Rio Tinto Iron Ore

Yandicoogina Pocket and Billiard South Iron Ore Mine

Section 38 Referral

Supporting Information Document

Hamersley Iron – Yandi Pty Limited

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GPO Box A42, Perth, WA 6837

July 2014

RTIO-HSE-0225868

Disclaimer and Limitation

This report has been prepared by Rio Tinto Iron Ore (**Rio Tinto**), on behalf of Hamersley Iron - Yandi Pty Limited (**Hamersley Iron**), specifically for the Yandicoogina Pocket and Billiard South Iron Ore Project (**Yandi PBS Project**). Neither the report nor its contents may be referred to without the express approval of Rio Tinto, unless the report has been released for referral and assessment of proposals.

Document Status					
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8	M. Brand	T. Souster	27/06/14	G O'Donoghue	4/07/14

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1 INTRODUCTION

Hamersley Iron – Yandi Pty Limited (**Hamersley Iron**) is seeking to develop a major new brownfields iron ore mine at its existing Yandicoogina operations (**Yandi Operations**). This Proposal is referred to as the Yandicoogina Pocket and Billiard South Iron Ore Mine (the **Yandi PBS Project**) and will involve construction and operation of a new mine pit and associated infrastructure and is a key requirement to sustain the existing Yandi Operations.

The Yandi PBS Project is located immediately to the east of the Yandi Operations which is situated approximately 90 km north-west of Newman in the Pilbara region of Western Australia (Figure 1).

The Yandi PBS Project is likely to have a total throughput of up to 70 Mtpa as the Yandi operations are depleted and is expected to have an operational mine life of approximately 16 years.

1.1 PURPOSE OF THIS DOCUMENT

The Proposal is a revision to the Yandi Operations as approved under Ministerial Statement 914 (**MS 914**) in 2012.

This document has been prepared to support the formal referral of the Yandi PBS Project under Section 38 of the *Environmental Protection Act 1986* (**EP Act**). It provides information on the Proposal characteristics, existing environment, potential environmental impacts and proposed management commitments. It has been prepared in accordance with the *Environmental Impact Assessment (Part IV Division 1) Administrative Procedures 2012* of the EP Act. A completed s38 Referral Form is provided in Appendix 1.

1.2 PROPONENT DETAILS

The Proponent for the Yandi PBS Project is Hamersley Iron – Yandi Pty Limited.

Hamersley Iron - Yandi is a wholly owned member of the Rio Tinto group of companies and forms part of Rio Tinto's global iron ore business. This includes several wholly owned subsidiaries and joint venture initiatives in the Pilbara region of north-west Western Australia. The Rio Tinto iron ore Pilbara operations include assets owned by Hamersley Iron, the Robe River Iron Associates Joint Venture (**RRIA**), Bao-HI Joint Venture, and Hope Downs Joint Venture. Pilbara Iron Pty Limited (**Pilbara Iron**) operates Rio Tinto's iron ore mine and joint venture assets in the Pilbara region.

The Rio Tinto contact person in relation to the environmental approvals process for the Yandi PBS Project is:

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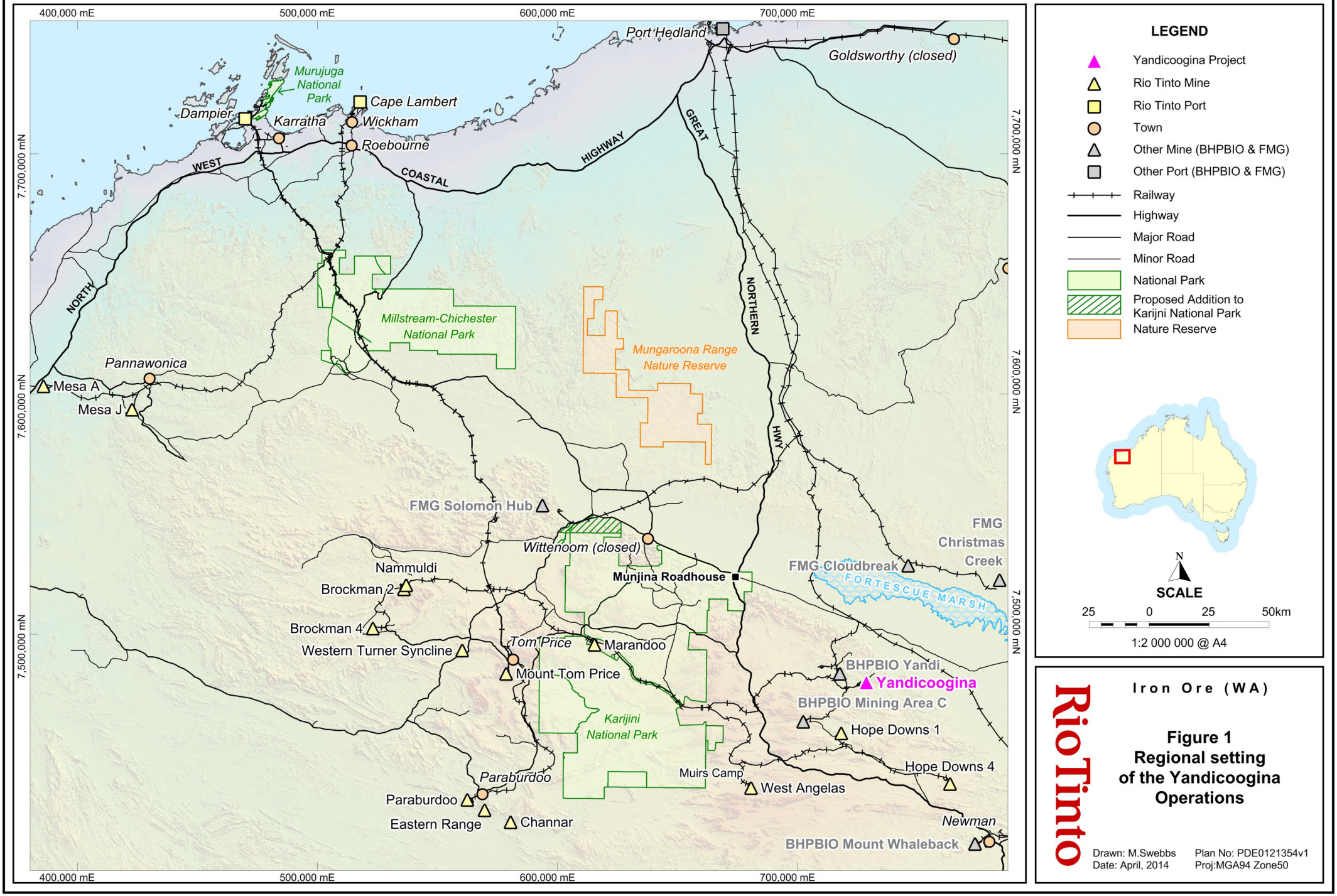

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Iron Ore (WA)

Figure 1
Regional setting of the Yandicoogina Operations

Drawn: M.Swebbs
Date: April, 2014

Plan No: PDE0121354v1
Proj:MGA94 Zone50

1.3 BACKGROUND TO PROPOSAL

1.3.1 Existing Yandicoogina Operations

The Yandi Operation is currently centred over three mining areas: Junction Central (**JC**); Junction South East (**JSE**); and Junction South West (**JSW-A & C**); with a replacement ore body Oxbow due to come online in 2017.

The mine lies within a channel iron deposit (**CID**), which also forms a major aquifer in the area, with approximately 80% of the ore body situated below the pre-mining water table. As a consequence, dewatering is a major requirement of mining activities for the Yandi Operation.

The Yandi Operation, as implemented, consists of:

- Five open cut pits within the CID: JC, JSE, JSW, and Oxbow (yet to be developed).
- A 90km rail line to Juna downs.
- Mine infrastructure (e.g. product stockpiles, waste dumps, topsoil, low-grade stockpiles and haul roads).
- Associated infrastructure (e.g. overland conveyors, mine access roads, offices, warehouses, accommodation, bore fields, fuel storage facilities and utilities).
- Abstraction of 53 GL per annum (**GL/a**).
- A water management system including on-site reuse of water abstracted from pit dewatering, and discharge of surplus volumes into creek systems.
- Dry and wet processing plants.
- Flood protection structures.
- Power and communications infrastructure.

The key characteristics of the Yandi Operation as described in Schedule 1 of MS 914 are outlined in Table 1-1

Table 1-1: Key Characteristics of the Yandicoogina Project (MS 914)

Element	Description
Clearing	Up to 5,600 ha
Dewatering from Junction South East and Junction Central Operations	No more than 35 GL/a
Dewatering from Junction South West A, Junction South West C and Oxbow Operations	No more than 18 GL/a
Surface Water Discharge from Junction South West A, Junction South West C and Oxbow Operations	Up to 16 GL/a

1.3.2 Environmental Factors relating to the Yandi Operation

Environmental factors identified as relevant to the Yandi Operation (revised as MS 914) included:

- Vegetation, Flora and Fauna (now Vegetation and Flora, Terrestrial Fauna, Subterranean Fauna under the EPA's Environmental Assessment Guideline 8 – EAG8);
- Groundwater and Surface water (now EAG 8: Hydrological Processes and Inland Waters Environmental Quality);
- Mine Rehabilitation and Closure; and
- Residual impacts (now EAG 8 Offsets).

1.4 ENVIRONMENTAL APPROVALS HISTORY

The Minister for the Environment issued Ministerial Statement 417 (**MS 417**) in May 1996 allowing implementation of the Yandicoogina Junction Central Project. Since then, several new mine pits have been approved under Part IV of the EP Act as summarised below in Table 1-2.

Table 1-2: Summary of Key Yandicoogina Approvals

Year	Ministerial Approval	Project	Description
1996	MS 417	Junction Central	Original Yandicoogina Approval including 90km rail.
1999	MS 523	Yandi JC Expansion	Yandi JC Expansion (via s46).
2006	MS 695	Junction South East	Yandi JSE pit.
2012	MS 914	Junction South West and Oxbow	Revised proposal to add 3 new mine pits and amalgamate MS 417, 523 and 695.

The most recent approval (MS 914 in October 2012) amalgamated the existing Junction Central and Junction South East Ministerial statements to a single set of contemporary conditions and included an expansion to incorporate 3 new mine pits at Junction South West (A & C) and Oxbow. A copy of MS 914 is provided in Appendix 2.

1.5 THIS PROPOSAL

The Yandi PBS Project is centred on a substantial CID deposit, located immediately to the east of the Yandi Operation. The Yandi Operation commenced in 1996 with JC and included rail and power-line networks servicing the operations, stockyards, plant, power, administration buildings, and camp facilities.

The Yandi PBS Project is currently subject to a Pre-Feasibility Study (**PFS**) study that commenced in late April 2014.

As a revision to the Yandi Operation, the Yandi PBS Project includes the following key additions:

- A new below water table open cut pit and associated infrastructure (ore and waste dumps and haul roads).

- Supporting infrastructure (conveyors, creek crossing, flood protection levees, ore processing).
- Additional dewatering of the CID aquifer.

2 LOCATION AND LOCALITY PLAN

2.1 LOCATION

The Yandi PBS Project is located in the central Pilbara region of Western Australia, approximately 90 km north-west of Newman and 300 km south-east of Dampier. The proposed Yandi PBS deposits are located immediately east of the Yandi Operations JC and JSE deposits and the recently approved JSW and Oxbow deposits (Figure 2).

2.2 LAND USE

The Yandi Operation lies within the Shire of East Pilbara. The main Pilbara regional centres are Newman, Tom Price, Paraburdoo, Roebourne, Karratha and Port Hedland.

Newman, with a population of ~4,500, is the nearest significant population centre to the Yandi PBS Project area, located approximately 90 km to the south east. The 54 km access road into Yandicoogina is located 135 km north-west of Newman on the Great Northern Highway.

2.2.1 Pastoral

The principal land use in the region is pastoral cattle production. A number of Hamersley Iron's existing Yandi deposits (JC, JSE, and part of JSW) are situated on Pastoral Lease L3114 984, which is currently held by a BHP Billiton Iron Ore (**BHPBIO**) subsidiary and operated as Marillana Station (Figure 3). The Yandi PBS Project area is also contained within Pastoral Lease L3114 984. Marillana Station has a long history of cattle grazing and is still used for this purpose.

Other regional land uses include the traditional use of land by Aboriginal groups, tourism, conservation and other mining operations.

2.2.2 Mining

The Yandi PBS Project area is separated from the Yandi Operation by Weeli Wolli Creek.

Additional mines at Hope Downs 1 (**HD 1**) to the south and Hope Downs 4 (**HD 4**, currently under construction) further to the east are operated by Hamersley HMS Pty Limited under joint venture arrangements between Rio Tinto Iron Ore and Hancock Prospecting.

The West Angelas Iron Ore Mine, owned by RRIA, is located approximately 65 km south-west of the Yandi Operations.

A number of other iron ore projects that are being investigated or developed by other proponents are in various stages of planning; many of these are proposed on the southern side of the Fortescue Marsh (refer Section 5).

2.2.3 Tourism

National Parks are the major tourism focus in the central Pilbara region. The Yandi PBS Project is located approximately 90 km from the nearest boundary of the Karijini National Park and 100 km from the nearest boundary of the Millstream Chichester National Park.

The Yandi PBS Project area contains no significant features that warrant attention from the tourism sector, and there are very few public roads in the vicinity to facilitate access for tourists, with the exception of Weeli Wolli Spring ~7km to the south. Therefore tourism is very limited in, or adjacent to, the Yandi PBS Project area.

2.2.4 Tenure

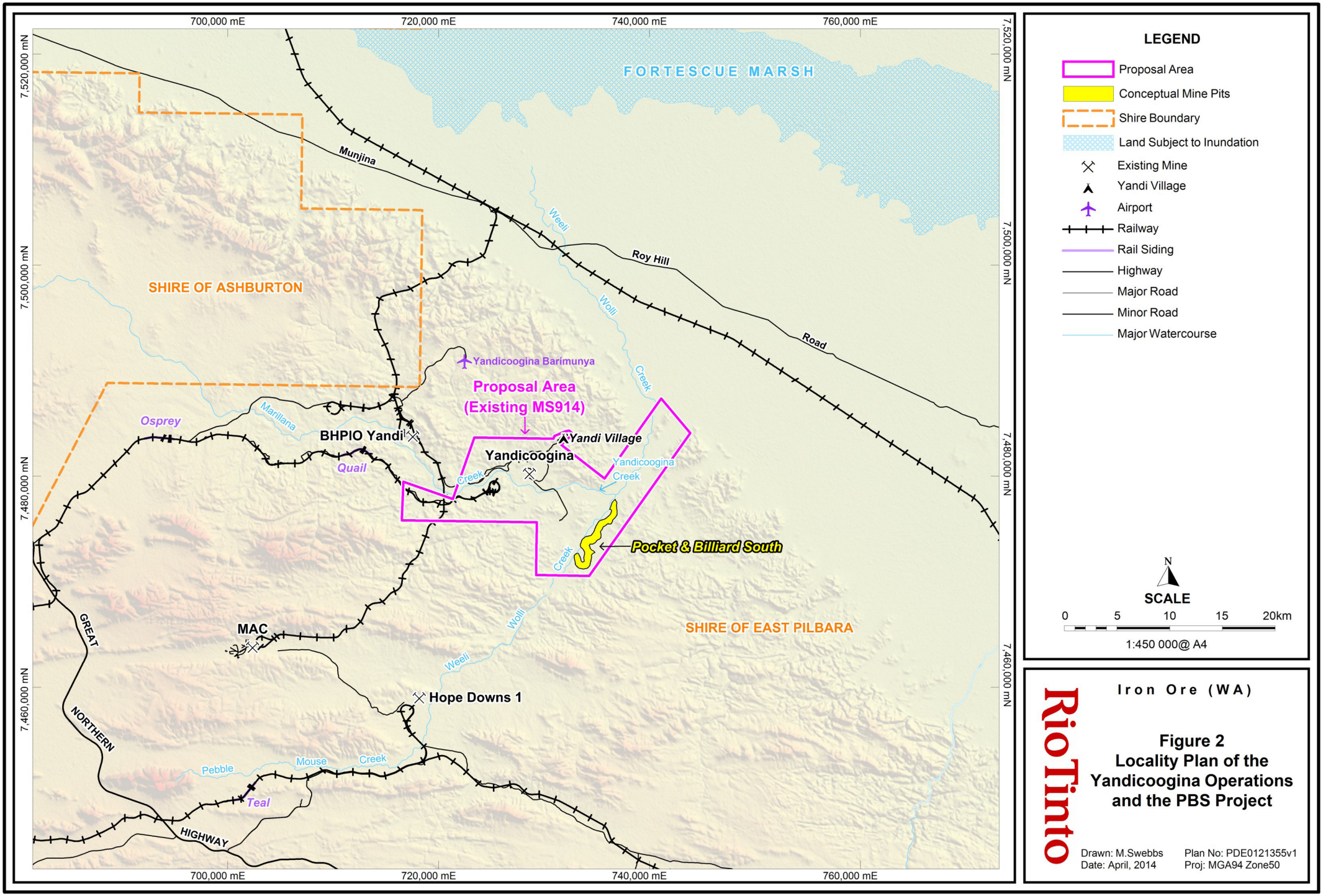
The Yandi Operation, including the proposed Yandi PBS Project, is located on Mining Lease ML274SA held by Hamersley Iron established under the *Iron Ore (Yandicoogina) Agreement Act 1996* (Figure 3). Pilbara Iron operates a railway corridor extending from the rail load-out facility near JC in a west and then north westerly direction; ultimately connecting with existing Rio Tinto Iron Ore port facilities at Cape Lambert.

To the west of the Yandi Operation is ML270SA, held by a BHPBIO subsidiary, which includes a working iron ore mining operation (BHPBIO Yandicoogina Operation). BHPBIO operates a railway line and power transmission corridor which crosses ML274SA in a north south direction immediately east of Oxbow.

Three native title claims exist over the Yandi area; these are:

- Innawonga Bunjima WC96_061;
- Nyiyaparli 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).

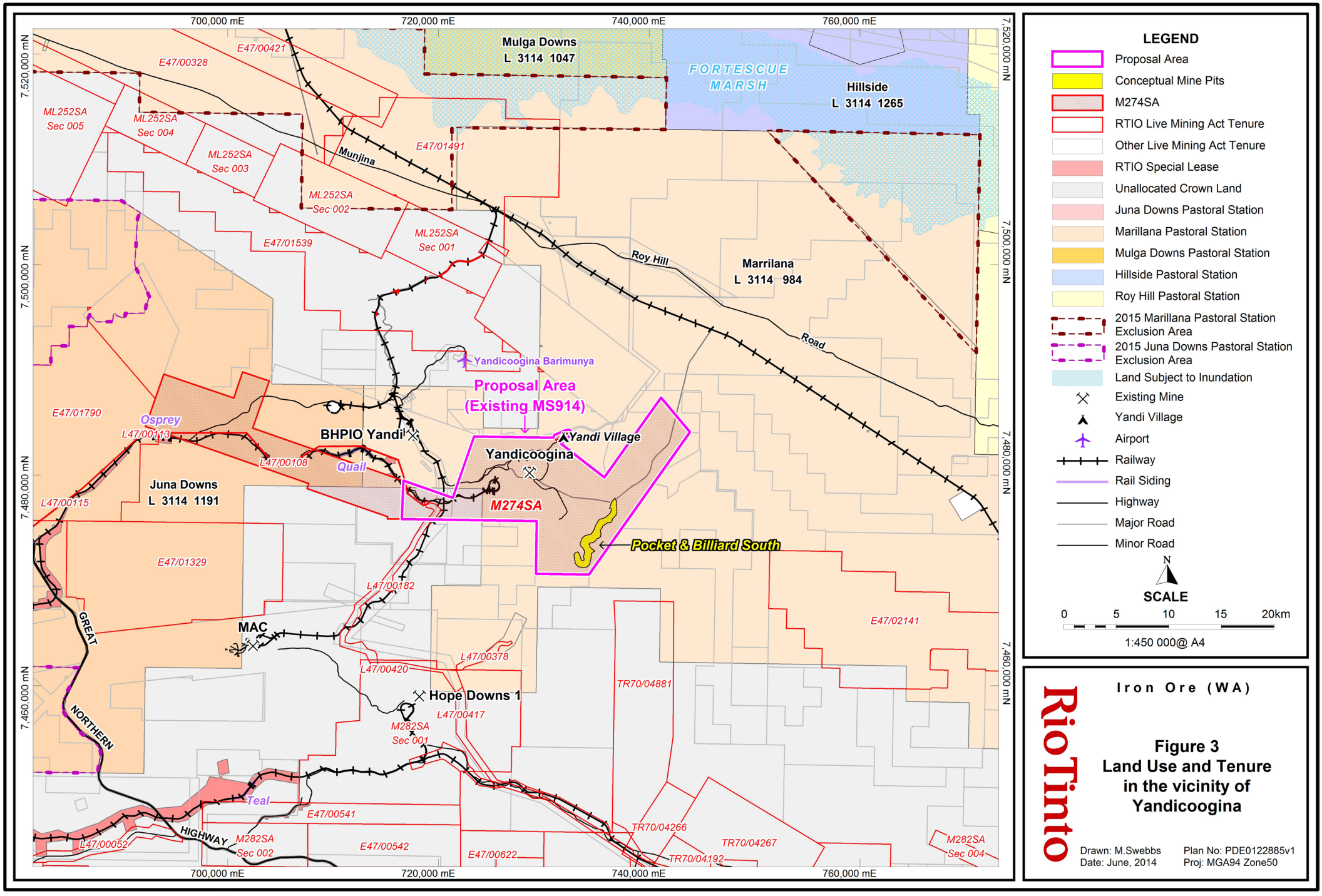


Iron Ore (WA)

Figure 2
Locality Plan of the Yandicoogina Operations and the PBS Project

Drawn: M.Swebbs
Date: April, 2014

Plan No: PDE0121355v1
Proj: MGA94 Zone50



LEGEND

- Proposal Area
- Conceptual Mine Pits
- M274SA
- RTIO Live Mining Act Tenure
- Other Live Mining Act Tenure
- RTIO Special Lease
- Unallocated Crown Land
- Juna Downs Pastoral Station
- Marillana Pastoral Station
- Mulga Downs Pastoral Station
- Hillside Pastoral Station
- Roy Hill Pastoral Station
- 2015 Marillana Pastoral Station Exclusion Area
- 2015 Juna Downs Pastoral Station Exclusion Area
- Land Subject to Inundation
- Existing Mine
- Yandi Village
- Airport
- Railway
- Rail Siding
- Highway
- Major Road
- Minor Road

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SCALE

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Iron Ore (WA)

Figure 3
Land Use and Tenure in the vicinity of Yandicoogina

Drawn: M.Swebbs
Date: June, 2014

Plan No: PDE0122885v1
Proj: MGA94 Zone50

2.3 CONSERVATION AREAS

The Yandi PBS Project area is located approximately 90 km east of Karijini National Park and is in proximity to three Priority Ecological Communities (**PECs**)[1] identified by the Department of Parks and Wildlife (**DPaW**) (DPaW 2013) (refer Figure 4):

- **Fortescue Marsh** Land System (PEC Priority 1): the Fortescue Marsh is an extensive, episodically inundated samphire wetland located approximately 32 km north (downstream) of the northern extent of the Yandi PBS Project area. DPaW has identified a section of the Fortescue Marsh on the Fortescue River, east of Mulga Downs on Marillana and Roy Hill Stations, as a PEC.
- **Weeli Wolli Spring Community** (PEC Priority 1): Weeli Wolli Spring's riparian woodland and forest associations are considered significant due to the composition of the understorey, particularly the sedge and herbfield communities that fringe many of the pools and associated water bodies along part of Weeli Wolli Creek. The spring and creekline are also noted for their relatively high diversity of stygofauna. The valley of Weeli Wolli Spring is also known to support a rich microbat assemblage including a threatened species. The spring is ~7km upstream of the Yandi PBS Project's southern boundary and unlikely to be impacted as a result of the Proposal.
- **Fortescue Valley Sand Dunes** (PEC Priority 3): red linear sand dune communities, including mapped occurrences located approximately 12 km to the north and 13 km to the northeast of the northern boundary of the Yandi PBS Project area, and unlikely to be impacted as a result of the Proposal.

The WA Environmental Protection Authority (**EPA**) has prepared a Fortescue Marsh Management Guideline[2] with assistance from DPaW, the Department of Water (**DoW**), and the Department of State Development (**DSD**), together with industry and Traditional Owner stakeholders. This Guideline provides guidance for land use activities affecting the Fortescue Marsh by establishing an objective-based zoning framework.

The key conservation area relevant to the Yandi PBS Project is the Fortescue Marsh.

2.3.1 Local Environmental Values

In addition to the DPaW listed conservation areas identified within the vicinity of the Yandi PBS Project, local environmental values were identified during the Yandi JSW and Oxbow environmental impact assessment (**EIA**).

Condition 6-2 of MS 914 requires the Proponent to develop an Environmental Values Statement (**EVS**) for the Weeli Wolli Creek System, to the satisfaction of the CEO of the Office of the EPA (**OEPA**) in consultation with the DPaW. The identified values include:

[1] PECs are poorly understood ecological communities, which potentially have high conservation values and may be subject to threatening processes. They are classified as either priority 1, 2 or 3; ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status.

[2] EPA *Guidance for Environmental and Water Assessments Relating to Mining Operations in the Fortescue Marsh Area* document was released in July 2013

- **Flora and Vegetation:**
  - the riparian woodland communities of Marillana and Weeli Wolli Creeks; and
  - *Lepidium Catapycnon* (Declared Rare Flora) known to occur in the wider Yandi Operation area.
- **Fauna:**
  - Stygofauna communities – a number of species known only from the Marillana – Weeli Wolli catchment; and
  - Microbats – a known assemblage from the Weeli Wolli Spring area Chocolate Wattled Bat (*Chalinolobus morio*) is known to utilise parts of Weeli Wolli Creek (DEC 2009).
- **Hydrology:** the Yandi Operation area includes major creek systems that ultimately drain into the Fortescue Marsh PEC.
- **Heritage and Social:** the local creek systems have cultural is spiritual significance for traditional owners.

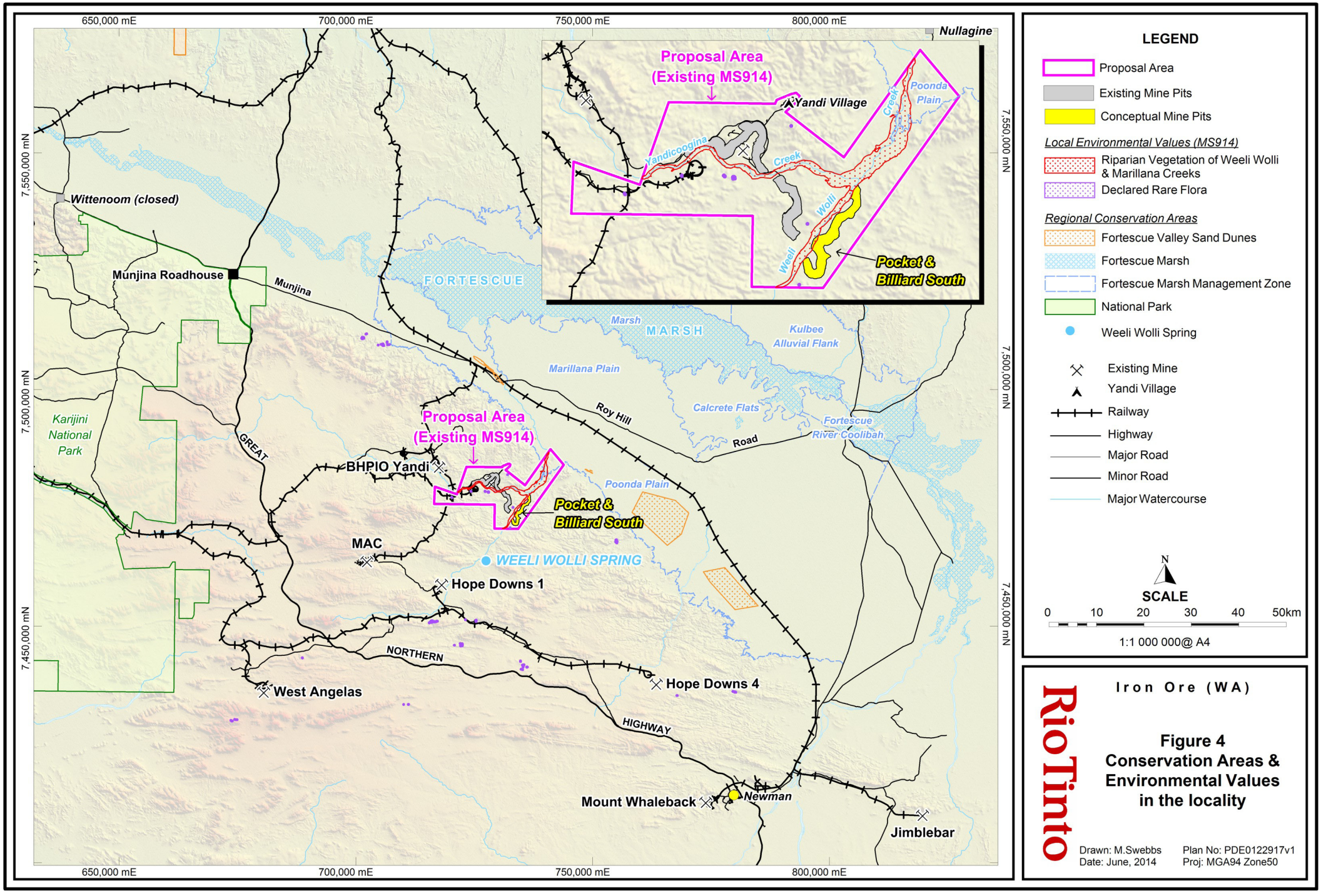

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Figure 4
Conservation Areas & Environmental Values in the locality

Drawn: M.Swebbs
Date: June, 2014

Plan No: PDE0122917v1
Proj: MGA94 Zone50

3 PROPOSAL DESCRIPTION

3.1 OVERVIEW

The Yandi PBS deposits occur across the eastern extents of an extensive 80km long CID characterised by relatively continuous iron mineralisation along a palaeochannel. Mining will consist of a single, below water table open cut pit along the CID palaeochannel.

