Report and recommendations of the Environmental Protection Authority

Sino Iron Mine Continuation

Sino Iron Pty Ltd and Korean Steel Pty Ltd

Report 1602

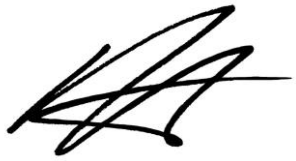
August 2017

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
10/04/2017	EPA decides to assess – level of assessment set	
14/06/2017	EPA accepted final Environmental Review Document	8
21/06/2017	EPA Meeting	1
02/08/2017	EPA provided report to the Minister for Environment	6
07/08/2017	EPA report published	3 days
21/08/2017	Close of appeals period	2

Timelines for an assessment may vary according to the complexity of the proposal and are usually agreed with the proponent soon after the EPA decides to assess the proposal and records the level of assessment.

In this case, the Environmental Protection Authority met its timeline objective to complete its assessment and provide a report to the Minister.



Dr Tom Hatton
Chairman

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1. Introduction

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for Environment on outcomes of the EPA's environmental impact assessment of the proposal by Sino Iron Pty Ltd and Korean Steel Pty Ltd to deepen and extend the existing iron ore mine at Cape Preston, with concomitant increases in the extent of tailings storage facilities, waste rock dumps and groundwater discharge from mine dewatering.

The EPA has prepared this report in accordance with section 44 of the *Environmental Protection Act 1986* (EP Act), which requires that the EPA prepare a report on the outcome of its assessment of a proposal and provide this assessment report to the Minister for Environment. The report must set out:

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

The EPA may also include any other information, advice and recommendations in the assessment report as it thinks fit.

The proponent referred the proposal to the EPA on 15 February 2017. On 10 April 2017 the EPA published its decision to assess the proposal and set the level of assessment at Assessment on Referral Information with additional information required under Section 40(2)(a) of the *Environmental Protection Act 1986*.

1.1 EPA procedures

The EPA followed the procedures in the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016* and the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual 2016*.

2. The proposal

A summary of the proposal is set out below.

2.1 Proposal summary

The proponent, Sino Iron Pty Ltd and Korean Steel Pty Ltd, proposes a change (referred to in this report as the 'proposal') to its approved proposal (referred to as 'the approved project' or 'the project') to mine and process iron ore at Cape Preston (Figure 1).

The approved project consists of the existing approved components:

- Ministerial Statement 635, issued on 20 October 2003. *Iron Ore Mine, Downstream Processing (Direct Reduced and Hot Briquetted Iron) and Port Construction, Cape Preston, Pilbara*. Statement 635 approved the construction and operation of a 44.8 million tonnes per annum (tpa) iron ore mine, power station, desalination plant, processing plant, accommodation and port facilities in the Cape Preston area. The processing plant was to produce pelletised, direct reduced and hot briquetted iron.
- Ministerial Statement 635, Attachments 1 to 5 have resulted in approvals to increase the mining rate to 95 million tonnes per annum (Mtpa), the production of concentrate to 27.6 mtpa and produced waste to tailings storage to 67.4 Mtpa. Other approved changes include a mine pit area of 360 hectares (ha), waste dumps of 600 ha, tailings storage facilities (TSFs) of 987 ha, and other facilities for a total disturbed area of 2,734 ha and discharge of up to 2 gigalitres per annum (GL/yr) of dewatered groundwater from the mine pit to a point near the mouth of the Fortescue River.
- Ministerial Statement 822, issued on 23 December 2009, amended conditions in Statement 635 to remove requirements for further investigations into seawater quality and the location of the marine outfall and replaced them with conditions related to Ecological Protection Areas.

The proposed change involves extension of facilities at both the mine and port areas to facilitate the existing approved throughput rates and extend the duration of operations. It does not seek to alter existing mining, processing or tailings production rates or increase throughput of the desalination plant.

The proposed change seeks approval to increase the total approved disturbance area from 2,734 ha to 10,100 ha. The proposed change is constituted by the following additional activities and elements:

- Mine site:
  - Deepen mine from ~220 m to ~400 m and extend west
  - Expand waste rock dumps
  - Expand tailings storage facilities
  - Divert Edwards Creek in two places

  - Create additional corridors for roads, power and water supplies.
- Port:
  - Increase product stockpile area
  - Increase stockyard area
  - Provide additional supporting infrastructure.
- Groundwater discharge to the Fortescue River Estuary:
  - Increase groundwater discharge from 2 GL/yr to up to 8 GL/yr.

All the elements above would be included in the proposed total disturbance area of 10,100 ha.

The key characteristics of the revised proposal (that is, the amalgamation of the existing approved project and the proposed change) are summarised in Tables 1 and 2 below. A detailed description of the proposed change in relation to the existing project is provided in Section 2 of the Environmental Review Document (Citic Pacific Mining, 2017).

In undertaking this assessment, the EPA has assessed the impacts of the proposed change in the context of the approved project, considering the cumulative impacts of the entire revised proposal where appropriate.

Table 1: Summary of the Proposal

Proposal Title	Sino Iron Mine Continuation Proposal
Short Description	Expansion of existing iron ore mine, processing and export facility at Cape Preston including mine pits, waste rock landforms, tailings storage facilities, product stockyard capacity, and other supporting infrastructure.

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

Element	**Location**	**Existing approvals (Ministerial Statements 635, 822 and other regulatory approvals)**	**Proposed change (This proposal)**	**Proposed extent (Revised proposal)**
Physical elements				
Mine and associated infrastructure • Mine pit • Waste rock dump • Tailings storage • Port + stockyard • Other infrastructure	Mine and port area	• 360 ha • 600 ha • 987 ha • 48 ha • 739 ha	**Increase in total disturbance of 7,366 ha**	Disturbance of no more than 10,100 ha in development envelope of 22,737 ha

Element	Location	Existing approvals (Ministerial Statements 635, 822 and other regulatory approvals)	Proposed change (This proposal)	Proposed extent (Revised proposal)
Total		**2,734 ha**	**7,366 ha**	**10,100 ha**
Operational elements				
Pit depth	Figure 1	Up to 220 m	**Additional 180m**	**Up to 400 m**
Mining rate		Up to 95 Mtpa	No change	Up to 95 Mtpa
Concentrator rate		Up to 27.6 Mtpa	No change	Up to 27.6 Mtpa
Tailings storage		Up to 67.4 Mtpa	No change	Up to 67.4 Mtpa
Pellet production		Up to 13.8 Mtpa	No change	Up to 13.8 Mtpa
Direct reduced/ hot briquetted iron		Up to 4.7 Mtpa	No change	Up to 4.7 Mtpa
Power station capacity		640 MW	No change	640 MW
Conveyor/ haul road		25 km mine to port	No change	25 km mine to port
Mine to port service corridor		Buried slurry pipeline Dewatering plant Additional buried pipelines Power lines	No change	Buried slurry pipeline Dewatering plant Additional buried pipelines Power lines
Groundwater bore field		Amount to be determined by relevant decision making authority	No change	Amount to be determined by relevant decision making authority
Pit dewatering		In accordance with water licence	No change	In accordance with water licence
Dewater discharge	Fortescue River mouth	2 GL/yr	**Increase in discharge by up to 6 GL/yr**	**Up to 8 GL/yr**
Seawater desalination	Figure 1	Up to 44 GL/yr	No change	Up to 44 GL/yr
Brine disposal		Up to 57.8 GL/yr	No change	Up to 57.8 GL/yr
Accommodation		One permanent village (up to 970 people) Two construction	No change	One permanent village (up to 970 people) Two construction

Element	Location	Existing approvals (Ministerial Statements 635, 822 and other regulatory approvals)	Proposed change (This proposal)	Proposed extent (Revised proposal)
		camps		camps
Port product stockyard	Figure 1	Approx. 1 Mt	**Up to 2 Mt**	**Up to 3 Mt**
Bridging/ causeway to Preston Island		Approx. 1.1 km bridging or causeway then trestle jetty	No change	Approx. 1.1 km bridging or causeway then trestle jetty
Dredging		Up to 4.5 Mm^3 disposed offshore	No change	Up to 4.5 Mm^3 disposed offshore

2.2 Context

The proposal is located in the Roebourne sub-region of the Pilbara Bioregion within the Interim Biogeographic Regionalisation of Australia (IBRA). Surrounding land use consists of mining and pastoral activities, with coastal camping and fishing, particularly around the Fortescue River mouth. Human settlement is sparse, with the nearest towns at Dampier, Karratha and Onslow between 80 and 120 km away (See Figure 1). Surface runoff is generally northwards towards the coast via the Fortescue River and its tributaries. The nearest conservation lands managed by the Department of Biodiversity, Conservation and Attractions (DBCA) are 'Ex Mardie', outside the Fortescue catchment about 25 km to the north-east, and a number of offshore islands.

The floodplain of the Fortescue River supports vegetation that is moderately to highly dependent on groundwater (Astron, 2009), including belts of riverine forest that are more extensive here than elsewhere on the Pilbara coast. The floodplain is also extensively infested with Mesquite (*Prosopis pallida*), and other introduced weeds.

In the Environmental Review Document (ERD) the proponent addressed the cumulative impacts of the proposal, other nearby potential mining operations and the potential impact of the Balmoral borefield on groundwater drawdown. The studies showed other mine pits would not substantially increase the extent of groundwater drawdown. If the Balmoral borefield was implemented, the extent of the 0.5 m and 1.0 m drawdown contours would be substantially expanded, by about two-fold.

The rock types associated with the orebody contain fibrous, but not asbestiform, minerals, predominately massive riebeckite. Management of this material is largely a worker health issue. While there are few permanent residents (other than mine workers) in the region, management of fibrous materials would be required during operations and in the long-term across the pits, waste rock dumps and tailings storage facilities created by the proposal.

Clearing for mines and associated infrastructure in the Pilbara region amounts to approximately 371,300 ha, representing approximately two per cent of the Pilbara IBRA region (EPA, 2016a). This proposal adds a further 7,366 ha of clearing, representing a two per cent increase in cleared land in the Pilbara.

3. Consultation

The EPA advertised the referral information on the proposal for public comment in April 2017 and received no submissions.

The proponent consulted with government agencies and key stakeholders during the preparation of the report provided with the referral. The agencies and stakeholders consulted, the issues raised and the proponent's response are detailed in Table 3-1 of the supplementary report provided with the proponent's referral, referred to as the Environmental Review Document or ERD (Citic Pacific Mining, 2017).

The EPA considers that the consultation process has been appropriate and that reasonable steps have been taken to inform the community and stakeholders about the proposed development. Relevant significant environmental issues identified from this process were taken into account by the EPA during its assessment of the proposal.

