of 2000 m^2). Assessment will include recording the presence (i.e. number) of weeds species within the assessment area. Estimation of percentage cover, although subjective, may also be beneficial information to collect for some weed species such as *Cenchrus ciliaris* (Buffel grass), where individual plants may number too many to accurately count.

- Transects will be pegged and their location recorded using a GPS. Transects will be monitored annually or as required (at a frequency deemed appropriate based on weed prevalence during the life of the mine). A qualitative assessment (involving site inspections) will be used to assess and report on whether weeds are spreading in the Yandicoogina Mine area.

Table 40 Weed monitoring program

Topic	Parameter	Frequency	Location	Purpose
Monitor permanent transects (100 m x 20 m)	Assessment of presence/absence of weed species and/or changes in cover (%)	Annually, or as required	At 20 sites within the Yandicoogina Mine area to be determined based on the Weed Management Map. The monitoring sites are to include:	To quantitatively assess the effectiveness of weed control measures throughout the project area
			Control sites – Five sites located outside of the Yandicoogina Mine area. Three of these sites must be located within 100m of riparian vegetation and two sites located over 500m from riparian vegetation..	
			Weed treatment sites – up to 15 sites to be located in areas where weeds are present as identified on the Weed Management Map. Up to ten of these sites must be located within 100m of riparian vegetation of which at least three must be located in the area of the mine de-watering discharge points on Marillana Creek.	
Site inspections	Assessment of presence/absence of weed species	Opportunistic	Entire Yandicoogina Mine area.	To qualitatively assess whether weeds are spreading in the Yandicoogina Mine area

The reporting requirements outlined under Ministerial Condition 695:M10-3 will be met through the existing reporting framework and mechanisms established for the Yandicoogina Mine. Reporting on the monitoring and weed management actions undertaken in the Yandicoogina Mine area will be presented in the Annual Environmental Report.

8.5.1 Contingency actions

Contingency actions will be initiated if there are unexpected significant increases in the presence of weed infestations; the distribution of weeds or the introduction of new weeds. The contingencies include further investigation to determine the cause for the increase in the presence of weeds or the introduction of a new weed.

The weed management contingency actions are outlined in Table 41 below.

Table 41 Weed management contingency actions

Trigger	Action
Increase in distribution (extent) of a specific weed species within the project area	1. Map the revised extent of the specific weed species within the high conservation areas (creek areas) 2. Identify potential sources of weed infestation. 3. Review treatment and control methods. 4. Seek further advice from relevant authorities. 5. Implement revised weed control methods.
Introduction of a new weed species considered to be classified as a 'High Priority' species within the project area	1. Map the distribution of the newly introduced weed species. 2. Plan a weed control treatment program. 3. Identify operational activities that may have potentially introduced the weed species. 4. Apply hygiene control and education measures.

Trigger	Action
Isolated satellite weed infestation located	1. Identify the extent of the weed infestation. 2. Undertake targeted weed treatment measures to eradication weed species from locality. 3. Monitor site for a determined period to ensure eradication is achieved.

9. ABORIGINAL HERITAGE MANAGEMENT PLAN

Aboriginal heritage will be managed under the approved "Yandicoogina Cultural Heritage Management Plan" prepared in consultation with Gumala Aboriginal Corporation (Gumala) and the Department of Indigenous Affairs (DIA).

9.1 DESCRIPTION

The Yandicoogina Cultural Heritage management Plan (CHMP) provides protocols and procedures for protection and management of Aboriginal heritage sites on the Yandicoogina Project mine lease (AM70/00274). The management plan is an important component of RTIO's Cultural Heritage Management System (CHMS).

There are no requirements under Ministerial Statements for an Aboriginal Cultural Heritage Plan. This plan is a management tool designed to ensure that the Yandicoogina Rio Tinto Iron Ore (RTIO) operations and proposed operations comply with the requirements of the *Aboriginal Heritage Act 1972,* DIA guidelines and RTIO cultural heritage standards.

The CHMP also provides the relevant Native Title Claimants and Aboriginal groups with details concerning the ongoing Aboriginal heritage management at Yandicoogina during construction and operation.

The Yandicoogina CHMP is currently in draft form and requires consultation and comment from Gumala and the relevant traditional owners prior to being made public. For this reason it is not possible to provide a copy of the document at the time of application of the Yandi JSW PER. It is anticipated that a final version of the Yandicoogina CHMP will be available during 2011 (following approval from Gumala).

Native Title

Three native title claims exist over the Yandicoogina area. These are Innawonga Bunjima WC96_061, Nyiyarparli WC05_006 and Martu Idja Banyjima WC98_062. Gumala Aboriginal Corporation (GAC) is the representative body for these claimant groups in relation to the Hamersley Iron's Yandicoogina mining lease area (AM70/00274). In March 1997, Hamersley Iron entered into the Yandicoogina Land Use Agreement (YLUA) with the Aboriginal parties which facilitated the granting of tenure for the Yandicoogina Project. The agreement provides benefits to the Aboriginal parties over 20 years for education, training, employment, business and community development. The YLUA is jointly managed by Gumala Aboriginal Corporation and Hamersley Iron.

Economic Opportunity

Business contracting arrangements, including joint ventures, developed with Gumala as part of the Yandicoogina Project will provide equity for Gumala and initial employment opportunities.

Aboriginal heritage sites

Currently there are 247 known Aboriginal heritage sites within the greater Yandicoogina mining lease area. This number is likely to increase as surveys continue within the area (Figure 11). Management

and mitigation options for heritage sites situated within the proposed footprint are currently being investigated. One or more of the following actions may be implemented in regard to these sites:

- Additional archaeological and ethnographic surveys were required
- modify the proposed mine expansion and infrastructure plans extensions to avoid Aboriginal sites and apply appropriate management measures to protect sites in consultation with Gumala (i.e. buffer and fence sites, GIS identification of avoidance areas for contractors)
- where it is not possible to avoid sites, apply for approval to disturb sites under section 18 of the *Aboriginal Heritage Act 1972* in consultation with Gumala.

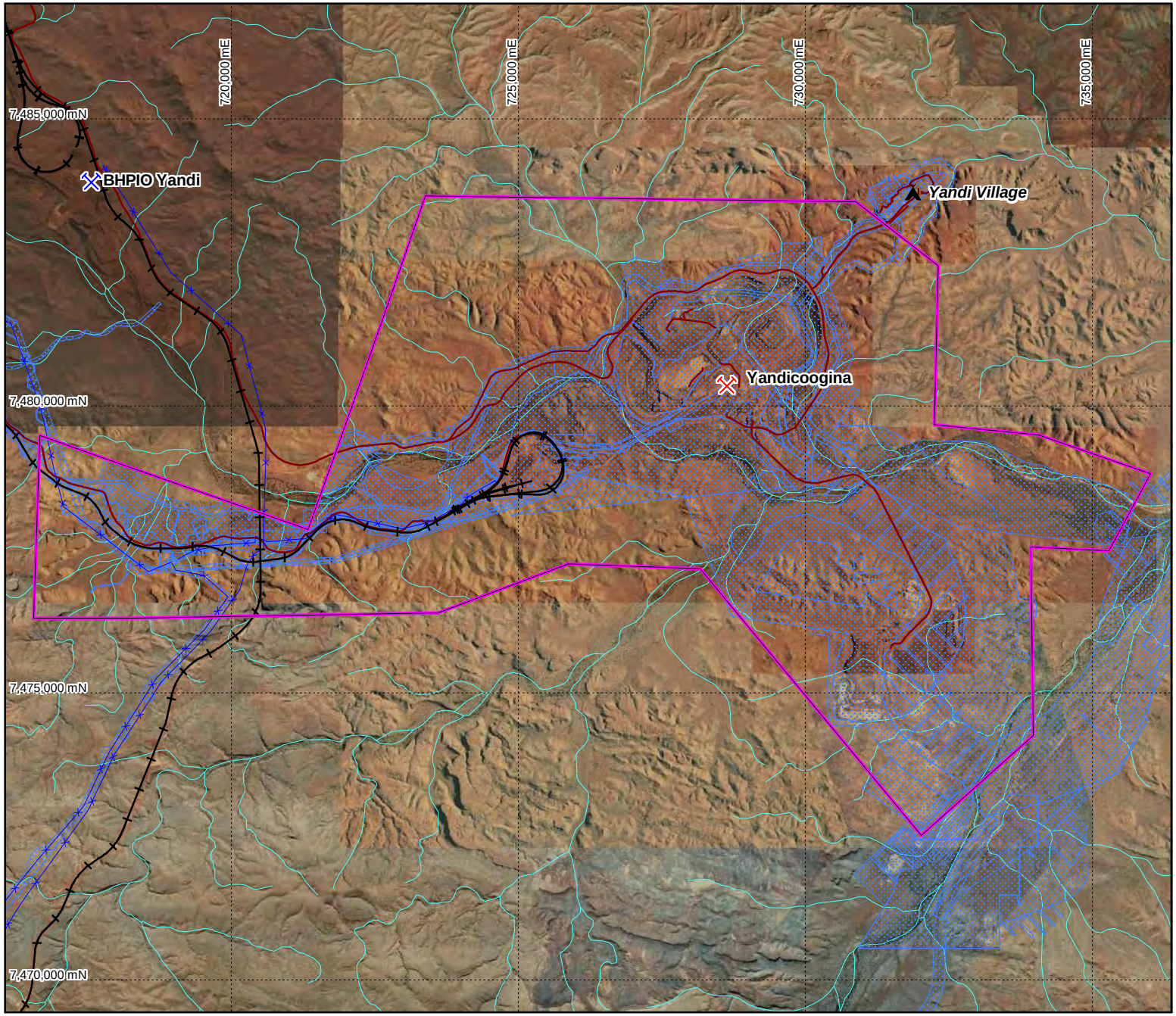
All actions regarding Aboriginal heritage sites will be undertaken in consultation with relevant traditional owners identified by Gumala and the Department of Indigenous Affairs (DIA), in accordance with the *Aboriginal Heritage Act 1972.*

Ethnographic consultation has also identified a number of culturally important creeks within the Yandi mining lease. Marillana, Yandicoogina, Weeli Wolli and Phils Creeks have been identified as having high cultural value. Whilst these landscape features have not been recorded as heritage sites, RTIO recognises their significance to the local traditional owners and as such, exclusion zones have been placed along each creek to effectively manage ground works within these sensitive areas. As part of this management guideline, RTIO heritage protocols recommend that consultation with relevant traditional owners is undertaken and consent given prior to any proposed ground disturbance taking place within these exclusion zones. The successful management of water and drainage systems, and the associated cultural heritage values should remain an ongoing consideration for RTIO within the Yandi mining lease area.

9.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following aspects of the mine operation have been identified as requiring management to ensure protection of Aboriginal heritage values:

- clearing
- dewatering
- excavation and ground clearance
- drilling
- surface water discharge
- secondary impacts (ie. Dust and vibration)
- human access.



LEGEND

- Yandi Project Footprint
- Heritage Survey Areas
- Railway
- Powerline
- Road

N

SCALE

1 0 1 2 3km

1:100 000 @ A4

RioTinto

Resource Strategy & Planning

Figure 11

Location of Heritage Surveys

Drawn: M.Swebbs Plan No. PDE0074948v2
Date: February, 2011 Proj: MGA94 Zone50

9.3 PERFORMANCE OBJECTIVES

This plan details management procedures to protect Aboriginal Heritage sites both within and in proximity to active project areas. The performance standard in relation to Aboriginal sites for the project is to protect all Aboriginal sites in accordance with the provisions of the *Aboriginal Heritage Act 1972* and RTIO's own *Cultural Heritage Management System.*

Table 42 Objectives, targets and indicators for Aboriginal Heritage management

Management objective	Target	Key performance indicators
Protect Aboriginal heritage sites within the Yandicoogina mining lease from accidental disturbance.	Conduct archaeological and ethnographic surveys prior to any work proceeding in an area. Ensure effective management of sites in high risk areas (i.e. fencing, heritage awareness training).	Sites not disturbed
Open communication and consultation with the relevant Aboriginal traditional owner groups.	Undertake regular consultation with Gumala Aboriginal Corporation and relevant Native Title Claimant groups regarding proposed project work at Yandicoogina.	Positive relationship with Gumala.
Protect new sites (previously unrecorded).	Manage new sites in accordance with the requirements of the Aboriginal Heritage Act 1972 and internal RTIO systems throughout the duration of the proposal.	Report any suspected sites prior to clearing or disturbing ground surface for assessment.
Mitigation and/or clearance of Aboriginal heritage sites only once approvals and consents have been granted.	S16 and/or S18 consent is granted by the DIA, under the Aboriginal Heritage Act 1972 prior to clearance or disturbance of any Aboriginal site. Gumala consent is also granted.	Sites not disturbed unless consents have been granted
Provide clarity and process for RTIO personnel and contractors regarding the heritage management process.	Personnel are aware of heritage process and the importance of Aboriginal cultural heritage as a value to be protected wherever possible	Relevant staff and contractors receive heritage awareness training.

9.4 IMPLEMENTATION STRATEGY

The implementation of the Yandicoogina CHMP emphasises RTIO's commitments to meeting national and state government statutory requirements, internal cultural heritage management systems and heritage protocols, as well as open communication exchange with the relevant traditional owners and native title claimant groups.

9.4.1 Management actions

Table 43 Management actions for Aboriginal Heritage

Parameter	Action	Timing
Information	Include in induction program for all quarry personnel (including contractors) information on: • significance of Aboriginal heritage and the potential impacts of the project • procedures to report potential new sites • obligations under the *Aboriginal Heritage Act 1972* • requirements for the protection of known Aboriginal sites. procedures in the event of disturbance of a known heritage site and/or the discovery of a suspected heritage site.	Induction and training of staff and contractors
	Establish and maintain a register of sites of Aboriginal significance within the site, including GIS records of site locations, and site descriptions. Make this register available to contractors and relevant employees, except in the case that Aboriginal people or DIA wish for site locations to remain undisclosed (see AH3).	Within 6 months of implementation of this EMP
Surveys	Comprehensive surveys are undertaken by archaeologists, anthropologists and traditional owners across all areas of proposed ground disturbance.	
Site protection	Archaeological and Ethnographic sites of high significance are not disturbed throughout the duration of the proposal.	At all times
	Archaeological and Ethnographic sites of moderate to low significance are only disturbed following traditional owner consultation and consent and section 18 approval under the *Aboriginal Heritage Act 1972*. Effort should always be made in the first instance to avoid heritage sites	Ongoing
	Flag and/or fence the boundaries of Aboriginal sites in the vicinity of construction or operation areas to ensure activities do not intrude into areas where Aboriginal sites are present.	
	Implement contingency actions in the event of disturbance to a known heritage site.	At all times
	Implement contingency actions in the event of discovery of a suspected heritage site.	At all times
	Salvaged material from sites cleared via section 18 consent is stored in a location agreed by the relevant traditional owner group.	Agreed following S18 salvage activity.
Communication	Maintain regular ongoing communication with representatives of local Aboriginal groups, and ensure consultation and involvement of the local Aboriginal people occurs in matters of heritage management.	At all times
Community	Continue involvement in Aboriginal training, employment, enterprise and community development programs.	At all times

9.5 MONITORING AND REPORTING

Monitoring

Table 44 provides monitoring actions to enable an assessment of the effectiveness of the Aboriginal heritage management actions in place.

Table 44 Monitoring actions for Aboriginal heritage

Topic	Parameter	Frequency	Purpose
Condition of known heritage sites	Visual inspections of known heritage sites and confirmation of site boundaries are correct and correspond with GIS register information. In accordance with site-specific requirements as indicated by Aboriginal representatives or the DIA	To be determined in consultation with local indigenous groups	To ensure no unauthorised site disturbance
disturbance footprint	Reconciliation of approved clearing with actual clearing	To be determined in consultation with local indigenous groups	To ensure no unauthorised site disturbance

Reporting

- The location of recorded heritage sites will be documented in an internal Cultural Heritage Sites Register and GIS system.
- The CHMP will be regularly updated as heritage surveys are completed and new information is obtained.
- Internal records will be kept regarding formal and informal communication with Aboriginal representatives.
- Significant incidents will be reported immediately to the DIA and to Aboriginal representatives.

9.5.1 Contingency actions

Contingency actions will be initiated if there are unexpected disturbance to sites or a new site is detected. The contingencies include further investigation to determine the cause for the disturbance and further management.

Table 45 Contingency actions for Aboriginal heritage

Trigger	Action
Site disturbance of known heritage site	1. Stop work immediately, and notify manager 2. Investigate the cause of the incident, the level of severity, and record the incident and all other relevant information 3. Report the incident to regulatory authorities (DIA) and relevant Aboriginal stakeholders 4. Implement corrective actions to mitigate harm in consultation with the DIA and Aboriginal stakeholders 5. Review and revise heritage management measures as appropriate to prevent recurrence.