Key components included in the Yandi PBS Project (Table 3-1) are:

- **A new below water table open cut iron ore mine** (approximately 10km in length) to the east of the Yandi Operation within the CID.
- **Temporary and permanent surface waste dumps**, including mineralised waste dumps, sub-grade dumps, low grade ore dumps and topsoil and sub-soil stockpiles.
- **Major infrastructure includes:**
    - **A flood protection levee –** along the eastern margin of Weeli Wolli Creek**.**
    - **Weeli Wolli crossing** – either a floodway or bridge-type structure.
    - **Ore handling and processing infrastructure** including dry crushing and potentially future wet processing facilities.
    - **In-pit waste fines storage facilities** (**WFSF's**) will be required when wet processing is undertaken.
    - **Supporting mine infrastructure** - haul roads and ramps, mine access and internal road network, conveyors

In addition, a number of the Yandi Operation's existing facilities will be upgraded or integrated:

- **A land bridge** across Junction South East pit.
- **Trucking or conveying ore** back to the existing Yandi Plant.
- **A water management system** including on-site reuse of water abstracted from pit dewatering, and discharge of surplus volumes into creek systems. Discharge infrastructure servicing the existing Yandicoogina operations will be used.
- **Mine support facilities** (e.g. power supply infrastructure, communications infrastructure, offices, explosives storage, waste water treatment plants, etc.).

The Yandi PBS Project is scheduled to be commissioned with first ore production in 2017. These project schedules may change, depending on business priorities.

Mined and processed ore from the Yandi PBS Project will be railed to Rio Tinto Iron Ore's existing port operations at Dampier and/or Cape Lambert using the existing rail network.

A preliminary summary of key features for the Yandi PBS Project are described in Table 3-1. Further details of the components of the Yandi PBS Project are included in the remainder of Section 3.

Table 3-1: Summary of features of the Yandi PBS Project

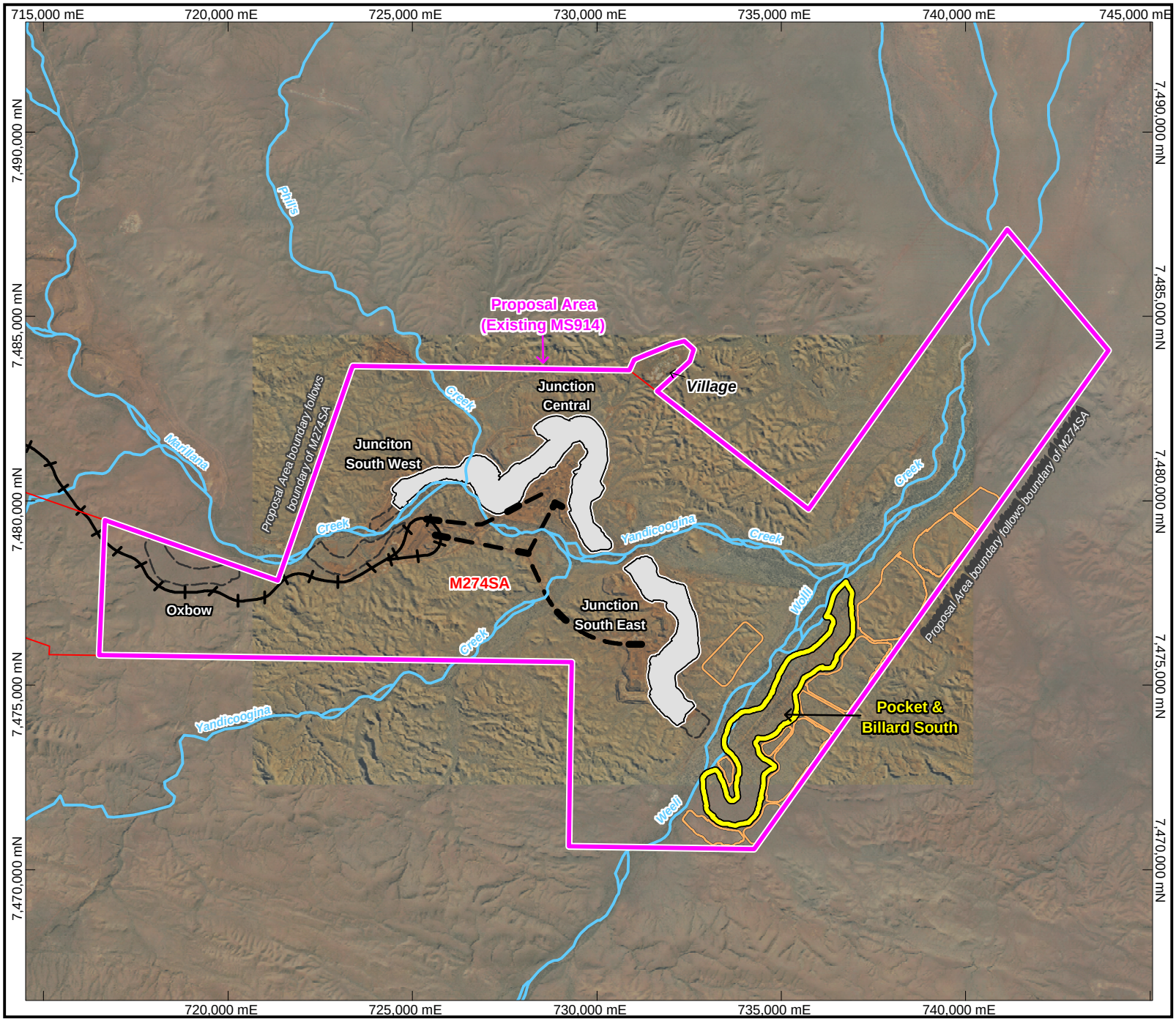
Component	Project Characteristic	Detail
General	Project life	> 16 years
	Resources	The current resource consists of 452 million tonnes of CID ore
	Production rate	Up to 70 Mtpa
Development footprint	Approximate disturbance area – mining/waste stockpiles	Up to 2,500 ha (17ha of riparian vegetation)
	Approximate disturbance area – infrastructure	Up to 300 ha (18ha of riparian vegetation)
Mining	Ore type	Pisolite (Channel Iron Deposit)
	Mining in relation to the watertable	99% BWT mining. Abstraction rate - additional 30 GL/a
	Mineral waste disposal	Surface waste dumps, with some progressive backfilling once individual mine pits are exhausted
Processing	Processing type	Both wet and dry processing using existing Yandicoogina facilities
	Residue disposal	In-pit WFSF's will be required for wet processing
	Water demand	Peak demand (with wet processing) approximately 30 GL/a
	Roads	Existing and new access roads to approach/depart Pocket and Billiard South and internal road system
	Conveyor	Haul road or conveyor options or from Billiard South to the existing Yandi processing plants
	Power spur	Connection into the existing Yandicoogina 220 kV power-line

Mtpa million tonnes per annum
GL/a 1×10^9 Litres per annum
BWT Below water table
WFSF Waste Fines Storage Facility
Ha Hectares

3.2 SITE PLAN

The Yandicoogina Operation site plan is provided in Figure 5, with an indicative conceptual site plan for the Yandi PBS Project shown in Figure 6. This plan also shows the Yandi PBS Project in relation to the existing MS 914 project envelope and existing roads (Figure 7).

Note that planning for the Yandi PBS Project is at a relatively early stage. More detailed planning is contingent on the completion of concurrent resource and engineering feasibility studies, which will be progressed in parallel with the environmental approvals process.



LEGEND

- Proposal Area (Existing MS914)
- M274SA
- Existing Mine Pit
- Proposed Mine Pit
- Existing Conveyor
- Existing Railway
- Major Creek

Conceptual Mine Layout

- Mine Pit
- Waste Dump

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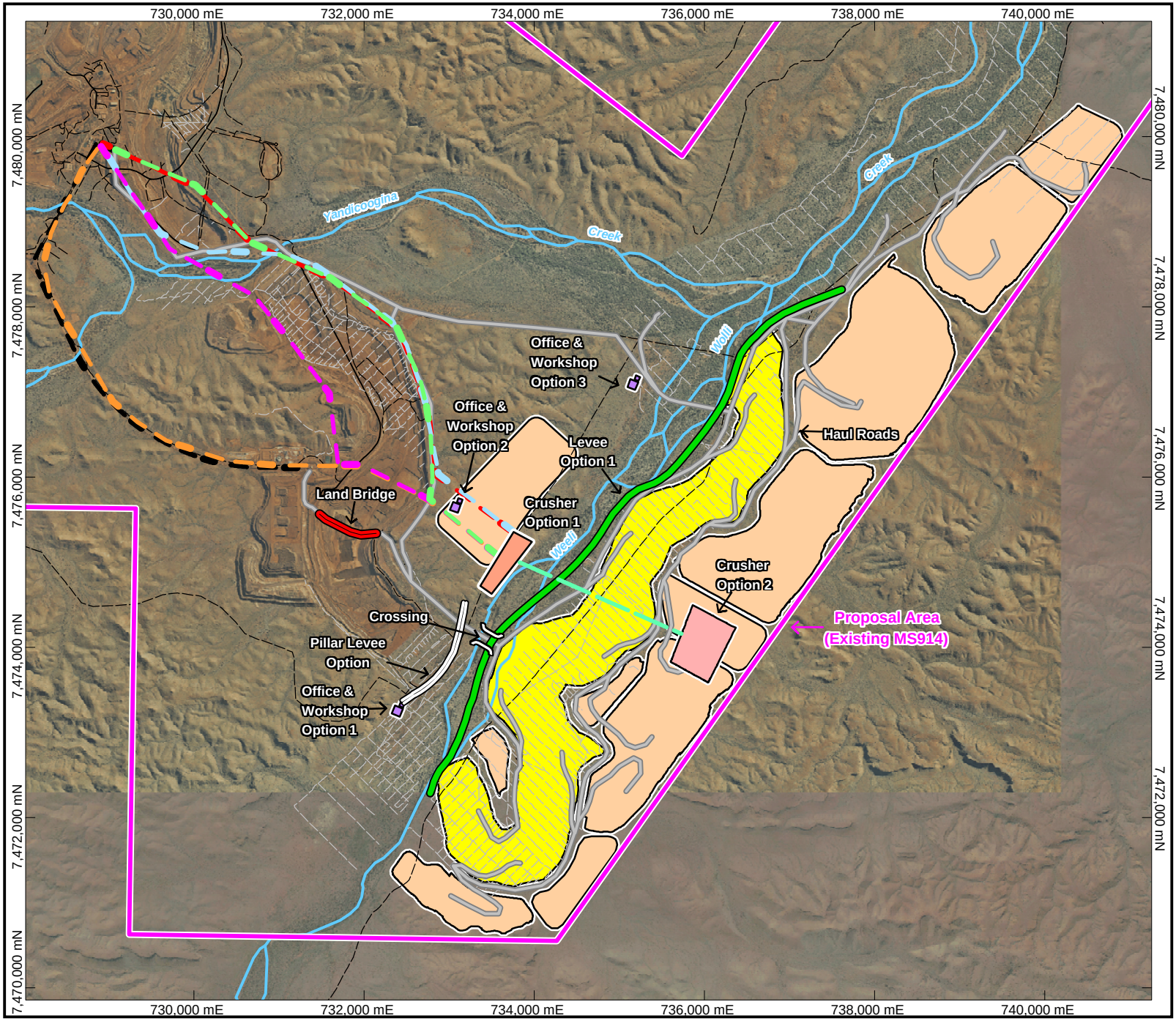
Iron Ore (WA)

Figure 5
Site Plan (Existing Environment) for the Yandicoogina Operations

Drawn: M.Swebbs
Date: June, 2014

Plan No: PDE0121357v1
Proj: MGA94 Zone50

Geospatial Information and Mapping



LEGEND

- Proposal Area (Existing MS914)
- Existing Conveyor
- Existing Road
- Existing Track
- Existing Exploration Track
- Major Creek

Conceptual Mine Layout

- Mine Pit
- Waste Dump
- Crusher Option 1
- Crusher Option 2
- Office & Workshop Options

Conveyor Options

- 1
- 2
- 3
- 4
- 5
- Levee Option
- Pillar Levee Option
- Haul Road
- Land Bridge

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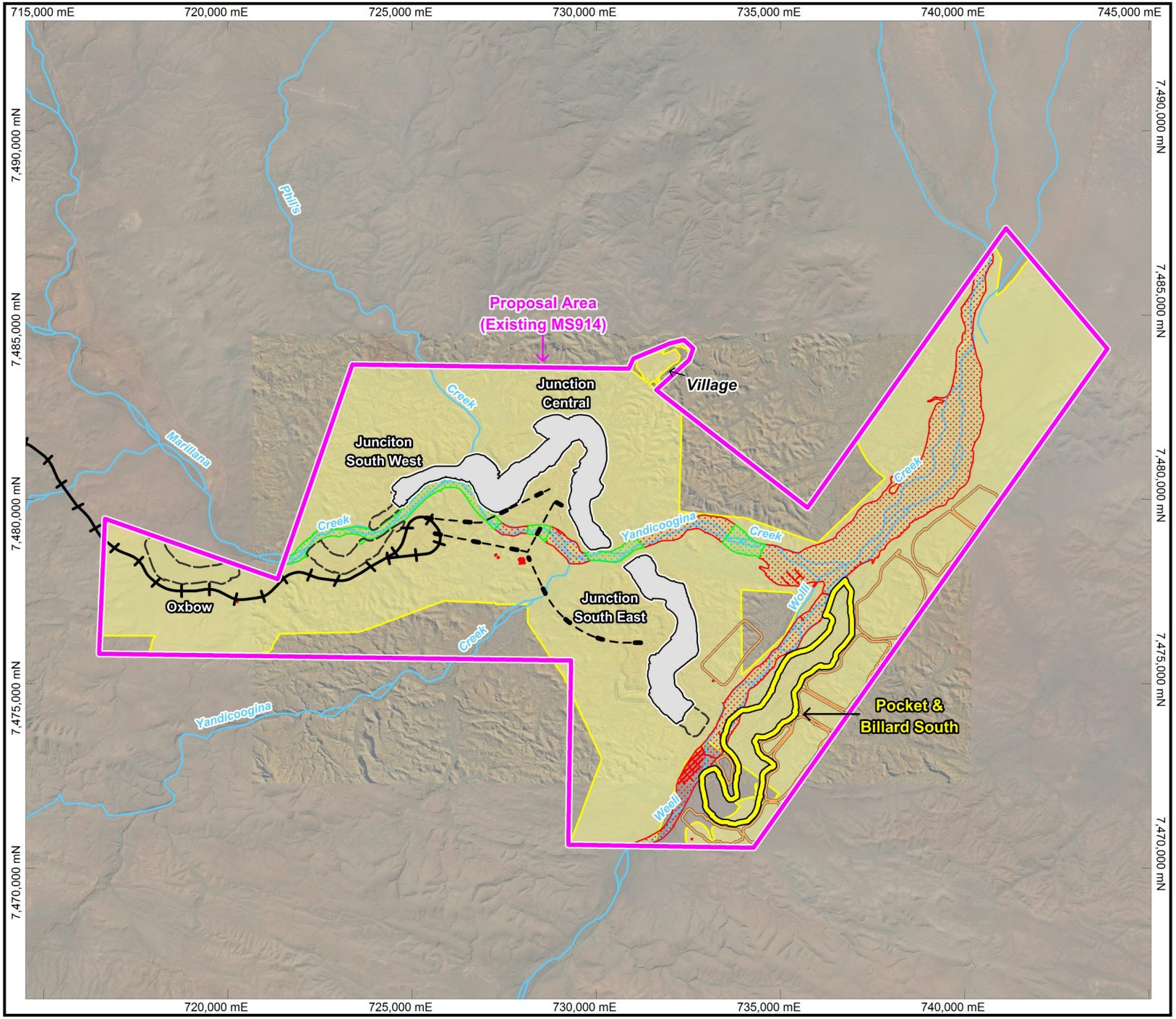
Iron Ore (WA)

Figure 6
Conceptual Site Plan (Proposal Details) for the Revised Yandicoogina Operations including the PBS Project

Drawn: M.Swebbs
Date: June, 2014

Plan No: PDE0121356v1
Proj: MGA94 Zone50

Geospatial Information and Mapping



LEGEND

Ministerial Statement 914

- Yandi Project Footprint
- Yandi Clearing Area 1
- Yandi Restricted Clearing Area 2
- Yandi Clearing Avoidance Area

- Existing Mine Pit
- Proposed Mine Pit
- Existing Conveyor
- Existing Railway
- Major Creek

Conceptual Mine Layout

- Mine Pit
- Waste Dump

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SCALE

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Iron Ore (WA)

Figure 7
Existing approvals as per Yandicoogina MS914

Drawn: M.Swebbs Plan No: PDE0121512v1
Date: April, 2014 Proj: MGA94 Zone50

Geospatial Information and Mapping

3.3 MINING

The scope of mining for the Yandi PBS Project includes CID ore resources located within existing tenure ML274SA as depicted in Figure 5. Additional potential mining areas have been identified within the vicinity of the Yandi PBS Project area; however as they require further studies to determine their economic viability they are excluded from this referral and will be subject to future development applications should Rio Tinto Iron Ore propose to progress.

The Yandi PBS Project will involve developing a single mine pit, of which 99% will be below the water table. The pit will be approximately 10km from end to end (~7km strike length) and mining will involve conventional drill, blast, load and haul methods, as currently used at the existing Yandi Operation. For ore blending purposes, several faces within the mine pits will be worked simultaneously.

The total quantity of extractable ore from the proposed pit is estimated to be ~452 Mt over the life of the Proposal. The maximum depth of mining is expected to be approximately 90 m below the surface.

Mining is proposed to start at Pocket in 2017 and progress northwards to Billiard South. The rate and sequence of mining will ultimately be dictated by ore blending requirements to meet product specification from the entire Yandi Operation. A small portion of the proposed mine pit (~17ha) will encroach into the riparian woodland community of Weeli Wolli Creek to access the CID ore which extends below the floodplain alluvials (refer to Figure 6).

Overburden and waste will be used to progressively backfill the depleted pit, where possible; although if the development sequence changes, temporary surface storage options will be required.

Mining is estimated to produce ~272 million tonnes of waste rock. Above ground stockpiles and mineral waste dumps have been provided for in the mine design. If they are required they will be located in close proximity to the mine pits. The quantity of material to be placed in temporary storage areas will depend on the mining sequence.

A portion of the overburden from the initial mining area will be used as ‘borrow material’ for construction activities. As a result, the total area that would otherwise be disturbed during construction will be reduced.

Characterisation of the ore resource is ongoing, but the current estimate indicates a total resource of 452 million tonnes at Pocket and Billiard South. Initial start-up mining rates will be in the order of 28 Mtpa, which may increase to bring the entire Yandi operations up to 70 Mtpa.

3.4 ORE HANDLING, TRANSPORT AND PROCESSING

The Yandi Operation is well established with central administration and workshop facilities at JC. The workforce currently operates on a Fly in Fly out (**FIFO**) model using the Barimunya airport located to the north.

Some new infrastructure will be required to accommodate the Yandi PBS Project, including:

- **Civil infrastructure** such as light and heavy vehicle road networks to connect the Pocket and Billiard deposits to existing plant and facilities.
- **Workshop and refuelling facilities small office facilities:** The main workshop and storage areas will remain at JC. Heavy vehicle refuelling facilities and a workshop for daily and weekly maintenance will be constructed closer to the Pocket and Billiard deposits.
- **Small office facilities** will be developed central to Pocket and Billiard. These facilities will consist of an administration building for daily crew shift change meetings and a crib room with toilets.
- **Weeli Wolli Crossing** is required to enable ore movement from the Pocket and Billiard deposits to the various processing plants. As Pocket and Billiard South are entirely located on the east side of Weeli Wolli creek, a creek crossing via a bridge-type structure will be required to access the facilities at the existing Yandi Operation, located entirely on the western side of Weeli Wolli creek. A number of locations for a creek crossing have been identified, with the aim of minimising the impact and disturbance on the Weeli Wolli creek or on any heritage or environmentally sensitive areas.

  Two alternatives were considered as options for crossing Weeli Wolli Creek:

  - **the existing Marillana type floodway** option with culverts; or
  - **a bridge-floodway concept**: This design consists of compacted earth approaches to a number of box culvert-type panels over the low flow channel.

- **A land bridge** capable of accommodating 930E trucks is required across the JSE pits to enable ore movement from mine to plant. It is understood that the current waste fines cells design at JSE will be catering for a land bridge for vehicular access across the pit. For transportation of ore from Pocket and Billiard to the PC3 plant, this land bridge will be required to cater for loaded 930E traffic.
- **Local Drainage and Flood Management** protecting against stormwater runoff as well as water ingress into pits lying adjacent to the Weeli Wolli creek (covered in the Water Management chapter of this document).
- **Dewatering** to enable mining of Pocket and Billiard South wherein the ore bodies are essentially 99% below the water table. Based on initial hydrogeological modelling it is believed that dewatering of the pit will be required to occur at least a year prior to mining.
- **Electrical distribution** via additional 33 MW installations will be required nearer to Pocket and Billiard South.

The existing capacity of the processing plants at JC (secondary and tertiary crushing and screening) with minor upgrades will accommodate all of the production from Yandi PBS Project. Any plant expansion requirements at JC will be subject to the provisions of the EP Act.

The existing waste fines cells at JSE will be used for the disposal of waste generated by wet processing. As per existing operational practices, any reclaimed water will be used for dust suppression with any surplus discharged to the surface drainage system.

Processed ore will be trucked from Yandi PBS to one of the existing operations wet or dry processing plants, where it will then be conveyed to the Loop Stockyard for rail loading and export. The existing capacity of the Loop Stockyard is expected to accommodate all of the production from Yandi PBS. Upgrades or extensions to the existing Yandi Operation plants are a consideration, however will be managed under Part V of the EP Act.

Consideration will also be given to initial trucking of early ore from the Yandi PBS Project mine pits directly to the existing train loading facility.

3.5 MINERAL WASTE

Overburden and waste will be used to backfill the depleted pit where mine pit sequencing and schedules allow. However temporary surface storage options for waste, topsoil, subsoil and low grade ore stockpiles will be required over the life of the Yandi PBS Project. The quantity of material to be placed in temporary storage areas will depend on the final mining and processing sequence selected.

Locations for waste dumps have not yet been finalised, however investigations into in-pit disposal of waste and stockpiling of low grade ore will be undertaken.

The existing adjacent Yandi JSE pit will serve as in-pit fines tailings storage facility (waste fines storage facility) for any material from Pocket and Billiard which is wet processed during the life of operations. The JC and JSE pits are currently used as a waste fines storage facility for the existing Yandi Operation.

Asbestiform minerals are not known from the CID ore body; however there is a risk of encountering asbestiform material during disturbance of the surrounding banded iron-formation (BIF) and alluvium. Asbestiform fibres have been identified in the alluvium within the current mine operations at Yandi JC in the hairpin area.

Any fibrous waste encountered during construction or mining of the Yandi PBS pit will be disposed of at the existing on-site facilities (store, encapsulate and record in the same waste dump), in accordance with the current Yandicoogina Fibrous Mineral protocols and procedures.

3.6 WATER

3.6.1 Mine dewatering and surplus water management

The majority (~80%) of the CID ore at the Yandi Operation occurs below the water table (**BWT**), and as a consequence, dewatering is a major requirement of mining activities at the Yandi Operation.

Dewatering

The Yandi PBS deposit is situated almost entirely (~99%) below the water table and will require dewatering to commence approximately 12 months before mining activities start. Dewatering will be facilitated by vertical bore holes completed in curtain or cluster arrangements within or adjacent to the mine pits; permanent bores will be placed along the western perimeter of the Yandi PBS pit and permanent and sacrificial bores will be placed within and around the Yandi PBS pit. The sacrificial bores will be decommissioned and replaced as the pit advances over time. Pumping of residual groundwater from in-pit sumps will also be used when the mine pits reach final bench elevation.

An overland discharge pipeline to connect with existing Yandi Operation discharge outfalls will be aligned along the inner margins of levees and existing roads where feasible.

A groundwater model has been developed and calibrated (Appendix 3) to estimate dewatering rates and volumes from the Yandi PBS mine pit. Preliminary calculations for the conceptual peak water demand is estimated to be in the order of an additional ~30 GL/a for 2 years (~83 GL/a cumulative peak for the combined Yandi Operation). These estimates may be adjusted based on ongoing design and engineering assessments.

Surplus water management

Dewatering will be fully integrated with site water demand; however, a significant volume of surplus water (ranging from the existing Yandi Operation approved ~47 GL/a up to ~77 GL/a) is likely to be generated over the life of the Yandi Operation. Some of the groundwater extracted during dewatering is expected to be used for dust control, camp usage and ore processing. The remainder will be discharged into the Marillana and Weeli Wolli creek systems at controlled, release discharge points.

Alternate options for surplus water management over and above the existing approved discharge limits for the Yandi Operation will be investigated during the Pre-feasibility study, in line with the Pilbara Water in Mining Guidelines (DoW 2009) and *Strategic Policy 2.09: Use of mine dewatering surplus* (DoW 2013) including consideration of:

- reuse on site;
- transfer to other demand;
- aquifer recharge info aquifers;
- reinjection into aquifers;
- storage and evaporation;
- seasonal storage and release of water; and
- continuous surface release of water.

Water discharge will utilise the existing Yandi Operation water disposal infrastructure in the lower reaches of Marillana Creek towards the Weeli Wolli Creek confluence. Observations to date indicate that discharge from the Yandi Operation and HD 1 have created sustained low flow in Weeli Wolli Creek up to 8 km downstream of the Marillana Creek confluence. The subsequent environmental effects of the sustained flow are described in Section 4.7.

Developing the Yandi PBS Project will result in localised disruptions to hydrological flow regimes. The following surface water management structures will be required to protect mine pits from accumulating water during large surface water flow events and to facilitate mine access:

- **A 10km long surface water interception levee** along the western margin of the Yandi PBS pit, adjacent to Weeli Wolli Creek. This will encroach into the Weeli Wolli Creek floodplain in some areas to facilitate the proposed Yandi PBS pit extent.
- **Creek crossings** – including light vehicle access, heavy vehicle access in the form of either a bridge / floodway across Weeli Wolli creek, and/or overland ore conveyors.
- **Maintaining a low flow channel in Weeli Wolli Creek** near the Yandi PBS pit within the existing Weeli Wolli braided creek channel.

These features are depicted in Figure 6 and will be designed to maintain flow volumes and flow speeds in Weeli Wolli Creek to prevent scouring during flooding events.

3.6.2 Water supply

Process water will be sourced from groundwater abstracted through the mine dewatering process. Potable water will be sourced from the borefields servicing the current Yandi Operation.

3.7 POWER

Power supply will be derived from the existing distribution system at the Yandi Operation, sourced from the Hamersley Iron power stations in Dampier and Paraburdoo. High voltage take-off facilities were upgraded for the Yandi JSE project and additional infrastructure was installed to connect that power supply to the JSE site and plant. Power connections to Yandi PBS Project will be largely aligned with other infrastructure corridors (e.g. roads).

Back-up power supply will be provided by the existing on-site 10 MW diesel fired generator, currently servicing the Yandi Operation.

3.8 SUPPORTING FACILITIES AND INFRASTRUCTURE

3.8.1 Road access

Mine roads will be developed in and alongside the Yandi PBS pit. The roads will provide access to mining areas, soil and waste stockpiles and supporting infrastructure. The mine road network is expected to change to some extent during the life of the Proposal, in accordance with the mine plan.

