



# **Brockman 2 Detrital Iron Ore Mine Extension Phase 2B**

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**Hamersley Iron Pty Ltd**



**Report and recommendations  
of the Environmental Protection Authority**

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**Environmental Protection Authority  
Perth, Western Australia**

**Report 1393  
April 2011**

## Assessment on Proponent Information Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
07/02/11	Level of assessment set	
22/03/11	Proponent's final API document received by EPA	6
19/04/11	Publication of EPA report (3 days after report to Minister)	4
03/05/11	Close of appeals period	2

Timelines for an assessment may vary according to the complexity of the project and are usually agreed with the proponent soon after the level of assessment is determined.

In this case, the Environmental Protection Authority met its timeline objective in the completion of the assessment and provision of a report to the Minister.



Dr Paul Vogel  
Chairman  
19/4/11

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# Contents

	<b>Page</b>
<b>1. Introduction and background.....</b>	<b>1</b>
<b>2. The proposal .....</b>	<b>1</b>
<b>3. Consultation.....</b>	<b>3</b>
<b>4. Key environmental factors.....</b>	<b>3</b>
4.1 Groundwater .....	3
4.2 Mine Closure and Rehabilitation .....	11
<b>5. Recommended Conditions .....</b>	<b>15</b>
<b>6. Conclusions .....</b>	<b>15</b>
<b>7. Recommendations .....</b>	<b>16</b>

## **Tables**

1. Summary of key proposal characteristics .....	2
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## **Figures**

1. Regional location
2. Site layout

## **Appendices**

1. References
2. Recommended Environmental Conditions

# 1. Introduction and background

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment on the proposal to extend the Brockman 2 Detrital Iron Ore Mine by extending the existing P4 Extension, Lower Pit 4, Valley Pit and Pit 6 from 580 metres Reduced Level (mRL) to an approximate depth of 530 mRL to form an amalgamated pit (BS2 pit). The proponent is Hamersley Iron Pty Ltd (a subsidiary of Rio Tinto Iron Ore).

Section 44 of the *Environmental Protection Act 1986* (EP Act) requires the EPA to report to the Minister for Environment on the outcome of its assessment of a proposal. The report must set out:

- 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 include in the report any other advice and recommendations as it sees fit.

The proponent has submitted a referral document setting out the details of the proposal, potential environmental impacts and proposed commitments to manage those impacts.

The EPA considers that the proposal, as described, can be managed to meet the EPA's environmental objectives, subject to the EPA's recommended conditions being made legally binding.

The EPA has therefore determined under Section 40 of the EP Act that the level of assessment for the proposal is Assessment on Proponent Information (API) – category A, and this report provides the EPA advice and recommendations in accordance with Section 44 of the EP Act.

## 2. The proposal

The Brockman 2 Detrital Iron Ore Mine (B2 Project) commenced mining operations in 1992 in the central Pilbara region of Western Australia. It is located in the Brockman Syncline area, approximately 55 kilometres (km) northwest of Tom Price. Ore from the mine is currently exported through Dampier and Cape Lambert ports. Figure 1 shows the regional location of the mine.

This proposal is for the Phase 2B development of the B2 Project and involves further development of parts of the existing Pit 4 Extension, Lower Pit 4, Valley Pit and Pit 6 to an approximate depth of 530 mRL to form an amalgamated pit known as the BS2 Pit (Figure 2). The key components of the proposal are:

- mining of approximately 3.2 million tonnes (Mt) of high grade ore with approximately 2.7 Mt of waste rock;
- dewatering of the orebody of 1.2 gegalitres over the mine life;

- black shale containing mineral waste to be stored within a new waste dump in a section of the existing Pit 4 void;
- discharge of excess dewatering water not used in processing or for dust suppression, into Pit 5 for passive recharge into the regional aquifer; and
- depressurisation holes (if required) to be drilled into the pit walls at regular intervals to ensure water pressures are reduced to meet geotechnical factors of safety.

Approval for the original proposal was granted by the then Minister for the Environment in April 1991. The B2 Project is located on State Agreement Act Mining Lease ML4S granted pursuant to the *Iron ore (Hamersley Range) Agreement Act 1963*.

Following the original approval of April 1991 (Statement 131), several changes to the project have been approved. These changes include the following:

- development of Lens C East (Pit 5) to a depth of 590 mRL (approved in August 1997 under Condition 2 of Statement 131);
- development of Pit 4 Extension and Pit 6 to a depth of 620 mRL (approved in July 1998 under Condition 2 of Statement 131);
- further extension of Pit 4 to a depth of 620 mRL (approved in July 1999 under Condition 2 of Statement 131);
- development of additional land bridges, ramp and haul roads (approved in December 1999, November 2001 and February 2004 under Condition 2 of Statement 131);
- development of the Valley Pit to a depth of 620 mRL (approved in December 2004 under Section 45C of the EP Act);
- increasing the depth of mining in Lower Pit 4 from 620 MRL to 580 mRL, with associated dewatering of the orebody aquifer to a depth of 570 mRL (approved in September 2005 under Section 45C of the EP Act);
- development of Pit 7 to a depth of 690 mRL (approved in September 2005 under Section 45C of the EP Act);
- additional stockpiles and upgrades to roads and other infrastructure (approved in June 2006 and November 2007 under Section 45C of the EP Act); and
- a change to the proposal to allow the 'Phase 2A' development to the B2 Project (approved in August 2009 under Section 45C of the EP Act).

The main characteristics of the proposal are summarised in the table below.

**Table 1: Summary of key proposal characteristics**

<b>Element</b>	<b>Description</b>
Life of Mine	5 years
Area to be cleared	0 Hectares
Total production	3.2 Mt high grade ore
Dewatering volume	1.2 gigalitres
Discharge volume (Brockman 2 operations)	No more than 950 ML/year

The potential impacts of the proposal are discussed by the proponent in the API document (Strategen 2011).

### **3. Consultation**

During the preparation of the API, the proponent has undertaken consultation with government agencies and key stakeholders. The agencies, groups and organisations consulted are detailed in the proponent's API document (Strategen 2011). The proponent placed a public notice in the regional newspaper over two consecutive weeks inviting public submissions. No submissions were received.

The EPA considers that the consultation process has been appropriate and that reasonable steps have been taken to inform the community and stakeholders on the proposed development.

### **4. Key environmental factors**

It is the EPA's opinion that the following key environmental factors relevant to the proposal require evaluation in this report:

- (a) Groundwater; and
- (b) Mine Closure and Rehabilitation.

The key environmental factors are discussed in Sections 4.1 – 4.2. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