Trigger	Action
Detection of suspected Aboriginal heritage site (previously unrecorded)	6. Immediately cease all works in the area and inform the manager 7. Contact the RTIO heritage team who will coordinate tasks 3-11 below: 8. Determine the authenticity of the site or material using appropriate methods, in consultation with relevant stakeholders. A qualified archaeological and or ethnographic consultant in consultation with the relevant traditional owner group will assess the site and advise the next course of action. 9. Notify the DIA of the identification of the new site in accordance with section 15 of the *Aboriginal Heritage Act 1972*. The DIA must be notified of the site within a timely manner, preferably within seven days of discovery of potential site. Notify police if skeletal remains are involved. 10. Update the Yandicoogina Cultural Heritage Sites Register 11. Following the RTIO heritage fencing procedure, erect fence/flagging /barrier around the potential heritage site including a 10 m buffer (signage to be confirmed following consultation with traditional owners) until further advice is received. 12. Record details of the site discovery for internal management records, including: • date and time of the discovery • method by which the site was uncovered, and the project activities occurring at the time • site description / nature of the site • nature of investigations taken in relation to the potential site • action taken in relation to the site (including supplementary monitoring and corrective actions) • reasons for taking no action in relation to the site (if such a decision was made) • outcomes of the process. 13. Implement suitable mitigation/management measures as soon as practicable once agreed upon by stakeholders. 14. Investigate potential for site avoidance. Where disturbance to the site can be avoided (e.g. via reconfiguration of the development), actions may include compiling a detailed site record, collection of the cultural material or protection of the site (e.g. fencing). 15. Where avoidance is not practicable, seek consent to disturb the site from the Minister for Indigenous Affairs through a Section 18 application under the Aboriginal Heritage Act 1972 (WA), in consultation with the Native Title holders.

10. WASTE MANAGEMENT PLAN

10.1 DESCRIPTION

This plan complies with Ministerial Statement 417 condition 4-1 (5) and licence L7340/1997/9.

The waste materials that are typically generated from Yandicoogina include:

- domestic solid and liquid waste
- food scraps from the accommodation and construction camp
- scrap metal/drums
- rubber products (conveyor belt, tyres)
- batteries
- overburden
- hydrocarbon waste
- sewage
- washdown water.

A Non-Mineral Waste Management Plan has been developed for all Rio Tinto Sites. This plan establishes overarching waste management practices such as waste segregation, collection, disposal and regular audits. Site specific waste management information can be found in the Waste Storage, Treatment and Disposal Guidelines.

A Class II landfill facility has been constructed for the disposal of general domestic solid waste. Only putrescibles (food scraps), biodegradables (paper, cardboard etc), inert substances (concrete, steel, wood) and other general rubbish is disposed of in this landfill.

Overburden from the mine is placed in waste rock dumps, and where practicable, backfilled into mined-out sections of the pit.

Sewage from the Yandicoogina village and mine area is directed to bacterial digestion plants. The sewage is fed to a compact treatment plant, then passes into a holding tank. The effluent is treated with chlorine prior to being discharged through nominated irrigation systems within designated irrigation areas that are fenced off. A licensed contractor takes any separated solids off site.

Hydrocarbon management is discussed separately in Section 11.

10.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

Incorrect disposal of waste could result in groundwater, surface water or soil contamination, vegetation or fauna impacts, poor visual amenity or health and safety issues.

10.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The environmental objectives for waste management arte presented in Table 46.

Table 46 Environmental objectives, targets and indicators for waste management

Management objective	Target	Key performance indicators
To ensure that all waste is disposed of in a manner that does not have unacceptable impacts on the environment.	All waste is managed appropriately	No unacceptable material is dumped in the landfill.
		As much overburden is returned to the mined void as is practicable.
		No contaminated seepage from the landfill is detected.
		All grey/sewage water and waste is disposed of appropriately.
		All rubber is disposed of in the licensed tyre disposal facility.
		All hazardous waste is managed appropriately.
		No waste management non-compliances.
Minimise the volume of non-process wastes generated through the adoption of practicable waste reduction strategies.	Recycling is undertaken as a standard practice	An increase in the number of items recycled.

10.4 IMPLEMENTATION STRATEGY

10.4.1 Management actions

The following actions will be undertaken to ensure that management objectives are met.

Table 47 Management actions for waste

Parameter	Action	Timing
Waste Segregation:	All hazardous and recyclable waste from the operation is segregated prior to disposal and disposed of as per the Hamersley Iron Waste Management Plan held by the Environmental MRU.	ongoing
Landfill Management L7340/1997/9 conditions S1 (a-d)	The landfill is fenced and backfilled on a regular basis, with burning of wastes in the landfill (or elsewhere at the operation) prohibited. Management practices are outlined in the Hamersley Iron Landfill Management Plan and Landfill Management Work Instruction held by the Environmental MRU. The tipping area of the landfill is not greater than 30 m in length and 2 m above ground level in height. Waste in the tipping area of the landfill is to be covered at least weekly, with a dense (at least 200 mm) inert and combustible material or other suitable material approved by the Director and totally so no waste is left exposed. There is to be no waste within 100 m of any surface water body at the site and 3 metres of the highest level of the water table aquifer at the landfill site. The stormwater is to be managed so that it is diverted from areas of the site where there is waste and water that has come into contact with waste is to be diverted into a sump on the site, or otherwise retained on the site.	ongoing
Landfill Disposal:	Only putrescibles (food scraps), biodegradables (eg packaging, cardboard), inert materials (eg concrete) and other general rubbish (plastics, aerosol cans, rags) are disposed of in the landfill. Empty chemical or hydrocarbon containers, batteries, oil or oil filters, rubber (tyres) and similar materials are not permitted in the landfill.	ongoing

New Landfill Construction:	Any future landfill sites are to be selected, constructed and managed in accordance with Hamersley Iron's Landfill and Waste Management Plans.	Prior to construction of new landfills
Hazardous Wastes	Normal mining and processing operations do not generate hazardous wastes, however, in the case that some is produced, it will be disposed of according to the Hamersley Iron Waste Management Plan and the relevant regulations. (Waste is classified as hazardous if it doesn't meet the criteria for Class II landfills).	
Spent Chemicals:	Spent chemicals, such as coolants, solvent and inhibitors are disposed of off-site by a licensed contractor.	As required
Rubber Disposal:	Used tyres, old conveyor belt sections and other large rubber products are disposed of in the tyre disposal facility on site (approved by the DEC). This facility is managed as per the DEC guidelines, which are held by the Environmental MRU.	ongoing
Waste Audits	On-site waste storage, treatment and disposal facilities are to be inspected on a regular basis to ensure compliance with procedures.	quarterly
Overburden Management:	Overburden and waste rock will be returned to the mined void when practicable otherwise it is placed in a waste rock dump.	
Wastewater Treatment Plant Discharge	Effluent from the wastewater treatment plant is discharged within designated irrigation area.	ongoing
Wastewater Treatment Plant Solids:	Separated sewage solids are disposed of off-site.	ongoing
Wastewater Treatment Plant Maintenance:	The sewage treatment plant is to be managed and operated in a manner such that (condition W7): Uncontaminated stormwater runoff does not enter the wastewater treatment system There is no discernable seepage loss from the tank treatment system All effluent from the wastewater treatment plant is only discharged through nominated irrigation systems within the designated irrigation areas Any sludges removed from the treatment system are disposed of in accordance with the WA guidelines for direct land application of biosolids and biosolids products, February 2002 or to a approved landfill.	ongoing
Waste Reduction Reviews	Periodic reviews are undertaken to identify opportunities for more effective means of reducing waste generation or waste disposal.	annually
Recyclable Materials:	Recyclable and re-useable materials (such as some steel and batteries) are stored in designated areas outside the landfill and made available for re-use or periodic collection as outlined in the Waste Management Plan.	Ongoing
Asbestiform minerals	The CID formation is considered to have a low risk of containing such material, due in part to its absence from the existing JC and JSE mine pits. However, in the event that fibrous material is intercepted, the material will be managed in accordance with internal plans and industry requirements and guidelines.	As required
Acid rock drainage	The deposits were assessed to have a low risk of acid rock drainage (ARD), based on geochemical interpretation and analytical testing of drill hole samples. If such material is detected it will be managed in accordance with internal plans and industry requirements and guidelines.	As required

10.5 MONITORING AND REPORTING

The following monitoring actions (Table 48) are already being undertaken to monitor the waste management at the Yandicoogina site.

Table 48 Monitoring actions for waste

Topic	Parameter	Frequency	Purpose
On-Site Waste Disposal	Visual observation of designated litter/rubbish areas	Quarterly	To ensure proper disposal of all domestic and industrial wastes (including putrescible wastes)
On-Site Waste Facilities	Visual inspection of design and condition of on-site waste facilities	Quarterly	To ensure suitable, effective function and condition (no corrosion) of all on-site waste facilities, including landfill and storage areas.
Separation Of Different Waste Categories	Visual observation of bin contents (where safe) at all on-site waste facilities, and of signage	Opportunistic	All bins and on-site waste facilities contain only wastes in the category designated for that bin, and are clearly sign posted
Liability Associated With Third Party Waste Transport	Review Controlled Waste Transport Certificates to ensure they are up to date and complete	Quarterly	All waste transported by a third party complies with regulatory requirements
Mine WWTP discharge water Quality	pH, TDS, TSS, BOD, Nitrate, Nitrite, Total N, Total P, Thermo tolerant Coliforms (TCC).	As required	Check efficient and correct operation of WWTP and ensure water quality does not exceed RTIO internal discharge criteria
Village WWTP discharge water Quality	pH, TDS, TSS, BOD, Total N, Total P, Thermo tolerant Coliforms (TCC).	As required	Check efficient and correct operation of WWTP and ensure water quality does not exceed RTIO internal discharge criteria
Volume Of Waste Generated	Review the Waste Register to ensure all waste have been recorded	Quarterly	Waste register is complete and accurate

10.5.1 Contingency actions

The following contingency actions are to be undertaken if waste management appears to be inadequate.

Table 49 Contingency actions for waste

Trigger	Action
Incorrect disposal of waste.	1. Report as an Environmental Incident. 2. Implement corrective actions, including correct disposal of wastes and re-informing personnel of correct disposal procedures as required.
Spills/leaks	1. Mitigate (initiate spill response procedure) and investigate cause 2. Report as an Environmental Incident. 3. Implement corrective actions, including correct disposal of wastes and re-educating personnel of correct disposal procedures as required.
Poor Water Quality from WWTP discharge	1. Report as an Environmental Incident. 2. Implement corrective actions, including correct disposal of wastes and re-informing personnel of correct disposal procedures as required.
Bins or waste facilities overflowing	1. Arrange for more frequent waste collection and/or larger receptacles

11. HYDROCARBON MANAGEMENT PLAN

11.1 DESCRIPTION

11.2 DESCRIPTION

This section complies with Ministerial Statement 417 4-1 (4) Pollution prevention measures and with the conditions in Licence L7340/1997/9.

The potential impacts upon the environment from the use and storage of hydrocarbons include groundwater, surface water and soil contamination, vegetation impacts from spillage or leaks and impacts associated with accidental fires.

Shell is contracted to Rio Tinto Iron Ore to supply lubricant oil, BP supplies diesel fuel and Tox Free Solutions Pty Ltd are contracted to remove and dispose of hydrocarbon contaminated waste. Tox Free have responsibility for the provision, handling, removal and disposal of hydrocarbons used on-site.

There are six waste oil tanks at Yandicoogina, they are located as follows:

- Fixed Plant Workshop 10,000L
- Fixed Plant Junction Central 10,000L
- Heavy Vehicle Workshop (MEM) 55,000L and 10,000L
- Rail Loop 5,000L
- Junction South East 5,000L
- Junction Central Fuel Farm 55,000L.

There are 10 oil/lubricant tanks at Yandicoogina, they are located as follows:

- between Fixed Plant Workshop and MEM 4 x 10,000L and 1 x 50,000L tanks
- MEM workshop 3 x 5,000L day tanks
- Fixed Plant workshop 2 x 20,000L tanks.

Diesel can be brought onto site by rail or road. Diesel is normally brought onto site by road train to the bulk fuel facility in central. There are eight 110 000 L tanks in the Central bulk fuel farm. This diesel is piped to JSE where there are two 110,000L day tanks for the refuelling of Heavy and Light vehicles or to the rail loop where there are two 110,000L tanks for use in the trains. All fuel and oil facilities are bunded to a standard that meets the requirements of Australian Standard (AS) 1940:2004 - *The storage and handling of flammable and combustible liquids*. The storage and handling of hydrocarbons is covered by the *Dangerous Goods Safety Act 2004* and Regulations administered by the DMP.

11.3 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following aspects of the Yandicoogina operation have been identified as requiring management to minimise potential for contamination of the environment by hydrocarbons:

- hydrocarbon storage
- hydrocarbon spills
- disposal of contaminated of water and soil.

11.4 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The environmental management objectives for hydrocarbon management are presented in Table 50.

Table 50 Environmental objectives, targets and indicators for hydrocarbon management

Management objective	Target	Key performance indicators
To ensure that all hydrocarbons are transported, handled, stored and disposed of in a manner that minimises contamination of the environment.	All hydrocarbon storage facilities are compliant with Australian Standard 1940:2004.	Licences and audits
	All waste oil is collected and disposed of off-site by an approved method.	Records and audits
	All used drums and oil/fuel filters are sent off-site.	No used drums or oil filters remain on site
	All hydrocarbon spills are contained and cleaned up.	Audit documentation and incident reporting
	There are no discharges of oily water.	
	All hydrocarbon contaminated soil is removed and taken to the land farm.	
	There are no leaks from the hydrocarbon pipework.	

11.5 IMPLEMENTATION STRATEGY

11.5.1 Management actions

The management actions in Table 51 are to be undertaken to ensure management objectives are met.

Table 51 Management actions for hydrocarbons

Parameter	Action	Timing
Storage	All areas where more than 250 L of hydrocarbons are stored are appropriately bunded (as outlined in Australian Standard 1940:2004). Environmentally hazardous chemicals (where volume on the premises exceeds 250 litres) are to be stored in a compound with low permeability designed to contain not less than 110% of the volume of the largest storage vessel or inter-connected system, and at least 25% of the total volume of substances stored in the compound. Licence condition W4(a). Specific design criteria are in condition W4(b).	ongoing
Waste Oil:	Waste oil is collected and stored in aboveground tanks. It is then taken off-site for reprocessing by a DEC licensed contractor as outlined in the Rio Tinto Waste Management Treatment, Storage and Disposal Guidelines.	ongoing

Waste Grease:	Waste grease is stored in marked drums, which are sealed and collected together with empty oil and grease drums for off-site disposal by a DEC licensed contractor.	As required
Used Oil Drums:	Used oil drums and similar containers are collected and stored in a designated area until they are removed by a DEC licensed contractor for offsite disposal as outlined by the Rio Tinto Waste Management Treatment, Storage and Disposal Guidelines.	ongoing
Oil/Fuel Filter Disposal:	All used oil and fuel filters are collected and taken off site by a DEC licensed contractor as outlined in the Rio Tinto Waste Management Treatment, Storage and Disposal Guidelines.	ongoing
Quick-Break Detergents:	Quick-break detergents are used across site to prevent oil-water emulsions from passing through the separator systems. The use of degreasers on-site is controlled. Condition W5(b)	ongoing
Hydrocarbon Spills	Any hydrocarbon spills that occur either in the pit or in the plant/mine area are contained and cleaned up in the manner outlined in the Hamersley Iron Spill Response Work Instruction (WI-H-017TP) and as per licence condition W4(c)).	As required
Spill Containment:	Protective bunding, skimmers, silt traps, neutralisation pits, fuel and oil traps, drains and sealed collection sumps are to be used around the process plant, maintenance workshops and power generation areas to enable recovery of spillages and protection of surrounding soils and groundwater. Condition W5(a).	ongoing
Contaminated Soil Handling:	Contaminated soil resulting from hydrocarbon spills is removed and taken to the land farm where it is treated by bioremediation as outlined in the Rio Tinto Landfarm Management Plan.	ongoing
Oily Water:	A wastewater treatment system for oily and solvent wastewater, such as uncontaminated stormwater is prevented from entering the system. Condition W6	When required
Testing of Pipework:	Sub-surface and above-ground pipework containing hydrocarbons is periodically inspected, pressure-tested and maintained to ensure that leakages are prevented or detected as early as possible.	As per schedule

11.6 MONITORING AND REPORTING

Monitoring actions are to be undertaken as per Table 52. Reporting is as per required annual environmental reporting.