Based on the current mine plan, the primary heavy vehicle access road for Yandi PBS Project will be aligned along the perimeters of the mine pit. Either a floodway crossing or culvert-bridge and floodway will be constructed so that the existing Weeli Wolli low-flow line can be maintained through culverts during small and medium-sized stream flows and run over the top of the floodway during large flooding events. The structure will be protected with rock armour to minimise flood damage and ensure that erosion is minimised.

Road access will be provided through the existing sealed Yandicoogina access road.

3.8.2 Fuel storage

The existing fuel storage and handling facilities at the Yandi Operation may be upgraded to service the Yandi PBS Project mining operations. These are likely to be supplemented by local heavy vehicle refuelling facilities near the Yandi PBS pits.

3.8.3 Wastewater treatment

Wastewater generated by the Yandi Operation is treated using the existing licensed wastewater treatment plants at the JC mine site and the recently expanded facility servicing the accommodation village. These will continue to be used over the life of the Yandi PBS Project.

The Yandi PBS mining areas are not anticipated to need new wastewater treatment facilities. However, existing facilities may need to be expanded for construction and future operations. If any new facilities are required (to treat more than 10 m^3/day), then appropriate licenses under Part V of the EP Act will be obtained.

3.8.4 Other facilities/infrastructure

Other facilities that will be required for the Yandi PBS Project include an ammonium nitrate storage facility, fabrication and heavy/light vehicle maintenance workshops, offices and laydown areas. Options for the locations of these facilities are depicted in Figure 6.

3.9 WORKFORCE AND ACCOMMODATION

The Yandi Operation is well established with a permanent village and a temporary construction camp. The workforce currently operates on a FIFO basis from Perth or other WA regional centres using the Barimunya airport. The Yandi Operation currently employs around 1,400 people.

All operational personnel are housed at the permanent village, approximately 2.5 km north east of the JC mine site. The existing operational workforce is not expected to increase to support the Yandi PBS Project, as such the existing accommodation village is expected to meet anticipated FIFO workforce requirements.

The recently re-commissioned construction camp for JSW and Oxbow operations comprises single and double story rooms which will be maintained to accommodate the additional construction capacity (~1,500 personnel) required for the Yandi PBS Project.

The permanent village and construction camp are both part of the existing mining operation and they have been assessed under previous project approvals.

3.10 TIMING

Subject to obtaining all relevant internal and external approvals, construction for the Yandi PBS Project is scheduled to commence in Q3 2016. Production is scheduled to commence in 2017.

3.11 STAKEHOLDER ENGAGEMENT

Identified key stakeholders for this project include:

- Government agencies:
    - Office of the Environmental Protection Authority (**OEPA**);
    - Department of the Environment (**DoE**);
    - Department of Parks and Wildlife (**DPaW**) – Pilbara regional office and Perth office Environmental Management Branch (**EMB**);
    - Department of Environmental Regulation (**DER**);
    - Department of Mines and Petroleum (**DMP**);
    - Department of State Development (**DSD**);
    - Department of Water (**DoW**) – Pilbara regional office and Perth office; and
    - Shire of Ashburton.
- Traditional Owners:
    - Gumala Aboriginal Corporation.

Pre-referral meetings and general discussion on aspects of the Yandi PBS Project have been held with the OEPA, DPaW, DoW, DoE and DMP (refer Table 3-2). Rio Tinto Iron Ore will continue to consult with relevant stakeholders during the environmental approval process.

Table 3-2: Stakeholder consultation relevant to the Yandi PBS Project

Date	Topics/Issues Raised	Proponent Response
Office of the Environmental Protection Authority		
21/4/14	Rio Tinto Iron Ore provided detailed overview of Yandi PBS Project, current/planned environmental studies, potential environmental impacts and proposed management. The preferred approvals pathway was discussed – existing management in place via MS914 – Level of Assessment will depend on significance of proposal. OEPA queried: • Closure - why Billiard North was not included in the referral if it is included in the Yandi Life of Mine (**LoM**) closure plan. • Cumulative impacts – FMG Nyidinghu would need to be included in the cumulative impact assessment as well as Jinidi. • Avoidance areas in MS 914 – queried where they were derived from and what Hamersley Iron was proposing in terms of disturbance. • Referral – to focus on key changes for this Yandi PBS Project in relation to the existing Yandi Operation.	Rio Tinto Iron Ore believes that existing conditions and management required under MS 914 would cover key potential impacts for the Yandi PBS Project. An increase in disturbance, additional water management, and consideration of cumulative impacts being the key additional features.
21/4/14	Rio Tinto Iron Ore provided detailed overview of the LoM Closure plan for the Yandi Operation including the Yandi PBS Project. OEPA were interested in approach to wetland rehabilitation and also rehabilitation success / monitoring. Discussion on pit lakes and potential for Oxbow to be saline.	Rio Tinto Iron Ore provided a copy of the presentation to the OEPA and submitted the Yandi LoM closure Plan to the OEPA on 31 March 2014.
12/6/14	Updated hydrological information discussed with OEPA. Discussion on Yandi PBS pit encroachment into Weeli Wolli clearing avoidance area depicted on MS 914. Referral – to focus on key changes for this project in relation to the existing project (Flora and Veg, fauna, Hydrological processes, Closure and Rehabilitation). Context and justify impacts to environmental values identified in MS 914.	The referral document has been updated to include further details on Yandi PBS pit encroachment on the clearing avoidance zone depicted in MS 914, and will focus on key changes to the Yandi Operation.

Date	Topics/Issues Raised	Proponent Response
Department of Parks and Wildlife		
4/4/14	Rio Tinto Iron Ore provided detailed overview of Yandi PBS Project, current/planned environmental studies, potential environmental impacts and proposed management, with focus on biological issues. Updated details on Fortescue Marsh hydrogeology presented. The LoM closure plan was presented. Key queries from DPaW included how the 'avoidance areas' in MS914 were developed, how water would be managed, interactions of surface water and groundwater in terms of riparian vegetation; results of biological surveys and significant flora, fauna; if the Yandi PBS Project was a new assessment or would be amalgamated (as a revised proposal) with MS 914. Discussion of other projects in the vicinity.	Rio Tinto Iron Ore has further work to undertake in order to confirm the abstraction and discharge estimates for the project; however existing operational ministerial conditions and management plans relating to water management will largely cover the management required in order to minimise the potential impacts of the PBS proposal. No new priority flora and no Declared Rare Flora (**DRF**) have been identified in the Yandi PBS Project area. Pilbara Olive Python found downstream of the Yandi PBS Project area. No evidence of Northern Quoll. Rio Tinto Iron Ore will continue to consult with DPaW throughout the environmental approvals process.
Department of Environment Regulation		
Ongoing	Rio Tinto Iron Ore will apply for approval to discharge surplus dewatering water to the environment under Part V of the EP Act. This includes providing a detailed overview of the Yandi PBS Project, relevant environmental studies, potential environmental impacts and proposed management.	Ongoing liaison is required as part of Yandi Operation, particularly in relation to amendments to discharge outlets.
Department of Water – Perth Office		
21/4/14	Rio Tinto Iron Ore provided detailed overview of LoM Closure plan for the Yandi Operation including the Yandi PBS Project. DoW queried the pit lakes and options if future deposits were not approved; likely salinity ranges; interactions for saline and fresh water pits; metals released in hypersaline conditions.	Rio Tinto Iron Ore has looked at 'early closure' contingencies and has addressed the possible options of future deposits not being approved. Depending on the parameters, salinity could range from 1500mg/l – 10,000mg/l.

Date	Topics/Issues Raised	Proponent Response
10/4/14	Rio Tinto Iron Ore provided detailed overview of Yandi PBS Project, current/planned environmental studies, potential environmental impacts and proposed management, with focus on water related issues. Abstraction rates were discussed and status of modelling. Monitoring bores were queried and frequency of logging data; flood protection levees and details of height, material and what happens on closure. DoW queried if any stygofauna or troglofauna have been identified in the Yandi PBS Project area and about maintaining suitable habitat. The proposed 2014 pump testing program for the Yandi PBS project was also discussed.	Rio Tinto Iron Ore provided details of current tree health monitoring, geology and alluvial bores, current abstraction licence limit (53Gl/a) and current rates. Most of the cased bores at Yandi have EC and in-situ data loggers and could provide hourly data. Stygofauna have been found in the catchment, with a number of species only known from the Marillana – Weeli Wolli catchment. The Yandi Operation and Yandi PBS Project take into consideration maintaining habitat for stygofauna during mining operations. Stygofauna are still found within the bores of active mining areas. A few troglofauna have been found in the Yandi PBS Project area, however because all of the CID deposit (potential habitat) which is proposed for mining is situated below the water table, no available troglofauna habitat exits in the mine pit footprint.
Ongoing	Rio Tinto Iron Ore is liaising with the DoW to amend the existing *Rights in Water and Irrigation Act 1914* Groundwater Licence (GWL 166205(4)). The Groundwater Operating Strategy under GWL 166205(4) will also be updated. This involves providing an overview of the Yandi PBS Project, relevant hydrogeological studies and proposed management measures, with a focus on groundwater management issues.	An updated GWOS was updated in consultation with DoW and will be submitted to DoW in early July 2014.
Department of Mines and Petroleum		
21/4/14	Rio Tinto Iron Ore provided a detailed overview of the LoM Closure plan for Yandi Operations including the Yandi PBS Project. DMP discussed that their guidelines are being changed so that Section 4 flows better. DMP commented about future unapproved projects in the LoM plan. Discussed focus on rehabilitation in the Pilbara; access to pits and safety issues post closure; completion criteria – want a target frames as “not to exceed” – need a way in which to measure/assess completion criteria.	Rio Tinto Iron Ore has looked at ‘early closure’ contingencies and has addressed the possible options of future deposits not being approved. A wetland rehabilitation trial is currently being developed to support the closure plan, including sourcing seeds of local provenance - possibly from the Fortescue Marsh area for similar wet tolerance. Completion criteria can be difficult to measure as it can take 50-100 years for some Groundwater systems to recover.

Date	Topics/Issues Raised	Proponent Response
Department of State Development		
Ongoing	Rio Tinto Iron Ore provides ongoing updates on relevant projects at monthly meetings with the DSD. No specific concerns have been raised to date with the Proposal.	Rio Tinto Iron Ore will continue consultation with DSD.
Department of Aboriginal Affairs		
Ongoing	Rio Tinto Iron Ore provides ongoing updates on relevant projects and heritage matters at regular liaison meetings.	Rio Tinto Iron Ore will continue liaising with the DAA and will discuss Project specific matters as required. Rio Tinto Iron Ore will consult with DAA regarding any planned submissions for approval under s18 of the *Aboriginal Heritage Act 1972* to disturb any heritage sites that cannot be avoided.
Gumula – Traditional Owners		
Ongoing	Any issues relevant to the Gumula People are raised at quarterly Monitoring and Liaison Meetings. It is a condition of the Agreements that notification of any activities is provided to Gumula prior to works taking place and effort is made to address any areas of concern raised by the group. Key concerns raised relate to potential impacts (including clearing, drawdown and discharge) within the Marillana and Weeli Wolli creek systems, final LoM closure landform, and future access.	Rio Tinto Iron Ore will continue with regular consultation with Gumula through the Monitoring and Liaison meetings and through the pre-feasibility and feasibility studies. Regular technical updates are provided including the approval process; environmental impact assessment predictions and findings; and closure workshops.

3.12 EXCLUSIONS FROM THE YANDI PBS PROJECT

The scope of the Yandi PBS Project subject to environmental approvals assessment specifically excludes:

- Associated site offices, access roads, temporary concrete batch plant, borrow pit/quarry for suitable material, temporary services (communications, water supply, on-site power generation), upgrades to existing access roads/tracks and lay down areas and drilling/geotechnical/water investigation activities (to be subject to relevant provisions of Part V [Land Clearing and Works Approvals/Licensing] of the EP Act).
- Low impact activities, including drilling activities associated with geology (including resource drilling), geotechnical and water investigations (including bore installation and pump testing) and power generation investigations (to be subject to relevant provisions of Part V [Land Clearing] of the EP Act).
- Essential environmental, heritage or other studies/investigations involving fieldwork.

4 EXISTING ENVIRONMENT

4.1 BASELINE STUDIES

Environmental baseline studies completed for the Yandi PBS Project are described in Table 4-1.

Table 4-1: Environmental baseline studies completed in the Yandi PBS Project

Study	Description
Biota 2009, *Yandicoogina Targeted Northern Quoll Survey*, Unpublished report prepared by Biota Environmental Sciences Pty Ltd for Rio Tinto, December 2009	Targeted Northern Quoll Survey conducted over the entire Yandicoogina Operations footprint (MS914) during 2009.
Biota 2010a, A *Flora and Vegetation Survey of the Billiards Deposit, near Yandi,* Unpublished report prepared by Biota Environmental Sciences Pty Ltd for Rio Tinto, December 2009.	Surveys conducted in July 2008 and 2009 documenting the vegetation and flora of the Yandi Billiard South Project area.
Biota 2010b, *Yandicoogina Subterranean Fauna Assessment Phases I-V, and Yandi Stygofauna 2010 Addendum*, Unpublished report prepared by Biota Environmental Sciences Pty Ltd for Rio Tinto, December 2010.	Surveys within the Yandicoogina area conducted from 2003 – 2010 documenting within the Yandi PBS Project area: • Stygofauna and troglofauna fauna related baseline data; and • collation of subterranean fauna data in the Yandicoogina locality and habitats or species of particular conservation significance that may require specific management.
Biota 2011, *Yandicoogina Expansion Billiard Deposit Fauna Survey*, Unpublished report prepared by Biota Environmental Sciences Pty for Rio Tinto, January 2011.	Single phase fauna survey completed in 2008, documenting within the Yandi PBS Project area and adjacent contextual areas: • fauna related baseline data; and • fauna habitats or species of particular conservation significance that may require specific management. Followed up with a targeted SRE fauna survey conducted in March 2010 in the Yandi PBS Project area.
Biota 2013, *Yandi Additional Areas Vegetation and Flora Level 2 Assessment*, Unpublished report prepared by Biota Environmental Sciences Pty for Rio Tinto, January 2013.	Additional Flora and Vegetation surveys conducted in the Yandicoogina area, including Billiard South in 2012 documenting: • the broad vegetation types that occur; and • locations of priority and DRF.
Various targeted flora surveys associated with Rio Tinto exploration activities.	Vegetation and fauna surveys in localised areas subject to Native Vegetation Clearing Permit applications, completed in the period 2000 to 2014.

Additional surveys of the Yandi PBS Project area are in progress, with details provided below in Table 4-2. All of these surveys are expected to be completed by July 2014 and, together with the existing studies, will provide a comprehensive assessment of the biological attributes of Yandi PBS Project area.

Table 4-2: Additional environmental baseline studies currently being undertaken in the Yandi PBS Project area.

Study	Description
Biota in prep., Yandi *PBS Project Subterranean Fauna Assessment,* Unpublished report being prepared by Biota Environmental Sciences Pty Ltd for Rio Tinto.	Targeted troglofauna and stygofauna sampling conducted over multiple phases during 2009 - 2014, documenting the stygofauna and troglofauna of the proposed mine pit areas and reference area habitats.
Biota in prep., Yandi *PBS Project Terrestrial and Targeted Fauna Survey*, Unpublished report being prepared by Biota Environmental Sciences Pty Ltd for Rio Tinto.	Additional updated Level 2 fauna survey of the Yandi PBS area during 2014, including immediate surrounds, documenting terrestrial vertebrate and targeting SRE and MNES fauna.
Biota in prep., *A Flora and Vegetation Survey of the Yandi PBS Project*, Unpublished report being prepared by Biota Environmental Sciences Pty Ltd for Rio Tinto.	Additional updated Level 2 flora and vegetation seasonal surveys conducted during 2014 of Yandi PBS and immediate surrounds, including targeted priority flora searches.

4.2 SITE PLAN – EXISTING ENVIRONMENT

Key aspects of the existing environment are spatially represented in Figure 5. These key aspects include:

- tenure boundaries;
- existing roads;
- topography;
- flora of conservation significance;
- priority ecological communities (**PECs**); and
- hydrology (wetlands, watercourses, creek lines, seasonal creeks and artificial drainage lines).

4.3 GEOLOGY

The Yandicoogina CIDs are located in the Yandicoogina, Marillana and Weeli-Wolli river catchments. They are an accumulation of pisolitic iron that formed in the Tertiary Period. The paleo-channel system incised the Weeli Wolli Iron Formation in a broad structural basin of the Yandicoogina Syncline and extends for a strike distance of approximately 80 km.

Most of the Yandicoogina CID outcrops as low lying mesas or is covered by colluvium and alluvium, up to 60 metres thick. The paleo-channel is saucer-shaped in cross section and between 450 and 750 metres wide. The main ore zone is 40-60 m thick in the centre of the channel, and thins towards the channel margins. The top of the ore zone may be weathered, silicified or clay rich due to infiltration of clays along joints, fractures, faults and tree roots.

The Pocket and Billiard deposits represent the final stretches of the CID palaeo-channel through the Hamersley ranges, prior to entering and fanning out on the Fortescue plains. To the east of the JSE deposit, the palaeo-channel follows a north-easterly course, staying within the confines of the Weeli Wolli valley until entering the Fortescue plains in the north. The Yandi PBS prospect, which has a total length of 7km, lies to the east and runs parallel to the floodplain of the current Weeli Wolli creek.

4.4 LANDSCAPE

The Yandi PBS Project is located near the eastern edge of the Hamersley sub-region, adjacent to the Fortescue Plains sub-region, of the Pilbara biogeographic region. The majority of the landscape within the Yandi PBS Project area is considered to be typical of the Hamersley sub-region, while the creek systems have affinities with the Fortescue Plains sub-region. A description of the major characteristics of each IBRA sub-region is provided in Table 4-3.

Table 4-3: Hamersley and Fortescue Plains sub-regions of the Pilbara Biogeographic Region

Pilbara Sub-region	Description
Hamersley	Mountainous area of Proterozoic ranges and plateaus of mulga woodland of bunch grasses on fine textured soils and snappy gum over *Triodia brizoides* on skeletal soils.
Fortescue Plains	Alluvial plains and river frontages, salt marsh, mulga bunch grass and short grass communities on alluvial plains. River Gum woodlands fringe drainage lines. Northern limit of the *Acacia aneura* complex (Mulga).

The Pilbara region has been surveyed by the Western Australian Department of Agriculture and Food (**DAFWA**), for the purposes of land classification, mapping and resource evaluation. The region consists of 102 land systems; distinguished on the basis of topography, geology, soils and vegetation (Van Vreeswyk *et al*. 2004).

The Yandi PBS Project area coincides with the Boolgeeda, McKay, Newman, Robe and River land systems. The River land system includes the major drainage lines (Marillana,

Yandicoogina and Weeli Wolli Creeks). These land systems are all widely represented in the central Pilbara region.

4.5 GROUNDWATER

Pilbara Iron Company (Services) Pty Limited (the Licensee) currently draws groundwater for the Yandi Operations in accordance with the DoW Groundwater Licence GWL166205 (5). Water is abstracted from the following borefields: Phil's Creek Cutback; Marillana Replacement; Ridge North; JSE-Central; JSE- Sacrificial; Southern and JSW-C Southern;, JSW-A Eastern; JSW-A Western; and in-pit sumps.

The total licensed abstraction limit for the Yandi Operations is 53 GL/a, of which, a combined maximum of 18 GL/a can be removed from Junction South West and Oxbow deposits.

4.5.1 Hydrological Setting

The Yandicoogina iron ore deposits infill the dissected palaeo-river valley of the Marillana-Yandicoogina – Weeli Wolli Creek system to form the CID. The main CID extends approximately 80 km on a north west-south east axis and adjacent to the current alignment of Marillana and Weeli Wolli Creeks. The CID is approximately 300 to 500 m wide and bounded at depth (a maximum of about 110 m) by relatively less permeable basement rocks of the Weeli Wolli Formation (RTIO 2010). The CID aquifer is characterised by a relatively high water yield associated with secondary porosity.

The CID is overlain and flanked by alluvium and unconsolidated materials, which are also relatively transmissive and variably connected with the CID aquifer. The combined width of the CID and alluvium aquifers range from 1,000 to 2,000 m. The overall groundwater system is bounded by low transmissivity parent rocks. The depth of the CID channel diminishes towards the flanks of the flood plain.

The natural depth to groundwater at the Yandi Operations varies from 2 m to 25 m below the surface, with the groundwater flow direction to the northeast at the Yandi PBS locations, adjacent to Weeli Wolli Creek.

Periods of above average rainfall cause disequilibrium between recharge and discharge; resulting in elevated groundwater levels, steepening of hydraulic gradients and increased aquifer through flow and discharge. Periods of rainfall deficit result in less recharge, lowered water levels, a flattening of hydraulic gradients, reduced through flow and decreased discharge. The rise and fall of the water table acts to maintain the natural balance between recharge and discharge.

4.5.2 Local hydrological Setting

The estimated thickness of the flood plain material occurring adjacent to the CID deposit at Pocket and Billiard South, is between 6-24 m, with the greatest thickness occurring adjacent to the Weeli Wolli Creek and limited cover found at locations further (approximately 1 km) from the creek.

A new conceptual model was constructed in 2009 that minimised the technical uncertainties associated with the hydraulic properties of the alluvium and in-situ weathered basement aquifers (Dogramaci and Kirkpatrick 2009). The conceptual and new numerical model has

been constructed to reflect more accurately the impact of leakage of the alluvium aquifer on the water budget and ultimate dewatering volumes from proposed mine pits. A major component of the new conceptual model is the dynamic relationship between Marillana Creek and Weeli Wolli Creek and the CID aquifer.

Stream flow in the Marillana and Weeli Wolli Creeks normally occurs only after heavy rainfall events. However, surplus water has been discharged directly into the Marillana Creek from the BHP Yandi mine operations (since 1991), and from the Hamersley Yandicoogina mine operations (since 1998) at varying rates (including a re-injection scheme), resulting in continuous stream flow and saturated bank storage. Additionally, surplus water discharged from the HD 1 mine since 2007 has resulted in continuous flows directly into Weeli Wolli Creek. The increased discharge rates and continuous creek flows have resulted in significant leakage into the CID aquifer.

4.5.3 Groundwater Model

The Yandicoogina regional groundwater model was originally developed in 2011 and was used to assess the dewatering volumes and determine the number of production bores needed to dewater the Yandi mine site, including the Oxbow, JSW and JSE pits together with the Billiard pits (PBS). This model was updated in May 2013 with continuous updates and iterations being performed in conjunction with mine plan updates.

Most of the ore body at PBS is saturated beneath the water table of the CID owing to the combination of re-injection of JSE water and surplus discharge from HD1. To achieve dry mining operations these reserves require extensive dewatering to draw the water level below the base of the ore body, in the order of 60 m to 90 m below natural ground surface.

The dewatering schedule is based on the mine plans that require the water levels at PBS deposits to be lowered to the base of the ore body early in the mine life. The timing to commence mining ore bodies Pocket and Billiard South is 2017 and 2022 respectively. Modelling work to date is based on assumptions on water management that require further confirmation as the Study evolves to optimise capital and operational costs and limit undesirable legacies on water quality and quantity. Assumptions on HD1 dewatering schedule, water management in mined out pits and management options for surplus dewater will all impact the final dewatering load required across the entire Yandi Operations. Upper limits of dewatering comprise ~83 GL/a for a 1-2yr period whilst lower limits may fit into existing Part IV approved limits (~53 GL/a).

The dewatering of PBS will have an impact on the regional water table within the surrounding mine site (as previously observed in the mining of JSW and JSE). Long term monitoring bores have already been constructed into the basement aquifer and in the Weeli Wolli Creek alluvium to measure water levels and predict the impact of mining on the water budget of the alluvium and ultimately, the health of the phreatophytic vegetation.

4.6 SURFACE WATER

4.6.1 Rainfall and Climate

The Yandicoogina area is a semi-arid to arid environment characterised by hot summers and warm winters. The region experiences climate extremes, where severe droughts and major floods can follow in close succession.

Rainfall records for Weeli Wolli Creek are available from DoW gauging stations at Wonmunna (507012) from 1984; Tarina (505040) from 1985; and Waterloo Bore (505041) from 1985. A weather station recording daily rainfall was established at the Yandi Operations in 1998. The long term mean annual rainfall (1985 to 2011) estimated for the catchment of Weeli Wolli Creek is approximately 382 mm, but actual rainfall is highly variable between years with the annual recorded rainfall for the region varying from 130 mm to 1,100 mm. It is also highly seasonal with rain falling mainly in the summer months from January to March, as a result of scattered thunderstorms producing heavy localised falls in short periods. Tropical lows originating off the Pilbara coast can also bring widespread rain to the area. Winters are typically dry and mild though winter rain events can occur in June and July as a result of tropical cloud bands that intermittently affect the area.

The mean annual Class A pan evaporation estimated for the region is approximately 3,283 mm. The mean annual evaporation rate (sheltered free water surface) recorded at the Yandi Operations weather station, between April 2004 and March 2009, is 1898 mm/year, which exceeds the mean annual rainfall keeping the landscape typically arid.

The topography of the central Pilbara region generally supports well-defined surface catchments. The Marillana Creek catchment occupies 2,230 km^2 and extends west from Yandicoogina to within about 20 km of the Great Northern Highway. The Yandi PBS Project area is located near the downstream end of the catchment, adjacent to Weeli Wolli creek.

4.6.2 Major Drainage

The Yandi Operations are located near the intersection of Marillana Creek, Phil's Creek, Yandicoogina Creek and Weeli Wolli Creek in the regional Weeli Wolli catchment.

Weeli Wolli Creek is the dominant drainage feature in the Yandi PBS Project area. It enters from the south of the Yandi PBS deposit and drains parallel to the deposit in a predominantly north-easterly direction before taking a north-westerly route, downstream of the deposit and the Marillana Creek confluence, as it ultimately drains into the fluvial outwash fan south of Fortescue March and into the Fortescue Marshes, located approximately 40 km to the north of Yandicoogina. The creekline becomes increasingly braided and ill-defined as it approaches the Marsh within the fluvial outwash fan (Aquaterra 2001).

Like all major rivers in the Pilbara, Weeli Wolli Creek and its tributaries are ephemeral and flow only occasionally. Large flows in Weeli Wolli Creek are correlated with rain bearing depressions or high intensity cyclonic events, which bring heavy rain over a large area of the catchment. Peak flow generally occurs within 24 hours; however, flow recession is such that minor stream flow can continue for days after the peak has passed. Retention basins in the upper catchment, such as the Munjina Claypan, can sustain flows into the dry season in

some years. The claypan is an internally draining basin with an area of approximately 274 km^2. It acts to reduce peak discharges for lower rainfall events (up to 1 in 10 year ARI) and delay the time to the peak of runoff. In the lower catchment, including the Yandi PBS Project area, major flow events can cause transient water table rises in the alluvium of several metres. The lateral extent of these flows defines a greater creekline floodplain, within which preferred pathways transmit smaller flow events. The floodplain is well defined at its boundaries and ranges from 200 m to 350 m wide in the vicinity of Yandi PBS.

However, while Weeli Wolli Creek loses water to ground infiltration over most of its length, it is believed to gain water naturally through base flow following recharge events as it approaches Weeli Wolli Spring where groundwater intersects the surface throughout the year.

Since 2007, release of surplus water into Weeli Wolli Creek from both the HD1 and Yandicoogina (including BHPBIO) mine operations has altered the flow regime of the creek system and temporarily shifted the creek from an ephemeral to a perennial system. Regular surface water footprint measurements carried out by site personnel indicates that the wetting front currently fluctuates between 4.0 and 8.0 km downstream of the Marillana and Weeli Wolli Creek confluence.

4.7 VEGETATION AND FLORA

4.7.1 Vegetation types

Based on surveys completed to date, the Yandi PBS Project area does not contain a particularly high level of vegetation or plant species diversity for the Pilbara bioregion (Biota 2014a, Appendix 4). The total number of native plant species recorded from the Yandi PBS Project area is within the expected range for an area of this size in this locality.

Twenty-three vegetation units have been identified across the Yandi PBS Project area distributed amongst the following broader categories:

- **Major creeklines and tributaries** (4 units): predominately *Eucalyptus vitrix* open woodland over Acacia low woodland over tussock grassland, with some sections of *Eucalyptus camaldulensis* and *E. victrix* woodland over Melaleuca and Acacia open woodland.
    - **Minor creeklines, floodplains and valleys** (5 units): Predominantly *Eucalyptus leucophloia / Corymbia hamersleyana* scattered low trees to low open woodland over Acacia shrubland, over Triodia hummock grassland
- **Hills ridges and breakaways** (5 units): Predominantly *Eucalyptus leucophloia subsp. leucophloia* scattered low trees over *Hakea chordophylla*, *Acacia inaequilatera*, *Grevillea wickhamii* tall open shrubland over *Triodia* sp. *Shovelanna Hill* (S.van Leeuwen 3835) hummock grassland.
    - **Plains** (9 units): *Eucalyptus leucophloia* subsp. *leucophloia* / *Corymbia hamersleyana* scattered low trees over Acacia low open woodland over open Acacia, Eremophila shrubland *over Triodia* open hummock grassland.