#### **4.1 Groundwater**

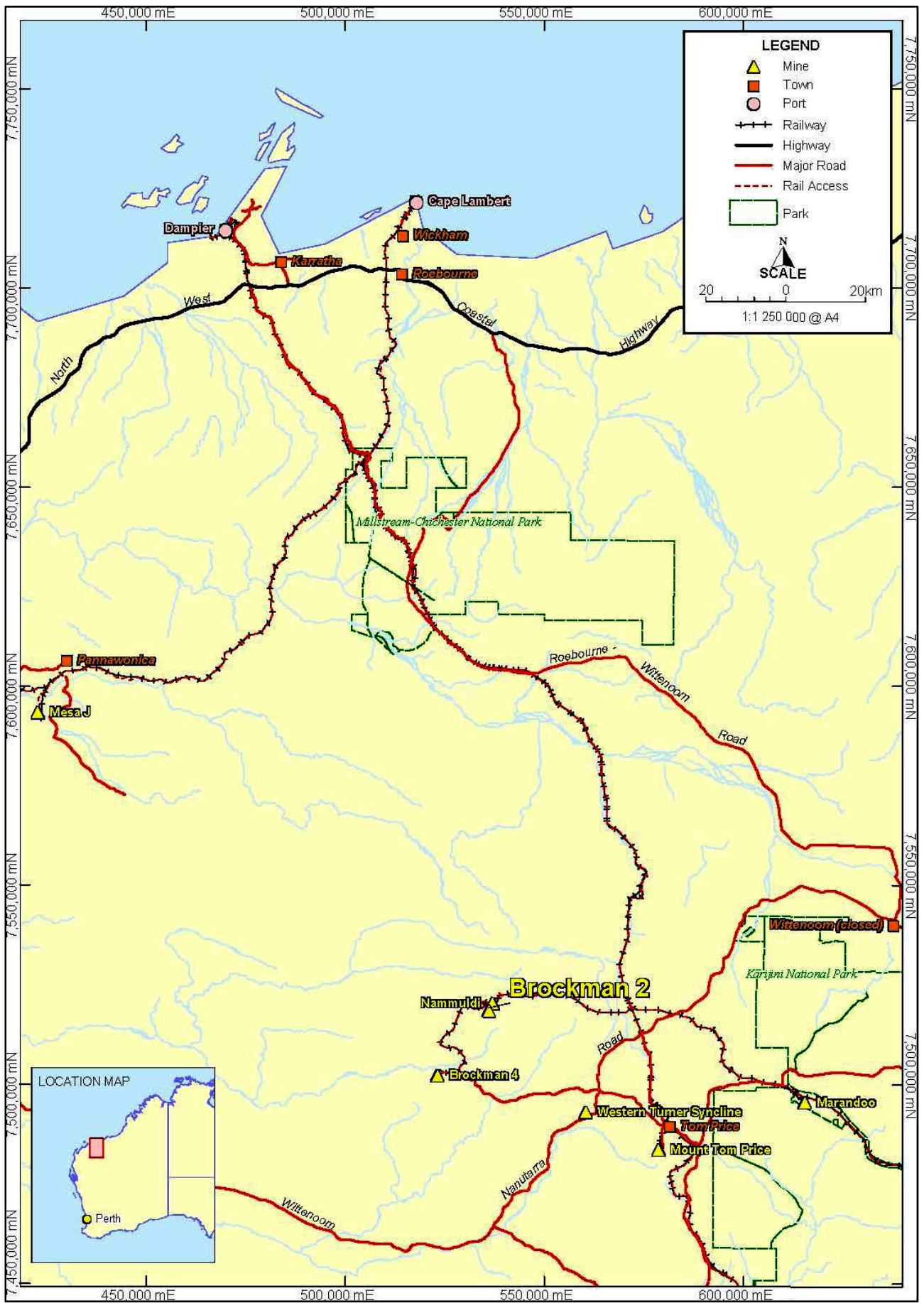
##### **Description**

The proposal would involve the dewatering of the newly constructed pit (BS2) to enable mining to occur.

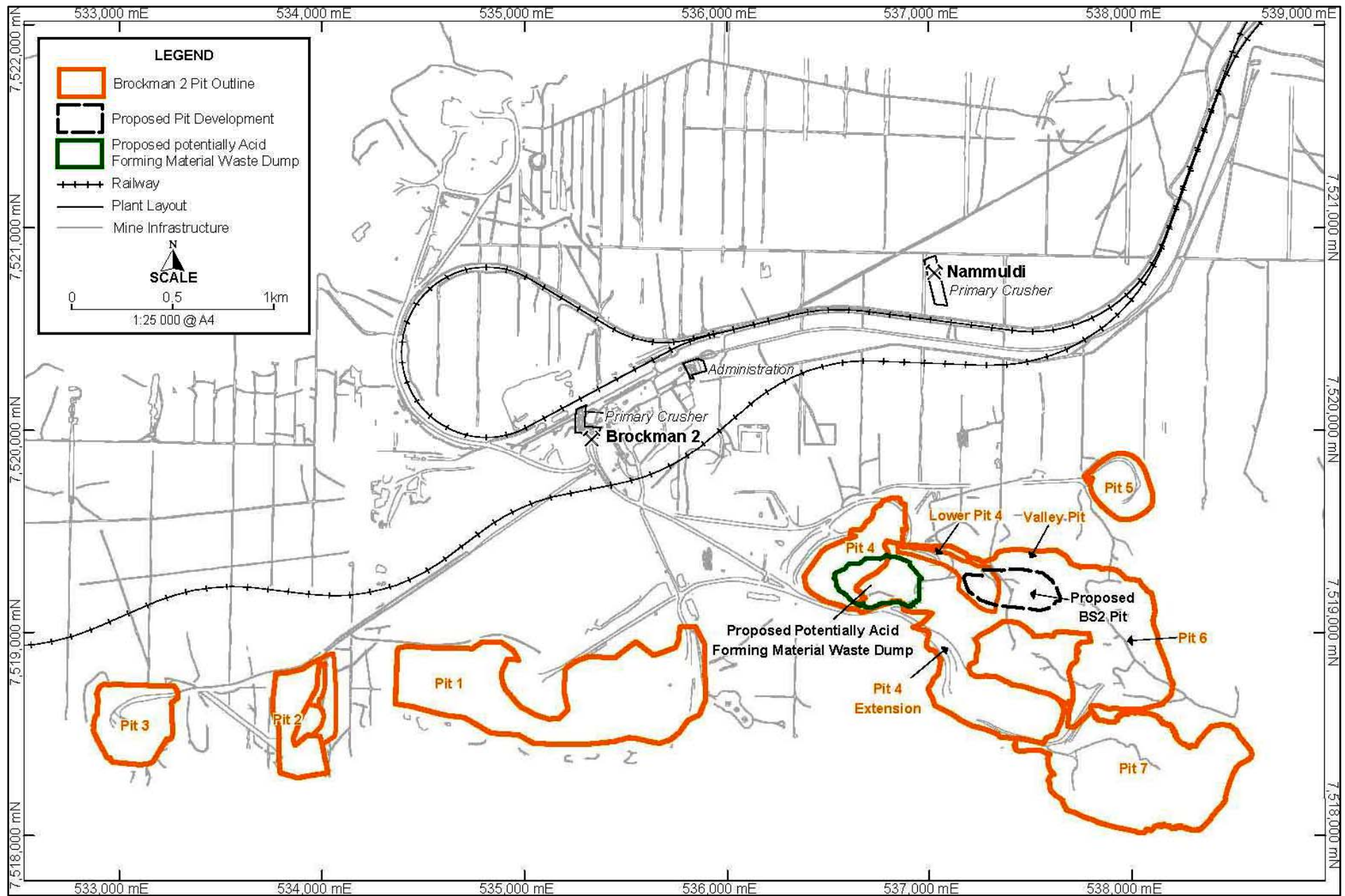
Groundwater quality could be impacted by:

- acid and metalliferous drainage;
- oxidation of potentially acid forming material in the pit; and
- dewater discharge into Pit 5.

The orebody occurs within a syncline that is bound by relatively impermeable unmineralised Brockman Iron Formation and Mount McRae Shale aquitard. The synclinal structure of the Brockman Iron Formation isolates that aquifer from the regional aquifer. Geological investigations indicate that there are no major structures providing conduits between the orebody aquifer and the regional aquifer, and thus the orebody aquifer is hydrogeologically isolated. The synclinal structure of the Brockman Iron Formation contributes to this isolation (Strategen 2011).



**Figure 1: Regional location**



**Figure 2: Site layout**



A groundwater model for BS2 was originally constructed by Aquaterra Consulting. However, for the updated modelling, the boundary conditions were modified from the original Aquaterra model to demonstrate the flow system and 'no flow' boundary conditions anticipated from the geology and more recent hydrological interpretation by URS (2008). The groundwater model was calibrated to dewatering of the Pit 4 orebody to 580 mRL using monitoring data from the period March 2006 to November 2008. The groundwater model has since been validated against monitoring data from the period November 2008 to April 2009.

The pre-mining watertable of the BS2 orebody was approximately 618 mRL. Bores screened in the areas north of the BS2 within the Mt McRae Shale and Nammuldi valley have groundwater levels at 576 to 580 mRL. Dewatering of the mining area to allow access to the ore would lower the groundwater table of the orebody aquifer to approximately 520 mRL. Dewater that is not used within mining operations would be discharged into Pit 5. This may potentially affect the groundwater levels of the regional aquifer and alter the local groundwater flow in the vicinity.

The existing Brockman Mine Borefield is located 1.0 km north of the Brockman 2 processing plant. Approximately 1.2 gigalitres (GL) of groundwater abstraction would be required to facilitate mining below the watertable. Dewatering would be required at a rate of between 500 to 600 megalitres (ML) in 2011 and 400 to 500 ML in 2012. Small dewatering volumes may continue to be abstracted post-mining to allow backfilling of the mine.

Abstracted water would be used to meet processing and other site requirements. Excess water would be directed via a pipeline to Pit 5 which has been utilised during past dewatering operations and act as a source of recharge to the surrounding regional aquifer.

The groundwater from the orebody aquifer is fresh, containing generally less than 400 mg/l total dissolved solids. There is not a specific dominant cation; however, the dominant anions are chloride and sulphate. Compared with other areas in the Pilbara, the groundwater is low in bicarbonate and magnesium and not very hard, indicating its source is from rainfall with minimal evaporative impact. Regional groundwater is higher in dissolved constituents, in particular magnesium and bicarbonate, and is much harder, which is more typical of Pilbara aquifers (Strategen 2011).

The orebody aquifer does not support groundwater-dependent ecosystems or taxa with conservation significance (Strategen 2011).

The proponent has a Brockman 2 and Nammuldi Operations Groundwater Operating Strategy which includes the following:

- the aim of water management at Brockman2/Nammuldi is to maximise reuse of water abstracted from dewatering borefields and use production borefields for the remaining site water needs;
- in instances where the volume of water abstracted from these bores exceeds the operational demand, excess water is returned to the aquifer through passive recharge in Pit 5;
- monitoring is reviewed by the Site Hydrogeologist and evaluated for its validity before it is utilised for reporting requirements. Data collected through the

monitoring programme is included within the annual and triennial aquifer reviews submitted in accordance with the requirement under the State Agreement Act;

- given that Brockman 2/Nammuldi is an operation where groundwater levels are being deliberately drawn down to facilitate mining, the focus of the operating strategy for the Pit 4/6 Dewatering Borefield is on optimising the dewatering volume so as to maximise the local intended impact by minimising any regional non-targeted impact; and
- any adverse impact on groundwater quality as a result of passive recharge in Pit 5 from pit dewatering activities in Pit 4 and 6 will result in immediate cessation of dewatering and discharge.