Table 52 Monitoring actions for hydrocarbons

Topic	Parameter	Frequency	Purpose
Unmanaged leaks and spills	Visual observation of re-fuelling area, soils and drainage system within site, to look for spills or other evidence of unmanaged hydrocarbon contamination	During re-fuelling and any activities where leaks and spills may occur	To ensure that minor spills and leaks controlled, contained and cleaned up within 24 hours
Prevent large spills	Visual inspection of hydrocarbon storage and stationary re-fuelling facilities	Weekly	To ensure no spills greater than 100 litres to occur on site at any time
Condition of storage facilities	Visual inspection of the condition and integrity of storage facilities and pipelines (check for leaks and deterioration/corrosion)	Weekly and opportunistically	All storage tanks and pipelines in good working order with no deterioration/corrosion
Condition of spill response infrastructure and equipment	Visual inspection of bunding and spill response equipment	Weekly and opportunistically	All bunds and spill response equipment present, stored correctly, and in good order at all times

Topic	Parameter	Frequency	Purpose
Prevent incidents from the storage of incompatible substances e.g. fire, explosion	Inspect storage facilities to ensure that hazardous substances / dangerous goods are segregated appropriately	Monthly	Hazardous materials / dangerous goods are appropriately segregated according to regulations

11.6.1 Contingency actions

The following contingency actions (Table 53) are to be undertaken in the event of a hydrocarbon spill.

Table 53 Contingency actions for hydrocarbons

Trigger	Action
Hydrocarbon spill	1. Initiate Incident Response Procedure, including : • control the source of the spill • contain the spill • clean up the spill 2. Complete Environmental Incident Report

12. EMISSIONS MANAGEMENT PLAN (DUST, NOISE, GREENHOUSE)

12.1 DESCRIPTION

This plan complies with Ministerial Statement 417 condition 4-1 (4) and (5), Licence (L7340/1997/9) conditions A1 (a) and A1(b).

Greenhouse

The Greenhouse Challenge Program was announced in 1995 following an Australian industry approach to Government seeking a voluntary industry-based program to abate greenhouse gas emissions. Rio Tinto (covering all Australian businesses) became a signatory to the Program in 1996.

Prior to becoming a Signatory to the Challenge, Hamersley Iron established an inventory of greenhouse gas emissions that measures the emissions of greenhouse gas emissions arising from the operation and action plans for the implementation of the challenge were developed. The action plans identified areas where greenhouse gas emissions can be made and how these programs will be implemented.

Activities or aspects of the project that will directly result in the emission of greenhouse gases include:

- fuel usage by vehicles, mobile plant and equipment used for the extraction and transportation of ore and waste
- explosives used for blasting
- land clearing and revegetation.

Activities that are indirectly responsible for contributing to emissions of greenhouse gases include:

- decomposition of waste (landfill)
- electrical energy usage by processing plants and conveyors.

Revegetation of disturbed areas during rehabilitation will result in gradual carbon sequestration in these areas.

The existing operations at Yandicoogina have an emissions intensity of approximately 3 to 5 kg CO2 equiv. per tonne of mined product (excluding rail and port shipment). This compares favourably with other iron ore projects in the Pilbara. Based on this figure, annual GHG emissions resulting from the proposal will exceed 100,000 tonnes CO2 equiv. yr-1 over the life of the project (MWH 2010).

Noise

The ambient noise levels are low, with periodic noise level elevations due to blasting and vehicle movements. The accommodation village is located sufficient distance away from the mine to ensure that noise levels at this location will be negligible. The BHPIO accommodation village is also located too far away for noise from Yandicoogina to be audible. The nearest pastoral homestead is 25 km away.

After application of noise management to meet occupational health and safety regulations through the HIsafe systems and procedures, there are no anticipated environmental noise impacts. At present, environmental noise monitoring is not undertaken, as it is not seen as necessary due to the large distance between the operation and the nearest premises.

The following noise mitigation measures should assist in further reducing the potential for any impact to local amenity from noise:

- use of 'smart reversing alarms'
- selection and location of conveyor start-up alarms to reduce noise impacts
- blasting restricted to daylight hours.

Dust

Compared with other Pilbara mines, Yandicoogina ore has a relatively high moisture content. This assists in minimising dust generation during ore handling and processing. Dust is generated from a number of activities and facilities on-site, however, the main sources of dust include stockpiles, the primary crushing facilities and conveyor transfer points.

Dust lift-off during ore transport between Yandicoogina and the port of Dampier is not likely to be a problem due to the moisture levels of the ore when loaded. The likely impacts of dust generation from the mining and processing activities will mainly be related to health and safety issues, however, dust may also affect the biological environment.

The generation of dust from the project will depend upon:

- the frequency at which a dust generating activity takes place
- meteorological conditions, such as wind speed
- moisture content of the dust source
- composition of dust, including particle size distribution, particle density
- the condition of the dust source.

12.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following aspects of the Yandicoogina operation have been identified as requiring management to minimise potential for contamination of the environment by emissions:

- greenhouse emissions
- noise
- dust.

12.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The environmental objectives for emissions management are presented in Table 54.

Table 54 Environmental objectives, targets and indicators for emissions management

Management objective	Target	Key performance indicators
Greenhouse		
To comply with the requirements of the Greenhouse Challenge.	To reduce the amount of Greenhouse Gas emissions from the Yandicoogina operation.	• Meet annual targets for greenhouse gas emissions.
• **Noise**		
To ensure that there is no significant impact on the natural or social environments from excessive generation of noise.	All reasonable measures are taken to control noise.	• There are no noise related complaints
• **Dust**		
To ensure that there is no significant environmental impact on the natural or social environments from the generation of dust.	All reasonable measures are undertaken to control dust. Vegetation adjacent to disturbance areas is not smothered by dust.	• All dust control equipment is operational. • Vegetation health and condition monitoring.
Maintain compliance with dust related Environmental licence conditions (A1(a) and A1(b)).	Dust emissions remain within licence.	• All reasonable dust control measures have been taken. • There are no dust related non-compliances identified.

12.4 IMPLEMENTATION STRATEGY

12.4.1 Management actions

The management actions in Table 58 will assist with achieving the objectives for emissions.

Table 55 Management actions for emissions

Parameter	Action	Timing
Greenhouse		
Efficiency	Continue with monitoring extent of emissions and with continual improvement to reduce emissions, by increasing efficiency and continually updating to more efficient technology.	ongoing
	Evaluate the need for emissions offsets such as revegetation carbon abatement offsets.	
Noise		
Vehicle and equipment noise suppression	Various noise suppression measures have been implemented, depending on need and type of equipment.	ongoing
	Mobile and stationary equipment has been fitted with effective exhaust mufflers to suppress noise emissions.	Ongoing and when new equipment is purchased
	Stationary items of equipment with potential to generate significant noise levels are screened, enclosed or otherwise located such that acceptable noise levels are achieved.	ongoing
Maintenance of noise suppression equipment	All noise suppression equipment is maintained so that it is effective in reducing noise levels to an acceptable standard.	ongoing
Dust		

Parameter	Action	Timing
Utilisation of Tracks	Existing tracks are utilised to minimise the extent of clearing and exposure of soil surfaces. Implementation of speed limits to minimise dust generation on roads. Sealing high usage roads.	ongoing
Vegetation Retention	Vegetated areas are retained until required ahead of mine development in order to minimise the extent of soil surface exposed at any time.	ongoing
Progressive Rehabilitation	Progressive rehabilitation of disturbed areas is undertaken, which minimises dust through the reduction of exposed soil (LA1(a)).	As required
Water Application	Watering from water tankers is undertaken over heavily trafficked areas within the operation and other areas prone to dust generation. This includes Licence conditions A1(a): Stockpiles are maintained in damp condition Non-working faces to be sealed to prevent dust lift off Spraying surfaces with water Seal surfaces with chemical dust suppressants	ongoing
Crushing Process	The ore crushing facilities are fitted with water sprays and dust collection equipment.	ongoing
Train Loadout Facility	The train loadout facility is fitted with water sprays to reduce dust generation.	ongoing
Stacker Features	The stacker delivering material to the product stockpile has a 30 degree luffing range which allows the boom to be lowered when the height of the stockpile is low and raised when it is high. This reduces the drop height and therefore reduces the potential for dust generation during stacking operations.	ongoing
Conveyor Scraping:	Conveyors are fitted with primary and secondary scrapers to remove material from the plant conveyor belts and reduce the potential for dust generation. Material removed is fed to the conveyor. Covers on conveyors, transfer points and discharge points, skirtings and dust filters (Licence condition A1(b)).	ongoing
Housekeeping in the Plant Area	Regular housekeeping practices are employed to prevent an accumulation of material in or around the plant facilities that may result in airborne dust.	ongoing

12.5 MONITORING AND REPORTING

Table 56 Monitoring actions for emissions

Topic	Parameter	Frequency	Purpose
Greenhouse gas	The amount of greenhouse gases produced from the operation is calculated and reported	monthly	To ensure that emissions are measured
Noise	Any noise complaints recorded	As required	To track noise issues
Dust	Any dust complaints recorded	As required	To track dust issues
	Visual inspection	Ongoing	To ensure timely response to excessive dust emissions

Reporting

Rio Tinto is required to report the progress of each of its operations to the Greenhouse Challenge Office on an annual basis. The information required includes:

- aggregate summary of total greenhouse emissions by the site
- outline of the process undertaken to develop the action plan
- summary of Company's progress in terms of policy, training, information systems and monitoring
- summary of greenhouse reduction projects planned
- forecast of static efficiency emissions of greenhouse gases over a defined period
- list of performance indicators that demonstrate the effect of actions undertaken.

In accordance with the requirements under the *National Greenhouse and Energy Reporting Act 2007*, RTIO will report annually on project related:

- consumption of energy
- Scope 1 (direct) emissions
- Scope 2 (indirect) emissions.

12.5.1 Contingency actions

The actions in Table 57 are to be undertaken in the event of a breach of target or objective.

Table 57 Contingency actions for emissions

Trigger	Action
Dust complaint received	1. Contact any complainants that have concerns related to dust and maintain contact until such time as the source of the incident is verified and resolved as far as practicable. 2. Establish the date and nature of the complaint nature, and resolution action.
Dry windy conditions	1. Increase dust suppression through increased application of water and evaluate the need to delay blasting activities until more favourable conditions return
Noise complaint received	1. Contact any complainants that have concerns related to noise and maintain contact until such time as the source of the incident is verified and resolved as far as practicable. 2. Establish the date and nature of the complaint nature, and resolution action.
Greenhouse emissions exceed annual target	1. Determine cause and establish new annual targets if required.

13. FIRE MANAGEMENT PLAN

13.1 DESCRIPTION

This plan complies with Ministerial Statement 417 condition 4-1 (6).

Wildfires or bushfires have the potential to cause major damage to the environment, threaten lives and property and destroys grazing area. Therefore, it is important that the outbreak of fires caused by the operations is prevented and that any fires are controlled.

13.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following aspects of the proposed operation have been identified as requiring management to minimise fire risk:

- **storage and use of flammable material** onsite may increase the potential risk of fire outbreak
- **onsite machinery** may increase the risk of fire through the use of fuels and by providing ignition sources.
- **repair and maintenance** of vehicles, plant and equipment may pose a fire risk.

The storage and handling of hydrocarbons is addressed in Section 11 of this EMP. Fire management is also addressed under site safety rules and regulations.

13.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The following objectives and targets relate to fire management.

Table 58 Environmental objectives, targets and indicators for fire management

Management objective	Target	Key performance indicators
To prevent the outbreak of fires caused by the operation.	There are no accidental fires caused by the operation.	Absence of fire
To ensure that any fires from the operation or bushfires are contained and controlled so that any damage to the environment and to existing facilities or property is minimised.	There is no damage resulting from fires caused by the operation.	No fire-related damage to vegetation, property or infrastructure
	There is no impact on the operation from bushfires	Incident report

13.4 IMPLEMENTATION STRATEGY

13.4.1 Management actions

Management actions for meeting site objectives regarding fire are listed in Table 59.

Table 59 Management actions for fire

Parameter	Action	Timing
Open fires	Open ground fires are banned, except for purpose of fire training.	At all times
Burning of rubbish	The burning of rubbish in the landfill or anywhere else on site is banned.	At all times
Fire fighting equipment	Appropriate fire fighting equipment is available to control localised bushfires under coordinated supervision.	At all times
	Fire fighting equipment will be maintained to comply with relevant fire safety standards. Heavy duty (x2) and light attack (x4) fire fighting vehicles maintained on site and isolated water supply (2 x 30,000 L capacity) water trucks available for fire suppression.	At all times
	Subset of mine-site personnel trained in fire suppression to FESA standards.	At all times
Firebreaks	Firebreaks have been established around key facilities and will be maintained annually.	Annually (November)
Fire risk assessments	Visual assessments for identifying potential fire risks are made at periodic intervals as part of safety audits.	Annually (November)
	Inclusion of a bushfire response plan in site emergency procedures.	At all times

13.5 MONITORING AND REPORTING

The following management actions will be undertaken to ensure firebreaks and access are open and that ignitions sources are managed appropriately.

Table 60 Monitoring actions for fire

Topic	Parameter	Frequency	Location	Purpose
Firebreaks and access	Condition of the fire breaks.	Monthly. Not necessary during wet season.	All firebreaks onsite.	To ensure that the firebreaks around structures are maintained to required standards.
Ignitions sources	Hydrocarbon storage areas and other ignition sources (e.g. machinery).	Monthly	Hydrocarbon storage areas and location of machinery.	To identify potential onsite fire risks.

13.5.1 Contingency actions

These actions are to be undertaken in the event of a breach in target or objective.

Table 61 Contingency actions for fire

Trigger	Action
Fire incident.	1. Respond to fire in accordance with fire response procedures. 2. Investigate cause of the fire. 3. If fire was a result of mining operations, confirm operations are being undertaken in accordance with the fire management actions. 4. If operations are found to differ from the fire management actions, make necessary changes to operations. 5. If operations are being undertaken in accordance with the fire management actions, investigate and implement preventative measures to reduce future fire risk. 6. An Environmental Incident Report will be completed.
Unauthorised burning onsite.	1. Immediately extinguish fire. 2. Investigate to identify responsible person(s). 3. Reinform person(s) of the onsite fire prohibitions. 4. Reinform all onsite personnel of the onsite fire prohibitions via internal communications procedures

14. CONTAMINATED SITES MANAGEMENT PLAN

14.1 DESCRIPTION

Contaminated sites are not listed specifically in the ministerial conditions, but they could be considered to be referred to in Ministerial Statement 417 4-1 as regards pollution prevention, waste management and rehabilitation of disturbed areas.

A contaminated site investigation of the Yandicoogina operation was undertaken by Sinclair Knight Merz during 1999/2000 (Sinclair Knight Merz 2000) and by URS in 2010. The first phase of the investigation was to identify potentially contaminated sites (Figure 12). The second stage was to define the character and extent of contamination at each site and categorise them according to their risk and impact. These sites were then registered on the site Contaminated Sites Register held by the Environment MRU.

The URS PSI was carried out to identify potential sources of contamination resulting from current and historical site activities, as well as to qualitatively assess the implications of the potential impact to soil, groundwater, environmental and human receptors in accordance with the *Contaminated Sites Act 2003* (CS Act) and current DEC guidelines relating to the reporting and investigation of potentially contaminated land. Based on the findings of the PSI, the main sources of contamination from the mining operations include:

- hydrocarbon (mainly diesel) storage and handling facilities with associated underground pipework (where present) and fuel pumps
- other sources of contamination including vehicle washdown and maintenance facilities, waste oil handling and storage facilities, liquid waste storage facilities, ANFO and chemicals, equipment laydown landfilling, wastewater treatment and land farm facilities.

14.2 ENVIRONMENTAL ASPECTS TO BE MANAGED

The following aspects of the Yandicoogina operation have been identified as requiring management to ensure that contaminated sites at the mine do not affect the environmental values of the area:

- current contaminated sites are monitored and remediated
- contaminating materials do not create new contaminated sites.

14.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The environmental objectives for contaminated sites management are presented in Table 62

Table 62 Management objectives, targets and indicators for contaminated sites management

Management objective	Target	Key performance indicators
Ensure that contaminated sites do not pose a risk of harm to human health or environmental value.	Keep records of all contaminated sites	All contaminated and potentially contaminated sites have been identified and registered.
	Determine risks and impacts of contaminated sites	The character and extent of the contamination of each identified site has been defined and the risks and impacts have been identified and prioritised.
	Manage and contain contaminated sites	A management plan has been developed for each site identified.