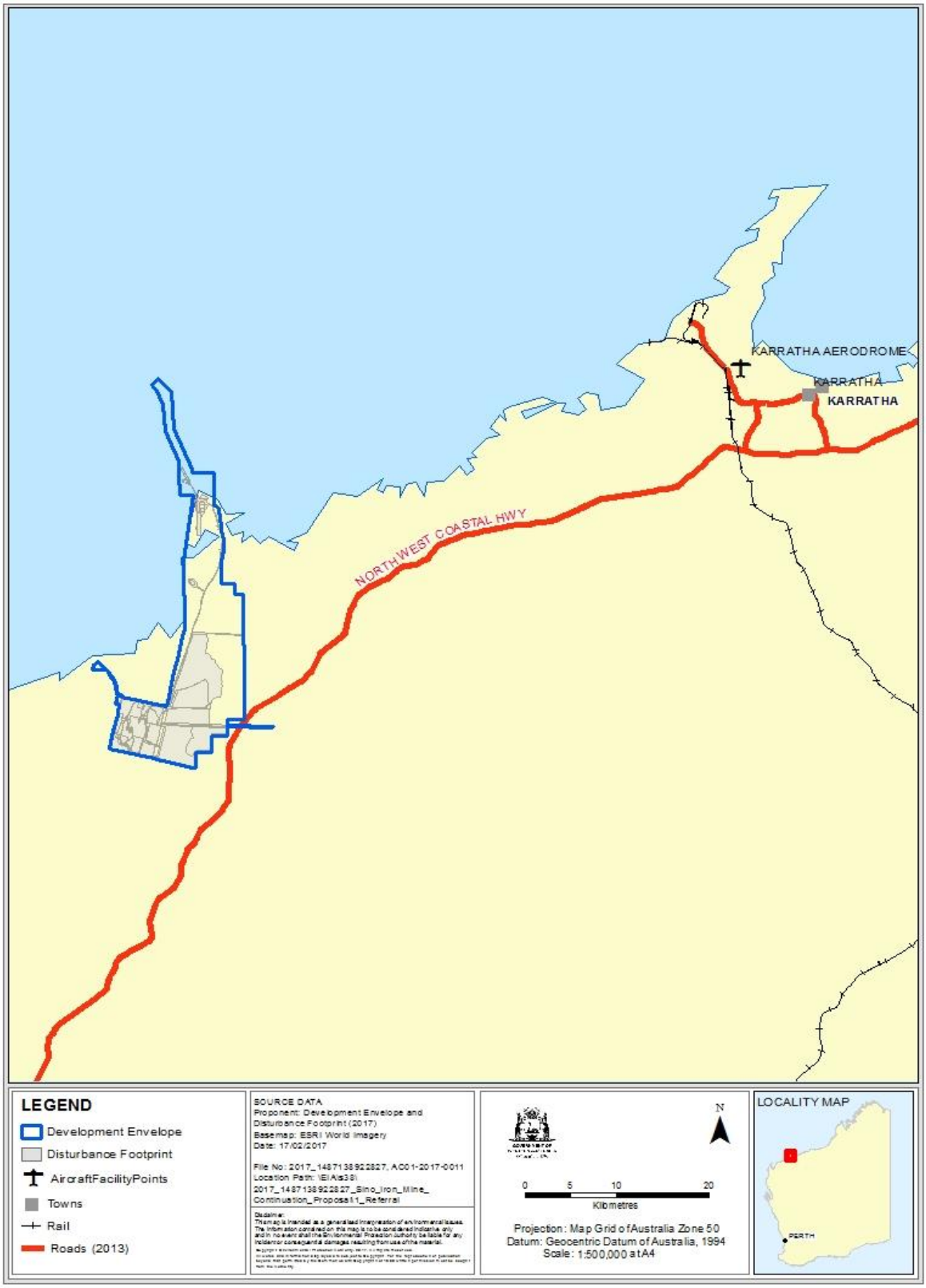

Figure 1 – Development Envelope

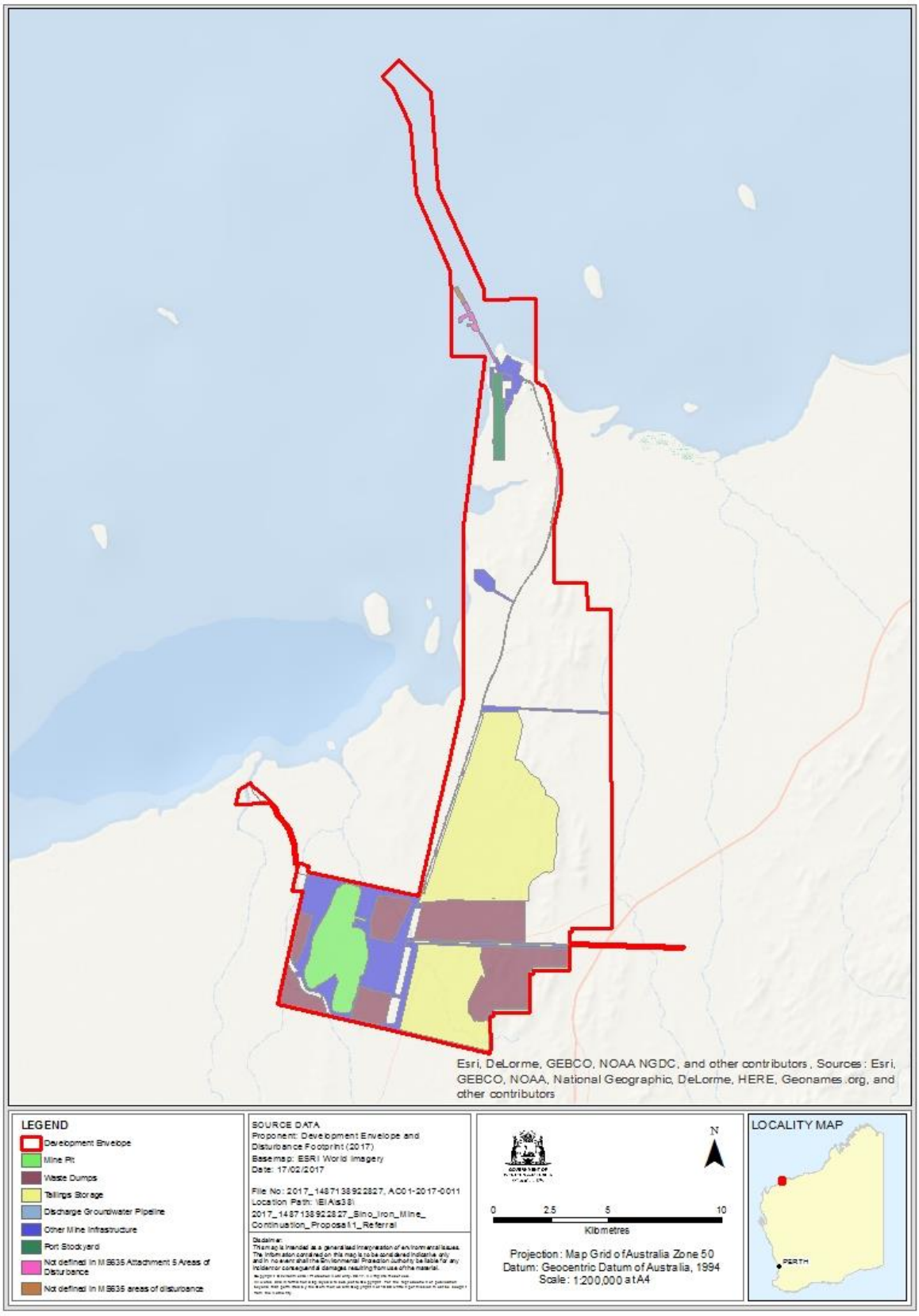

Figure 2 - Sino Mine Continuation Proposal Layout

4. Key environmental factors

In undertaking its assessment of this proposal and preparing this assessment report, the EPA had regard for the object and principles contained in s4A of the EP Act to the extent relevant to the particular matters that were considered.

The EPA considered the following information during its assessment:

- The proponent's referral information, Environmental Review Document (ERD) and responses to queries from the EPA;
- Stakeholder comments received during the preparation of proponent documentation and agency comments received on the referral information;
- The EPA's own inquiries
- The EPA's *Statement of environmental principles, factors and objectives; and*
- The relevant principles, policy and guidance referred to in the assessment of each key environmental factor in sections 4.1 to 4.7.

Having regard to the above information, the EPA identified the following key environmental factors during the course of its assessment of the proposal:

- **Hydrological processes** – groundwater drawdown has the potential to adversely affect groundwater-dependent ecosystems and dependent fauna.
- **Inland waters environmental quality** – creek diversion and site clearing have the potential to increase flows and turbidity; formation of a pit lake has potential to increase salinity via evaporation.
- **Marine environmental quality** – discharge of groundwater has the potential to affect estuarine water quality and dependent organisms.
- **Flora and vegetation** – clearing has the potential to reduce regional representation of vegetation communities and flora species.
- **Terrestrial fauna** – clearing has the potential to reduce critical fauna habitat and linkages; operations have the potential to attract feral species and kill or injure native fauna.
- **Air quality** – activities have the potential to generate dust including fibrous minerals.
- **Terrestrial environmental quality** – management of waste rock dumps and tailing storage facilities required to ensure fibrous materials are appropriately encapsulated.

The EPA considered other environmental factors during the course of its assessment of the proposal. These factors, which were not identified as key environmental factors, are discussed in the proponent's referral documentation (Citic Pacific Mining, 2017). Appendix 3 contains an evaluation of why these other environmental factors were not identified as key environmental factors.

Having regard to the EP Act principles, the EPA considered that the following principles were particularly relevant to its assessment of the proposal:

1. The principle of waste minimisation.
2. The principle of conservation of biological diversity and ecological integrity

Appendix 2 provides a summary of the principles and how the EPA considered these principles in its assessment.

The EPA's assessment of the proposal's impacts on the key environmental factors is provided in Sections 4.1 – 4.7. These sections outline whether or not the EPA considers that the impacts to each factor are manageable. Section 5 provides the EPA's conclusion as to whether or not the proposal as a whole is environmentally acceptable.

Changes to EPA environmental policy and guidance

The EPA introduced a new suite of environmental guidance for environmental impact assessment on 13 December 2016. This replaced EPA policies and guidance that were current at the time of preparation of the Environmental Review Document for the proposal.

In its assessment of the proposal, the EPA considered and gave due regard to, where relevant, its current environmental impact assessment policy and guidance documents. The EPA consulted the proponent on the application of the current environmental impact assessment policy and guidance documents relevant to its environmental review and the EPA's assessment of the proposal.

4.1 Hydrological processes

EPA objective

The EPA's environmental objective for this factor is *to maintain the hydrological regimes of groundwater and surface water so that environmental values are protected*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline – Hydrological Processes (EPA, 2016b).

The considerations for environmental impact assessment (EIA) for this factor are outlined in Environmental Factor Guideline – Hydrological Processes (EPA, 2016b).

EPA assessment

Groundwater in the proposal area is found in two main aquifer types. The mine and areas to the east comprise hard rocks with groundwater retained in fracture zones.