### Potential Acid Forming (PAF) Materials

The ore deposit is located in proximity to the potentially carbonaceous and sulphide-bearing Mount McRae Shale geological formation. The uppermost portion of the Mount McRae Shale comprises thin Brockman Iron Formation units with inter-bedded shale, known as the Footwall Zone. Resource characterisation has shown that unoxidised black shale, containing varying amounts of pyrite and other sulfate containing material, occurs in saturated layers. Site specific test work has shown that PAF black shale material can be any material that contains pyrite and has a total sulfur concentration greater than 0.1%. Mining below the watertable would expose this material.

Approximately 1330 kt of the waste material projected to be removed from the BS2 pit consists of black shale. Of this, approximately 100 kt is predicted to be 'hot' black shale, which presents as a spontaneous combustion risk.

The acid forming potential of black shale at the Brockman 2 pit was determined by initial assessment of the percentage of the sulphur content with drill samples, and subsequently via standard acid base accounting test work on 120 samples from 13 drillholes. Test work has confirmed that black shale associated with total sulfur concentration greater than 0.1% is PAF.

The proponent has a Spontaneous Combustion and Acid Rock Drainage (SCARD) Management Plan and the Brockman 2 Environmental Management Plan which include management such as the following:

- acidic contact water must be stored in a manner that will not lead to groundwater quality degradation and potential loss of the beneficial use of down gradient aquifers;
- where possible acidic water should be treated and put to a beneficial use rather than stored and discharged;
- runoff water in the open pits should be diverted around black shale exposures to the extent possible;
- ensure that routine sampling and visual inspection is performed of groundwater monitoring wells (surrounding black shale dumps and pits), dewatering water and surface water bodies (including inactive open pits that contain black shale exposures), the sampling should occur at least quarterly;

- significant changes in water quality, infiltration rate or other key parameters should be investigated and mitigation actions should be instituted if required;
- site specific cyclone water management plans should be developed that plan for the appropriate disposal of potentially acidic water in pits with black shale exposures;
- acidic contact water must be contained on site and it should be segregated so it does not contaminate clean water;
- background groundwater quality surrounding the dump location must be measured before any material is dumped. This will require the installation of groundwater monitoring bores. These bores will be used to provide a temporal record of groundwater quality in the vicinity of the dump;
- minimising the exposure and mining of PAF as far as practicable;
- identification and special handling of PAF material that must be mined;
- encapsulation of PAF material inside inert waste rock dumps to limit water contact and allow the dumps to be revegetated; and
- monitoring of groundwater and surface water quality and interpreting trends to determine if there are early signs for ARD (ie monitoring sulphate concentration trends).

### Heavy Metals

The proponent has provided data from approximately 40 weeks of kinetic testing and a report for 4 months of the data. These results can be found in Appendix 4 within the proponent's API document.

### **Assessment**

The EPA's environmental objectives for this factor are:

- ensure that the beneficial uses of groundwater can be maintained;
- maintain or improve the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance are protected;
- ensure that the quality and seasonal variation in flow of groundwater is maintained, throughout the life of the mine and after decommissioning; and
- maintain the abundance, species diversity, geographic distribution and productivity of fauna species and ecosystem levels through avoidance or management of adverse impact and improvement in knowledge.

The EPA considers that the proposal has the potential to impact on groundwater from excess dewatered water being piped into Pit 5. Pit 5 acts as a source of recharge to the surrounding regional aquifer. Additionally, impacts to groundwater may result from seepage from PAF and metalliferous drainage into the groundwater.

The EPA notes that an isolated and unconfined aquifer occurs within the Brockman Iron Formation at the B2 Mine. The B2 orebody aquifer is geologically bounded by the unmineralised, relatively impermeable Brockman Iron Formation and by the Mount McRae shale aquitard.

Hydraulic testing of the unmineralised BIF has not been undertaken around the BS2 pit. However, the EPA notes that at other Rio Tinto Iron Ore sites, testing has

indicated that hydraulic conductivity of BIF material is considered to be very low, in the order of  $10^{-3}$  to  $10^{-4}$  m/day (RTIO 2009a).

The Department of Water (DoW) has advised the EPA that it accepts results from the Brockman 2 Groundwater Model Update (April 2009) which suggests that the orebody aquifer is an isolated, unconfined aquifer with limited connection to the regional aquifer. DoW considers the proposed dewatering would have limited impacts on the regional aquifer and can be managed under the Brockman and Nammuldi Operation's Groundwater Operating Strategy and Environmental Management Plan.

The water table would be lowered to 520 mRL to allow for mining and peak dewatering rates are predicted to be approximately 6.5 ML/day initially, but would decline as dewatering is reduced to around 1 ML/day.

The proponent has stated that previous dewatering of Pit 4 appears to have affected a very local area associated with the Pit 4 orebody aquifer alone and has had negligible impact on groundwater levels with the Mt McRae Shale or Nammuldi valley detritus. This supports the concept of low conductivity for the unmineralised BIF material that isolates the Pit 4 orebody aquifer from the regional groundwater flow system (RTIO 2009a).

The EPA notes that recharge to the orebody aquifer is predominantly via infiltration of rainfall falling directly above the aquifer. Due to the confines of the Mt McRae Shale, which has a low hydraulic conductivity, there is negligible groundwater recharge into the orebody aquifer. The pre-mining orebody aquifer watertable naturally occurred at approximately 618 mRL; however, to allow mining of Lower Pit 4, dewatering of the Pit 4 – 6 orebody aquifer commenced in 2006 to lower the orebody aquifer watertable to 570 mRL (Strategen 2011).

The dewater would be used within the mine operation. Surplus water from dewatering that is not required for mine operations would be discharged to the disused Pit 5 (located to the northeast, on the southern margin of the Nammuldi valley). The EPA notes that surplus dewater from previous operations at Brockman has been discharged into Pit 5 at a rate of between zero to 6 ML/day.

The proponent would ensure that abstracted groundwater is monitored and that any water discharged into Pit 5 meets the relevant guidelines as per Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ 2000). Groundwater that becomes acidic would be neutralised using portable treatment systems. Recommended condition 7 would ensure that this outcome is met.

Ministerial Statement 131 for previous operations at Brockman 2 specifies a maximum dewatering volume of 950 ML/yr into Pit 5, which is more than this proposal requires. The EPA notes that the proponent has indicated that they would not exceed this discharge volume.

### PAF Material

Acid rock drainage is the process where sulfide minerals in the presence of oxygen and water oxidise to form insoluble ferric hydroxide and sulfuric acid. The reaction needs a continuing supply of oxygen and water and generates acid and heat.

Geochemical characterisations of ore and waste at Brockman 2 have identified material other than Mt McRae Shale with elevated sulfur content (0.1%). The EPA notes that the proponent has prepared a SCARD Management Plan and the Brockman 2 Environmental Management Plan to manage the impacts of PAF material.

The exposure of PAF material in the pit wall has the potential to generate acid if it comes in contact with oxygen and incident rainfall on the surface or from runoff channelled onto the surface. Water making contact with the exposed PAF material may become acidic, and collect in the base of the pit or infiltrate into the orebody aquifer. The EPA notes that the proponent would treat any water that collects within the base of the pit with portable treatment systems. The EPA considers that implementation of recommended condition 8 which includes further kinetic geochemical testing for potential acid and the proponent to provide prevention, monitoring, contingency and remediation strategies, would ensure the long term management of PAF material.

### Heavy Metals

The proponent has stated that 40 weeks of kinetic testing has been conducted on the site. The EPA has been provided with results for the 40 weeks and a report on the findings of 4 months of these tests. The DEC advises that kinetic testing should be undertaken for time periods in excess of 12 months to give a definite prediction of leachate quality produced by the oxidation of waste rock materials. The DEC also states that although results from the testing indicate that acid rock drainage is unlikely to be produced at the mine site by the rock materials tested, leachate produced during the kinetic testing consistently contained selenium concentrations in excess of 5 micrograms per litre ( $\mu\text{g/L}$ ). The EPA notes that the proponent's report demonstrates measures in milligrams and not micrograms. The conversion is 1 to 1000.

Taking into consideration the advice from the DEC, the EPA considers that prior to implementation of the proposal, the proponent should provide a report which identifies any Acid or Metalliferous Drainage, the extent of the potential hazard and the impacts, along with strategies for prevention, monitoring, contingencies and remediation. The implementation of recommended condition 8 would ensure that long term kinetic testing is continued. Water quality monitoring within the maximum distance boundary would be carried out using national and international standards including the *Australian Water Guidelines for Fresh and Marine Waters*, Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000 (ANZECC/ARMCANZ 2000).

The EPA considers that kinetic testing should be conducted on all rock types that would be disturbed if the proposal was to be implemented and has therefore recommended a condition to this effect.

The EPA notes that the proponent has prepared the Brockman 2 and Nammuldi Groundwater Strategy, the Spontaneous Combustion and Acid Rock Drainage (SCARD) Management Plan and the Brockman 2 Environmental Management Plan to manage the impacts of the proposal on groundwater resources.