14.4 IMPLEMENTATION STRATEGY

Specific strategy and management actions have been identified to assist in achieving the contaminated sites management objectives above.

14.4.1 Management actions

Table 63 Management actions for contaminated sites

Parameter	Action	Timing
Identification of Sites	All contaminated and potentially contaminated sites are to be identified and registered on the Contaminated Sites Register held by the Environmental MRU.	As occurring
Assessment of Contamination	An assessment of the extent of contamination based on evaluation against the National Environmental Protection Measure (NEPM) for the Assessment of Site Contamination will be undertaken for each contaminated site.	Following identification of a site
Risk Assessment	Where a risk assessment under the RTIO risk assessment framework indicates that there is a "potentially high or moderate risk " (URS 2010) of adverse effects on human health or ecological values, a detailed investigation will be conducted based on: • NEPM investigation levels • Environmental Licence Conditions and general provisions of the *Environmental Protection Act 1986* • Hamersley Iron Iron's Risk Assessment Matrix.	Following initial site investigation
Development of Management Plans	Site management plans will be developed in accordance with the risk assessment outcomes for Areas of "potentially high or moderate" risk.	Ongoing

14.5 MONITORING AND REPORTING

Monitoring activities ensure the contamination is not spread and all sites are to be reported to the DEC upon discovery.

Table 64 Monitoring actions for contaminated sites

Topic	Parameter	Frequency	Location	Purpose
Containment	Contaminating material is contained and has not spread beyond boundaries	6 Monthly	Site	To ensure contamination from sites is not spread to a larger area
Prevention	Potentially contaminating materials are managed	6 Monthly	Site	To ensure new contaminated sites are not created

7,485,000 mN

ML274SA

Junction Central

JSW

Junction South East

Oxbow

7,480,000 mN

7,475,000 mN

7,470,000 mN

720,000 mE

725,000 mE

730,000 mE

735,000 mE

LEGEND

Tenure boundary

Pit outlines

Registered contaminated Site

LOCATION MAP

SCALE

N

1:100000 @ A4

RioTinto

Figure 12

Yandi
Location of Contaminated Sites

Drawn: MB
Date: 8/10/10

Plan No:
Proj: Yandi

14.5.1 Contingency actions

The contingency actions presented in Table 65 are to be undertaken when the objectives or targets are exceeded or not met.

Table 65 Contingency actions for contaminated sites

Trigger	Action
Incorrect management of site	1. Report as an Environmental Incident. 2. Implement corrective actions, including disposal of material/remediation and re-informing personnel of correct procedures as required.
Damage to health or environment due to presence of site	1. Investigate cause. 2. Determine and implement remedial measures.
New sites are located	1. Investigate cause. 2. Notify DEC and place on database. 3. Determine and implement remedial measures.

15. DECOMMISSIONING AND REHABILITATION PLAN

The overarching vision of Rio Tinto for the closure is to create a positive legacy by:

- working with Indigenous communities and other stakeholders to preserve, protect and manage the cultural heritage values of the area
- considering the implications of closure on local communities when developing and implementing closure strategies
- negotiating relinquishment criteria with Government stakeholders, and working towards achieving those goals
- returning the area to landforms that are safe, stable and compatible with the surrounding environment
- working towards achieving environmental outcomes that are compatible with the surrounding environment
- delivering a net positive result with respect to regional biodiversity
- working with employees and key stakeholders to identify and manage ongoing employment and other opportunities
- achieving these objectives in a cost effective manner.

15.1 DESCRIPTION

The Hamersley Iron approach to planning for closure at Yandicoogina has followed a strategy that seeks to resolve the major question of the long term hydrogeological status of the area's groundwater before developing the details around removal of infrastructure and return of vegetation.

Ministerial Statements 417 and 523 (Junction Central) and 695 (Junction South East) require Decommissioning and Rehabilitation (Closure) Plans to be submitted and approved by Government on a five-yearly basis.

The first Closure Plan for Yandicoogina was completed in 1999 and approved by Government in 2000. The plan considered only the initial stages of Junction Central pit. The plan was updated in 2000 to incorporate the remainder of Junction Central, and was approved by Government the same year. The plan was further updated in 2003 and approved in2005. A further update in 2008, incorporating Junction South East, was submitted but not yet approved by Government.

Hamersley iron is currently undertaking a closure study to develop a closure plan that incorporates all current and future mining areas.

15.2 PURPOSE AND INCLUSIONS

The purpose of the Conceptual Closure and Rehabilitation Management Plan is to:

- consider legislative requirements, corporate standards and appropriate industry guidelines

- document closure objectives for the site
- describe the strategies proposed to meet these objectives.

The closure study report will include a Final Landform Plan, a Biodiversity Management Plan, a Post-Closure Management Plan (i.e. monitoring) and a Heritage Management Plan.

15.3 ENVIRONMENTAL PERFORMANCE OBJECTIVES

The objectives of this plan are to:

- achieve construction of landforms that are stable, non-polluting and aesthetically compatible with the surrounding landscape
- establish sustainable endemic vegetation communities consistent with the reconstructed landscape and surrounding vegetation
- ensure that closure planning and rehabilitation are carried out in a coordinated progressive manner and are integrated with development planning, consistent with current best practice, and the agreed land uses.

This plan sets out procedures to:

- manage long-term hydrogeological impacts of mining the CID
- model the long-term hydrogeological impacts, particularly the water levels and quality in the pit void
- manage over the long-term the surface water systems affected by the open pit
- progressively rehabilitate all disturbed areas to a standard suitable for the agreed end land use(s), with consideration and incorporation of:
    - the characteristics of the pre-mining ecosystems within the project area (through research and baseline surveys)
    - the performance of previously rehabilitated areas within the mining lease
    - the performance of rehabilitation areas at the proponents other operations in the Pilbara
    - best practice rehabilitation techniques used elsewhere in the mining industry.
- develop and identify completion criteria
- monitor rehabilitation to assess the performance of all rehabilitated areas against the completion criteria
- report on the rehabilitation and monitoring results
- remove all infrastructure
- develop management strategies and/or contingency measures in the event that operational experience and/or monitoring identify any significant environment impact as a result of the proposal
- develop a ‘walk away’ solution for the decommissioned mine site.

The predicted environmental performance of the closure strategy on key criteria is summarised in Table 66.

Table 66 Environmental performance predictions for closure

Criterion	Closure objectives
Water quality in Weeli Wolli braided area.	Water quality at Waterloo bore suitable for stock water
Drawdown in Marillana Creek and CID adjacent to the pit (Approved Project and the Mining Area Extension)	Drawdown effects on phreatophytic vegetation limited to 1-2 km from the pit
In-pit salinity	Limited at 15,000 mg/L.
Landforms	Landforms are to be safe, stable and resilient.
Visual amenity	Suitable visual amenity to be provided.
Heritage	Retain suitable heritage values.
Landuse	Determine and provide for suitable land use.
Rehabilitation	• include resilient and self-sustaining vegetation comprised of local provenance species • reach agreed numeric targets for vegetation recovery • comprise habitats capable of supporting all types of biodiversity
Monitoring	Monitor rehabilitation to assess the performance of rehabilitated areas against completion criteria
Reporting	Report on rehabilitation and completion criteria
Decommissioning	Remove infrastructure Develop 'walk away' solution for the decommissioned site
Contingency	• Develop contingency measures to come in effect if management and/or monitoring detects significant environmental impact as a result of the project. • Develop a plan for unplanned closure.

The above environmental performance is based on assumptions that relate to:

- groundwater salinity in the Marillana Creek CID up-gradient of the Hamersley Iron void being maintained at present levels (BHPBIO modelling suggests this will be the case)
- salinity of flow down Weeli Wolli CID upstream of the confluence with Marillana Creek CID remaining around 500 mg/L.

The WRC (Water and Rivers Commission – now Department of Water) has indicated that there are potentially important groundwater resources downstream of the Approved Project/Mining Area Extension in the area of Waterloo Bore along the Weeli Wolli Creek system (Figure 3). Therefore, water quality in this area needs to be preserved for present and future beneficial uses.

15.4 IMPLEMENTATION STRATEGY

15.4.1 Management actions

The management actions in Table 67 refer to actions as part of a preliminary decommissioning and rehabilitation strategy.

Table 67 Management actions for decommissioning and rehabilitation

Parameter	Action	Timing
Landform	Final landforms are to be constructed and managed in accordance with the Final Landform Plan contained within the 2010 Yandicoogina Closure Study report (as yet incomplete).	At end of use
Rehabilitation	Rehabilitation is to be undertaken in accordance with the Biodiversity Management Plan contained within the 2100 Yandicoogina Closure Study report (as yet incomplete). The general management of rehabilitation includes: • recovery and stockpiling of cleared vegetation and topsoil in advance of mining for use on rehabilitation areas. Careful management of topsoil and reuse of vegetative material is an important factor in successful rehabilitation • battering slopes to an angle ≤ 20º (angle depends on the nature of the material being shaped) • re-spreading of topsoil and deep ripping of soil surfaces • progressive seeding using local provenance seed where possible. A species list will be included in the site rehabilitation plan, which will be continuously refined based on rehabilitation monitoring results and stakeholder consultation • monitoring establishment of plants and development of ecosystem processes consistent with the anticipated end land use and compared with existing vegetation at adjacent controlled sites.	Prior to completion of mining
Decommissioning	Decommissioning is to be undertaken in accordance with the RTIO Generic Decommissioning Strategy. The general aims for decommissioning of infrastructure include: • demolition/removal of all above ground structures (structures more than 1 m below final ground level may be left in situ if they pose no long-term threat to the environment) • removal/burial of all concrete slabs, footings and retaining wall • removal of services (including water lines, power lines and communications) unless approved for further use (services more than 1 m below final ground level may be left in situ if they pose no long-term threat to the environment) • removal of all culverts (including those along rail corridor) to reinstate natural drainage contours • permanently capping bores no longer required and removal of all associated infrastructure (piping greater than 1 m deep to remain in situ) • draining of ponds and removal and disposal of any liners • removal of all services and infrastructure associated with the waste water treatment plants, rail line and rail loop (including rails, sleepers, ballast and signaling equipment) • removal of decking and piers of the bridges (should the bridges require removal); steelwork and other re-usable items will be salvaged • removal of all bitumen surfaces within the site (the main access road up to the main gate will remain) • removal and dismantling of decontaminated storage tanks • initial mine planning to ensure location and design of infrastructure (including camps, dewatering infrastructure and processing facilities) minimises potential post-closure impacts.	At the end of mining

15.4.2 Contingency actions

The contingency actions presented in Table 68 are to be undertaken when the objectives or targets are exceeded or not met.

Table 68 Contingency actions for closure

Trigger	Action
Management action is not preventing significant impact to the environment	1. Review action. 2. Implement corrective actions, including remediation and re-informing personnel of correct procedures as required.
Monitoring detects significant impact to the environment	1. Investigate cause 2. Determine and implement remedial measures as per individual .management plans. 3. Monitor to ensure remedial measures are successful.
Unplanned mine closure	1. Implement decommissioning actions. 2. Implement rehabilitation actions. 3. Commence closure monitoring.

15.5 MONITORING AND REPORTING

The proposed monitoring program covers:

- **groundwater quality in the Weeli Wolli CID:** to detect potential impacts to groundwater quality in the Weeli Wolli drainage before beneficial uses are negatively impacted (through the use of Early Warning bores and a key Compliance Bore along the Weeli Wolli CID - refer Figure 3) and to confirm the baseline Weeli Wolli water quality assumed in the Closure Plan.
- **impacts to riparian vegetation:** to assess if tree deaths that occur outside 2km from the pit do not result from water quality or drawdown impacts stemming from pit closure.
- **pit water salinity:** to test whether groundwater within the pit shell exceeds a salinity of 15,000 mg/L.

The monitoring program is summarised in Table 69.

Table 69 Preliminary monitoring program

Performance criteria	Monitoring technique
Protect groundwater quality in the Weeli Wolli drainage for future beneficial use	Groundwater quality monitoring in Marillana and Weeli Wolli CID aquifers
Minimise impacts to alluvial groundwater that could impact phreatophytic vegetation	Remote sensing and ground transects
Minimise the development of poor quality (saline) water within the final void	Water quality from in-pit bores
Success of rehabilitation	Monitoring quadrats criteria based on research trials

Based on the predicted post-closure hydrogeological configuration, water quality in the Weeli Wolli CID should reach equilibrium within a relatively short time (at least 100 years). The water quality

monitoring bores within Marillana and Weeli Wolli creeks should detect changes in the water quality shortly after closure.

RTIO will:

- commence planning for closure at project inception to enable closure considerations to be incorporated into project design
- develop a closure provision, to a specified accuracy that narrows as the site moves closer to closure
- conduct regular closure study updates throughout the life of the mine, taking into account developments that may influence closure scope, strategies or implementation
- undertake research trials into rehabilitation methodology and suitable species
- develop a final decommissioning plan as the site approaches closure.

PART 4 – COMPLIANCE AUDIT AND PERFORMANCE REVIEW

1. COMPLIANCE AUDIT

Conditions in Ministerial Statements for reporting on the compliance and performance of the effectiveness of management plans are becoming more regulated and specific. Condition 4-1 of Ministerial Statement 695 specifies that:

The proponent shall prepare an audit program and submit compliance reports to the Department of Environment (now Department of Environment and Conservation (DEC)) which address:

1. *The status of implementation of the proposal as defined in schedule 1 of Statement 695.*
2. *Evidence of compliance with the conditions.*
3. *The performance of the environmental management plans and programs.*

Condition 695:4-2 requires that:

The Proponent shall submit a performance review report every five years following the formal authority issued to the decision-making authorities under section 45(7) of the Environmental Protection Act 1986, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, which addresses:

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

A performance review table has been prepared to assist with the systematic reporting for the five yearly performance review.

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Appendix 1 Ministerial Statements 417, 523 and 695

MINISTER FOR THE ENVIRONMENT;
LABOUR RELATIONS

Statement No.

000523

STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL (PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE ENVIRONMENTAL PROTECTION ACT 1986)

YANDICOOGINA IRON ORE MINE & RAILWAY
90 KILOMETRES NORTH-WEST OF NEWMAN
HAMERSLEY RANGE

Proposal: The Yandicoogina Iron Ore Mine and Railway is located approximately 90 kilometres north-west of the town of Newman.

The proposal involves the construction and operation of an open cut iron ore mine; facilities to crush and screen ore and convey it to the rail loadout facility; and a 90 kilometre rail section which connects the mine to the Central Pilbara Railway.

Proponent: Hamersley Iron Pty Limited

Proponent Address: 152-158 St George's Terrace, Perth WA 6000

Assessment Number: 1174

Previous Assessment Number: 979

Previous Statement Number: Statement No. 417 (published on 27 May 1996)

Report of the Environmental Protection Authority: Bulletin 946

Previous Reports of the Environmental Protection Authority: Bulletin 809, April 1996

The implementation of this proposal is subject to the conditions and procedures contained in Ministerial Statement No. 417 (May 1996), as amended by the following conditions and procedures:

Condition 1 of Statement No. 417 is deleted and the following conditions are inserted:

1 Proponent Commitments

1-1 The proponent shall implement the consolidated environmental management commitments of April 1996 as amended on 12 July 1999 and documented in schedules 2 and 3 of this statement.

1-2 The proponent shall implement environmental management commitments which the proponent makes or has made as part of the fulfilment of conditions and procedures in this and the previous statement issued for this proposal.

Published on

- 1 OCT 1999

18th FLOOR, ALLENDALE SQUARE, 77 ST. GEORGE'S TERRACE, PERTH 6000 TELEPHONE: (08) 9421 7777 FACSIMILE: (08) 9221 4665/8

Condition 2 of Statement No. 417 is deleted and the following conditions are inserted:

2 Implementation

2-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in schedule 1 of this statement.

2-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

2-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

The following conditions are inserted after Condition 7 of Statement No. 417:

8 Environmental Management System

8-1 In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to mining within the extended mining area, the proponent shall demonstrate to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection that there is in place an environmental management system which includes the following elements:

1 An environmental policy and corporate commitment to it;

2 Mechanisms and processes to ensure:

(1) planning to meet environmental requirements;

(2) implementation and operation of actions to meet environmental requirements;

(3) measurement and evaluation of environmental performance; and

3 Review and improvement of environmental outcomes.

8-2 The proponent shall implement the environmental management system referred to in condition 8-1.

CHERYL EDWARDES (Mrs) MLA
MINISTER FOR THE ENVIRONMENT

- 1 OCT 1999

Schedule 1

Proposal (979/1174)

The Yandicoogina Iron Ore Mine and Railway (also known as "Yandi (HIY) Project") is located approximately 90 kilometres north-west of the town of Newman.