To the west of the mine, alluvial sediments on the floodplain of the Fortescue River make up the principal near-surface aquifer. The depth to groundwater in the alluvial sequence is reported to range from one metre to 20 m according to the proponent's documentation. Groundwater on the floodplain supports existing environmental and usage values including bores for stock water, riverine pools and dependent vegetation species, some of which are dependent on groundwater.

The proponent notes that the modelled extent of the 0.5 m drawdown contour overall would be less than the extent modelled for the existing approved project. This difference is due to the use of a superior model for the current proposal. Predicted drawdown contracts north and south of the mine and extends further to the west in to the Fortescue floodplain alluvial sediments. This has the potential to impact vegetation, pools and bores for stock and other users.

A result of this change in understanding is that the proponent predicts that dewatering requirements would increase by an additional 6 GL/yr from 2 GL/yr for the approved project, to 8 GL/yr, because of inflows from the alluvial sediments.

The EPA notes advice from the Department of Water and Environmental Regulation (DWER) (previously the Department of Water) that the modelling predicting the extent of drawdown is sound and that the majority of the area affected is predicted to experience drawdowns of less than five metres over the 40 year mining period. While loss of some groundwater dependent vegetation can be expected, the EPA notes that this vegetation type is scattered but widespread in the Pilbara.

The proponent has modelled the potential cumulative impact that could occur if all currently proposed mines and a 6 GL/yr bore field were developed in the Cape Preston area. The cumulative impact modelling predicts that the 0.5 m drawdown contour would extend over an area approximately twice as large as that for this proposal, predominantly due to the bore field.

The proponent plans to monitor groundwater levels, as well as vegetation health (see Section 4.4), but does not propose any groundwater management actions as feasible in this setting. No offsets were proposed by the proponent for this factor. No specific rehabilitation actions are proposed with respect to groundwater. The proponent's modelling predicts that groundwater levels would steadily recover in the surrounding area once dewatering ceases, apart from immediately adjacent to the mine pits.

The ERD notes that there are a number of pastoral bores within the alluvial aquifer that may naturally vary up to six metres in water level. Noting that the proponent manages the bores on the surrounding station, additional drawdown is unlikely to have a deleterious effect on stock water supplies.

A permanent freshwater pool at Mungajee falls between the predicted 0.5 and 1 m drawdown contours. The ERD notes that pools are recharged by river flow events, during which groundwater is recharged from surface flow and the water table rises. It is thus probable that groundwater contributes to maintaining the pool during dry periods between floods. The worst case would be that Mungajee pool might dry out

on some occasions if groundwater drawdown lowers the water table below the floor of the pool during an extended dry period.

The EPA notes that groundwater is predicted to recover once dewatering ceases. If Mungajee pool dries out on some occasions due to dewatering, it could be expected to recover after dewatering stops. Given that there are other pools, outside the influence of the proposal, the EPA considers that the potential risk of occasional drying of Mungajee pool may have local impacts but is unlikely to be so significant as to warrant prevention of the implementation of the proposal.

The EPA notes that the proponent intends to continue to monitor groundwater levels and vegetation health for the expanded proposal. Condition 6 of Ministerial Statement 635 for the operating mine requires a Pit Dewatering and Vegetation Monitoring Plan. The EPA notes that this plan is now a sub-plan of the *Sino Iron project: Operational Environmental Management Plan* (Citic Pacific, 2013). The Operational Environmental Management Plan (Operational EMP) was approved by the Office of the Environmental Protection Authority in August 2014 to fulfil Commitment 2 of Ministerial Statement 635, which requires an Environmental Management Programme, containing various plans, to manage environmental issues during construction and operations.

The EPA notes that the approved Operational EMP does not contain specific EMP provisions (such as trigger and threshold criteria, trigger level actions and threshold contingency actions) to address drawdown impacts. The EPA recommends that the Pit Dewatering and Vegetation Monitoring sub-plan of the Operational EMP is revised to be consistent with the EPA's guidance on Environmental Management Plans (*Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*).

Summary

The EPA has paid particular attention to:

- The principle of conservation of biological diversity and ecological integrity.
- The potential impacts of the proposal on groundwater levels.
- Likely impact of the proposal on groundwater dependent river pools and stock water bores.
- The importance of monitoring groundwater levels.
- The limited information available on the relationship between groundwater levels and the base level of river pools.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Hydrological Processes, that the impacts on this factor are manageable and would no longer be significant, provided there is:

- Control of the volume of annual dewatering authorised in Schedule 1 of the Recommended Environmental Conditions (Appendix 4).
- Continued implementation of the intent of condition 6 (Pit Dewatering and Vegetation Monitoring Plan) of Ministerial Statement 635 through the revision

of the sub-plan of the Operational EMP to protect the environmental values of ground and surface waters.

4.2 Inland waters environmental quality

EPA objective

The EPA's environmental objective for this factor is *to maintain the quality of groundwater and surface water so that environmental values are protected*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline – Inland Waters Environmental Quality (EPA, 2016c)

The considerations for environmental impact assessment (EIA) for this factor are outlined in Environmental Factor Guideline – Inland Waters Environmental Quality (EPA, 2016c).

Surface water quality

Surface flows in the proposal area are intermittent, with high intensity runoff following cyclonic rain and periodic flooding of the Fortescue River and its tributaries. Alternatively, waterways may be dry for long periods. Flooding is an important mechanism for recharging alluvial sediments with groundwater, replenishing river pools and for discharging sediment and nutrients from the Fortescue River mouth to the ocean. Naturally high flows lead to naturally high turbidity levels in runoff waters and waterways.

The proposal involves placing waste rock on the floodplain of Du Boulay Creek and the Fortescue River. Material on the floodplain may increase the height of floodwaters by displacement. Increased flow rates and consequent scouring could occur if flows were constricted and concentrated. The proponent considers that the placement of material on the floodplain would not lead to material increases in flood height or erosion because part of Edwards Creek would be diverted to accommodate the proposal, with the new sections constructed with the same slope and cross-sectional area as the existing profile of the creek. This approach is expected to lead to similar flow rates and erosive forces in the diverted section of the creek as currently occur naturally. Sedimentation basins have been included in the design of the proposal. The proponent advises that these basins would be designed to trap sediment from first flush runoff events equivalent to a 1 in 5 year runoff event.

The EPA notes advice from the DWER acknowledging the proponent's prediction that siting a waste dump adjacent to Du Boulay Creek would not produce a 'measureable change' in sediment load and noting that surface water management would be subject to the licensing process.

In addition, condition 5 of Ministerial Statement 635 for the operating mine contains design requirements for the design and construction of the waste rock dump and tailings storage facility, to minimise erosion and runoff from these structures. The approved Operational Environmental Management Plan also contains a Surface Water Management sub-plan. The EPA considers that the controls planned for surface water management of the proposal are likely to be adequate to protecting the environmental values of surface waters in this environment, provided there is continued implementation of condition 5 and the Surface Water Management sub-plan is updated to include the expansion.

Groundwater quality

The proposal involves mining to a depth of about 400 m in the west pit and to about 350 m in the east pit. Once mining is complete and dewatering ceases, the proponent's modelling predicts that groundwater would fill the west pit to about 160 m below ground level and about 300 m below ground level in the east pit. Modelling predicts these levels to be maintained by a balance between annual groundwater inflows and evaporation. Modelling also predicts groundwater levels would steadily recover across most of the surrounding area, except for immediately adjacent to the pits.

The pits would remain as permanent sinks for groundwater. Ongoing evaporation is then expected to steadily concentrate salts in the groundwater to the point where water in the pits would become hypersaline. DWER advises that hypersaline groundwater in the pits has the potential to contaminate surrounding groundwater supplies by diffusion of salt against the hydraulic gradient and encourages further work on this aspect as mining progresses. The proponent considers that hypersaline water in the pits does not pose a substantive threat to the surrounding groundwater because pit water levels are one to several hundred metres below the groundwater surface in the surrounding areas. Given the depth of hypersaline water from the surface, the EPA accepts that the risk from hypersaline water to groundwater dependent vegetation, river pools, and shallow stock water bores, is unlikely to be significant but further work is required to confirm this prediction as mining progresses.

The EPA notes that a Preliminary Decommissioning and Closure Plan was prepared (and approved) to meet the requirements of condition 16 of Ministerial Statement 635 for the operating mine. Condition 16 does not require regular updates of the plan. The EPA notes advice from the Department of Mines, Industry, Regulation and Safety (DMIRS) recommending that a condition requiring a Mine Closure Plan be imposed, including the management of:

- waste rock, including waste rock capable of generating Acid Metalliferous Drainage, and
- the tailings storage facility.

The EPA recommends that a condition is imposed requiring the proponent to prepare and implement a Mine Closure Plan (and revise it at a minimum of every three years), consistent with the *Joint Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015).

Summary

The EPA has paid particular attention to:

- The principle of conservation of biological diversity and ecological integrity.
- Potential impacts of the proposal on ground and surface water quality
- The importance of monitoring ground and surface water quality
- Potential for increases in pit lake salinity to affect the water quality in groundwater after mining
- The proponent's plans for the application of avoidance and mitigation measures to manage impacts to an acceptable level in the context of the surrounding environment and its values

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Inland Waters Environmental Quality, that the impacts on this factor are manageable and would no longer be significant, provided there is:

- Continued implementation of condition 5 of Ministerial Statement 635 and the revision of the Surface Water Management sub-plan of the Operational EMP.
- The imposition of a condition requiring the proponent to manage rehabilitation and decommissioning consistent with the guidelines for preparing Mine Closure Plans.

4.3 Marine environmental quality

EPA objective

The EPA's environmental objective for this factor is *to maintain the quality of water, sediment and biota so that environmental values are protected*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline – Marine Environmental Quality (EPA, 2016d)
- Technical Guidance – Protecting the Quality of Western Australia's Marine Environment (EPA, 2016e).

The considerations for environmental impact assessment (EIA) for this factor are outlined in Environmental Factor Guideline – Marine Environmental Quality (EPA, 2016d).

EPA assessment

Water quality in the lower reaches of the Fortescue River varies between 39,000 mg/L and 41,000 mg/L in the dry summer season and has a typical salinity level of 37,000 mg/L, which is slightly higher than the typical seawater level of

35,000 mg/L. This is due to the concentration of salts in the shallow waters of the river under the high ambient evaporative conditions typical of the region in summer. The proponent expects salinity levels to be lower when freshwater floods occur. The river and adjacent ocean are used for recreational fishing and locally important commercial fisheries occur offshore.

This proposal is to increase the discharge of saline groundwater from the mine to the lower reaches of the Fortescue River from two to up to eight GL/yr. This discharge has the potential to affect marine water quality and dependent organisms in the river and adjacent ocean. The current discharge is regulated by the DWER through a licence (L8308/2008/2).