Vegetation of minor creeklines and tributaries is considered to have low-moderate conservation significance, while the Weeli Wolli Creek riparian vegetation type was considered to be high (Biota 2012).

Additional vegetation and flora surveys of the Yandi PBS Project area are currently underway during 2014 (refer Table 4-2). Whilst the updated vegetation mapping is not yet complete, information from previous surveys of the Yandi Operation area together with preliminary findings from the recent Yandi PBS surveys indicate that the vegetation units and flora are similar to that found during previous surveys, including the new mapping across the Pocket area.

4.7.2 Declared Rare Flora

The DRF species *Lepidium catapycnon* (Hamersley Lepidium) has been recorded from the Yandi Operation area, generally on rocky hilltops or break of slopes. *Lepidium catapycnon* has previously been recorded from two locations near the PBS Project area (to the West of Weeli Wolli creek near JSE), however recent (Biota 2014a) targeted searches and mapping traverses have not recorded *Lepidium catapycnon* in the Yandi PBS Project area.

Lepidium catapycnon is also listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**).

4.7.3 Priority species

To date, 12 Priority flora species listed by DPaW have been recorded from the Yandi Operation area. However the only Priority flora species recorded from the Yandi PBS locality during recent surveys was *Goodenia nuda* (Priority 4). Of the 12 priority species occurring within the broader Yandi operations area, the following 2 priority species are considered likely to occur in the Yandi PBS Project area (based the presence of suitable habitat):

- *Stylidium weeliwolli (Priority 2);* and
- *Rostellularia adscendens* var. *latifolia (Priority 3).*

4.7.4 Threatened Ecological Communities and Priority Ecological Communities

The Yandi PBS Project area does not contain any TECs recognised by the DPaW or listed under Commonwealth legislation.

As stated in Section 2.3, the Yandi PBS Project area is in proximity to (but does not contain) three PECs:

- Fortescue Marsh – Marsh Land System (PEC Priority 1);
- Weeli Wolli Spring Community (PEC Priority 1); and
- Fortescue Valley Sand Dunes (PEC Priority 3)

4.7.5 Weeds

To date the following eighteen introduced flora species have been recorded in the Yandi PBS Project area to date:

- **Acetosa vesicaria* (Ruby Dock);
- *Aerva javanica (Kapok Bush);
- **Argemone ochroleuca* subsp. *ochroleuca* (Mexican Poppy);
- **Bidens bipinnata* (Bipinnate Beggartick);
- **Cenchrus ciliaris* (Buffel Grass);
- **Cenchrus setiger* (Birdwood Grass);
- **Cucumis melo* susp. *agrestis* (Ulcardo Melon);
- **Datura leichhardtii* (Native Thornapple);
- **Flaveria trinervia* (Speedy Weed);
- **Malvastrum americanum* (Spiked Malvastrum);
- **Portulaca oleracea* (Purslane);
- **Setaria verticillata* (Whorled Pigeon Grass);
- **Sigesbeckia orientalis* (Indian Weed);
- **Sisymbrium orientale* (Indian Hedge Mustard);
- **Solanum nigrum* (Black Berry Nightshade);
- **Sonchus oleraceus* (Common Sowthistle) ;
- **Tribulus terrestris* (Caltrop); and
- **Vachellia farnesiana* (Mimosa Bush).

These weed species generally occurred infrequently, with the exception of a number of Ruby Dock and Buffel Grass infestations associated with creeklines and areas disturbed by historical mining. Most of these species are common in the Pilbara bioregion.

One of the weeds recorded, **Argemone ochroleuca* subsp. *Ochroleuca* (Mexican Poppy), is listed as a Declared Pest for the WA State under the *Biosecurity and Agriculture Management Act 2007.*

None of the introduced species recorded are specified as Weeds of National Significance (Thorp and Lynch 2000). However, **Acetosa vesicaria, *Aerva javanica*, **Cenchrus ciliaris, *Cenchrus setiger, *Malvastrum americanum*, **Setaria verticillata* and **Vachellia farnesiana* are ranked as weeds with High ecological impact (DEC 2012).

4.8 TERRESTRIAL FAUNA

The fauna assemblage recorded from the Yandi PBS project area is typical of what would be expected for an area the size and location within the Pilbara bioregion (Biota 2011, 2014b),

Appendix 5). The suite of species present is representative of the fauna of the Hamersley and Fortescue sub-regions.

Twenty-three fauna sites have been established within the Yandi PBS Project area during previous surveys, including pit, funnel or Elliot box traps, recording of bat echolocation calls using Anabat detectors, and hand foraging for invertebrates. Further targeted surveys are scheduled for late 2014 (refer to Table 4-2).

4.8.1 Habitat types

Four broad fauna habitat types have been identified in the Yandi PBS Project area, classified on the basis of landform, substrate and vegetation. These include:

- plain;
- hill slope;
- colluvial drainage line;
- minor drainage line;
- gully floor;
- rocky hill slope; and
- rocky gorge.

4.8.2 Species of conservation significance

The fauna assemblage recorded from the Yandi PBS Project area included 7 species of conservation significance (Table 4-4).

Table 4-4: Fauna species of conservation significance recorded in Yandi PBS surveys

Species	Conservation status
Pilbara Olive Python[2] (*Liasis olivaceus barroni*)	Listed as Schedule 1 under State legislation and as Vulnerable under Federal legislation.
Brush-tailed Mulgara	Listed by DPaW as Priority 4
Star Finch (*Neochmia ruficauda*)	Listed by DPaW as Priority 4
Australian Bustard (*Ardeotis australis*)	Listed by DPAW as Priority 4
Western Pebble-mound Mouse (*Pseudomys chapmani*)	Listed by DPaW as Priority 4
Fork-tailed Swift (*Apus pacificus)*	Listed by DPAW as Schedule 3
Rainbow Bee-eater (*Merops ornatus*)	Listed by DPAW as Schedule 3 and Migratory under Federal legislation

The following additional fauna species of conservation significance also have the potential to occur in the Yandi PBS Project area, based on knowledge of their wider distribution and habitat preferences:

- Night Parrot (*Pezoporus occidentalis*);
- Northern Quoll (*Dasyurus hallucatus*);
- Bilby (*Macrotis lagotis*);
- Orange Leaf-nosed Bat (*Rhinonicteris aurantius*);
- Peregrine Falcon (*Falco peregrinus*);
- Long-tailed Dunnart (*Sminthopsis longicaudata*);
- Short-tailed Mouse (*Leggadina lakedownensis*);
- Grey Falcon (*Falco hypoleucos*);
- Bush Stone Curlew (*Burhinus grallarius*);
- Ghost Bat (*Macroderma gigas*);
- Eastern Great Egret (*Ardea modesta*);
- Cattle Egret (*Ardea ibis*);
- Oriental Plover (*Charadrius veredus*); and
- *Ramphotyphlops ganei* (a species of blind snake).

To date, no additional species of conservation significance have been recorded during the ongoing surveys of the Yandi PBS Project area.

4.8.3 Short range endemic species

Short range endemic (**SRE**) species have been targeted in fauna surveys of the Yandi PBS Project area. Specimens belonging to two invertebrate groups known to contain SREs (the pseudoscorpions and mygalomorph spiders) were collected during the survey.

4.8.4 Fauna habitat and MNES species mapping

Preliminary fauna habitat mapping and Matters of National Environmental Significance (**MNES**) species mapping has been completed for the Yandi PBS Project area based on Biota's fauna landscape approach. Results of this work indicate that suitable habitat for the Pilbara Olive Python and foraging habitat for the Orange Leaf-nosed Bat is widespread in the area, primarily associated with the major drainage channels of the Marillana-Weeli Wolli creek system. Biota's field appraisal, and past survey data, suggest there is very limited core habitat for the Northern Quoll in the study area (Biota 2014b).

4.9 SUBTERRANEAN FAUNA

Subterranean fauna can be classified into two main groups:

- Stygofauna which are obligate groundwater-dwelling aquatic fauna; and
- Troglofauna which are obligate subterranean terrestrial fauna.

Both groups occur in fractured, karstic or cavernous geology types, with troglofauna utilising underground caves or humid air-filled voids. Subterranean fauna in WA are generally invertebrates and often exhibit high levels of endemism.

Subterranean fauna sampling in the Yandi PBS Project area to characterise the local subterranean fauna assemblages has focused on stygobitic fauna due to the nature of the Yandicoogina deposits occurring largely below the water table, with the Yandi PBS deposit being ~99% below water table. Based on preliminary sampling in 1998 and 1999, and significant sampling since 2003, (over 12 phases) the stygobitic fauna assemblage of the Marillana and Weeli Wolli catchment is well documented.

After eleven years of surveys and monitoring, there is no evidence to suggest that the long-term survival of any stygobitic taxa has been placed at risk due to existing mining operations at Yandicoogina.

The greater Marillana and Weeli Wolli Creek systems are believed to provide contiguous habitat for stygofauna based on geological drilling information (Biota 2010). This would support the recolonisation of areas disturbed by mining activities.

Targeted surveys for troglofauna were originally completed in 2009, with an additional survey completed in 2010. A total of 58 sites (130 traps) were sampled in the Yandi Operations areas and areas adjacent to the Weeli Wolli Creek line (40 bores). Site hydrogeological data was used to identify target sampling areas above the water table. Out of 4,827 invertebrate fauna specimens recorded, only 16 specimens displayed troglomorphic characters. These included: one schizomid; one pseudoscorpion; four Blattodea (cockroach) from two sites; ten polyxenid millipede species from six sites; and a single pauropod specimen. In total, eight confirmed troglobitic specimens have been collected from Yandicoogina since 2008 (including by-catch from stygofauna sampling).

A number of troglofauna records were found in areas adjacent to the Weeli Wolli Creek south east of the JSE mine pit (Biota 2010, Appendix 6).

The majority of the alluvium deposits within the Yandi Operations area are subject to seasonal inundation/flooding. These characteristics suggest that the Yandi PBS area does not provide core habitat for troglofauna. Elsewhere in the Pilbara, it is uncommon for troglobitic fauna to be abundant in low-lying alluvium and colluvium deposits (Biota 2010).

Further sampling for troglobitic fauna at Pocket and Billiard South is currently underway (refer Table 4-2).

4.10 HERITAGE

4.10.1 Native title

Three native title claims exist over the Yandicoogina area. These are Innawonga Bunjima WC96_061; Nyiyaparli 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 enabled tenure to be granted for the Yandi Operation. 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.

4.10.2 Heritage sites

Extensive archaeological and ethnographic surveys have been undertaken within the Yandicoogina locality (e.g Quartermaine 1993, 1995, 1996; Hammond 1997; Archae-Aus 2001, 2003a & b; 2005, 2010a and b; O'Conner and Brunton 1995; MacDonald 2003; Day 2004; Ethnosciences 2010; MacDonald and Coldrick 2010).

Collectively, these surveys have identified numerous Aboriginal archaeological sites within the Yandicoogina locality including: artefact scatters; quarries; rock shelters; engraving sites; and scarred trees. These sites range from low to high archaeological and cultural significance. Possible burial sites (high significance) have also been identified within the area.

A number of ethnographic sites have been identified within the Hamersley Yandicoogina mining lease area, most significantly Weeli Wolli Creek and Marillana Creek. Significant creeks within the area have been identified as having important associations with camping, ceremonies and cultural activities. A heritage exclusion zone has been identified around Weeli Wolli Creek, Marillana Creek and Phil's Creek for the purposes of the existing mining operations. The Native Title claimants have requested that no ground disturbance work be undertaken in the creeks without prior consultation and agreement.

5 ASSESSMENT OF ENVIRONMENTAL FACTORS

The indicative environmental footprint for the Yandi PBS Project is provided in Figure 6. This may be refined at the completion of feasibility studies.

A range of impact mitigation and management strategies will be used to minimise the overall environmental footprint of the Yandi PBS Project (Table 5-1). Rio Tinto Iron Ore has developed and refined environmental management policies, systems and procedures over decades of operational mining experience in the Pilbara region. These are successfully applied at Rio Tinto Iron Ore's existing Pilbara iron ore mine sites.

The key components of Rio Tinto's environmental management approach for its iron ore business that will be applicable to the PBS Project include:

- **Health, Safety, Environment and Quality Policy** (**HSECQ Policy**) is the guiding document for environmental management and provides context and direction for continuous improvement.
- **Environmental Management System (EMS)** is a continuous improvement model covering systematic assessment of environmental risk and legal requirements and the development of objectives and targets for improvement; as well as systems for training, operational control, communication, emergency response, corrective actions, and audits and review.
- **Construction Environmental Management Plan** (**CEMP**) will be prepared to address environmental factors potentially subject to impacts arising from construction activities. For each factor, the CEMP will identify potential impacts, management controls, monitoring, reporting and contingency actions. This will include clear identification of roles and responsibilities associated with the implementation of the CEMP.
- **Environmental Management Program (EMP)** will be prepared and implemented for the operational phase of the Yandi PBS Project. The EMP will be interfaced with the EMS, and address all relevant environmental aspects of the Yandi PBS Project.
- **Closure Standard** will guide closure planning and implementation from project inception, addressing:
    - the development of a Closure Knowledge Base;
    - developing and maintaining a Closure Strategy;
    - developing and maintaining a Closure Management Plan;
    - stakeholder consultation;
    - financial provisioning for closure;
    - reviews of closure plans on a regular basis; and
    - developing a final decommissioning plan five years prior to scheduled closure.

Table 5-1: Relevant Environmental Factors and Indicative Environmental Footprint of the Yandi PBS Project

Environmental Factor	Relevant Aspect	Relevant Proposal Activities	Impact Mitigation and Management	Extent of Potential Impact
Flora and Vegetation	• Clearing. • Groundwater dependant vegetation. • Surplus water discharge.	• Clearing and earthworks to develop mine pits and associated mine infrastructure facilities. • Groundwater drawdown will extend beneath Weeli Wolli creek during mining operations and potentially effect groundwater dependant vegetation. • Surplus water discharge will alter the natural ephemeral nature of the creek system to perennial for the duration of mining operations. • Localised disruption to natural surface drainage.	**Non-Riparian Vegetation** • Planning and design to minimise the required amount of clearing. • The proponent's ground disturbance authorisation process. • Conducting additional flora and vegetation surveys of project areas not already surveyed. • Obtaining the required approvals to disturb and/or remove significant species (if unavoidable). • Mapping and control of weed species. • Vehicle hygiene procedures. • Rehabilitation post-mining and rehabilitation of areas no longer required post-construction. **Riparian Vegetation** • Maintaining the flow paths, quantity and quality of water within Marillana and Weeli Wolli Creeks and the underlying aquifers to protect the dependant ecological systems. • Monitoring the effects of dewatering on riparian vegetation communities in areas where the water table is predicted to be lowered. • Managing and minimising potential impacts on riparian vegetation associated with dewatering and at the discharge points. • Maintaining creekline discharge in areas subject to groundwater drawdown impacts in order to maintain environmental water requirements. • Avoiding disturbance and the introduction of weeds to vegetation in creeklines. • Minimising physical disturbance to the Weeli Wolli Creek floodplain.	• Up to 2,500 ha (preliminary estimate) of vegetation will be removed. • Up to 35ha of Riparian vegetation would be cleared to facilitate the PBS mine pit, flood protection levees and infrastructure. • Up to 8km of Riparian vegetation would be exposed to the effects of groundwater drawdown. • Up to 17km of Weeli Wolli creek (from the Marillana confluence) would be subject to perennial flow for an extended period of time. • This area will be rehabilitated post-mining with native species of the relevant provenance suitable for the final closure landform.

Environmental Factor	Relevant Aspect	Relevant Proposal Activities	Impact Mitigation and Management	Extent of Potential Impact
Terrestrial Fauna	• Clearing • Groundwater drawdown • Surplus water discharge	• Clearing of habitat to develop mine pits and associated mine infrastructure facilities. • Groundwater drawdown will extend beneath Weeli Wolli creek during mining operations and potentially effect creekline fauna habitats • Surplus water discharge will alter the natural ephemeral nature of the creek system to perennial for the duration of mining operations	• Planning and design to minimise the required amount of clearing • Maintaining appropriate speed limits for vehicles by ensuring all roads are sign-posted and vehicle speeds are monitored • Implementing programs for education of the workforce with respect to fauna identification, protection and management • Implementing feral animal control activities • Maintain the flow regime and flood plain of Weeli Wolli Creek to protect riparian habitat and fauna associated with the creeks • Implementing appropriate bunding and hydrocarbon management at hydrocarbon storage facilities, re-fuelling locations, and stationary hydrocarbon usage areas • Developing and implementing fauna management plans for species of elevated conservation significance • Complying with the *Wildlife Conservation Act 1950*.	• Up to 2,500 ha clearing of native vegetation habitat • Up to 35ha of Riparian vegetation habitat would be cleared to facilitate the PBS mine pit, flood protection levees and infrastructure • Up to 8km of Riparian vegetation would be exposed to the effects of groundwater drawdown • Up to 17km of Weeli Wolli creek (from the Marillana confluence) would be subject to perennial flow for an extended period of time, providing increased water availability

Environmental Factor	Relevant Aspect	Relevant Proposal Activities	Impact Mitigation and Management	Extent of Potential Impact
Subterranean Fauna	Stygofauna	• Excavation of Mine pits will result in direct loss of habitat • Groundwater drawdown will extend beneath Weeli Wolli creek during mining operations	• Characterising the local and regional conservation significance of subterranean taxa and assemblages • Characterising the habitat requirements of subterranean taxa and assemblages • Providing sufficient habitat wherever practicable, to prevent a change in the conservation status of identified subterranean taxa • Maintaining the flow regime of Weeli Wolli Creek to preserve stygofauna habitat during operations • Maintaining discharge to supplement areas of groundwater drawdown during operations • Implementing appropriate bunding and hydrocarbon management at hydrocarbon storage facilities, re-fuelling locations, and stationary hydrocarbon usage areas • Complying with the *Wildlife Conservation Act 1950*.	• Loss of some subterranean fauna and habitat due to mine pit excavation and extraction • Temporary loss of some stygofauna habitat in groundwater drawdown areas beyond the mine pit.

Environmental Factor	Relevant Aspect	Relevant Proposal Activities	Impact Mitigation and Management	Extent of Potential Impact
Hydrological Processes	• Groundwater Drawdown • Surface Water Discharge	Groundwater abstraction required to access ore located below the water table. Surplus water management.	• Implementation of the groundwater dependant ecosystems monitoring and management plan. • Implementation of the approved Groundwater Operating Strategy. • Re-use of groundwater on site. • Management and reporting in accordance with existing Licence to Operate and 5C Licence to Take. • Implementation of the surface water discharge monitoring and management plan. • Maintain the existing low flow lines of Weeli Wolli Creek. • Investigation of options for surplus water management. • Maintain surface water flow in the vicinity of groundwater drawdown to supplement phreatophytic vegetation.	• An ~8km section of Weeli Wolli Creek riparian vegetation and stygofauna habitat will be exposed to groundwater drawdown, which may result in some tree mortality and temporary loss of stygofauna habitat. • Up to 17km of Weeli Wolli creek (from the Marillana confluence – identified as a potential impact from the existing Yandicoogina operations) will be subject to extended exposure to surface water flow for the duration of the mining activities. • The risk or potential impact on the Fortescue Marsh from extended surface water drainage in Weeli Wolli creek is negligible.

Environmental Factor	Relevant Aspect	Relevant Proposal Activities	Impact Mitigation and Management	Extent of Potential Impact
Inland Waters Environmental Quality.	• Surface Water Discharge. • Closure.	• Surplus water management. • Formation of pit lakes in mine voids.	• AMD risk assessment undertaken (including Neutral Mine Drainage assessment). • Implementation of the surface water discharge monitoring and management plan. • Maintain the existing low flow lines of Weeli Wolli Creek. • Baseline Water Quality triggers developed specifically for Yandicoogina Operations (in accordance with ANZECC Guidelines (2000)). • Implementation of the approved Groundwater Operating Strategy. • Management and reporting in accordance with existing discharge licence. • Implementation of the Yandicoogina LoM Closure Plan.	• The risk or potential impact on the Fortescue Marsh from altered surface water drainage is negligible. • Formation of pit lakes will result in increased salinity of the retained lakes, however overall water quality in the Marillana – Weeli Wolli catchment will be maintained to support groundwater dependant ecosystems.
Rehabilitation & Closure	• Mine pits and other disturbed areas. • Formation of pit lakes in mine voids.	Rehabilitation of disturbed areas post-mining.	Yandicoogina Life of Mine Closure Plan prepared in accordance with the Department of Mines and Petroleum (DMP) and EPA *Guidelines for Preparing Mine Closure Plans* (June 2011).	An area up to 2,500 hectares (preliminary estimate) will need to be rehabilitated post-mining with native species of the relevant provenance. Altered landforms - formation of pit lakes in mine voids and increased salinity.

5.1 ENVIRONMENTAL FACTORS RELEVANT TO THE YANDI PBS PROJECT

Rio Tinto Iron Ore has undertaken an assessment of the key environmental factors relevant to the Yandi PBS Project based on the EPA's Environmental Assessment Guideline 8 (**EAG8**) for assessing environmental factors and objectives (EPA 2013).

The factors which are considered most relevant to the Yandi PBS Project and considered to have the greatest potential environmental impacts are the focus of this assessment, and are summarised in Table 5-1 and Figure 8.

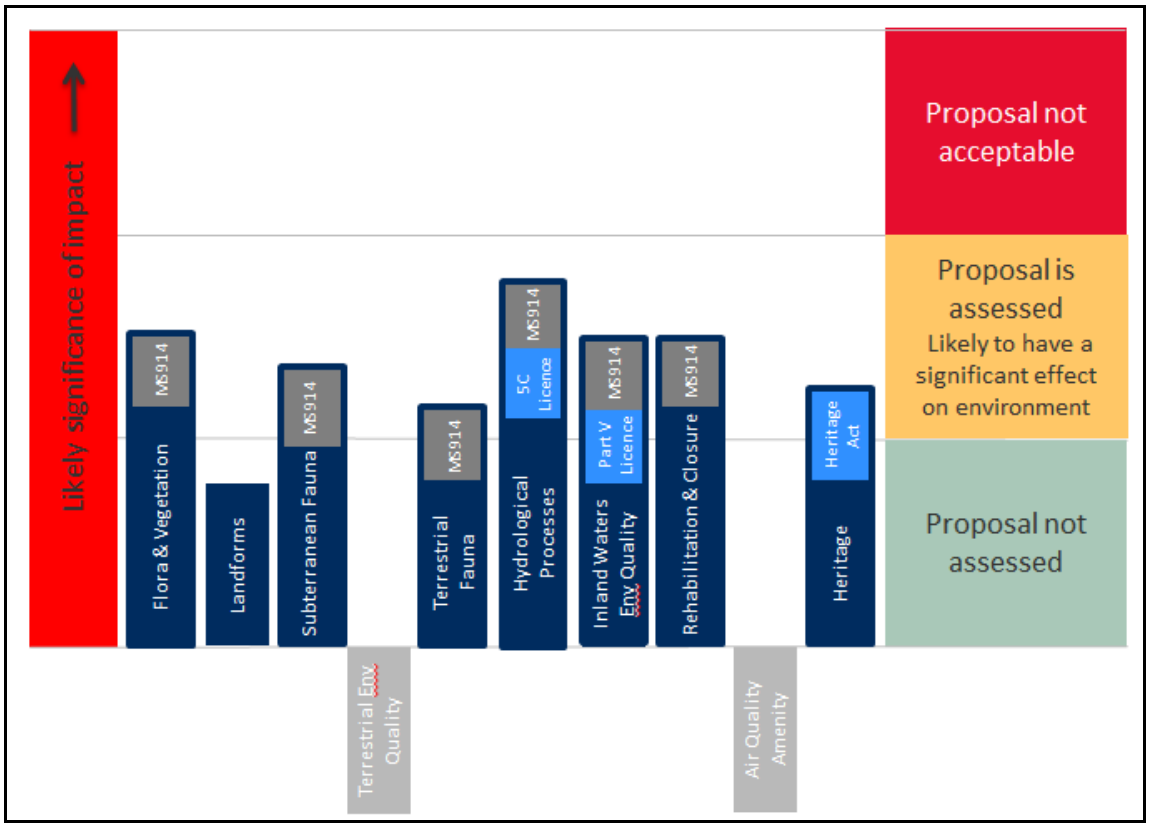


Figure 8: Relevant environmental Factors for the Yandi PBS Project (revision to MS 914)

A detailed assessment of the key environmental factors, proposed management and mitigation, and potential impacts is addressed in Section 5.

5.2 FLORA AND VEGETATION

5.2.1 Management objective

The EPA applies the following management objective for the protection of vegetation and flora according to EAG8 for Environmental Factors and Objectives (EPA 2013):

'To maintain representation, diversity, viability and ecological function at the species, population and community level'.

5.2.2 Potential impacts

The following aspects of the Yandi PBS Project may affect flora and vegetation values:

- **Clearing of up to 2,500ha of vegetation** in mining and infrastructure development areas including:
    - Vegetation communities of local conservation significance: **up to 35 ha of riparian vegetation** would be cleared within Weeli Wolli creek to facilitate the Yandi PBS mine pit (~17 ha), flood protection levees and infrastructure (~18 ha).
    - Priority Flora species and potentially DRF (*Lepidium catapycnon*).
- **Groundwater drawdown** from mine pit dewatering, affecting the health of riparian vegetation along an 8km section of the Weeli Wolli Creekline adjacent to Yandi PBS.
- **Discharge of surplus water** from mine pit dewatering into Marillana Creek and / or Weeli Wolli Creek, affecting riparian vegetation along these creek systems.
- **Introduction and spread of weeds** from vehicle movements and earthworks.

5.2.3 Management strategies

The impacts of clearing and other forms of vegetation disturbance can be reduced through appropriate project planning and implementation. It is useful to distinguish between riparian and non-riparian vegetation for management purposes, given that these vegetation categories will be exposed to a range of differing impacts.

5.2.4 Non-riparian vegetation

Strategies for minimising impacts to **non-riparian vegetation** include:

- **Minimising the clearing disturbance footprint** during the mine planning and design phase, sufficient to enable safe construction and implementation of the proposed mining operation. Vegetation and flora with elevated conservation significance will be preferentially avoided where practicable.
- **Implementing the Rio Tinto ground disturbance authorisation procedure** incorporating:
    - clear demarcation of areas approved for clearing, including the establishment and demarcation of **Environmental Exclusion Areas**;
    - use of GPS vehicle guidance systems during clearing activities where appropriate; and

- environmental awareness training to ensure that employees are aware of the requirement to minimise ground disturbance.

- **Conducting additional flora and vegetation surveys** in parts of the Yandi PBS Project area that have not already been surveyed.
- **Obtaining the required approvals** to disturb and/or remove significant species where disturbance is unavoidable.
- **Implementing vehicle hygiene procedures** to prevent the introduction and spread of weeds.
- **Applying water to active construction/mining areas** to minimise dust generation and prevent dust coating on adjacent vegetation.
- **Mapping and control of weed species**, as necessary to protect conservation values.
- **Rehabilitation with native species** of the relevant provenance in selected available areas following the construction phase and progressively thereafter through to beyond the conclusion of mining.

5.2.5 Riparian vegetation

Tree health will continue to be monitored at established monitoring points (Figure 10), using the remote sensing and digital cover photography techniques developed for this purpose, in addition to vegetation condition transects. The Yandi Operations manages potential impacts to riparian vegetation through its Groundwater Dependant Vegetation Monitoring and Management Plan (Appendix 7), which was subject to approval by DPaW and the OEPA (MS 914, Condition 6).

Strategies for minimising impacts to **riparian** vegetation include:

- **Maintaining the flow paths,** quantity and quality of water within Marillana and Weeli Wolli Creeks and the underlying aquifers. The aim is to protect the ecological systems that depend on surface water and groundwater.
- **Monitoring 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.
- **Managing and minimising potential impacts** on riparian vegetation associated with dewatering and at the discharge points.
- **Maintaining creekline discharge** particularly in areas subject to groundwater drawdown impacts in order to maintain water requirements to sustain the riparian vegetation.
- **Avoiding disturbance and the introduction of weeds** to vegetation in creeklines, particularly vegetation which is currently in good or excellent condition.
- **Minimising physical disturbance to the Weeli Wolli Creek floodplain**. The aim is to protect riparian vegetation and fauna habitat associated with the creeks. Flood protection levees, a heavy vehicle road crossing and a small section of the pit will

encroach on ~30ha of the floodplain; however, designs will ensure the flow regime of Weeli Wolli Creek is maintained.