The proposal involves the construction and operation of:

- an open cut iron ore mine;
- facilities to crush and screen ore and convey it to the rail loadout facility; and
- a 90 kilometre rail section which connects the mine to the Central Pilbara Railway.

Table 1 summarises the key characteristics of the project - the initial mining area and the mining area extension.

Table 1: Key project characteristics

Aspect	Project (initial mining area)	Mining Area Extension	Variation from Project (initial mining area)
Length of CID to be mined	SL12.2km to SL15.0km	SL15.0km to a point 750m beyond SL19.0km (equivalent to 19.75km)	Additional 4.75km
Area of CID to be mined	300ha	300ha	Additional 300ha
Initial mining rate	About 8Mt/a, increasing to design capacity of 15Mt/a	About 15Mt/a, maintaining design capacity	No change
Ore reserve to be mined	140Mt	160Mt, bringing total to 300Mt	Additional 160Mt
Estimated mine life	15-20 years	25-30 years	Additional 10-15 years
Mine pit profile	About 65m deep; 40m below pre-mine watertable	About 65m deep; 40m below pre-mine watertable	No change
Dewatering requirements	Initial: 30ML/d Maintenance: 10-15ML/d	Initial: 15-20ML/d Maintenance: 10-15ML/d	Initial - lower Maintenance - same
Volume of dewatering used	5ML/d	5ML/d	No change
Number of dewatering borefields	Two: • a Permanent borefield • a Sacrificial borefield	Three: • an existing Permanent borefield • a new Permanent borefield on Phils Creek CID • a new Sacrificial borefield in the main CID	An additional Permanent borefield and a replacement Sacrificial borefield in the CID
Proportion of waste material backfilled (versus out-of-pit)	100% (after first three years, all waste reports as backfill, with out-of-pit waste used as backfill upon mine closure)	100% (waste reports as backfill from commencement of mining or is stockpiled and returned as backfill later)	No change
Proportion of mine void to be filled with overburden	About 50%	About 50%	No change
Mine infrastructure requirements	Refer CER (1995) and Section 1.2 and Figure 1.2 of the Section 46 Environmental Review document.	Utilise existing infrastructure until additional ore processing plant (or re-location of existing one) needed. Some new haul roads also.	Additional or re-located ore processing plant. More haul roads.

Abbreviations:

CID	Channel Iron Deposit
ha	hectares
ML/d	megalitres per day
Mt/a	million tonnes per annum
SL	drill Section Line

Figures

Figure 1 - Location plan.

Figure 2 - Project layout map.

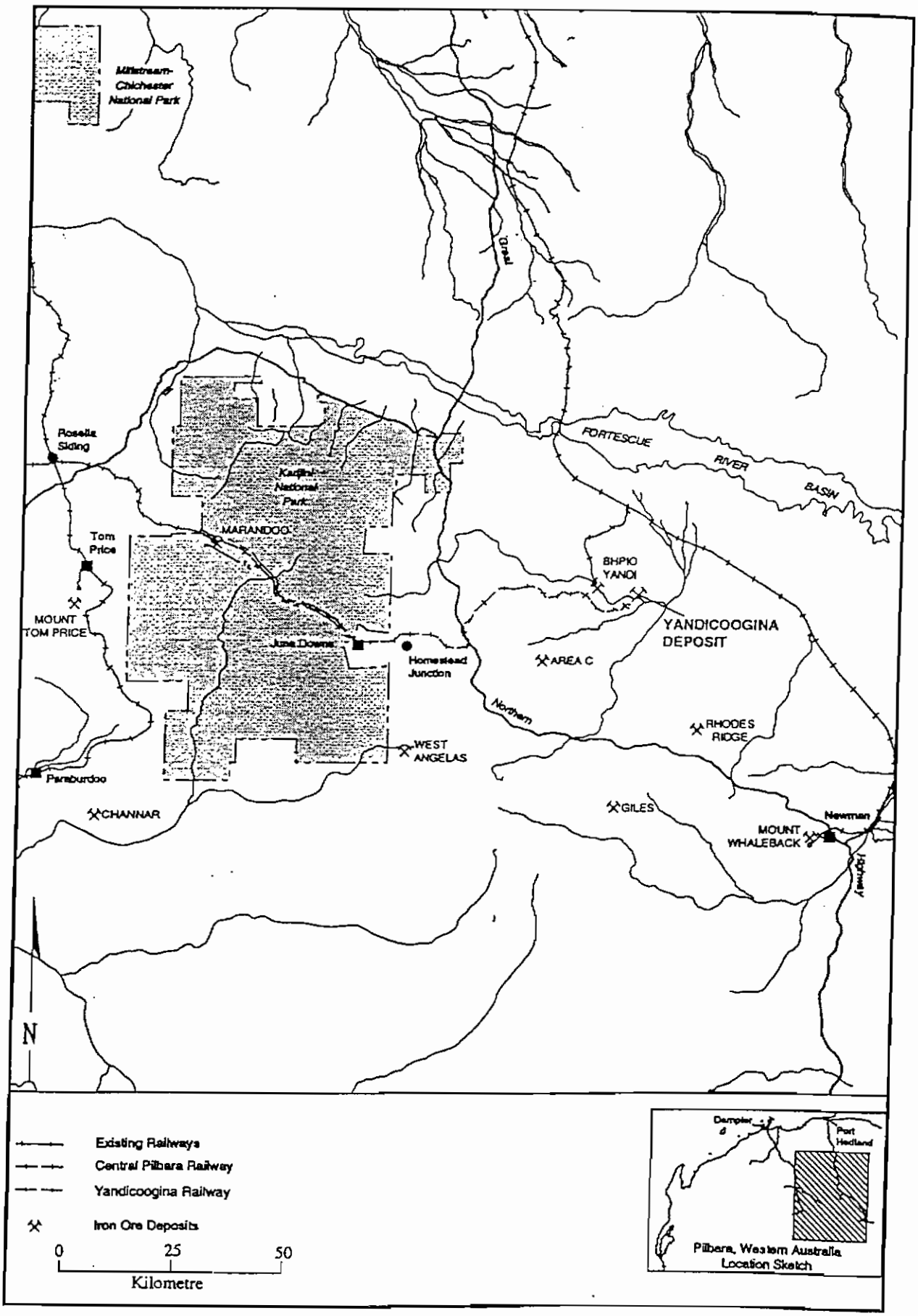
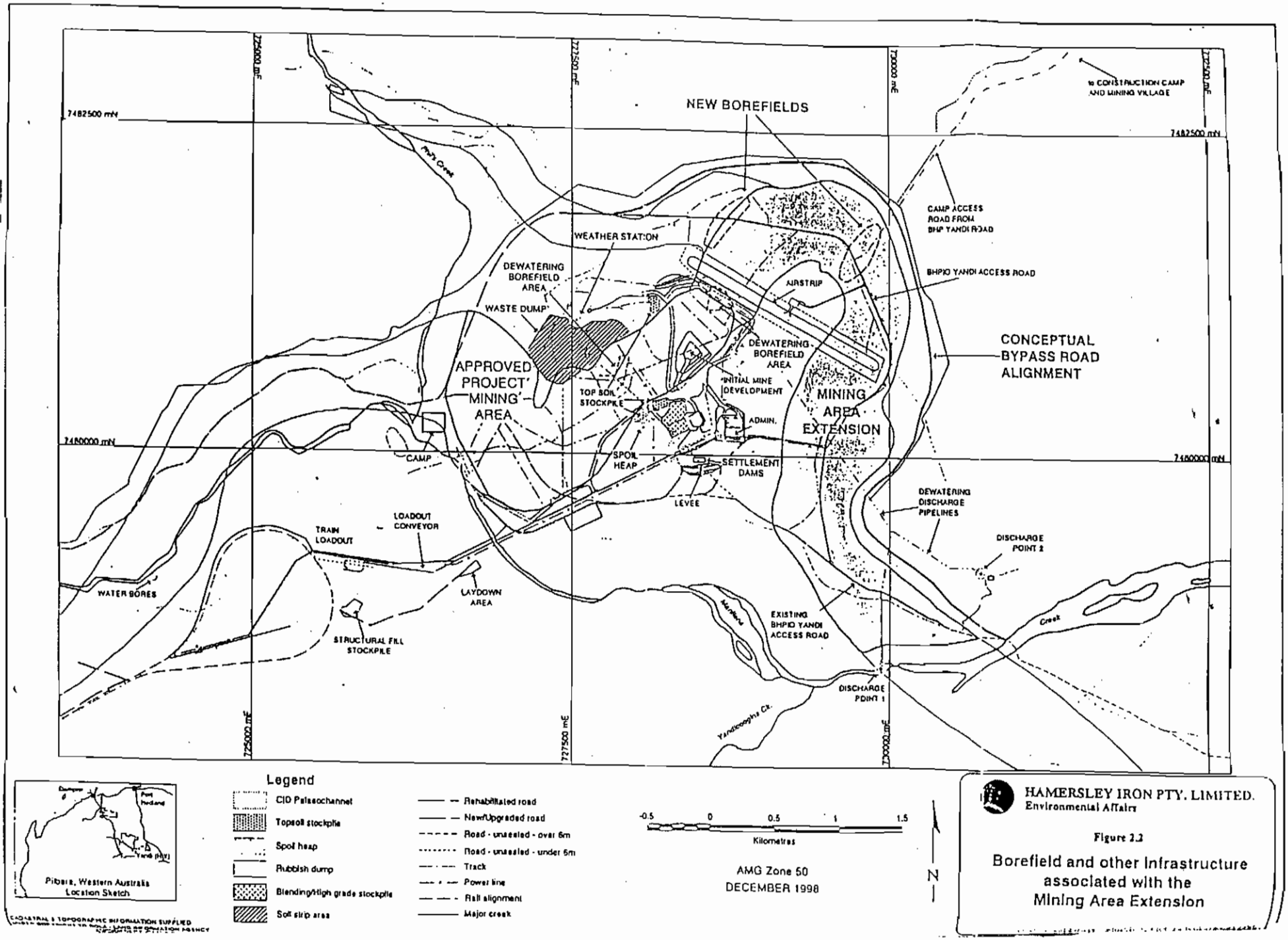


Figure 1. Location plan

Figure 2. project layout



Schedule 2

Proponent's Environmental Management Commitments

April 1996

Yandicoogina Iron Ore Mine & Railway
90 Kilometres north-west of Newman
Hamersley Range
(979/1174)

Hamersley Iron Pty Limited

ISSUE	OBJECTIVE	COMMIT -MENT NUMBER	COMMITMENT	PHASE
Legislation	Comply with relevant legislation.	1	The construction and operation of the project will be undertaken in accordance with the requirements of relevant Commonwealth and State legislation and regulations.	Pre-construction and Post-commissioning.
Amendments to the project	Refer significant project amendments for assessment.	2	Details of any plan to alter the project from that outlined in the CER that is likely to result in significant environmental impacts will be provided to the EPA for environmental assessment.	Pre-construction and Post-commissioning.
Understanding hydrogeological system	Understand hydrogeological systems and develop and evaluate options for long term management.	3 4	Hamersley will continue to evaluate the impacts of mining and decommissioning on Marillana Creek and the CID jointly with BHPIO for the purposes of further understanding the hydrogeological system in order to develop and evaluate options for viable and compatible long term management strategies. Results of evaluations will be reported to the Pilbara Iron Ore Environmental Management Committee.	Pre-construction, Construction and Post-commissioning.
Groundwater monitoring in Marillana Creek	Monitor groundwater in the Marillana Creek alluvium.	5 6 7	Hamersley will establish groundwater monitoring bores in the alluvium to monitor surface and groundwater levels before dewatering commences. The results of this monitoring will be submitted to the State on an annual basis. The monitoring programme will be implemented to the satisfaction of the Minister for the Environment on advice from DEP.	Pre-construction, Construction and Post-commissioning.

Hydrogeological data collection	Collect further hydrogeological data to develop a model for the final void.	8 9 10	Hamersley will continue to collect necessary hydrogeological data for the development of a model to predict long term water levels and quality in the final void. This model will be applied to assist design the final void to minimize long term impacts of mining on local and regional groundwater resources to the satisfaction of the Minister for the Environment on advice of DEP. A report on this model and the final outcome will be prepared and submitted to the DEP before finalising the decommissioning plan.	Pre-construction, Construction and Post-commissioning.
Environmental Audits	Conduct regular environmental reviews.	11 12	Hamersley will conduct internal environmental reviews during the construction (every 6 months) and operation (annually) of the project. These environmental reviews will assess compliance with project commitments, relevant Works Approval and Operating Licence conditions and any other environmental requirements.	Pre-construction, Construction and Post-commissioning.
Environmental Reporting	Prepare reports on environmental management and monitoring.	13	Annual and triennial reports that describe the actions taken to comply with environmental management conditions and monitoring commitments will be prepared by Hamersley and issued to the State.	Post-commissioning.

Environmental Management Programme (EMP)	Prepare an EMP for the construction and operation of the project.	14	Hamersley will submit and implement an EMP for the project prior to the commencement of major construction activities. The EMP will be developed in consultation with the DEP, and to the satisfaction of the Minister for the Environment. The EMP will provide details on the following: 1 groundwater and surface water management during mining and post-mining 2 sheet and gully drainage management along the railway 3 dust and noise emissions 4 waste management 5 flora and fauna protection 6 fire and weed management 7 environmental inductions for construction and operation personnel 8 rehabilitation of disturbed areas, and 9 monitoring programmes.	Pre-construction and Post-commissioning.
Biological	Minimise impacts on riverine vegetation.	15 16 17	During the project life, Hamersley will undertake monitoring to assess the impacts of dewatering on riverine vegetation. If unacceptable impacts are detected, management strategies for the riverine vegetation will be implemented to the satisfaction of the Minister for the Environment on advice from DEP. The results of this monitoring and management will be submitted to the State on a triennial basis.	Pre-construction, Construction and Post-commissioning.
Waste Disposal	Manage wastes in an appropriate manner.	18 19	Burning will not be permitted as a means of rubbish or other waste disposal within the project area. All putrescible, biodegradable, inert substances and other general rubbish will be disposed of in a fenced, excavated waste pit that will be regularly backfilled to cover the waste material.	Post-commissioning.

Sewage Treatment Plants	Ensure sewage treatment plants are approved.	20	Plans for sewage treatment plants proposed at Yandicoogina will be submitted by Hamersley for approval by the Western Australian Department of Health.	Pre-construction.
Hydrocarbons	Appropriate storage of hydrocarbons.	21	All bunding for hydrocarbon storage areas will be constructed in accordance with the requirements of AS1940 - 1993.	Construction and Post-commissioning.
Contaminated Surface Runoff	Ensure that contaminated surface runoff does not enter natural drainage.	22	Management procedures will be put in place to ensure that stormwater runoff from areas that may result in contamination by hydrocarbons does not enter natural drainage channels without prior treatment.	Post-commissioning.
Dust	Minimise dust.	23	Dust suppression measures, including application of water from tankers, will be implemented to minimise dust generation during site preparation and construction activities.	Construction and Post-commissioning.
Pastoral Activities	Minimise potential disruption to pastoral activities.	24	Hamersley will enter into negotiations with the Marillana pastoral station manager on the issue of means of managing any potential disruptions to pastoral activities.	Pre-construction, Construction and Post-commissioning.
Archaeological and Ethnographic Sites in Railway Corridor	Obtain archaeological and ethnographic clearance for the railway corridor.	25	Once suitable access has been established, Aboriginal people involved in the earlier site survey process with Hamersley will be invited to inspect the route of the surveyed railway alignment to identify any significant archaeological or ethnographic sites.	Pre-construction.
Disturbance to Aboriginal Sites	Comply with *Aboriginal Heritage Act*.	26	If any Aboriginal site is required to be disturbed, a written application, as required under Section 18 of the *Aboriginal Heritage Act*, will be made to the Trustees of the Western Australian Museum for consent by the Minister for Aboriginal Affairs.	Pre-construction and Construction.
Rehabilitation	Ensure disturbed areas are rehabilitated.	27	Vegetation and topsoil removed during site preparation will be used to progressively rehabilitate disturbed areas.	Construction and Post-commissioning.

Decommissioning Plan	Prepare plan for decommissioning of the project.	28	A conceptual decommissioning plan will be prepared in consultation with DEP, DOME, and the Water and Rivers Commission to the satisfaction of the Minister for the Environment for subsequent implementation.	Post-commissioning.
		29	The plan will be submitted to Government at least two years prior to decommissioning of the project.	
		30	The plan will address post-mining water management issues giving due consideration to the known results of environmental management at other mines on the channel iron deposit.	