This increased discharge would be via a similar diffuser system to that operating now as part of the existing, approved project. The existing diffuser system would be replicated four-fold to accommodate the four-fold increase in discharge rate and would only discharge during outgoing tides, as is the case for the existing project. Modelling commissioned by the proponent indicates that this approach would result in better than 27-fold dilution of the discharged water at the diffuser. The modelled level of dilution would result in median salinity levels better than the 80th percentile of the 1200 mg/L above the median ambient background level of 37,000 mg/L required to comply with the existing condition for salinity set on the existing project.

The EPA considers that monitoring data from the proponent's existing operation provides a high level of confidence that modelling prepared for this proposal can be used as a reliable indicator of potential impacts from the higher proposed groundwater discharge rate. New modelling that demonstrates a capacity to continue to more than meet the requirements in existing conditions on marine discharge also provides additional confidence that discharge can be managed to avoid significant impacts on marine environmental quality.

Summary

The EPA has paid particular attention to:

- The principle of conservation of biological diversity and ecological integrity.
- Potential for increases in salinity to affect the water quality in the lower reaches of the Fortescue River
- The proponent's plans for the application of mitigation measures to manage impacts to an acceptable level in the context of the surrounding marine environment and its values.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Marine Environmental Quality that the impacts on this factor are manageable and would no longer be significant, provided there is:

- Control of the volume of discharge of surplus dewater authorised in Schedule 1 of the Recommended Environmental Conditions (Appendix 4).
- Continued regulation of discharge into the Fortescue River through DWER Licence L8308/2008/2.

4.4 Flora and vegetation

EPA objective

The EPA's environmental objective for this factor is *to protect flora and vegetation so that biological diversity and ecological integrity are maintained*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline – Flora and Vegetation (EPA, 2016f)
- Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016g).

The considerations for environmental impact assessment (EIA) for this factor are outlined in Environmental Factor Guideline – Flora and Vegetation (EPA, 2016f).

In addition to the relevant current policy and guidance above, the EPA also had regard to the requirements for flora and vegetation survey in *Position Statement No. 3 Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA, 2002) and *Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004a) noting that those documents were in force when a number of flora and vegetation surveys were undertaken across the area that is relevant to this proposal. The earlier surveys provide important background information.

EPA assessment

The two key activities relevant this factor are clearing and groundwater drawdown, as set out under the sub-headings below.

Clearing

The proposal is located within the Roebourne sub-region of the Pilbara Bioregion of the Interim Biogeographic Regionalisation of Australia. The nearest conservation lands managed by DBCA are 'Ex Mardie', outside the Fortescue catchment about 25 km to the north-east, and a number of offshore islands.

In having regard to the Flora and Vegetation technical policy, the EPA notes that not all the vegetation surveys conducted in the past fully meet the current guidance. In this particular case, the EPA considers that this is partly due to the change in guidance in December 2016, as surveys met guidance at the time they were undertaken and were accepted as part of previous assessment by the EPA. Also, in the case of the Maunsell, 2008 survey, while it was not undertaken at an optimal time for the Pilbara, it was undertaken following significant late rain in April ensuring that survey retained its integrity.

A peer review of all surveys by Mattiske Consulting Pty Ltd (2016), commissioned by the proponent, noted that while not all areas were assessed in multiple seasons, the

broad nature of the plant communities and consistency of mapping approaches enabled the correlation and interpretation of data between survey areas. The EPA also notes that the area, which is within an active pastoral station, is unlikely to have had a positive change in terms of vegetation since the surveys were completed. Therefore as part of the transitional arrangements with its new policy suite the EPA accepts that these surveys are sufficient to allow assessment of this proposal.

Clearing for mines and associated infrastructure in the Pilbara region amounts to approximately 371,300 ha, representing approximately 2% of the Pilbara IBRA region (EPA, 2016a). The Fortescue River floodplain is extensively infested with Mesquite (*Prosopis pallida*), and other introduced weeds.

This proposal includes a further 7,366 ha of clearing, representing a 2% increase in cleared land in the Pilbara, which would increase the total clearing across the Pilbara to approximately 2.04%. Data on the extent and percentage clearing of land systems in the Development Envelope appeared in Table 8-2 of the proponent's ERD (Citic Pacific Mining, 2017). That table, which set out clearing in the proposal area within the Roebourne IRBA sub-region, has since been updated by the proponent and is set out below.

Table 3: Existing and future extent and clearing within land systems occurring within the development footprint of the Sino Iron Continuation Proposal

Land System	Total area of Land System within the Pilbara Region (ha)	% Cleared within Pilbara Region	Total area of Land System within Roebourne Subregion (ha)	% Cleared within Roebourne Subregion	Cleared from the Proposal (ha)	% cleared within Roebourne Subregion including Proposal
Boolgeeda	826,416.12	0.02	27,085.24	0.49	12.4	0.54
Cheerawara	49,210.84	0.01	48,424.73	0.01	2.7	0.02
Horseflat	328,911.14	0.39	297,358.74	0.43	1291.0	0.86
Littoral	248,221.78	0.15	212,125.90	0.18	156.5	0.25
Newman	1,458,027.91	0.03	4,872.65	9.17	16.4	9.51
Paraburdoo	64,135.89	1.52	17,850.10	5.46	1283.6	12.65
River	463,955.92	0.01	125,519.60	0.03	2249.5	1.82
Rocklea	2,428,593.74	0.06	43,182.63	3.36	4104.2	12.86
Yamerina	120,270.82	0.49	119,391.09	0.5	769.9	1.14

The data in Table 3 above indicate that clearing would be focussed on the Horseflat, Paraburdoo, River, Rocklea and Yamerina units at the land system level. The proposal would increase the degree of clearing at the sub-regional level from about 5.5% to about 12.6% in the Paraburdoo land system, from about 3.4% to about 12.9% in the Rocklea land system and from about 9.2% to about 9.5% in the Newman land system. Clearing in all other land systems would remain below 2%. The proponent's assessment indicates that creeklines, floodplains and stoney and clayey plains are of 'high' to 'moderate to high' conservation significance, while other landscape types vary between 'low' and 'moderate' significance.

The Department of Parks and Wildlife (now part of the Department of Biodiversity, Conservation and Attractions) (2014) lists the Horseflat land system as a Priority 3 iii Ecological Community (PEC). Clearing of 1,291 ha of this system for the proposal would increase its level of clearing from 0.43% to 0.86% in the sub-region. The

proponent's analysis concludes that there are no threatened flora species listed under the EPBC Act within three kilometres of the development envelope.

The clearing of an additional 7,366 ha of land for this proposal would result in cumulative vegetation loss due to clearing of less than 3% across the Pilbara region and the Roebourne sub-region. Furthermore, no listed threatened species would be affected and loss of the Horseflat PEC would be limited to 0.86% in the sub-region.

The proponent plans to progressively rehabilitate legacy landforms such as waste rock dumps and tailings storage facilities. Decommissioned processing plant and infrastructure locations would be rehabilitated at the conclusion of the project. These activities would be managed via a Mine Closure Plan. The EPA considers that management of rehabilitation under such a plan is appropriate for this factor.

The EPA considers that the clearing of about 1,138 ha of that land which has 'high' and 'moderate to high' local conservation values is not likely to have a significant impact on the representation of the conservation values of the affected land units at the sub-regional level. The EPA has formed this view given the extent of each of these land systems within the Roebourne sub-region and more broadly across the Pilbara region (Table 3).

The EPA notes that successful rehabilitation would be important for a project area where some 10,100 ha would be disturbed as a result of this proposal and the proponent's existing operations in this area. Establishment of clear rehabilitation criteria would be an essential part of the Mine Closure Plan. The EPA expects that regular monitoring of achievement against the plan and its completion criteria would be undertaken and reported publicly. The EPA recommends that this is required as part of the condition requiring a Mine Closure Plan, recommended in Section 4.2.

Groundwater drawdown and vegetation

The floodplain of the Fortescue River, to the west of the proposed mine expansion, supports vegetation that is moderately to highly dependent on groundwater (Astron, 2009), including belts of riverine forest that are more extensive here than elsewhere on the Pilbara coast. As set out in Section 4.1 above, dewatering of the mine pit would lower the water table by one metre or more up to six kilometres west of the pit and by ten metres or more close to the pit (see Figure 3).

The proponent provided supplementary information setting out the extent of groundwater dependent vegetation on the Fortescue River floodplain that would be affected by drawdown caused by mine dewatering (Table 4).

Table 4. Area of groundwater dependent vegetation on the Fortescue River floodplain that modelling shows would be affected by groundwater drawdown.

Groundwater dependence	Total mapped extent (ha)	Extent within ≥0.5m drawdown contour		Extent within ≥5.0m drawdown contour		Extent within ≥10.0m drawdown contour	
		ha	%	ha	%	ha	%
High	171.1	171.1	100.0	28.3	16.5	0.0	0.0
Moderate	21,984.0	4,984.0	22.7	342.3	1.6	164.2	0.7
Low	93.3	0.0	0.0	0.0	0.0	0.0	0.0
Total	**22,248.5**	**5,155.1**	**23.2**	**370.6**	**1.7**	**164.2**	**0.7**

Groundwater drawdown has the capacity to compromise trees and other vegetation on the Fortescue floodplain. Groundwater dependent vegetation (GDV) along waterways require groundwater to survive. Other vegetation may utilise groundwater where it is readily available but may also gain water through soil moisture. The proponent concludes that drawdown within the 0.5 m drawdown contour is not expected to result in a measurable change to vegetation.

Table 4 above shows that up to 5,155.1 ha (23.2%) of vegetation that is highly or moderately dependent on groundwater has been modelled as subject to drawdown of 0.5 m or more. Similarly, 370.6 ha (1.7%) of moderately or highly groundwater dependent vegetation has been modelled to incur 5.0 m or more of drawdown. This means that 4,784.5 ha would have modelled drawdowns between 0.5 m and 5.0 m.

The EPA notes that loss of GDE was approved in Ministerial Statement 635, and that the area subject to 5.0 m or more of drawdown in the original approved proposal was 1,864 ha, compared to 370.6 ha for this proposal. This reduction of area is due to refinement and improvement of the groundwater modelling.

Drawdown is considered likely to result in the loss of groundwater dependent trees in the vicinity of Du Boulay Creek and the eastern branch of the Fortescue River west of the mine, especially in dry periods between irregular flood events when surface water is not available. The proponent considers that some groundwater dependent vegetation has the potential to be impacted where drawdown is five metres or more (370.6 ha) though it is expected that vegetation value are not expected to be entirely lost.

The EPA considers that groundwater drawdown due to pit dewatering may lead to the loss of trees that are groundwater dependent along parts of Du Boulay Creek and the eastern channel of the Fortescue River, where drawdown may reach five metres or more. However, the EPA considers that, while some loss of groundwater dependent vegetation is likely, this loss is not likely to be so extensive as to be environmentally significant at the sub-regional level.