5.2.6 Anticipated residual impacts

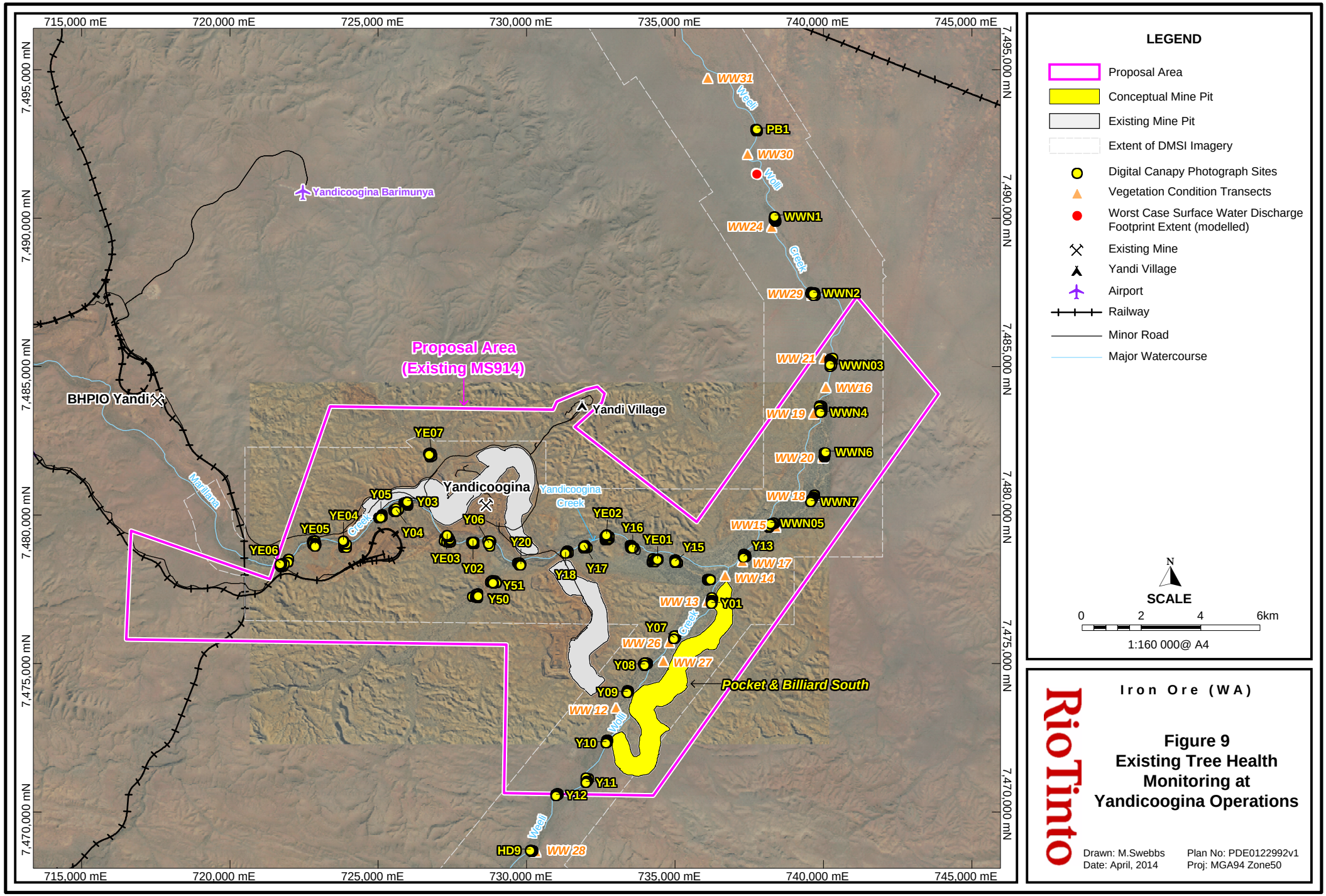
As a preliminary estimate, implementation of the Yandi PBS Project will result in the clearing of up to 2,500 ha of native vegetation. The clearing will not result in the disturbance of any TECs or upland vegetation communities with regional conservation significance and will not impact on the conservation status of DRF or priority listed flora. Disturbance to individual plants may occur, subject to the provision of the *Wildlife Conservation Act 1950.*

The proposed clearing is considered to be unlikely to significantly affect the regional distribution of any vegetation community, or affect the regional conservation status of any plant taxon known from the Yandi PBS Project area.

The Yandi PBS Project will result in drawdown impacts on riparian tree species in the vicinity of the Pocket and Billiard South pit, along an approximately 8 km section of Weeli Wolli Creek. Tree health is expected to decline, potentially resulting in some tree deaths within this zone, however continual surface water discharge from the upstream HD 1 operations is likely to provide some supplementary water to the alluvial aquifer which supports the riparian vegetation. The vegetation in this area has been modified by historical mining activities since 2006 and subject to permanent surface water flows since 2008.

Rio Tinto will investigate the impact of groundwater drawdown on phreatophytic tree species in Weeli Wolli Creek near the Pocket and Billiard South deposits to ascertain tree responses to different exposure levels to drawdown, taking into consideration the exiting discharge from HD 1 operations, climate regime and other environmental variables.

Implementing the Yandi PBS Project is not expected to result in significant impacts on flora or vegetation conservation values, and is consistent with the EPA objective for flora and vegetation protection.



LEGEND

- Proposal Area
- Conceptual Mine Pit
- Existing Mine Pit
- Extent of DMSI Imagery
- Digital Canapy Photograph Sites
- Vegetation Condition Transects
- Worst Case Surface Water Discharge Footprint Extent (modelled)
- Existing Mine
- Yandi Village
- Airport
- Railway
- Minor Road
- Major Watercourse

N

SCALE

0 2 4 6km

1:160 000@ A4

Iron Ore (WA)

Figure 9
Existing Tree Health Monitoring at Yandicoogina Operations

Drawn: M.Swebbs
Date: April, 2014

Plan No: PDE0122992v1
Proj: MGA94 Zone50

5.3 TERRESTRIAL FAUNA

5.3.1 Management objective

The EPA applies the following management objective for the protection of terrestrial fauna according to Environmental Assessment Guideline 8 for Environmental Factors and Objectives (EPA 2013):

'To maintain representation, diversity, viability and ecological function at the species, population and community level'.

5.3.2 Potential impacts

The following aspects of the Yandi PBS Project will affect terrestrial fauna values:

- **Habitat removal and fragmentation** due to vegetation clearing. The habitat types within the clearing footprint are common in a local and regional context and the impact of this loss on fauna species will be minimal.
- **increased water availability**, causing persistent surface water ponding in downstream riparian areas and changes in vegetation composition, potentially resulting in:
    - increased habitat heterogeneity and carrying capacity for macroinvertebrates and benefits to other aquatic fauna that are favoured by saturated conditions;
    - enhanced breeding opportunities for terrestrial and aquatic fauna; and
    - disadvantages to aquatic fauna that rely on both wet and dry conditions characteristic of the existing ephemeral regime.
- **Decreased water availability** when dewatering discharge ceases, potentially causing adjustments in fauna populations that have acclimatised to the increased water availability during the project dewatering phase.
- **Habitat contamination** from spills and leaks in localised areas associated with refuelling, vehicle operation and vehicle maintenance.
- **Death or injury of individual animals** from vehicle movements (i.e. collisions) and the operation of other mining equipment.
- **Disruption to animals** resulting from dust, noise and light emissions.
- **Encouraging increased feral animal numbers** in the Yandicoogina locality, resulting in heightened threat to native species. Feral animals are known to be attracted to mining camps where food waste is not appropriately managed, and may benefit from more persistent water sources created by surplus water discharge activities.

5.3.3 Management strategies

Strategies for minimising impacts to terrestrial fauna include:

- Locating infrastructure and transport routes preferentially in previously disturbed areas wherever practicable, to minimise disturbance of fauna habitat.
- Maintaining appropriate speed limits for vehicles by ensuring all roads are sign-posted and vehicle speeds are monitored.

- Implementing programs for education of the workforce with respect to fauna identification, protection and management.
- Implementing feral animal control activities.
- Maintain the flow regime and flood plain of Weeli Wolli Creek to protect riparian habitat and fauna associated with the creeks.
- Implementing appropriate bunding and hydrocarbon management at hydrocarbon storage facilities, re-fuelling locations, and stationary hydrocarbon usage areas.
- Developing and implementing fauna management plans for species of elevated conservation significance.
- Complying with the *Wildlife Conservation Act 1950.*

5.3.4 Anticipated residual impacts

As a preliminary estimate, implementation of the Yandi PBS Project will result in the clearing of up to 2,500 ha of native vegetation habitat. This proposed clearing is considered to be unlikely to significantly affect the regional distribution of terrestrial fauna habitat.

The Yandi PBS Project disturbance area does not include any habitat areas with high conservation significance. The overall Yandi PBS Project area may contain individual animals belonging to species with conservation significance, which could be disturbed by mining and related activities. However, none of these species are restricted to the area, and all are distributed broadly across the Pilbara region.

A range of management measures will be used to protect fauna and their habitat outside the clearing footprint. This includes maintaining ground-disturbance avoidance zones around riparian areas. Rehabilitation procedures will include specific habitat reinstatement components.

Implementing the Yandi PBS Project will not cause a change in the conservation status of any of fauna species with conservation significance. The Yandi PBS Project is consistent with the EPA objective for fauna protection.

5.4 SUBTERRANEAN FAUNA

5.4.1 Management objectives

The EPA applies the following management objective for the protection of Subterranean fauna according to EAG 8 for Environmental Factors and Objectives (EPA 2013):

'To maintain representation, diversity, viability and ecological function at the species, population and assemblage level'.

5.4.2 Potential impacts

Activities or aspects of the project with the potential to affect subterranean fauna populations include:

- **direct loss of subterranean fauna habitat** from the excavation of ore and overburden material.

- **a temporary loss of stygofauna habitat** within the groundwater drawdown cones of depression beyond the mine pit, for the duration of the dewatering phase of the Proposal.
- **altered subsurface habitats** due to modifications to the surface environment, including:
    - **increased sediment loads** due to runoff from surface operations, resulting in reduced habitat space in strata above the water table.
    - **changes to groundwater recharge or discharge regimes** due to sealing of surface areas from roads/infrastructure.
- **groundwater pollution** - e.g. chemical pollutants spills, unlined landfills and direct discharge of waste or different quality water into streams or aquifers.
- **groundwater systems becoming saline** following mine closure, if the post-mining landscape is not designed to prevent salt accumulation in pit voids.

Stygofauna

The Yandicoogina locality has been subjected to extensive subterranean fauna surveys over multiple phases since 2003.

Given the level of connectivity along the alluvial substrate, as well as the significant seasonal water movement through the project area, especially during cyclonic activity, short-range endemism stygofauna at the Pocket and Billiard South location is unlikely.

Mine pit excavation is unlikely to significantly affect the diversity and persistence of subterranean fauna in the Yandicoogina locality for the following reasons:

- **The zone of contiguous subterranean fauna habitat** in the CID and adjacent alluvial sediments is extensive beyond the mine pits.
- **The alluvial habitat will be preserved** with only a small portion of habitat impacted by the mine pit (~17ha).
- Surface water discharge from upstream HD 1 operations **will provide supplementary water to the alluvial habitat** during dewatering activities for the purposes of mining.
- **All of the obligate subterranean taxa recorded at Yandicoogina** have been recorded in reference sites outside of the footprint of the mine pit, based on the results of multiple sampling phases.

Impacts on subterranean habitat will extend beyond the boundaries of the mine pit due to groundwater drawdown required for mine pit dewatering. Hydrogeological modelling will be used to assess the spatial and temporal extent of groundwater drawdown over the Yandi PBS Project life.

Although groundwater drawdown will be extensive over the life of the Yandi PBS Project, significant volumes of saturated habitat for stygofauna will be preserved adjacent to the mine pit.

Troglofauna

The Yandi PBS Project area is not considered to contain primary habitat for troglofauna. This is mainly due to the high volume of water flow and creek bed morphology changes within the alluvials during cyclonic events. The majority (99%) of the subterranean CID habitat occurs below the water table.

Evidence from elsewhere in the Pilbara region suggests that troglofauna habitat quality is correlated with relatively high (and constant) humidity. Another key criterion for troglofauna habitat is the presence of cavities or void spaces. Groundwater drawdown may result in the drying out of the soil profile in localised areas directly above the water table (as the zone of capillary rise falls with the declining water table). However, infiltration from rainfall and surface flow in overlying drainage lines is considered to have an overriding influence on profile humidity.

5.4.3 Management strategies

Strategies for minimising impacts to subterranean fauna include:

- Characterising the local and regional conservation significance of subterranean taxa and assemblages.
- Characterising the habitat requirements of subterranean taxa and assemblages.
- Providing sufficient habitat wherever practicable, to prevent a change in the conservation status of identified subterranean taxa.
- Maintaining the flow regime of Weeli Wolli Creek to preserve stygofauna habitat during operations.
- Implementing appropriate bunding and hydrocarbon management at hydrocarbon storage facilities, re-fuelling locations, and stationary hydrocarbon usage areas.
- Complying with the *Wildlife Conservation Act 1950.*

5.4.4 Anticipated residual impacts

After applying management and mitigation measures, the following outcomes for subterranean fauna are expected:

- **Loss of some subterranean fauna and habitat** due to ore access and extraction, and additional temporary loss of stygofauna habitat in groundwater drawdown areas beyond the mine pit. The predicted loss of habitat is relatively small compared to the amount of habitat available for subterranean fauna in the Yandicoogina locality. Most subterranean species are known to occur extensively outside the Yandi PBS Project area. As such, their conservation status is unlikely to be affected by the Yandi PBS Project.
- **Negligible impact on troglofauna habitat or fauna assemblages**, given that the resource is predominately (~99%) below the water table and the project area is sparsely populated with troglofauna.
- **Areas exposed to modified infiltration and runoff regimes will be restricted** relative to the amount of available habitat for subterranean fauna.

- **Areas exposed to groundwater contamination risk will be restricted** (e.g. from hydrocarbons or salinisation), relative to the amount of available habitat for subterranean fauna.

Minimal change to the diversity and long term persistence of subterranean fauna and their associated habitat is predicted at Yandicoogina. This is supported by multiple phases of subterranean fauna surveying and assessment. Subterranean fauna will continue to be monitored both inside and outside the project disturbance area to detect trends in species diversity and abundance.

Implementing the project will not cause a change in the conservation status of subterranean fauna taxa with conservation significance, and is consistent with the EPA objective for fauna protection.

5.5 HYDROLOGICAL PROCESSES

5.5.1 Management objective

The EPA applies the following management objective in its assessment of proposals that may affect hydrological processes according to EAG 8 for Environmental Factors and Objectives (EPA 2013):

'To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.'

5.5.2 Surface water potential impacts

Activities or aspects of the project that have the potential to affect surface water systems in the project area include:

- **Surface water diversions** – surface water flows will be disrupted by excavation of mine pits, surface waste dumps and stock piles, creek crossing structures (roads, bridges, floodways), and drainage structures (drains and levees) for protecting the mine pits from inundation from flows in Weeli Wolli creek and its tributaries.
- **Discharge of surplus water volumes** into the Weeli Wolli Creek system. The Yandi PBS Project may result in up to ~30Gl/a surplus water being generated in addition to the existing Yandicoogina operations surplus water volumes. The discharge would ultimately continue downstream along Weeli Wolli creek, infiltrating into the alluvial gravel beds.
- **Cumulative impacts to ecosystems and identified environmental receptors** (riparian vegetation, stygofauna, Fortescue Marsh) resulting from surface water discharge of a number of mining operations into the ephemeral creeklines of Marillana and Weeli Wolli creeks.
- **Contaminating surface water systems** with sediments and other pollutants such as hydrocarbons and detergents.

Note that impacts to ecosystems, including vegetation, flora and fauna are discussed in Sections 5.2– 5.4.

5.5.3 Surface water management strategies

Strategies for minimising both impacts to surface water and impacts from surface water include:

- Constructing surface water management structures that will mimic the natural erosion and sediment transport regimes.
- Maintaining creek system natural low-flow lines.
- Infrastructure which is required to cross over / through Weeli Wolli Creek will be designed to minimise upstream impoundment of minor flows. This will minimise inundation impacts upstream from the crossing.
- Rock armouring of channels, levees and discharge outlets where flow velocities are likely to induce scour. This will minimise sediment contribution to the downstream environment.
- Implementing appropriate bunding and hydrocarbon management at hydrocarbon storage facilities, re-fuelling locations, and stationary hydrocarbon usage areas to prevent flood waters and runoff entering and leaving these areas.
- Installing hydrocarbon treatment facilities in priority areas (eg. wash down and workshop areas) to minimise potential release of hydrocarbons to the environment.
- Removing soil contaminated by accidental spills to treatment areas that are not subject to flooding risk.
- Using in-pit sumps to manage storm runoff within the pits, prior to treatment and safe disposal as necessary.
- Rehabilitating all available disturbed areas as soon as practicable to minimise sediment runoff into creek lines.
- Implementing alternate strategies for managing surplus discharge water, including reinjection, pit void recharge, and transfer to other locations/operations.

The Yandi Project manages potential impacts resulting from surplus water discharge through its Groundwater Dependant Vegetation and Surplus Water Discharge Monitoring and Management Plan (Appendix 7), which was approved by DPaW and the OEPA in 2013 (MS 914, Condition 6 and 7).

5.5.4 Surface water anticipated residual impacts

After applying management and mitigation measures, the following outcomes for surface water are expected:

- **Maintaining pre-disturbance flow paths upstream and downstream** from the mining areas, wherever practicable, by designing surface water diversion structures appropriately. Surface water diversion structures are needed to protect mine pits from runoff events and flooding in existing creek systems.
- **Minimising impacts to Weeli Wolli Creek** during construction and operation by implementing management measures and rehabilitation in line with the CEMP.

- **Unlikely to significantly affect surface flows down gradient of the Yandi PBS Project area**. The proposed design and management measures will minimise impact on surface water flows and changes in topography, particularly from infrastructure.
- **Increased sediment load from the project area is unlikely to elevate** the already naturally high background sediment load-levels observed in creek systems in the locality after rainfall.
- **Disturbance** of up to 35 ha of the Weeli Wolli Creek plain from pit excavation, flood protection, infrastructure and management activities.
- **Exposure of vegetation and aquatic fauna** communities to modified flow regimes in the lower Weeli Wolli Creek. This is likely to increase the temporal scale of exposure of the 17 km creek section downstream of the Marillana Creek confluence which is predicted to be potentially exposed to cumulative discharge from current, approved mining activities in the catchment.
- **Maintaining the quality and quantity of surface water** downstream of the project area. Water discharged from operational areas will meet background water quality trigger levels developed for Yandi Operations in line with ANZECC (2000) guidelines. Given the management measures to be implemented, it is unlikely that hydrocarbon spills represent a significant environmental risk.
- **Ecosystem expected to return to a similar state post-discharge**. In Weeli Wolli Creek, away from the reaches impacted by groundwater drawdown, the ecosystem is considered to be sufficiently resilient to recover from any changes resulting from discharge. When discharge activities stop, the ecosystem is expected to return to a similar community structure and composition to the existing system.
- **No affects to the ecological values of the Fortescue Marsh** from the discharge.

5.5.5 Groundwater potential impacts

Activities or aspects of the Yandi PBS Project with the potential to affect groundwater systems in the Yandi PBS Project area include:

- **Mine pit dewatering** resulting in a drawdown zone extending beyond the mine pit boundaries into the alluvial aquifer. The drawdown will reduce the groundwater resource for phreatophytic vegetation along a section of Weeli Wolli Creek and reduce the extent of saturated habitat for obligate groundwater dependent fauna (stygofauna).
- **Mine pit excavations**, which will alter the hydraulic properties of the CID aquifer and may cause localised declines in adjacent water tables due to lateral leakage into the pits. The excavations will result in the removal of habitat for obligate groundwater dependent fauna (stygofauna).
- **Contamination of groundwater**, for example from hydrocarbon spills/leakages or the evaporative concentration of salts in pit lakes or discharge water.

Managing potential impacts from the discharge of surplus volumes from mine pit dewatering is discussed in Section 5.5.3. Managing potential impacts from changes in subterranean

fauna habitat caused by groundwater drawdown is discussed in Section 5.4. Protecting groundwater post mine closure is addressed in Section 5.7.

Potable water demand will be relatively low for the Yandi PBS Project and will be locally sourced.

5.5.6 Groundwater management strategies

Management strategies to address the potential groundwater impacts identified in Section 5.5.5 are summarised below. The Yandicoogina Groundwater Operating Strategy together with the Yandicoogina groundwater dependant ecosystems monitoring and management plan will provide the operational framework for implementing groundwater protection and managing potential impacts.

Dewatering

- Borefield optimisation - will minimise the lateral extent of drawdown by using a series of 'cluster' borefields, located up gradient and down gradient or adjacent to the active mining area. The cones of groundwater depression created by each bore will interface to concentrate the effect of dewatering in the CID ore body in the active mining areas and also minimise the dewatering discharge volumes.
- Progressive backfilling of the PBS pit will also assist in reducing the lateral extent of groundwater drawdown.
- Updating the groundwater numerical model based on collection of new information and calibration with monitoring data.
- Implementation of the approved Yandicoogina Operations Groundwater Operating Strategy as approved by the DoW, including monitoring of groundwater levels, flow rates and groundwater quality.
- Management and reporting in accordance with existing Licence to Operate and 5C Licence to Take.
- Implementation of the Yandicoogina groundwater dependant ecosystems monitoring and management plan to manage potential impacts on phreatophytic vegetation and stygofauna.
- Maintain surface water flow in the vicinity of groundwater drawdown to supplement phreatophytic vegetation.

Mine pit excavations

- Excavation and dewatering from the PBS pits will intercept incoming flows and ultimately return a large proportion of these flows to downstream aquifer following infiltration through the creek beds

Groundwater contamination

- Implementing appropriate bunding and hydrocarbon management at hydrocarbon storage facilities, re-fuelling locations, and stationary hydrocarbon usage areas to prevent groundwater contamination.

- Implementing hydrocarbon treatment facilities in priority areas (eg. wash down and workshop areas) to minimise potential release of hydrocarbons to the environment.
- Using in-pit sumps to manage storm runoff within the pits, prior to treatment and safe disposal as necessary.
- Using excess water from the Yandi Operations that will otherwise be released into local creeks.
- monitoring groundwater levels and quality in the Yandi PBS Project area to enable any deterioration in water level or quality to be detected.

5.5.7 Groundwater anticipated residual impacts

- **Dewatering of the CID aquifer** at PBS.
- **Groundwater drawdown** cone of depression extending in areas surrounding the PBS pits, including beneath Weeli Wolli creek and near the Marillana creek confluence.
- **Removing and permanently modifying CID aquifer** characteristics within the PBS pits.
- **Minor changes in water volumes and water quality** in downstream groundwater systems during the operational life of the Yandi PBS Project. These changes are expected to be transient and ecologically insignificant due to the overwhelming effect of cyclonic recharge events to control water volumes and quality in the local groundwater system.

Mine pit dewatering for the Yandi PBS Project will create a zone of lowered water tables extending beyond the mine pit boundaries. This will reduce the volume of saturated subterranean habitat and potentially make groundwater unavailable to phreatophytic vegetation in localised areas within Weeli Wolli creek over the operational life of the Yandi PBS Project. These impacts and their management are further discussed in Sections 5.2 and 5.4.

Long term water quality in the local groundwater system will be influenced by the final mine closure plan. Management considerations for post-closure groundwater protection are further discussed in Section 5.7.

Given the current understanding of the hydrogeology and aquifers in the Yandi PBS Project area, the dewatering anticipated is unlikely to affect the Fortescue Marsh, nor affect any existing or proposed uses of groundwater in the vicinity of the Yandi PBS Project area. Impacts on stock water supplies associated with pastoral activities are not anticipated.

Implementing the project will not result in significant impacts on groundwater conservation values, and is consistent with the EPA objective for maintaining hydrological regimes.

5.6 INLAND WATERS ENVIRONMENTAL QUALITY

The potential impacts of the Yandi PBS Project in relation to Inland Waters Environmental Quality relate to management of water during operations (surface water discharge, mineral and non-mineral waste management) and changes to water quality upon closure (retention of pit lakes).

5.6.1 Management objective

The EPA applies the following management objective for the protection of Inland Water Environmental Quality according to EAG 8 for Environmental Factors and Objectives (EPA 2013):

'To maintain the quality of groundwater and surface water, sediment and biota so that environmental values, both ecological and social, are protected.'

5.6.2 Potential impacts

Activities or aspects of the project with the potential to affect inland water environmental quality in the Yandi PBS Project area include:

Operations: Surface water discharge

Surplus water discharge into the environment during operations, including potential surplus water management options has the ability to impact on a number of environmental receptors in relation to water quality, including terrestrial, avian, aquatic and subterranean fauna; creekline (riparian) vegetation, and Fortescue Marsh.

Mine surplus discharge water quality will be managed in line with the existing Yandicoogina Surface Water Monitoring and Management Plan required by Condition 6 of MS 914. This includes a requirement for managing water quality discharged into the environment in line with ANZECC Guidelines (2000).

Further details of the potential impacts and management are discussed in Section 5.5.

Operations: Non-mineral waste

Incorrect disposal of solid and liquid wastes has the potential to result in contamination of soil and groundwater.

Wastes generated by activities associated with the Yandi PBS Project will be similar in composition to those already generated at the existing Yandicoogina operations. The Yandi PBS Project will result in increased volumes of the following waste types:

- domestic solid and liquid wastes;
- food scraps from the accommodation village and construction camp;
- scrap metal and drums;
- rubber products, such as conveyor belt sections, tyres;
- batteries;
- waste oils and lubricants; and
- wash down water.

Operations / Closure: Mineral Waste

Mineral wastes can result in landscape modification, altered hydrology and other ecosystem impacts. Certain mineral wastes have the potential to release pollutants into the environment if handled or stored incorrectly.

Closure: retention of pit lakes

The potential impacts resulting from the retention of pit lakes on environmental receptors (including the local and regional groundwater and surface water resources) is dependent on the final closure landform.

The water quality in the retained pit lakes is expected to be slightly different in each pit with salinity ranging from sub-potable to saline depending on the final landform configuration, rate of surface and groundwater inflows, and resultant lakes reaching a state of equilibrium over time.

5.6.3 Management measures

Non-mineral waste

Inert and putrescible solid waste from the mine and processing sites and the operations village will be disposed of at licensed and managed facilities established within the Yandi Operation. Liquid waste hydrocarbons will be disposed in an appropriate off-site facility. Sewage effluent will either be treated on-site in sewage treatment plants or disposed in an appropriate off-site licensed facility.

Waste management is controlled through licence conditions and through the following management:

- Environmental Protection (Controlled Waste) Regulations 2004
- RTIO waste management treatment, storage and disposal guidelines – which outlines the relevant disposal procedures, accountabilities and contacts.

Mineral Waste

The Yandi PBS Project will comply with the proponent's mineral waste management processes (which address environmentally safe and effective management of mining and process wastes generated or handled at Rio Tinto sites) and the acid rock management plan in place for existing Rio Tinto's iron ore operations. These standards provide a structured basis for characterising mineral waste attributes, evaluating risk factors and formulating appropriate management strategies.

- Landforms will be constructed in accordance with the landform design guidelines in place for Rio Tinto iron ore operations.
- The Yandicoogina Life of Mine Closure plan also addresses management of mineral waste (Appendix 8).

Groundwater quality in the Yandi PBS Project area will be monitored.

Pit Lakes

Management strategies integrated into the closure landform design to minimise impact to surface water and pit lake water quality include:

- Minimising disturbance of the existing creek systems.
- Limiting interaction between the existing creek systems and the former mine area – where creeks systems interact with the former mine area, engineering controls are required to control erosion.

- Modifying the landform to increase groundwater recovery levels and improve groundwater quality.
- Minimising lake surface areas to reduce evaporation.
- Using engineered control structures to minimise erosion where the lakes intersect creeks.
- Rehabilitation of in pit backfill areas to reduce erosion and subsequent sediment loads into the pit lakes.
- Pit lake development predictions based on updated operational information.
- Updated groundwater modelling.

5.6.4 Anticipated residual impacts

Non-mineral Waste

With appropriate waste handling and disposal procedures, no significant impacts relating to non-mineral wastes are anticipated.

Mineral Waste

An assessment of acid rock drainage (**ARD**) at the PBS deposits has been undertaken. The deposits were assessed to have a low risk of ARD, based on geochemical interpretation and analytical testing of drillhole samples. This finding is consistent with historical assessments undertaken at the existing Yandicoogina deposits.