## **Summary**

Having particular regard to the:

- confined nature of the aquifer to be dewatered to facilitate the mine;
- minimising of discharge water into Pit 5 which has the potential to affect the regional groundwater;
- proponent's leachate testing on the BS2 deposit which shows there is PAF material and some potential for acid and metalliferous drainage; and
- implementation of the Brockman 2 and Nammuldi Groundwater Strategy, the Spontaneous Combustion and Acid Rock Drainage and the Brockman 2 Environmental Management Plans,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that recommended conditions 7 and 8 are implemented.

## **4.2 Mine Closure and Rehabilitation**

### **Description**

The proposal is expected to extend mining at the Brockman 2 Detrital Iron Ore Mine for two years.

Current mine planning estimates that approximately 1330 kt of black shale would be generated from the proposal. It is estimated that of this 100 kt would comprise "hot" black shale which presents a spontaneous combustion risk.

The proponent has identified the key risks for closure, associated with this proposal to include:

- preventing a lake forming in the pit void;
- minimising and managing exposure of PAF material in the pit shell; and
- managing PAF materials in waste dumps.

The proponent is currently progressing the completion of its updated Conceptual Closure Study for the Brockman 2 mine. This Study will be completed by December 2011.

The Conceptual Closure Study would address the following:

- a statement of the closure study scope;
- a statement of RTIO's vision for closure of the Brockman 2 and Nammuldi sites;
- a knowledge base that describes RTIO's current understanding of operational, legal, environmental and social issues that may be relevant to closure of the Brockman 2 and Nammuldi sites;
- a communication register to summarise the general outcomes of stakeholder consultation with relevance to closure;

- a statement of closure objectives that outlines the outcomes to be achieved by the closure process;
- a sustainability assessment of closure options;
- a final landform plan that outlines the proposed final landform configuration, and documents actions proposed to achieve it;
- a biodiversity management plan that documents the actions to be taken to maximise biodiversity;
- post-closure, and how this is to be measured;
- a heritage management plan that documents the actions to be taken to preserve cultural heritage;
- values post-closure; and
- a summary of actions proposed to improve closure outcomes.

Prior to the end of the mine life (for the B2 Mine), a Decommissioning and Closure Plan would be prepared and submitted to the Department of Mines and Petroleum consistent with Ministerial Statement 131.

The proponent proposes to monitor water collected at the base of the pit after rainfall in accordance with the Rio Tinto Spontaneous Combustion and Acid Rock Drainage (SCARD) Management Plan. Management includes:

- an annual ARD inspection program of all black shale dumps and open pits with black shale exposures should be performed. This should occur during the wet season or immediately after a significant rainfall event. Samples of key runoff water flows should be collected;
- field inspections to ensure Brockman Shale management, dump construction, rehabilitation and store and release cover performance is consistent with requirements of the SCARD Management Plan;
- ensuring that routine sampling and routine inspection is performed of groundwater monitoring wells (surrounding black shale dumps and pits), dewatering water and surface water bodies (including inactive open pits that contain black shale exposures). The sampling will occur at least quarterly;
- analysis of water quality trends for, at a minimum, sulphate, pH and dissolved metals will be made on an annual basis to monitor the long-term behaviour of the system. Significant changes in water quality, infiltration rate or other key parameters will be investigated and mitigation actions should be instituted if required;
- ensure that regular acid-base accounting, net acid generation testing and other characterisation work is carried out on black shale samples;
- IEMS modules on dust management and ARD will be presented every 2 years to groups working with black shale. The IEMS modules will be updated annually to reflect the current management plan and will describe the hazards, incident reporting and the relevant procedures to each working group that has responsibilities for any aspect of black shale management;
- report the tonnes of sulfidic material excavated and dumped at the end of each year;
- report black shale environment risks in a site risk register and annually review these risks;

- the hydrogeological and geochemical behaviour of each pit will be predicted so that it can be managed appropriately at closure to minimise significant groundwater impacts and surface water exposures to wildlife and humans;
- the most protective pit closure strategy is to completely backfill the pit or to backfill the pit to above the estimated pre-mining water table where practicable; and
- backfilling to above the pre-mining water table would lead to a near complete recovery of the water table elevation and should cut off oxygen to the majority of black shale or sulfidic material exposed on the pit walls.

Groundwater levels of the orebody are estimated to recover to approximately 540 mRL following cessation of dewatering, should the final void not be backfilled. Closure planning for the BS2 Pit void includes backfilling the pit to a level that would preclude the establishment of a permanent pit lake.

To manage the potentially acid forming material, the proposal includes the development of a PAF black shale waste dump within the existing Brockman 2 mine Pit 4 and Pit 4 Extension. A store and release cover system would be constructed on top of flat accessible PAF material exposures. The approximate depth of the cover would be 4 m, overlaying a 2 m deep inert layer over any PAF materials. The cover would be rehabilitated by planting local Brockman 2 vegetation species. An abandonment bund would be placed around the top of each dump slope.

These management methods are included within the proponent's SCARD Management Plan.

### **Assessment**

The EPA's environmental objectives for this factor are to:

- ensure that mining is planned and carried out so to ensure a sustainable mine closure outcome is achieved, consistent with mining industry best practice as set out in the Australian and New Zealand Minerals and Energy Council/Minerals Council of Australia, 2000, *Strategic Framework for Mine Closure*;
- ensure that closure and rehabilitation achieves stable, non polluting and functioning landforms which are consistent with the surrounding landscape and other environmental values; and
- ensure that self-sustaining native vegetation communities are returned after mining, which in species composition and ecological function are as close as possible to naturally occurring analogue sites.

The proponent's kinetic testing results have been discussed in section 4.1. The EPA notes that selenium concentrations are consistently in excess of 5 µg/L and that these levels are generally considered to pose a high risk of causing harm to wildlife on discharge from mine sites to receiving environments.

The EPA considers, on advice from the DEC, that the proponent should undertake further kinetic test work to assess the potential magnitude of the risks at the site, and develop strategies to manage risks at the site. The implementation of recommended condition 8 would ensure that long term kinetic testing is carried out.



The EPA agrees with the proponent's position on backfilling of the pit to prevent a permanent pit lake and considers that it is essential to minimise the potential for wildlife to be exposed to contaminants that might have been leached from the site. The EPA notes that the proponent has stated that they would backfill to a post-mining level of 540 mRL. The EPA considers that the implementation of recommended condition 9 would ensure that a permanent pit lake does not occur.

The EPA considers that PAF material exposed by mining on pit walls has the potential to result in groundwater contamination from runoff. This is also addressed as part of recommended condition 9 (9-7).

The EPA also notes that there is sufficient waste from the Brockman/Nammuldi operations to ensure that the PAF materials liberated during mining are encapsulated within the pit. The proponent has stated that the PAF material would be encapsulated within at least 2 m of an inert waste rock layer overlaid on the uppermost PAF material layer. A thick store and release cover of a minimum of 4 m will be constructed on top of the 2 m layer and topsoil spread to a minimum of 0.3 m on top of the store and release cover. Therefore, the EPA has recommended condition 9-8 that the PAF material would be encapsulated within a waste material landform to these specifications.

The proponent's encapsulation of PAF material and the proposed store and release cover have been designed to ensure that the PAF material is stored above the groundwater table. The design includes 5 m of inert waste between the predicted post-mining water table and the sulfidic material (refer figure 13 Strategen 2011). There remains some uncertainty about the final water levels and hence condition 9-9 has been recommended to ensure that the water levels are monitored and that it is confirmed the PAF materials remain above the groundwater table or mitigation strategies would need to be developed.

The DMP has stated that all waste material sourced for the encapsulation must be of an appropriate physical and chemical nature that would not compromise the effectiveness of the store and release cover. This would include any material sourced from the Brockman/Nammuldi Operations. In addition waste material must be readily available to ensure that PAF material would not be exposed to the atmosphere for extended periods of time, whilst the required waste becomes available from nearby operations. The EPA considers that condition 9-6 would ensure that PAF material is encapsulated within an acceptable amount of time and with material of appropriate physical and chemical nature.

Store and release covers are designed to limit infiltration into the underlying waste rock by maximising the evapo-transpiration of incident rain water. The cover is designed to store water near the surface during the wet season so that it can be removed from the cover material and returned to the atmosphere during the dry season by evaporation and plant transpiration.

The proponent's rehabilitation would include the planting of vegetation on the store and release cover to assist with transpiration. The proponent has stated that vegetation on the cap would not penetrate into the PAF materials. The EPA considers that some plant roots have the potential to penetrate in the PAF material. Therefore,

the EPA has recommended condition 9-12 which requires the proponent to ensure that plants used for rehabilitation are shallow rooted.

The EPA notes that the waste dump would have an abandonment bund placed around the top of each dump slope. This bund is designed to prevent runoff water from flowing from the dump surfaces over the slopes and causing erosion.

The Department of Water has also stated that post-closure monitoring of the encapsulated PAF material should be undertaken to allow for early identification of groundwater seepage contamination. The EPA agrees with this advice and has therefore recommended condition 9 in relation to monitoring and contingencies for seepage.