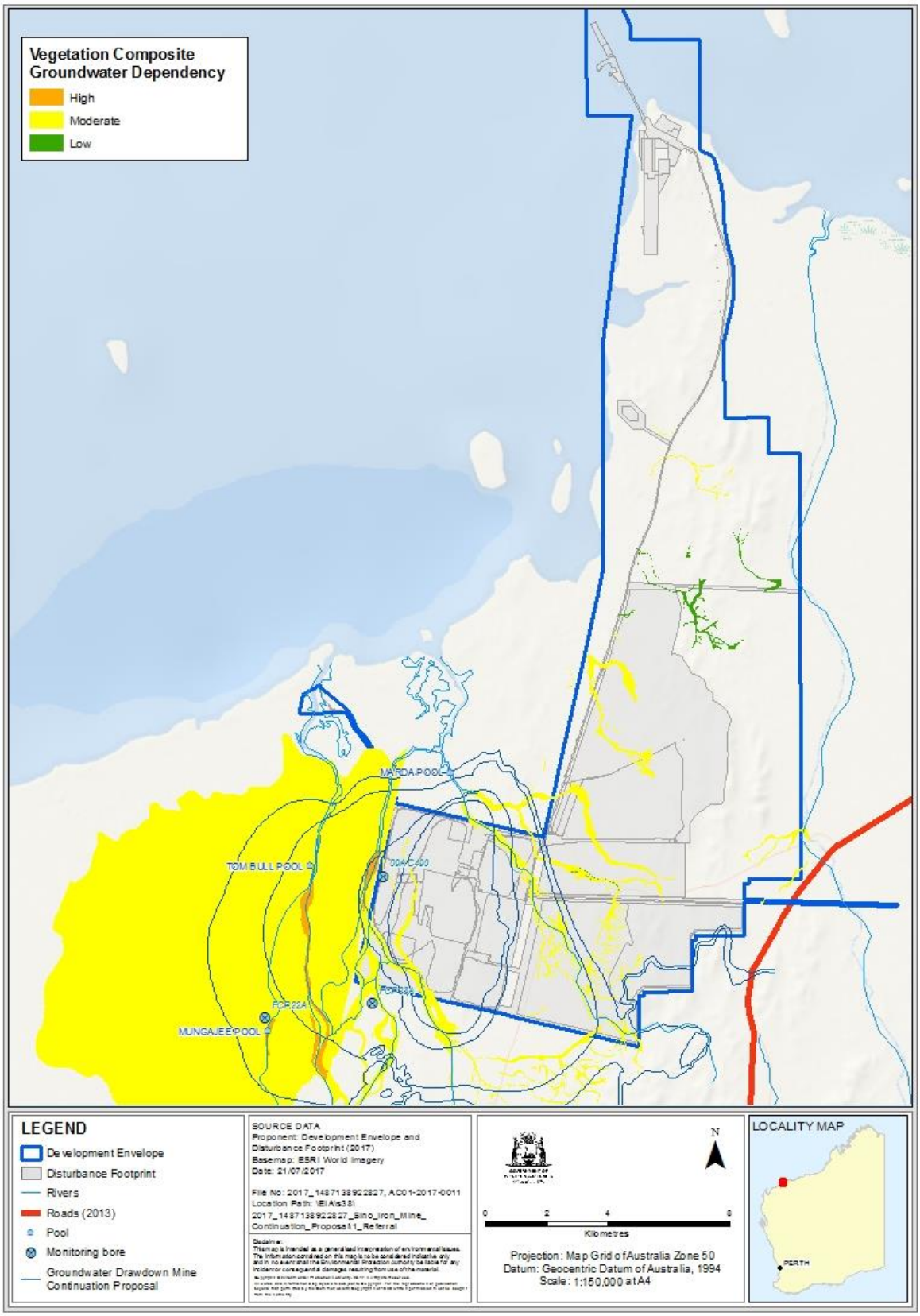

Figure 3 – Groundwater drawdown contours and groundwater dependnent vegetation.

The EPA has recommended offsets for the clearing of 'good to excellent' condition native vegetation in the Pilbara IBRA bioregions. The recommended approach to these offsets recognises the significant residual impacts of the proposal and the specific constraints of undertaking certain offset measures in the region, as well as acknowledging the cumulative impacts of mining in the region. Impacts to the coastline differ from those in the hinterland (e.g. impacts to coastal vegetation communities). These are areas not subject to mining tenements and pastoral leases, and the cumulative impact from development is not considered significant. Therefore, the clearing of 'good to excellent' condition native vegetation as the trigger for offsets is not considered appropriate in this environment at this point in time.

In the case of clearing in the Roebourne IBRA subregion for this proposal, there are no significant residual environmental impacts as the impacts can be mitigated and managed, therefore no offset is required.

The EPA acknowledges that some loss of vegetation is likely for the expanded proposal. However, the EPA considers that provided the intent of existing condition 6 continues to be imposed and the Pit Dewatering and Vegetation Monitoring sub-plan is appropriately revised, this loss is not likely to be so extensive as to be environmentally significant.

Summary

The EPA has paid particular attention to:

- The principle of conservation of biological diversity and ecological integrity.
- The direct clearing of 7,366 ha of vegetation and the likelihood that groundwater drawdown would result in the loss of some areas of groundwater dependent vegetation.
- Prospects for some restoration of vegetation values on rehabilitated areas disturbed by the proposal

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Vegetation and Flora that the impacts to this factor are manageable and would no longer be significant, provided there is:

- Control of clearing through the authorised extent in schedule 1 of the Recommended Environmental Conditions (Appendix 4).
- Continued implementation of the intent of condition 6 (Pit Dewatering and Vegetation Monitoring Plan of Ministerial Statement 635 through the revision of the sub-plan of the Operational EMP to protect the environmental values of groundwater dependent vegetation.

4.5 Terrestrial fauna

EPA objective

The EPA's environmental objective for this factor is *to protect terrestrial fauna so that biological diversity and ecological integrity are maintained*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline – Terrestrial Fauna (EPA, 2016h)
- Technical Guidance – Terrestrial Fauna Surveys (EPA, 2016i)
- Technical Guidance – Sampling Methods for Terrestrial Vertebrate Fauna (EPA, 2016j)
- Technical Guidance – Sampling of Short Range Endemic Fauna (EPA, 2016k).

The considerations for environmental impact assessment (EIA) for this factor are outlined in Environmental Factor Guideline – Terrestrial Fauna (EPA, 2016h).

In addition to the relevant current policy and guidance above, the EPA also had regard to the requirements for fauna survey in *Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and Department of Environment and Conservation, 2010), *Guidance Statement No. 56 Terrestrial fauna surveys for environmental impact assessment in Western Australia* (EPA, 2004b) and *Guidance Statement No. 20 Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia (EPA, 2009)*. These documents were in force when earlier fauna surveys were undertaken across the area that is relevant to this proposal. These earlier surveys provide important background information for this proposal.

EPA assessment

The proposal is located within the Roebourne sub-region of the Pilbara Bioregion of the Interim Biogeographic Regionalisation of Australia. The nearest conservation lands managed by DBCA are 'Ex Mardie', outside the Fortescue catchment about 25 km to the north-east, and a number of offshore islands. Of seven habitat types delineated during fauna surveys for the proponent around the proposed development envelope, drainage lines and cracking clay habitats were considered to have moderate to high conservation significance for fauna. Drainage lines often contain mature trees that provide roosting sites and hollows for nesting, as well as acting as corridors linking fauna habitats.

Northern Quoll was considered potentially affected by the proposal. Additional assessment recorded Northern Quolls at four locations in the existing port area but not within the proposed development envelope, despite the presence of about 50 ha of potential habitat.

The proposal would result in the direct clearing of 7,366 ha of vegetation. While between 70% and 85% of some habitat types with moderate to high conservation significance (drainage lines, cracking clay) mapped within the survey area would be cleared, the impact is not likely to be significant because of the widespread nature of these habitats in the surrounding area.

The EPA understands that the high percentage of some habitat types within the development envelope that would be impacted by clearing is likely to be an artefact of the limited extent of mapping beyond the actual proposal footprint. The EPA considers the regional extent of habitats to be more relevant to an assessment of potential impacts. On this basis, the EPA notes that this proposal will result in a further 7,366 ha of clearing, representing a 2% increase in cleared land in the Pilbara, which would increase the total clearing across the Pilbara to 2.09%. The EPA further notes that loss of the Horseflat PEC would be limited to 0.86% in the sub-region and understands that no listed conservation significant fauna, including the Northern Quoll, would be significantly affected.

The EPA notes that some drainage line and cracking clay habitat would be impacted as a result of direct clearing, realignment of part of Edward Creek and groundwater drawdown. While these habitat types have moderate to high conservation significance, they are represented more widely in the sub-region and the region.

The proponent plans to maintain a buffer alongside De Boulay Creek to potentially allow ongoing fauna movement and considers that rehabilitation of disturbed post-mining landforms could provide some fauna habitat.

The proponent plans to progressively rehabilitate legacy landforms such as waste rock dumps and tailings storage facilities. Decommissioned processing plant and infrastructure locations would be rehabilitated at the conclusion of the project. These activities would be managed via a Mine Closure Plan. The EPA considers that management of rehabilitation under such a plan is appropriate with respect to this factor.

Summary

The EPA has paid particular attention to:

- The principle of conservation of biological diversity and ecological integrity.
- The loss of a relatively small area of habitat within the Pilbara region due to direct clearing and loss of some stands of trees that depend on groundwater and serve as fauna habitat.
- Potential for restoration of some habitat on disturbed areas if they are successfully rehabilitated in future.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Terrestrial Fauna, that the impacts on this factor are manageable and would no longer be significant, provided there is:

- Control of clearing and dewatering through the authorised extent in Schedule 1 of the Recommended Environmental Conditions (Appendix 4).

- the imposition of a condition requiring the proponent to manage rehabilitation and decommissioning consistent with the guidelines for preparing Mine Closure Plans.

4.6 Air quality

EPA objective

The EPA's environmental objective for this factor is *to maintain air quality and minimise emissions so that environmental values are protected*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline – Air Quality (EPA, 2016l)
- Management of Fibrous Minerals in Western Australian Mining Operations – Guideline 2nd Edition (Department of Mines and Petroleum, 2015)
- Guidance Note on Public Health Risk Management of Asbestiform Minerals Associated with Mining (Department of Health, 2013).

The considerations for environmental impact assessment (EIA) for this factor are outlined in Environmental Factor Guideline – Air Quality (EPA, 2016l).

EPA assessment

Mining, gas-fired power generation and processing operations at the existing project are the main local sources of emissions regarded as criteria pollutants.

This proposal includes plans to deepen and extend the mine and continue operations at the mine and port at the current throughput rate for a longer period. These changes would result in an increased extent of pit walls, waste dumps, product stockpiles, unsealed infrastructure corridors and tailings storage facilities, leading to increased potential for dust and fibrous mineral emissions. Emission rates of criteria pollutants and greenhouse gases are not proposed to increase, although operations releasing these emissions would continue for longer.