Schedule 3

Proponent's Additional Environmental Management Commitments

12 July 1999

Yandicoogina Iron Ore Mine & Railway
90 Kilometres north-west of Newman
Hamersley Range
(979/1174)

Hamersley Iron Pty Limited

No.	Issue	Objective	Action	Phase	Require-ments (Advice)
31	Environmental Management Programme (EMP)	To manage environmental impacts of the mining area extension.	Review and revise where relevant the Environmental Management Programme for the Project for the purpose of extending the environmental management and monitoring to address issues arising from the mining area extension.	Pre-mining (of mining area extension)	DEP (WRC, DME, and CALM)
32	Decommissioning and rehabilitation plan	To satisfactorily decommission the mine site and rehabilitate the site and its environs.	Prepare a conceptual decommissioning and rehabilitation plan covering all infrastructure associated with the Yandi (HIY) Project area. The plan will incorporate the initial mining area and the mining area extension.	Pre-mining (of the mining area extension) — within six months of the mining area extension being approved	DEP (DME and WRC)
33	Aboriginal heritage (archaeological) sites	To identify any archaeological sites	Involve the Gumala Aboriginal Corporation in a detailed archaeological survey to identify any sites within the areas to be disturbed. The findings of this survey shall be reported to the Aboriginal Affairs Department.	Pre-mining (of mining area extension)	DEP (AAD)

Abbreviations:

AAD	Aboriginal Affairs Department
CALM	Department of Conservation and Land Management
DEP	Department of Environmental Protection
DME	Department of Minerals and Energy
WRC	Water and Rivers Commission

Attachment to Statement 523, change to definition of proposal

Proposal: Yandicoogina Iron Ore Mine and Railway

Change: expand existing waste rock dump area by 38ha in a crescent shaped area to the north and northeast; develop a new waste rock dump to the east of the current pit with an area of 22ha, which will be adjacent to the approved future mine pit area; and, develop two stockpile areas with a combined footprint of approximately 15ha to the southeast of the new waste rock dump. Figure 1 shows the locations.

Approval date: 25 February 2005

Attachment to Statement 523, change to definition of proposal

Proposal: Yandicoogina Iron Ore Mine and Railway

Change: Junction Central (figure 1, area 4) - new heavy vehicle workshop; new administration offices; new training room; new warehouse; Junction Central (figure 1, area 1, 2 & 7) – duplication of rail loop; Junction Central (figure 1, area 6) – expansion of permanent village; expansion of construction camp; upgrade of sewage treatment plant and expansion of effluent spray areas. Figure 1 shows the locations; and, Junction Central (figure 1, area 3 & 7 and area 5) – upgrade of substations at both the Tertiary Crushing and Screening Facilities; new explosives magazine facility; new power distribution infrastructure; and, realignment of road from airstrip to Junction Central.

Approval date: 25 February 2005

Attachment to Statement 417 & 523

Change to Description of Proposal

Proposal: Yandicoogina Iron Ore Mine & Railway, 90 km north-west of Newman Hamersley Range.

Proponent: Hamersley Iron Pty Limited.

Change: to the description in the Consultative Environmental Review for Statement for 417 and to Schedule 1 of Statement 523.

From:

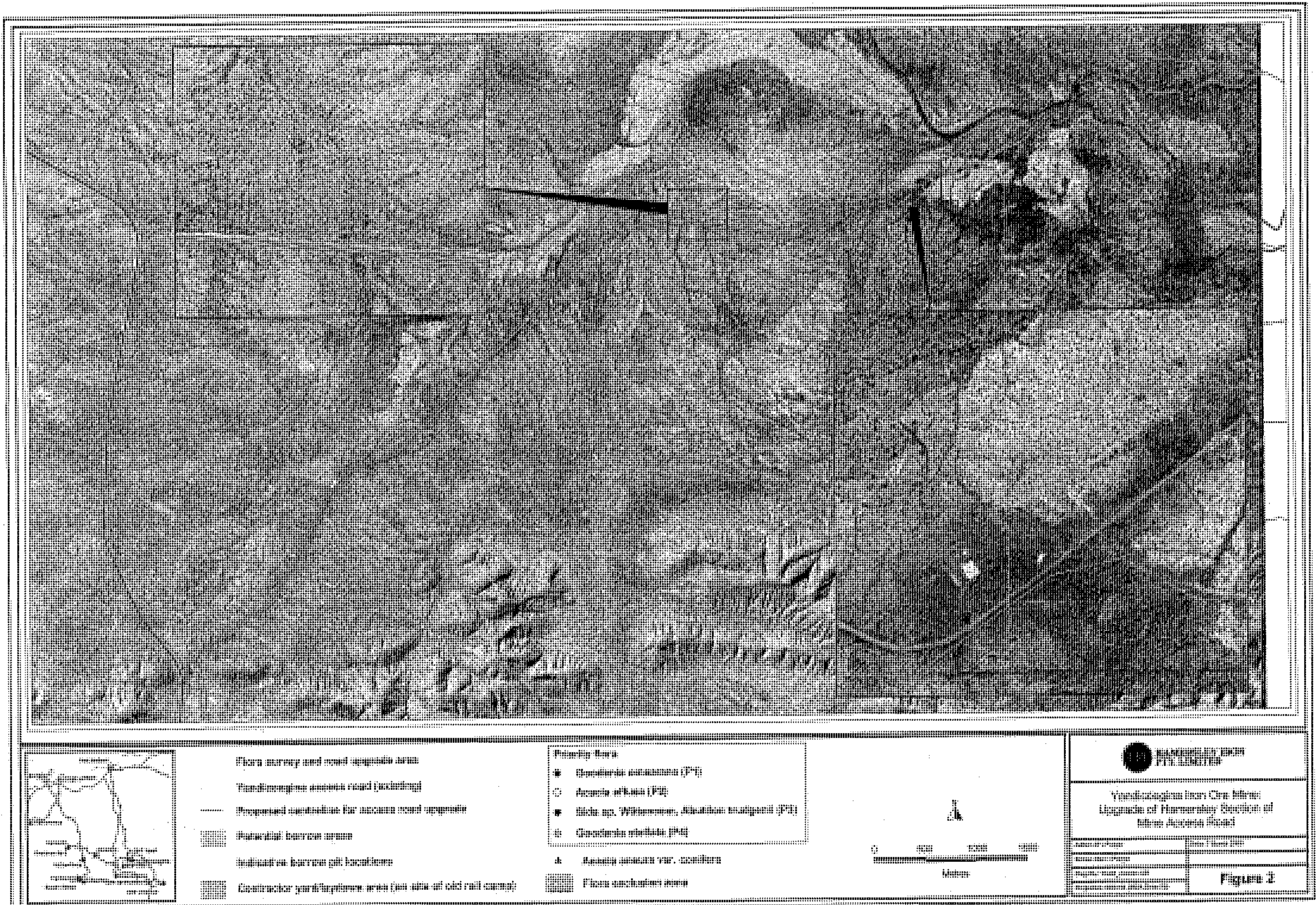
Element	Quantities/Description
Access Road	Unsealed road 27km long linking Great Northern Hwy and western boundary of BHPB's mining lease 70/270

To:

Element	Quantities/Description
Access Road	Sealed road with minor deviations, new floodway crossing at Marillana Creek, and other improvements

Figure 2. Layout map

Approval Date: 12/05/06


Flora survey and road upgrade area
Yandicoogina access road (existing)
Proposed centreline for access road upgrade
Potential borrow areas
Indicative borrow pit locations
Contractor yard/laydown area (on site of old rail camp)
Priority flora
Flora exclusion zone
0
Metres
Hamersley Iron Pty Limited
Yandicoogina Iron Ore Mine: Upgrade of Hamersley Section of Mine Access Road
Figure 2

Ass # 979
Bull # 809
State # 417

MINISTER FOR THE ENVIRONMENT WESTERN AUSTRALIA

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

YANDICOOGINA IRON ORE MINE & RAILWAY
90 KILOMETRES NORTH WEST OF NEWMAN
HAMERSLEY RANGE (979)

HAMERSLEY IRON PTY LIMITED

This proposal may be implemented subject to the following conditions:

1 Proponent Commitments
The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposal, the proponent shall fulfil the commitments made in the Consultative Environmental Review and in response to issues raised following public submissions; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

The environmental management commitments were published in Environmental Protection Authority Bulletin 809 (Appendix 4) and a copy is attached.

2 Implementation
Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal.

2-2 Where, in the course of the detailed implementation referred to in condition 2-1, the proponent seeks to change the designs, specifications, plans or other technical material submitted to the Environmental Protection Authority in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

Published on

2 [illegible]

12th Floor, Dumas House, 2 Havelock Street, West Perth, Western Australia 6005
Telephone (09) 321 2222 Facsimile (09) 322 5149

3 Proponent

These conditions legally apply to the nominated proponent.

3-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

4 Environmental Management Programme

A detailed Environmental Management Programme should contribute to the development of long term management options through comprehensive monitoring and management practices.

4-1 Prior to construction, the proponent shall prepare an Environmental Management Programme to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

This Programme shall detail the procedures and practices for protection of the environment during all phases of mining and include, but not be limited to the following:

1 groundwater monitoring and management;

2 surface water monitoring and management, including measures for the protection of the integrity of Marillana Creek;

3 sheet and gully drainage management along the railway;

4 pollution prevention measures, including noise and dust;

5 waste management, including overburden, liquid, solid and gaseous wastes;

6 protection of flora and fauna, including fire and weed management;

7 rehabilitation of disturbed areas; and

8 development of a comprehensive monitoring, management and reporting programme for the above.

The reporting programme shall provide for:

1 annual reports outlining implementation of the Environmental Management Programme;

2 triennial reports reviewing the implementation of the Environmental Management Programme; and

3 six yearly reports reviewing the environmental objectives and implementation of the Environmental Management Programme and its effectiveness in achieving those objectives,

to the requirements of the Environmental Protection Authority.

4-2 The proponent shall implement the Environmental Management Programme required by condition 4-1 to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, the Department of Minerals and Energy, the Water and Rivers Commission and the Department of Resources Development.

5 Decommissioning

The satisfactory decommissioning of the project, removal of the plant and installations and rehabilitation of the site and its environs to a sustainable condition in the long term, is the responsibility of the proponent.

5-1 Within five years following commissioning of the Yandicoogina mine, or at such later time considered appropriate by the Minister for the Environment acting on the advice of the Department of Environmental Protection, the proponent shall prepare a plan which:

1 describes the process for decommissioning and rehabilitation of the project area;

2 provides for the long term management of salinity in the mined-out pit;

3 provides for the long term management of any regional effects arising from mining the Channel Iron Deposit;

4 has the objective of protecting the water resources and phreatophytic vegetation of the area; and

5 provides for the development of a 'walk away' solution for the decommissioned mine,

to the requirements of the Environmental Protection Authority on advice of the Department of Minerals and Energy and the Water and Rivers Commission.

Note: A "walk away" solution means that the site shall either no longer require management at the time the proponent ceases mining operations, or if further management is deemed necessary, the proponent shall make adequate provision so that the required management is undertaken with no liability to the State.

5-2 The proponent shall implement the plan required by condition 5-1 to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, the Department of Minerals and Energy, the Water and Rivers Commission and the Department of Resources Development.

6 Time Limit on Approval

The environmental approval for the proposal is limited.

6-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced.

Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period to the Minister for the Environment.

Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Department of Environmental Protection that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years.

7 **Compliance Auditing**
To help determine environmental performance and compliance with the conditions, periodic reports on the implementation of the proposal are required.

7-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

Procedure

1 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

2 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

Note

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

Hon Peter Foss QC MLC
MINISTER FOR THE ENVIRONMENT

24 MAY 1996

Proponent's Environmental Management Commitments

April 1996

YANDICOOGINA IRON ORE MINE & RAILWAY
90 KILOMETRES NORTH WEST OF NEWMAN
HAMERSLEY RANGE (979)

HAMERSLEY IRON PTY LIMITED

ISSUE	OBJECTIVE	COMMIT -MENT NUMBER	COMMITMENT	PHASE
Legislation	Comply with relevant legislation.	1	The construction and operation of the project will be undertaken in accordance with the requirements of relevant Commonwealth and State legislation and regulations.	Pre-construction and Post-commissioning.
Amendments to the project	Refer significant project amendments for assessment.	2	Details of any plan to alter the project from that outlined in the CER that is likely to result in significant environmental impacts will be provided to the EPA for environmental assessment.	Pre-construction and Post-commissioning.
Understanding hydrogeological system	Understand hydrogeological systems and develop and evaluate options for long term management.	3 4	Hamersley will continue to evaluate the impacts of mining and decommissioning on Marillana Creek and the CID jointly with BHPIO for the purposes of further understanding the hydrogeological system in order to develop and evaluate options for viable and compatible long term management strategies. Results of evaluations will be reported to the Pilbara Iron Ore Environmental Management Committee.	Pre-construction, Construction and Post-commissioning.
Groundwater monitoring in Marillana Creek	Monitor groundwater in the Marillana Creek alluvium.	5 6 7	Hamersley will establish groundwater monitoring bores in the alluvium to monitor surface and groundwater levels before dewatering commences. The results of this monitoring will be submitted to the State on an annual basis. The monitoring programme will be implemented to the satisfaction of the Minister for the Environment on advice from DEP.	Pre-construction, Construction and Post-commissioning.

Hydrogeological data collection	Collect further hydrogeological data to develop a model for the final void.	8 9 10	Hamersley will continue to collect necessary hydrogeological data for the development of a model to predict long term water levels and quality in the final void. This model will be applied to assist design the final void to minimize long term impacts of mining on local and regional groundwater resources to the satisfaction of the Minister for the Environment on advice of DEP. A report on this model and the final outcome will be prepared and submitted to the DEP before finalising the decommissioning plan.	Pre-construction, Construction and Post-commissioning.
Environmental Audits	Conduct regular environmental reviews.	11 12	Hamersley will conduct internal environmental reviews during the construction (every 6 months) and operation (annually) of the project. These environmental reviews will assess compliance with project commitments, relevant Works Approval and Operating Licence conditions and any other environmental requirements.	Pre-construction, Construction and Post-commissioning.
Environmental Reporting	Prepare reports on environmental management and monitoring.	13	Annual and triennial reports that describe the actions taken to comply with environmental management conditions and monitoring commitments will be prepared by Hamersley and issued to the State.	Post-commissioning.

Environmental Management Programme (EMP)	Prepare an EMP for the construction and operation of the project.	14	Hamersley will submit and implement an EMP for the project prior to the commencement of major construction activities. The EMP will be developed in consultation with the DEP, and to the satisfaction of the Minister for the Environment. The EMP will provide details on the following: 1 groundwater and surface water management during mining and post-mining 2 sheet and gully drainage management along the railway 3 dust and noise emissions 4 waste management 5 flora and fauna protection 6 fire and weed management 7 environmental inductions for construction and operation personnel 8 rehabilitation of disturbed areas, and 9 monitoring programmes.	Pre-construction and Post-commissioning.
Biological	Minimise impacts on riverine vegetation.	15 16 17	During the project life, Hamersley will undertake monitoring to assess the impacts of dewatering on riverine vegetation. If unacceptable impacts are detected, management strategies for the riverine vegetation will be implemented to the satisfaction of the Minister for the Environment on advice from DEP. The results of this monitoring and management will be submitted to the State on a triennial basis.	Pre-construction, Construction and Post-commissioning.
Waste Disposal	Manage wastes in an appropriate manner.	18 19	Burning will not be permitted as a means of rubbish or other waste disposal within the project area. All putrescible, biodegradable, inert substances and other general rubbish will be disposed of in a fenced, excavated waste pit that will be regularly backfilled to cover the waste material.	Post-commissioning.