The Yandi PBS Project will increase the volume of wastes generated by the entire Yandicoogina operation; however the composition of the wastes will be similar to the existing operations. The proposed mine pit does not contain significant amounts of asbestiform minerals or potential acid forming materials. The geochemical characteristics of the mineral waste do not predispose this material to the formation of metallic leachate contaminants.

Pit Lakes

Pit lakes will form permanent features of the proposed Yandicoogina closure landform due to lack of available material to backfill the pits. The closure landform has been designed to minimise the future lake surface area. This will reduce evaporation and thereby reduce groundwater / lake salinity, reduce the potential for alkaline water conditions (which lead to metal mobilisation) to develop and increase groundwater recovery levels. This is expected to lead to better groundwater conditions within the adjacent alluvial groundwater aquifers that support groundwater dependent ecosystems.

5.7 REHABILITATION AND CLOSURE

Closure challenges for Yandicoogina are largely associated with water management. These challenges include the rehabilitation and stability of the creek systems, to ensure continuity of surface water flow regimes and preservation (where possible) of riparian ecosystems, and the management of water quality in line with post-mining land use requirements.

5.7.1 Management objective

The EPA applies the following objectives when assessing proposals that have a closure component:

'To ensure that premises can be closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the State'.

5.7.2 Potential impacts

Developing the PBS deposits and associated infrastructure will result in the loss of vegetation and habitat, disturb soil profiles, landforms and drainage features, and lower the water table. Given the relatively low quantities of overburden and waste material, insufficient waste will be generated to completely backfill the PBS pits, unless additional materials are externally sourced. This will result in the formation of pit lakes.

The approach taken to mine closure and rehabilitation will affect the degree to which environmental values associated with each of these factors are preserved or reinstated post-mining. Mining activities will result in an altered landform remaining upon closure of the site.

Progressive rehabilitation of disturbed land will be undertaken in order to minimise erosion, restore habitat and reinstate key ecological functions. Rehabilitation work will be undertaken in accordance with the Rehabilitation Handbook developed for Rio Tinto operations, and associated company standards and protocols, together with additional rehabilitation studies and trials in the area.

The impacts created by the project will be in addition to those from the existing Yandi Operations. Landforms and landscape processes (e.g. hydrological processes associated with Marillana Creek) are integrated across the overall Yandicoogina operations. The way the overall mine plan is implemented (e.g. timing and sequence of mining) will influence the feasibility of options for reconstructing the landscape post-mining.

Rio Tinto has prepared a Mine Closure Plan for the Yandi Operations in accordance with the DMP and EPA Guidelines for Preparing Mine Closure Plans (June 2011) (Appendix 8). This plan will be regularly updated over the life of the project in consultation with relevant government agencies.

5.7.3 Management measures

A LoM closure approach has been developed for the Yandi Operations which includes the following elements:

- **Ongoing updating and refining** of the Yandicoogina Closure Plan in accordance with MS 914. This plan applies to the overall Yandi Operations and will take into account new knowledge, including the revised conceptual hydrogeological model. The plan will continue to be reviewed on a three yearly basis.
- **Targeted studies and investigations** to test and refine the closure landform design.

- Developing a Final **Closure and Rehabilitation Plan** approximately 5 years prior to mine closure.

Land use options are currently being investigated in consultation with local communities and Traditional Owners. Until a land use is agreed, the closure and rehabilitation strategy will focus on the following, to ensure the system remains compatible with general Pilbara land uses:

- create landforms that are stable for access by humans and native fauna;
- ensure water systems support existing riparian vegetation and are compatible with the natural system dynamics; and
- establish ecosystems with similar biodiversity and cultural heritage values as surrounding reference sites.

All of these activities will occur within the closure planning framework applied to the Yandi Operations including the Yandi PBS Project.

5.7.4 Anticipated residual impacts

Upon closure of Yandicoogina, a series of pit lakes with varying water quality will remain, including small pockets of new habitat with characteristics similar to wetland systems.

The pit lakes are expected to be disconnected from the Marillana Creek surface flows, allowing the water table under the creek to recover and sustain the riparian (including phreatophytic) ecosystem.

Lakes will be allowed to develop adjacent to Weeli Wolli Creek. Flow events of less than ten year average recurrence intervals would be expected to flow along Weeli Wolli Creek without loss of flood volume to the adjacent pit lakes. The lakes will be sustained by groundwater during the dry season and will syphon the peak of the flow from high flow events. Following large rainfall and flood events, the lake will overtop, returning water to Weeli Wolli Creek. Due to the relatively small storage capacity of the pit lakes, no change to the inundation frequency at Fortescue Marsh is anticipated.

Most of the surrounding disturbed land will be re-vegetated to create habitat that functions with a similar performance to the pre-mining areas. This will include re-establishment of a section of the Weeli Wolli Creek floodplain and minor remediation of other disturbed riparian areas; and new wetland-type habitat will be created around the fringes of the pit lakes.

5.8 CUMULATIVE IMPACTS

Cumulative impacts can arise where operation level impacts act synergistically, cause indirect impacts or combine to exacerbate impacts spatially and/or through time. In the case of Pilbara mining projects, a principal concern is the potential for multiple mining projects to incrementally diminish and degrade environmental values that would otherwise not be significantly affected by each project in isolation.

The Fortescue Marsh catchment has been identified by regulatory authorities as a priority area for conservation management, and a policy framework for managing ongoing mining developments in the catchment has been developed (DOW *et al.* 2013).

To the Proponent's knowledge, current and potential mining projects on the southern side of the Fortescue Marsh (DPaW proposed management zones 1 and 2), in addition to the Yandi Operation include:

Marillana Catchment

- BHPBIO's Yandicoogina mine (Ministerial Statement 323)
- BHPBIO - Marillana I and II deposits (potential)

Weeli Wolli creek catchment

- BHPBIO's Mining Area C (Ministerial Statement 491)
- BHPBIO's proposed Jinidi mine (potential, under assessment).
- Hamersley HMS's Hope Downs 1 mine (Ministerial Statement 584)
- Brockman Resources – Marillana Project (Ministerial Statement 855)
- Fortescue Metals Group – Nyidinghu deposits (potential, under assessment)
- Iron Ore Holdings (IOH) – Iron Valley Project (Ministerial Statement 933)

Possible cumulative impacts associated with the Yandi PBS Project and an assessment of their significance is provided in Table 5-2.

Table 5-2: Possible cumulative impacts associated with the Yandi PBS Project

Possible cumulative impact	Description and assessment of significance
Disturbance to vegetation and significant flora	The surplus water discharge volumes from Hamersley and BHPBIO's Yandicoogina projects in Marillana creek, combined with discharge from HD 1 (and potentially BHPBIO Jinidi, FMG Nyidinghu projects) in Weeli Wolli creek has altered the hydrological regime in the catchment and exposed significant stretches of riparian vegetation along both Marillana and Weeli Wolli creeks to perennial flow for an extended period of time. The Yandi PBS Project is also likely to increase the temporal scale of cumulative exposure to inundation by discharge of the 17 km creek section downstream of the Marillana Creek confluence - predicted to be potentially exposed to cumulative discharge from current, approved mining activities in the catchment. The remainder of the major vegetation types in the Yandi PBS Project area (with the exception of the creekline vegetation) have unexceptional conservation values and are widely distributed outside current and proposed mining areas near Yandicoogina. However, the additional clearing footprint of 2,500ha will add to the cumulative vegetation clearing footprint of the Yandi Operations (to 8,100ha) and the wider Pilbara. The proposed clearing for the Yandi PBS Project will result in minor direct disturbance of up to 35ha within the riparian woodland of Weeli Wolli creek as a result of clearing activities, which will increase

Possible cumulative impact	Description and assessment of significance
	the cumulative clearing footprint of this vegetation unit in the catchment to approximately 95ha. The Yandi PBS Project area does include some populations of Priority 4 flora (refer to Section 4.7.3); however populations of these taxa are well represented outside the Yandi PBS Project area.
Disturbance to habitat for significant fauna species	The habitat types within the project area are well represented in the central Pilbara. These habitats do not have regional significance for rare and endangered fauna species; however the riparian woodland of Weeli Wolli creek supports a known population for the Chocolate Wattle bat. The proposed clearing for the Yandi PBS Project will result in minor direct disturbance of up to 35 ha within the riparian woodland of Weeli Wolli creek as a result of clearing activities, which will increase the cumulative clearing footprint of this vegetation unit in the catchment to approximately 95 ha. The Yandi PBS Project will also result in indirect impacts to an 8 km stretch of riparian woodland of Weeli Wolli creek as a result of groundwater drawdown and surface water discharge and temporary reduction in stygofauna habitat as a result of groundwater drawdown in both Marillana and Weeli Wolli creeks during Yandicoogina operations. No significant cumulative impacts to habitat for significant fauna species are predicted.
Disturbance to Hydrological processes	The Yandi PBS Project is expected to contribute cumulatively to the total volume of surplus water discharged into the ephemeral creeklines of Marillana and Weeli Wolli creeks, which ultimately feed into Fortescue Marsh. This has the potential to incrementally increase both the spatial and temporal nature of exposure of the creekline ecosystems to a modified flow regime, particularly identified environmental receptors (riparian vegetation, stygofauna, and Fortescue Marsh) in addition to Heritage values. A proportion of natural flows entering the Fortescue Marsh will be increased due to additional surface water discharge for the life of the operation (~16 years), in addition to the existing and proposed mining operations within the Weeli Wolli catchment, however the contribution of these flows to Fortescue Marsh relative to natural rainfall events is negligible. Groundwater drawdown for the project will ultimately extend the time for the groundwater systems to recover, taking into account the Yandi Operations dewatering, and other operations dewatering in the vicinity.

Possible cumulative impact	Description and assessment of significance
Disturbance to landforms	The Yandi PBS Project area does not include landforms with elevated conservation significance or other special interest. The land systems mapped as occurring in the project area (Newman, Boolgeeda and River) are widely distributed across the Pilbara. No significant cumulative impacts are predicted.

5.9 OTHER ENVIRONMENTAL FACTORS

Other environmental factors not considered significant or relevant to this Proposal are briefly discussed below.

5.10 GASEOUS EMISSIONS

5.10.1 Potential impacts

Gaseous emissions associated with construction and mining activities will include diesel combustion products from mobile equipment and nitrogen compounds from blasting.

Greenhouse gas emissions will be generated during:

- fuel usage by vehicles, mobile plant and equipment used for extracting and transporting ore and waste;
- explosives used for blasting;
- electrical energy usage by processing plants and conveyors, sourced from external facilities;
- land clearing (a source) and re-vegetation (a sink); and
- decomposition of waste (landfill).

The amount of greenhouse gas emissions estimates cannot be accurately estimated until engineering designs for the Yandi PBS Project are further advanced. However, the emissions intensity of the mining operation at Yandicoogina is relatively low compared with other iron ore projects in the Pilbara region, in the order of 3 to 5 kg CO_{2equiv}. per tonne of mined product (excluding rail and port shipment). This is partly attributable to the low amount of overburden and properties of the ore.

5.10.2 Management strategies

All Rio Tinto mining operations are subject to greenhouse gas management protocols and procedures. These provide a framework for establishing targets for reducing energy consumption, increasing energy use efficiency and limiting overall emissions. The Yandi Operations are registered under the *National Greenhouse and Energy Reporting Act 2007* and *Energy Efficiency Opportunities Act 2006* as a component of Rio Tinto's national operations. Systems and methods are in place for assessing and reporting energy consumption and greenhouse gas emissions from the current operations. These will be extended to apply to the Yandi PBS Project.

A comprehensive greenhouse assessment will be undertaken as part of the detailed Yandi PBS Project design work program. Opportunities for energy efficiency improvements in relation to infrastructure will be assessed and implemented where practicable.

From an emission perspective, the Yandi PBS Project will benefit from the ability to connect with and utilise existing infrastructure, including ore processing facilities, the rail network, and power and water distribution networks.

5.10.3 Anticipated residual impacts

No significant off site air quality or odour impacts on neighbouring receptors are anticipated, on account of the proposed management controls and the Yandi PBS Project being centred in a location remote from any sensitive receptors.

The Yandi PBS Project will contribute towards greenhouse gas emissions from the Yandicoogina operations (which are in the order of 100,000 tonnes CO^2equiv/a) over the life of the Yandi PBS Project.

5.11 AIR QUALITY

5.11.1 Potential impacts

Dust will be generated by construction and mining activities such as vegetation clearing, earthworks and mining (including blasting), vehicle movements and dry ore processing, stockpiling, reclaiming and transport.

5.11.2 Management strategies

Dust management procedures successfully employed at existing Rio Tinto mines will be used to control dust emissions. The strategies for minimising impacts from dust include:

- clearing work areas only as they are required;
- minimising exposed surfaces by progressively rehabilitating disturbed and available areas no longer in use;
- using equipment enclosures, water sprays and dust extraction at ore processing, stockyard and rail load-out facilities;
- using and maintaining scrapers to remove excess material from plant conveyor belts;
- applying water sprays to reduce dust and maintain ore moisture content when mining ore above water table;
- applying water, or appropriate suppressants to haul roads, working surfaces and stockpiles;
- implementing speed limits to minimise dust generation from roads;
- scheduling blasting activities to coincide with favourable weather conditions, wherever possible; and
- sealing selected high usage roads, such as access roads, servicing mining operations.

Potential dust emissions from processing facilities may be subject to controls imposed through an environmental licence required for such prescribed premises, in accordance with Part V of the EP Act.

5.11.3 Anticipated residual impacts

No significant dust impacts as a result of the Yandi PBS Project are anticipated as the existing Rio Tinto procedures and practices used at Yandicoogina are effective in preventing significant dust emissions and will be extended to cover the Yandi PBS Project. In addition, the Proposal is remote from sensitive dust receptors.

5.12 HUMAN HEALTH (NOISE AND VIBRATION)

5.12.1 Potential impacts

The main components of the Yandi PBS Project that generate noise will include blasting and excavation at the new mine pits, ore processing and vehicle and rail movements. The main source of ground vibration from the Yandi PBS Project will be associated with blasting.

5.12.2 Management strategies

The proposed Pocket and Billiard South operations are remote from most significant noise-sensitive receptors, with the closest receptor being the Yandicoogina accommodation camp (~7km away).

Noise and vibration management procedures successfully employed at existing Yandi Operations will be used to contain emissions. The strategies for minimising environmental impacts from noise and vibration include:

- using ‘smart’ reversing alarms;
- selecting and locating conveyor start-up alarms so that they reduce noise impacts; and
- restricting blasting to daylight hours.

Plant and mobile equipment will be maintained to ensure that noise levels remain within regulated limits.

Noise associated with train movements have already been assessed as part of the existing Yandi Operations.

5.12.3 Anticipated residual impacts

No significant noise and vibration impacts are anticipated, on account of the existing Yandi Operations management controls which will be extended to the Yandi PBS Project, in addition to the remoteness of the Yandi PBS deposits from sensitive noise receptors.

5.13 HERITAGE

5.13.1 Potential impacts

Aboriginal heritage sites could potentially be disturbed by proposed activities such as clearing, dewatering, excavation and surface water discharge, although it is Rio Tinto’s policy

to avoid heritage sites, wherever practicable. Section 18 approvals under the *Aboriginal Heritage Act 1972* will be required where disturbance to heritage sites cannot be avoided. All potential secondary impacts to heritage sites and cultural values are also considered prior to any works approvals being granted (e.g. relating to dust, blasting, and subsidence). These are often site and works specific, and as such mitigation measures may vary.

The major risks to Aboriginal heritage are related to the disturbance of archaeological or ethnographic sites and impacts on the heritage values of sites and places. Management strategies are in place to ensure comprehensive surveys are undertaken by archaeologists, anthropologists and Traditional Owners across all areas of proposed ground disturbance and the sites are protected and managed appropriately.

5.13.2 Management strategies

Management strategies to address the potential impacts identified in Section 5.7.1are briefly summarised below. Rio Tinto has well developed practices and procedures for protecting Aboriginal heritage sites including the *Rio Tinto Cultural Heritage Management Standard* and the *Rio Tinto Iron Ore Heritage Policy*. An overarching *Cultural Heritage Management Plan* (**CHMP**) has been developed for the Yandi Operations, which includes the Yandi PBS Project.

Rio Tinto also adheres to environmental legislation with relevance for managing potential impacts on heritage values (such as dust monitoring), together with Rio Tinto's internal environmental and health compliance policies and procedures.

Specific strategies for minimising impacts to heritage values include:

- Ensuring that ethnographic and archaeological surveys cover all areas where ground disturbance is proposed, using established Aboriginal heritage protocols at Yandicoogina.
- Continuing consultation with the Traditional Owners likely to be affected by the Yandi PBS Project.
- Avoiding Aboriginal heritage sites whenever reasonably practicable in accordance with internal Rio Tinto guidelines and policies.
- Complying with the *Aboriginal Heritage Act 1972.*
- Implementing a CHMP for the Yandi PBS Project, that will include obligations and commitments regarding heritage values at Yandicoogina.
- Appropriately fencing/signposting or barricading key heritage sites outside the footprint area (where approval to disturb is not being sought under the *Aboriginal Heritage Act 1972)* to prevent inadvertent impacts to these sites, or alternative suitable approaches agreed with Traditional Owners.
- Requiring all personal working in the Yandi PBS Project area to attend inductions for the area covering Health, Safety and Environmental requirements, of which heritage is one component.

5.13.3 Anticipated residual impacts

After mitigation and management measures have been applied, the Yandi PBS Project is expected to have the following effects on Aboriginal heritage values:

- Direct disturbance of some archaeological sites - mostly of low archaeological significance. Any disturbance will be in accordance with the provisions of the *Aboriginal Heritage Act 1972* (WA) and will have the consent of the relevant Traditional Owners.
- Some effect on the cultural values of Weeli Wolli Creek - this is associated with the environmental significance of the creek system to Traditional Owners. However, no known ethnographic sites are likely to be affected.

Rio Tinto will maintain ongoing consultation with Aboriginal stakeholders over the life of the Yandi PBS Project, in accordance with processes established for the existing Yandi Operations. Implementing the proposed management measures should ensure that the EPA objective for the protection of Aboriginal heritage is fulfilled.

5.14 PUBLIC RISK

The Yandi PBS Project area is distant from any hazardous industrial plants/processes or high-pressure gas pipelines. The Yandi PBS Project will not impact on any identified water supplies or other significant natural resources. As such, the Yandi PBS Project is considered to have very low potential for generating off-site environmental or social risks.

6 OFFSETS

The EPA applies the following objective in relation to projects likely to have a significant residual environmental impact according to EAG 8:

'To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets.'

6.1 DETERMINATION OF CRITICAL AND HIGH VALUE ASSETS

EPA Position Statement No. 9: Environmental Offsets (EPA 2006a) and EPA Guidance Statement No. 19: Environmental Offsets (EPA 2008a) provide guidance to proponents on the approach needed to determine offset requirements for proposals. The environmental aspects of the Yandi PBS project have undergone a preliminary assessment for their potential value as critical or high value assets as per the definitions and additional criteria presented in these policy documents.

The definitions of critical and high value assets are contained in EPA Position Statement No. 9: Environmental Offsets:

Critical Assets: represent the State's most important environmental assets that must be fully protected and conserved (as defined in Section 4). Significant adverse impacts to these assets should be avoided at all costs. Therefore, the EPA in providing its advice will adopt a presumption against approval of project proposals where significant adverse impacts affect 'critical assets'. However, where projects have been approved by the State Government (see Section 4) approval should be conditional on the:

- *consideration or demonstration (to the maximum extent possible) of onsite impact mitigation; and*
- *development and implementation of an acceptable offsets package for significant, residual adverse impacts.*

High Value Assets: represents those environmental assets that are in good to excellent condition, are considered valuable by the community and / or government, but are not identified as 'critical assets'. Project proposals and offset activities for these assets may be referred to and assessed by the EPA on a case-by-case basis, but are otherwise considered by relevant environmental government agencies.

As described in Section 2.3 the Yandi PBS Project does not contain any assets within a State or Commonwealth Government reserve or protected area.

Vegetation mapping for the Yandi PBS Project to date does not indicate the presence of any vegetation types that qualify for specific legislative protection (i.e. TECs (DPaW 2014b)). Similarly, no PECs have been identified within the PBS Project area (DPaW 2014a, Biota 2014a).

However, the riparian woodland vegetation of the Weeli Wolli creekline has been identified as having local conservation significance, and was one of the environmental values identified in MS914. Additionally, the riparian woodland vegetation extent into the Fortescue Marsh management boundary also represents a significant environmental value.

Vegetation communities mapped within the Yandi PBS Project area were generally found to be in Good to Very Good condition as per the Keighery Condition Scale despite the evidence of **Cenchrus ciliaris* invasion along creek beds and surrounding floodplains.

As described in Section 5.2, the majority of vegetation communities recorded in the Yandi PBS Project are well represented across the Pilbara region. Whilst some occurrences of Priority Listed Species (flora and fauna) have been recorded within the PBS project area, none of these were found to be restricted to the Yandi PBS Project and therefore have not been individually classified as 'high value assets'.

Offset considerations for the Revised PBS Proposal

The key elements for consideration of an offset for the Yandi PBS project include:

- Approximately 2,800ha of clearing for the Yandi PBS Project in vegetation of good to excellent condition.

A subset of this clearing includes:

- Approximately 35ha of direct clearing (including 17ha of excavation for the mine pit development) within the identified Weeli Wolli riparian woodland community of local environmental value (ranging from good to poor condition).

In addition, further potential impacts could include:

- Exposure of a 10km section of the riparian woodland vegetation to the potential effects of drawdown, and ongoing exposure of the existing predicted 17 km wetting footprint in Weeli Wolli of MS 914.

Should an offset be required for the Yandi PBS project, it will be implemented consistent with Condition 10 of MS 914.

7 EPA OBJECTIVES AND PRINCIPLES

In 2003, the EP Act was amended to include the following five core environmental principles. These guide the EPA in carrying out its role and responsibilities (EPA 2004):

- Precautionary principle;
- Principle of intergenerational equity;
- Principle of the conservation of biological diversity and ecological integrity;
- Principles relating to improved valuation, pricing and incentive mechanisms; and
- Principle of waste minimisation.

These principles were taken into account when developing impact mitigation and management measures for the Yandi PBS Project (Table 6-1).

Table 7-1: EPA principles of environmental protection considered in the Yandi PBS Project

Principle	How they are being addressed by the Yandi PBS Project
1. Precautionary principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by: (a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and (b) an assessment of the risk-weighted consequences of various options.	The environmental values of the Yandi PBS Project area have been identified during the planning stage of the project. Comprehensive baseline environmental assessments have been completed; with additional surveys in progress (refer Section 4). Rio Tinto has developed a range of impact mitigation and management tools, which are implemented across its existing Yandicoogina operations. These include risk assessments during the project planning phase to minimise the overall environmental footprint of the Yandi PBS Project. Potential environmental impacts for the Yandi PBS project have been identified, and where feasible have been mitigated, or plausible management measures have been proposed.
2. Intergenerational equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The Rio Tinto HSECQ Policy incorporates the principle of sustainable development and includes the following commitments: • Prioritising research and implementation programs through technology to reduce impacts to land, enhancing our contribution to biodiversity and improving our efficiency in water and energy use. • Identifying climate change improvement solutions through dedicated optimisation work programs. • Contributing to the health and well-being of local communities.

Principle	How they are being addressed by the Yandi PBS Project
	The Yandi PBS Project will not significantly compromise current or foreseeable future land use options in the PBS locality, which include pastoral activities. Community benefits will be derived from indigenous engagement by Rio Tinto for the construction and operational phases. The Yandi PBS Project can be effectively managed to ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
3. Conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	The baseline studies completed to date indicate that the Yandi PBS Project is unlikely to significantly impact biological diversity and ecological integrity at local and regional scales. Where significant potential environmental impacts are identified, measures have been, and will continue to be, incorporated into Proposal design and management to avoid or minimise these impacts where practical. The Rio Tinto HSEQ Management System has well established rehabilitation procedures for restoring disturbed environments.
4. Improved valuation, pricing and incentive mechanisms a. Environmental factors should be included in the valuation of assets and services. b. The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. c. The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. d. Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	Environmental factors have been considered during the Proposal planning phase, and will continue to be considered during the operational and closure phases of the Proposal. Proposal planning, design and operational management will continue to investigate and implement opportunities to reduce impact to land, and improve efficiency in water and energy use, in accordance with the Rio Tinto Iron Ore Group HSECQ Policy. The Yandi PBS Project is incorporated into a broader Yandicoogina Life of Mine Closure Plan, prepared in accordance with the Department of Mines and Petroleum (DMP) and EPA *Guidelines for Preparing Mine Closure Plans* (June 2011) and the Rio Tinto Closure Standard. This will provide the basis for ensuring that post-mining land use objectives are identified (through a consultative process) and can be met. Rio Tinto will undertake land rehabilitation activities to underpin the mine closure process.

Principle	How they are being addressed by the Yandi PBS Project
5. Waste minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	Application of the Rio Tinto environmental management policies, systems and procedures, and Life of Mine Closure Plan (see above), will provide the basis for minimising the generation of waste and its discharge into the environment. In addition to existing Part V licence requirements Rio Tinto will manage in accordance with the relevant legislation.

8 PROPOSED REVISION TO SCHEDULE 1 OF MS 914

Table 8-1 provides details regarding the proposed changes to Schedule 1 of MS 914.

The key changes reflect the additional clearing, dewatering and associated infrastructure to support the development of the new mine pit at Pocket and Billiard South, and tie in with existing Yandicoogina Operations.

Table 8-1: Proposed Key Characteristics of the Revised Yandicoogina Project (MS 914)

Element	Description	Proposed Change
Clearing	Up to 5,600 ha within Restricted Clearing Area 1; and Up to 60 ha within Restricted Clearing Area 2	Up to 8,400 ha within the Project envelope Up to 95 ha within [Revised] Restricted Clearing Area 2
Dewatering from Junction South East and Junction Central Operations	No more than 35GL/y	No more than 83 GL/a for the entire Yandicoogina Operations
Dewatering from Junction South West A, Junction South West C and Oxbow Operations	No more than 18GL/y	
Surface Water Discharge from Junction South West A, Junction South West C and Oxbow Operations	Up to 16 GL/y	No more than 80 GL/a for the entire Yandicoogina Operations

9 REFERENCES

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10 APPENDICES

Appendix 1 : Completed Proponent EPA Referral Form for the Yandi PBS Project.

GOVERNMENT OF WESTERN AUSTRALIA

Environmental Protection Authority

EPA REFERRAL FORM PROPONENT

Referral of a Proposal by the Proponent to the Environmental Protection Authority under Section 38(1) of the *Environmental Protection Act 1986*.

PURPOSE OF THIS FORM

Section 38(1) of the *Environmental Protection Act 1986* (EP Act) provides that where a development proposal is likely to have a significant effect on the environment, a proponent may refer the proposal to the Environmental Protection Authority (EPA) for a decision on whether or not it requires assessment under the EP Act. This form sets out the information requirements for the referral of a proposal by a proponent.

Proponents are encouraged to familiarise themselves with the EPA's *General Guide on Referral of Proposals* [see Environmental Impact Assessment/Referral of Proposals and Schemes] before completing this form.

A referral under section 38(1) of the EP Act by a proponent to the EPA must be made on this form. A request to the EPA for a declaration under section 39B (derived proposal) must be made on this form. This form will be treated as a referral provided all information required by Part A has been included and all information requested by Part B has been provided to the extent that it is pertinent to the proposal being referred. Referral documents are to be submitted in two formats – hard copy and electronic copy. The electronic copy of the referral will be provided for public comment for a period of 7 days, prior to the EPA making its decision on whether or not to assess the proposal.

CHECKLIST

Before you submit this form, please check that you have:

	Yes	No
Completed all the questions in Part A (essential).	✓	
Completed all applicable questions in Part B.	✓	
Included Attachment 1 – location maps.	✓	
Included Attachment 2 – additional document(s) the proponent wishes to provide (if applicable).	✓	
Included Attachment 3 – confidential information (if applicable).		✓ N/A
Enclosed an electronic copy of all referral information, including spatial data and contextual mapping but excluding confidential information.	✓	

Following a review of the information presented in this form, please consider the following question (a response is optional).

Do you consider the proposal requires formal environmental impact assessment?
☒ Yes ☐ No ☐ Not sure
If yes, what level of assessment?
☒ Assessment on Proponent Information ☐ Public Environmental Review

PROPONENT DECLARATION (to be completed by the proponent)

I, Michael Gollschewski *(full name)* declare that I am authorised on behalf of Hamersley Iron – Yandi Pty Limited (being the person responsible for the proposal) to submit this form and further declare that the information contained in this form is true and not misleading.

