

Development Proposal and  
Environmental Management Plan  
Project Specific Guidelines

*for*

**Shree Minerals**

**NELSON BAY RIVER MAGNETITE MINE**

Nelson Bay River, North West Tasmania

**Board of the Environment  
Protection Authority  
February 2017**



## 1. General

This document identifies the key issues that must be addressed in the Development Proposal and Environmental Management Plan (DPEMP) for Shree Minerals proposed Nelson Bay River Magnetite Mine.

This document should be read in conjunction with the *General Guidelines for the preparation of a Development Proposal and Environmental Management Plan* ([www.epa.tas.gov.au/assess\\_dpemp\\_guidelines.html](http://www.epa.tas.gov.au/assess_dpemp_guidelines.html)), which provides general information on preparing a DPEMP.

While the DPEMP should evaluate all potential effects of the proposal, the DPEMP should be principally focused on the key issues identified below. The level of detail provided on other issues should be appropriate to the level of significance of that issue for the proposal.

This document identifies the minimum survey requirements and studies required as part of the DPEMP in relation to the key issues.

This document should not be interpreted as excluding from consideration other matters deemed to be significant or matters that emerge as significant from environmental studies, public comments or otherwise during the course of the preparation of the DPEMP.

This document has been prepared on the basis of a permit application (DA 2016/105).

## 2. Key issues

The key issues that have been identified for consideration in relation to the proposal, and which should be the principal focus of the DPEMP, are as follows:

Key issues	
1	Surface water quality
2	Groundwater and pit stability
3	Acid mine drainage, waste rock/tailings management
4	Threatened flora and fauna
5	Closure strategy

### 3. Survey and study requirements

The following surveys and studies will be required as part of the DPEMP in relation to the key issues. The relevant sections of the DPEMP General Guidelines are also identified.

Key Issue	Surveys and studies required for DPEMP	Requirements	Relevant section of DPEMP General Guidelines
1	<ul style="list-style-type: none"> <li>Surface water quality monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Provide an assessment of the potential impact of aqueous emissions from the operation upon the receiving environment</li> <li>Quantify the acid, metal and other pollutant concentrations and mass loads from all existing Acid Rock Drainage sources on site.</li> </ul>	5.2/6.2/6.3
2	<ul style="list-style-type: none"> <li>Groundwater monitoring</li> <li>Pit stability assessment</li> </ul>	<ul style="list-style-type: none"> <li>Provide an assessment of ground water quality and flow pathways and the potential for the proposed mine to impact on groundwater.</li> <li>The assessment of pit stability (DSO and magnetite pits) must demonstrate a pit design that is stable and impermeable, ensuring pit walls adjacent to Nelson Bay River will not be compromised during the mining operations. The assessment must be supported by appropriate geotechnical and engineering advice and studies.</li> </ul>	
3	<ul style="list-style-type: none"> <li>Through geochemical test work (Acid Base Accounting) and modelling, quantify the acid generating potential of waste rock and distribution of potential acid forming rock types / zones within areas to be mined.</li> <li>Quantify the potentially acid forming waste rock (PAF), non-acid forming waste rock (NAF), and if present, acid consuming waste rock (ACM), production rates.</li> <li>Quantify the acid generating potential of ore and tailings.</li> <li>Assess the extent of element enrichment and leaching potential in waste rock and potential for enrichment and leaching in tailings.</li> </ul>	<ul style="list-style-type: none"> <li>Incorporate the full mining depth and extent of Stage 1 and Stage 2 mining into the survey.</li> <li>Identify timing and exposure of potentially acid forming materials for Stage 1 and stage 2 mining, over life of mine</li> <li>Identify elements and concentrations that may be of environmental concern based on background levels.</li> </ul>	2.1/6.5
4	<ul style="list-style-type: none"> <li>Survey for threatened species undertaken in accordance with the Guidelines for Natural</li> </ul>	Provide an assessment of the potential impact of the proposal on Nelson Bay River and tributaries, with attention to threatened aquatic species (e.g. Giant freshwater	6.7