The EPA notes that an updated Conceptual Closure Strategy for the Brockman 2 mine would be completed by the proponent in December 2011. The EPA considers that a detailed and project-specific Mine Plan and Preliminary Closure Strategy for this proposal should be completed within 6 months of approval.

## **Summary**

Having particular regard to the:

- proponent's commitment to complete the Conceptual Closure Study for the Brockman 2 mine by December 2011;
- requirements of Ministerial Statement 131 which requires a Decommissioning and Closure Plan to be prepared by the proponent and submitted to the Department of Mines and Petroleum prior to the end of the mine life;
- proponent carrying out further leachate testing;
- implementation of the SCARD Management Plan;
- proponent committing to backfilling the pit to prevent a pit lake;
- proponent ensuring the PAF materials waste dump is placed above the water table; and
- implementation of recommended condition 9,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that a store and release cover is constructed to the satisfaction of the Chief Executive Officer of the Office of the EPA and monitoring and contingencies for seepage are applied.

## **5. Recommended Conditions**

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Hamersley Iron Pty Ltd to further develop parts of the existing Pit 4 Extension, Lower Pit 4, Valley Pit and Pit 6 to an approximate depth of 530 mRL to create an amalgamated pit known as the BS2 Pit is implemented. These conditions are presented in Appendix 2.

## **6. Conclusions**

The EPA has considered the proposal by Hamersley Iron Pty Ltd to extend the Brockman 2 Detrital Iron Ore Mine by extending the existing P4 Extension, Lower Pit

4, Valley Pit and Pit 6 from 580 mRL to an approximate depth of 530 mRL to form an amalgamated pit (BS2 pit). The proposal would include dewatering of the pit and result in the extraction of approximately 3.2 Mt of ore. Mining would be for approximately 2 years.

The proposal has the potential to impact on groundwater through acid mine and metalliferous drainage. The EPA notes that the aquifer to be dewatered is isolated and unconfined and that water discharged from the mine would be according to ANZECC/ARMCANZ Guidelines.

Mine closure and rehabilitation would involve backfilling of the pit and the construction of a store and release cover over any PAF material. This cover would be rehabilitated and the EPA has recommended conditions to ensure this occurs. The EPA considers that acid and metalliferous drainage has the potential to occur and has therefore also recommended conditions for the proponent to conduct further kinetic testing at the site.

The EPA has therefore concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2.

## **7. Recommendations**

The EPA submits the following recommendations to the Minister for Environment:

1. That the Minister notes that the proposal being assessed is for the extension of existing pits at The Brockman 2 Detrital Iron Ore Mine including P4 Extension, Lower Pit 4, Valley Pit and Pit 6 to form the BS2 Pit, to dewater the pit and to mine below the groundwater table;
2. That the Minister considers the report on the key environmental factors as set out in Section 3;
3. That the Minister notes that the EPA has concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2; and
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

# **Appendix 1**

## **References**

Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ) 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Department of Mines and Petroleum (DMP) 2010, *Draft Guidelines for Preparing Mine Closure Plans*, Government of Western Australia, Perth

DITR 2007, *Managing Acid and Metalliferous Drainage*, Department of Industry, Tourism and Resources, Commonwealth of Australia, Canberra.

EPA 1990, *Bulletin 467 Brockman No 2 Detrital Iron Mine*

Minister for the Environment Western Australia 1991, *Ministerial Statement No 131 Brockman No 2 Detrital Iron-Ore Mine*

Rio Tinto 2009, *Rio Tinto Closure Standard*, May 2009.

RTIO 2010, *Brockman Syncline 2: Mineral Waste Management Plan*, July 2010.

RTIO 2010, *Brockman Syncline 2: Spontaneous Combustion and ARD (SCARD) Management Plan for Operations*, July 2010.

RTIO 2009a, *Brockman 2 Groundwater Model Update*, April 2009.

RTIO 2010, *Brockman 2 Operation Environmental Management Plan*, May 2010

RTIO 2009, *Rio Tinto Brockman 2 and Nammuldi Operations Groundwater Operating Strategy*, July 2009.

RTIO 2011, *Kinetic Testing of Black Shale from Brockman Syncline 2 (BS2)*, unpublished report prepared for Hamersley Iron Brockman 2 Detrital Iron Ore Mine Extension Phase 2B, 2011

RTIO 2010, *Brockman Syncline 2: Mineral Waste Management Plan*, December 2010

RTIO 2010, *IEMS Water Monitoring Procedure – Acid Rock Drainage*, July 2010

RTIO 2008, *Nammuldi Hydrogeological Review*, February 2008

Strategen 2011, *Brockman 2 Detrital Iron Ore Mine Extension Phase 2B Assessment on Referral*

# **Appendix 2**

## **Identified Decision-making Authorities and Recommended Environmental Conditions**

### Identified Decision-making Authorities

Section 44(2) of the *Environmental Protection Act 1986* (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, 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 for this consultation:

<b>Decision-making Authority</b>	<b>Approval</b>
Minister for Water	Water Extraction Licence
Minister for State Development	<i>Iron Ore (Hamersley Range) Agreement Act 1963</i>
Minister for Mines and Petroleum	<i>Mining Act 1978</i>

## RECOMMENDED ENVIRONMENTAL CONDITIONS

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

#### BROCKMAN 2 DETRITAL IRON ORE MINE EXTENSION PHASE 2B

- Proposal:** The proposal is to amalgamate parts of Pit 4 Extension, Lower Pit 4, Valley Pit and Pit 6 to approximately 530 metres Reduced Level (mRL) to form the BS2 Pit. Further dewatering of the orebody aquifer to 520 mRL is required to mine to a depth of 530 mRL.
- The proposal is further documented in schedule 1 of this statement.
- Proponent:** Hamersley Iron Pty Ltd
- Proponent Address:** 152-158 St George's Terrace,  
PERTH WA 6000
- Assessment Number:** 1865
- Related Statement:** Ministerial Statement 131 is the currently approved proposal.

#### **Report of the Environmental Protection Authority: Report 1393**

The proposal referred to in the above report of the Environmental Protection Authority may be implemented. The implementation of that proposal is subject to the following conditions and procedures:

#### **1 Proposal Implementation**

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

#### **2 Proponent Nomination and Contact Details**

- 2-1 The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.
- 2-2 The proponent shall notify the Chief Executive Officer of the Office of the Environmental Protection Authority of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.



### **3 Time Limit of Authorisation**

- 3-1 The authorisation to implement the proposal provided for in this statement shall lapse and be void five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.
- 3-2 The proponent shall provide the Chief Executive Officer of the Office of the Environmental Protection Authority with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement.

### **4 Compliance Reporting**

- 4-1 The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority.
- 4-2 The proponent shall submit to the Chief Executive Officer of the Office of the Environmental Protection Authority the compliance assessment plan required by condition 4-1 at least six months prior to the first compliance report required by condition 4-6, or prior to implementation, whichever is sooner.

The compliance assessment plan shall indicate:

- 1 the frequency of compliance reporting;
  - 2 the approach and timing of compliance assessments;
  - 3 the retention of compliance assessments;
  - 4 the method of reporting of potential non-compliances and corrective actions taken;
  - 5 the table of contents of compliance assessment reports; and
  - 6 public availability of compliance assessment reports.
- 4-3 The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.
- 4-4 The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the Chief Executive Officer of the Office of the Environmental Protection Authority.
- 4-5 The proponent shall advise the Chief Executive Officer of the Office of the Environmental Protection Authority of any potential non-compliance within seven days of that non-compliance being known.

- 4-6 The proponent shall submit to the Chief Executive Officer of the Office of the Environmental Protection Authority the first compliance assessment report fifteen months from the date of issue of this Statement addressing the twelve month period from the date of issue of this Statement and then annually from the date of submission of the first compliance assessment report.

The compliance assessment report shall:

- 1 be endorsed by the proponent's Managing Director or a person delegated to sign on the Managing Director's behalf;
- 2 include a statement as to whether the proponent has complied with the conditions;
- 3 identify all potential non-compliances and describe corrective and preventative actions taken;
- 4 be made publicly available in accordance with the approved compliance assessment plan; and
- 5 indicate any proposed changes to the compliance assessment plan required by condition 4-1.

## **5 Public Availability of Data**

- 5-1 Within three months of the issue of this Statement, and for the remainder of the life of the proposal, the proponent shall make all environmental data (including sampling design and sampling methodology) used in the assessment of this proposal publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.

## **6 Proposal Boundary**

- 6-1 In implementing the proposal, the proponent shall not increase the mine pit footprint beyond that delineated by AMG co-ordinates listed in Schedule 2 (attached).

## **7 Groundwater**

- 7-1 The proponent shall ensure that run-off and/or seepage from the mineral waste dump and waste material landforms does not impact the quality of groundwater and surface water within or adjacent to the proposal area to the extent that it exceeds the trigger values for a slightly to moderately disturbed ecosystem provided for in Table 3.4.2 of Chapter 3 of the Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, *Australian Water Quality Guidelines for Fresh and Marine Waters* and its updates, taking into consideration natural background water quality.