Signature 	Name (print) Michael Gollschewski
Position Managing Director Pilbara Mines	Company Rio Tinto Iron Ore
Date 4 July 2014	

PART A - PROPONENT AND PROPOSAL INFORMATION
(All fields of Part A must be completed for this document to be treated as a referral)

1 PROPONENT AND PROPOSAL INFORMATION

1.1 Proponent

Name	Hamersley Iron - Yandi Pty Limited
Joint Venture parties (if applicable)	N/A
Australian Company Number (if applicable)	ABN: 009 181 793
Postal Address (where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State)	GPO Box A42, Perth, WA 6837
Key proponent contact for the proposal: • name • address • phone • email	Ms Melinda Brand Principal Advisor Environmental Approvals Rio Tinto Tel: (08) 6211 6991 Fax: (08) 9327 2696 E-mail: melinda.brand@riotinto.com
Consultant for the proposal (if applicable): • name • address • phone • email	N/A

1.2 Proposal

Title	Yandicoogina Pocket and Billiard South Iron Ore Mine	
Description	Construction and operation of a major brownfields Iron Ore mining operation at Yandicoogina in the central Pilbara region.	
Extent (area) of proposed ground disturbance.	Up to 2,800 hectares	
Timeframe in which the activity or development is proposed to occur (including start and finish dates where applicable).	Construction scheduled 2016 and production proposed to start in 2017. Project Life >16 years.	
Details of any staging of the proposal.	N/A	
Is the proposal a strategic proposal?	No	
Is the proponent requesting a declaration that the proposal is a derived proposal? If so, provide the following information on the strategic assessment within which the referred proposal was identified: • title of the strategic assessment; and • Ministerial Statement number.	No	
Please indicate whether, and in what way, the	The Proposal will involve connection	

proposal is related to other proposals in the region.	to existing Rio Tinto mining operations at Yandicoogina and rail networks.	
Does the proponent own the land on which the proposal is to be established? If not, what other arrangements have been established to access the land?	The entire Yandicoogina mining operation is contained within ML274SA held by Hamersley Iron – Yandi Pty Limited. The PBS project area is located within the Marillana Station Pastoral Lease (L3114984) held by a BHP Billiton subsidiary.	
What is the current land use on the property, and the extent (area in hectares) of the property?	Pastoral land use. The proposed mining area is contained within Pastoral Lease L3114 984 (Marillana Station).	

1.3 Location

Name of the Shire in which the proposal is located.	Shire of East Pilbara
For urban areas: • street address; • lot number; • suburb; and • nearest road intersection.	N/A
For remote localities: • nearest town; and • distance and direction from that town to the proposal site.	Approximately 90 km north-west of Newman and 300 km south-east of Dampier.
Electronic copy of spatial data - GIS or CAD, geo-referenced and conforming to the following parameters: • GIS: polygons representing all activities and named; • CAD: simple closed polygons representing all activities and named; • datum: GDA94; • projection: Geographic (latitude/longitude) or Map Grid of Australia (MGA); • format: Arcview shapefile, Arcinfo coverages, Microstation or AutoCAD.	Enclosed?: Yes GIS polygons (Arcview shapefiles) are attached on CD

1.4 Confidential Information

Does the proponent wish to request the EPA to allow any part of the referral information to be treated as confidential?	No
If yes, is confidential information attached as a separate document in hard copy?	N/A

1.5 Government Approvals

Is rezoning of any land required before the proposal can be implemented? If yes, please provide details.		No	
Is approval required from any Commonwealth or State Government agency or Local Authority for any part of the proposal? If yes, please complete the table below.		Yes – Project will be referred under the EPBC Act	
Agency/Authority	Approval required	Application lodged Yes / No	Agency/Local Authority contact(s) for proposal
Department of Environment and Conservation	Works approvals and licences	No	N/A
Department of Water	Licences to take water and manage its use, and construct and alter wells	No	N/A
Department of Mines and Petroleum	Clearing permits	No	N/A
Shire of East Pilbara	Development approval under the Shire Town Planning Scheme No. 4	No	N/A

PART B - ENVIRONMENTAL IMPACTS AND PROPOSED MANAGEMENT

2. ENVIRONMENTAL IMPACTS

Describe the impacts of the proposal on the following elements of the environment, by answering the questions contained in Sections 2.1-2.11:

2.1 flora and vegetation; Section 5.2

2.2 fauna; Sections 5.3 and 5.4

2.3 rivers, creeks, wetlands and estuaries; Section 5.5

2.4 significant areas and/ or land features; Section 5

2.5 coastal zone areas; N/A

2.6 marine areas and biota; N/A

2.7 water supply and drainage catchments; Sections 5.5 and 5.6

2.8 pollution; Sections 5.6

2.9 greenhouse gas emissions; Section 5.10

2.10 contamination Sections 5.6; and

2.11 social surroundings. Sections 5.7, 5.12 and 5.13.

Further detail is provided in the Referral Supporting Information Document. Relevant document sections are listed against the above items.

These features should be shown on the site plan, where appropriate.

For all information, please indicate:

(a) the source of the information; and

(b) the currency of the information.

Details regarding the sources and currency of information are provided in the Section 38 Referral Supporting Information Document.

2.1 Flora and Vegetation

2.1.1 Do you propose to clear any native flora and vegetation as a part of this proposal?

[A proposal to clear native vegetation may require a clearing permit under Part V of the EP Act (Environmental Protection (Clearing of Native Vegetation) Regulations 2004)]. Please contact the Department of Environment and Conservation (DEC) for more information.

(please tick) ✓ Yes **If yes**, complete the rest of this section.

If no, go to the next section

2.1.2 How much vegetation are you proposing to clear (in hectares)?

Up to 2,800 ha.

This includes up to 2,500 ha in proposed mining/waste stockpiles and up to 300 ha for infrastructure.

2.1.3 Have you submitted an application to clear native vegetation to the DEC (unless you are exempt from such a requirement)?

✓ No

If yes, on what date and to which office was the application submitted of the DEC?

2.1.4 Are you aware of any recent flora surveys carried out over the area to be disturbed by this proposal?

✓ Yes

If yes, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey(s).

If no, please do not arrange to have any biological surveys conducted prior to consulting with the DEC.

Hamersley Iron - Yandi Pty Limited has commissioned vegetation and flora surveys in the Pocket and Billiard South (**the Proposal**) area during 2009 and 2014 as a component of developing the Proposal. The key findings are described in Section 4.7 of the Referral Supporting Information Document.

2.1.5 Has a search of DEC records for known occurrences of rare or priority flora or threatened ecological communities been conducted for the site?

✓ Yes

If you are proposing to clear native vegetation for any part of your proposal, a search of DEC records of known occurrences of rare or priority flora and threatened ecological communities will be required. Please contact DEC for more information.

This has been completed as a component of the Proposal area vegetation and flora surveys. Further information is provided in Section 4.7 of the Referral Supporting Information Document.

2.1.6 Are there any known occurrences of rare or priority flora or threatened ecological communities on the site?

✓ Yes

If yes, please indicate which species or communities are involved and provide copies of any correspondence with DEC regarding these matters.

Although some occurrences of DRF and priority flora have been recorded in the broader Yandicoogina operations locality, surveys of the Proposal area to date have identified only one Priority 4 flora species occurring within the proposal area: *Goodenia nuda.* Further information is provided in Section 4.7 of the Referral Supporting Information Document.

2.1.7 If located within the Perth Metropolitan Region, is the proposed development within or adjacent to a listed Bush Forever Site? (You will need to contact the Bush Forever Office, at the Department for Planning and Infrastructure)

✓ No

If yes, please indicate which Bush Forever Site is affected (site number and name of site where appropriate).

2.1.8 What is the condition of the vegetation at the site?

The vegetation surveys completed to date indicate that the project area does not contain a particularly high level of vegetation or plant species diversity for the Pilbara Bioregion.

Most of the vegetation mapped within the Proposal area was in Good to Very Good condition; however the vegetation mapped within the creekline and floodplain habitats ranged from Good to Very Poor condition due to weed invasion and disturbance from cattle.

2.2 Fauna

2.2.1 Do you expect that any fauna or fauna habitat will be impacted by the proposal?

(please tick) ✓ Yes

If yes, complete the rest of this section.

If no, go to the next section.

2.2.2 Describe the nature and extent of the expected impact.

Up to 2,800 hectares of native habitat will be cleared. Further information is provided in Section 4.8 & 4.9 of the Referral Supporting Information Document.

2.2.3 Are you aware of any recent fauna surveys carried out over the area to be disturbed by this proposal?

✓ Yes

If yes, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey(s).

If no, please do not arrange to have any biological surveys conducted prior to consulting with the DEC.

Hamersley Iron – Yandi Pty Limited has commissioned vertebrate fauna surveys in the Proposal area during 2009 and 2014 as a component of developing the Proposal. One Schedule 1 fauna species (Pilbara Olive Python) was recorded to the north of the proposal area; two Schedule 3 migratory avifauna (Fork-tailed swift and Rainbow Bee-eater) and Four Priority 4 fauna (Star Finch, Australian Bustard and Western Pebble-mound Mouse) were also recorded within the Proposal area. Details of the key findings are described in Section 4.8 and 4.9 of the Referral Supporting Information Document.

2.2.4 Has a search of DEC records for known occurrences of Specially Protected (threatened) fauna been conducted for the site?

✓ Yes

(please tick)

2.2.5 Are there any known occurrences of Specially Protected (threatened) fauna on the site?

✓ Yes ☐ No **If yes**, please indicate which species or communities are involved and provide copies of any correspondence with DEC regarding these matters.

Some Specially Protected (Threatened) fauna have been recorded within the Proposal area. Further information is provided in Section 4.8 of the Referral Supporting Information Document.

2.3 Rivers, Creeks, Wetlands and Estuaries

2.3.1 Will the development occur within 200 metres of a river, creek, wetland or estuary?

(please tick) ✓ Yes **If yes**, complete the rest of this section.

If no, go to the next section.

2.3.2 Will the development result in the clearing of vegetation within the 200 metre zone?

✓ Yes **If yes**, please describe the extent of the expected impact.

Clearing activities and landscape modification resulting from the development of mine pits and supporting access roads, ore handling and rail load-out facilities, waste dumps and flood protection structures at Weeli Wolli Creek.

2.3.3 Will the development result in the filling or excavation of a river, creek, wetland or estuary?

✓ Yes **If yes**, please describe the extent of the expected impact.

The Proposal is entirely located on the east side of Weeli Wolli creek, however the proposal will require a small encroachment of the mine pit into the mapped riparian woodland area of approximately 17ha. An additional 18ha of clearing within this area will also be required to support mine infrastructure including a flood protection levee and a creek crossing required to access the facilities at the existing Yandicoogina operations which are located on the western side of Weeli Wolli creek. Total clearing of approximately 35ha within the mapped riparian woodland extent

2.3.4 Will the development result in the impoundment of a river, creek, wetland or estuary?

✓ No **If yes**, please describe the extent of the expected impact.

2.3.5 Will the development result in draining to a river, creek, wetland or estuary?

✓ Yes **If yes**, please describe the extent of the expected impact.

2.3.6 Are you aware if the proposal will impact on a river, creek, wetland or estuary (or its buffer) within one of the following categories? (please tick)

Conservation Category Wetland	☐ Yes	✓ **No**	☐ Unsure
Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998	☐ Yes	✓ **No**	☐ Unsure
Perth's Bush Forever site	☐ Yes	✓ **No**	☐ Unsure
Environmental Protection (Swan & Canning Rivers) Policy 1998	☐ Yes	✓ **No**	☐ Unsure
The management area as defined in s4(1) of the *Swan River Trust Act 1988*	☐ Yes	✓ **No**	☐ Unsure
Which is subject to an international agreement, because of the importance of the wetland for waterbirds and waterbird habitats (e.g. Ramsar, JAMBA, CAMBA)	☐ Yes	✓ **No**	☐ Unsure

2.4 Significant Areas and/ or Land Features

2.4.1 Is the proposed development located within or adjacent to an existing or proposed National Park or Nature Reserve?

✓ **No** **If yes**, please provide details.

2.4.2 Are you aware of any Environmentally Sensitive Areas (as declared by the Minister under section 51B of the EP Act) that will be impacted by the proposed development?

✓ **No** **If yes**, please provide details.

2.4.3 Are you aware of any significant natural land features (e.g. caves, ranges etc) that will be impacted by the proposed development?

☐ Yes ✓ **No** **If yes**, please provide details.

2.5 Coastal Zone Areas (Coastal Dunes and Beaches)

2.5.1 Will the development occur within 300metres of a coastal area?

(please tick) ✓ No **If yes**, complete the rest of this section.

If no, go to the next section.

2.5.2 What is the expected setback of the development from the high tide level and from the primary dune?

2.5.3 Will the development impact on coastal areas with significant landforms including beach ridge plain, cuspate headland, coastal dunes or karst?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.5.4 Is the development likely to impact on mangroves?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.6 Marine Areas and Biota

2.6.1 Is the development likely to impact on an area of sensitive benthic communities, such as seagrasses, coral reefs or mangroves?

✓ No **If yes**, please describe the extent of the expected impact.

2.6.2 Is the development likely to impact on marine conservation reserves or areas recommended for reservation (as described in *A Representative Marine Reserve System for Western Australia*, CALM, 1994)?

✓ No **If yes**, please describe the extent of the expected impact.

2.6.3 Is the development likely to impact on marine areas used extensively for recreation or for commercial fishing activities?

✓ No **If yes**, please describe the extent of the expected impact, and provide any written advice from relevant agencies (e.g. Fisheries WA).

2.7 Water Supply and Drainage Catchments

2.7.1 Are you in a proclaimed or proposed groundwater or surface water protection area?

(You may need to contact the Department of Water (DoW) for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the DoW website)

✓ No **If yes**, please describe what category of area.

2.7.2 Are you in an existing or proposed Underground Water Supply and Pollution Control area?

(You may need to contact the DoW for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the DoW website)

✓ No **If yes**, please describe what category of area.

2.7.3 Are you in a Public Drinking Water Supply Area (PDWSA)?

(You may need to contact the DoW for more information or refer to the DoW website. A proposal to clear vegetation within a PDWSA requires approval from DoW.)

✓ No **If yes**, please describe what category of area.

2.7.4 Is there sufficient water available for the proposal?

(Please consult with the DoW as to whether approvals are required to source water as you propose. Where necessary, please provide a letter of intent from the DoW)

✓ Yes (please tick)

Process water supply is proposed via abstraction of water from within mining deposits and potable water sourced from the borefields servicing the current Yandicoogina operations.

2.7.5 Will the proposal require drainage of the land?

✓ No **If yes**, how is the site to be drained and will the drainage be connected to an existing Local Authority or Water Corporation drainage system? Please provide details.

2.7.6 Is there a water requirement for the construction and/ or operation of this proposal?

(please tick) ✓ Yes **If yes**, complete the rest of this section.

If no, go to the next section.

2.7.7 What is the water requirement for the construction and operation of this proposal, in kilolitres per year?

Preliminary conceptual peak water demand estimates for the Project are described in Section 4.5.3 of the Referral Supporting Information Document. Peak water demand is for the Proposal is estimated to be in the order of 30,000,000 kl/year (30 Gl/year).

2.7.8 What is the proposed source of water for the proposal? (e.g. dam, bore, surface water etc.)

The proposed water source will be abstraction of water from within the local aquifer (Channel Iron Deposit) through mine dewatering. This will include abstraction for potable water sourced from the borefields servicing the current Yandicoogina operations

2.8 Pollution

2.8.1 Is there likely to be any discharge of pollutants from this development, such as noise, vibration, gaseous emissions, dust, liquid effluent, solid waste or other pollutants?

(please tick) ✓ Yes **If yes**, complete the rest of this section.

If no, go to the next section.

2.8.2 Is the proposal a prescribed premise, under the Environmental Protection Regulations 1987?

(Refer to the EPA's *General Guide for Referral of Proposals to the EPA under section 38(1) of the EP Act 1986* for more information)

✓ Yes **If yes**, please describe what category of prescribed premise.

The proposal potentially includes components that are expected to be prescribed premises under the following *Environmental Protection Regulations 1987* categories:

- Category 05(a) - Processing or beneficiation of metallic or non-metallic ore
- Category 6 − Mine Dewatering
- Category 12 – Screening of material

2.8.3 Will the proposal result in gaseous emissions to air?

✓ Yes **If yes**, please briefly describe.

Gaseous emissions associated with construction and mining activities will include diesel combustion products from mobile equipment and nitrogen compounds from blasting. Further information is provided in Section 5.10 of the Referral Supporting Information Document.

2.8.4 Have you done any modelling or analysis to demonstrate that air quality standards will be met, including consideration of cumulative impacts from other emission sources?

✓ No **If yes**, please briefly describe.

The Proposal will result in minor emissions as a result of mining activities, including blasting, vehicle movements and processing. Gaseous air emissions will be localised and highly dispersed and therefore are unlikely to represent a significant environmental issue.

2.8.5 Will the proposal result in liquid effluent discharge?

✓ No **If yes**, please briefly describe the nature, concentrations and receiving environment.

It is possible that effluent streams containing hydrocarbons or sediments could arise from wash down and hydrocarbon storage areas. There may also be effluent streams from sewerage treatment plant facilities. These will be managed through licensing under Part V of the EP Act.

2.8.6 If there is likely to be discharges to a watercourse or marine environment, has any analysis been done to demonstrate that the State Water Quality Management Strategy or other appropriate standards will be able to be met?

✓ Yes **If yes**, please describe.

The groundwater in the Proposal area is classified as fresh. The Proposal will result in the abstraction of groundwater and subsequent discharge into local freshwater ephemeral creeklines. Existing operational management controls include monitoring for water quality in line with ANZECC/ARMCANZ (2000) guidelines.

2.8.7 Will the proposal produce or result in solid wastes?

✓ Yes **If yes**, please briefly describe the nature, concentrations and disposal location/ method.

Solid waste such as office, food scraps, building waste will be generated. Inert and putrescible solid waste will be disposed of at licenced and managed facilities established within the project area. Waste that cannot be disposed at this landfill will be collected and disposed at a licensed facility located off site.

Waste rock material will be deposited in temporary surface stockpiles before being used to backfill the mine pit.

2.8.8 Will the proposal result in significant off-site noise emissions?

✓ No **If yes**, please briefly describe.

Noise generation will be localised and subject to management controls. Noise sources include blasting and excavation at the new mine pits, ore processing and vehicle and rail movements. The Proposal area does not include and is distant from any noise sensitive premises as defined in the *Environmental Protection (Noise) Regulations*.

2.8.9 Will the development be subject to the Environmental Protection (Noise) Regulations 1997?

✓ No **If yes**, has any analysis been carried out to demonstrate that the proposal will comply with the Regulations?

Please attach the analysis.

2.8.10 Does the proposal have the potential to generate off-site, air quality impacts, dust, odour or another pollutant that may affect the amenity of residents and other "sensitive premises" such as schools and hospitals (proposals in this category may include intensive agriculture, aquaculture, marinas, mines and quarries etc.)?

✓ No **If yes**, please describe and provide the distance to residences and other "sensitive premises".

The Proposal area does not include and is distant from any residential or otherwise sensitive premises. Dust generation will be localised and subject to on-site management controls.

2.8.11 If the proposal has a residential component or involves "sensitive premises", is it located near a land use that may discharge a pollutant?

✓ No **If yes**, please describe and provide the distance to the potential pollution source

2.9 Greenhouse Gas Emissions

2.9.1 Is this proposal likely to result in substantial greenhouse gas emissions (greater than 100 000 tonnes per annum of carbon dioxide equivalent emissions)?

✓ No **If yes**, please provide an estimate of the annual gross emissions in absolute and in carbon dioxide equivalent figures.

The emissions intensity of the mining operation at Yandicoogina is relatively low compared with other iron ore projects in the Pilbara region, in the order of 3 to 5 kg CO_2equiv. per tonne of mined product (excluding rail and port shipment). Based on existing data it is believed GHG emissions from the Proposal will be less than 100,000 tonnes CO_2equiv/a over the life of the project.

2.9.2 Further, if yes, please describe proposed measures to minimise emissions, and any sink enhancement actions proposed to offset emissions.

Further details are provided in the Referral Information Supporting Document, Section 5.10 and 5.11.

2.10 Contamination

2.10.1 Has the property on which the proposal is to be located been used in the past for activities which may have caused soil or groundwater contamination?

✓ No **If yes**, please describe.

2.10.2 Has any assessment been done for soil or groundwater contamination on the site?

✓ No **If yes**, please describe.

2.10.3 Has the site been registered as a contaminated site under the *Contaminated Sites Act 2003*? (on finalisation of the CS Regulations and proclamation of the CS Act)

☐ Yes ✓ No **If yes**, please describe.

2.11 Social Surroundings

2.11.1 Is the proposal on a property which contains or is near a site of Aboriginal ethnographic or archaeological significance that may be disturbed?

✓ Yes **If yes**, please describe.

Extensive archaeological and ethnographic surveys have been undertaken within the Yandicoogina locality. A number of archaeological sites have been identified

ranging from low to high archaeological and cultural significance. Weeli Wolli and Marillana Creek are identified ethnographic sites. Existing management controls will be applied to avoid identified heritage sites (where feasible). Where heritage sites cannot be avoided, a Section 18 application under the *Aboriginal Heritage Act 1972* will be submitted in consultation with the traditional owner group/s.

2.11.2 Is the proposal on a property which contains or is near a site of high public interest (e.g. a major recreation area or natural scenic feature)?

✓ No **If yes**, please describe.

The Proposal is located near a major creek line and a spring which has local and Traditional owner interest, however is not considered a major recreational area due to limited public access.

2.11.3 Will the proposal result in or require substantial transport of goods, which may affect the amenity of the local area?

✓ No **If yes**, please describe.

The Proposal will involve transport of iron ore to port facilities using Rio Tinto's exiting Pilbara rail network.

3. PROPOSED MANAGEMENT

3.1 Principles of Environmental Protection

3.1.1 Have you considered how your project gives attention to the following Principles, as set out in section 4A of the EP Act? (For information on the Principles of Environmental Protection, please see EPA Position Statement No. 7, available on the EPA website)

1. The precautionary principle.	✓ Yes	☐ No
2. The principle of intergenerational equity.	✓ Yes	☐ No
3. The principle of the conservation of biological diversity and ecological integrity.	✓ Yes	☐ No
4. Principles relating to improved valuation, pricing and incentive mechanisms.	✓ Yes	☐ No
5. The principle of waste minimisation.	✓ Yes	☐ No

Refer to Section 7 of the Referral Supporting Information Document for additional details.

3.1.2 Is the proposal consistent with the EPA's Environmental Protection Bulletins/Position Statements and Environmental Assessment Guidelines/Guidance Statements (available on the EPA website)?

✓ Yes ☐ No

3.2 Consultation

3.2.1 Has public consultation taken place (such as with other government agencies, community groups or neighbours), or is it intended that consultation shall take place?

✓ Yes ☐ No **If yes**, please list those consulted and attach comments or summarise response on a separate sheet.

Pre-referral meetings and general discussion on aspects of the project have been held with the OEPA, DPaW, DoW, DoE and DMP. In addition, an overview of the project has been provided to the traditional owners. Further consultation is proposed as more details of the Proposal and relevant stakeholders are identified.

Appendix 2: Ministerial Statement 914

MINISTER FOR ENVIRONMENT; WATER

Statement No. 914

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

YANDICOOGINA IRON ORE PROJECT – EXPANSION TO INCLUDE JUNCTION SOUTH WEST AND OXBOW DEPOSITS

Proposal: The proposal includes the existing Hamersley Yandicoogina iron ore project and proposed expansion. The existing project includes open pit mining at the Junction Central and Junction South East operations and associated infrastructure, dewatering activities, closure and rehabilitation. The expansion includes the development of new pits at Junction South West and Oxbow, temporary waste landforms, the development of new infrastructure, additional dewatering and water disposal activities. The proposal is located in the central Pilbara region of Western Australia, on mining lease 274SA.

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

Proponent: Hamersley Iron Pty. Limited

Proponent Address: Level 22
Central Park 152-158 St Georges Terrace,
PERTH WA 6000

Assessment Number: 1726

Previous Assessment Numbers: 979, 1174, 1590

Report of the Environmental Protection Authority: 1448

Previous Reports of the Environmental Protection Authority: 809, 946, 1195

Previous Statement Numbers: 417, 523, 695 (Published on 25 May 1996, 1 October 1999, 25 October 2005 respectively).

The implementation conditions of this statement supersede the implementation conditions of Statements 417, 523 and 695 in accordance with section 45B of the *Environmental Protection Act 1986.* The proposal referred to in the above reports of the Environmental Protection Authority may be implemented. The implementation of these proposals is subject to the following implementation conditions and procedures, unless specifically stated otherwise within this Statement and Schedule 2 details definitions of terms and phrases used in the implementation conditions and procedures.

Published on

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www.ministers.wa.gov.au/marmion

Proposal Implementation

1-1 When implementing the proposal, the proponent shall not exceed the authorised extent of the proposal as defined in Column 3 of table 2 in Schedule 1, unless amendments to the proposal and the authorised extent of the Proposal has been approved under the EP Act.

Contact Details

2-1 The proponent shall notify the CEO of any change of its name, physical address or postal address for the serving of notices or other correspondence within 28 days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.

Time Limit for Proposal Implementation

3-1 The proponent shall not commence implementation of the proposal after the expiration of five years from the date of this statement, and any commencement, within this five year period, must be substantial.

3-2 Any commencement of implementation of the proposal, within five years from the date of this statement, must be demonstrated as substantial by providing the CEO with written evidence, on or before the expiration of five years from the date of this statement.

Compliance Reporting

4-1 The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the CEO.

4-2 The proponent shall submit to the CEO the compliance assessment plan required by condition 4-1 at least six months prior to the first compliance report required by condition 4-6, or prior to implementation, whichever is sooner.

The compliance assessment plan shall indicate:

(1) the frequency of compliance reporting;

(2) the approach and timing of compliance assessments;

(3) the retention of compliance assessments;

(4) the method of reporting of potential non-compliances and corrective actions taken;

(5) the table of contents of compliance assessment reports; and

(6) public availability of compliance assessment reports.

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

4-4 The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the CEO.

4-5 The proponent shall advise the CEO of any potential non-compliance within seven days of that non-compliance being known.

4-6 The proponent shall submit to the CEO a compliance assessment report by the end of April each year addressing compliance in the previous calendar year. The first compliance assessment report must be submitted by 30 April 2013 addressing compliance for the period from the date of issue of this statement, notwithstanding that the first reporting may be less than 12 months.

The compliance assessment report shall:

(1) be endorsed by the proponent's Managing Director / General Manager / Chief Executive Officer or a person delegated to sign on the Managing Director's / General Manager's / Chief Executive Officer's behalf;

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

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

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

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

Public Availability of Data

5-1 Subject to condition 5-2, within six months of the issue of this satement and for the remainder of the life of the proposal the proponent shall make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products [e.g. maps]) relevant to the assessment of this proposal and implementation of this statement.

5-2 If any data referred to in condition 5-1 contains particulars of:
(1) a secret formula or process; or
(2) confidential commercially sensitive information

The proponent may submit a request for approval from the CEO to not make this data publically available. In making such a request the Proponent shall provide the CEO with an explanation and reasons why the data should not be made publically available.

Surface Water Discharge (Protection of Weeli Wolli Creek)

6-1 The proponent shall ensure that the discharge of excess water from the Yandicoogina Iron Ore Project – Expansion to Include Junction SouthWest and Oxbow Deposits as a result of mining does not cause long term impacts to environmental values of the Weeli Wolli Creek System.

6-2 To verify that condition 6-1 is being met, the proponent shall develop an Environmental Values Statement for the Weeli Wolli Creek System that defines the environmental values of the Weeli Wolli Creek System to the satisfaction of the CEO in consultation with the DEC.

6-3 The proponent shall ensure that dewatering discharge from the Yandicoogina Iron Ore Project – Expansion to Include Junction South West and Oxbow Deposits does not cause water flow or pooling further than 17 kilometres downstream from the Marillana Creek and Weeli Wolli Creek System Confluence.

6-4 The proponent shall ensure that any dewater discharged to the environment does not exceed whichever is greater of the following:

(1) the default trigger for the protection of marine and freshwater ecosystems as per the Australian and New Zealand Environmental and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ (2000)) *Australian Water Quality Guidelines for Fresh and Marine Waters* and its updates; or

(2) baseline levels identified pursuant to condition 6-6(3).

6-5 The proponent shall prepare a Water Discharge Monitoring and Management Plan.

6-6 The Water Discharge Monitoring and Management Plan required pursuant to condition 6-5 shall:

(1) when implemented, require the proponent to monitor to substantiate whether condition 6-1, 6-3 and 6-4 are being met;

(2) when implemented, require the proponent to manage the implementation of the proposal to meet the requirements of condition 6-1, 6-3 and 6-4;

(3) identify water quality baseline levels at the Western tenement boundary for the criteria measured under the Australian and New Zealand Environmental and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ (2000)) *Australian Water Quality Guidelines for Fresh and Marine Waters* and its updates;

(4) require the proponent to monitor the hydrology, extent of discharges and ecology of the Weeli Wolli Creek System;

(5) include provisions for remediating the Weeli Wolli Creek System to ensure that identified environmental values associated with the Weeli Wolli Creek System and any downstream ecosystems, including the Fortescue Marsh, are maintained.