	Values Surveys.	crayfish, <i>Astacopsis gouldi</i> ) and biological communities.	
5	<ul style="list-style-type: none"> <li>Through geochemical test work and modelling, assess the long term acid generating capacity of the mine site after closure, with a focus on the waste rock dumps (NAF and PAF), tailings storage facility, and pits.</li> </ul>	<ul style="list-style-type: none"> <li>Provide details of expected levels (and volumes) of contaminated material to be managed at closure.</li> </ul>	8.0

The following guidelines may be of particular use in helping to prepare the DPEMP:

- Australian Government, Department of Resources, Energy and Tourism, Leading Practice Sustainable Development Program for the Mining Industry series.
  - Preventing Acid and Metalliferous Drainage (2016)
  - Mine closure (2016)
  - Mine rehabilitation (2016)
  - Tailings management (2016)
  - Biodiversity Management (2016)
  - Evaluating Performance: Monitoring and Auditing (2016)

The guidelines maybe downloaded from the following website:

<https://www.industry.gov.au/resource/Programs/LPSD/Pages/LPSDhandbooks.aspx#>

## 4. Detailed requirements for the DPEMP

The following DPEMP requirements are in addition to the requirements of the DPEMP General Guidelines. These additional requirements are grouped under the relevant section number corresponding to the DPEMP General Guidelines.

### 2 Proposal Description

#### 2.1 General

In addition to the matters stipulated in Section 2.1 of the DPEMP General Guidelines the DPEMP must contain the following:

- History of the project;
- Description of the current mine site, including detail on pit development, waste rock dumps, mine infrastructure, AMD treatment facilities, and water management facilities;
- A description of the mineral resource, including the oxidised hematite ore (DSO), beneficial oxide ore (BFO) and magnetite resources, with detail of the percentage ‘Indicated’ and ‘Inferred’;
- An estimate of the projected life of the operation, and expected long-term prospects;
- Description and indicative timeframes of key stages of the proposed development (Stage 1 and Stage 2) of the mine pits (DSO pit and Magnetite pit, including BFO

section), NAF and PAF waste rock dumps and tailings storage facility (TSF) over the mine life. Use explanatory diagrams and flow charts where appropriate to augment text;

- It is noted in DA 2016/105 (page 7) that the proposed development may proceed directly to Stage 2 mining (i.e. not complete the DSO pit). The conditions under which this may occur must be clearly outlined, including a full description of the impact this have on key mine elements (e.g. PAF storage, Water balance etc).
- Description of proposed mining methods, including extraction methods, direction of works, bench heights, ramping and haulage. Extraction plans should demonstrate the resource will be extracted in a systematic manner that will minimise the area of disturbance and allow for progressive rehabilitation of the site (including procedures for top soil and overburden management);
- Description of the major items of equipment (e.g. excavation and haulage equipment, pollution control equipment, processing plant equipment, generators etc) and on-site facilities (e.g. offices, crib rooms, car parks, workshops/maintenance sheds, fuel stores, refuelling areas);
- Detail the types and quantities of materials to be extracted (e.g. DSO ore, BFO ore, magnetite ore, waste rock (see also Section 6.5), including production capacity and production rates (in cubic metres and tonnes per annum) including both peak rates and daily average rates;
- Details of the raw materials required for the proposal (e.g. for TSF construction, see also Section 6.5), including their estimated quantities, characteristics and likely sources (on- or off-site);
- Operational life of the mine, and hours of operation (hours per day and days per week);
- Energy requirements for the mine, including a description of any proposed power line corridor, method of power delivery, operational easements etc.
- Description of all sources of non-mining waste (liquid, atmospheric emissions and solid), and proposed treatment facilities (e.g. sewage, domestic waste water);
- The volume (per day and per year), composition, and route of all vehicle movements likely to be generated during the operational phase, including a break-down for over-dimension and heavy road vehicles.
- Description, including a map, of the current and proposed stream diversions, drainage works, discharge points and drainage control infrastructure (e.g. collection basins/settlement dams, water storage dams etc).