- 7-2 The proponent shall monitor the quality of groundwater and surface water within the proposal area including around the edge of the BS2 pit and the waste material landform to ensure that the requirements of condition 7-1 are met. This monitoring is to be carried out using methods consistent with Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, *Australian Guidelines for Water Quality Monitoring and Reporting* (and its updates) and to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority.
- 7-3 The proponent shall commence the water quality monitoring required by 7-2 prior to ground disturbing activities in order to collect baseline data and submit the data to the Chief Executive Officer of the Office of the Environmental Protection Authority.
- 7-4 Discharge water into Pit 5 is not to exceed the trigger values for a slightly to moderately disturbed ecosystem provided for in Table 3.4.2 of Chapter 3 of the Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000 (ANZECC/ARMCANZ (2000)), *Australian Water Quality Guidelines for Fresh and Marine Waters* and its updates, taking into consideration natural background water quality.
- 7-5 The proponent shall submit annually the results of monitoring required by condition 7-2 to the Chief Executive Officer of the Office of the Environmental Protection Authority. Discharge water is to meet ANZECC/ARMCANZ (2000) guidelines as required by condition 7-4.
- 7-6 In the event that monitoring required by condition 7-2 indicates that the requirements of condition 7-1 are not being met, the proponent shall:
1. report such findings to the Chief Executive Officer of the Office of the Environmental Protection Authority within 21 days of the decline in water quality being identified;
  2. provide evidence which allows determination of the root cause of the decline in water quality; and
  3. if determined to be a result of activities undertaken in implementing the proposal, state the actions and associated timelines proposed to be taken to remediate the water quality.
- 7-7 The proponent shall on approval of the Chief Executive Officer of the Office of the Environmental Protection Authority, implement the actions identified in 7-6 (3) and continue to implement such actions until the Chief Executive Officer of the Office of the Environmental Protection Authority determines that the remedial actions may cease.

7-8 The proponent shall make the monitoring reports required by condition 7-2 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.

## **8 Acid and Metalliferous Drainage**

8-1 Prior to ground-disturbing activities the proponent shall provide a report with a detailed risk assessment, using national and international standards, for any potential Acid Metalliferous Drainage as defined in Section 2.1 of the *Managing Acid and Metalliferous Drainage*, February 2007 Department of Industry Tourism and Resources (and its updates) including selenium, within the area of the Proposal as defined in Figure 1 to identify:

1. The extent of the activity and metal contamination hazard associated from related mining activities in the area of the proposal; and
2. The potential environmental receptors that could be impacted on exposure to this hazard.

8-2 Prior to the mining of any material with the potential to generate Acid Metalliferous Drainage including selenium, the proponent shall prepare and subsequently implement long-term prevention, monitoring, contingency and remediation strategies for the management of any potential Acid and Metalliferous Drainage including selenium, to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority on advice of the Department of Environment and Conservation and the Department of Mines and Petroleum.

8-3 The proponent shall undertake static and kinetic geochemical testing for potential Acid and Metalliferous Drainage including selenium on all disturbed rock types, as part of the long-term monitoring strategies required by condition 8-2 using national and international standards to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority.

8-4 The proponent shall report the results and include an assessment of the efficacy of the long-term prevention, monitoring, contingency and remediation strategies required by condition 8-2 as part of the compliance assessment report required by condition 4-6 to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority.

8-5 The proponent shall manage all material with the potential to generate Acid and Metalliferous Drainage including selenium so that the quality of surface water or groundwater does not exceed the trigger values for a slightly to moderately disturbed ecosystem provided for in Table 3.4.2 of Chapter 3 of the Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, *Australian Water Quality Guidelines for Fresh and Marine Waters* and its updates.

## NOTE

The national and international standards referred to in Condition 8.1 are the *Managing of Acid and Metalliferous Drainage*, February 2007 Department of Industry Tourism and Resources, and the *Global Acid and Metalliferous Drainage (GARD) Guide*, December 2008.

### 9 Rehabilitation and Mine Closure

9-1 The proponent shall undertake progressive rehabilitation of disturbed areas including the waste material landform over the life of the proposal to achieve the following outcomes:

- 1 The waste material landform facility shall be non-polluting and shall be constructed so that its stability, surface drainage, resistance to erosion and ability to support local native vegetation, are similar to undisturbed natural analogue landforms as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority.
- 2 Waste material landforms and other areas disturbed through implementation of the proposal (excluding mine pits), shall be progressively rehabilitated with vegetation composed of native plant species of local provenance.
- 3 The percentage cover and species diversity of living self sustaining native vegetation in all rehabilitation areas shall be comparable to that of undisturbed natural analogue sites as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the Chief Executive Officer of the Office of the Environmental Protection Authority.
- 4 No new species of weeds (including both declared weeds and environmental weeds) shall establish in the area as a result of the implementation of the proposal.
- 5 The coverage of weeds (including both declared weeds and environmental weeds) within rehabilitated areas shall be no greater than the average of three reference sites on nearby land, with the reference sites to be chosen in consultation with the Department of Environment and Conservation.

9-2 Rehabilitation activities shall continue until such time as the requirements of condition 9-1 are met, and are demonstrated by inspections, monitoring and reports to be met, for a minimum of five years following mine completion to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority, on advice of the Department of Mines and Petroleum.

9-3 Within two years of the end of productive mining in the BS2 pit, the proponent shall backfill the BS2 pit with inert waste to sufficient depth to ensure that,

following mine closure and backfilling, the groundwater water table would permanently remain at least 3 metres below the lowest point of the pit floor.

- 9-4 The proponent shall undertake monitoring to ensure that the requirements of condition 9-3 are adhered to until such time as the watertable remains constant for 3 years after backfilling.

## NOTE

Watertable refers to the upper surface of groundwater below which soil is saturated with water that fills all voids and interstices, and where the pressure of water in the soil equates to atmospheric pressure.

Constant refers to invariable or unchanging.

- 9-5 Should the backfilling of the pit not ensure that the watertable remains at least 3 metres below the backfilled level of the BS2 and provide a sufficient capillary break to maintain groundwater quality and prevent the upward movement of salts; metals or other mobile elements (whichever is the greater); the proponent shall remediate and monitor to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority.
- 9-6 The proponent shall ensure that all waste material used for the encapsulation of potential acid forming (PAF) material and the construction of the store and release cover is of appropriate physical and chemical nature to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority on advice from the Department of Mines and Petroleum.
- 9-7 The proponent shall prevent the leaching of soluble constituents from pit walls at levels that may cause environmental harm as defined in Section 3A (2) of the *Environmental Protection Act 1986*.
- 9-8 At the completion of mining of the BS2 pit the proponent shall encapsulate PAF material within a waste material landform consisting of:
1. an inert waste rock layer overlaid on the uppermost PAF layer of a minimum of 2 metres;
  2. a thick store and release cover of a minimum of 4 metres constructed on top of the 2 metre layer of inert waste rock; and
  3. topsoil spread of a minimum of 0.3 metres on top of the store and release cover.
- 9-9 The proponent shall ensure that an adequate capillary break is installed under the waste dump as outlined in Figure 1 to prevent upward movement of groundwater coming into contact with material with potential to produce acid, metalliferous or seleniferous drainage.
- 9-10 The proponent shall undertake monitoring to ensure that the requirements of condition 9-9 are met.

9-11 In the event that monitoring required by condition 9-10 indicates that the requirements of condition 9-9 are not being met, the proponent shall:

1. report such findings to the Chief Executive Officer of the Office of the Environmental Protection Authority within 21 days;
2. prepare mitigation strategies on advice from the Department of Mines and Petroleum to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority; and
3. implement the mitigation strategies.

9-12 The proponent shall ensure that vegetation species for rehabilitation planting on the store and release cover are to be native to the proposal area with root penetration of less than 5 metres.

9-13 The proponent shall monitor progressively the rehabilitation for the store and release cover against the criteria developed pursuant to condition 9-1 with appropriately timed surveys as agreed with the Department of Environment and Conservation, until the completion criteria are met. The surveys shall be conducted annually unless otherwise agreed by the Chief Executive Officer of the Environmental Protection Authority, on advice from the Department of Environment and Conservation.

9-14 The proponent shall include the results of the rehabilitation monitoring required pursuant to condition 9-2 in the compliance assessment report referred to in condition 4-6 commencing no less than 15 months from the date rehabilitation was commenced. The report shall address the following:

- 1 The progress made towards meeting the completion criteria developed pursuant to condition 9-1(3); and
- 2 Contingency management measures in the event that the completion criteria required by condition 9-1(3) are unlikely to be met.

9-15 The proponent shall make the monitoring reports required by condition 9-2 publicly available in a manner approved by the Chief Executive Officer of the Environmental Protection Authority.

## **10 Mine Plan and Preliminary Closure Strategy**

10-1 Within six months of the date of the Ministerial Statement being issued, the proponent shall submit to the Office of the Environmental Protection Authority a detailed and project-specific Mine Plan and Preliminary Closure Strategy to the requirements of the Chief Executive Officer of the Office of the Environmental Protection Authority on advice of the Department of Mines and Petroleum and Department of Environment and Conservation.