Monitoring of existing operations has shown ambient emissions levels, such as NO_2 concentrations to be well below NEPM guidelines. The proponent states that ambient dust monitoring has detected a number of exceedances associated with regional events, road use, clearing operations, and localised wind erosion from a waste overburden dump. Fibrous minerals (principally massive, non-asbestiform riebeckite) are present in some rocks associated with the orebody.

The existing project is approved for emissions in excess of 5.5 Mtpa of CO_2 equivalent. The scope of the approved project included a six open cycle gas turbine (640 MW), pellet plant and Direct Reduced Iron (DRI) plant. The EPA notes that a combined cycle power station (480 MW) has been constructed which has approximately 40% less emissions compared to an equivalent open cycle turbine.

The EPA also notes that the pellet plant and Direct Reduced Iron (DRI) plant have not been constructed. Currently the proponent estimates they are likely to report 1.05 Mt of CO_2 equivalent for the 2016/17 financial year with an increase to approximately 1.25 Mt the following financial year. This is well within the approved amount. No expansion of the main greenhouse gas sources from the power station, processing plant or mobile equipment are planned as annual throughput would remain the same, although this continuation proposal would enable these operations to occur for longer.

Additional greenhouse gas emissions can be expected as a result of additional clearing, where increased transport distances occur for ore, waste rock, and tailings. The EPA also notes that improvements in technology over time are likely to create opportunities for the proponent to lower emissions and the EPA expects all proponents to take these opportunities whenever practicable.

Condition 11 of Ministerial Statement 635 for the operating mine requires a Greenhouse Gas Emissions Plan. The EPA notes that this plan was approved in 2006 and is now a sub-plan of the Operational EMP. The condition includes requirements for benchmarking against other projects, and for minimising, monitoring, calculating and reporting of emissions. The project is also subject to reporting under the federal *National Greenhouse and Energy Reporting Act 2007*, and offsets for the DRI plant if/when constructed.

The proponent notes that any additional fibrous material as a result of the expansion will be managed according to a Fibrous Material Management Plan (FMMP), as is the case for the existing project and that the FMMP has been supported by the DMIRS (formerly Department of Mines and Petroleum). The DMIRS has the expertise and primary legislative responsibility for managing worker health with respect to fibrous materials. Potentially fibrous waste rock material is to be encapsulated within the interior of the dumps where it is surrounded by at least 50 m of clean material at the sides and covered by at least 10 m of clean material on top. Existing levels of worker protection and on- and off-site monitoring are expected to continue if the new proposal is implemented.

The proponent plans to progressively rehabilitate legacy landforms such as waste rock dumps and tailings storage facilities. Decommissioned processing plant and infrastructure locations would be rehabilitated at the conclusion of the project. These activities would be managed through a Mine Closure Plan. The EPA considers that management of rehabilitation under such a plan is appropriate to assist in mitigating air quality impacts following mine closure.

Ramboll Environ undertook an expert peer review of the Air Quality section of the ERD. The peer review highlights the potential for increased inherent risks of fibrous material and dust releases as a consequence of the increased area of disturbance for this proposal. The reviewer considers that the proponent is likely to be able to manage the increased risk of fibrous mineral release, based on demonstrated performance in managing the current risks, but considers that further information is required to demonstrate this, particularly for waste rock dumps and tailings storage facilities. The EPA expects the proponent to continue to focus on managing fibrous minerals and dust to the required standards.

The EPA notes advice from the Department of Health (DoH) that it is satisfied with the proponent's conservative approach to monitoring and managing fibrous minerals.

The independent peer reviewer, Ramboll Environ, also noted that 'ongoing monitoring programs are very important to the achievement of the EPA's objective for air quality.' The EPA notes this advice and recommends a condition requiring a Mine Closure Plan include the management of fibrous materials.

Summary

The EPA has paid particular attention to:

- The principle of conservation of biological diversity and ecological integrity.
- Potential for the increased area of the mine, waste dumps, TSFs and other infrastructure to increase the inherent risk of dust and fibrous minerals affecting air quality.
- Expert advice that occupation exposure to fibrous materials can be regulated by the DMIRS through the existing FMMP, and dust management plans and procedures.
- Expert advice that the plans above should be reviewed and revised where necessary to demonstrate that increased inherent risk from dust and fibrous minerals to air quality could be managed.
- The need for management of dust and fibrous minerals to a level that is as low as practicable.
- The continued emission of greenhouse gases over an extended period not exceeding the previous approved limit for the current operation.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Air Quality that the impacts on this factor are manageable and would no longer be significant, provided there is:

- Control of the area disturbed through the authorised extent in Schedule 1 of the Recommended Environmental Conditions (Appendix 4).
- The imposition of condition requiring a Mine Closure Plan which includes the management of fibrous materials.
- Continued implementation of the FMMP required by DMIRS.
- Continued management of Greenhouse Gases through condition 11 of Ministerial Statement 635.

4.7 Terrestrial environmental quality

EPA objective

The EPA's environmental objective for this factor is *to maintain the quality of land and soils so that environmental values are protected*.

Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline – Terrestrial Environmental Quality (EPA, 2016m)
- Management of Fibrous Minerals in Western Australian Mining Operations – Guideline 2nd Edition (Department of Mines and Petroleum, 2015)

The considerations for environmental impact assessment (EIA) for this factor are outlined in Environmental Factor Guideline – Terrestrial Environmental Quality (EPA, 2016m).

EPA assessment

According to the proponent's ERD, fibrous minerals (principally massive, non-asbestiform riebeckite) are present in rocks forming part of the Joffre and Dales Gorge members associated with the orebody. Crushing and milling of riebeckite can liberate material classified as countable fibres under occupational health guidelines.

This proposal includes plans to deepen and extend the mine and continue operations at the current throughput rate for a longer period. These changes would result in an increased extent of pit walls, waste dumps and tailings storage facilities that could increase the potential for fibrous mineral exposures and subsequent soil contamination.

The proponent states that potentially hazardous minerals mined near dolerite intrusions are quarantined and encapsulated in cells within the waste dumps. These cells are designed to have 50 m of clean material on their sides, to be covered with at least three metres of oxidised, compacted material and to be no less than ten metres below the surface of the final landform. Material from the Dales Gorge member would also be quarantined, stored and capped within waste dumps according to the proponent. Fibrous minerals may also occur in rocks associated with the Joffre member, which hosts magnetite ore. Waste from the ore processing plant is stored in the tailings storage facilities. Management of fibrous materials is subject to the FMMP as set out in Section 4.6 above. The proponent plans to rehabilitate waste dumps and tailings storage facilities as set out in a Mine Closure Plan.

The ERD indicates that the tailings storage facilities (TSFs) would be rehabilitated by reconstructing outer batter slopes to an angle of five horizontal metres for each vertical metre and covering the tailings material with waste rock with a slope of three to seven degrees to encourage water shedding without inducing erosion. Between 100 and 200 mm of topsoil would be placed on the surface. Seeding and vegetation mulching would be undertaken. A specific objective set out in the proponent's conceptual closure plan is to verify that the tailings storage facility cover is erosion resistant so that fibrous materials are appropriately encapsulated. The proponent expects that ongoing maintenance of the external walls would be required.

The proponent plans to construct waste dumps that do not significantly change regional surface water drainage patterns, with concave outer slopes, sheeted with sufficient rock to prevent erosion and with no potential for fibrous materials to be exposed. Potential acid forming and fibrous materials would be encapsulated using the same specifications as set out for encapsulation cells in tailings storage facilities above. Topsoil return, reseeding and mulching would also be to the same specifications as for TSFs.

The proponent plans to progressively rehabilitate legacy landforms such as waste rock dumps and tailings storage facilities. These activities would be managed via a Mine Closure Plan. The EPA notes that an expert peer review of the Terrestrial Environmental Quality section of the ERD (Ramboll Environ), expressed the view that long-term contamination would make the area unsuitable for other future land uses.

The EPA notes that the peer review agrees with the predicted outcome in the ERD that the project could be managed to ensure that there are no unacceptable impacts to Terrestrial Environmental Quality resulting from fibrous minerals, provided that the proponent maintains a strong focus on the implementation of the FMMP, other dust management plans and procedures, and the mine closure plan.

The key issue to ensure the EPA's objective for this factor is met is that waste rock dumps, TSFs and areas of the pit where fibrous minerals occur are durably encapsulated or otherwise covered and maintained so that fibrous minerals do not escape in the long term.

Summary

The EPA has paid particular attention to:

- The principle of waste minimization.
- The potential for fibrous minerals to contaminate the terrestrial environment of the mine, waste dumps, tailings storage facility and surroundings.
- Capacity for quarantine and encapsulation within the waste dumps and tailings storage facilities to manage fibrous minerals during operations.
- Expert advice that the proposal can be managed to ensure there are no unacceptable impacts to terrestrial environmental quality provided the proponent maintains a strong focus on the implementation of the Fibrous Materials Management Plan and associated plans to adequately manage dust and fibrous minerals.
- Capacity for rehabilitation and subsequent monitoring and management consistent with the proponent's Mine Closure Plan to contain fibrous minerals in the waste dumps and TSFs in the long term.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Terrestrial Environmental Quality, that the impacts on this factor are manageable and would no longer be significant, provided there is:

- Control through the authorised extent of disturbance in schedule 1 of the Recommended Environmental Conditions (Appendix 4).
- The imposition of condition requiring a Mine Closure Plan which includes the management of fibrous materials.
- Continued implementation of the FMMP required by DMIRS.

5. Conclusion

In drawing its conclusions below, the EPA has considered the assessment in the previous sections and taken an holistic view of the likely residual impacts of the proposal. The EPA has considered the degree of connectivity and inter-relatedness of processes operating across systems and communities that make up the environment.

The EPA has taken the following into account in its assessment of the proposal as a whole, including the likely impacts on groundwater dependent vegetation from groundwater drawdown and the increased inherent risk from exposure of fibrous minerals:

- The impacts to all the key environmental factors.
- The EPA's confidence in the proponent's proposed mitigation measures.
- The relevant EP Act principles (the principle of waste minimisation and the principle of conservation of biodiversity and ecological integrity) and the EPA's objectives for the key environmental factors.
- The EPA's view that the impacts to the key environmental factors are manageable, provided the recommended conditions are imposed.

In addition to the proposed additional condition requiring a Mine Closure Plan, the EPA also recommends that a condition be imposed requiring the proponent to revise all plans required for the approved project that are relevant to this proposal, including the Operational EMP. The EPA also recommends that the revised plans are consistent with contemporary standards, policies, guidelines and procedures, including EPA guidance and guidance from relevant government departments.

Given the above, the EPA has concluded that the proposal is environmentally acceptable and therefore recommends that the proposal may be implemented subject to the conditions contained in Ministerial Statements 635 and 822 and the conditions recommended in Appendix 4.