## **2.2 Proposal Description – Construction**

In addition to the matters stipulated in Section 2.2 of the DPEMP General Guidelines the DPEMP must contain the following:

- Details on any pre-construction works, including site preparation works, removal of vegetation and establishment of erosion control measures to reduce the potential transport of pollutants (e.g. suspended solids) from areas of disturbance;
- Details on pre-clearance surveys and sampling to be carried out prior to commencement of construction, including dam geotechnical studies.
- A description and timetable of significant activities during the construction phase of the proposal, e.g. indicative timeframes for the completion of key mine elements (e.g. processing plant, TSF etc), and the likely sequencing of steps;

- Estimates of the quantities of major raw materials required for construction activities (such as clay, sand, aggregate, fill etc);
- Proposed hours per day and days per week of construction activities;
- Volume, composition, and route for vehicle movements likely to be generated during the construction phase, including a breakdown for over-dimension and heavy vehicles.
- Measures designed to prevent the introduction or spread of introduced plant species, weeds, pests and diseases (such as *Phytophthora cinnamomi*) during construction works.

### **2.3 Commissioning**

In addition to the matters stipulated in Section 2.3 of the DPEMP General Guidelines the DPEMP must contain the following:

- A step-by-step description of major commissioning activities, including defined points at which commissioning of key items will be considered completed.

### **2.5 Site Plan**

In addition to the matters stipulated in Section 2.5 of the DPEMP General Guidelines the DPEMP must contain the following:

- A map showing the location of the Mining Lease(s), all elements of the mining operation (current and proposed), and waterways (permanent and ephemeral).

## **5 Existing Environment**

### **5.2 Environmental aspects**

In addition to the matters stipulated in Section 5.2 of the DPEMP General Guidelines the DPEMP must contain the following:

- Identification of PEVs and Key Indicators for Nelson Bay River and tributaries that have the potential to be impacted from the mining operation.
- Quantitative description of the hydrology of Nelson Bay River and East and West creeks, including a summary of results of stream flow catchment monitoring data (with full report(s) as appendix);
- Summary results of all groundwater and surface water quality monitoring, including identification and quantification of acid, metal and other pollutant mass loads from all existing ARD sources on site. Wherever possible these mass loads should be quantified over a range of flow conditions (with full report(s));
- Discussion of the impact of past mining operations on the water quality of Nelson Bay River and East and West creeks;
- Summary results of biological monitoring (with full report(s) as appendix);
- Description of the general physical characteristics of the proposal site and surrounding area, including topography, geology, geomorphology, soils (including erodibility), vegetation, fauna, groundwater and surface drainage.

## **6 Potential Effects and their Management**

### **6.1 Air Quality**

In addition to the matters stipulated in Section 6.1 of the DPEMP General Guidelines the DPEMP must contain the following:

- A discussion of all potential on site sources of dust and other air emissions (e.g. from processing plant and generators) during construction and operation;
- An assessment of the potential for the identified emissions to cause environmental nuisance and health effects beyond the site boundaries, and identification of measures to mitigate identified impacts;
- A description of the local climatology in terms of its ability to suppress or erode and transport nuisance dust from stockpiles and other dust sources. e.g. wind roses;
- A map of the site showing the site boundary, location of nearest residences and other sensitive uses; and
- Discussion of compliance with *Environment Protection Policy (Air Quality) 2004* and Air NEPM standards.

## 6.2 Surface water

In addition to the matters stipulated in Section 6.2 of the DPEMP General Guidelines the DPEMP must contain the following:

### Water Balance

- A detailed description, including map(s), and quantitative analysis of the water balance at; 1) the current mine site, and 2) at key stages in the development of the proposed mine, including all development scenarios (see comment under 2.1).
  - The water balance must include details of mine site surface water flows and water transfer routes, discharge/decant points (storm related or otherwise), receiving drainage/fluvial features, water requirements for each mine element (including any freshwater input requirements), process/tailings water flows, water storage facilities, groundwater recharge into the mine pit(s), and all current acid and metalliferous drainage (AMD) point sources and seeps. The analysis must consider variations in precipitation and natural flow, accounting for extended dry periods and periods of excessive rainfall.