10-2 The Mine Plan and Preliminary Closure Strategy shall include detailed results of geochemical and geophysical characterisation of materials, in particular the

potential for acid drainage, metalliferous drainage, and of the occurrence of dispersive materials. Testing for materials with potential to cause acid and/or metalliferous drainage including selenium shall include static and kinetic testing carried out using techniques and timeframes consistent with national and international standards (*Leading Practice Sustainable Development Program for the Mining Industry – Managing Acid and Metalliferous Drainage 2009* – Department of Industry, Tourism and Resources; *The Global Acid Rock Drainage Guide 2009* – International Network for Acid Prevention).

- 10-3 The Mine Plan and Preliminary Closure Strategy shall provide detailed technical information on proposed management measures to prevent contamination, environmental harm or human health impacts during implementation of the proposal and after mine completion and closure.
- 10-4 The Mine Plan and Preliminary Closure Strategy shall include maps and diagrams showing the proposed placement, dimensions, design and proposed methods of construction and closure of waste disposal facilities, mine pits and evaporation pond.
- 10-5 The Mine Plan and Preliminary Closure Strategy shall demonstrate that waste disposal facilities will be located, designed and constructed to ensure that they are non-polluting and so that their final shape, height, stability and ability to support native vegetation are comparable to natural landforms in the area. The Mine Plan and Preliminary Closure Strategy shall describe remedial options available to deliver condition 7.1 if condition 7.6 is triggered.
- 10-6 The proponent shall implement the Mine Plan and Preliminary Closure Strategy referred to in conditions 10-1.
- 10-7 The Mine Plan and Preliminary Closure Strategy shall be reviewed on a 3 year basis and incorporate new knowledge as the mine develops. The revised Mine Plan and Closure Strategy should be submitted in accordance with relevant Western Australian Government closure guidelines and updates.

#### **Notes**

- 1. Where a condition states “on advice of the Office of the Environmental Protection Authority”, the Office of the Environmental Protection Authority will provide that advice to the proponent.
- 2. The Office of the Environmental Protection Authority may seek advice from other agencies or organisations, as required.
- 3. The Minister for Environment will determine any dispute between the proponent and the Office of the Environmental Protection Authority over the fulfilment of the requirements of the conditions.



**The Proposal (Assessment No. 1865)**

The proposal is to deepen and extend several mine pits from a depth of 580 metres Reduced Level (mRL) to an approximate depth of 530 mRL at the existing Brockman 2 Detrital Iron Ore Mine (B2 Mine).

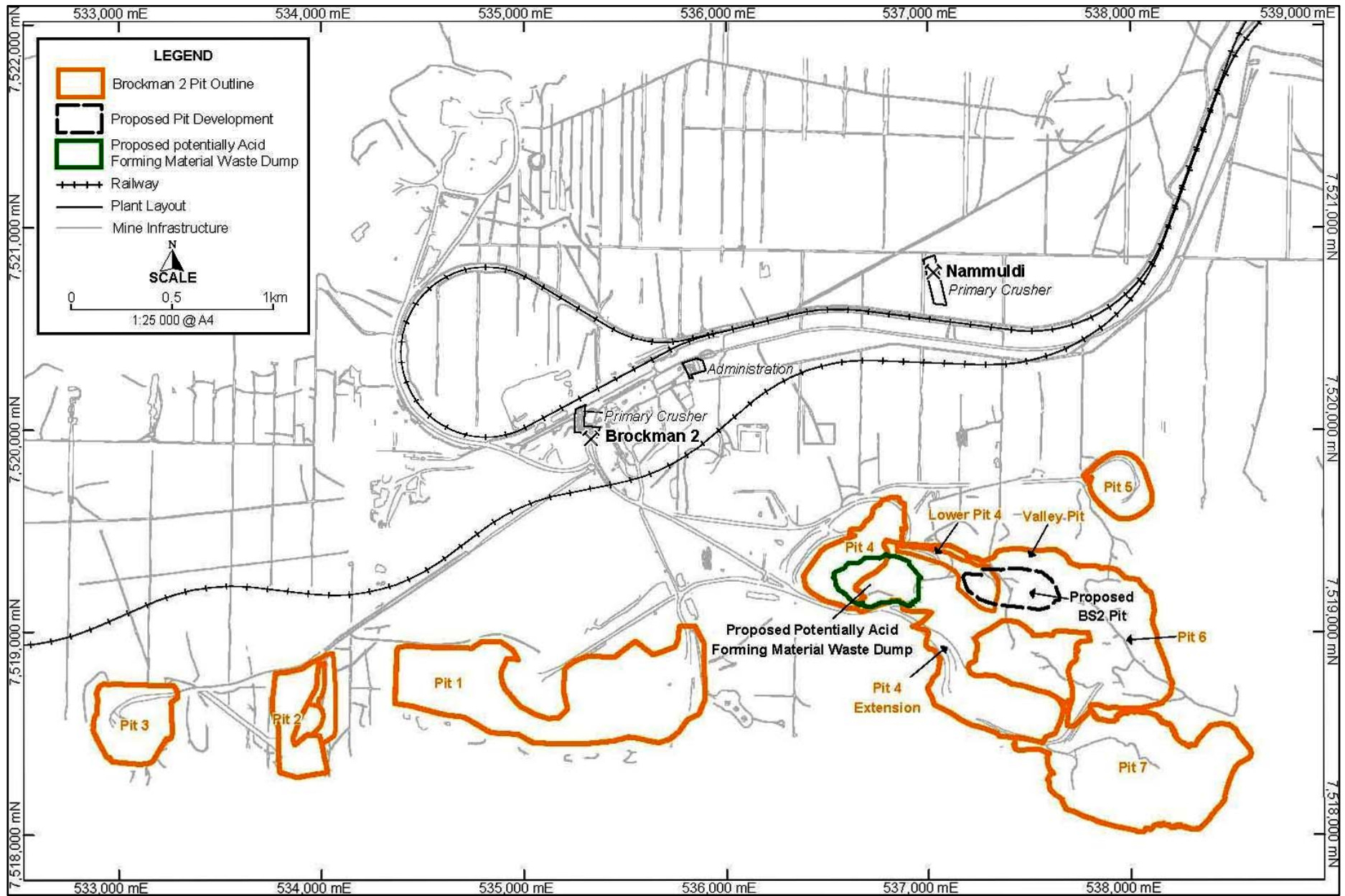
The location of the various project components is shown in Figure 1.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in sections 1 to 6 of the API document, *Brockman 2 Detrital Iron Ore Mine Extension Phase 2B*, prepared by Strategen for Hamersley Iron Pty Ltd, Perth, Western Australia (March 2011).

**Table 1: Summary of Key Proposal Characteristics**

<b>Element</b>	<b>Description</b>
Project life:	5 years
Area to be cleared	0 hectares
Total Production	3.2 Mt high grade ore
Dewatering volume	1.2 gigalitres over the life of the project
Discharge Rate to Pit 5	No more than 950 ML/annum

Figure 1 – Site Layout with proposed BS2 pit and Material Waste Dump. (Attached)



**Figure 1: Site Layout with proposed BS2 pit and Material Waste Dump.**

## Schedule 2

Proposed_BS2_Pit_LL	537184.65137700000	7519285.47222000000
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Proposed_BS2_Pit_LL	537474.33611300000	7519308.64752000000
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Proposed_BS2_Pit_LL	537647.07006500000	7519155.22876000000
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Proposed_BS2_Pit_LL	537493.42526500000	7519117.01654000000
Proposed_BS2_Pit_LL	537421.44728100000	7519124.68502000000
Proposed_BS2_Pit_LL	537359.29009700000	7519129.25411000000
Proposed_BS2_Pit_LL	537342.61694500000	7519130.52387000000
Proposed_BS2_Pit_LL	537293.98296100000	7519146.61052000000
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Proposed_BS2_Waste_Dump_LL	536925.76484800000	7519136.74262000000
Proposed_BS2_Waste_Dump_LL	536925.51742400000	7519136.77257000000
Proposed_BS2_Waste_Dump_LL	536915.23492800000	7519137.72233000000
Proposed_BS2_Waste_Dump_LL	536914.26187200000	7519137.81232000000
Proposed_BS2_Waste_Dump_LL	536913.63518400000	7519137.88233000000
Proposed_BS2_Waste_Dump_LL	536912.92606400000	7519137.96233000000
Proposed_BS2_Waste_Dump_LL	536912.92606400000	7519136.20272000000
Proposed_BS2_Waste_Dump_LL	536912.94257600000	7519135.75280000000
Proposed_BS2_Waste_Dump_LL	536913.14865600000	7519128.12425000000
Proposed_BS2_Waste_Dump_LL	536912.97547200000	7519128.09430000000
Proposed_BS2_Waste_Dump_LL	536909.37201600000	7519127.50448000000
Proposed_BS2_Waste_Dump_LL	536902.28068800000	7519128.88419000000
Proposed_BS2_Waste_Dump_LL	536900.77169600000	7519129.13404000000
Proposed_BS2_Waste_Dump_LL	536899.71620800000	7519128.71420000000
Proposed_BS2_Waste_Dump_LL	536899.70788800000	7519128.71420000000
Proposed_BS2_Waste_Dump_LL	536899.55121600000	7519128.73417000000
Proposed_BS2_Waste_Dump_LL	536898.05873600000	7519128.88419000000
Proposed_BS2_Waste_Dump_LL	536895.75819200000	7519130.35388000000