Sewage Treatment Plants	Ensure sewage treatment plants are approved.	20	Plans for sewage treatment plants proposed at Yandicoogina will be submitted by Hamersley for approval by the Western Australian Department of Health.	Pre-construction.
Hydrocarbons	Appropriate storage of hydrocarbons.	21	All bunding for hydrocarbon storage areas will be constructed in accordance with the requirements of AS1940 - 1993.	Construction and Post-commissioning.
Contaminated Surface Runoff	Ensure that contaminated surface runoff does not enter natural drainage.	22	Management procedures will be put in place to ensure that stormwater runoff from areas that may result in contamination by hydrocarbons does not enter natural drainage channels without prior treatment.	Post-commissioning.
Dust	Minimise dust.	23	Dust suppression measures, including application of water from tankers, will be implemented to minimise dust generation during site preparation and construction activities.	Construction and Post-commissioning.
Pastoral Activities	Minimise potential disruption to pastoral activities.	24	Hamersley will enter into negotiations with the Marillana pastoral station manager on the issue of means of managing any potential disruptions to pastoral activities.	Pre-construction, Construction and Post-commissioning.
Archaeological and Ethnographic Sites in Railway Corridor	Obtain archaeological and ethnographic clearance for the railway corridor.	25	Once suitable access has been established, Aboriginal people involved in the earlier site survey process with Hamersley will be invited to inspect the route of the surveyed railway alignment to identify any significant archaeological or ethnographic sites.	Pre-construction.
Disturbance to Aboriginal Sites	Comply with *Aboriginal Heritage Act.*	26	If any Aboriginal site is required to be disturbed, a written application, as required under Section 18 of the *Aboriginal Heritage Act*, will be made to the Trustees of the Western Australian Museum for consent by the Minister for Aboriginal Affairs.	Pre-construction and Construction.
Rehabilitation	Ensure disturbed areas are rehabilitated.	27	Vegetation and topsoil removed during site preparation will be used to progressively rehabilitate disturbed areas.	Construction and Post-commissioning.

Decommissioning Plan	Prepare plan for decommissioning of the project.	28	A conceptual decommissioning plan will be prepared in consultation with DEP, DOME, and the Water and Rivers Commission to the satisfaction of the Minister for the Environment for subsequent implementation.	Post-commissioning.
		29	The plan will be submitted to Government at least two years prior to decommissioning of the project.	
		30	The plan will address post-mining water management issues giving due consideration to the known results of environmental management at other mines on the channel iron deposit.	

Attachment to Statement 417 & 523

Change to Description of Proposal

Proposal: Yandicoogina Iron Ore Mine & Railway, 90 km north-west of Newman Hamersley Range.

Proponent: Hamersley Iron Pty Limited.

Change: to the description in the Consultative Environmental Review for Statement for 417 and to Schedule 1 of Statement 523.

From:

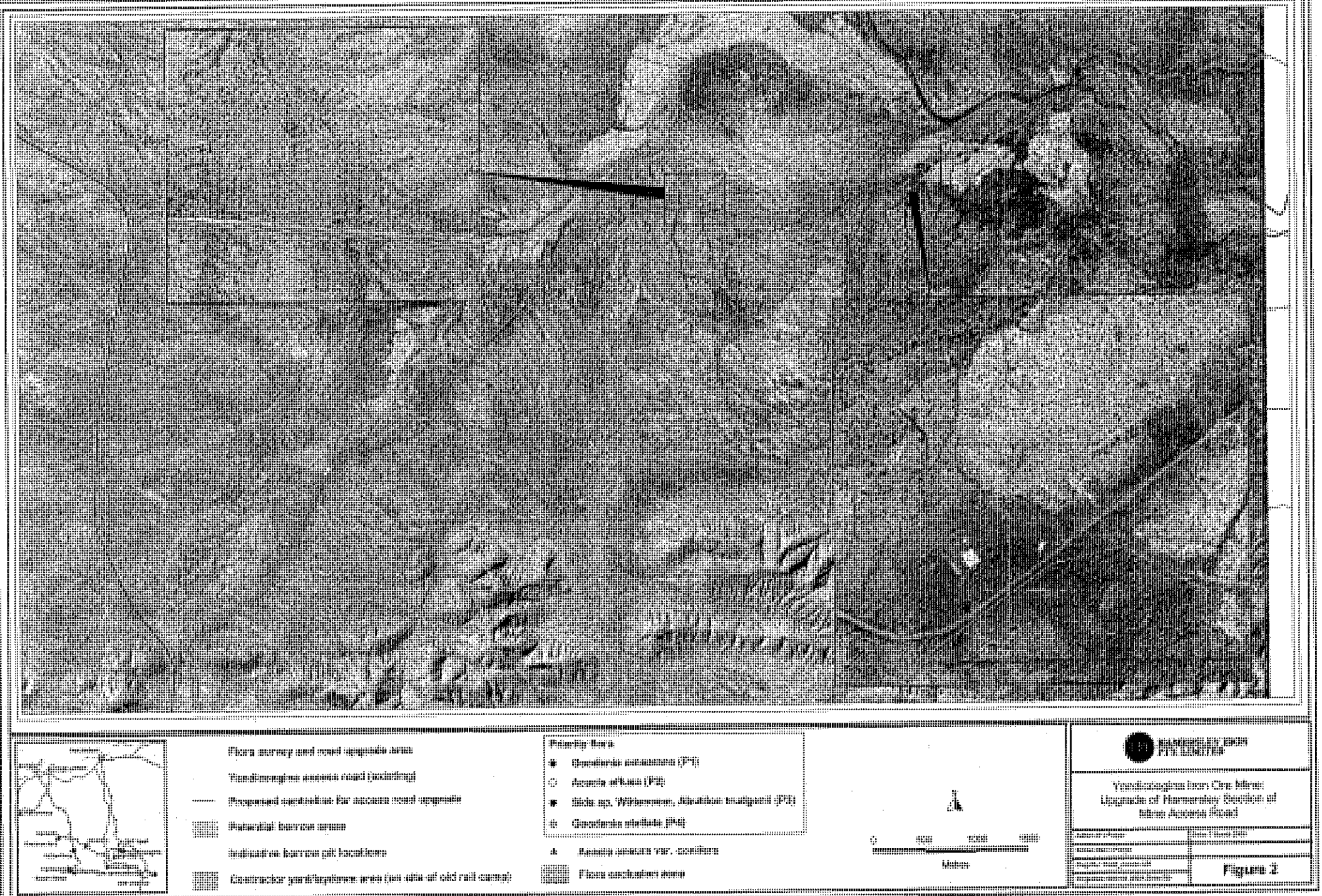
Element	Quantities/Description
Access Road	Unsealed road 27km long linking Great Northern Hwy and western boundary of BHPB's mining lease 70/270

To:

Element	Quantities/Description
Access Road	Sealed road with minor deviations, new floodway crossing at Marillana Creek, and other improvements

Figure 2. Layout map

Approval Date: 12/05/06


Flora survey and road upgrade area
Transmission access road (existing)
Proposed realignment for access road upgrade
Potential borrow areas
Indicative borrow pit locations
Construction compound area (on site of old rail camp)
Priority flora
Geraldton sedge (P1)
Acacia alkaloa (P2)
Hicks sp. Wilsonsen, Abydos subplain (P3)
Goodenia stellata (P4)
Survey location var. conditions
Flora exclusion area
0
500
1000
Metres
Yandicoogina Iron Ore Mine
Upgrade of Hamersley Section of
Mine Access Road
Figure 1

MINISTER FOR THE ENVIRONMENT; SCIENCE

Statement No. 000857

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

YANDICOOGINA JUNCTION SOUTH-EAST MINE
MINING LEASE 274SA
SHIRE OF EAST PILBARA

Proposal: The mining of iron ore within Mining Lease 274SA at a rate of approximately 16 million tonnes per annum, and subsequent rehabilitation and decommissioning of the site, as documented in schedule 1 of this statement.

Proponent: Hamersley Iron Pty Limited

Proponent Address: Level 22, 152-158 St George's Terrace, PERTH WA 6000

Assessment Number: 1590

Report of the Environmental Protection Authority: Bulletin 1195

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

1 Implementation

1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions and procedures of this statement.

2 Proponent Nomination and Contact Details

2-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.

Published on
25 OCT 2005

29th FLOOR, ALLENDALE SQUARE, 77 ST. GEORGE'S TERRACE, PERTH 6000
TELEPHONE: (08) 9220 5050 FACSIMILE: (08) 9221 4665
E-MAIL: judy-edwards@dpc.wa.gov.au
WEBSITE: www.ministers.wa.gov.au/edwards

2-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.

2-3 The nominated proponent shall notify the Department of Environment of any change of contact name and address within 60 days of such change.

3 Commencement and Time Limit of Approval

3-1 The proponent shall substantially commence the proposal within five years of the date of this statement or the approval granted in this statement shall lapse and be void.

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

3-2 The proponent shall make application for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement to the Minister for the Environment, prior to the expiration of the five-year period referred to in condition 3-1.

The application shall demonstrate that:

1. the environmental factors of the proposal have not changed significantly;

2. new, significant environmental issues have not arisen; and

3. all relevant government authorities have been consulted.

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

4 Compliance Audit and Performance Review

4-1 The proponent shall prepare an audit program and submit compliance reports to the Department of Environment which address:

1. the status of implementation of the proposal as defined in schedule 1 of this statement;

2. evidence of compliance with the conditions; and

3. the performance of the environmental management plans and programmes.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environment is empowered to monitor the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions and procedures contained in this statement.

4-2 The proponent shall submit a performance review report every five years following the formal authority issued to the decision-making authorities under section 45(7) of the *Environmental Protection Act 1986*, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, which addresses:

1. the major environmental issues associated with implementing the project; the environmental objectives for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those objectives;

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

3. significant improvements gained in environmental management, including the use of external peer reviews;

4. stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and

5. the proposed environmental objectives over the next five years, including improvements in technology and management processes.

4-3 The proponent may submit a report prepared by an independent auditor to the Chief Executive Officer of the Department of Environment on each condition of this statement which requires the preparation of a management plan, programme, strategy or system, stating whether the requirements of each condition have been fulfilled within the timeframe stated within each condition.

5 Decommissioning and Rehabilitation

5-1 Within 12 months following commissioning, the proponent shall review and revise the existing Yandicoogina Decommissioning and Rehabilitation Plan to include the Yandicoogina Junction Southeast Mine, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Department of Conservation and Land Management and the Department of Industry and Resources.

The objectives of this Plan are to:

- achieve construction of landforms which are stable, non-polluting and aesthetically compatible with the surrounding landscape;
- establish sustainable endemic vegetation communities, consistent with the reconstructed landscape and surrounding vegetation; and

- ensure that closure planning and rehabilitation are carried out in a coordinated, progressive manner and are integrated with development planning, consistent with current best practice, and the agreed land uses.

The Plan shall set out procedures to:

1. manage long-term hydrogeological impacts of mining the channel iron deposit;

2. model the long-term hydrogeological impacts, particularly the water levels and quality in the pit void;

3. manage over the long-term the surface water systems affected by the open pit;

4. progressively rehabilitate all disturbed areas to a standard suitable for the agreed end land use(s), with consideration and incorporation of:
   - the characteristics of the pre-mining ecosystems within the project area (through research and baseline surveys);
   - the performance of previously rehabilitated areas within the mining lease;
   - the performance of rehabilitation areas at the proponent's other operations in the Pilbara; and
   - best practice rehabilitation techniques used elsewhere in the mining industry;

5. develop and identify completion criteria;

6. monitor rehabilitation to assess the performance of all rehabilitated areas against the completion criteria;

7. report on the rehabilitation and monitoring results;

8. remove all infrastructure;

9. develop management strategies and/or contingency measures in the event that operational experience and/or monitoring identify any significant environmental impact as a result of the proposal; and

10. develop a 'walk away' solution for the decommissioned mine site.

Note: A 'walk away' solution means that the site shall either no longer require management at the time the proponent ceases mining operations, or if further management is deemed necessary, the proponent shall make adequate provisions so that the required management is undertaken with no liability to the State.

5-2 The proponent shall implement the Yandicoogina Decommissioning and Rehabilitation Plan required by condition 5-1.

5-3 The proponent shall review and revise the Yandicoogina Decommissioning and Rehabilitation Plan required by condition 5-1 at intervals not exceeding five years.

5-4 The proponent shall make revisions of the Yandicoogina Decommissioning and Rehabilitation Plan required by condition 5-1 publicly available.

6 Post-closure Backfill Source

6-1 At least six months prior to decommissioning, the proponent shall complete Aboriginal ethnographic and archaeological surveys and vegetation, flora and fauna surveys of the preferred backfill source, "Backfill Hill", located approximately two kilometres west of the proposed pit.

6-2 Prior to removal of material from "Backfill Hill" for the purpose of backfilling the pit void, the proponent shall prepare a Backfill Hill Management Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Department of Conservation and Land Management and the Department of Indigenous Affairs.

The objective of the Plan is to minimise impacts on vegetation, flora, fauna, surface drainage patterns and Aboriginal sites arising from the use of the nearby hill for backfill.

This Plan shall include:

1. the results of the Aboriginal ethnographic and archaeological surveys and the biological surveys required by condition 6-1; and

2. measures to minimise and manage impacts on vegetation, flora, fauna, Aboriginal sites and surface water flows associated with taking material from the hill.

6-3 The proponent shall only implement the Backfill Hill Management Plan if the following criteria are met:

1. no loss of Declared Rare Flora;
2. no loss of Threatened Ecological Communities;
3. no significant impact on other flora species and vegetation communities considered of conservation significance;
4. no impact on Threatened Fauna;
5. no significant impact on other fauna species of conservation significance; and
6. Archaeological and ethnographic sites to be managed in accordance with the *Aboriginal Heritage Act 1972*.

6-4 The proponent shall make the Backfill Hill Management Plan required by condition 6-2 publicly available, subject to matters regarding indigenous heritage being included with the consent of the relevant Traditional Owners.

7 Groundwater

7-1 Prior to commencement of dewatering, the proponent shall prepare a Groundwater Management Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority.

The objectives of this Plan are to:

- monitor the impacts of the proposal on key water parameters; and
- maintain the quantity and quality of water so that existing and potential environmental values, including ecosystem maintenance, are protected.

This Plan shall set out procedures to:

1. model the short-term hydrogeological impacts;
2. establish baseline data on groundwater levels, quality and through-flow at the downstream boundary of Mining Lease 274SA, and at appropriate locations along the channel iron deposit aquifer;
3. monitor the groundwater levels, quality and through-flow at appropriate locations along the channel iron deposit aquifer and along Weeli Wolli Creek during all phases of mining;
4. monitor the dewatering and discharge rates (both cumulative and direct);
5. re-inject surplus water from dewatering into the Billiards channel iron deposit aquifer if investigation studies indicate that it is feasible;
6. manage and minimise impacts on groundwater; and
7. report on the management actions and monitoring results.

7-2 The proponent shall review and revise the Groundwater Management Plan required by condition 7-1 at intervals not exceeding five years.

Note: In revising the Groundwater Management Plan, the proponent shall adopt current best practice, while having regard for continuous improvement in groundwater management, based on adaptive management.

7-3 The proponent shall implement the Groundwater Management Plan required by condition 7-1.

7-4 The proponent shall make the Groundwater Management Plan required by condition 7-1 publicly available.

8 Riparian Vegetation

8-1 Prior to commencement of dewatering, the proponent shall prepare a Riparian Vegetation Management Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management.

The objectives of this Plan are to:

- minimise impact on riparian vegetation from dewatering and discharge; and
- maintain the abundance, diversity, geographical distribution and productivity of vegetation communities through the avoidance or management of adverse impacts and improvement in knowledge.

This Plan shall set out procedures to:

1. maintain the flow paths, quantity and quality of water within Marillana, Yandicoogina and Weeli Wolli Creeks and the underlying aquifers to protect surface water and groundwater dependent ecological systems;

2. monitor the effects of dewatering on riparian vegetation communities in areas where the water table is predicted to be lowered by at least two metres (during and after mining), and to implement remedial measures if impacts are detected;

3. manage and minimise potential impacts on riparian vegetation associated with dewatering and at the discharge point;

4. evaluate alternative discharge locations and methodologies, including the re-injection of surplus water from dewatering into the Billiards channel iron deposit aquifer;

5. avoid disturbance and weed introduction to vegetation in creek lines, particularly vegetation which is currently in good or excellent condition; and

6. maintain a riparian vegetation buffer of not less than 200 metres around Marillana, Yandicoogina and Weeli Wolli Creeks to protect riparian vegetation and the habitat for fauna associated with the creeks (Note: The buffer does not apply at the two creek crossings. See Figure 2 of Schedule 1.).

8-2 The proponent shall review and revise the Riparian Vegetation Management Plan required by condition 8-1 at intervals not exceeding five years.

8-3 The proponent shall implement the Riparian Vegetation Management Plan required by condition 8-1.

8-4 The proponent shall make the Riparian Vegetation Management Plan required by condition 8-1 publicly available.

9 Conservation of Significant Flora and Fauna

9-1 Prior to ground-disturbing activities, the proponent shall commence staged pre-land-clearing surveys of the areas to be disturbed by the proposal for conservation-significant flora and fauna species, and shall provide the summary report of the results of the surveys to the Environmental Protection Authority and the Department of Conservation and Land Management within two weeks of it becoming available.