### Acid and Metalliferous Drainage (AMD) (including neutral metalliferous drainage)

- Discussion of historical and current acid mine drainage formation on site, including sources (e.g. NAF and PAF waste rock dumps, pit etc), mass loads, quality and volumes;
- Discussion of current AMD treatment facilities;
- Discussion of the potential for AMD formation, including potential sources (e.g. waste rock dump, tailings dam, DSO and magnetite pits), pathways off site (e.g. seepage, decant water, pumping discharge) and volumes;
  - The discussion must provide an assessment of the expected emission levels and quality of all emitted water, including seepage and decant, and the expected impact on the receiving environment, with attention given to Nelson Bay River and tributaries likely to be impacted by the mine. The discussion should consider variations in precipitation and flow, accounting for extended dry periods and periods of excessive rainfall;
- Discussion of best practice mitigation measures and management strategies that will be implemented to; 1) prevent and mitigate the formation of acid and metalliferous drainage and (see also section 6.5), and 2) for the collection and treatment of acid and metalliferous drainage which cannot be prevented from occurring, to ensure the protection of the region's water resources.

- Detailed assessment of the potential impact of AMD from the proposed mining operation on the water quality of Nelson Bay River and East and West creeks.

#### Other pollutants

- An assessment of the potential for sediment to enter and impact on receiving waters through storm water run-off during both the construction and operational phases of the mine, and entrainment from vehicle movements (across drainage lines/waterways). Include details of mitigation measures and management strategies to prevent the sourcing and mobilisation of sediment (e.g. erosion control measures), and transport of sediment off-site (e.g. settlement dams etc);
- An assessment of the potential impact of hardstand stormwater run-off (e.g. car park, workshop etc), and sewage and domestic wastewater effluent on receiving waters, including a description of mitigation measures and management strategies to prevent, mitigate or reduce pollution potential. Facilities to collect and treat non-mining liquid wastes (e.g. sewage and wastewater) must be described together with the resultant concentrations and mass loads of pollutants to be emitted after treatment;

### 6.3 Groundwater

In addition to the matters stipulated in Section 6.3 of the DPEMP General Guidelines the DPEMP must contain the following:

- Detail on the hydrogeology of the mine site and surrounding area;
- Results of groundwater monitoring, including detail of all current and proposed bore locations.
- Assessment of the potential impact of all aqueous emissions from the mining operation (e.g. DSO and magnetite pits, TSF, waste rock dumps).
- Assessment of the impact of the water management system (e.g. water storage features, abstraction, and mine pit (DSO and magnetite) dewatering) on the surrounding groundwater resource (quantity and flow) and surface waters (i.e. Nelson Bay River).
- Mitigation measures and management strategies to ensure protection of the region's groundwater resources.
- Results of pit stability assessment. The assessment of pit stability (DSO and magnetite pits) must demonstrate a pit design that is stable and impermeable, ensuring pit walls adjacent to Nelson Bay River will not be compromised during the mining operations. The assessment must be supported by appropriate geotechnical and engineering advice and studies.

### 6.5 Waste management

In addition to the matters stipulated in Section 6.5 of the DPEMP General Guidelines the DPEMP must contain the following:

#### Waste rock characterisation

- Detailed assessment of waste rock types, mineralogy, and geochemical characteristics, including results of all geochemical test work (static and kinetic testing) and assessment of their acid generating (or neutralising) potential.
  - Note, sufficient geochemical test work must be undertaken in order to clearly demonstrate the acid forming or non-acid forming potential of all waste rock from Stage 1 (DSO pit) and Stage 2 (magnetite pit) mining. Detailed



geochemical assessment and analysis must be presented in the DPEMP, including detail on the drilling program and sample selection methodology. The assessment must also clearly describe any limitations of sample selection and or the drilling program.