Proposed_BS2_Waste_Dump_LL	536891.78366400000	7519132.05347000000
Proposed_BS2_Waste_Dump_LL	536886.75377600000	7519134.53296000000
Proposed_BS2_Waste_Dump_LL	536876.57009600000	7519140.36182000000
Proposed_BS2_Waste_Dump_LL	536863.82206400000	7519141.45161000000
Proposed_BS2_Waste_Dump_LL	536859.64132800000	7519146.35056000000
Proposed_BS2_Waste_Dump_LL	536858.98174400000	7519147.12048000000
Proposed_BS2_Waste_Dump_LL	536856.17816000000	7519149.01001000000
Proposed_BS2_Waste_Dump_LL	536853.64670400000	7519150.76976000000
Proposed_BS2_Waste_Dump_LL	536853.58065600000	7519150.81968000000
Proposed_BS2_Waste_Dump_LL	536849.80414400000	7519151.59958000000
Proposed_BS2_Waste_Dump_LL	536847.61892800000	7519151.80950000000
Proposed_BS2_Waste_Dump_LL	536842.29208000000	7519149.88988000000
Proposed_BS2_Waste_Dump_LL	536839.11742400000	7519148.77014000000
Proposed_BS2_Waste_Dump_LL	536836.23140800000	7519148.94012000000
Proposed_BS2_Waste_Dump_LL	536833.58449600000	7519149.30006000000
Proposed_BS2_Waste_Dump_LL	536831.72926400000	7519150.16982000000
Proposed_BS2_Waste_Dump_LL	536831.49835200000	7519150.28976000000
Proposed_BS2_Waste_Dump_LL	536828.23294400000	7519149.95990000000
Proposed_BS2_Waste_Dump_LL	536828.21643200000	7519149.95990000000
Proposed_BS2_Waste_Dump_LL	536828.18353600000	7519149.95990000000
Proposed_BS2_Waste_Dump_LL	536822.93912000000	7519149.03011000000
Proposed_BS2_Waste_Dump_LL	536818.66776000000	7519148.28016000000
Proposed_BS2_Waste_Dump_LL	536818.18123200000	7519148.15024000000
Proposed_BS2_Waste_Dump_LL	536815.80644800000	7519147.19049000000
Proposed_BS2_Waste_Dump_LL	536808.56664000000	7519146.91043000000
Proposed_BS2_Waste_Dump_LL	536803.66859200000	7519146.72048000000
Proposed_BS2_Waste_Dump_LL	536803.13265600000	7519146.77052000000
Proposed_BS2_Waste_Dump_LL	536803.03371200000	7519146.78051000000
Proposed_BS2_Waste_Dump_LL	536803.02539200000	7519146.78051000000
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Proposed_BS2_Waste_Dump_LL	536792.82532800000	7519146.30064000000
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Proposed_BS2_Waste_Dump_LL	536781.43780800000	7519144.80086000000
Proposed_BS2_Waste_Dump_LL	536771.89732800000	7519143.90115000000
Proposed_BS2_Waste_Dump_LL	536771.05624000000	7519143.80118000000
Proposed_BS2_Waste_Dump_LL	536771.02334400000	7519143.79107000000
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Proposed_BS2_Waste_Dump_LL	536756.36222400000	7519141.03164000000
Proposed_BS2_Waste_Dump_LL	536756.30449600000	7519141.01168000000
Proposed_BS2_Waste_Dump_LL	536756.27147200000	7519140.99171000000
Proposed_BS2_Waste_Dump_LL	536756.15601600000	7519140.92169000000

Proposed_BS2_Waste_Dump_LL	536756.04888000000	7519140.84169000000
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Proposed_BS2_Waste_Dump_LL	536730.64344000000	7519126.35465000000
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Proposed_BS2_Waste_Dump_LL	536680.34379200000	7519129.63401000000
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Proposed_BS2_Waste_Dump_LL	536668.89854400000	7519131.96348000000
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Proposed_BS2_Waste_Dump_LL	536606.41969600000	7519169.34588000000
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Proposed_BS2_Waste_Dump_LL	536602.91531200000	7519173.97500000000

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Proposed_BS2_Waste_Dump_LL	536593.91076800000	7519183.69302000000
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Proposed_BS2_Waste_Dump_LL	536569.25579200000	7519201.54940000000
Proposed_BS2_Waste_Dump_LL	536568.44760000000	7519201.55939000000



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Proposed_BS2_Waste_Dump_LL	536554.47089600000	7519215.02665000000
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Proposed_BS2_Waste_Dump_LL	536551.44472000000	7519219.74563000000
Proposed_BS2_Waste_Dump_LL	536551.44472000000	7519219.75561000000
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Proposed_BS2_Waste_Dump_LL	536546.66212800000	7519227.42409000000
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Proposed_BS2_Waste_Dump_LL	536545.80452800000	7519229.02384000000
Proposed_BS2_Waste_Dump_LL	536545.47467200000	7519229.23376000000
Proposed_BS2_Waste_Dump_LL	536544.88932800000	7519231.06339000000

Proposed_BS2_Waste_Dump_LL	536545.39224000000	7519231.45328000000
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Proposed_BS2_Waste_Dump_LL	536545.55723200000	7519232.09315000000
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Proposed_BS2_Waste_Dump_LL	536543.79262400000	7519234.31267000000
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Proposed_BS2_Waste_Dump_LL	536543.51217600000	7519235.80233000000
Proposed_BS2_Waste_Dump_LL	536543.52049600000	7519236.11235000000
Proposed_BS2_Waste_Dump_LL	536543.56171200000	7519237.54198000000
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Proposed_BS2_Waste_Dump_LL	536544.05643200000	7519241.04137000000
Proposed_BS2_Waste_Dump_LL	536543.97400000000	7519241.23132000000
Proposed_BS2_Waste_Dump_LL	536543.66065600000	7519241.53123000000
Proposed_BS2_Waste_Dump_LL	536543.37201600000	7519243.13084000000
Proposed_BS2_Waste_Dump_LL	536543.09169600000	7519244.76054000000
Proposed_BS2_Waste_Dump_LL	536543.19064000000	7519245.09052000000
Proposed_BS2_Waste_Dump_LL	536543.42155200000	7519245.89040000000
Proposed_BS2_Waste_Dump_LL	536542.86897600000	7519247.02012000000
Proposed_BS2_Waste_Dump_LL	536542.73713600000	7519248.54985000000
Proposed_BS2_Waste_Dump_LL	536542.74532800000	7519248.57980000000
Proposed_BS2_Waste_Dump_LL	536542.74532800000	7519248.58979000000
Proposed_BS2_Waste_Dump_LL	536542.67940800000	7519248.65980000000
Proposed_BS2_Waste_Dump_LL	536542.81137600000	7519249.97948000000
Proposed_BS2_Waste_Dump_LL	536542.91032000000	7519251.00924000000
Proposed_BS2_Waste_Dump_LL	536542.72881600000	7519254.12860000000
Proposed_BS2_Waste_Dump_LL	536542.63819200000	7519255.72835000000
Proposed_BS2_Waste_Dump_LL	536542.31652800000	7519256.32816000000
Proposed_BS2_Waste_Dump_LL	536541.78059200000	7519257.32796000000
Proposed_BS2_Waste_Dump_LL	536541.01374400000	7519258.80777000000
Proposed_BS2_Waste_Dump_LL	536538.86974400000	7519262.90684000000
Proposed_BS2_Waste_Dump_LL	536538.00395200000	7519263.41680000000
Proposed_BS2_Waste_Dump_LL	536536.06616000000	7519264.52656000000
Proposed_BS2_Waste_Dump_LL	536534.51595200000	7519265.43638000000
Proposed_BS2_Waste_Dump_LL	536532.33086400000	7519266.64611000000
Proposed_BS2_Waste_Dump_LL	536530.45080000000	7519267.71593000000
Proposed_BS2_Waste_Dump_LL	536531.72888000000	7519268.30576000000
Proposed_BS2_Waste_Dump_LL	536532.47102400000	7519268.35580000000
Proposed_BS2_Waste_Dump_LL	536532.81739200000	7519268.42569000000
Proposed_BS2_Waste_Dump_LL	536534.21092800000	7519268.64572000000
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Proposed_BS2_Waste_Dump_LL	536537.12164800000	7519269.87542000000
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Proposed_BS2_Waste_Dump_LL	536539.88401600000	7519293.14070000000
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Proposed_BS2_Waste_Dump_LL	536560.87793600000	7519302.92873000000
Proposed_BS2_Waste_Dump_LL	536560.88625600000	7519302.92873000000
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Proposed_BS2_Waste_Dump_LL	536964.49560000000	7519269.49552000000
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