6. Recommendations

The EPA recommends that the Minister for Environment notes:

1. That the proposal assessed is for continuation of the Sino Iron Ore Mine at Cape Preston by an increase in clearing from 2,734 ha to 10,100 ha, increased dewatering and discharge from 2 to 8 GL/yr, deeper mining, additional waste dumps and tailings storage facilities and a shift in groundwater drawdown to areas supporting groundwater dependent vegetation.
2. The key environmental factors identified by the EPA in the course of its assessment are:
    a) Hydrological processes
    b) Inland waters environmental quality
    c) Marine environmental quality
    d) Flora and vegetation
    e) Terrestrial fauna
    f) Air quality, and
    g) Terrestrial environmental quality, set out in Section 4.
3. The EPA has concluded that the proposal may be implemented, provided the implementation of the proposal is carried out in accordance with the conditions and procedures in Ministerial Statements 635 and 822 and the recommended conditions in Appendix 4. Matters addressed in the conditions include the following:
    a) Mine Closure Plan to address fibrous materials and management of waste rock and tailings during the rehabilitation and decommissioning of the mine.
    b) Requirement to revise all plans required for the approved project that are relevant to this proposal, consistent with contemporary guidance.

Appendix 1

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Appendix 2

Consideration of principles

EP Act Principle	Consideration
1. The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by –* *a) Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* *b) An assessment of the risk-weighted consequences of various options.*	In considering this principle, the EPA notes that Hydrological Processes, Inland Waters Environmental Quality, Marine Environmental Quality, Flora and Vegetation, Terrestrial Fauna, Air Quality, and Terrestrial Environmental Quality could be significantly impacted by the proposal. Investigations into the biological and physical environmental that have been undertaken by the proponent have provided sufficient certainty to assess risks and identify measures to avoid or minimise impacts. The EPA has recommended conditions to ensure relevant measures are undertaken by the proponent From its assessment of this proposal the EPA has concluded that there is no threat of serious or irreversible harm.
2. The principle of intergenerational equity *The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.*	In considering this principle, the EPA notes that the proponent has taken measures to avoid and minimise impacts. In assessing this proposal the EPA has recommended conditions to manage impacts to the key environmental factors identified during the course of this assessment. From its assessment of this proposal the EPA has concluded that the environmental values would be protected and that the health, diversity and productivity of the environment would be maintained for the benefit of future generations.
3. The principle of the conservation of biological diversity and ecological integrity	This principle is a fundamental and relevant consideration for the EPA when assessing and considering the impacts of the

Conservation of biological diversity and ecological integrity should be a fundamental consideration.	proposal on the environmental factors of flora and vegetation and terrestrial fauna. The EPA notes that the proponent has identified measures to avoid or minimise impacts. The EPA has considered these measures during its assessment. The EPA notes that the proposal avoids areas supporting rare or threatened flora, has minimal impact on the Northern Quoll and affects only a small area of a Priority Ecological Community. Some groundwater dependent vegetation would be lost. Despite the loss of groundwater dependent vegetation, the EPA notes that impacts would not significantly affect biological diversity and the effect on ecological integrity would be to a limited area and can be managed. The EPA has considered the extent to which potential impacts from the proposal can be ameliorated by recommended conditions. The EPA has concluded that, given the nature of the impacts, the proposed conditions are likely to ameliorate the impacts of the loss of ecological integrity.
4. Principles relating to improved valuation, pricing and incentive mechanisms *(1) Environmental factors should be included in the valuation of assets and services.* *(2) The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.* *(3) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services,*	In considering this principle, the EPA notes that the proponent would bear the cost relating to environmental management of dust and fibrous minerals and rehabilitation of disturbed landscapes. The EPA has had regard to this principle during the assessment of the proposal.

including the use of natural resources and assets and the ultimate disposal of any waste. *(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimize costs to develop their own solution and responses to environmental problems.*	
5. The principle of waste minimisation *All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.*	This principle is a fundamental and relevant consideration for the EPA when assessing and considering the impacts of the proposal on the environmental factors of air quality, terrestrial environmental quality, marine environmental quality, inland waters environmental quality and hydrology. The proposal is designed to minimise the extraction of groundwater and its subsequent discharge to the ocean. Surface water design and control measures have been included in the proposal to minimise reductions in surface water quality to the extent practicable. Mine pit design principles have included the objective of avoiding or quarantining and encapsulating fibrous minerals. Dust control measures have been considered with a view to minimising dust generation to the extent practicable. The EPA concludes that all reasonable and practicable measures have been included in the proposal design to minimise the generation of waste.

Appendix 3

Evaluation of other environmental factors

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
SEA		
Benthic Communities and Habitats	• Organisms that make up benthic communities could be adversely affected by differences between the salinity and composition of discharged mine water and seawater. • Discharged mine water could scour the seabed, removing loose habitat.	Benthic Communities and Habitats was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal or in the ESD. Having regard to: • The large tidal range and flow volume in the mouth of the Fortescue River where mine water is discharged; • The proposal to discharge mine water on outgoing tides only; • The relatively small volume and localised nature of discharged mine water compared to the tidal volume of the river; • Rapid dilution predicted within close proximity to the mine water discharge diffuser; and • The significance considerations in the *Statement of Environmental Principles, Factors and Objectives*, the EPA considers that it is unlikely that the proposal would have a significant impact on Benthic Communities and Habitats and that the impacts on this factor are manageable. Accordingly, the **EPA did not consider Benthic Communities and Habitats to be a key environmental factor** at the conclusion of its assessment.
Coastal Processes	• Discharged mine water could scour the seabed, removing loose habitat and adversely affect coastal processes.	Coastal Processes was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal or in the ERD.

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
		Having regard to: • The large tidal range and flow volume in the mouth of the Fortescue River where mine water is discharged; • The proposal to discharge mine water on outgoing tides only; • The relatively small volume and localised nature of discharged mine water compared to the tidal volume of the river; and • The significance considerations in the *Statement of Environmental Principles, Factors and Objectives*, the EPA considers that it is unlikely that the proposal would have a significant impact on Coastal Processes and that the impacts on this factor are manageable. **Accordingly, the EPA did not consider Coastal Processes to be a key environmental factor** at the conclusion of its assessment.
Marine Fauna	• Marine fauna could be adversely affected by differences between the salinity and composition of discharged mine water and seawater.	Marine Fauna was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal or in the ERD. Having regard to: • The large tidal range and flow volume in the mouth of the Fortescue River where mine water is discharged; • The proposal to discharge mine water on outgoing tides only; • The relatively small volume and localised nature of discharged mine water compared to the tidal

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
		volume of the river; • Rapid dilution predicted within close proximity to the mine water discharge diffuser; and • The significance considerations in the *Statement of Environmental Principles, Factors and Objectives*, the EPA considers that it is unlikely that the proposal would have a significant impact on Marine Fauna and that the impacts to this factor are manageable. Accordingly, the **EPA did not consider Marine Fauna to be a key environmental factor** at the conclusion of its assessment.
LAND		
Landforms	• Failure of rehabilitation could result in long-term erosion and adverse impacts on post-mining landforms. • Eroded post-mining landforms could liberate fibrous minerals.	Landforms was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal or in the ESD. There are no distinctive landforms physical landforms within the development envelope at a local or regional scale. Accordingly, the **EPA did not consider Landforms to be a key environmental factor** at the conclusion of its assessment.
Subterranean Fauna	• Lowering the watertable may reduce subterranean habitat availability • Mining may remove subterranean habitat	Subterranean Fauna was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal or in the ESD. Having regard to: • Subterranean fauna habitats in alluvial sediments subject to large, periodic, freshwater floods are likely to be well connected;

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
		• Subterranean fauna in alluvial habitats are likely to be readily transported throughout the floodplain by flooding; • Alluvial water tables fluctuate naturally by up to 6 m during flooding and drying cycles, hence drawdown of up to a few metres is unlikely to materially change the environment for subterranean fauna; • Drawdown beyond 6 m is limited in extent, around the mine pit; • More than three quarters of the floodplain is not predicted to be affected by groundwater drawdown • Aquifers in hard rock fractures that would be mined have limited volume and extent; and • The significance considerations in the *Statement of Environmental Principles, Factors and Objectives*, the EPA considers that it is unlikely that the proposal would have a significant impact on Subterranean Fauna and that the impacts on this factor are manageable. Accordingly, the **EPA did not consider Subterranean Fauna to be a key environmental factor** at the conclusion of its assessment.
PEOPLE		
Social Surroundings	• The proposal could adversely affect social amenity via noise, dust and visual impacts on the landscape. • The proposal could limit access to socially valuable recreation resources at the Fortescue River mouth.	Social Surroundings was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal or in the ESD. Having regard to: • The sparse population density around the proposal, with Mardie Station homestead 30 km away and

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
	• The proposal could have unacceptable impacts on sites that are significant to indigenous or other people.	the informal campground at Fortescue River mouth 7 km away; • Provisions to maintain access to visitor locations such as the Fortescue River mouth and permanent pools along the river; • The limited predicted watertable drawdown at the permanent pool at Mungajee (0.5 to 1 m); • The existence of an Indigenous Land Use Agreement between the proponent and the relevant representative body for the purpose of an iron ore mine; and • The significance considerations in the *Statement of Environmental Principles, Factors and Objectives*, the EPA considers that it is unlikely that the proposal would have a significant impact on Social Surroundings and that the impacts on this factor are manageable. Accordingly, the **EPA did not consider Social Surroundings to be a key environmental factor** at the conclusion of its assessment.
Human Health	• Emissions of fibrous minerals, criteria pollutants or other pollutants could subject humans to harmful impacts outside the mine site.	Human Health was not identified as a preliminary key environmental factor when the EPA decided to assess the proposal or in the ESD. Having regard to: • The existing authorised rate of emissions of criteria pollutants or other pollutants is not proposed to change as a result of this proposal as the mining, processing and production rates would not change; • The measures in place and proposed to continue

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
		for this proposal to manage emissions of fibrous minerals on and off the mine site; • Previous monitoring data demonstrating the effectiveness of existing controls for health impacts; and • The significance considerations in the *Statement of Environmental Principles, Factors and Objectives*, the EPA considers that it is unlikely that the proposal would have a significant impact on Human Health and that the impacts to this factor are manageable. Accordingly, the **EPA did not consider Human Health to be a key environmental factor** at the conclusion of its assessment.