- Assessment of the extent of element enrichment and leaching characteristics of the waste rock from Stage 1 and Stage 2 mining.
- Description of the distribution of potential acid forming rock types / zones within areas to be mined during Stage 1 and Stage 2.
- An estimate of the quantities and production rates of potentially acid forming (PAF) waste rock, non-acid forming (NAF) waste rock and acid consuming (ACM) waste rock from Stage 1 and Stage 2 mining;
- Proposed reuse (as relevant) of non-acid forming waste rock types for civil construction or other purposes.

#### Waste rock dumps

- Detailed description of all proposed NAF and PAF waste rock dumps, including details on location, design (including lining, cell construction, permeabilities, capping etc), dimensions, drainage collection, dump monitoring (e.g. O<sub>2</sub>, lysimeter, etc) and final landform.
  - Note, the description must account for all proposed scenarios, including proceeding directly to Stage 2 mining (see comment in 2.1).
- Detail on proposed disposal practices and management of the NAF and PAF dumps (including, laying, compaction, segregation, blending, liming etc) to minimise acid rock drainage formation, erosion, and ensure long term geotechnical and geochemical stability of the dumps.
- Detailed description of waste rock segregation and verification practices to ensure the effective management and placement of PAF materials. The description must include PAF separation process, auditing procedures (external and internal), on site and external laboratory testing and analysis, procedures to trace blast benches to their horizontal and vertical position within the waste dumps, reporting of separation and verification success.

#### Tailings and ore characteristics

- Detailed description of the ore and tailings mineralogy and geochemical characteristics, including an assessment of their acid generating (or neutralising) potential and estimated quantities and production rates (for PAF/NAF and ACM classified tailings). The description must include results and analysis from of all static and kinetic test work.
- An Assessment of the extent of element enrichment and leaching potential of the tailings.

#### Tailing Storage Facility (TSF)

- Description of the TSF including detail on the design, permeability and construction of all elements (including proposed lifts as relevant).
- Describe all quality control measures that will be in place during the construction phase of the TSF, including sourcing of all material, clay, waste rock etc. If mine site waste rock is to be used in construction, detail must be provided in relation to the

scheduling of the mine waste rock to meet dam construction requirements, accounting for potential variability in waste material during mine scheduling with emphasis on ARD generation capacity.

- Description of the method of tailings delivery and management (e.g. pH control).
- Detail on the closure strategy taking into account tailings geochemistry and potential for acid generation, dam permeability, hydrology, and long term geochemical stability.

### **6.7 Biodiversity and natural values**

In addition to the matters stipulated in Section 6.7 of the DPEMP General Guidelines the DPEMP must contain the following:

- Results of threatened species survey(s).
  - Surveys must be undertaken in accordance with the Guidelines for Natural Values Surveys - Terrestrial Development Proposals, which can be found at: <http://dpiwwe.tas.gov.au/conservation/development-planning-conservation-assessment/survey-guidelines-for-development-assessments>
  - Surveys should include consideration of Tasmanian Devils (including impacts from any increase in traffic) in accordance with the Devil Guidelines. This assessment should include consideration of the presence of ‘virtual fencing’ for approx. 3.5 km along the Arthur River Road).
- An assessment of the potential impact of the proposal on threatened species, taking into account all likely impacts of the proposal including AMD and groundwater drawdown.
- The confirmed presence of *Astacopsis gouldi* at sites in the Nelson Bay River is significant, and an extension of the known range of this species. Impact from AMD and sediment is an acknowledged threat to this species. The DPEMP must clearly demonstrate how impacts to this species will be minimised/avoided through Stage 1 and Stage 2 mining, and on closure.
- Description of an ongoing *Astacopsis gouldi* monitoring programme.