6-7 Prior to commencing groundwater abstraction from or excavation below the water table at Junction South West A, Junction South West C and Oxbow and until advised otherwise by the CEO, the proponent shall implement the approved Water Discharge Monitoring and Management Plan.

6-8 Commencing on the date of this statement and until it commences implementation of the approved Water Discharge Monitoring and Management Plan in accordance with condition 6-7, the proponent shall implement Section 1 Groundwater Management Plan and Section 2 Surface Water Management Plan of Part 3 – Management Plans of the *Yandicoogina iron Ore Environmental Management Program (March 2011).*

6-9 The proponent shall annually submit the results of monitoring required by condition 6-6, in the compliance assessment report required by condition 4-6.

Riparian Vegetation

7-1 The proponent shall ensure that groundwater abstraction does not cause clearing or loss of vegetation or groundwater dependent ecosystems outside Zones 1, 2, 2a, 3, 3a, 4 and 5 as shown in Figure 1.

7-2 The proponent shall ensure that dewatering discharge does not cause clearing or loss of vegetation or groundwater dependent ecosystems outside Zones 1, 2, 2a, 3, 3a, 4 and 5.

7-3 The proponent shall manage the proposal in a manner that ensures there is no irreversible impact to riparian vegetation or groundwater dependent ecosystems within Zones 1, 2, 2a, 3, 3a, 4 and 5.

7-4 The proponent shall prepare a Vegetation and Groundwater Dependent Ecosystems Monitoring and Management Plan.

7-5 The Vegetation and Groundwater Dependent Ecosystems Monitoring and Management Plan required pursuant to condition 7-4 shall:

(1) when implemented, require the proponent to manage the implementation of the proposal to meet the requirements of conditions 7-1, 7-2, and 7-3;

(2) when implemented, require the proposal to monitor to substantiate whether conditions 7-1, 7-2 and 7-3 are being met;

(3) require the proponent to minimise impact to riparian vegetation and groundwater dependent ecosystems from groundwater abstraction and dewatering discharge;

(4) require the proponent to maintain the abundance, diversity, geographical distribution and productivity of vegetation communities through the avoidance or management of adverse impacts and improvement in knowledge;

(5) require the proponent to maintain the flow paths, quantity and quality of water within Marillana, Yandicoogina and Weeli Wolli Creeks and the underlying aquifers to protect the surface water and groundwater dependent ecological systems;

(6) identify potential impact monitoring and control sites between the Oxbow pit and the Fortescue Marsh;

(7) require the proponent to design a survey to acquire baseline biotic data, including health and abundance parameters and environmental data;

(8) define health and abundance parameters;

(9) define monitoring frequency and timing;

(10) identify criteria to measure any decline in health;

(11) define critical correlative environmental parameters, including groundwater drawdown;

(12) define trigger levels for no impact;

(13) define trigger levels for no irreversible impact;

(14) provide details of management actions and strategies to be implemented should trigger levels defined pursuant to condition 7-5(12) be exceeded outside Zones 1, 2, 2a, 3, 3a, 4 and 5; and

(15) provide details of management actions and strategies to be implemented should trigger levels defined pursuant to condition 7-5(13) be exceeded within Zones 1, 2, 2a, 3, 3a, 4 or 5.

7-6 Prior to commencing groundwater abstraction from or excavation below the water table at Junction South West A, Junction South West C and Oxbow and until advised otherwise by the CEO, the proponent shall implement the approved Vegetation and Groundwater Dependent Ecosystems Monitoring and Management Plan.

7-7 The proponent shall review and revise the approved Vegetation and Groundwater Dependent Ecosystems Monitoring and Management Plan at intervals not exceeding five years, to the approval of the CEO.

7-8 Commencing on the date of this statement and until it commences implementation of the approved Vegetation and Groundwater Dependent Ecosystems Monitoring and Management Plan in accordance with condition 7-6, the proponent shall implement Section 6 Riparian vegetation management Plan Part 3 – Management Plans of the *Yandicoogina Iron Ore Environmental Management Program (March 2011).*

7-9 In the event that monitoring, undertaken pursuant to condition 7-6, identifies that trigger levels for no impact, defined pursuant to condition 7-5(12), have been or are being exceeded outside Zones 1, 2, 2a, 3, 3a, 4 and 5, the proponent shall implement management actions and strategies defined in condition 7-5(14) to the satisfaction of the CEO.

7-10 In the event that monitoring, undertaken pursuant to condition 7-6, identifies that trigger levels for no irreversible impact, defined pursuant to condition 7-5(13), have been or are being exceeded within Zones 1, 2, 2a, 3, 3a, 4 or 5, the proponent shall implement management actions and strategies defined in condition 7-5(15) to the satisfaction of the CEO.

Weeds

8-1 The proponent shall ensure:

(1) no increase in the species of weeds (including both declared weeds and environmental weeds) in the proposal area as a result of the implementation of the proposal;

(2) the cover of weeds (including both declared weeds and environmental weeds) within the proposal area does not exceed that on comparable, nearby land, determined by the CEO which has not been disturbed during implementation of the proposal; and

(3) reference sites on nearby land are to be chosen in consultation with the OEPA, on advice from the DEC and established within the proposal area and outside the impact area to the satisfaction of the CEO. The reference sites are to be monitored biennially to determine whether changes in weed cover and type are as a result of proposal implementation or broader regional changes.

Decommissioning and Rehabilitation

9-1 Within 12 months following commissioning of the Junction South West or Oxbow pits, whichever is first, the proponent shall prepare and implement a Yandicoogina Decommissioning and Rehabilitation Plan in accordance with the *Guidelines for Preparing Mine Closure Plans, June 2011* and any updates to the requirements of the CEO on advice of the Department of Mines and Petroleum.

9-2 The Yandicoogina Decommissioning and Rehabilitation Plan required pursuant to condition 9-1 shall 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.

9-3 The Yandicoogina Decommissioning and Rehabilitation Plan required pursuant to condition 9-1 shall set out procedures to:

(1) manage long-term hydrogeological impacts of mining the channel iron deposit;
(2) model the long-term hydrological impacts, particularly the water levels and quality both in the pit void and downstream of waste material landforms;
(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:
    (a) the characteristics of the pre-mining ecosystems within the project area (through research and baseline surveys);
    (b) the performance of previously rehabilitated areas within the mining lease;
    (c) the performance of rehabilitation areas at the proponent's other operations in the Pilbara; and
    (d) 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;
(10) manage and monitor mineral waste including physical characteristics and acid or neutral metalliferous drainage using national and international standards and updates; and
(11) develop a 'walk away' solution for the decommissioned mine site.

9-4 The proponent shall review and revise the Yandicoogina Decommissioning and Rehabilitation Plan required by condition 9-1 at intervals not exceeding three years.

9-5 The proponent shall make revisions of the Yandicoogina Decommissioning and Rehabilitation Plan required by condition 9-1 publicly available.

Residual Impact and Risk Management Measures

10-1 In view of the significant residual impacts and risks (permanent and temporary) to native vegetation including riparian vegetation as a result of the implementation of the proposal, the proponent shall contribute three million dollars ($AUD) to a strategic regional conservation initiative for the Pilbara as determined by the Minister for Environment on advice of the Environmental Protection Authority and the DEC.

10-2 The contribution shall be paid in full by 31 December 2013, unless otherwise agreed by the CEO.

Bill Marmion

HON BILL MARMION MLA
MINISTER FOR ENVIRONMENT; WATER

18 OCT 2012

Schedule 1
The Proposal (Assessment No. 1725)

Table 1: Summary of proposal

Proposal Title	Yandicoogina Iron Ore Project - Expansion to Include Junction South West and Oxbow Deposits
Short description	The proposal is to develop iron ore deposits, Junction Central, Junction South East, Junction South West and Oxbow, located in the central Pilbara region of Western Australia, on mining lease 274SA. Terrestrial infrastructure includes: • ore transport and storage infrastructure (including rail link) - car dumpers, conveyors, stockyards, ore stackers and ore reclaimers, and storage infrastructure, rail loops; • rail corridor allowing for rail lines and associated infrastructure; • construction and operations support infrastructure; • a diesel-fired power station and transmission lines; • accommodation camps; • access roads; and • an airstrip. The location of the various project components is shown in Figures 1, 2 and 3.

Table 2: Location and authorised extent of physical and operational elements

Column 1	Column 2	Column 3
Element	**Location**	**Authorised Extent**
Clearing	Figure 2	• Up to 5,600 ha within Restricted Clearing Area 1; and • up to 60 ha within Restricted Clearing Area 2.
Dewatering from Junction South East and Junction Central operations	Figure 3	No more than 35 GL/y
Dewatering from Junction South West A, Junction South West C and Oxbow operations	Figure 3	No more than 18 GL/y
Surface Water Discharge from Junction South West A, Junction South West C and Oxbow operations	Figure 3	Up to 16 GL/y

Table 3: Abbreviations

Abbreviation	Term
Ha	hectare
GL/y	Gigalitres per year

Figures (attached)

Figure 1: Yandicoogina Operations Development Envelope and Predicted Dewatering Impact Areas

Figure 2: Yandicoogina Operations Proposed Clearing Areas

Figure 3: Location of the Junction South West (JSW A and JSW C), Oxbow, Junction Central and Junction South East pits.

Figure 1: Yandicoogina Operations Development Envelope and Predicted Dewatering Impact Areas

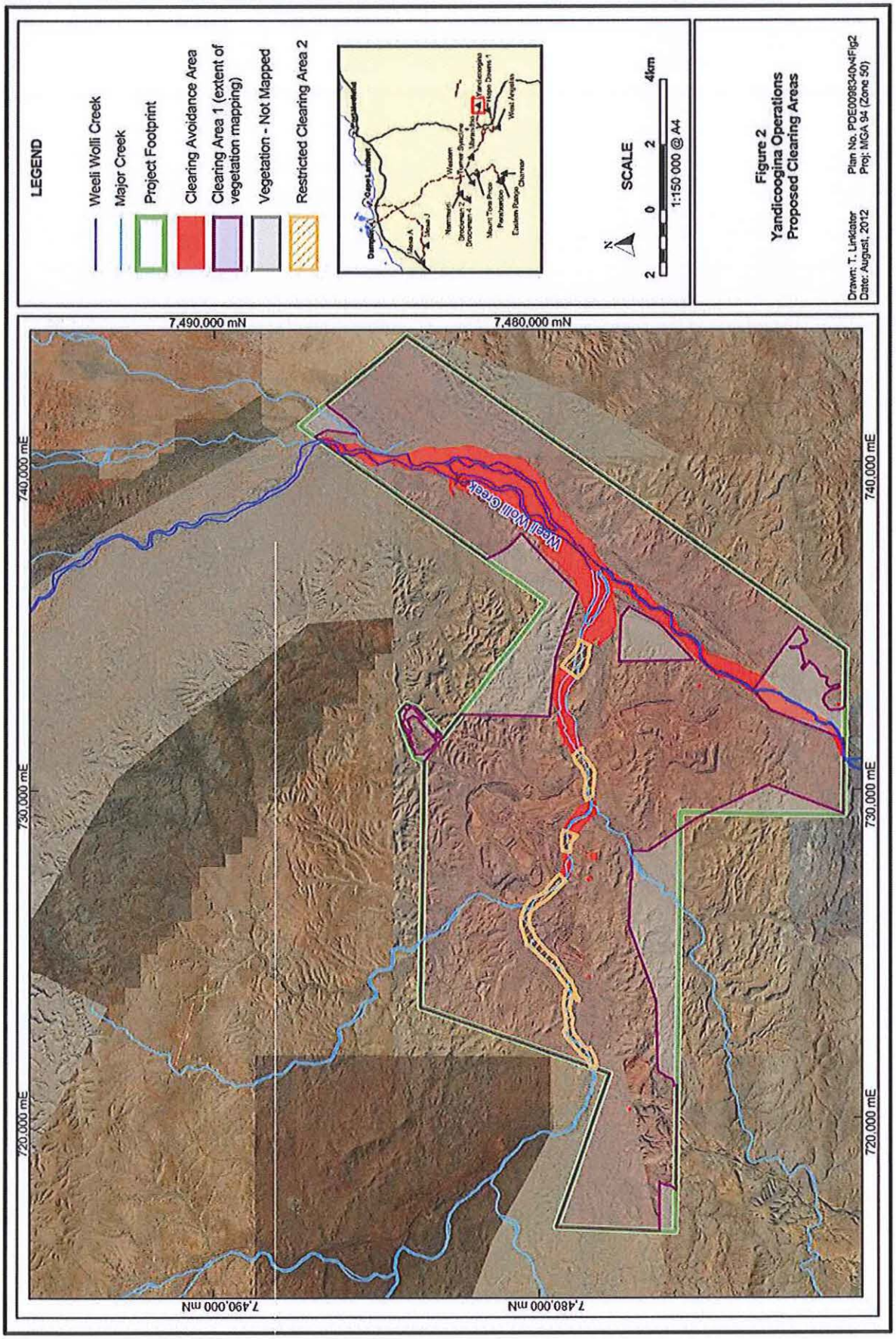

Figure 2: Yandicoogina Operations Proposed Clearing Areas

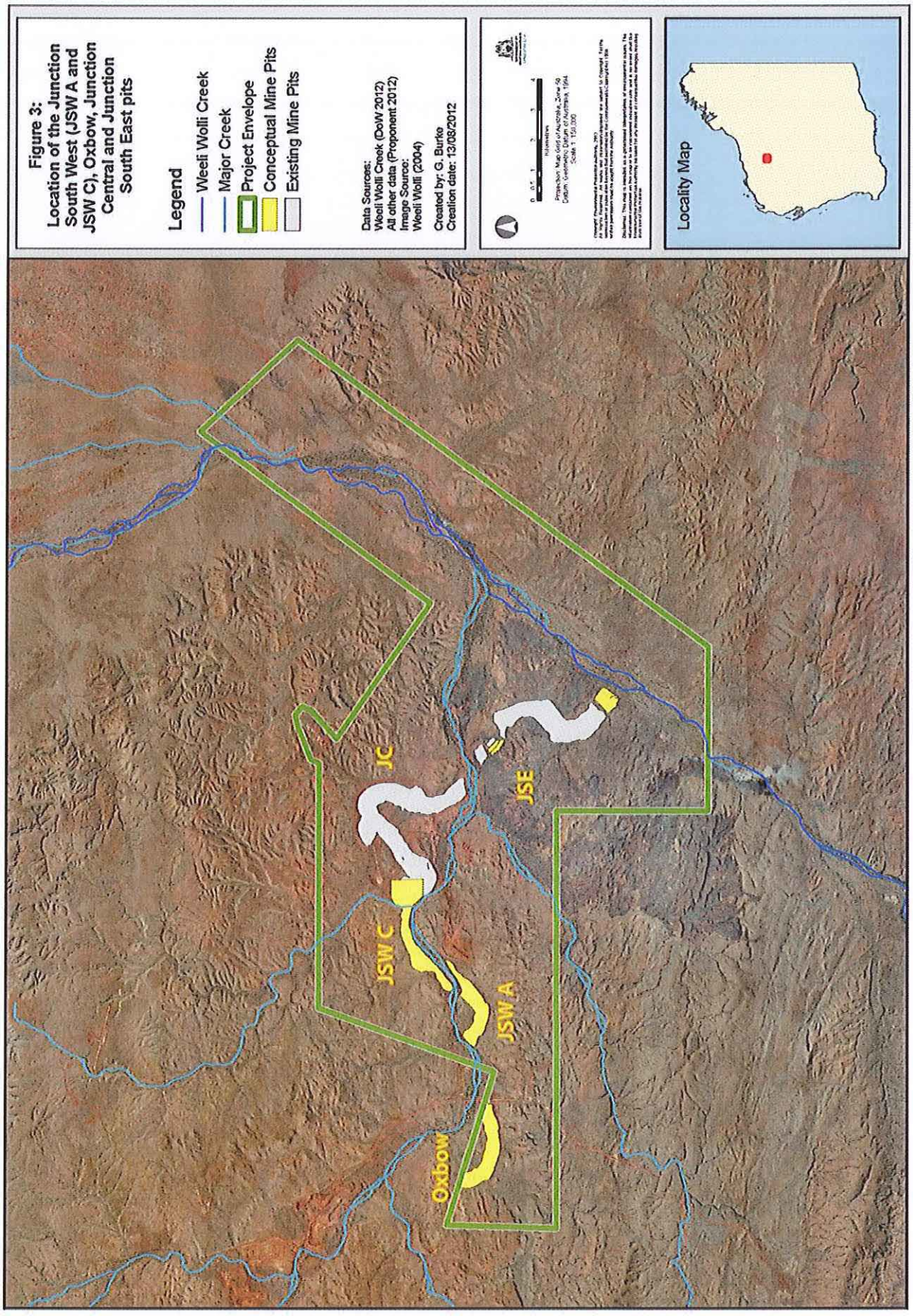

Figure 3: Location of the Junction South West (JSW A and JSW C), Oxbow, Junction Central and Junction South East Pits

Schedule 1

Term or Phrase	Definition
Approved Vegetation and Groundwater Dependent Ecosystems Monitoring and Management Plan	The Vegetation and Groundwater Dependent Ecosystems Monitoring and Management Plan for which the proponent has received written notification from the CEO that it meets the requirements of condition 7-5.
Approved Water Discharge Monitoring and Management Plan	The Water Discharge Monitoring and Management Plan for which the proponent has received written notification from the CEO that it meets the requirements of condition 6-6.
CEO	The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the *Environmental Protection Act 1986*, or his delegate.
DEC	Department of Environment and Conservation
Junction Central	Delineated in Figure 3 as JC.
Junction South East	Delineated in Figure 3 as JSE.
Junction South West A	Delineated in Figure 3 as JSW A.
Junction South West C	Delineated in Figure 3 as JSW C.
Marillana Creek and Weeli Wolli Creek System Confluence	Delineated in Figure 1 as Marillana – Weeli Wolli Confluence.
MGA	Map Grid of Australia
No Clearing Area	Delineated in Figure 2 as No Clearing Area.
OEPA	Office of the Environmental Protection Authority.
Oxbow	Delineated in Figure 3 as Oxbow.
Proposal Area	Delineated in Figure 1 as Project Footprint.
Restricted Clearing Area 1	Delineated in Figure 2 as Restricted Clearing Area 1.
Restricted Clearing Area 2	Delineated in Figure 2 as Restricted Clearing Area 2.
Riparian Vegetation	The distinctive vegetation associated with a wetland or watercourse. (Department of Environment and Conservation – *Native vegetation clearing legislation in Western Australia* (Version 2 April 2010).
'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.
Weeli Wolli Creek System	Delineated in Figure 1 as Weeli Wolli Creek.
Zone 1	Delineated in Figure 1 as Zone 1 and defined by MGA co-ordinates for Zone 1 in Schedule 2.
Zone 2	Delineated in Figure 1 as Zone 2 and defined by MGA co-ordinates for

	Zone 2 in Schedule 2.
Zone 2a	Delineated in Figure 1 as Zone 2a and defined by MGA co-ordinates for Zone 2a in Schedule 2.
Zone 3	Delineated in Figure 1 as Zone 3 and defined by MGA co-ordinates for Zone 3 in Schedule 2.
Zone 3a	Delineated in Figure 1 as Zone 3a and defined by MGA co-ordinates for Zone 3a in Schedule 2.
Zone 4	Delineated in Figure 1 as Zone 4 and defined by MGA co-ordinates for Zone 4 in Schedule 2.
Zone 5	Delineated in Figure 1 as Zone 5 and defined by MGA co-ordinates for Zone 5 in Schedule 2.

Yandicoogina Junction South West and Oxbow
Zone 1

Prepared 14 August 2012

Co-ordinates defining *Zone 1* are prescribed below, noting that the correct recreation of the boundary requires the sequential connection of the co-ordinates as per its co-ordinate number.

All co-ordinates are listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geodetic Datum of Australia 1994 (GDA94).

Co-ordinate No.	Easting	Northing
1	723522.48	7479273.82
2	723778.20	7479261.64
3	723956.79	7479212.94
4	724151.63	7479322.53
5	724638.70	7479712.19
6	724898.48	7480004.44
7	725052.72	7480219.55
8	725271.90	7480459.04
9	725896.98	7480645.75
10	726351.58	7480564.57
11	726566.69	7480477.78
12	726939.78	7479896.35
13	726516.39	7479693.86
14	726233.87	7480256.09
15	725905.10	7480252.03
16	725308.44	7479882.66
17	725060.84	7479566.07
18	724561.58	7479241.34
19	724192.21	7478969.40
20	723668.61	7478770.51
21	723490.01	7478819.22
22	723522.48	7479273.82

END OF CO-ORDINATE LISTING

Yandicoogina Junction South West and Oxbow
Zone 2

Prepared 14 August 2012

Co-ordinates defining *Zone 2* are prescribed below, noting that the correct recreation of the boundary requires the sequential connection of the co-ordinates as per its co-ordinate number.

All co-ordinates are listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geodetic Datum of Australia 1994 (GDA94).

Co-ordinate No.	Easting	Northing
1	723522.48	7479277.88
2	723494.07	7478811.09
3	723007.00	7478876.04
4	722698.51	7478855.74
5	722304.79	7478608.14
6	722199.26	7478388.96
7	721752.77	7478173.83
8	721200.74	7478210.36
9	720413.31	7478332.14
10	719828.82	7478478.26
11	719536.57	7478750.21
12	719353.91	7479164.23
13	719317.38	7479817.73
14	719106.32	7480215.50
15	718943.95	7480532.10
16	719288.97	7480755.34
17	719629.93	7480178.97
18	719804.47	7479687.83
19	719861.29	7479147.99
20	720161.65	7478900.39
21	720656.85	7478827.34
22	721322.52	7478604.08
23	721566.06	7478510.73
24	721947.59	7478794.86
25	722373.79	7479204.82
26	722641.69	7479298.17
27	723522.48	7479277.88

END OF CO-ORDINATE LISTING

Yandicoogina Junction South West and Oxbow
Zone 2a

Prepared 14 August 2012

Co-ordinates defining *Zone 2a* are prescribed below, noting that the correct recreation of the boundary requires the sequential connection of the co-ordinates as per its co-ordinate number.

All co-ordinates are listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geodetic Datum of Australia 1994 (GDA94).

Co-ordinate No.	Easting	Northing
1	729316.44	7478971.23
2	729469.66	7478861.78
3	729554.09	7478771.10
4	729866.79	7478627.26
5	730204.50	7478611.62
6	730389.00	7478611.62
7	730579.75	7478739.84
8	730776.74	7478908.69
9	730898.70	7478943.08
10	731316.68	7478650.92
11	731120.72	7478624.13
12	730989.38	7478545.95
13	730779.87	7478380.23
14	730617.27	7478258.27
15	730185.75	7478277.04
16	729913.69	7478311.43
17	729619.76	7478214.49
18	729257.02	7478227.00
19	729316.44	7478971.23

END OF CO-ORDINATE LISTING

Yandicoogina Junction South West and Oxbow
Zone 3

Prepared 14 August 2012

Co-ordinates defining *Zone 3* are prescribed below, noting that the correct recreation of the boundary requires the sequential connection of the co-ordinates as per its co-ordinate number.

All co-ordinates are listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geodetic Datum of Australia 1994 (GDA94).

Co-ordinate No.	Easting	Northing
1	737365.29	7491641.81
2	738101.04	7491917.07
3	739789.09	7488078.97
4	740730.85	7487208.30
5	741086.23	7486408.70
6	740677.53	7485911.17
7	740730.84	7485466.94
8	740411.00	7484152.03
9	739718.02	7484383.03
10	739913.47	7485431.40
11	740056.38	7486354.96
12	739131.64	7487545.90
13	738847.34	7487954.59
14	737745.67	7490282.33
15	737365.29	7491641.81

END OF CO-ORDINATE LISTING

Yandicoogina Junction South West and Oxbow
Zone 3a

Prepared 14 August 2012

Co-ordinates defining *Zone 3a* are prescribed below, noting that the correct recreation of the boundary requires the sequential connection of the co-ordinates as per its co-ordinate number.

All co-ordinates are listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geodetic Datum of Australia 1994 (GDA94).

Co-ordinate No.	Easting	Northing
1	732610.18	7473145.31
2	732923.39	7473740.85
3	733560.26	7474876.14
4	734003.30	7475374.56
5	734764.78	7476371.40
6	735401.65	7477645.14
7	736398.49	7478988.10
8	737187.65	7480054.17
9	738170.65	7481051.00
10	738849.05	7482103.22
11	739361.32	7483044.68
12	739719.85	7484391.49
13	740406.58	7484172.12
14	740482.75	7483556.94
15	740658.21	7482396.36
16	740344.29	7480566.42
17	740039.69	7479915.72
18	739278.23	7479389.60
19	737852.20	7478323.54
20	737602.99	7477769.74
21	737104.58	7477174.40
22	735955.44	7475886.82
23	735193.97	7474405.41
24	733501.13	7472501.85
25	732610.18	7473145.31

END OF CO-ORDINATE LISTING

Yandicoogina Junction South West and Oxbow
Zone 4

Prepared 14 August 2012

Co-ordinates defining *Zone 4* are prescribed below, noting that the correct recreation of the boundary requires the sequential connection of the co-ordinates as per its co-ordinate number.

All co-ordinates are listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geodetic Datum of Australia 1994 (GDA94).

Co-ordinate No.	Easting	Northing
1	733793.61	7479334.18
2	734462.81	7478946.40
3	735433.52	7478629.57
4	735622.26	7478710.46
5	735972.79	7478845.28
6	736700.81	7479216.04
7	737213.13	7478043.11
8	736646.89	7477571.24
9	735932.35	7477517.31
10	735440.26	7477510.57
11	734840.30	7477638.64
12	734287.54	7478164.45
13	733299.14	7478674.90
14	733793.61	7479334.18

END OF CO-ORDINATE LISTING

Yandicoogina Junction South West and Oxbow
Zone 5

Prepared 14 August 2012

Co-ordinates defining *Zone 5* are prescribed below, noting that the correct recreation of the boundary requires the sequential connection of the co-ordinates as per its co-ordinate number.

All co-ordinates are listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geodetic Datum of Australia 1994 (GDA94).

Co-ordinate No.	Easting	Northing
1	731330.05	7478642.02
2	730902.64	7478946.02
3	731276.22	7479115.83
4	731354.96	7479342.36
5	731688.76	7479396.84
6	732490.83	7479544.02
7	732980.39	7479640.01
8	733450.74	7479553.62
9	733796.94	7479336.58
10	733300.72	7478676.22
11	732867.20	7479090.30
12	732587.92	7479131.18
13	732383.56	7478981.32
14	732135.66	7478814.49
15	731732.52	7478699.30
16	731330.05	7478642.02
17	726464.49	7479723.60
18	726886.85	7479925.18
19	727247.41	7479614.83
20	727606.78	7479378.04
21	728048.34	7479320.44
22	728534.86	7479362.78
23	728861.83	7479294.66
24	729318.22	7478967.70
25	729256.92	7478225.20
26	728969.85	7478485.32
27	728582.54	7478804.21
28	728269.20	7478981.33
29	727875.55	7478984.48
30	727472.21	7478974.51
31	726838.85	7479282.04
32	726704.47	7479454.83
33	726464.49	7479723.60

END OF CO-ORDINATE LISTING

Notes

The following notes are provided for information and do not form a part of the implementation conditions of the statement:

- The proponent for the time being nominated by the Minister for Environment under section 38(6) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal unless and until that nomination has been revoked and another person is nominated.
- If the person nominated by the Minister, ceases to have responsibility for the proposal, that person is required to provide written notice to the Environmental Protection Authority of its intention to relinquish responsibility for the proposal and the name of the person to whom responsibility for the proposal will pass or has passed. The Minister for Environment may revoke a nomination made under section 38(6) of the *Environmental Protection Act 1986* and nominate another person.
- To initiate a change of proponent, the nominated proponent and proposed proponent are required to complete and submit *Post Assessment Form 1 – Application to Change Nominated Proponent.*
- The General Manager of the Office of the Environmental Protection Authority was the Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the *Environmental Protection Act 1986* at the time the statement was signed by the Minister for Environment.

Appendix 3 – 8 (attached on CD)

Appendix 3: **Yandicoogina Groundwater Model Setup and Calibration**

Appendix 4: **Yandicoogina PBS Vegetation and Flora Reports**

Appendix 5: **Yandicoogina PBS Fauna Reports**

Appendix 6: **Yandicoogina Subterranean Fauna Assessment Phases I-V and Yandicoogina Stygofauna 2010 Addendum**

Appendix 7: **Yandicoogina Groundwater Dependent vegetation and Surplus Water Discharge Monitoring and Management Plan**

Appendix 8: **Yandicoogina Closure Plan 2014**