9-2 Prior to any ground-disturbing activities in a particular staged area to be cleared, the proponent shall prepare a Significant Species Management Plan for any conservation-significant flora or fauna species recorded during the pre-land-clearing survey required by condition 9-1, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management.

The objective of this Plan is to maintain the abundance, diversity, geographic distribution, conservation status and productivity of flora and fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

The Plan shall describe the significant, identified species of flora and fauna, and describe significant vegetation associations and habitat areas, and shall set out procedures to:

1. demarcate identified populations and/or individuals of conservation-significant, identified species of flora and fauna, vegetation associations and habitat areas;

2. modify land clearing plans and evaluate alternative mine plans, to minimise or avoid impacts on the conservation-significant, identified species of flora and fauna, vegetation associations and habitat areas;

3. minimise impacts where proposed mining activities are likely to impact on conservation-significant, identified species of flora and fauna, vegetation associations and habitat areas;

4. monitor and record impacts on conservation-significant, identified species of flora and fauna, vegetation associations and habitat areas; and

5. implement appropriate contingency measures where impacts on conservation-significant, identified species of flora and fauna, vegetation associations and habitat areas are identified.

9-3 The proponent shall review and revise the Significant Species Management Plan required by condition 9-2 at intervals not exceeding five years.

9-4 The proponent shall implement the Significant Species Management Plan required by condition 9-2.

9-5 The proponent shall make the Significant Species Management Plan required by condition 9-2 publicly available.

10 Weeds

10-1 Within 12 months following the formal authority issued to the decision-making authorities under section 45(7) of the *Environmental Protection Act 1986*, the proponent shall prepare a Weed Management Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Department of Conservation and Land Management and the Department of Agriculture.

The objectives of this Plan are to:

- minimise the spread of weed species;
- prevent the introduction of new weeds; and
- control and/or eradicate both noxious and environmental weeds in the project area.

The Plan shall set out the procedures to:

1. identify target weeds having regard for weed species outside the project area;
2. control and eradicate target weeds;
3. monitor the success of weed control; and
4. report on the weed management actions and monitoring results.

10-2 The proponent shall review and revise the Weed Management Plan required by condition 10-1 at intervals not exceeding five years.

10-3 The proponent shall implement the Weed Management Plan required by condition 10-1.

10-4 The proponent shall make the Weed Management Plan required by condition 10-1 publicly available.

11 Subterranean Fauna

11-1 Prior to commissioning, the proponent shall prepare a Subterranean Fauna Management Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Department of Conservation and Land Management and the Western Australian Museum.

The objective of this Plan is to maintain the abundance, diversity, geographic distribution and productivity of stygofauna at species and ecosystem levels through the avoidance or management of adverse impacts and through improvements in knowledge.

The Plan shall set out the procedures to:

1. avoid and/or manage impacts on subterranean fauna species, communities and their habitats where the long-term survival of those species and communities may be at risk as a result of project operations;

2. establish additional data on the distribution of existing stygofauna species and communities, particularly the ostracod *Gomphodella* sp. and water mite *Recifella* sp., to demonstrate that there is no threat to these species;

3. take timely remedial action in the event that additional data indicates that project operations may compromise the long-term survival of subterranean fauna species and/or communities; and

4. report on the survey results and management actions.

11-2 The proponent shall implement the Subterranean Fauna Management Plan required by condition 11-1.

11-3 The proponent shall make the Subterranean Fauna Management Plan required by condition 11-1 publicly available.

12 Liaison with Adjacent Leaseholders

12-1 During mining and decommissioning, the proponent shall liaise with adjacent mining leaseholders in order to develop and evaluate options for viable and compatible long-term management strategies and to minimise cumulative environmental impacts.

12-2 During mining and decommissioning, the impacts of mining and decommissioning on the Marillana-Yandicoogina-Weeli Wolli Creek systems and the channel iron deposit shall be evaluated jointly with the proponent of the adjacent proposal(s) for the purposes of understanding the hydrological system.

Procedures

1. Where a condition states "to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority", the Environmental Protection Authority will provide that advice to the Department of Environment for the preparation of written notice to the proponent.

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

3. Where a condition lists advisory bodies, it is expected that the proponent will obtain the advice of those listed as part of its compliance reporting to the Department of Environment.

Notes

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

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

3. Compliance and performance reporting will endeavour to be in accord with the timing requirements of the *Iron Ore (Yandicoogina) Agreement Act 1996*.

Dr Judy Edwards MLA
MINISTER FOR THE ENVIRONMENT; SCIENCE

25 OCT 2005

Schedule 1

The Proposal (Assessment No. 1590)

The proposal is to mine a section of the Yandicoogina channel iron deposit, known as the Yandicoogina Junction South-east Mine, and subsequently rehabilitate all the disturbed areas. The proposal is located within Mining Lease 274SA, approximately 90 kilometres north-west of Newman, in the Central Pilbara Region (Figure 1). The Yandicoogina Junction South-east Mine is a downstream extension of the existing channel iron deposit being mined at Yandicoogina Junction Central.

The Yandicoogina Junction South-east proposal comprises:

- conventional open-cut mining of overburden and ore from the channel iron deposit;
- dewatering of the orebody, with a supply pipeline to Yandicoogina Junction Central where the water will be discharged at a licensed location;
- placement of overburden in a temporary out-of-pit storage area for later use as fill material during partial backfill of the pit void;
- construction of the following infrastructure:
    - a light vehicle access road and a heavy vehicle access road, which include crossings of Yandicoogina and Marillana Creeks, respectively;
    - realignment of part of the public access road to Newman;
    - dry primary and secondary crushing plant with run-of-mine (ROM) pad;
    - 4.8 kilometre long overland conveyor (with covers fitted over its length), to link the crushing plant with the existing conveyor system;
    - fuelling facility, connected to the Yandicoogina Junction Central fuel facility by an above-ground pipeline; and
    - administration building and workshop.
- tertiary crushing and screening of the ore at the existing Yandicoogina Junction Central processing plant;
- wet processing of the lower channel iron deposit with a high clay content, at the existing Yandicoogina Junction Central wet processing plant;
- loading and transportation of ore along the Central Pilbara Railway to the ship-loading facilities at Dampier Port and Cape Lambert;
- maintenance of a 200-metre separation distance between the proposed pit and Yandicoogina, Marillana and Weeli Wolli Creeks;
- possible re-injection of a component of the dewatering discharge into the Billiards channel iron deposit aquifer, down-gradient of the proposed pit, near Weeli Wolli Creek;
- permanent loss of at least part of a nearby hill to partially fill the pit void to at least 490 metres Relative Level; and
- progressive rehabilitation of all disturbed areas.

Figures (attached)

Figure 1 – Site location
Figure 2 – Site layout

Table 1 - Key Proposal Characteristics (Assessment No. 1590)

Characteristic	Quantities / Description
Mining	
Project life	Approximately 16 years
Length of deposit to be mined	Approximately 5.8 kilometres
Ore reserve to be mined	Approximately 280 million tonnes
Mining rate	Approximately 16 million tonnes per annum
Pit depth	Approximately 65 metres (45 metres below the present water table).
Overburden	Overburden will be stockpiled in a temporary storage area. Some of the material will be used for constructing drainage embankments. The remaining material will be used as backfill in the pit void.
Total disturbance area - Infrastructure - Overburden waste dump - Pit - Post-closure backfill source	Approximately 669 hectares (within mining lease 274SA) - Approximately 79 hectares - Approximately 60 hectares - Approximately 370 hectares - Approximately 160 hectares
Closure and rehabilitation	The final pit void will be backfilled to at least 490 metres Relative Level. The total disturbance area will be rehabilitated with local native vegetation.
Dewatering	
Initial dewatering	Approximately 27 to 30 megalitres per day
Maintenance	Approximately 15 to 20 megalitres per day
Sump dewatering	Approximately 1 megalitre per day
Dewatering well fields	Initially 2 clusters of wells and a sacrificial well. As mining progresses, 3 additional cluster wellfields, plus sumps.
Processing and transport	
Crushing plant	Construction of a dry primary and secondary crushing plant
Conveyor	Construction of a 4.8 kilometre long overland conveyor to link the crushing plant to the existing overland conveyor at Yandicoogina Junction Central. Ore will be conveyed to the Yandicoogina Junction Central mine, where it will undergo additional processing.
Transport	Ore will be transported along the Central Pilbara Railway to the ship-loading facilities at Dampier Port and Cape Lambert.
Infrastructure	
Power	An 8-megawatt diesel-fired power station will be used for additional power during early stages of construction. Connected to grid with power supplied by Hamersley's gas-fired power stations at Dampier and Paraburdoo.
Access roads	▪ Light vehicle access road from the transfer point on the current conveyor to the new crushing plant at Yandicoogina Junction Southeast. A crossing on Yandicoogina Creek will be required. ▪ Heavy vehicle access road from Yandicoogina Junction Central to Junction Southeast. A crossing on Marillana Creek will be required. ▪ Realignment of part of the public access road to Newman to allow bypass of heavy vehicle access road.
Other facilities	Administration building, plant workshop and fuelling facility.
Water	
Water management	Construction of flood protection levees and diversion drains
Water use	Approximately 3 megalitres per day of dewatered water for dust suppression and potable use.

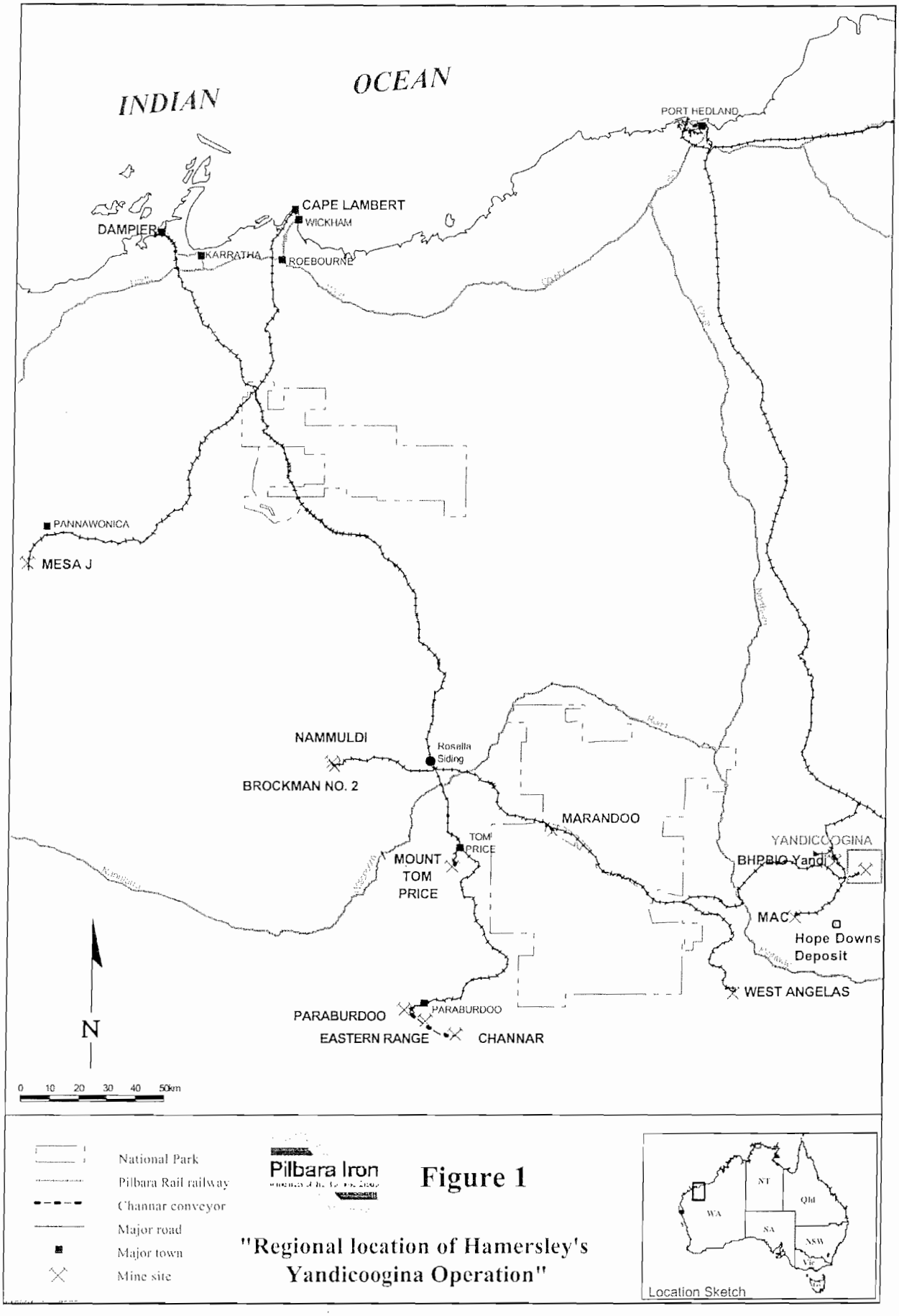


Figure 1: Site location

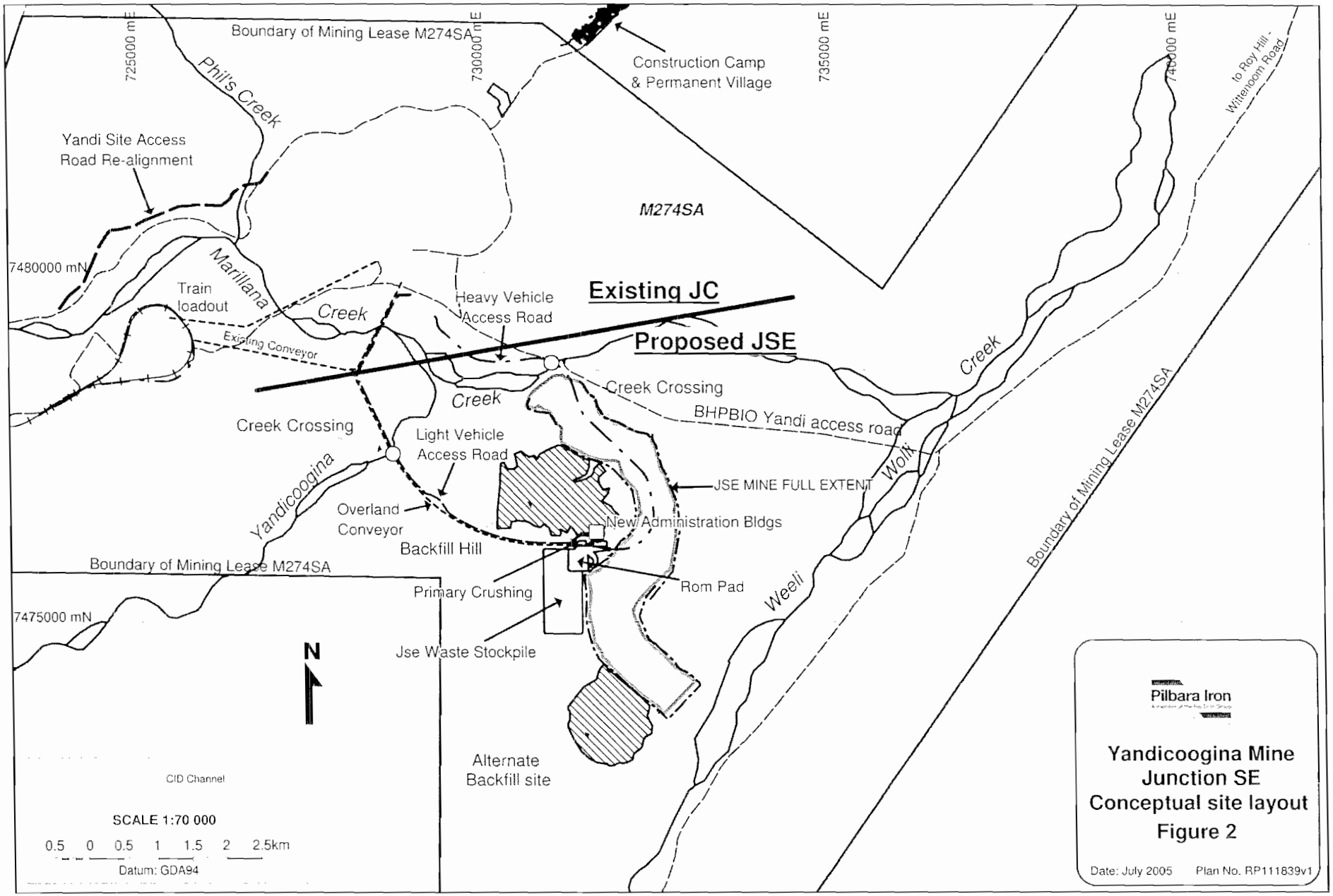


Figure 2: Site layout