### **6.15 Hazard Analysis and Risk Assessment**

In addition to the matters stipulated in Section 6.15 of the DPEMP General Guidelines, the DPEMP must contain the following:

- A risk assessment incorporating the requirements of Australian/New Zealand Standard AS/NZS 4360:1995 *Risk Management*, or equivalent, should be conducted, to identify all credible risks associated with specific major hazard events identified through hazard analysis. The risk assessment should identify measures to avoid and mitigate potential adverse effects.

The following issues should be addressed by the risk assessment (where relevant):

- Identify hazard events with the potential to cause a major accident or significant impact on people or the environment. This should include consideration of the risks associated with malfunctions, accidents or fires, in addition to those posed by natural disasters such as storms, bushfires, and floods, including the impact of extreme rainfall events or flooding on the acid mine drainage management system. For each hazard event, estimate the frequency and consequence of such an event occurring;
- Identify high risk locations and facilities;

- Describe technical and management safeguards to be employed to assess and minimise the likelihood of occurrence and the consequences of identified hazard events; and
- Define the objectives and management principles to be adopted for the preparation of a detailed emergency plan (including emergency response, recovery/cleanup procedures and consultation with relevant emergency services).

### **6.20 Traffic impacts**

In addition to the matters stipulated in Section 6.20 of the DPEMP, the following comment was provided by Forestry Tasmania:

- Forestry Tasmania (FT) has a current Forest Road Use Agreement with Shree Minerals Ltd, which authorises the company to use Wuthering Heights Rd and Wuthering Heights Spur 10, for general and heavy vehicular access for the purpose of mining and transporting iron ore.
- FT intend to arrange for an additional agreement with Shree Minerals Ltd, for the use of the relevant sections of Sumac Rd and Roger River Rd, that FT maintain north of Kanunnah Bridge.

### **7.0 Monitoring and Review**

In addition to the matters stipulated in Section 7.0 of the DPEMP General Guidelines the DPEMP must contain details of the following:

- Surface water monitoring program for products which may be precursor indicators of acid mine drainage;
- Groundwater monitoring program for products which may be precursor indicators of acid mine drainage;
- Aquatic invertebrate monitoring program (including *Astacopsis gouldi*), incorporating an assessment of river health using a suitable model (e.g. AusRivAS). The monitoring should include reaches of Nelson Bay River extending from the mouth to a point upstream of the development footprint, and incorporate an appropriate number of control sites;
- A fish monitoring program;
- Waste rock monitoring program, incorporating external and internal auditing procedures to identify, test, and track PAF waste rock;
- Tailings monitoring program to identify and test for PAF tailings; and
- A map showing the location of all existing and proposed surface, groundwater and biological monitoring sites.

### **8.0 Decommissioning and rehabilitation**

Due to the finite nature of mining operations and their susceptibility to external economic influences, mine closure planning should commence before the operation commences. The DPEMP should contain sufficient detail to enable a bond to be established to protect the Crown from future liabilities in the event of unforeseen mine closure or company failure.

In addition to the matters stipulated in Section 8.0 of the DPEMP General Guidelines the DPEMP must contain the following:

- A mine closure plan for end-of-mine life and premature mine closure with a framework for regular review as development of the mine occurs. This should consider, as a minimum, the following:

- Consideration of long term stability (*i.e.* post-mine closure);
  - Potential for acid mine drainage (AMD), including sources, pathways to water environment and volumes/mass loads in the long term (including subsequent to the life of project);
  - Tailings dam, waste rock dump (NAF and PAF) and mine pit closure plans;
  - Ongoing AMD mitigation measures, including maintenance requirements;
  - The proposed method of rehabilitation of disturbed areas, including the replacement of stockpiled topsoil and revegetation techniques to be applied and contingencies to achieve satisfactory rehabilitation, should the operation cease early;
  - Post closure monitoring programs; and
  - Management strategies for decontamination.
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- Determination of a cost estimate, based on the closure (decommissioning and rehabilitation) concepts correlated to the proposed level of development/disturbance associated with the project. It is envisaged that with future revisions of the closure plan, revision of the closure cost estimate will also be undertaken to more accurately reflect the true cost of decommissioning and rehabilitation of the site.