Appendix 4

Identified Decision-Making Authorities and Recommended Environmental Conditions

Identified Decision-making Authorities

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

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

The following decision-making authorities have been identified:

Decision-making Authority	Legislation (and Approval)
1. Minister for Environment	*Wildlife Conservation Act 1950* (Taking of flora and fauna)
2. Minister for Water	*Rights in Water and Irrigation Act 1914* (Water abstraction licence)
3. Minster for State Development	*Iron Ore Processing (Mineralogy Pty Ltd) Agreement Act 2002 as amended*
4. Minister for Aboriginal Affairs	*Aboriginal Heritage Act 1972* (Section 18 clearances)
5. CEO, Department of Water and Environmental Regulation	*Environmental Protection Act 1986* (Works Approval and Licence)
Department of Mines, Industry Regulations and Safety, Environment Division State Mining Engineer Chief Dangerous Goods Officer	*Mining Act 1978* (Mining proposal) *Mines Safety and Inspection Act 1994* (Mine safety) *Dangerous Goods Safety Act 2004* (Dangerous goods)

Note: In this instance, agreement is only required with DMAs 1 – 4, since these DMAs are Ministers.

Statement No. XXX

RECOMMENDED ENVIRONMENTAL CONDITIONS

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
***(Environmental Protection Act 1986*)**

SINO IRON MINE CONTINUATION PROPOSAL

Proposal: To expand the existing iron ore mine, processing and export facility at Cape Preston.

Proponent: Sino Iron Pty Ltd and Korean Steel Pty Ltd
Australian Company Number: 058 429 708 and 058 429 600

Proponent Address: CITIC Pacific Mining Management Pty Ltd
45 St Georges Terrace, PERTH WA 6000

Assessment Number: 2118

Report of the Environmental Protection Authority: 1602

Previous Assessment Numbers: 1114 and 1814

Previous Reports of the Environmental Protection Authority: 1056 and 1343

Previous Statement Numbers: 635 and 822

Pursuant to section 45, read with section 45B of the *Environmental Protection Act 1986* [1], it has been agreed that:

1. the proposal described and documented in Schedule 1 may be implemented; and
2. the implementation of the proposal is subject to the implementation conditions in Ministerial Statement No. 635 dated 20 October 2003, as amended by the implementation agreement set out in Ministerial Statement No. 822 dated 23 December 2009, and as further amended as follows.

Note: Words and expressions used in this Statement shall have the same respective meanings as in the EP Act or as provided for in Schedule 1 of this Statement.

[1] Section 45B, read with section 47 of the EP Act, means that the Proponent is to ensure that the revised proposal (being the proposal defined in Ministerial Statement No. 635, as amended by the proposal defined in Ministerial Statement No. 822 and the proposal referred to in this Statement) is to be implemented in accordance with the implementation conditions set out in Ministerial Statement No. 635, as amended by Ministerial No. 822, and this Statement.

Replace condition 16 of Ministerial Statement No. 635 with the following:

16 Rehabilitation and decommissioning – mine and borefield

16-1 The Proponent shall manage the implementation of the Proposal to meet the following environmental objective:

(1) ensure that the Proposal is rehabilitated and decommissioned in an ecologically sustainable manner.

16-2 Within six months of the issue of this Statement or as otherwise agreed in writing from the CEO, the Proponent shall prepare and submit a Mine Closure Plan in accordance with the Guidelines for Preparing Mine Closure Plans, May 2015 (or any subsequent revisions of the guidelines), to the requirements of the CEO, on advice of the Department of Mines, Industry Regulation and Safety, and the Department of Water and Environmental Regulation.

16-3 The proponent shall continue to implement the version of the Preliminary Decommissioning and Closure Plan most recently approved by the CEO in writing until the CEO has confirmed by notice in writing that that the Mine Closure Plan satisfies the requirements of condition 16-2 to meet the objective required by 16-1.

16-4 The plan shall include, but not be limited to, the following:

(1) management of fibrous materials;

(2) management of waste rock including waste rock capable of generating Acid Metalliferous Drainage;

(3) management of the Tailings Storage Facility; and

(4) management of pit lakes.

16-5 The plan shall include a schedule of progressive rehabilitation for all areas of clearing within the mine development envelope.

16-6 The plan shall include a performance report for the period since the last revision of the plan, including, but not limited to:

(1) a gap analysis and risk assessment to determine what further information is required in relation to rehabilitation and decommissioning of each domain or feature;

(2) progress towards meeting information gaps, including results of research activities and rehabilitation trials;

(3) identification of actual progressive rehabilitation against the schedule of progressive rehabilitation required in condition 16-5; and

(4) progress against completion criteria.

16-7 The Proponent shall review and revise the Mine Closure Plan required by condition 16-2 at intervals not exceeding three years, or as otherwise specified by the CEO, and submit the plan to the CEO at the agreed interval.

16-8 The Proponent shall implement the latest revision of the Mine Closure Plan, which the CEO has confirmed by notice in writing, satisfies the requirements of condition 16-2.

Insert the following additional condition into Ministerial Statement No. 635:

17 Amendment of plans, reports, systems or programs

17-1 The proponent shall revise the versions most recently approved by the CEO of plans, reports, systems or programs, required by Ministerial Statement 635, which are applicable to the Sino Iron Mine Continuation Proposal, to include the Sino Iron Mine Continuation Proposal and to be consistent with contemporary standards, policies, guidelines and procedures.

17-2 Within six months of the issue of this statement, or as otherwise agreed in writing by the CEO, the proponent shall revise and submit the plans reports, systems or programs, required by condition 17-1, to the requirements of the CEO.

17-3 The proponent shall implement the latest revision of the plans reports, systems or programs, required by condition 17-1, which the CEO has confirmed by notice in writing, satisfies the requirements of condition 17-1.

Schedule 1

Table 1: Summary of the Proposal

Proposal Title	Sino Iron Mine Continuation Proposal
Short Description	Expansion of the approved iron ore mine, processing plant and export facilities in the Cape Preston area. In addition to the proposal approved under Ministerial Statement No. 635, as amended by Ministerial Statement No. 822, the expansion includes the following: • Mine and processing plant: deepening the mine pit, additional infrastructure (including waste storage, creek diversion and infrastructure corridors), additional dewatering and discharge of surplus dewater. • Port: an increase in port stockyard capacity.

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

Column 1	**Column 2**	**Column 3**
Element	**Location**	**Authorised extent**
Mine		
Mine and associated infrastructure	Figure 1	Additional clearing of no more than 7,366 ha (from 2,734 ha to 10,100 ha) within a development envelope of 22,737 ha
Pit depth	Figure 1	Additional 180 m (from 220 m to 400 m)
Pit dewatering		Additional abstraction of up to 6 GL/a (from 2 GL/a to 8 GL/a) of groundwater
Surplus dewater management	Figure 1 Fortescue River mouth	Additional disposal of up to 6 GL/a (from 2 GL/a to 8 GL/a) of dewater discharge to Fortescue River
Port		
Port stockyard capacity	Figure 1	Additional 2 Mt (from 1 Mt to 3 Mt)

Table 3: Abbreviations and Definitions

Acronym or Abbreviation	Definition or Term
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.
Clearing	As defined in the *Environmental Protection Act 1986*
GL/a	Gigalitres per annum
ha	Hectare
Mt	Mega tonne

Figures

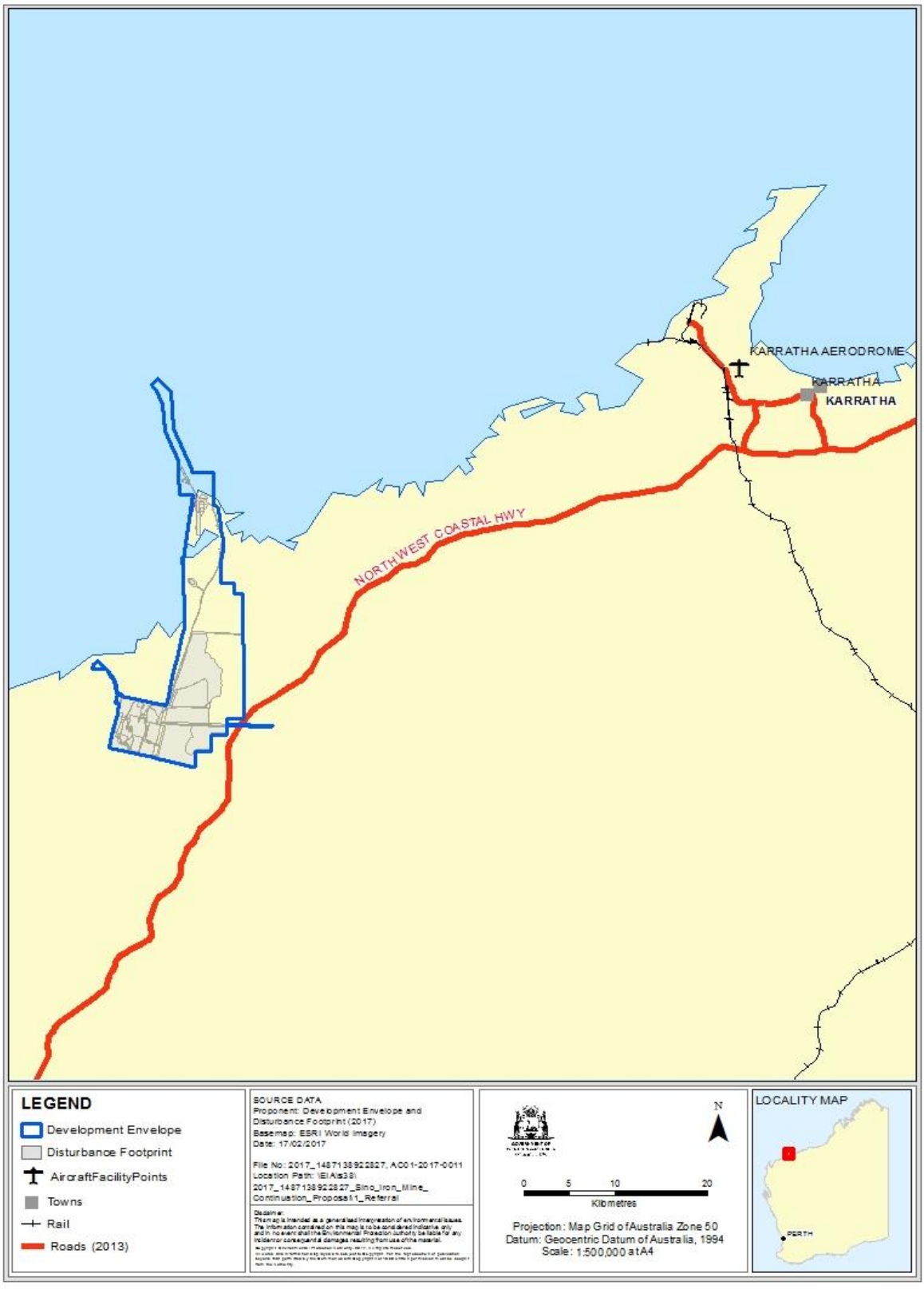

Figure 1 Development Envelope

Coordinates defining the Sino Iron Mine Continuation Development Envelope in Figure 1 are held by the Department of Water and Environment Regulation, Document Reference Number DWERDA-003110